



**Hay Point Peat Mine Development
Manitoba Environment Act Proposal**
FINAL REPORT
October 2011

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October 28, 2011

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ATTENTION: Ms. Tracey Braun, M.Sc.
Director

RE: Sun Gro Horticulture Canada Ltd.
Hay Point Peat Mine Development
Environment Act Proposal

Dear Ms. Braun:

On behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro), KGS Group is pleased to submit 24 paper and 9 electronic copies of the Environment Act Proposal submission for the proposed Sun Gro Horticulture Canada Ltd. Peat Mine Development at Hay Point Bog. As part of the licencing process a Manitoba Conservation Environment Act Proposal Form with the \$5,000.00 application fee has been included with this Environmental Assessment report.

Please do not hesitate to contact Mr. Shaun Moffatt or the undersigned if you have any questions or require additional information.

Yours truly,

J. Bert Smith, P. Eng.
Principal

SM/jr
Enclosure

cc: Connie Proceviat, Sun Gro Horticulture Canada Ltd. (5 copies)

EXECUTIVE SUMMARY

Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) was contracted by Sun Gro Horticulture Canada Ltd. (Sun Gro) to prepare a Manitoba Environment Act Proposal (EAP) for the proposed peat mining development at Hay Point Bog. Sun Gro would like to obtain an Environmental Act Licence for peat harvesting operations at the Hay Point Bog. The proposed peat mine development will not likely result in significant adverse environmental effects, based on the available information for this project, the environment, the assessment of environmental effects outlined in this environmental assessment report, and application of proposed mitigation measures, including conducting the required follow-up.

Sun Gro is the largest producer of peat moss in North America and the largest distributor of peat moss and peat-based growing media products. In order to sustain their current needs it is necessary to develop bog sites in the Interlake region for future peat moss harvesting. Sun Gro had secured these leases approximately 16 years ago in anticipation of this future need. The purpose of the proposed development is to continue to provide quality peat-based growing media products to meet the demand of their distribution network in over 40 countries worldwide.

The scope of the project includes planning, designing, constructing, operating, maintaining and eventual decommissioning and restoration of the proposed peat development at Hay Point Bog. The scope of the assessment included identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. The scope of the assessment also included consideration of direct and indirect biophysical and socio-economic effects, including cumulative environmental effects.

The Class 2 peat mining development will include an access road, bog roads, drainage ditch system with settling ponds and an on-site facility and equipment storage area. Major project activities include providing access, clearing vegetation and surface soils, harvesting and stockpiling unprocessed peat, excavating and trenching, transporting peat and restoring harvested peatland.

The environmental assessment of the proposed peat development was carried out based on project information provided by Sun Gro and the advice document from Manitoba Conservation. Additional considerations included environmental information acquired from literature, internet searches, and publications by the peat industry and environmental organizations; contacts with federal and provincial government representatives; consultations with stakeholders; and site investigations by the project team.

Information regarding the proposed peat development project has been provided to stakeholders in the region through various means, including phone conversations and letters. Stakeholders included Manitoba Conservation (in particular Parks and Natural Areas Branch), Grindstone Cottage Owners Association, Hecla Oasis Resort, Hecla Tourism Association, Rural Municipality (RM) of Bifrost and Peguis First Nation. Concerns expressed by the stakeholders and mitigation measures to address these have been discussed throughout this EAP.

Potential environmental effects of the proposed peat mine development were identified using scoping methods, interaction matrix techniques, public comments, advice from specialists and professional judgment. Effects of accidents and malfunctions, effects of the environment on the project and cumulative environmental effects were also determined. Mitigation measures were identified to eliminate, reduce and control environmental effects determined to be adverse. Follow-up was proposed to verify the accuracy of the assessment and determine the effectiveness of the mitigation measures. Significance of the residual environmental effects remaining after mitigation was then evaluated.

Potential adverse environmental effects of the proposed peat mine development assessed to be major in the environmental assessment included the loss and disturbance of soil (harvested peat), risk of fire (and explosions), and potential for accidents during the transportation of peat. Additional environmental effects assessed to be potentially moderate included; increased dust and particulates; modified drainage pattern; increased sediment levels in surface water; change in receiving water quality; disturbance of fish habitat; loss of wetlands and herpetile habitat; clearing of vegetation; loss of wildlife habitat; contamination of soil and surface water; increased traffic and the associated public attitude. Positive effects identified included improvements in economic conditions, business opportunities and employment, as well as an increase in dust control and, during restoration, an increase in diversity of flora and fauna.

With mitigation and follow-up, the residual effects of the project for all of the potential adverse effects were determined to be not significant. There are no known historic resources or federally protected endangered plants and animals in the vicinity of the proposed peat mine development area.

Mitigation for potential adverse effects identified for the proposed peat mine development included a wide variety of design and proposed measures, regulatory requirements and management practices. Some of the more important mitigation measures to address the adverse effects included:

- Minimizing surface area disturbed and leaving non-commercial peat reserves in place;
- Draining water to sedimentation ponds and discharging to the existing drainage system;
- Instructing employees on proper harvest equipment operation to minimize dust;
- Moistening stockpiles, regular removal of stockpiled materials and covering loads being hauled from the site;
- Using low sulphur fuels, muffling vehicles and equipment, and requiring a high standard of maintenance of vehicles and equipment and limiting unnecessary long-term idling;
- Preventing leaks, spills and releases and requiring drip trays for equipment and secondary containment for fuel storage;
- Designating fuel storage and re-fueling areas and providing spill clean-up equipment and materials;
- Preparing and regular updates of emergency response plan including fire; and
- Implementing a mine closure plan to restore vegetation, surface water to predevelopment conditions;
- Ensure workers are aware of provincially rare orchid species outside of development area.

Follow-up identified for the proposed peat mine development included a variety of inspecting, monitoring, record keeping and reporting requirements. Proposed inspection involves periodic observations of the project and local areas for microclimatic changes, dust accumulation, VOC sources, leaks, spills and releases, potential soil contamination, noise levels, surface water runoff, erosion and maintenance of re-vegetated areas. Proposed monitoring includes periodic sampling of surface water quality as required and semi-annual monitoring of surface water quality. Record keeping includes maintaining operation files, documentation related to mitigation measures and follow-up implemented such as the mine closure plan and tracking public complaints. Reporting requirements for the proposed peat mine development will be placed in the public registry for the project and an annual summary of the detailed reports filed immediately following incidents that require implementation of the emergency response plan.

The proposed peat mine development project will not likely result in significant adverse environmental effects, based on the available information on the project and the environment, the assessment of environmental effects outlined in this environmental assessment report, and the application of proposed mitigation measures and conducting of required follow-up.

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1.0 INTRODUCTION

Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) was retained by Sun Gro Horticulture Canada Ltd. (Sun Gro) to prepare a Manitoba Environment Act License Proposal for the proposed peat mining development. The proposed project consists of developing a peat mining operation in an area of undisturbed bog within the Hecla/Grindstone Provincial Park in the Interlake area of Manitoba. An Environmental Act Proposal (EAP) is required for all environmentally significant developments within the province of Manitoba, under the Environment Act (C.C.S.M. c. E125). The purpose of this EAP is to ensure that the proposed peat mining operation is designed, constructed and operated in an environmentally responsible manner consistent with provincial environmental legislation, policies and guidance. A peat mining operation such as the one proposed by Sun Gro is considered a mining development under Manitoba Regulation 164/88 and is therefore considered a Class 2 Development. The EAP will be prepared in accordance with *Manitoba Conservation's Advice for the Preparation of an Environment Act Proposal for a Class 2 Peat Mining Development*. An Environmental Impact Statement (EIS) will also be included as part of the EAP as required by the province of Manitoba, Mineral Resource Division. This will also satisfy the requirements of the Parks and Natural Areas Branch project impact assessment review process.

1.1 CORPORATE INFORMATION

Sun Gro is the largest producer of peat in North America and the largest distributor of peat moss and peat-based growing media products to the North American professional plant growers market. Sun Gro sells products primarily to professional greenhouse, nursery and specialty crop growers throughout North America, as well as to golf course developers and landscapers.

Sun Gro was founded in 1929 in Vancouver, British Columbia as the Western Peat Company Ltd., as a producer of peat moss. Initial success enabled the company to grow and its operations expanded throughout British Columbia and eastward into central Canada. The business has had a number of owners over the years and was acquired by Hines in June 1993. In 1995, Hines was acquired by Madison Dearborn Partners II, L.P. ("Madison Dearborn"), a Chicago based private equity firm. Madison Dearborn introduced a new management team to Sun Gro in 1997, led by Mitch Weaver, as Chief Executive Officer.

Sun Gro operates in 28 separate locations throughout North America, many of which in small rural towns and are committed to providing jobs that are safe and pay a fair wage. Sun Gro employs over 800 people and contributes to the economic well-being of local communities. Sun Gro is also committed to minimizing the impact on the local environment and takes great pride in their stewardship of natural resources. Peat moss is a renewable resource, and Sun Gro manages their bogs so that less peat moss is harvested in any given year than is being naturally replenished.

1.2 ENVIRONMENTAL ASSESSMENT

The purpose of this EAP is to obtain an Environmental Act Licence for Sun Gro peat harvesting operations at Hay Point Bog located within the Hecla/Grindstone Provincial Park of Manitoba.

1.3 PREVIOUS STUDIES AND ACTIVITIES

The study of peatland areas in southern Manitoba conducted by Bannatyne for the Manitoba Department of Energy and Mines was reported in 1980 entitled, *Sphagnum Bogs in South Manitoba and their identification by Remote Sensing*, included the Hay Point Bog proposed for development ⁽¹⁾. The study presented results of a survey of selected bog areas in southern Manitoba and evaluated their potential for commercial development of *Sphagnum* peat moss. As well, KGS Group completed a field survey during the winter of 2010 and 2011 which included sampling and testholes within the Hay Point Bog site to determine the potential peat volume and quality ⁽²⁾.

1.4 REPORT ORGANIZATION

The environmental assessment report on the proposed Hay Point peatland development project in the Interlake area of Manitoba is organized into ten chapters and appendices as follows:

1.0 Introduction

The purpose of the environmental assessment is discussed and the organization of the report is described. Corporate information for Sun Gro is also presented.

2.0 Scope

The scope of the project and the environmental assessment for the proposed peatland development is outlined.

3.0 Project Description

The proposed peatland development is described in general and specific terms. Project need, purpose and alternatives, as well as the proposed schedule and funding are discussed. The project is broken down into components and activities for the purpose of the environmental assessment.

4.0 Environment Description

The existing environment at the proposed peatland development and the surrounding area is described in general and specific terms. The environment is broken down into biophysical, social and economic components for the purpose of the environmental assessment. Valued Ecosystem Components (important, protected or valued components of the environment) or VECs are identified to focus the assessment of environmental effects.

5.0 Public Consultation

Consultations carried out as part of planning for the proposed peatland development and the environmental assessment of the project are reviewed. Comments and concerns expressed by the public and stakeholders are summarized, and actions taken or proposed to address issues and concerns are outlined.

6.0 Environmental Effect Analysis

Potential environmental effects of the proposed peatland development on biophysical, social and economic conditions are identified and assessed. Mitigation measures are proposed, follow-up needs are identified and significance of residual effects are evaluated. The effects of accidents and malfunctions, cumulative effects and effects of the environment on the project are

also considered. Sustainability of the proposed peatland development is discussed in relation to Manitoba's principles and guidelines of sustainable development.

7.0 Mitigation Measures

Measures identified by the environmental assessment to mitigate potential adverse effects of the proposed peatland development are summarized.

8.0 Follow-up Summary

Follow-up requirements identified by the environmental assessment of the proposed peatland development are summarized.

9.0 Conclusions

Conclusions on the significance of residual environmental effects of the proposed peatland developments are presented.

10.0 References

Literature and websites consulted as part of the environmental assessment as well as contacts with governments, stakeholders and the public are listed.

The appendices contain background information on the proposed peatland development, existing environment, environmental effects and public consultation.

2.0 SCOPE

2.1 SCOPE OF THE PROJECT

The scope of the project includes planning, designing, constructing, operating, maintenance and eventual decommissioning and restoration of the proposed peatland development at Hay Point Bog. The scope does not include the construction of a processing or packaging plant at this time.

The proposed peatland project includes the development of Hay Point Bog, which is entirely within the Hecla/Grindstone Provincial Park in the Interlake area of Manitoba. The project is located in an area along the western shoreline of Lake Winnipeg where peat covers between 81 and 100% of the total area (Figure 1). The entire production lifespan of the proposed development is estimated to be approximately 45 years based on the estimated peat capacity at Hay Point Bog. The project includes development of an access road, bog roads, drainage ditch system with settling ponds and an on-site facility and equipment storage area. Major project activities include providing access, clearing vegetation and surface soils, harvesting and stockpiling unprocessed peat, excavating and trenching, transporting and restoring harvested peatland.

2.2 SCOPE OF THE ASSESSMENT

The scope of the assessment for the proposed peatland development includes identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. The scope includes direct and indirect biophysical and socio-economic effects, including cumulative environmental effects. The need for the project, alternatives to the project and requirements for a follow-up are considered in the assessment.

The spatial boundary of the environmental assessment is the project study area and regional study area (Figure 2). The project study area includes the development area defined by the quarry lease boundary and the area within a 3 km radius of the quarry lease boundary (6,414 ha), whereas the regional study area includes the area within a 10 km radius of the quarry lease

boundary (41,883 ha). Direct and indirect biological and physical environmental effects of the project are considered within the project study area, while socio-economic and cumulative environmental effects are considered in the regional study area.

The proposed development is located in an unorganized area of Crown land in Division No. 18. The Rural Municipality of Bifrost, is within the project study area and will be considered during the assessment because of economic opportunities that will develop and also because the peat will be transported along provincial trunk highway (PTH) 8 to the existing processing and packaging plant located near Elma, Manitoba.

The assessment considered comments received from government reviewers, stakeholders and the public.

3.0 PROJECT DESCRIPTION

3.1 OVERVIEW

The proposed peatland project includes the development of Hay Point Bog within the Hecla/Grindstone Provincial Park in the Interlake area of Manitoba. The entire production lifespan of the proposed development is estimated to be approximately 45 years. Development of the Hay Point Bog is anticipated to begin in the winter of 2012/2013 once the necessary approvals are received. Peat harvesting is anticipated to begin in 2013 with the development of the peat bog occurring in approximately 60 ha increments.

3.2 PEAT INDUSTRY IN CANADA

Peatlands are wetland ecosystems that are characterized by the accumulation of partially decomposed organic matter. It is estimated, that peatlands in Canada cover 113 million ha, and over the past 70 years a total of only 17,000 ha has been harvested. As well, over 70 million tonnes of peat accumulate each year within Canada, with only 1.3 million tonnes of this harvested by the sphagnum peat moss industry ⁽³⁾.

North American Wetlands Conservation Council Committee reported in 1999 ⁽⁴⁾ that approximately 85% of peat harvesting operations in Canada produced horticultural peat and approximately 99% of the national production came from the combined operations of 15 corporations. These 15 corporations currently form the Canadian Sphagnum Peat Moss Association (CSPMA).

Southern and southeastern Quebec and eastern and northeastern New Brunswick are the primary focus area of horticultural peat mining operations. Alberta, southern Saskatchewan and Manitoba as well as Nova Scotia, Prince Edward Island, Ontario and Newfoundland ⁽⁴⁾ have some peat mining operations.

Peat harvesting occurs primarily in the boreal wetland regions, in particular in the Atlantic and Low Boreal Regions ⁽⁴⁾. These boreal regions, which are characterized by the bog wetland type are the focus of horticultural peat developments in Canada.

Weakly decomposed peat is the preferred choice for horticultural use. This type of peat is composed mainly of Sphagnum moss. A thick layer of weakly decomposed peat can only be found if the right combination of climatic and topographic conditions exists. Daigle and Gautreau-Daigle ⁽⁴⁾ list several issues that are considered in the selection of a peatland utilized for peat harvest. These issues include the following:

1. Peat quality must meet marketing requirement;
2. The thickness of the high quality peat layer must be sufficient to warrant development. An average depth of 2 m is a minimum;
3. The aerial extent of the peatland should be large enough to warrant development. An area of 50 ha is required, occasionally a smaller site area is also developed;
4. The peatland must have good potential for development of enhanced drainage;
5. Proximity to transportation infrastructure, low density of tree cover, availability of a labour force, access to electrical power and similar factors are preferred; and
6. Climatic factors must be suitable for drying of the peat layer during the harvesting period, such as, there being appropriate periods of consecutive days without rain.

In 2005, total world-wide peat production for horticultural, fuel and other purposes was over 26 million tonnes ⁽⁵⁾. Approximately 16 million tonnes of peat production was used as fuel, whereas only 5 million tonnes was utilized for horticultural purposes. In 2005, on an international basis, Canada ranked first followed closely by Finland in the global production of horticultural peat production. At this time, none of the peat produced in Canada was utilized for fuel consumption ⁽⁵⁾.

Mr. Dunfield presented various methods for harvesting peat as described in *Methods of Harvesting Peat Moss at the 1975 Seminar on Peat: A resource in Manitoba's Agriculture and Industry*. Three main methods are summarized below ⁽⁶⁾:

Block method – Is a method that utilizes manual labour or machines to dig peat blocks. The blocks are subsequently stacked in fields to dry and then stored in buildings during winter months.

Vacuum or Milling Process – Peat is vacuumed and stored in the field before being processed.

Dredging System – Is a continuous, direct line of extraction, dewatering and drying and delivery to the packing plant.

3.3 PEAT INDUSTRY IN MANITOBA

The peat moss industry in Manitoba has been discussed in several reports in the 1975 *Proceedings of the Seminar on Peat: A Resource in Manitoba's Agricultural and Industry* by Mr. Bannatyne, Mr. Lunan, Mr. Smith, Mr. Dunfield and many other experts at the time.

The first peat production in Manitoba was from the Julius Bog in 1941, which produced 1,480 tonnes of peat moss in its first year. In 1964, Western Peat Moss Ltd. obtained peat permits to mine at the “Medika” or Elma Bog. However, production of peat at Medika Bog was not in process until 1970. In 1973, Evergreen Peat and Fertilizer Ltd. brought the Evergreen Bog into production. Approximately 42,500 m³ of moss were produced annually at the Evergreen Bog ⁽⁷⁾. Lunan reported that Manitoba has an estimated 19 million ha of peatland, which is of similar size to the amount of agricultural land available in the province ⁽⁸⁾. The three bogs that were in commercial production between the late 40's and 70's produced over 30,000 tonnes of peat, with a dollar value of approximately \$1.8 million. The majority of peat moss produced during this time period was sold to the United States market for horticultural uses.

Manitoba has approximately 19.3 million ha of peatland, which makes up approximately 35% of Manitoba's land surface, ranking second to glacial till ⁽⁹⁾. Approximately 5.1 million ha of these peatlands are located in the area north of Lake Winnipeg that is primarily used for agriculture. The organic deposits are distributed throughout the cool, Subhumid Boreal Forest Region of eastern and central Manitoba and in the cold, humid, Subarctic Region of the Hudson's Bay Lowland in the northeastern corner of the province (Figure 1). However, the quality and quantity of peat moss in some of these peatlands are unknown due to lack of studies and inaccessibility to the areas ⁽⁸⁾.

3.4 PROJECT LOCATION

The proposed peat development at Hay Point Bog is located within the Hecla/Grindstone Provincial Park in the Interlake of Manitoba, approximately 21 km northeast of Riverton, Manitoba and approximately 600 m west of Grindstone Road which runs north from PTH 8 as it

enters the Hecla/Grindstone Provincial Park (Figure 2). The development area is approximately 800 m east of the west boundary of the park and the R.M. of Bifrost. This is also the boundary with the Peguis First Nation Community Interest Zone (CIZ) (Figure 2).

As the proposed project lies on Crown Land, there are no Certificates of Titles available for the properties, however Sun Gro holds the mineral rights for the development area under Manitoba quarry leases as shown in Figure 2 and provided in Appendix A. The proposed development at Hay Point Bog includes quarry leases (QL) 475, 476, 477 (Table 1). This covers a total area of approximately 531 ha in size and is located on part of Sections 17 to 20 Township 25, Range 5. Within the total 531 ha, approximately 375 ha is proposed to be developed as shown in Figure 3 in approximately 60 ha sections. The development area is estimated to contain approximately 12.5 million m³ of *Sphagnum* moss with an average harvestable depth of approximately 3.3 m. This is equivalent to approximately 1.3 million tonnes of product assuming 0.1 tonnes of product per cubic metre of peat harvested. It has an absorptive value of 18.9 (25.6 dry) and contains very low sedge content, ranging from 1 to 33 percent ⁽¹⁾. The quality of the moss is generally good, except for the upper layer of woody peat.

3.5 NEED AND PURPOSE OF PROPOSED DEVELOPMENT

Sun Gro is the largest producer of peat moss in North America and the largest distributor of peat moss and peat-based growing media products. In order to sustain their current needs it is necessary to develop bog sites in the Interlake region for future peat moss harvesting. Sun Gro had secured these leases in anticipation of this future need. The purpose of the proposed development is to continue to provide quality peat-based growing media products to meet the demand of our distribution network in over 40 countries worldwide.

3.6 PROJECT COMPONENTS AND ACTIVITIES

3.6.1 Project Components

The proposed peatland development project will include the following components:

Access Roads

The access road will be 10 m wide with a 2 percent minimum grade. Two ditches will be constructed with one on either side of the road and will have a slope of 4:1 and a width of 7.5 m. A typical road construction layout is shown in Figure 4. Topsoil and any other material not suitable for the road base will be stripped and spread on the sides of the road. Material excavated during ditching will be used to build the road base. If required, gravel will be hauled on-site from the nearest available source and spread to a thickness that will be determined on-site after evaluating the road base condition. Construction of the access road to the proposed development will start with site preparations and construction at the site. Approximately 750 m of road heading west from Grindstone road to the northeast edge of Hay Point Bog QL 475 will be constructed along the existing cleared cutline (Figure 3) during the winter of 2012/2013.

The proposed access road requires the installation of a culvert to convey land drainage within the Grindstone Road roadside ditch. The roadside ditch conveys runoff to an existing culvert crossing of the Grindstone Road, located approximately 300 m north of the proposed access road location. The flow through the existing crossing discharges to Lake Winnipeg. The natural drainage basin for the Grindstone Road crossing is approximately 3.05 km², as shown on Figure 5. For the design condition, the ditch at the proposed access road crossing location could convey up to 50% (1.5 km²) of the drainage area flow.

The installation of the proposed access road culvert, as shown in Figure 3, will have no impact on the natural drainage pattern. The ditch at the proposed crossing location is approximately 1.5 m wide and 1.2 m deep. The proposed culvert has been designed to a 1 in 33 year storm event and has been designed to pass flow in accordance with Manitoba Infrastructure and Transportation (MIT) standards for PR roadside ditches.

The Rational Method was used for flow calculations, utilizing the nearest recorded precipitation data at the City of Gimli. This method considers the precipitation and the land characteristics to calculate the anticipated runoff. Due to the prevalence of bog area, a reduction factor was applied to the flow value to account for water retention. The Modified Rational Method, as established by the Province of Manitoba, was also used as a secondary method for calculating discharge rates. The more conservative design discharge was used. The flow calculated for the drainage area at the proposed access road location is 0.47 m³/s. To convey this flow, while maintaining the headwater level below the pipe obvert, a 900 mm diameter CMP culvert will be required. The design event would produce a headwater approximately 0.2 m below the top of the pipe with an exit velocity of 1.14 m/s.

The existing 3 culvert crossings along Grindstone Road that are located south of the proposed access road convey the drainage from the bog and the surrounding forested areas. The sub basin is approximately 17.7 km² and contains the entire Sun Gro Hay Point Bog (Figure 5). The drainage plan (Figure 3) has been designed to follow the natural runoff patterns, and will direct flow to the three unnamed streams (including what has been labeled as Hay Creek in this report) that discharge to Lake Winnipeg through the existing Grindstone Road crossings. The drainage plan for the Hay Point Bog has been designed such that it will not change the total overland flow to these culverts. However, flow rates were calculated so that the existing culvert capacities could be analyzed.

The Rational Method was used to estimate the 1 in 33 year storm event, utilizing the nearest recorded precipitation data at the City of Gimli. Typically, the methodology for a drainage area of this size integrates the results of the Rational Method and a Frequency Analysis (as established by the Province of Manitoba) to calculate a design flow. However, it was determined that flow data for a representative watercourse did not exist, so the Rational Method was used with conservative reduction factors so that the presence of wetlands in the sub basin was not overestimated. The total flow calculated for the drainage area is 2.18 m³/s. This flow is conveyed through the 3 culverts, each passing a percentage of the total discharge. Further delineation of flow in this sub-basin is uncertain based on the available contour data. Therefore, it was assumed the flow split was equal amongst the culvert locations.

Based on the analysis, the existing Grindstone road culvert crossings have adequate capacity to accommodate the design discharge. The 1:33 year event would produce a headwater below the top of each pipe, with exit velocities that would range from 1.1 to 1.4 m/s.

Sedimentation Ponds

Sedimentation ponds will be constructed before starting main drainage ditch and field drainage ditch construction for each 60 ha section. The sedimentation pond is used to treat peatland drainage water by slowing down the water flow to maximize the settlement of suspended peat particles. The design, construction and maintenance of the ponds will be in accordance with the information submitted for the EAP for Sun Gro's Moss Spur Bog on May 25, 2005. The sedimentation ponds will be constructed approximately 15 m wide x 138 m long x 4 m deep resulting in a total volume of 8,280 m³. The design of the sediment pond is shown on Figure 6 with the conceptual design of the sedimentation pond being based on the following criteria:

- Recommended basin volume of 25 m³ per ha of peatland area;
- Minimum depth at outlet of 1.5 m;
- Optimum length to width ratio of 6.5:1 to 12:1;
- Minimum retention time of two hours;
- Boom required to contain floating debris and should be located at a distance of 25% of the pond length upstream of the pond outlet; and
- Five year maximum instantaneous discharge of 0.75 m³/sec/km² resulting in a peak five-year flow of 0.148 m³/sec (same as Julius Lake South Peat Bog).

Each sedimentation pond has the capacity to handle the drainage from a 168 ha of operational peatland area. The production area at each peat bog determines the total number of sedimentation ponds for that bog based on these capacities. For example, Hay Point Bog will need three sedimentation ponds to handle the peatland drainage for the total development area of 375 ha. Sedimentation ponds will be constructed to ensure efficiency during cleaning and maintenance (Figure 6).

The sedimentation ponds will be constructed at the end of the main drainage ditches and will have an outlet ditch. Each sedimentation pond will be equipped with a 15 cm by 15 cm floating boom situated near the outlet to prevent escape of floating debris. Water leaving the sedimentation ponds through the outlet ditch will be drained into the natural drainage system.

A control culvert with a sliding gate will be placed in the inlet ditch upstream of the pond. The gate will be used to regulate water levels in the peat layer within the harvesting area. The gate can also be used to reduce or stop inflow to the sediment pond in the event of a major precipitation event, which exceeds the design flow criteria. As a first step, the control culvert will be installed in the upper portion of the drain to limit the flow of water toward the pond location during construction. The control gate will remain closed until the pond construction is complete and the drain blocks have been removed. Excavation of ditches in the harvest area will not begin until the sediment pond is complete and functioning.

The sedimentation ponds will be cleaned periodically to ensure that the accumulated sediment volume does not exceed 25% of the total basin volume. Water levels will be monitored during periods of normal operation to ensure that there is always at least a 1 m depth of free water over a minimum 10 m distance from the pond outlet. Cleaning will take place before and after any significant ditch cleaning or cutting takes place within the upstream catchment area.

During cleaning operations the water level will be maintained below the bottom of the outlet culvert to ensure that sediment is not released into the outlet ditch. If required, the control gate on the inlet ditch will be closed before cleaning operations to ensure that additional flow does not raise the water level. The control gate would remain closed until the cleaning operation is complete and remaining disturbed sediment has an opportunity to settle.

Solids will be scooped from the pond with a backhoe. The recovered settlement will be reapplied to the harvest area.

Water quality will be monitored immediately downstream of the outlet culvert. Water samples will be taken on a monthly basis for analyses of Total Suspended Solids (TSS) and pH. Additional samples may be taken on an as required basis.

Main Drainage Ditches

Following the completion of the sedimentation ponds, main drainage ditches approximately 2 m wide and 3 m deep will be excavated around the perimeter of each harvesting area. The main drainage ditches are designed with a low gradient to maintain a slow flow so that they will be

more conducive to settlement of suspended solids. These main drainage ditches connect the field ditches to the sedimentation ponds. Drainage water from the field ditches flows into the main ditches around the harvesting area where water will then flow to the sedimentation ponds at the edge of the proposed development site. A site layout of the proposed area is shown in Figure 3.

Field Drainage Ditches

Field drainage ditches are used to remove interstitial surface water and prepare the peat surface for harvesting after clearing. A network of parallel ditches will be cut through the bog using a “V” ditcher. Each field ditch is excavated to 1.5 m deep and 1.5 m wide and spaced 33 m apart. Field drainage ditches will be constructed at 90° angles to the main drainage ditches. For each 60 ha section prepared for harvesting an additional 56 field ditches will be required. Therefore at the peak development in the year 2018, with all 375 ha under operation, a total of 350 field ditches will have been cut.

Water will drain from the field ditches into the main ditches, where it will eventually flow into the sedimentation pond. It takes approximately 1 day to cut each field ditch and once it has been cut water will drain rapidly from the bog for a period of approximately three weeks. After this period, water will drain more gradually; however, the rate at which water drains from the bog will depend on the amount of precipitation. Water will continue to drain from the bog until the arrival of frost. The storage volume of each development phase area was calculated to estimate the potential water discharge following the development of the field drains. The natural moisture content of peat at Hay Point Bog varies from 89.3 to 96.2 percent as described in the Manitoba Department of Energy and Mines report ⁽¹⁾.

Hay Point Bog, as previously discussed, will be developed by opening 60 ha of peatland per year. Based on the field ditches being cut to a depth of 1.5 m the total volume of peat to be drained each year is approximately 900,000 m³. This volume of peat will hold approximately 855,000 m³ of water assuming an average 95 percent moisture content before drainage. Moisture content varies anywhere between 60 to 85 percent following drainage after the field ditches are cut ⁽¹⁰⁾. Therefore, assuming an average of 70 percent moisture content remains after drainage (25 percent drains), the volume of drainage water from 60 ha of peatland will total

approximately 215,000 m³. It will take approximately 11 weeks to cut the 56 field ditches required for each 60 ha area. With the additional 3 weeks of initial draining, it will take approximately 14 weeks to drain the entire 60 ha area, resulting in an average flow of approximately 0.025 m³/s.

Under the existing conditions, with no constructed drainage, the drainage from a 60 ha area during the design event (33 year rainstorm) would be approximately 0.07 m³/s. Therefore the constructed drainage with an average flow of 0.025 m³/s is less than the runoff for the design event. However, if the design event occurred during the initial bog drainage, a conservative estimate would be that the drainage results in an increase of 35% for the duration of the storm under the design conditions. This temporary increase in flow rate from the bog area would have a negligible impact on the culvert crossings at Grindstone Road for the following reasons;

- The 60 ha area being drained under development is only 3.4% of the 1,765 ha total drainage area of the sub basin;
- The temporary increase in flow rate of 0.025 m³/s (35% over the existing flow from that section) to the discharge point is an increase of only 1.0% compared to the design flow of 2.2 m³/s at the road culverts (33 year rainstorm); and
- The total drainage volume of 215,000 m³ from a 60 ha area over 14 weeks is discharged to Lake Winnipeg, where the increased volume over this time would have no impact to the Lake.

Once the initial increased drainage is completed following drain cutting the amount of drainage from the developed areas would be the same as drainage prior to development. The timing of drainage, however, would be slightly modified. During a rain event there will be a slight lag (delay in time) before drainage from a developed area begins compared to undeveloped peat land and then the drainage rate would be slightly higher because of the constructed drains. As noted above the increased drainage rate would be negligible compared to the overland flow during the design event, and the sedimentation ponds are equipped with gates to control the flow if required.

Outlet Ditches

The outlet ditches convey the discharge from the sedimentation ponds for outlet to the surrounding environment. The flow will be directed by the ditches to natural discharge points in order to best integrate the drainage into the existing natural drainage system, and cause

minimal change to the water regime. All of the drainage within the development area eventually discharges into Lake Winnipeg.

The entire project area is located within an existing drainage area (Figure 5), and the outlet ditches from the sedimentation ponds will extend towards the headwater area of 3 intermittent streams located immediately southeast of the quarry lease boundary, as shown on Figure 3.

Bog Roads

The bog roads connect the equipment parking area to the individual bog fields. The roads will be constructed using non-merchantable timber and surface vegetation that is removed from the fields as part of the preparation for harvesting. A clay base and gravel topping will be added to allow trucks access to the fields for loading purposes (Figure 3).

Facility and Equipment Required at Proposed Peat Development Site

The on-site facility and equipment storage at the proposed peat bog site will be contained in a 4 ha staging area in northeast corner of QL 475 and connected to the proposed access road as shown in Figure 3. This area will be cleared, graded for drainage to match the surrounding topography and will have gravel placed over top of the existing materials. Peat may be temporarily stockpiled in this staging area before it is hauled to the existing Sun Gro processing and packaging facility near Elma, Manitoba. A typical layout of the required facilities at a peat mining operation within the 4 ha staging area site is shown in Figure 7 and described below.

A 64 m² construction trailer will be located at the site to provide employees with a lunchroom and washroom equipped with a septic tank installed and maintained by a local authorized contractor. An 18 m² steel shipping container will be installed as an equipment repair and maintenance garage. A 400 m² wood framed building with a concrete foundation will be constructed to serve as a general repair facility. A groundwater well will be installed in the overburden till material to supply domestic water for use in the washrooms and for washing equipment. Once installed if the water quality meets the Canadian Drinking Water Quality standards it will also be used as a source of potable water otherwise bottled water will be used. Electricity will be supplied by a 30,000 watt generator.

All fuel required for this development will be stored in the 4 ha staging area in accredited (CAN/ULC S601) steel double walled diesel fuel aboveground storage tanks (ASTs). Hay Point Bog will have two 2,420 L portable diesel fuel ASTs, and one 13,800 L diesel fuel AST. All the ASTs will be equipped with a 90 L/m electric pump for dispensing fuel. The 13,800 L AST will be installed near the equipment storage area on a 20 cm thick concrete platform surrounded by 15 cm posts located at intervals of 60 cm for protection. Sun Gro Horticulture will comply with the Canadian Council of Ministers of the Environment (CCME) Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products. Manitoba provincial and municipal guidelines and regulations will also be observed and followed for the installation and operation of all ASTs. Small amounts of gasoline will also be stored at the site in two 20 L portable containers. The gasoline and other petroleum products, such as hydraulic oil, motor oil, and lubricants will be stored in a designated contained storage area within the service garage on site.

On-site equipment will include farm tractors to haul and power the different types of peat harvesting operation equipment, loaders to push stacks and load trucks, dozers and excavators to maintain bog operations.

3.6.2 Project Activities

Preliminary Site Investigations

Site investigations were completed by KGS Group between January 18th and August 5th, 2010 and during March, 2011. Activities conducted during these site investigations are as follows:

- Peat assessment and topographic surveys were completed preliminarily between January and March 2010 with a more intensive survey completed during March, 2011 in order to supplement and confirm the data collected by the 1980 investigation by Manitoba Department of Energy and Mines on the Hay Point Bog and to better determine the quality of peat located in the bog.
- Aquatic biota / habitat assessment was attempted from May 17th to May 18th, 2010 to determine the types, abundance, and life stage of fish species utilizing the ephemeral water body within the study area during spring and summer. As there was limited to no water able to support fish species, only visual assessments were conducted within the proposed development area. Additionally it was conducted to assess the fish habitat

conditions within the study area and obtain basic water quality and water temperature information along defined reaches of the study area.

- Five baseline water quality samples were collected from either surface or bog water in June 2010. The samples were collected within the peat area, from water bodies adjacent to the peat bogs and the downstream receiving water. These were submitted for laboratory analyses for metals and general water quality data.
- A detailed surface water hydrologic investigation and survey was completed in June 2010 at the Hay Point Bog. Visual inspections of water flow at the existing Grindstone road culverts and the proposed crossing location were completed.
- A vegetation and wildlife survey was conducted over three site visits in June, July and August, 2010. A systematic approach was used to ensure that each plant community in the development area was included in the vegetation survey. Observations were made in the morning and evening to represent daytime and nocturnal bird species. The mammal survey was conducted by recording all mammalian species observed during the vegetation and bird surveys, as well as by sound or any visible evidence such as dens, tracks or scat. The amphibian and reptile survey was conducted by recording all species observed during the other surveys, as well as, by sound or any visible evidence such as tracks or shed skins.

Results of the hydrogeological investigations, surface water and bog water sampling events and biological surveys within the quarry leases are described in Section 4.0. The peat assessment and topographic survey is described in detail in a separate report which can be made available upon request ⁽²⁾.

Site Preparation

Pre-construction activities will include the development of detailed construction plans if required to be submitted to the Director of Environmental Approvals Branch. Prior to the start of site construction, a buffer zone with a minimum of 100 m will be identified and protected between the quarry lease limit and the area to be developed. The buffer zone will be used to prevent potential damage and disturbance to the surrounding environment. The buffer zone will also be used as a windbreak, a habitat corridor and a reference source of material for the restoration of abandoned areas at a later date.

Construction

Construction activities at the Hay Point Bog will commence in the winter of 2012/2013, once all environmental approvals have been received. Construction activities will include:

- Clearing a 30 m width for proposed access road and the two ditches one on either side of the road (Figure 4);
- Construction of the Hay Point Bog access road from Grindstone Road;
- Layout of the site;
- Clearing trees and extracting merchantable timber, as authorized by Manitoba Conservation Forestry Branch, for peat harvesting areas during winter months when ground is frozen and can support heavy equipment;
- Construction of sedimentation ponds;
- Construction of main drainage ditches and outlet ditches connected to the sedimentation ponds;
- Construction of field drainage ditches;
- Stripping and stockpiling the upper 15 cm of the remaining vegetation after tree removal; and
- Construction of bog roads, utilizing non-merchantable timber and the upper 15 cm of surface debris.

Operation

Sun Gro operations follow the best practices developed by the CSPMA. Operational activities for the proposed development will start during the spring following tree clearing and will include the following:

- **Field Preparation:** The peat surface is prepared for harvesting as described above by drawing down the water table through construction of main drainage ditches, field ditches, sedimentation ponds and outlet ditches. Afterwards the roots, stumps and embedded logs will be removed from the uppermost layer of the peat (topspit). The areas located between the field ditches (peat fields) are then rotavated or milled and shaped into crown surface between the field ditches and left to dry by solar heat and natural air movement until the moisture content is reduced to the desired level for harvesting.
- **Field Harrowing:** Following field preparation, the surface is repeatedly harrowed to a depth of 0.15 m using a tooth rake to break capillary flow and enhance the drying process. This process separates the peatland surface and in-fills small depressions. The top 2 to 4 cm layer is turned over to allow the peat particles and fibers to dry by the sun and wind until the moisture content is reduced to the desired level for harvesting.

- **Peat Harvesting:** Peat is harvested using a vacuum machine once the peat is sufficiently dry (about 40% to 55% moisture content). The harvesting is weather dependant, and when the moisture content of the peat moss is acceptable, all efforts are made towards harvesting. Over the course of the summer, the harvesters and harrows will pass over the bogs numerous times. The production levels are weather dependent; however, approximately 6-10 cm of the peat surface is expected to be harvested each summer.
- **Peat Stockpiling:** Harvested peat is unloaded at designated peat stockpile areas at the field end adjacent to the bog roads, on the bog roads or within the 4 ha staging area. The peat is pushed up by a front-end-loader into windrow shaped stockpiles with an approximate volume of 1,500 m³. In Sun Gro's experience, harvested peat when exposed to rain forms a hard crust layer, which prevents peat particles from being carried into the drainage system or off the site.
- **Transporting:** Excavators or front-end loaders will load stockpiled peat into open-box trailers for transporting. The trailers will be covered by a tarp to prevent peat particles from escaping and minimize financial losses for Sun Gro. Harvested peat will be transported from the stockpiles along the access road, south along Grindstone road to PR 8 and then on to the processing and packaging facility near Elma, Manitoba. Approximately 5 truck loads are required to transport each hectare of peat under development. The estimated number of truck loads required for transporting peat to the processing and packaging plant is described in Table 2.
- **Maintenance:** Activities will be undertaken at regular intervals, including during weather conditions that prohibit harvesting, such as frost, high winds, or heavy rainfall. Field maintenance activities include cleaning and deepening the drainage ditches, profiling the fields for harvesting and weed control. Maintenance of the drainage ditches is done throughout the harvesting operation. Sun Gro will be responsible for maintenance and repair of all the drainage works involved with the bog operation to the time their reclamation works are completed. This includes the correction of any erosion or silting problems, the correction of any icing problems, the cleaning out of the ditches should the capacity become reduced due to vegetative growth, the removal of debris that interferes with the passage of water and the removal of any beaver dams (if required) that are causing flow problems. Weed control is done manually without the use of any chemicals. Maintenance of sedimentation ponds includes inspecting them once a week to verify the overall functioning capacity of the pond, the position of the floating wooden boom, and the bank of the pond. The ponds will be cleaned on a regular basis to maintain optimal efficiency with sediments removed before 25% of the pond is filled with sediments. Excavated sediments will be transported to, and spread on the fields for harvesting. Sedimentation ponds will also be cleaned prior to cleaning field ditches.
- **Monitoring:** Sun Gro proposes that during the peat harvesting activity period, normally from April to October of each year, monitoring of the sedimentation ponds will include taking a 1 L water sample every month per outlet, or 24 hours after heavy rainfall (10 mm/hr for 6 consecutive hours) or after heavy wind with an average speed of 50 km/h or more. Water samples will be sent to an accredited laboratory for analysis. Results are reviewed, compiled and available for inspection on site at any time. A report will be filled out for every water sample collected and indicate the employee name, date

and time of sampling, pond code #, present and past 24 hr weather conditions plus comments.

During the harvesting season, operational activities will occur seven days a week from sunrise to sunset. Sun Gro anticipates harvesting an average of 850 m³ of horticultural grade peat each year per ha of land under development. Harvesting of peat continues until commercial peat resources are exhausted and the colour of peat changes from light brown to black-brown or when the density of the material in the field is too heavy to be harvested. For the purpose of peat regeneration process, a minimum of 1.0 m of peat will remain after harvesting, unless justification for a shallower depth can be provided to Manitoba Conservation.

Closure and Restoration

Under the provincial Mines and Minerals Act, Subsection 128(3) Non-aggregate Quarry Closure Plan, the holder of a quarry lease for materials other than an aggregate quarry must submit a Mine Closure plan for approval by the Mines Branch Director prior to commencement of mine development. Restoration aims at replacing lost elements due to peat harvesting, such as reintroducing peatland vegetation. Restoration is scheduled to begin once commercial grade peat has been removed or exhausted from the peatland development. Mined out areas will be restored based on the experience gained by Sun Gro from successful restoration of a demonstration site in Elma and Moss Spur, Manitoba and following the requirements of The Preservation and Reclamation Policy of the Canadian Sphagnum Peat Moss Association.

A mine closure plan for the proposed peat development as prepared by Sun Gro has been submitted to Manitoba Innovation Energy and Mines, Mines Branch with a copy provided in Appendix B. The closure plan has been developed in accordance with the Manitoba Mine Closure Regulation 67/99; General Closure Plan Guidelines ⁽¹¹⁾ and Mine Closure Guidelines Financial Assurance ^(12,13). The purpose of the mine closure plan is to define a program for the protection of the environment over the duration of peat mining activities and for site rehabilitation during the life of the mine and after mine closure. The plan describes the stages of closure (progressive and final), closure activities, closure costs and outlines operational and post operational monitoring.

3.7 SCHEDULE

The general peat mining schedule consists of site preparation of an area during winter months with peat harvesting to start the following spring typically during April and continue typically until October. Hay Point Bog development is anticipated to start during the winter of 2012/2013 once the appropriate approvals have been received. Approximately 60 ha of land will be cleared and prepared for peat harvesting. The mining plan proposes that peat mining operations start with harvesting of 60 ha in 2013. Development is proposed to increase, with consecutive 60 ha areas of development each year, to a maximum of approximately 375 ha of production area by 2018 once all areas within the bog have been developed. Peat mining operations will continue at this maximum production area of 375 ha until approximately 2051 after which sections of the Hay Point Bog area are expected to be mined down to the final planned depth of mining and progressive closure will begin.

3.8 PEAT PRODUCTION DURING PROJECT LIFE

The lifespan of the proposed peat production is estimated to be at a minimum 39 years. This is based on the average peat production rate of 850 m³/ha/year and a total of 12.5 million m³ of harvestable peat. However, as Hay Point Bog will be developed in 60 ha stages the lifespan is estimated to have approximately 45 years worth of peat to harvest.

During the first year of peat development at the Hay Point Bog operation, the 60 ha is estimated to supply 51,000 m³ of horticultural grade peat (Table 2). Once fully developed, in the 6th year of operation (2018), a total of 375 ha of peatland will be in production and is estimated to provide a total volume of approximately 318,750 m³ of harvested horticultural grade peat per year (Table 2). By the end of 2018 a cumulative of approximately 1.1 million m³ of peat will be harvested. Based on the average harvest rate of 850 m³/ha/year during the peak years from 2018 to 2051 a total of approximately 318,750 million m³ will be harvested each year such that by 2051 Hay Point Bog is expected to have produced approximately 11.6 million m³ of peat.

3.9 PEAT PROCESSING

The existing Sun Gro peat processing and packaging plant, with finished goods storage, is located approximately 10 km south of Elma, Manitoba on Highway 11. Peat harvested from the proposed Hay Point bog will be processed, bagged, placed on pallets and stored at this plant before transport to markets. Once development of the Hay Point Bog has started Sun Gro will evaluate the need for a processing plant located closer to the Hay Point Bog to reduce costs and impacts of transporting peat.

During the first year of peat development at the Hay Point Bog operation approximately 301 truck loads would be required to transport the 51,000 m³ of peat harvested from the active 60 ha (Table 2). This is equivalent to approximately 10 trucks/week or 1.43 trucks/day based on the proposed 7 days/week operation schedule from April to October. An additional 301 trucks per year will be required to accommodate the proposed expansion of 60 ha per year. Once fully developed by 2018 and throughout the peak to 2051, approximately 1,881 truck loads would be required to transport the 318,750 m³ of peat harvested from the active 375 ha (Table 2). This is equivalent to approximately 67 trucks/week or 10 trucks/day.

3.10 GREENHOUSE GAS EMISSIONS

Recent work by Cleary *et al.* described the net GHG emissions from the Canadian Peat Industry. Land-use change, particularly from undisturbed peatland (which typically has a high water table and full vegetation cover) to peatland under extraction (which has a reduced water table and no vegetation cover), results in a net increase in greenhouse gas (GHG) emissions⁽¹⁴⁾. The net increase is caused by an increase in the rate of *in situ* decomposition through increased diffusion of oxygen, increased CO₂ emissions and reducing CH₄ emissions, and a reduction of ecosystem production resulting through the removal of living biomass from the peatland surface. Cleary *et al.* established a formula for estimating the GHG emissions from land use change which includes a value for the standard flux of GHG per unit area within peatland under extraction (PUE - 1061 t/km²/yr) and within cutover peatland under restoration (CPUR - 1288 t/km²/yr).

The proposed development plan, as previously discussed, consists of opening a 60 ha area per year until the peak harvesting area of 375 ha is reached in the sixth year of operation. Harvesting will continue on these areas until year 39 of operation (2051), after which the disturbed areas will begin to be covered over and restored in 60 ha sections annually until all the development area is closed

Recent work conducted by Waddington *et al.* suggested that sphagnum restoration could result in a carbon sink in as little as two years post restoration ⁽¹⁵⁾. Regardless, to be conservative KGS Group assumed that the areas experiencing restoration only become net neutral for GHG 5 years post restoration when calculating CO₂ equivalent values.

Using the equations established by Cleary *et al.* incorporating PUE and CPUR, the total quantity of CO₂ equivalent produced due to land use change throughout the 45 years of development and 5 years post restoration was calculated to be 179.64×10^3 t - CO₂ eq. Cleary *et al.* estimated the GHG contributions from each component of the life cycle of peat harvesting where land-use change accounted for 15%, peat harvesting and processing accounted for 4%, transport to market accounted for 10% and decomposition accounted for 71% ⁽¹⁴⁾. However, GHG emissions from decomposition are associated with the end use and should not be attributed to the producer. Therefore, after 45 years of operation and 5 years post restoration of Sun Gro's Hay Point Bog, in addition to the quantity of GHG emitted from land-use change the GHG emissions from peat harvesting and processing would be 47.90×10^3 t - CO₂ eq. and from transportation to market would be 119.76×10^3 t - CO₂ eq. for a total of 347.30×10^3 t - CO₂ eq. This is equivalent to 7.24×10^3 t - CO₂ eq/yr. The most recent available data for CO₂ emissions in Canada are for 2008 ⁽¹⁶⁾, which had a total value of $734,000 \times 10^3$ t - CO₂ eq. Therefore, an average year of production of the Hay Point Bog will account for less than 0.001% of the total annual emissions for the country. Regardless, this quantity of CO₂ equivalent can be decreased by incorporating mitigation measures (as presented in Section 6) to reduce and/or prevent GHG emissions throughout the life cycle of peat harvesting.

3.11 EMPLOYEES

Approximately 5 full time jobs and 25 seasonal jobs will be created for opening and harvesting the peat bog. An additional permanent full time job will be created for the peat processing at the

packaging plant. Jobs will also be created for transportation of the peat as discussed above. Permanent and seasonal employees will be obtained from the regional area as much as possible.

3.12 WASTE DISPOSAL

There are virtually no wastes produced from the peat harvesting operations. Trees, including branches and roots are saved and used as underlay for bog road construction. Petroleum, oils, lubricants and hazardous wastes are disposed of through licensed companies. Domestic sewage from Hay Point Bog will be retained in holding tanks and pumped out on a regular basis by a local licensed contractor. Solid wastes such as paper, organics, plastics, packaging materials, etc. will be removed by a local licensed contractor. Wastes are taken to local licensed municipal waste disposal grounds for recycling.

4.0 ENVIRONMENTAL DESCRIPTION

4.1 BIOPHYSICAL

4.1.1 Physiography and Climate

The proposed peat mine development is located in Hecla/Grindstone Provincial Park within the Grindstone Ecodistrict of the Mid-Boreal Lowland Ecozone in the Boreal Plains Ecozone. The Grindstone Ecodistrict occupies the southern portion of the Mid-Boreal Lowland Ecozone and consists of an area along the west shore of Lake Winnipeg ⁽¹⁷⁾.

The surface of the Grindstone Ecodistrict is characterized by ridge and swale topography trending north-south. The ridges range in width from 400 to 800 m and the swales are up to 800 m wide. Due to these characteristics the ecodistrict is poorly drained. As a result, the region is extensively covered in peat in the form of flat bogs, raised bogs and horizontal fens. The regional relief in the subject area is approximately 0.6 m per km and the relief between ridges and swales is approximately 0.5 to 3.0 m ⁽¹⁷⁾.

The Grindstone Ecodistrict is located within the Low Boreal Ecoclimatic region and is characterized by short, warm summers, and long, cold winters ⁽¹⁷⁾. The Pine Dock weather station, located approximately 50 km north, is the closest active weather station to the proposed peat mining project. The weather data from the Pine Dock weather station is based on a 30-year record from 1971 – 2000 ⁽¹⁸⁾. The mean annual air temperature at the weather station is 1.1 °C and the daily mean temperature ranges between 18.9 °C in July and –19.7 °C in January ⁽¹⁸⁾. The average growing season is 171 days with about 1470 growing degree-days and an average annual moisture deficit of 50 mm ⁽¹⁷⁾. Precipitation at the station averages 612 mm annually, with 425 mm falling as rain and the rest as snow. August has the highest average rainfall (92.3 mm) and November has the highest average snowfall (42.7 cm) ⁽¹⁸⁾.

4.1.2 Air Quality

Maximum time-based pollutant concentration levels for the protection and preservation of ambient air quality within the Province of Manitoba ⁽¹⁹⁾ are listed below for selected parameters

(Table 3). Maximum Tolerable Levels denote a time-based concentration of air contaminant beyond which, due to a diminishing margin of safety, appropriate action is required to protect the health of the general population. Maximum Acceptable Levels are deemed essential to provide adequate protection for soils, water, vegetation, materials, animals, visibility, personal comfort and well being. Maximum Desirable Levels define the long-term goal for air quality and provides a basis for an anti-degradation policy for the pristine areas of Manitoba for the continuing development of pollution control technology. Maximum Tolerable Levels are used only for evaluation purposes to identify the severity of an anthropogenic or natural phenomenon in order to protect human health and institute appropriate corrective action. In general, Maximum Acceptable Levels are not to be exceeded in any urban centre including areas that are in the vicinity of industries with atmospheric emissions. Within rural areas, the goal is to maintain pollutant concentrations at or below Maximum Desirable Levels.

TABLE 3
MAXIMUM TIME-BASED POLLUTION CONCENTRATION LEVELS
PROVINCE OF MANITOBA ⁽¹⁹⁾

Name of Contaminant	Units of Concentration Measurement	Period of Time Contaminant is Measured	Maximum Tolerable Level Concentration	Maximum Acceptable Level Concentration	Maximum Desirable Level Concentration
Carbon Monoxide	Milligrams per cubic meter (parts per million) of air	1 - hour average	-	35 (30)	15 (13)
		8 - hour average	20 (17)	15 (13)	6 (5)
Nitrogen Dioxide	Micrograms per cubic meter (parts per million) of air	1 - hour average	1000 (0.53)	400 (0.213)	-
		24 - hour average	-	200 (0.106)	-
		Annual arithmetic mean	-	100 (0.053)	60 (0.032)
Ground-level Ozone	Micrograms per cubic meter (parts per billion) of air	1 - hour average	400 (200)	160 (82)	100 (50)
		Annual arithmetic mean	-	30 (15)	-
		8 - hour average *	-	128 (65)	-
Sulphur Dioxide	Micrograms per cubic meter (parts per million) of air	1 - hour average	-	900 (0.34)	450 (0.17)
		24 - hour average	800 (0.31)	300 (0.11)	150 (0.06)
		Annual arithmetic mean	-	60 (0.02)	30 (0.01)
Suspended Particulate Matter	Micrograms per cubic meter of air	24 - hour average	400	120	-
		Annual geometric mean	-	70	60
Particulate Matter <2.5 µm in diameter (PM _{2.5})	Micrograms per cubic meter of air	24 - hour average *	-	30	-
Particulate Matter <10 µm in diameter (PM ₁₀)	Micrograms per cubic meter of air	24 - hour average	-	50	-

Notes: For details see <http://www.gov.mb.ca/conservation/pollutionprevention/airquality/index.html>.

“-“ No Data

* - The objective used is the national Canada-wide Standard

Manitoba Conservation in cooperation with Environment Canada and the Manitoba Lung Association and with the assistance of Manitoba Health and Health Canada developed an Air Quality Index (AQI) for Winnipeg ⁽¹⁹⁾. The AQI is a system for rating air quality in urban areas to provide a general idea of air quality to the public. It is provided in this EAP for reference purposes only as the study area is a remote location. The objective of the AQI is to provide a current description of air quality and the potential effect on the environment. The AQI considers five common pollutants that typically effect human health or the environment at specific air concentration levels. These include Carbon Monoxide (CO), Inhalable Particulates (PM₁₀), Ozone (O₃), Soiling Index (COH) and Nitrogen Dioxide (NO₂) ⁽¹⁹⁾. Manitoba Conservation monitors these pollutants each hour and converts the pollutant levels to the index scale resulting in a sub-index for each pollutant. The highest resulting sub-index value becomes the value for the overall AQI. Based on the air pollution levels Manitoba Conservation divided AQI values into four ranges with effects described as follows;

- Good (0 - 25) – No effects;
- Fair (26 to 50) – Noticeable health effect unlikely, some environmental effects may be observed;
- Poor (51 to 100) – Some people, especially those with pre-existing health problems may notice health effects, some environmental effects may be observed; and
- Very Poor (> 100) – Health effects may be experienced by all and especially those with existing respiratory conditions, some environmental effects may be observed.

It is expected that the AQI for the regional study area is typically good throughout the year; although there are no published sources of air quality data. Air quality in the area is generally excellent compared to large cities and commercial and industrial areas in Manitoba and Canada. There is no industrial development in the regional study area. The only developments in the regional study area, which is otherwise undeveloped wilderness, include cottages, a camp and Provincial Park/Campground, agricultural land and the community of Washow Bay. The AQI may be periodically reduced to fair during dry periods resulting in dust along Grindstone road during periods of high winds affecting the peat harvesting area, or during forest fires that may result in increased particulates. However, Manitoba Conservation indicated that they generally do not have concerns with the air quality in the regional study area ⁽²⁰⁾.

4.1.3 Geology

The surficial geology of the Grindstone Ecodistrict consists of a mixture of silt diamicton and organic deposits. The silt diamicton is calcareous in composition and consists of Paleozoic rocks that come from the Hudson Bay Lowland and Interlake region of Southern Manitoba. The organic deposits are from the Quaternary period and are composed of peat and muck between 1 to 5 m thick. The site is characterized by low relief wetland deposits, with low lying areas where the organic deposits accumulate in fen, bog, swamp and marsh settings ⁽¹⁷⁾.

4.1.4 Soils

In March 2011 KGS Group completed seventeen peat probes at Hay Point Bog as part of the peat investigation, with testholes augured at nine of these locations ⁽²⁾. The majority of the testholes displayed a similar stratigraphy consisting of live sphagnum peat from surface to a depth of approximately 0.15 m below ground surface. Below this live sphagnum was a layer of medium to dark brown organic peat which ranged from 3.0 m to 4.2 m thick. This organic peat ranged from wet to very wet and often had white fibers and varying amounts of tree organics. The organic peat layer was underlain by low permeability clay causing the perched water table which is typical of peat bogs and forms a barrier between the perched water within the peat layer and the groundwater in the underlying aquifers described in the following section.

4.1.5 Groundwater

Regional groundwater flow is presumably controlled by the close proximity of Lake Winnipeg which at the closest point is approximately 800 m east of the proposed development area; therefore, flow is assumed to be easterly. The groundwater in the Grindstone Ecodistrict is mainly from sand and gravel aquifers associated with till, beach and inter-till outwash and deposits ⁽¹⁷⁾. Groundwater is used as a potable water source in the regional study area by many of the cottagers and likely by the towns located beyond the regional study.

A search of the Provincial GWDrill Database ⁽²¹⁾ identified 10 groundwater wells (all domestic) approximately 3 km southwest of the proposed development area. The registered wells found in the GWDrill Database were carbonate limestone and/or shale bedrock aquifer wells. Wells were

cased to depths ranging from 1.2 to 3.9 m below ground surface, with open borehole below the casing. The GWDrill Database files had limited information in terms of water quality for the wells in close proximity to the project study area.

4.1.6 Surface Water

The Grindstone Ecodistrict is located within the Lake Winnipeg watershed that is part of the Nelson River drainage system, with most drainage in the area into Lake Winnipeg through the numerous creeks ⁽¹⁷⁾. As noted in Section 4.1.1, the area has poor drainage, although overall surface water in the Grindstone Ecodistrict flows east towards Lake Winnipeg.

Within the proposed development area there is a single small bog lake in the northern section of quarry lease 477. Hay Creek begins within the development area and flows east to Lake Winnipeg; however, the creek is ephemeral and was dry within the development area (Appendix C: Photo 1) during field investigations with the exception of small pockets of water. The natural flow patterns in the development area are illustrated in Figure 5.

The KGS Group environmental assessment team collected baseline surface water samples on June 23, 2010 in accordance with Manitoba Conservation's Scientific Research Permit Special conditions and associated work permit #2010 P HQ 007 (Appendix D). These were collected from Hay Creek within the development area, from depressions in peat within the development area, from an unnamed lake east of the development area (Appendix C: Photo 2), and at the confluence with Lake Winnipeg (Appendix C: Photo 3) which is the receiving water for all surface water leaving the development area (Figure 8). Water samples were submitted for laboratory analysis for general surface water quality (Table 4) and metals (Table 5). These water quality results will form a baseline for comparison of any future surface water sampling at the development area.

Baseline surface water samples collected from the peat water at Hay Point Bog (H4 and H5), from Hay Creek (H2) and from the small unnamed lake just outside of the southeast section of the proposed development area (H1) had acidic pH levels ranging from 4.09 to 4.50 (Table 4). These pH levels are below the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) and the Canadian Council of Ministers of the Environment (CCME) Canadian

Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life which is between 6.5 and 9.0. Water quality analysis of the surface water sampled from Lake Winnipeg at the confluence point between the water leaving the site and the lake indicated that the water is neutral (pH = 7.00). This is similar to data recorded from a proximate location on Lake Winnipeg by Manitoba Water Stewardship in 2008 and 2009 (Appendix E – station 44S). Similarly, the analyses of the baseline surface water samples indicated that the nutrient levels were comparable to the Lake Winnipeg data and none of the variables, with the exception of pH, exceeded the MWQSOG or the CCME (Table 4). One noteworthy outlier in the results was the analysis of TSS from the duplicate sample collected from Hay Creek (284 mg/L). This value was likely due to disturbance of the substrate during sampling for TSS as there was very little water in the creek, and the water was not flowing.

Baseline surface water sampling for metal concentrations indicate that some of the baseline concentrations of aluminum, iron and lead exceed the applicable MWQSOG and CCME criteria for the Protection of Freshwater Aquatic Life (Table 5). These exceedances were observed in the samples collected from the peat, downstream receiving waters and Lake Winnipeg. All other parameters were below the MWQSOG and CCME criteria. These elevated concentrations are typical of water quality in the region. The elevated baseline concentrations were typically within the range of metal concentrations observed in Lake Winnipeg as measured during 2008 and 2009 by Manitoba Water Stewardship (Appendix E).

4.1.7 Vegetation

Wetlands are considered one of the most productive ecosystems, sustaining more life than any other ecosystem. Wetlands in Canada developed following the most recent retreat of glacial ice and are typically between 5,000 and 10,000 years old. According to the Conference on Wetlands Stewardship ^(4,22), Canada has more than 150 million ha of wetlands covering approximately 15 percent of Canada's land area in fifteen different ecozones. Canada has 25% of the world's wetland and covers 6% of the earth's land and freshwater surface ^(4,23).

The Grindstone Ecodistrict is dominated by peatland associated vegetation, however, well drained till areas have a variety of vegetation including trembling aspen, jack pine and white spruce as well as a mix of shrubs, grasses and herbs ⁽¹⁷⁾. The proposed development area is

primarily classified as a bog which is described as an ombrotrophic peatland. These are mineral-poor and involves surface vegetation obtaining nutrient from precipitation as they are isolated from groundwater ^(23,24). A bog is characteristically acidic with the water table (perched) at or near the surface. It typically has a dense layer of peat usually covered with mosses, shrubs and sedges; trees may also be present. Typical vegetation dominating bog peatlands are stunted black spruce, *Sphagnum* moss and ericaceous shrubs.

Hay Point Bog can be described as a lightly to moderately treed raised bog area with open areas of *Sphagnum* moss ⁽¹⁾ (Appendix C: Photo 4). The Manitoba Conservation Data Center (MBCDC) website identified the presence of twenty-six vegetative species of conservation concern (S1-S2) within the ecoregion (Appendix F) ⁽²⁵⁾. The MBCDC was contacted to provide an updated list of any known occurrences of vegetative species of conservation concern located within the project study area. Currently there is one species of conservation concern within the project study area, ram's head lady's slipper (S2S3) listed within the MBCDC (Appendix E) ⁽²⁶⁾. Two species (stalked sedge and round-leaved bog orchid) with S3 provincial status have also been observed within 2km of the project study area. The MBCDC also has a record of occurrence of necklace sedge (S2) sensitive fern (S3S4), and Canada yew (S3) within 10 km of the project study area. With the exception of Canada yew and stalked sedge, the remaining four species typically area found in marsh and bog environments similar to the conditions within the proposed development area and, therefore, could potentially occur. Manitoba Conservation stated that although there are no known occurrences of these species within the proposed development area, this does not indicate that these species are not present in the area.

Vegetation surveys were conducted at the Hay Point bog in accordance with Manitoba Conservation's Scientific Research Permit Special conditions and associated work permit #2010 P HQ 007 (Appendix D). These surveys occurred during three site visits (June 8, July 20 and August 3) along transects established throughout the project study area (Figure 8). During the surveys plant communities were classified by 'V-type' based on the forest ecosystem classification (FEC) system developed for Manitoba and northwestern Ontario ⁽²⁷⁾. Most of the development area had a consistent cover type with the plant communities ranging from V31 to V33. These vegetation types include overstory species, primarily consisting of black spruce and tamarack. The primary overstory species throughout the majority of the subject property was black spruce; however, the density and height classes of the stands varied throughout. Ground

cover for these vegetation types are comprised of continuous cover of Sphagnum and feather moss over a range of poorly drained organic soils to wet peat deposits. The moist to fresh, well drained mineral soils support a ground cover with a more diverse community of shrubs and herbs than the wet areas described above.

During the vegetation surveys 24 species were identified within the project study area (Table 6). Most of the subject property was occupied by relatively small poorly developed black spruce and a few treeless areas of exposed sphagnum hummocks. Ground cover for these vegetation types are comprised primarily of continuous cover of Sphagnum with occasional feather moss over a range of poorly drained organic soils to wet peat deposits. Herbaceous ground cover was primarily cloudberry, pitcher plant and three-leaved Solomon's seal. Shrub species were typical of raised bogs in the boreal landscape, consisting mainly of bog rosemary, Labrador tea, leatherleaf, mountain cranberry, pale laurel and small cranberry. No species of conservation concern were identified within the project study area.

4.1.8 Mammals/Habitat

The Mid-Boreal Lowland Ecoregion typically includes terrestrial habitat for moose, black bear, wolf, lynx, red fox and snowshoe hare ⁽¹⁷⁾. The MBCDC website identified the presence of one species of conservation concern (S1-S2) within the ecoregion; the little brown myotis (S2N, S5B) ⁽²⁵⁾. Likewise the MBCDC website noted the woodland caribou Boreal population, which has a provincial rank of S4 (widespread and apparently secure), is also located within the ecoregion. Though not categorized as a species of conservation concern in Manitoba, this population of woodland caribou is listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as threatened as a result of habitat loss and increase predation ⁽²⁸⁾. The MBCDC was contacted to request a list of wildlife species and species of conservation concern located within the project study area. Currently there are no occurrences of wildlife species of concern listed within the MBCDC for the project study area (Appendix E) ⁽²⁶⁾.

Wildlife surveys conducted at the Hay Point bog during the 2010 season identified the presence of two mammal species, moose and northern grey wolf, within the project study area (Table 7). Both of these species were listed provincially as either S4 or S5 (abundant and secure).

4.1.9 Birds/Habitat

The Mid-Boreal Lowland Ecoregion typically provides habitat for various raptor species, sandhill crane, ruffed grouse and waterfowl including various ducks, geese, white pelican and cormorant⁽¹⁷⁾. The MBCDC website identifies 11 bird species within the mid-boreal lowland Ecoregion; one of which is categorized as a species of conservation concern. The Piping plover has a provincial rank of S1B and is listed on COSEWIC as endangered. The nearest record of occurrence for Piping plover in Manitoba was approximately 8 km east-northeast of Riverton, Manitoba, which is approximately 18 km southwest of the project study area⁽²⁵⁾. This species will occupy only open sandy shoreline habitat and does not rely on peat forming boreal wetlands for nesting or foraging purposes. Therefore the proposed peat mining activities at Hay Point Bog will have no affect on the preferred habitat or the conservation status of this species. Additionally, the MBCDC indicated that there were no current records within their database for any bird species of conservation concern within the project study area; however, there were known occurrences of five species (Canada yew (S3), great blue heron (S4S5), red-headed woodpecker (S2B), double-crested cormorant (S5B) and Canada warbler (S4B)) and one gull colony within 10 km of the development area (Appendix E)⁽²⁶⁾.

Bird surveys were conducted in accordance with Manitoba Conservation's Scientific Research Permit Special conditions and associated work permit #2010 P HQ 007 (Appendix D). These surveys, which occurred from dawn to dusk, identified a total of 19 bird species within the project study area (Table 7), none of which are provincially listed as species of conservation concern. The bird community within the development area consisted primarily of a small core group including the dark-eyed junco, white-throated sparrow, least flycatcher, ruby-crowned kinglet, and savannah sparrow. The dark-eyed juncos and least flycatchers were the most frequently encountered throughout the site. Less common species at the site included the gray jay and hermit thrush which, along with the ruby-crowned kinglet tended to be more closely associated with taller black spruce stands occurring in patches throughout the area. Forest interior species such as Connecticut warblers were also detected, albeit rarely, in the vicinity of relatively contiguous black spruce stands. Savannah sparrows appeared to be restricted to continuously open, nearly treeless areas.

The relatively low diversity of breeding avian species is reflective of the typically uniform and unproductive plant community associated with peat bogs in the boreal forest. Species observed less frequently within the project study area were encountered in proximity to sporadic habitat such as open water, or variations in forest type. For example, the lesser yellowlegs was only encountered in immediate proximity to the open water in the north portion of QL 477. Similarly Savannah sparrow, were encountered only in relatively large treeless areas.

4.1.10 Aquatic Biota/Habitat

Aquatic biota and habitat, particularly fish and fish habitat are protected under the *Fisheries Act*. Discussions with Todd Schwartz of Fisheries and Oceans Canada (DFO) ⁽²⁹⁾ and with Laureen Janusz of the Aquatic Ecosystem Section of Manitoba water stewardship's Fisheries Branch ⁽³⁰⁾ indicated that no data existed for fish species present within Hay creek which is an ephemeral creek which flows east from the development area towards Lake Winnipeg . Among the fish species that have the potential to be present within Lake Winnipeg, shortjaw cisco (S3) has been identified within 10 km of the project study area (Appendix E) ⁽²⁶⁾.

The intent was to conduct a fish survey of Hay Creek using various methods including electrofishing and minnow traps, and a subsequent fish habitat assessment of the Creek. However, during the site visit the on May 17, 2010, the creek was dry within the development area (Appendix C - Photo 1). There was some water east of the proposed development area just upstream of the drainage ditch that runs along the west side of Grindstone Road. However, this water was very shallow and was essentially flood water back flooded from the swelled drainage ditch along Grindstone Road (Appendix C – Photo 5). There was no definable channel in this reach of the creek as it had been braided multiple times further upstream.

The vegetation within the channel was predominantly peat moss with patches of Labrador tea, leather leaf and other vegetation typically observed within peat bogs. Although there was a notable indentation within the peat identifying the location of the creek, the lack of water and lack of appropriate substrate vegetation suggests that fish are not utilizing the creek in the upper reaches that are situated within the development area.

A fish survey was conducted within the drainage ditch along the west side of Grindstone Road using minnow traps in concurrence with the Manitoba Water Stewardship Branch Scientific collection permit #34-10 (Appendix D) and Manitoba Conservation's Scientific Research Permit Special conditions and associated work permit #2010 P HQ 007 (Appendix D). No fish were captured nor observed within the drainage ditch. While it is likely that fish species would be able to travel up through the drainage/creek system from the Lake it is unlikely that large bodied fish would be present within the drainage ditch as there is a grate at the upstream side of the water crossing which would restrict passage (Appendix C – Photo 6). No fish surveys were conducted in the small lake in the northern section of QL 477; however, the development plan will avoid the lake keeping a minimum buffer of 100 m from the south and east side, and no water is proposed to be drained into the lake (Figure 3).

4.1.11 Amphibians and Reptiles

Several reptile and amphibian species are typically found within the Interlake area of Manitoba generally found in wetlands, riparian zones and forested areas. The MBCDC indicated that there were no current records within their database for any amphibian or reptile species of conservation concern within the regional study area (Appendix E) ⁽²⁶⁾.

Amphibian and reptile surveys were conducted at the Hay Point bog during the 2010 season in accordance with Manitoba Conservation's Scientific Research Permit Special conditions and associated work permit #2010 P HQ 007 (Appendix D). These surveys identified the presence of two amphibians; gray treefrog, and northern leopard frog. None of the species identified are documented as being provincially very rare (S1) or rare (S2). However, the northern leopard frog is listed as a Schedule 1 SC species under the SARA as it has been listed by COSEWIC. While the northern leopard frog Eastern population is listed as Not at Risk (NAR), the Western Boreal/Prairie populations is listed under COSEWIC as a species of special concern (SC). This is defined as a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats ⁽²⁸⁾. This species remains widespread but is of special concern as it has experienced a considerable reduction of range and loss of populations in the past, combined with increased isolation of remaining populations, particularly further west of Manitoba ⁽²⁸⁾. The species was formerly abundant along the southern shores of Lake Winnipeg and Lake Manitoba, and less common up to Southern

Indian Lake and east of Lake Winnipeg; however, it had been virtually extirpated from the province by 1976⁽³¹⁾. The species has reoccupied much of its historic range, although densities are far below previous levels, which is why it remains as Schedule 1 SC under SARA.

The Northern Leopard Frog was observed during the site visit in proximity to the lake situated in the northwest section of QL 477. This species uses a variety of habitats to meet its overwintering and breeding needs and in the summer is found in a wide variety of habitats, although the preferred habitat seems to be vegetation 15 to 30 cm tall that is relatively close to water⁽³¹⁾. Well-oxygenated water bodies, such as streams or larger ponds that do not freeze solid are used for overwintering sites. Temporary ponds that often dry up in late summer that are typically 30 to 60 m in diameter, 1.5 to 2.0 m deep, located in an open area, with a lot of emergent vegetation, and no fish are used for breeding sites. Therefore the species is adversely affected by habitat fragmentation and conversion, including wetland drainage and eutrophication, as well as game fish introduction, collecting and pesticide contamination. While the proposed development will alter the existing bog area; the unnamed lake situated in the northern section of quarry lease 477 will have a buffer of 100 m. This buffer will provide a substantial area of habitat with emergent vegetation along the shorelines which should mitigate any potential effects of the project on the northern leopard frog.

4.2 SOCIAL

4.2.1 Communities

The proposed peat operation is located on Crown land within the boundaries of the Hecla/Grindstone Provincial Park. There are no communities within the 3km project study area. Two sparsely populated communities are located within the regional study area. Blacks point (cottage community) is situated at the end of Grindstone road approximately 10 km northeast of the proposed development area. The community of Washow Bay extends east from PR HWY 234 towards the park and is approximately 6.5 km southwest of the proposed development area. Riverton, which is a larger community outside of the regional study area, was considered in the assessment. Riverton is situated approximately 21 km southwest of the proposed development area.

4.2.2 First Nations

There are no First Nation communities located in the project or regional study areas. Several First Nation communities are located beyond the study area. These include the Fisher River Cree Nation (Reserve No. 44 and No. 44A) located 45 km northwest and the Peguis First Nation (Reserve No. 1B and 1C) located 51 km west northwest. As previously noted the proposed development is located just beyond the extents of the Peguis First Nation CIZ.

4.2.3 Population

The proposed development is located in an unorganized area, referred to as Division No. 18. Individual population statistics for the small towns of interest located within and in vicinity to the regional study area were not available, with the exception of Riverton. Therefore population information for Division No. 18 (unorganized, east part) which includes Black Point subdivision, Blacks Point, Gull Harbour, Hecla, Island View North subdivision, Island View South subdivision, North Cliffs subdivision, and South Beach subdivision, were included in the population statistics below (Table 8). The statistics for the Rural Municipality (RM) of Bifrost were also included as Washow Bay, which is one of the small communities within that RM, is situated directly west of the project study area immediately bounded to Division No. 18 (unorganized, east part).

TABLE 8
POPULATION STATISTICS FOR SURROUNDING RURAL MUNICIPALITIES ⁽³²⁾

Population and Dwelling Information	Riverton	Division No. 18	RM of Bifrost
Population in 2006	537	88	2,972
Population in 2001	594	47	2,967
2001 to 2006 Population Change (%)	- 9.6	87.2	0.2
Total Private Dwellings Occupied by usual residents	218	44	1,016
Population Density per km ²	484.4	0.2	1.8
Land Area (km ²)	1.11	484.07	1,642.58

Population information for First Nation communities located beyond the regional assessment area of the proposed peat mine project is presented in Table 9.

TABLE 9
POPULATION STATISTICS FOR SURROUNDING FIRST NATION COMMUNITIES ⁽³³⁾

Community	Population on Own Reserve (# of people)	Population on Other Reserve (# of people)	Population Off Reserve (# of people)	Total Population (# of people)
Peguis	3,625	37	5,066	8,728
Fisher River	1,756	7	1,501	3,264

4.2.4 Services

The proposed peat mine development is located along Grindstone Road which is approximately 11 km NE of the junction of PR 234 and PR 8. The on-site services in the regional study area in addition to access roads include campsites, public beaches, private cottages and residences, and the Hecla Provincial Heritage Park.

The Royal Canadian Mounted Police (RCMP) provides law enforcement services to the communities located in the area. The nearest hospitals to the proposed developments are located in the towns of Arborg (RM of Bifrost) and Hodgson (Peguis First Nation), Manitoba.

Hazardous wastes such as petroleum, oils and lubricants as well as any domestic sewage will be disposed of through licensed companies. Solid wastes such as paper, organics, plastics, packaging materials, etc. will be removed by a local licensed contractor and taken to local licensed municipal waste disposal grounds for disposal and where possible recycling.

4.2.5 Land Use

The land use in the Grindstone Ecodistrict is predominantly crown land that is leased for pulpwood and saw log forestry ⁽¹⁷⁾; however, as most of the regional and project study area is situated within the Provincial Park, there is little evidence of commercial forestry occurring in the surrounding area. Limited commercial resource activities are permitted within the Hecla/Grindstone Provincial Parks including forestry, peat and silica sand mining and

agriculture. Many of these activities pre-date the establishment of the parks, and some long-term commitments are still in place. Agriculture and forestry operations occur on Grindstone peninsula and a silica-sand extraction operation is located on the southern shore of Black Island⁽³⁴⁾. At the time of the site investigations and based on aerial photos of the regional study area there was no evidence of commercial forestry occurring in the vicinity of the proposed development. The proposed development is located in an area of the Park that has been zoned as commercial resource/recreation which is intended to provide for both recreation and commercial resource use opportunities, with peat mining identified as a permitted commercial activity⁽³⁴⁾. The proposed development is located just beyond the boundary of the Peguis First Nation CIZ, as previously noted, which is a zone where trapping and fishing may occur.

4.2.6 Areas of Interest

The project study area is situated within the Hecla/Grindstone Provincial Park which is used for cottaging, camping, and picnicking. Lake Winnipeg is of interest because, in addition to recreational use, it supports commercial fishery activities. Lake Winnipeg has an approximate surface area of 23,750 km² (23,750,500 ha) and is about 436 km in length⁽³⁵⁾. There are seven provincial parks located in the south basin of Lake Winnipeg including Hecla/Grindstone, Beaver Creek, Camp Morton, Winnipeg Beach, Elk Island and Grand Beach⁽³⁵⁾.

4.2.7 Heritage Resources

The Manitoba Historic Resources Branch has reviewed the proposed project development area for Hay Point Bog, and has indicated a low potential to impact significant resources. Therefore, the Historic Resources Branch has no concerns with the project (Appendix E). In the event that heritage resources are discovered, construction will cease and the Historic Resources Branch of Manitoba Culture, Heritage and Tourism will be notified immediately, with further construction occurring as directed by the Historic Resources Branch.

4.3 ECONOMY

Industries in the Mid-Boreal Lowland Ecoregion include forestry, fishing and hunting and trapping⁽¹⁷⁾. Lake Winnipeg, in particular, provides an important economic source in the area

through fishing. During 2001 and 2002 there were 1,073 licensed fishers on Lake Winnipeg and the total value of commercial fish production was \$20,380,350 ⁽³⁵⁾. Pickerel is the main fish harvested, followed by whitefish and sauger.

In Division No. 18 (unorganized, east part) there were 85 people that were 15 years or older in 2006 with 35 of these people in the labor force resulting in a 41.2 % participation rate ⁽³²⁾. From this labor force, 25 people were employed resulting in an employment rate of 29.4% of the population. The population of Division No. 18 (unorganized, east part) has a population that is below a specified size determined by Statistics Canada and, as such, data suppression resulted in the deletion of any available information pertaining to income within the division ⁽³²⁾. The only listed industry for the region is agriculture and other resource-based, though the remainder of the industry in the area is listed as 'other services'.

5.0 CONSULTATION

5.1 OVERVIEW

Stakeholders were invited to provide Sun Gro and KGS Group with their questions, concerns and comments about the proposed peatland development project. Information regarding the proposed peatland development project and potential effects associated with the project has been provided to the stakeholders in the region through various means including, telephone conversations and letters to various stakeholders within the Hecla/Grindstone Provincial Park and surrounding area (Appendix E and Appendix G).

5.2 STAKEHOLDERS

Manitoba Conservation Parks and Natural Areas Branch is a stakeholder as the proposed development is entirely within the Hecla/Grindstone Provincial Park which is under the jurisdiction of the branch. Further, it is the responsibility of Manitoba Conservation to approve or deny an Environment Act Licence for the project and provide licence terms and conditions.

Other stakeholders identified within the regional study area include the Grindstone Cottage Owners Association, Hecla Oasis Resort, Hecla Tourism Association, the Manitoba Trappers Association, and the RM of Bifrost.

The Peguis First Nation were also considered a stakeholder as the proposed peat harvesting development at Hay Point Bog is situated in proximity to the outer boundary of the Peguis First Nation CIZ.

Fisheries and Oceans Canada is also a stakeholder for the project as this agency is responsible for issuing authorization for the proposed culvert installations upon review of the EAP. They have a responsibility to ensure that appropriate design and mitigation measures are implemented.

5.3 STAKEHOLDER CONCERNS

No responses outlining any concerns were received in response to the various stakeholder letters sent out on June 2, 2011. However, government officials contacted identified concerns such as, water quality, site drainage, fish habitat, fish use, linear developments and physical disruption or destruction of existing habitats. These concerns have been addressed in the EAP within Section 6.0.

In addition to the general concerns expressed by government officials, as noted above, the Manitoba Conservation, Parks and Natural Areas Branch provided a series of concerns as the proposed development is within the Hecla/Grindstone Provincial Park. These were provided in an email from Jessica Elliot on August 2, 2011 (Appendix E) and summarized as follows;

- Draining the wetland area from which peat is to be extracted may impact the wetland ecosystem beyond the mining area through changes to water flow, water regime and/or water table resulting in degradation of the surrounding wetland/peat land ecosystem. There may even be further reaching consequences into the forested ecosystems and small lakes and ponds.
- Provincially there are concerns over moose populations and increased access points into wetlands, which provide habitat for moose, could facilitate improved moose hunting access. In the recent past requests for construction of recreation trails in the area of the proposed peat mine have been denied due to the potential negative consequences increased access in this area would have on moose populations.
- Increased fire risk has been associated with operation of peat mines. Because the proposed peat mine is directly upwind (prevailing winds) from a cottage area there is a much greater risk that a fire from the peat mine could spread to the cottaging area threatening life and property. Additionally, there are hundreds of cottages in the Grindstone subdivision which is north of the proposed peat mine with only one road for access which passes the proposed peat mine development and could be blocked during a fire.
- The only road in Grindstone is a narrow gravel road that is maintained by Manitoba Conservation. The increased traffic and heavy equipment/trucks accessing the peat mine and hauling peat will quickly degrade the road and result in increased road dust.
- Increased large truck traffic poses a safety concern for park visitors. The increased traffic and associated dust along with the visual optics of having a large peat mine off the road as you drive into the park will potentially decrease the positive visitor experience that Parks and Natural Areas Branch promotes and Manitobans and visitors to our province expect.

- Restoration plans for other peat mines have included such things as a forest, lake, or cranberry farm. These are not considered acceptable for a Provincial Park that will only permit the site to be restored to as close to original state as possible. This means a functional, natural wetland habitat that in time, as a result of succession, will become a peat producing wetland.

5.4 MITIGATION MEASURES

Mitigation measures to control project effects are described throughout Section 6, however, the specific measures to address the concerns expressed by Manitoba Conservation, Parks and Natural Areas Branch are summarized as follows;

- Maintaining at a minimum the 100 m buffer between the perimeter drain and the quarry lease boundary and around the unnamed lake situated in the northern section of quarry lease 477 will mitigate potential impacts to the wetland ecosystem outside of the mining area. Previous operational monitoring at other peat mine operations in Manitoba has demonstrated that impacts to the water table and water regime from draining the mining area are generally localized and do not extend beyond the 100 m buffer zone. Additionally a mine closure plan will be implemented to restore water levels to predevelopment conditions.
- Installation of a gate at the proposed access road off of Grindstone Road will limit access to Sun Gro personnel and mitigate potential impacts to moose populations associated with increased access points into wetlands. The proposed access road will be constructed along the existing cleared cutline, as noted in Section 3.6.1, which already provides access for all-terrain vehicles into the proposed peat mine.
- Fires are also a serious concern to Sun Gro because they can cause serious harm to staff, construction workers, contractors, the public and the environment as well as causing project delays, increased costs and loss of revenues to Sun Gro. Mitigation measures to address the concern of fires are detailed in Section 6.3.6 and includes complying with applicable provincial and municipal legislation, codes and guidelines; forming a First Responder Committee; providing and testing fire suppression equipment on-site; preparing, exercising and implementing an emergency response plan that includes fire prevention, notification and response; regular employee training on use of equipment; and notifying Manitoba Conservation immediately if a fire occurs. Additionally there will be regular inspections for potential fire threats, routine examination of fire suppression equipment, and periodic testing and evaluation of the emergency response plan.
- Directing all traffic associated with the development to drive according to road conditions and adhere to the posted speed limits will help mitigate the potential damage to road infrastructure while using an approved dust suppressant such as water on roads will help mitigate the increased dust associated with the increased truck traffic. Additionally, Sun Gro is prepared to work with the Park to either assist in maintaining the section of Park

road that will be utilized by Sun Gro or provide financial assistance to the Park for road maintenance.

- The proposed peat mine will remain hidden from view by the public as a result of the buffer zone of forest that will remain in place between the development area and Grindstone Road, therefore only the access road and increased traffic and associated dust would have potential visual impacts that could decrease the positive visitor experience. During the initial harvesting year there will only be 10 trucks/week transporting peat which will increase each year to the maximum of approximately 67 trucks/week as described in Section 3.9. This is equivalent to approximately 1.4 and 9.6 trucks/day which is not a substantial increase over existing conditions and should not pose a significant safety or aesthetic concern. Regardless applying dust control such as water, reducing the number of vehicles traveling along Grindstone Road during high wind events, driving according to road conditions, adhering to the posted speed limits and operating transport trucks during daylight hours will mitigate the safety concern and visual impacts that could decrease the positive visitor experience. Additionally, Sun Gro is willing to discuss the transport schedule with the park to reduce the amount of trucking that would be done on weekends, in particular long-weekends, when the park is most used by visitors.
- A mine closure plan for the proposed peat development has been developed by Sun Gro in accordance with the Manitoba Mine Closure Regulation 67/99 as described in Section 3.6.2 and enclosed in Appendix B. In the Mine Closure Plan Sun Gro has stated that following closure and rehabilitation, the Hay Point Bog project site will return to its natural state as a functioning raised bog eco-system. The reclamation plan focuses on the procedures involved in establishing a productive wetland ecosystem and through wetland succession will again return to a functioning raised bog ecosystem. Sun Gro is also prepared to work with the Parks Branch to ensure that the closure plan satisfies their requirements.

6.0 ENVIRONMENTAL EFFECT ANALYSIS

6.1 ENVIRONMENTAL ASSESSMENT METHODS

The environmental assessment of the proposed peat development was carried out based on: project information provided by Sun Gro and the advice document from Manitoba Conservation. Additional considerations included environmental information acquired from literature and internet searches, publications by the peat industry and environmental organizations; contacts with federal and provincial government representatives; consultation with stakeholders; and site investigations by the project team.

Requirements of Manitoba's Environment Act and regulations and the Manitoba Conservation advice for the preparation of an Environment Act Proposal for a Class 2 Peat Mining Development were followed in the preparation of this Environment Act Proposal.

The environmental effects of the proposed peat harvesting project on the environment in the project and regional study areas were identified using checklists, an interaction matrix (Appendix H) and professional judgment. Advice by government representatives, concerns expressed by the stakeholders, and brainstorming among the consultant team was also used to identify environmental issues and associated environmental effects. The adversity of environmental effects was determined based on categories presented in Table 10.

The cumulative environmental effects of the proposed peat harvesting operation with the effects of other projects and activities in the area were assessed following the methods prescribed by the Canadian Environmental Assessment Agency ⁽³⁶⁾.

The significance of the residual environmental effects of the proposed peat harvesting operation were evaluated following the procedures outlined in the Canadian Standards Association draft environmental assessment standard. The degree of change from the existing conditions and the value of the environmental components being affected determine significance of an adverse effect. Criterion for this determination as referenced in Table 11 include: a) Societal value of affected environmental components, b) Ecological value or sensitivity of affected environmental components, c) Duration, d) Frequency, e) Geographic extent, f) Magnitude, and g)

Reversibility. For each criterion a particular level of significance rating (1, 2 or 3) is assigned. To judge the overall significance of an effect, the rating and criteria should be considered together. An effect is determined significant when: (1) it rates a “3” for at least four criteria, at least one of which must be criteria a or b; or (2) it is rated “2” or “3” for all criteria.

6.2 ENVIRONMENTAL ISSUES

Environmental issues associated with the proposed peat mine development project at Hay Point Bog are summarized below. The assessment team identified the issues by considering the nature of the project, the location and environmental effects typical of peat mining projects. Site specific environmental issues will be discussed in a regional context.

6.2.1 Loss of Wetland

Public concern regarding the loss of wetlands as a function of wildlife habitat and other ecological functions has become acute in some regions in Canada. This is due to land use changes such as urban development, increased population and agricultural development, especially in the prairie regions of Canada, where there are fewer wetlands remaining ⁽³⁷⁾. Already many wetland areas have been lost due to draining for agricultural land use. Overall, land use changes has accounted for approximately 15 percent loss of Canadian wetlands ⁽³⁷⁾. Horticultural peat mining, in comparison, only accounts for a small portion of the loss of wetlands ^(4,38).

6.2.2 Loss of Wildlife Habitat

Loss of wildlife habitat, particularly waterfowl nesting areas, is another concern. Waterfowl and other wildlife species favour swamps, marshes and shallow open water wetland classes as habitat due to the diverse range of vegetation. In contrast, bogs have little importance as habitat for waterfowl and some wildlife species because they tend to have very little open water ⁽³⁸⁾, low diversity of vegetation and limited cover for waterfowl or other bird nesting purposes. The number of waterfowl and wildlife species and the total wildlife populations in bogs are generally lower in comparison to other wetland classes or to mineral soil ecosystems.

A few small mammal species such as muskrat and beaver, and game species such as caribou, moose and deer typically utilize peatland habitat. Some rare or endangered bird and mammal species are known to utilize peatland areas on a seasonal basis include whooping crane, trumpeter swan, piping plover, and the wood bison.

Daigle and Gautreau-Daigle ⁽⁴⁾ evaluated natural peatlands (domed bogs) and peat harvesting areas in close proximity to each other in New Brunswick. It was found that some waterfowl use bog ponds during migration season and for staging. Usage was directly related to the availability of open water in the area. Overall, wildlife use of the bogs was found to be low due to low vegetation productivity of the bog habitat with little variation noted between the natural and developed areas. Other studies observed that moose populations use bog areas but again no population differences were observed between developed and undeveloped bogs ⁽²²⁾.

6.2.3 Loss of Rare Vegetative Species

Protecting rare or endangered species and other vegetation has become a growing issue in regard to peat harvesting development. Peat mining affects vegetation that is unique to peatland bog environments such as pitcher plants (*Sarracenia* spp.), bladderworts (*Utricularia* spp.) and sundews (*Drosera* spp.) that are not found in other mineral soil environments. Many of these species are widely distributed throughout Canada's boreal wetland regions. These types of species occupy a niche that few other species are suited to and are found in many bog ecosystems. Several orchid species, some of which are rare, also occur in peatland environments ⁽³⁹⁾.

The composition of vegetation in bogs tends to have a typical association of species adapted to the regional conditions. As such, the potential effects of a peatland development will depend on the regional environment. If there is a large area of undeveloped bogs in the region that will still support the unique vegetation types, then development of a peat bog that is only a small portion of the area will have minimal effects on rare vegetative species.

6.2.4 Release of Carbon

The release of carbon gases associated with peat development is another environmental concern. As *Sphagnum* grows, carbon is stored in the plant material. The plant material accumulates as peat because of the anaerobic conditions with low oxygen levels due to the high water table. Draining the area for peatland development lowers the water table. This results in decomposition of the peat that releases the stored carbon to the atmosphere in the form of carbon dioxide. Carbon dioxide is one of the greenhouse gases contributing to global warming. However, the greatest effects are associated with carbon release due to burning peat as a fossil fuel. The loss of the peat vegetation as a carbon sink is also a concern because it disturbs the carbon cycle ⁽⁴⁰⁾. However, as discussed already the amount of peat accumulated per year is substantially greater than the amount of horticultural peat harvested. Therefore, horticulture peat developments typically do not have a significant effect on the global carbon cycle.

6.2.5 Surface Water Contamination

Surface water contamination due to water draining from peatland developments has become a major concern. The exposed peat particles following the removal of surface vegetation can be transported into the drainage system, thus increasing suspended particles and other chemical parameters in the water. Settling ponds that slow down the flow of water enabling solids to settle out of the discharge water have become an integrated part of peat mining operations.

During initial drainage, there is an increase in runoff; however, this is over a limited period of time and well below the runoff of large rain events. Once the drainage is constructed, the rate of runoff is slower during a rain event compared to an undeveloped peat bog because of the absorption created by drained peat.

6.2.6 Reclamation and Restoration

Reclamation focuses on the potential after-uses of harvested peatland sites, whereas, restoration focuses more on re-establishment of the site as a peatland, with a functional natural ecosystem with characteristics as close as possible to the pre-harvesting conditions. Though reclamation and restoration requirements for peatland developments in Canada have not been

clearly defined, it has become an integral part of peatland management in this country. Canadian industries have little experience in reclamation and restoration of peatland developments because only a few developments have reached the end of their production life. Reclamation; however, is a very fundamental practice in some of the European countries such as Finland, Ireland and Germany because of their long term history of peat mining operations where reserves have been exhausted.

There are several methods for peatland reclamation such as transforming the site into a new functioning wetland that would be useful as waterfowl habitat, developing agricultural cropland or establishing a forestry plantation on site. Sun Gro proposes to restore the mined out phases based on their experience gained from successful restoration of the Elma demonstration site and following the requirements of The Preservation and Reclamation Policy of the Canadian Sphagnum Peat Moss Association.

6.2.7 Peat Fire

The Manitoba Clean Environment Commission conducted public hearings in 1977 on smoke problems encountered in southern Manitoba during 1976. The burning of peat deposits in 1976 were the primary cause and resulted in smoke causing traffic accidents and health concerns. Some fires were accidental and started from the overlying brush or grass. However, many fires were deliberately set to remove peat for cereal crop agriculture. The Commission recommended prohibiting the burning of peat moss deposits, with a provision for cases in which the proposed burning is demonstrated to be an acceptable agricultural practice, in which case, they must be executed with safety⁽⁴¹⁾.

6.3 BIOPHYSICAL EFFECTS ASSESSMENT

6.3.1 Microclimate

The clearing in preparation for the proposed peatland development project will likely result in minor changes in airflow, wind speed and snow depositional pattern in and adjacent to the development area. The potential adverse effects of the project on microclimate were assessed as minor. The effects may be mitigated by installing snow fences to control snow deposition on

the property if required. Follow-up involves periodic observation of the changes in airflow patterns and snow deposition. The residual effect was determined to be not significant (Table 12).

6.3.2 Air Quality

Increases in fugitive dust will result in the local area during construction and operation of the project associated with access road construction, clearing, ditching and peat harvesting, stockpiling, loading and transporting activities. A total of approximately 375 ha of peat will be exposed to potential wind erosion at the Hay Point Bog during peak operation. Handling of peat during harvesting and loading the harvested peat will potentially result in fugitive dust as well as increased truck traffic along Grindstone Road and PR 8. Dust is controlled as part of the routine operation and will reduce particulate matter in the air. It is unlikely that Manitoba's air quality guidelines would be exceeded during construction and operation phases of the project. The potential effects on air quality were assessed to be moderate. The effects may be mitigated by using an approved dust suppressant such as water on roads, minimizing peat harvesting and handling activities during high wind events, reducing the area of peat in fields and peat stockpiles exposed to prevailing winds, controlling vehicle speeds, instructing employees on proper harvest equipment operation to minimize dust, covering loads being hauled from the site, re-vegetating harvested areas and utilizing windbreaks (tree and brush barriers). Proposed follow-up involves periodic observations for fugitive dust levels, inspections of local area for accumulated dust and tracking of public complaints. The residual environmental effect of increased fugitive dust during construction and operation was determined to be not significant (Table 12).

Increased levels of NO_x, SO₂ and greenhouse gases may result from equipment and vehicle emissions during site preparation, peat harvesting and transporting activities. Additionally some construction materials and the use of fuel may release volatile organic carbons (VOC). The potential adverse effects on air quality in the local area were assessed to be minor. Proposed mitigation measures include using low sulphur fuels, requiring a high standard of maintenance for equipment and vehicles, limiting unnecessary long-term idling and using appropriate fuel dispensing equipment. Proposed follow-up includes periodic observation of air quality during construction, recording maintenance of heavy equipment and requiring submission of MSDSs

for all products used. Residual environmental effects of NO_x, SO₂, greenhouse gases and VOC on air quality were determined to be not significant (Table 12).

Increased releases of carbon dioxide into the atmosphere may result from clearing (land use change), peat harvesting and processing activities and transportation of peat to market as discussed in Section 3.10. After 45 years of operation and 5 years post restoration of Sun Gro's Hay Point Bog a total of 347.30×10^3 t - CO₂ eq. GHG will be emitted which is equivalent to 7.24×10^3 t - CO₂ eq/yr. Therefore, an average year of production of the Hay Point Bog will account for less than 0.001% of the total annual emissions for the country ($734,000 \times 10^3$ t - CO₂ eq). Therefore the potential changes to the carbon cycle and increase in GHG emissions associated with the propose project was assessed as minor. Regardless, mitigation measures proposed to address greenhouse gas concerns include minimizing the areas cleared and preparing and implementing a restoration plan that restores the area to a carbon sink condition. The proposed follow-up involves adherence to licence terms and conditions. The residual effect of increased greenhouse gases during construction and operation was determined to be not significant (Table 12).

6.3.3 Soils

Site preparation and peat harvesting activities will result in an average loss of 3.5 m depth of surface cover and peat; however, the actual depth of loss will vary across the site as the peat thickness is variable and the harvesting depth will depend on what depth of peat is required to be retained undisturbed. The average harvesting of peat is estimated to be 850 m³/ha/year. As previously noted the development will begin during the year 2013 with approximately 60 ha of peatland developed per year in years 1 to 5 and 75 ha of land cleared and readied for peat harvesting in year 6 by 2018. A total of 375 ha of land will be ready for harvesting by 2018 with full peat production continuing until the end of 2051 at which time sections of the Hay Point Bog area are expected to be mined down to the final planned depth of mining. This removal of soil (peat) from the site through the process of harvesting was assessed to be major. Mitigation measures proposed to address the effects of soil loss include minimizing the surface area disturbed to the area being harvested, leaving non-commercial peat reserves in place, and preparing and implementing a Mine Closure plan to restore the area to natural conditions. Proposed follow-up includes annual monitoring and reporting on implementation of the

progressive restoration activities. The residual effect of soil loss was determined to be not significant (Table 12).

Soils in the development area may become contaminated from accidental leaks, spills and releases of fuel or other hazardous substances during site preparation and peat harvesting activities. The potential adverse effects on soil quality were assessed to be moderate. Proposed mitigation includes preventing leaks, spills and releases, providing ULC Certified double-walled fuel storage tanks with spill prevention and leak detection, requiring drip trays for equipment, designating fuel storage and re-fueling areas, ensuring equipment arrives to site in good condition, providing spill clean-up equipment and materials, and providing an emergency spill response plan. Follow-up proposed involves periodic inspections for leaks, spills and releases, ensuring construction and operation crews adhere to designated areas, remediate and record fuel spills and releases, adherence to licence terms and conditions and periodic updates of the emergency response plan. The residual effect of accidental leaks, spills and releases on soil quality was determined to be not significant (Table 12).

6.3.4 Surface Water

Surface waters forming the wetlands such as small ponds and intermittent creeks within the harvesting area will be lost due to site drainage for peat harvesting operations. Approximately 375 ha of land will be cleared and drained over the expected life of the Hay Point Bog. A 100 m buffer with no development will remain around the unnamed lake situated in the northern section of quarry lease 477. The restoration work to begin as sections of the mine are closed will result in development of wetland area that will offset the surface water areas lost during project development. Potential adverse effects on surface waters associated with drainage for the proposed development were assessed to be moderate. Proposed mitigation includes minimizing the area disturbed, formulating a drainage plan to maintain the natural drainage patterns, maintaining water levels on the adjacent undisturbed lands, and preparing and implementing a mine closure plan to restore water levels to predevelopment conditions. Follow-up proposed includes periodic inspection of surface waters and annual reporting on implementation of the mine closure activities. The residual effect of loss of surface waters was determined to be not significant (Table 12).

Site drainage and land profiling activities during construction will result in changes to the runoff flow rate, however there will be negligible change to the direction of surface water runoff within the production area. As discussed in Section 3.6.1, the drainage plan has been developed to maintain the direction and discharge points common to the natural drainage patterns. The entire project area is located within an existing drainage area, and the outlet ditches from the sedimentation ponds will extend towards the headwater area of 3 intermittent streams located immediately southeast of the quarry lease boundary, as shown on Figure 3. Regardless as the rate and timing of drainage from the development area will be slightly modified during the extent of operation the effect of the project on the drainage pattern was assessed as moderate. No mitigation measures are proposed however, follow-up proposed includes monitoring of discharge flow rates from the peat development in accordance with licence terms and conditions. The residual effect of changes to the surface water regime was determined to be not significant (Table 12).

Suspended sediment levels in the surrounding wetlands, ponds and creek may become elevated during spring snowmelt and major precipitation events due to increased exposed peat area associated with harvesting. As discussed in Section 4.1.6, baseline surface water samples collected from the water bodies from within and surrounding the quarry leases generally had TSS below detection limits (<5 mg/L). Higher values for TSS were likely an artifact of sampling from sample stations with little water resulting in potential disturbance of substrate. The potential adverse environmental effects to surface water quality were determined to be moderate. Proposed mitigation includes directing drainage water into sedimentation ponds equipped with floating booms before discharging by an outlet to the existing drainage system. Proposed follow-up includes collecting surface water samples from each outlet monthly with analysis for suspended sediment levels, develop additional surface water sampling if required in consultation with Manitoba Conservation, cleaning of drainage ditches and sedimentation ponds on a regular basis, periodically inspecting for evidence of erosion and adherence to licence terms and conditions. The residual effect of increase surface water runoff on suspended sediments was determined to be not significant (Table 12).

The surface water chemistry in the downstream receiving water, in particular Lake Winnipeg, may become altered during site construction and operation associated with the draining of the peat bog. As discussed in Section 4.1.6, baseline surface water samples collected from within

the peat bog at Hay Point had acidic pH levels that were outside of the MWQSOG and CCME criteria for the Protection of Freshwater Aquatic Life. In comparison, at the confluence point between Hay Creek and the Lake, the downstream receiving water had a neutral pH and, as such, was within the applicable criteria. While peat land pore water is typically nutrient poor the samples collected from the bog area had a few nutrients concentrations that are slightly higher than those measured in Lake Winnipeg, however, all of the nutrient concentrations were within the applicable criteria for the protection of freshwater aquatic life (Table 4). Finally, the analysis of the water quality sampling indicated that the water in the bog and downstream receiving water had similar metal concentrations. Aluminum was elevated above applicable criteria at all sample stations, Iron was elevated above applicable criteria at the confluence point, and lead was elevated above criteria at all stations except for the confluence point (Table 5). The proposed development will not alter the existing natural drainage pattern with water from the bogs continuing to discharge into the adjacent streams and lakes in the area. The proposed development will however alter the timing and rate of drainage, in particular during the initial drainage of each harvesting parcel. The volume of water discharged from each 60 ha area during initial drainage is minimal in comparison to the drainage area within the watershed and the volume of the receiving water body. Therefore, the potential adverse environmental effects to surface water quality were determined to be minor. Proposed mitigation includes using a sedimentation pond to control the rate at which drainage water is discharged into the existing drainage system. If the control of the discharge rate is not sufficient in maintaining the water chemistry, a limestone or carbonate lined drainage ditch can be installed to increase the pH of the draining bog water before entering the sedimentation pond. Proposed follow-up includes collecting surface water samples from each outlet as required to carry out pH analysis. Any additional surface water sampling required will be developed in consultation with Manitoba Conservation. The residual effect of bog water runoff on surrounding water bodies was determined to be not significant (Table 12).

Surface water in the development area may become contaminated during construction and operation from accidental leaks, spills or releases of fuels or other hazardous substances. The surface water sampling in 2010 did not include contaminants such as hydrocarbons, however, it is assumed that the contaminants would not be present as there is likely minimal use of the area by vehicular traffic based on access. Assuming that the lake in the northern section of QL 477 is used for fishing and that a boat was pulled in, the impact from such occurrences is likely

minimal. The potential adverse effect of spills on surface water quality was assessed to be moderate. Proposed mitigation includes preventing leaks, spills and releases, providing secondary containment for fuel storage, requiring drip trays for equipment, providing spill clean-up equipment and materials, and preparing an emergency spill response plan. Follow-up proposed involves periodic inspections for leaks, spills and releases, remediate and record any fuel spills and releases, periodic updates of the emergency response plan and adherence to license terms and conditions. The residual effects of accidental leaks, spills and releases on surface water quality were determined to be not significant (Table 12).

6.3.5 Groundwater

Groundwater in the development area may become contaminated during construction from leaks and accidental spills or releases of fuels or other hazardous substances. Groundwater quality in the development area has not been analyzed for hydrocarbons or contamination by other hazardous substances however it is assumed to be good quality as residents of the provincial park and surround R.M to the southwest of the development use it as a potable water source. The low permeability clay cover on-site, as discussed in Section 4.1.4 forms a very good barrier between the perched water in the peat and the underlying local bedrock aquifer. This essentially isolates the peat from the groundwater so the proposed development will have minimal effects on the groundwater. However, the proposed development may include the installation of a groundwater well in the staging area that, if improperly installed, could provide a conduit. Therefore, the potential adverse effects of the project on groundwater quality were assessed to be minor. Proposed mitigation includes ensuring the new supply well (if installed) is properly sealed at ground level to prevent downward migration of surface contaminants, preventing leaks, spills and releases, providing secondary containment for fuel storage, requiring drip trays for equipment, providing spill clean-up equipment and materials, and preparing an emergency spill response plan. Follow-up proposed involves periodic inspections for leaks, spills and releases, remediate and record any fuel spills and releases, periodic updates of the emergency response plan and adherence to license terms and conditions. The residual effects of accidental leaks, spills and releases on groundwater quality were determined to be not significant (Table 12).

6.3.6 Vegetation

The proposed development activities will result in the loss and disturbance of terrestrial vegetation including tree, shrub, herbaceous and grass species. A total of 375 ha of land will be cleared for the peat development. Manitoba Conservation Data Centre has a record of one species of conservation concern, ram's head lady's slipper (S2S3), within the project study area. Further, there are five species of conservation concern within the regional study area; stalked sedge (S3), round leaved bog orchid (S3), necklace sedge (S2), sensitive fern (S3S4), and Canada Yew (S3). However, no plant species of conservation concern were identified within the proposed development area during the 2010 vegetation survey. While there are no species of conservation concern the potential adverse effect of the project on vegetation loss was still assessed to be moderate. Proposed mitigation measures include minimizing loss and disturbance of vegetation, protecting vegetation along the perimeter of the cleared areas from blow-down, limiting construction activities to designated areas, utilizing timber removed from site, and re-vegetating disturbed or reclaimed areas during and after peatland operations. The proposed follow-up involves periodic inspection for vegetation stress and mortality around the cleared area, invasion of nuisance or weed species, and annual reporting on restoration activities implemented. Positive outcomes of the proposed development will prevail during the restoration as restoration of a site often results in increased diversity of flora and fauna. The residual effects were determined to be not significant (Table 12).

Increases in fugitive dust will result in the local area during construction and operation of the project, as previously noted, which can settle on and stress vegetation in the local area. The potential adverse effects of dust on vegetation were assessed to be minor. However, the effects may be mitigated by controlling dust and stopping operational activities during high wind events. Proposed follow-up involves periodic inspection of the local area for accumulated dust. The residual effects of dust on vegetation were determined to be not significant (Table 12).

Peat harvesting and restoration activities pose a risk of starting a peat fire. Sources of fire include spontaneous combustion, lightning strikes in drained areas, equipment and accidents. Sparks or dust accumulation on hot surfaces of the engine and exhaust are common causes of fire from equipment. Fire is a concern in the lease area as well as the local and regional areas. Uncontrolled fires can result in substantial loss of peat resources to Sun Gro, forest cover and

wildlife habitat, property damage and the loss of life. Potential adverse effects from a peat fire were assessed to be major. Mitigation measures proposed to address potential fires include preparation and implementation of a fire management plan. Sun Gro will form a First Responder Committee with employees from the different levels of operations. Committee objectives are to detect, prevent and make recommendations to company representatives and employees. This committee will work in full collaboration with provincial and municipal regulations, codes and guidelines to provide fire suppression equipment on-site, prepare, exercise and implement an emergency response plan that includes fire and explosion prevention, notification and response. The committee will notify Manitoba Conservation immediately if a fire or explosion occurs. Every piece of mobile equipment will be equipped with one 10 lb ABC fire extinguisher. Rake, conditioner, profiler and vacuum harvesters will also be equipped with one 12 L galvanized steel bucket with a 3 m rope, as well as, one long handle round shovel. A mobile suction water pump with sufficient discharge hose to cover a 60 ha peat harvesting area will be installed. In areas without a natural water source, a filled water tank wagon will be on site. Other on-site equipment will also include fire blankets and water backpacks. Proposed follow-up includes regular inspections, including routine examination of fire suppression equipment, and periodic testing and evaluation of the emergency response plan, as well as, checking all fire fighting equipment twice a month by the First Responder Committee. During extreme dry weather conditions this check will be performed twice a week. Preventative measures will include regular employee education and training in the use of this equipment. The residual effects of the project on the risk of fire were determined to be not significant (Table 12).

6.3.7 Wildlife/Habitat

Site preparation and harvesting operation activities will result in loss and disturbance of wildlife habitat. The 375 ha area proposed to be cleared is less than 6% of the project study area, and only a fraction of a percent of the regional study area in which there is abundant undisturbed habitat as this is a relatively undeveloped region. Therefore, the potential adverse effects of clearing on habitat loss were assessed to be minor. Proposed mitigation measures include minimizing loss and disturbance of vegetation, limiting construction activities to designated areas, limit operation activities to areas disturbed during construction and re-vegetating disturbed or reclaimed areas during and after operation. Proposed follow-up involves periodic inspection during construction and operation, maintenance of re-vegetated areas, and ensuring

adherence to environmental guidelines and protocols. The positive aspect of the proposed development is that restoration of a site often results in a wider diversity of flora which will result in a wider variety of wildlife and habitats. The residual effects of wildlife habitat loss and disturbance were determined to be not significant (Table 12).

Construction activities and equipment use during operation may have adverse effects on large, small and burrowing terrestrial mammals. Some of the mammals may adapt, whereas most will avoid the area and use the surrounding undisturbed habitat. Manitoba Conservation Data Centre had no records of any provincially rare or endangered wildlife species in the development area while a single species (northern leopard frog) was listed as special concern under COSEWIC, none of the species listed are protected under SARA. Therefore, the potential adverse effects were assessed to be minor. Proposed mitigation measures include minimizing the area of disturbance by limiting construction activities to designated areas, limit operation activities to areas disturbed during construction, maintaining habitat around the quarry leases and implementing a closure plan to restore wildlife habitat. Follow-up proposed includes maintenance of re-vegetated areas and ensuring adherence to licence terms and conditions. The residual effects were determined to be not significant (Table 12).

Vehicle traffic associated with site preparation and mining operation activities, in particular transporting peat, may result in increased vehicle – wildlife interactions and associated wildlife mortalities, vehicle damage, and human injury or death. No local data are available on wildlife mortalities, vehicle damage or human injury/deaths. The potential adverse environmental effect of peat mining operations on vehicle – wildlife interactions was assessed to be minor. Mitigation measures proposed to address the effects on wildlife-vehicle interactions include limiting the operating of transport trucks to daylight hours, providing wildlife awareness information to drivers and adhering to posted speed limits. Proposed follow-up includes maintaining records of vehicle-wildlife interactions. The residual effect was determined to be not significant (Table 12).

Domestic waste materials at the bog facility may attract problem or nuisance wildlife to the development area. Problem or nuisance wildlife may include black bear, porcupine, skunk, rodents or raccoons. The potential environmental effect was assessed to be minor. Mitigation measures proposed include use of bear-proof garbage containers and regular disposal of waste at existing waste facilities. As required, animal deterrents such as noise-makers, reflectors and

scents may be used. Proposed follow-up includes maintaining records of problem or nuisance wildlife and adhering to licence terms and conditions. The residual effect of problem or nuisance wildlife associated with the peat mining operation was determined to be not significant (Table 12).

The proposed project may result in the loss and disturbance of migratory bird and waterfowl habitat. In addition to the tree clearing, there is potential for habitat disturbance to the unnamed lake situated in the north portion of QL 477. However, this area will be protected by a 100 m buffer zone of no development which will maintain the existing vegetation and habitat. The potential adverse environmental effects of habitat loss were assessed to be minor. Proposed mitigation measures includes avoiding ponds when possible in the peatland development area, minimizing loss and disturbance of vegetation around lakes by retaining a 100 m buffer zone, limiting construction activities to designated areas, limit operation activities to areas disturbed during construction, and re-vegetating disturbed or reclaimed areas during and after operation. Restoration of a site often results in increased diversity of flora and fauna, thus, an increase in the variety of migratory and other birds as well as in water fowl. Proposed follow-up involves periodic inspection during construction and operation for signs of potential effects (if directed, a biologist will be contracted), maintenance of buffer zone and re-vegetated areas. The residual effects of loss and disturbance of migratory bird habitat were determined to be not significant (Table 12).

Noise and vibrations associated with heavy equipment use during construction and operation of the proposed peat development may result in the disturbance of migratory and other birds and waterfowl during nesting and rearing periods. Spring and early summer are the most critical times for most of these bird species; the clearing will be conducted during the winter outside of these critical times. Manitoba Conservation Data Centre had no records of any provincially rare or endangered bird or waterfowl species in the proposed development area. Additionally, during the bird survey completed during 2010 none of the bird species identified on site were provincially rare, or protected under SARA. Therefore the potential adverse effects of peat mining construction and operation on birds were assessed to be minor. Proposed mitigation measures include locating peat mining components away from any identified critical migratory bird habitat and scheduling construction activities outside of critical nesting and rearing periods. Proposed follow-up involves periodic inspection of bird nesting and rearing activities,

observations of bird nesting and rearing success (if directed, a biologist will be contracted), and adherence to licence terms and conditions. The residual effects on bird nesting and rearing were determined to be not significant (Table 12).

Peatland construction and operation activities, in particular site drainage and equipment and vehicle use may have adverse effects on amphibians and reptiles and their habitat in the development area. Manitoba Conservation Data Centre had no records of any provincially rare or endangered amphibians and reptiles in the development area. Additionally, during the 2010 field survey none of the amphibians and reptiles identified on site were provincially rare. However, the northern leopard frog was observed on site and it is listed under COSEWIC and SARA as a species of special concern (SC). This is defined as a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats. As discussed in Section 4.1.11, this species remains widespread but is of special concern as it has experienced a considerable reduction of range and loss of populations in the past. The Northern Leopard Frog uses a variety of wetland habitats to meet its overwintering and breeding needs therefore the species is adversely affected by habitat fragmentation and conversion, including wetland drainage. While the proposed development will alter the existing bog area; the larger bog lake situated in the northwest portion of QL 477 will have a buffer of 100 m. This buffer will provide a substantial area of habitat with emergent vegetation along the shorelines which should mitigate any potential effects of the project on the northern leopard frog. The potential adverse effects were generally assessed to be minor, although the effects of harvesting on habitat were assessed as moderate. Proposed mitigation includes minimizing the area of disturbance by limiting construction activities to designated areas, limit operation activities to areas disturbed during construction and minimizing loss and disturbance of vegetation around ponds by retaining a 100 m buffer zone. Follow-up proposed includes keeping records of amphibians and reptiles observed on the site. The residual effects of the project on amphibians and reptiles were determined to be not significant (Table 12).

6.3.8 Aquatic Biota/Habitat

Construction and operation of the proposed project may have adverse effects on aquatic biota and habitat in the development area. As noted in Section 4.1.10, Hay Creek within the

development area is an undefined depression which acts as a conduit for excess surface water drainage and does not contain viable fish habitat. The lake which is situated in part within the northern section of QL 477 appears to be a bog lake which typically provides sub-optimal fish habitat for most large bodied and small bodied fish. These lakes often have the capacity to support forage fish species such as Canadian mudminnow, sculpin and stickleback. No development will occur within 100 m of any of these water bodies within the development area therefore, the concerns are primarily associated with the drainage from the development area as described in the following paragraph.

Drainage and harvesting activities during operation of the project could result in increased sediment loads to adjacent water bodies. Elevated levels of TSS can reduce water quality, which may interfere with fish spawning, navigation and the ability to locate food and escape predators. Settling suspended particles can potentially smother and kill fish eggs or larvae. Sedimentation ponds have been designed, as described in Section 3.6.1., to treat peatland drainage water by slowing down the water flow to maximize the settlement of suspended peat particles. Sedimentation ponds will be constructed at the end of the main drainage ditches and will be equipped with a floating boom situated near the outlet to prevent escape of floating debris. Water leaving the sedimentation ponds through the outlet ditch will be drained into the natural drainage system. A control culvert with a sliding gate will be placed in the inlet ditch upstream of the pond that can be used to reduce or stop inflow to the sediment pond in the event of a major precipitation event, which exceeds the design flow criteria. The potential adverse effects of sediments on aquatic biota and habitat were assessed to be minor. No additional mitigation is proposed beyond the use of settling ponds. Follow-up measures include periodically inspecting sedimentation ponds for debris, cleaning of drainage ditches and sedimentation ponds and monitoring water discharge on a monthly basis as previously detailed in Section 3.6.1. The residual effects were assessed to be not significant (Table 12).

Installation of a culvert required for the proposed Hay Point Bog access road to cross the Grindstone Road roadside ditch may have potential adverse effects on aquatic biota and habitat within the roadside ditch. Construction activities could result in a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat and, therefore, a separate submission is being made to the DFO for project review. If a DFO authorization is required, then construction activities would not begin until it has been obtained. The potential adverse effects were determined to be

moderate. Proposed mitigation includes following the Manitoba Stream Crossing Guidelines for the protection of Fish and Fish Habitat, following best management practices (regarding timing window, sediment/erosion control, revegetation of disturbed soils), and installing the culvert such that low flow connectivity is maintained (i.e. embedding the pipe below the ditch invert). Follow-up includes periodic inspection of the new culvert to ensure that fish passage is not blocked. The residual effect of disturbance to aquatic biota and habitat was determined to be not significant (Table 12).

6.4 SOCIO-ECONOMIC EFFECTS ASSESSMENT

6.4.1 Economic Conditions

The economy in the regional area surrounding the proposed development is dependent on fishing, forestry, tourism and recreational related activities and government operations. The peat harvesting industry currently also has a positive impact in the development area, employing residents from the surrounding communities, supporting local businesses, contracting local companies for service works (e.g. trucking, sewage and waste disposal) and supporting the local economy through payment of property taxes. The proposed project will bring additional employment and money into the regional area. The proposed peat mining operation will create a total of 30 jobs for residents in the surrounding communities. As noted in Section 3.11, five positions will be permanent and full-time and 25 positions will be permanent and seasonal with employees working from April to November each year. Therefore, the potential effect to the regional economy was determined to be positive (Table 12). As such no mitigation or follow-up activities are proposed.

6.4.2 Business Opportunities

Additional business opportunities for local contractors will include the contract for harvesting merchantable timber, constructing the access road with culvert installation, transporting harvested peat, disposal of sewage and domestic wastes as well as the eventual restoration. The potential effects were determined to be positive (Table 12). As such no mitigation or follow-up measures have been proposed.

6.4.3 Traffic

Construction activities will result in a small and temporary increase in traffic while peat transportation during operation will result in long term increased traffic volumes on Grindstone Road and PTH 8. Transport trucks will deliver the peat from the bog area to the processing and packaging facility near Elma by traveling south on Grindstone Road to PTH 8. During the first year of peat development at the Hay Point Bog operation approximately 301 truck loads would be required which is equivalent to approximately 10 trucks/week or 1.43 trucks/day based on the proposed 7 days/week operation schedule from April to October. An additional 301 trucks per year will be required to accommodate the proposed expansion of 60 ha per year. Once fully developed by 2018 and throughout the peak to 2051, approximately 1,881 truck loads would be required which is approximately 67 trucks/week or 10 trucks/day. Increased truck traffic along Grindstone Road and PTH 8 will increase dust, will further degrade the road requiring more frequent road maintenance, and has the potential to increase the number of vehicle accidents and vehicle-wildlife interactions. The potential adverse effects associated with the increased traffic were assessed to be moderate. Proposed mitigation measures include dust control by using an approved suppressant such as water and by reducing the number of vehicles traveling during high wind events, directing all traffic associated with the development to drive according to road conditions and adhere to the posted speed limits, operating transport trucks during daylight hours and providing wildlife awareness information to drivers. Follow-up measures proposed include recording the number of vehicles traveling along Grindstone Road and PTH 8 associated with the mine operation and any public complaints and vehicle accidents. Further action will be considered as warranted. The residual effect was determined to be not significant (Table 12).

6.4.4 Noise and Vibration

Construction and operation activities including the use of heavy equipment and machinery will result in increased noise and vibration levels in the local area, as well; the transport trucks along Grindstone Road and PTH 8 will result in increased noise and vibration. As the development area is within a provincial park, visitors to the park likely value the quiet associated with natural settings. Most of the camping, picnic and cabin developments are more than 10 km from the development area. Further, there is a buffer zone of forest surrounding the proposed

development area which will aid in reducing the noise resulting from work on site. However, construction of the access road and the transport trucks will not be buffered and therefore, the potential adverse effects were assessed to be minor. Proposed mitigation includes muffling vehicles and equipment, limiting use of heavy machinery and transport trucks to daylight hours, limiting unnecessary long-term idling and requiring a high standard of maintenance for heavy equipment. Proposed follow-up involves monitoring and periodically tracking noise levels and public complaints. The residual effects of noise and vibration during construction and operating were determined to be not significant (Table 12).

6.4.5 Human Health

Due to the relatively sparse population density within the vicinity of the proposed peatland development, there are very few people that would be affected by the operational activities. However, as the development is in a provincial park, greater value is attributed to natural settings and the increased noise, vibrations and dust generated from the increased traffic transporting peat will affect the public attitude toward the project and may adversely affect their well being. Additionally, with the increased traffic there is an increase risk of vehicle collisions that could adversely affect the public and workers health. The potential adverse effects on human health and general public attitude/well being were assessed to be moderate. Proposed mitigation measures include applying dust control such as water, reducing the number of vehicles traveling along Grindstone Road and PTH 8 during high wind events, driving according to road conditions, adhering to the posted speed limits and operating transport trucks during daylight hours. Proposed follow-up involves monitoring dust and tracking any public complaints. Further action will be considered as warranted. The residual effect on human health was determined to be not significant (Table 12).

Indoor air quality inside the trailer and service garage facilities may potentially be affected by volatile organic carbons (VOCs) and carbon monoxide (CO), propane gas, dust, refrigerants and moulds. VOCs and CO in the maintenance garage are of particular concern. The potential adverse effects of indoor air quality on human health were determined to be minor. Mitigation measures proposed include providing adequate ventilation and ensuring a high standard of facility and equipment maintenance. Follow-up includes regular maintenance of the facility and equipment. The residual effect was determined to be not significant (Table 12).

Construction and operation of the proposed peat development may have adverse effects on public and worker safety. Due to the remote location and limited access to the project site, security measures will be limited. Signs indicating 'No Trespassing' and locked gates will be placed on the main access road. Signs indicating open ditches and receiving drainage water areas will be installed next to the designated areas and visible to employees and trespassers. The gates will remain locked at night and during inactivity at the site. As well, the main ditches surrounding the harvesting areas will limit access to trespassers. With the exception of the access road construction, the potential adverse effects on public safety are negligible, whereas the effects on worker safety were assessed as minor. Proposed mitigation to reduce worker safety includes compliance with Manitoba Workplace Safety and Health regulations, development and enforcement of standard operation procedure guidelines, provision of training to employees and ensuring all visitors to the site have reported in and are accompanied by an employee. Follow-up proposed includes recording the occurrence of workplace accidents and updating employee training and safety guidelines as required. The residual effect was determined to be not significant (Table 12).

6.4.6 Aesthetic Values

The proposed peat mining operation is located in a relatively remote location with very few local residents and although in a provincial park, it is unlikely that the development area would be seen by regional visitors. There currently are no access roads that allow ease of passage to the Hay Point Bog. The bog will remain hidden from view by the public as a result of the buffer zone of forest which will remain in place between the development area and Grindstone Road. Therefore any potential effects of the project on aesthetics are primarily associated with the presence of the access road and transportation of peat. The increased truck traffic on gravel roads will contribute to covering vegetation in a layer of dust between rain events. The potential adverse effects of the project on aesthetic values were assessed to be minor. Proposed mitigation measures include utilizing dust control methods and covering loads during transport to and from the site. While not visible to the public re-vegetation of the peat fields in accordance with provisions in the mine closure plan will return the aesthetics in the area to a natural environment after peatland operation. Proposed follow-up includes observing dust levels and debris and recording public complaints. Further action will be considered as warranted. The residual effect of decreased aesthetics was determined to be not significant (Table 12).

6.4.7 Areas of Interest

Land use within the Hecla/Grindstone Provincial Park includes some, silica sand mining and agriculture practices; however, most of the area is used for recreational purposes and both seasonal and year-round residences. These recreational facilities and residences, as well as the natural environment are considered areas of interest. With the measures proposed to mitigate the environmental effects of the project the effect on these recreational land uses will be negligible when compared to the surrounding area with the exception of increased traffic along Grindstone road and PTH 8. The proposed development will result in clearing a small portion of the forest in the Hecla/Grindstone Provincial Park. The potential adverse environmental effects of the project on these areas of interest were assessed as moderate. Proposed mitigation measures include limiting construction activities to designated areas, marking maximum clearing width of the proposed development site, protecting adjacent trees from blow-down and re-using timber from clearing wherever possible and consistent with Provincial Park policies. Follow-up measures include periodically tracking the site during construction for signs of potential disturbances and ensuring construction crews adhere to designated areas. Residual environmental effects of the proposed development site on land use and areas of interest were evaluated to be not significant (Table 12).

6.4.8 Recreation/Tourism

The areas that surround the proposed peat mining operation are designated commercial resource/recreation which is intended to provide for both recreation and commercial resource use opportunities, with peat mining identified as a permitted commercial activity⁽³⁴⁾. The existing cottage developments along Lake Winnipeg attract a large number of visitors each year during the summer season. Recreational activities including water sports, fishing, camping and outdoor adventures in the area provide employment and income to the regional area. The potential adverse environmental effects of the peat mining operation on these recreational areas were assessed to be negligible due to the nature of the activities and the distance to these areas. However, as these attractions are all accessed along either PTH 8 or Grindstone Road the increased traffic associated with transporting peat was assessed as having a minor impact on tourism. Proposed mitigation measures are those previously outlined for controlling dust and driving safety which include applying dust control such as water, covering loads during transport

to and from the site, reducing the number of vehicles traveling along PTH 8 and Grindstone Road during high wind events, driving according to road conditions, adhering to the posted speed limits and restricting operating transport trucks to daylight hours. Proposed follow-up includes tracking public complaints. Further action will be considered as warranted. The residual effect was determined to be not significant (Table 12).

6.4.9 Heritage Resources

Historic Resources Branch of Manitoba Conservation has indicated a low potential to impact significant resources and therefore has no concerns with the project ⁽⁴²⁾. In the event that heritage resources are discovered, construction will cease and Historic Resources Branch of Manitoba Culture, Heritage and Tourism will be notified immediately. If this occurs, construction will occur as directed by the Historic Resources Branch. Therefore, the potential for adverse environmental effects of the project on cultural resources is unlikely and assessed as not significant.

6.5 EFFECTS OF ACCIDENTS AND MALFUNCTIONS

6.5.1 Fires and Explosions

Fires and explosions may result from spontaneous combustion, lightning strikes, equipment malfunctions, improper handling and storage of hazardous materials, as well as various construction and operation activities. Diesel fuel and small quantities of gasoline are stored, transported and dispensed as part of peat mining operations. Small quantities of hazardous materials and potentially flammable materials will be stored on-site. Fires and explosions can cause serious harm to staff, construction workers, contractors, the public and the environment. Project delays and increased costs to Sun Gro are possible. Potential adverse environmental effects of fires and explosions were assessed to be major. Proposed mitigation includes complying with applicable provincial and municipal legislation, codes and guidelines, forming a First Responder Committee, providing and testing fire suppression equipment on-site, preparing, exercising and implementing an emergency response plan that includes fire and explosion prevention, notification and response, regular employee training on use of equipment and notifying Manitoba Conservation immediately if a fire or explosion occurs. Follow-up

proposed includes adhering to licence terms and conditions, regular inspections, routine examination of fire suppression equipment, and periodic testing and evaluation of the emergency response plan. The residual effect of fires and explosions was determined to be not significant.

6.5.2 Transportation Accidents

Heavy equipment, specialty equipment, large trucks and support vehicles are used during peat mining operation activities. Construction equipment and some materials will be brought onto the project site during construction. Once the peat mining development is operational, large trucks will haul peat to the processing plant. There is a risk of accidents involving trucks and other vehicles accessing the peat mine sites operated by peat mine staff, the public and others. Accidents may also occur while transporting fuel and other materials onto the project site. The potential adverse effects of ground transportation accidents were assessed to be major. Mitigation proposed includes safe transportation routes, speed restrictions and signage, compliance with applicable provincial and municipal legislation, an emergency spill response plan that includes transportation accident prevention and response, and notification of Manitoba Conservation immediately if an accident occurs. Proposed follow-up includes adhering to licence terms and conditions, periodic testing and evaluation of the emergency response plan, ensuring that dangerous goods carriers are licensed and inspecting all shipments for compliance with regulatory requirements. The residual effect of ground transportation accidents on the environment was determined to be not significant.

6.5.3 Petroleum Spills

During peat mine site preparation and operation activities, there is potential for petroleum spills as a result of improper storage, negligent fuelling or collision by a vehicle. Spills of petroleum products from leaking vehicles and large trucks are also possible. Contamination of soil, surface water and groundwater, and impaired air quality could result depending on the type of product as well as the nature, size and location of the spill. There is also possibility that spills and releases can flow along drainage channels and into surrounding vegetation and water where drains are discharged. Indirect effects of a spill on worker and public health and safety are also concerns. Potential adverse environmental effects associated with spills were assessed

to be moderate. Proposed mitigation includes preventing spills, releases and accidents, ensuring compliance with applicable provincial and municipal legislation, using double wall storage tanks, providing protective barriers around fuel storage tanks, using drip trays, preparing and implementing an emergency response plan that includes petroleum spill prevention, notification and response, and notifying Manitoba Conservation immediately if a spill occurs. Follow-up proposed includes remediation of petroleum spills, adhering to licence terms and conditions, periodic testing and evaluation of the emergency response plan, inspecting fuel storage tanks for compliance with regulatory requirements, and maintaining records of fuel volumes delivered and used. The residual effect of fuel spills was determined to be not significant.

6.5.4 Hazardous Substances Release

Hazardous substances may be released during site preparation and operation. Common hazardous substances include fuels (diesel, gasoline and propane), waste oils and lubricants as well as chemicals, paints and solvents. Releases of hazardous substances may impair air quality, cause soil, surface water and groundwater contamination, and affect worker and public health. Remediation of soil and groundwater contamination would be costly for Sun Gro and could result in project and operational delays. The potential adverse effects were assessed to be moderate. Proposed mitigation includes preventing spills, releases and accidents, ensuring compliance with applicable provincial legislation, guidelines, codes and best practices, using licensed contractors, preparing an emergency response plan that includes hazardous substance release prevention, notification and response, and notifying Manitoba Conservation immediately if a release occurs. Follow-up adhering to licence terms and conditions, includes periodic testing and evaluation of the emergency response plan, inspecting hazardous substance storage for compliance with regulatory requirements, and maintaining waste manifests and tipping receipts. The residual effect of hazardous substances releases was determined to be not significant.

6.6 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

6.6.1 Climate

The cold continental climate of southern Manitoba produces very harsh environmental conditions for buildings, infrastructure and facilities. The Pine Dock weather station, located approximately 30 km north-northeast, is the closest active weather station to the proposed peat mining project. The mean annual air temperature at the weather station is 1.1 °C and the daily mean temperature ranges between 18.9 °C in July and –19.7 °C in January ⁽¹⁸⁾. The highest temperature ever recorded was 34.4 °C in July 1979 whereas the lowest was –48.9 °C in February 1967 ⁽¹⁸⁾. The proposed infrastructure at the peat harvesting facility must be designed to withstand extreme high and low temperatures, damaging winds, significant precipitation events and hail, and even tornadoes.

High wind velocities can cause increased dust and blow loose peat materials off the property. Mitigation measures include limiting stockpiled material during high wind events, orienting peat stockpiles in the prevailing wind direction to minimize the area exposed, observing wind directions before unloading and loading of peat, ensuring peat stockpiles has a crusted layer on top, using a tree or brush buffer to act as a windbreak, modifying and equipping peat harvesters to reduce peat dust emissions, covering peat transport trucks with tarps to eliminate dust emissions during transport, instructing employees in proper harvesting equipment operation to reduce dust emissions and suspending operations during high wind events. The residual effect of wind on the project was determined to be not significant.

Heavy rains or abrupt snowmelt can potentially flood the peatland area, cause soil erosion and create unsafe working conditions, slippery surfaces, and reduced visibility. The resulting high volumes of surface water runoff can erode off-site drainage channels and wash out roads and culverts. Proposed mitigation includes designing adequate drainage channels, installing sedimentation ponds, providing additional on-site pumping capacity, suspending work during high precipitation events and including flooding in the emergency response plan. The residual effect of precipitation on the project was determined to be not significant.

Manitoba is in a low seismic hazard area in Canada. Further consideration of the effects of an earthquake on the project is not warranted in this environmental assessment.

6.6.2 Flooding

The proposed peatland development site is not normally subjected to significant overland flooding during spring runoff, or following significant precipitation events. The site is typically wet in low lying locations, but the peat does contain a large capacity for absorption, and the surface water within the site tends to drain towards the surrounding lakes and water courses. Temporary flooding may occur from extreme precipitation events when on-site drainage becomes overwhelmed. Mitigation measures are the same as those proposed to deal with heavy rains as noted in Section 6.6.1. The residual effect of flooding on the proposed project was determined to be not significant.

6.6.3 Wildfire

Wildfire is common in the region, with mid-Boreal uplands ecoregion forest composition and succession stages largely controlled by forest fire. Operation and construction of the proposed project can potentially be interrupted in the event of a forest fire burning adjacent to the construction area. Forest fires risk the safety and health of workers and may damage equipment. Potential effects of wildfire on the construction and operation of the project were assessed to be minor. Proposed mitigation measures include providing fire suppression equipment at construction areas and within buildings during operation and implementing an emergency response plan that includes fire prevention, notification and response. Follow-up includes periodic testing of fire suppression equipment during construction and operation, periodic assessment of wildfire risk during construction and operation and periodically updating the emergency response plan. The residual effect of wildfires on the operation and construction of the project was determined to be not significant.

6.7 CUMULATIVE ENVIRONMENTAL EFFECTS

Cumulative environmental effects are defined as effects that are likely to result from the proposed project in combination with the effects of other projects or activities that have been or

will be carried out in the foreseeable future ⁽³⁶⁾. The Canadian Environmental Assessment Agency advocates a 5-step approach for assessing cumulative environmental effects ⁽³⁶⁾. The methodology involves five sequential steps: 1) scoping, 2) analysis of effects, 3) identification of mitigation, 4) evaluation of significance, and 5) follow-up.

6.7.1 Scoping

Scoping for a cumulative effects assessment (Table 13) involves determining regional issues, selecting appropriate regional Valued Ecosystem Components (VECs), defining spatial and temporal boundaries, describing other actions that may affect the VECs and identifying environmental effects of actions on VECs.

Regional Issues

The main regional issues identified in relation to the proposed peat harvesting are as follows:

- Loss of wetlands
- Loss of wildlife habitat
- Loss of rare vegetative species
- Surface water quality/contamination
- Impacts on Recreation/Tourism
- Increased traffic
- Reclamation and restoration

Valued Environmental Components

Valued Environmental Components (VECs) are components of the natural and human world that are considered to be valuable and should receive specific consideration in an environmental assessment. Value may be attributed for ecological, economic, social, cultural, aesthetic or ethical reasons. VECs in the regional study area for the proposed peatland development project include the following:

Air Quality

Air quality in the region is good and there are no industrial sources of pollution. Particulate matter from fields and roads is the major source of air contamination. There are no known exceedences of Manitoba's ambient air quality objectives. Pristine air quality is valued by rural Manitobans for health and aesthetic reasons.

Soils

Soils in the region are poorly drained forming wetlands therefore the area is less suitable for agriculture and the potential for forestry operations is limited due to the nature of wetlands, making it less economically feasible.

Surface Water Quality

Surface water quality in the region is generally good and there are no industrial sources of contamination. Pristine surface water quality is valued by Manitobans for consumption, agriculture and recreation, and is important for migratory birds and aquatic biota. Surface water in the vicinity of bogs tends to be acidic as was confirmed during the baseline surface water monitoring (Section 4.1.6). The baseline monitoring also indicated that a few parameter concentrations in the surface water were elevated above the applicable MWQSOG and CCME criteria for the protection of freshwater aquatic life.

Groundwater Quality

According to GWDRILL logs from wells situated in the regional study area, the groundwater is generally potable with no identified exceedences of Manitoba's water quality standards, objectives and guidelines. The silica-sand extraction operation located on the southern shore of Black Island and local agricultural practices are the only potential industrial sources of contamination within 10 km of the proposed development area. Pristine groundwater quality is valued by Manitobans for consumption, industry and agriculture.

Recreation/Tourism Economy

As the project is located within a provincial park, recreation and tourism is of significant importance. Further, the recreation/tourism economy in the regional study area is growing in importance. The industry benefits from a pristine environment with abundant and diverse natural resources and a general absence of industrial or other commercial development.

Wildlife/Habitat

Native wildlife species play an important role in the recreation and tourism industry in the regional area. Additionally, hunting is one of the traditional land-uses by the First Nations communities; one of which (Peguis FN) has a community interest zone which is immediately west of the Hecla/Grindstone Provincial Park boundary.

Aquatic Biota/Habitat

Native fish species also play an important role in the tourism, recreation and fishing industries in the regional area. Fish and fish habitat are protected under the Fisheries Act.

Quality of Life

The rural quality of life is of value to Manitobans. The quality of life is characterized by a remote setting with open spaces, peace and quiet, clean air, water and soil, and a general absence of industrial or other commercial development.

Spatial and Temporal Boundaries

Spatial and temporal boundaries for the proposed mining project cumulative effects assessment are as follows:

Spatial Boundary

The regional study area, which includes the area within 10 km from the edges of the Hay Point Bog covers a total area of approximately 41,833 ha (Figure 2).

Temporal Boundary

The temporal boundary for the cumulative effects assessment is the life expectancy of the proposed peat mining operation. This is estimated to be approximately 45 years of production. Following the expected decommissioning of the peat mining site, monitoring would continue for a number of years until outstanding environmental issues are addressed or Manitoba Conservation is satisfied.

Other Projects and Activities

Existing Projects and Activities

The proposed peat mining development is located in a relatively isolated area in the interlake area of Manitoba. The following is a list of known development, projects and activities in the cumulative effects spatial boundary:

- Communities/Cottage Developments within the Hecla/Grindstone Provincial Park
- Recreation including hunting, fishing and camping
- Silica sand mining
- Agricultural practices
- Forestry (minimal, and limited to periphery of regional study area)
- Hecla Oasis Resort (closed for interim – attempting to sell the property)
- Commercial trucking along PR 234, and PTH 8
- Road maintenance of PR 234, PTH 8, and park access roads (Grindstone Rd.)

Environmental Effects

Environmental effects of the proposed peat mining development project are summarized in Table 12 and described in Sections 6.3 and 6.4 of this report. The potential environmental effects used in the cumulative effects assessment are listed below:

- Increased particulates
- Increased greenhouse gases, SO₂, NO_x, etc.
- Contamination of soils / surface water (hydrocarbons and hazardous materials)
- Loss of soil (harvested peat)
- Loss of wetlands
- Change in drainage pattern
- Change in receiving water quality (TSS, ph and nutrients)
- Loss and disturbance of terrestrial vegetation
- Loss and disturbance of terrestrial wildlife and habitat
- Loss and disturbance of birds/waterfowl and habitat
- Loss and disturbance of aquatic biota and habitat
- Increased traffic and deterioration of highways and access roads
- Impacts to public safety / human health
- Increased wildlife mortalities
- Improved regional social conditions
- Improved regional economic conditions

6.7.2 Analysis

Analysis involves additional baseline information, assessing the effects of the proposed development on VECs and assessing the effects cumulative of all developments, projects and activities on VECs.

Baseline Information

Hydraulic assessments were completed to determine the existing drainage patterns in the area. Water quality samples were collected from Hay Creek within the quarry leases and at the confluence with the Lake Winnipeg which is the receiving water for all surface water leaving the subject property. Water quality samples were also collected from a small unnamed lake immediately east of the quarry leases. Biological surveys were conducted to obtain lists of plant, wildlife, bird, amphibian and reptile species present on site and to describe the fish and fish habitat within Hay Creek. Additionally during the peat investigations the composition of the soil underlying the peat was described.

Environmental Effects

Environmental effects associated with project activities for the proposed peat mining development project are identified in Table 12. Effects are identified for the site preparation, construction, operation and decommissioning stages of the peatland development project.

Cumulative Environmental Effects

Environmental effects of the proposed peat mining development project and environmental effects of other projects and activities occur within the cumulative effects assessment area (Table 13). As such, there is some potential for the effects of the proposed project to be cumulative with the effects of other projects and activities within this area. While these projects and activities overlay in time most of them do not overlap in space. Therefore most of the potentially cumulative effects are negligible and none of the cumulative effects identified were assessed as major. Cumulative effects identified that were assessed as potentially minor include the loss of soil (peat harvesting) and increased traffic on PTH 8, Grindstone Road, and PR234 with the associated deterioration of the road. These effects were assessed as minor as they overlay in time and do overlap in space with the other regional projects and activities.

6.7.3 Mitigation

No additional mitigation measures are required as a result of the cumulative effects assessment.

6.7.4 Significance

Potential cumulative effects associated with the proposed peat mining development were determined to be not significant.

6.7.5 Follow-up

No additional follow-up is required as a result of the cumulative effects assessment.

6.8 SUSTAINABILITY

6.8.1 Principles of Sustainable Development

Integration of Environmental and Economic Decisions

Economic decisions should adequately reflect environmental, human health and social effects, and environmental and health initiatives should adequately take into account economic, human health and social consequences. Sun Gro is committed to following the principles of sustainable development at all of their peat mine operations. The site selection process for the proposed facility considered environmental and human health protection issues, social effects, and economics of the site location.

Stewardship

The economy, environment, human health and social well-being should be managed for the equal benefit of present and future generations. Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations. Today's decisions are to be balanced with tomorrow's effects.

Sun Gro is committed to long-term management that provides economic benefit while ensuring the integrity of the development. The proposed peatland development will provide up to 5 full time jobs, numerous seasonal positions and additional contracts (transporting) over the next 45 years of peat mining. The natural soil conditions at the site will protect potential underlying groundwater sources. Site design will protect surface water quality and surrounding wildlife habitat. Long term effects on the environment, human health, and social well-being are expected to be negligible.

Shared Responsibility and Understanding

Manitobans should acknowledge responsibility for sustaining the economy, the environment, human health and social well-being, with each being accountable for decisions and actions in a spirit of partnership and open cooperation. Citizens share a common economic, physical and

social environment and should understand and respect differing economic and social views, values, traditions and aspirations. Manitobans should consider the aspirations, needs and views of the people of the various geographical regions and ethnic groups in Manitoba, including Aboriginal peoples, to facilitate equitable management of Manitoba's common resources.

Sun Gro will be responsible for the day-to-day operations at the proposed peatland development and will be responsible for keeping the general public informed about issues, actions, and decisions relevant to the facility.

Prevention

Manitobans should anticipate, and prevent or mitigate, significant adverse economic, environmental, human health and social effects of decisions and actions, having particular careful regard to decisions whose impacts are not entirely certain but which, on reasonable and well-informed grounds, appear to pose serious threats to the economy, the environment, human health and social well-being.

Sun Gro takes a proactive approach to prevent environmental and socio-economic effects by developing concrete policies and programs such as fire policy, health and safety and emergency response planning rather than reacting to effects after they occur. Sun Gro will complete environmental investigations and monitoring at the site as proposed and any additional monitoring specified in the Environmental Act License. Compliance monitoring will enable early detection of potential environmental issues at the site and allow for mitigation measures to be implemented.

Conservation and Enhancement

Manitobans should maintain the ecological processes, biological diversity and life-support systems of the environment, harvest renewable resources on a sustainable yield basis, make wise and efficient use of renewable and non-renewable resources, and enhance the long-term productive capability, quality and capacity of natural ecosystems.

The proposed development will protect existing potential wildlife and fish habitat areas by creating buffer zones around water bodies and watercourses within the development area. Additional measures, such as maintaining low flow connectivity at crossings and ensuring protection against erosion and sedimentation, will be included in all stages of construction and development.

Rehabilitation and Reclamation

Manitobans should endeavor to repair damage to or degradation of the environment, and consider the need for rehabilitation and reclamation in future decisions and actions.

The closure plan for the proposed development will enable the entire site to be restored back to a functioning wetland supporting a more diverse collection of native species and their habitat.

Global Responsibility

Manitobans should think globally when acting locally, recognizing that there is economic, ecological and social interdependence among provinces and nations, and working cooperatively, within Canada and internationally, to integrate economic, environmental, human health and social factors in decision making while developing comprehensive and equitable solutions to problems.

The proposed development will be operated using sound environmental management practices for the protection of the environment and local ecosystem. Because Sun Gro is an international company, environmental, human health, social, and economic issues will be addressed by Sun Gro to ensure that the needs and concerns of the region are being met, while meeting their market need around the world.

6.8.2 Guidelines for Sustainable Development

Efficient Use of Resources

This means encouraging and facilitating development and application of systems for proper resource pricing, demand management and resource allocation together with incentives to encourage efficient use of resources, and employing full-cost accounting to provide better information for decision makers. Sun Gro encourages efficient use of resources and materials and its operations through standard operating procedures established through past experience gained at the Elma demonstration site.

Public Participation

This means establishing forums which encourage and provide opportunity for consultation and meaningful participation in decision making processes by Manitobans, endeavoring to provide due process, prior notification and appropriate and timely redress for those adversely affected by decisions and actions, and striving to achieve consensus amongst citizens with regard to decisions affecting them.

Information regarding the proposed development has been provided to the public in the region through various means including: telephone conversations with stakeholders and community representatives; a letter to the Peguis First Nation community; and various stakeholders within the Hecla/Grinstone Provincial Park.

Access to Information

This means encouraging and facilitating the improvement and refinement of economic, environmental, human health and social information, and promoting the opportunity for equal and timely access to information by all Manitobans. To promote a greater understanding of their peat operations, Sun Gro provides relevant information to governments, the public and their employees.

Integrated Decision-Making and Planning

This means encouraging and facilitating decision making and planning processes that are efficient, timely, accountable and cross-sector and which incorporate an inter-generational perspective of future needs and consequences. Sun Gro encourages involvement from all levels of the organization through team design which supports decision making at the most appropriate levels. Sun Gro will continue to work closely with communities, local and provincial governments as with existing bog sites.

Waste Minimization and Substitution

This means encouraging and promoting the development and use of substitutes for scarce resources where such substitutes are both environmentally sound and economically viable, and reducing, reusing, recycling and recovering the products of society.

Sun Gro is committed to the environment and fully embraces these concepts through its operating procedures such as composting, re-using a variety of materials once considered waste and recycling. Sun Gro reduces their need for outside resources during access and bog road construction by using non-marketable timber and waste vegetation.

Research and Innovation

This means encouraging and assisting the researching, development, application and sharing of knowledge and technologies, which further our economic, environmental, human health and social well-being.

Sun Gro will monitor the site as directed in the Environmental Act License for the facility. The monitoring results submitted to Manitoba Conservation are public documents as is this EAP. Additionally, Sun Gro continually researches new innovations in mine restoration procedures.

7.0 MITIGATIVE SUMMARY

Mitigation is defined under the Canadian Environmental Assessment Act as the elimination, reduction and control of the adverse effects of a project and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. Mitigation measures for the proposed peat mining development are identified in Sections 6.3 and 6.4 and are summarized in Table 14. The nature of the mitigation measures, whether they are design, proposed, regulatory or management is shown in the table and described in the following sections.

7.1 DESIGN MITIGATION

Design mitigation includes measures that are either already included in the design of the proposed development or are to be addressed as a result of this environmental assessment. The design of the proposed development incorporates components, systems, controls and features that will mitigate potential adverse environmental effects typically associated with peat mining operations. Design mitigation for the proposed peat mining development are summarized in Table 14. Responsibility for implementing design mitigation rests with the proponent and their contractors.

7.2 PROPOSED MITIGATION

Proposed mitigation includes measures that are identified in the environmental assessment report to address potential adverse environmental effects. These mitigation measures, while not required by legislation, serve to eliminate, reduce and control potential adverse environmental effects and render them not significant. These measures are summarized in Table 14. For the most part, the measures are operational in nature and require incorporation into specifications for construction and standard operational procedures.

7.3 REGULATORY REQUIREMENTS

The proposed peatland development is subject to various federal and provincial environmental legislations. Regulatory requirements serve to mitigate adverse environmental effects, which

may have potentially significant environmental and human health consequences. Environmental legislation applicable to this development includes the following:

Manitoba

- *Environment Act*
 - Peat Smoke Control Regulation
 - Litter Regulation
 - Waste Disposal Grounds Regulation
- *The Mines and Minerals Act*
 - Operation of Mines Regulation
 - Mine Closure Regulation
- *Dangerous Goods Handling and Transportation Act*
 - Environmental Accident Reporting Regulations
 - Storage and Handling of Petroleum Products and Allied Products Regulation
 - Generator Registration and Carrier Licencing Regulation
 - Manifest Regulation
- *Public Health Act*
 - Atmospheric Pollution Regulation
 - Protection of Water Sources Regulation
- *The Provincial Parks Act*
- *Ozone Depleting Substances Act and Regulations*
- *The Forest Act*
 - Forest Use and Management Regulations
- *Workplace Safety and Health Act and Regulations*
- *Contaminated Sites Remediation Act*
- *Sustainable Development Act*
- *The Endangered Species Act*
- *The Highway Traffic Act and Regulations*
- *Water Protection Act*

Canada

- *Canadian Environmental Assessment Act* and Regulations
- *Canadian Environmental Protection Act* and Regulations
- *Fisheries Act*
- *Species at Risk Act*

Regulatory mitigation applies to site preparation activities, mining operations, transport and storage of hazardous substances, reporting of spills and accidental releases, reporting as a licence condition, worker and public safety, etc. Table 14 includes mitigation measures that are regulatory in nature.

Guidelines followed in the preparation of an EAP for peat mining developments include the following:

- Manitoba Water Quality Standards, Objectives, and Guidelines
- Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, Summary of Guidelines for Fresh Water Aquatic Life
- Advice for the Preparation of an Environment Act Proposal for a Class 2 Peat Mining Development

7.4 MANAGEMENT PRACTICES

Good environmental management practices can further protect the environment and human health and safety from potentially adverse effects of peat mining site preparation and operation activities. While many of the practices are not required by legislation, various policies, guidelines and procedures exist that provide direction in relation to environmental protection, environmental stewardship and sustainable development principles and guidelines. Examples of good management practices are summarized in Table 14.

Implementation of mitigation measures proposed by Sun Gro will be carried out through development of an Environmental Protection Plan that includes mitigation measures, follow-up requirements, licence and permit terms and conditions, and other related requirements. The

Environmental Protection Plan also provides for effective integration of environmental assessment results into contract specifications and operational procedures.

7.5 CONTINGENCY PLANNING

Sun Gro will prepare and implement a contingency plan for the proposed peat mining development site at Hay Point Bog. The plan will include provisions for fires, explosions, accidents, malfunctions, spills, storms and floods. Sun Gro will form a fully functional team at the site made up of employees from all levels of the operation. The team will work closely with communities, local and provincial governments on regulations, codes and guidelines as well as implement emergency response procedures as with their existing bog sites. These procedures will include training in emergency preparedness and evacuation plans for such emergencies as fire and explosion.

7.6 CLOSURE PLAN

A closure plan for the proposed mining sites has been developed in accordance with requirements of Manitoba Regulation 67/99 of the Mines and Mineral Act ⁽¹¹⁾. The mine closure plan outlines the restoration of the site and all final closure activities and cost (Appendix B).

8.0 FOLLOW-UP

Follow-up is defined under the *Canadian Environmental Assessment Act* as a program to verify the accuracy of the environmental assessment of a project and determine the effectiveness of measures taken to mitigate the adverse environmental effects of the project. Follow-up requirements identified for the proposed peat mining development in Sections 6.3 and 6.4 are summarized in Table 15. The primary nature of the follow-up, whether they are inspecting, monitoring, record keeping or reporting is shown in the table and described in the following sections.

8.1 INSPECTING

Inspecting involves periodic or regular observations of the project and local area during site preparation, construction and operation activities to determine whether mitigation measures are implemented and if they are effective in eliminating, reducing or controlling adverse environmental effects. Inspecting includes surveillance to identify problems, issues and concerns, and environmental effects not predicted in the environmental assessment report. Inspections may involve the use of checklists and should be maintained at the project site. Inspection requirements for the proposed peatland development during site preparations and construction are summarized in Table 15. Sun Gro staff is typically responsible for most of the inspections during the site preparation and operation phases.

8.2 MONITORING

Monitoring includes periodic or regularly scheduled collection or sampling for environmental information in the development or project area. Monitoring may be required by the environmental assessment or it may become necessary as a result of inspections that are carried out after the assessment. Follow-up monitoring for the proposed development during site preparation includes surface water quality after spring thaw. Monitoring during site operation includes surface water quality at sedimentation ponds monthly, surface water quality in adjacent water bodies three times a year or as directed by Manitoba Conservation in the Environment Act Licence. . Sun Gro is normally responsible for monitoring during the site preparation and operating phases.

8.3 RECORD KEEPING

Record keeping includes maintaining files and documentation related to mitigation measures and follow-up implemented as well as recording public complaints. Record keeping requirements for the proposed development include monitoring and tracking complaints from local residents, submission of Material Safety Data Sheets (MSDSs) for all products used, number of vehicle-wildlife interactions, number of problem or nuisance wildlife situations, number of amphibians and reptiles observed on the site, fuel volumes delivered and used, maintaining peat transportation manifests, number of monitoring and testing samples collected and analytical data generated, details of incidents requiring implementation of the emergency response plan and updating the emergency response plan following testing.

8.4 REPORTING

Reporting in the context of environmental assessment follow-up includes documentation and communication that mitigation measures and follow-up are implemented and whether or not they have been effective. Such reports are normally required by the Manitoba Conservation Environment Act Licence and are placed in the public registry for the project. Reporting is also required in the event of an accidental spill or release of hazardous substances. Reporting requirements for the proposed development will also likely include an annual compliance surface water quality report, summary of annual generation of peat and a detailed report following incidents that require implementation of the emergency response plan. Sun Gro will be responsible for submitting all required reports to Manitoba Conservation as specified in the Environment Act Licence.

9.0 CONCLUSIONS

The Environmental Act Proposal (EAP) for the proposed peatland development project was prepared based on project information provided by Sun Gro. The report followed the requirements of the *Environmental Assessment and Licencing Process Under the Manitoba Environment Act*. A peat mining operation such as the one proposed by Sun Gro is considered a mining development under Manitoba Regulation 164/88 and therefore considered a Class 2 Development. The EAP was also completed in accordance with Manitoba Conservation's *Advice for the Preparation of an Environment Act Proposal for a Class 2 Peat Mining Development*.

The EAP was carried out using available biophysical, social and economic information for the regional assessment area. Potential environmental effects of the proposed peatland development were identified using scoping methods, interaction matrix techniques, public comments, advice from specialists and professional judgment. Direct biophysical effects and indirect social and economic effects were identified in accordance with the *Canadian Environmental Assessment Act*. Cumulative environmental effects for the project were also considered. Mitigation measures were identified to eliminate, reduce and control environmental effects determined to be adverse. Follow-up was proposed to verify accuracy of the assessment and determine effectiveness of the mitigation measures. Significance of the residual environmental effects remaining after mitigation was then evaluated.

The proposed peat mining operation at Hay Point Bog, will not likely result in significant adverse environmental effects based on the available information on the project and the environment, the assessment of environmental effects outlined in this EAP, and the application of proposed mitigation measures and the conduct of required follow-up. Similarly, the cumulative environmental effects of the project in combination with the effects of other projects or activities that have been and will likely be carried out in the reasonably foreseeable future were determined to be not significant.

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TABLES

**TABLE 1
QUARRY LEASE INFORMATION
HAY POINT PEAT MINE DEVELOPMENT**

Quarry Lease No.	Area (Ha)
QL-475	255.79
QL-476	169.70
QL-477	105.64
Total	531.13

**TABLE 2
ESTIMATED PEAT PRODUCTION SCHEDULE
HAY POINT PEAT MINE DEVELOPMENT**

Production Year	Harvest Area (ha)	Total Volume (m ³) Harvested/Year	Truck Loads/Year
2013	60	51,000	301
2014	120	102,000	602
2015	180	153,000	903
2016	240	204,000	1,204
2017	300	255,000	1,505
2018	375	318,750	1,881
2019	375	318,750	1,881
2020	375	318,750	1,881
2021	375	318,750	1,881
2022	375	318,750	1,881
2023	375	318,750	1,881
2024	375	318,750	1,881
2025	375	318,750	1,881
2026	375	318,750	1,881
2027	375	318,750	1,881
2028	375	318,750	1,881
2029	375	318,750	1,881
2030	375	318,750	1,881
2031	375	318,750	1,881
2032	375	318,750	1,881
2033	375	318,750	1,881
2034	375	318,750	1,881
2035	375	318,750	1,881
2036	375	318,750	1,881
2037	375	318,750	1,881
2038	375	318,750	1,881
2039	375	318,750	1,881
2040	375	318,750	1,881
2041	375	318,750	1,881
2042	375	318,750	1,881
2043	375	318,750	1,881
2044	375	318,750	1,881
2045	375	318,750	1,881
2046	375	318,750	1,881
2047	375	318,750	1,881
2048	375	318,750	1,881
2049	375	318,750	1,881
2050	375	318,750	1,881
2051	375	318,750	1,881
2052	315	267,750	1,580
2053	255	216,750	1,279
2054	195	165,750	978
2055	135	114,750	677
2056	75	63,750	376
2057	30	25,500	151
2058	0	0	0

**TABLE 4
GENERAL WATER QUALITY
HAY POINT PEAT MINE DEVELOPMENT**

Sample No.	Date	Water Source	Parameters ⁽¹⁾																			
			pH (units)	E.C. (µS/cm)	Alkalinity as CaCO ₃	Bicarbonate as CaCO ₃	Carbonate as CaCO ₃	Hydroxide as CaCO ₃	Hardness as CaCO ₃	Sulphate	Ortho-phosphate as P	Ammonia (as N)	Nitrate & Nitrite (as N)	B.O.D.	Total Phosphorus	Total Dissolved Phosphorus	Total Pariculate Phosphorus	T.D.S.	T.S.S.	T.K.N.	Acidity	
<i>Laboratory Detection Limits</i>			0.1	0.4	1	2	0.6	0.4	0.3	9	0.01	0.05	0.05	1	0.003	0.003	0.003	5	5	0.2	1	
H1	21-Jun-10	Unnamed Lake	4.09	48	<1.0	<2.0	<0.6	<0.4	6.33	27.6	<0.010	<0.050	<0.050	1.3	0.0203	0.0184	<0.0030	106	<5.0	0.94	20.4	
H2	21-Jun-10	Hay Creek	4.50	34.7	<1.0	<2.0	<0.6	<0.4	9.77	22.7	<0.010	<0.050	<0.050	2	0.0271	0.0174	0.0097	110	<5.0	0.9	16.1	
	Field Dup. DUP-2		4.50	35.1	<1.0	<2.0	<0.6	<0.4	11.6	23.1	<0.010	<0.050	<0.050	4	0.0981	0.0178	0.0803	108	284	1.87	16.6	
H3	21-Jun-10	Lake Winnipeg	7.00	138	41.1	50.2	<0.6	<0.4	85.4	30.4	<0.010	<0.050	<0.050	1.6	0.0298	0.0202	0.0096	184	7	1.36	2.9	
H4	21-Jun-10	Peat Bog	4.17	43.1	<1.0	<2.0	<0.6	<0.4	6.1	22.3	<0.010	<0.050	<0.050	<1.0	0.0199	0.0146	0.0053	106	<5.0	0.78	18.3	
H5	21-Jun-10	Peat Bog	4.18	44.1	<1.0	<2.0	<0.6	<0.4	6.61	27.6	<0.010	<0.050	<0.050	1.1	0.0368	0.0159	0.0209	106	37	0.89	19.3	
Manitoba Surface Water Quality Objectives ⁽²⁾																						
Freshwater Aquatic Life			6.5 - 9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	⁽⁶⁾	-	-
CCME ⁽³⁾																						
Freshwater Aquatic Life			6.5 - 9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

- "-" = No Data
- E.C. = Electrical Conductivity
- B.O.D. = Biochemical Oxygen Demand
- T.K.N. = Total Kjeldahl Nitrogen
- T.D.S. = Total Dissolved Solids
- T.S.S. = Total Suspended Solids

1. All values are expressed in milligrams per litre (mg/L) unless indicated otherwise.
2. Manitoba Surface Water Quality Objectives, Manitoba Conservation Report 2002-11, Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOG), November 22, 2002.
3. CCME 2007 - Canadian Council of Ministers of the Environment. Canadian Environmental Quality Guidelines, 1999. Update 7.0 - 2009. Guidelines for Canadian Drinking Water Quality. Chapter 4 - Aquatic Life
4. See Tier II Water Quality Objective.
5. Ammonia as N is pH and Temperature dependant. See Factsheet for details.
6. **Total Suspended Sediment Tier II**
 - Background TSS less than or equal to 25 mg/L: 5 mg/L induced change from background (30 day averaging duration)
 - Background TSS less than or equal to 250 mg/L: 25 mg/L induced change from background (1 day averaging duration)
 - Background TSS greater than 250 mg/L: 10% induced change from background (1 day averaging duration)

BOLD - Exceedance of MWQSOG Freshwater Aquatic Life
Underline - Exceedance of CCME Freshwater Aquatic Life

**TABLE 5
METALS IN WATER
HAY POINT PEAT MINE DEVELOPMENT**

Sample No.	Date	Water Source	Parameter ⁽¹⁾																		
			Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum
H1	21-Jun-10	Unnamed Lake	<u>0.1980</u>	<0.0002	0.00090	0.00307	<0.0002	<0.0002	<0.010	0.000020	1.19	<0.00010	<0.001	<0.00020	0.00037	0.290	<u>0.000563</u>	0.0029	0.819	0.01680	<0.0002
H2	21-Jun-10	Hay Creek	<u>0.1150</u>	<0.0002	0.00055	0.00156	<0.0002	<0.0002	<0.010	0.000015	1.83	<0.00010	<0.001	<0.00020	<0.00020	0.224	<u>0.000380</u>	0.0030	1.270	0.03100	<0.0002
	Field Dup. DUP-2		<u>0.1490</u>	<0.0002	0.00060	0.00274	<0.0002	<0.0002	<0.010	0.000020	2.27	<0.00010	<0.001	<0.00020	0.00032	0.290	<u>0.000872</u>	0.0037	1.430	0.04020	<0.0002
H3	21-Jun-10	Lake Winnipeg	<u>0.2570</u>	<0.0002	0.00120	0.00944	<0.0002	<0.0002	0.014	<0.000010	20.70	<0.00010	<0.001	0.00023	0.00081	<u>0.436</u>	<u>0.000418</u>	0.0073	8.180	0.05650	<0.0002
H4	21-Jun-10	Peat Bog	<u>0.1400</u>	<0.0002	0.00057	0.00171	<0.0002	<0.0002	<0.010	0.000021	1.02	<0.00010	<0.001	<0.00020	0.00058	0.262	<u>0.001200</u>	0.0033	0.867	0.02710	<0.0002
H5	21-Jun-10	Peat Bog	<u>0.1850</u>	<0.0002	0.00088	0.00248	<0.0002	<0.0002	<0.010	0.000020	1.23	<0.00010	<0.001	<0.00020	<0.00020	0.264	<u>0.000629</u>	0.0027	0.861	0.01320	<0.0002
<i>Laboratory Detection Limits</i>			<i>0.005</i>	<i>0.0002</i>	<i>0.0002</i>	<i>0.0002</i>	<i>0.0002</i>	<i>0.0002</i>	<i>0.01</i>	<i>0.00001</i>	<i>0.1</i>	<i>0.0001</i>	<i><0.001</i>	<i>0.0002</i>	<i>0.0002</i>	<i>0.02</i>	<i>0.00009</i>	<i>0.002</i>	<i>0.01</i>	<i>0.0003</i>	<i>0.0002</i>
MWQSOG⁽²⁾																					
Freshwater Aquatic Life			0.1 ⁽⁴⁾	-	⁽⁵⁾	-	-	-	-	⁽⁶⁾	-	-	-	-	⁽⁶⁾	0.3	⁽⁶⁾	-	-	-	0.073
CCME⁽⁵⁾																					
Freshwater Aquatic Life			0.005 - 0.1 ⁽⁷⁾	-	0.005	-	-	-	29 ⁽⁸⁾ 1.5 ⁽⁹⁾	⁽¹⁰⁾	-	-	0.0089 (III), 0.001 (VI)	-	⁽¹⁰⁾	0.3	⁽¹⁰⁾	-	-	-	0.073

Sample No.	Date	Water Source	Parameter ⁽¹⁾																		
			Nickel	Phosphorus	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	Strontium	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
H1	21-Jun-10	Unnamed Lake	<0.002	<0.20	0.694	0.00174	<0.001	4.150	<0.0001	0.980	0.00351	<0.0002	<0.0001	<0.0001	<0.0002	0.00267	<0.001	<0.00010	0.00065	<0.0050	<0.0004
H2	21-Jun-10	Hay Creek	<0.002	<0.20	0.606	0.00155	<0.001	4.180	<0.0001	1.240	0.00652	<0.0002	<0.0001	<0.0001	<0.0002	0.00194	<0.001	<0.00010	0.00041	<0.0050	<0.0004
	Field Dup. DUP-2		<0.002	<0.20	0.704	0.00173	<0.001	4.300	<0.0001	1.300	0.00853	<0.0002	<0.0001	<0.0001	<0.0002	0.00246	<0.001	<0.00010	0.00052	<0.0050	<0.0004
H3	21-Jun-10	Lake Winnipeg	<0.002	<0.20	0.321	0.00075	<0.001	4.300	<0.0001	1.620	0.05070	<0.0002	<0.0001	<0.0001	<0.0002	0.00767	<0.001	0.00022	0.00106	<0.0050	<0.0004
H4	21-Jun-10	Peat Bog	<0.002	<0.20	0.698	0.00174	<0.001	4.200	<0.0001	1.090	0.00261	<0.0002	<0.0001	<0.0001	<0.0002	0.00195	<0.001	<0.00010	0.00043	<0.0050	<0.0004
H5	21-Jun-10	Peat Bog	<0.002	<0.20	0.596	0.00159	<0.001	4.140	<0.0001	0.913	0.00363	<0.0002	<0.0001	<0.0001	<0.0002	0.00222	<0.001	<0.00010	0.00056	<0.0050	<0.0004
<i>Laboratory Detection Limits</i>			<i>0.002</i>	<i>0.2</i>	<i>0.02</i>	<i>0.0002</i>	<i>0.001</i>	<i>0.05</i>	<i>0.0001</i>	<i>0.03</i>	<i>0.0001</i>	<i>0.0002</i>	<i>0.0001</i>	<i>0.0001</i>	<i>0.0002</i>	<i>0.0002</i>	<i>0.001</i>	<i>0.0001</i>	<i>0.0002</i>	<i>0.005</i>	<i>0.0004</i>
MWQSOG⁽²⁾																					
Freshwater Aquatic Life			⁽⁶⁾	-	-	-	0.001	-	0.0001	-	-	-	0.0008	-	-	-	-	-	-	⁽⁶⁾	-
CCME⁽³⁾																					
Freshwater Aquatic Life			⁽¹⁰⁾	-	-	-	0.001	-	0.0001	-	-	-	0.0008	-	-	-	-	-	-	0.03	-

**TABLE 5
METALS IN WATER
HAY POINT PEAT MINE DEVELOPMENT**

Notes:

1. All values are expressed in milligrams per litre (mg/L).
2. Manitoba Surface Water Quality Objectives, Manitoba Conservation Report 2002-11, Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOG), November 22, 2002.
3. CCME 2007 - Canadian Council of Ministers of the Environment. Canadian Environmental Quality Guidelines, 1999. Update 7.1 - 2009.
Guidelines for Canadian Drinking Water Quality. Chapter 4 - Aquatic Life
4. The concentration of total aluminum should not exceed 0.1 mg/L in waters with a pH greater than 6.5.
5. Arsenic Tier II Objectives:
0.15 mg/L = Duration 4 Days, Not more than once each 3 years, on average
0.34 mg/L = Duration 1 Hour, Not more than once each 3 years, on average
6. See Tier II Objectives for calculations (averaging 4 day duration).

Sample No.	Hardness	Cadmium	Copper	Lead	Nickel	Zinc
H1	6.33	0.000289	0.000850	0.00011	0.00504	0.01140
H2	9.77	0.003990	0.001230	0.00019	0.00977	0.01646
H2(DUP-2)	11.60	0.000453	0.001420	0.00023	0.00841	0.01904
H3	85.40	0.001991	0.007830	0.00212	0.04551	0.10335
H4	6.10	0.000281	0.000820	0.00011	0.00488	0.01105
H5	6.61	0.000298	0.000880	0.00012	0.00522	0.01182

7. Total aluminum should not exceed 0.005 mg/L in waters with a pH below 6.5.
The concentration of total aluminum should not exceed 0.1 mg/L in waters with a pH greater or equal to 6.5.
8. Short-term exposure periods (24 to 96 hours) on the impacts of severe transient situations (spill events to aquatic receiving environments and infrequent releases of short-lived/non persistent substances).
9. Long-term exposure guidelines that protect all forms of aquatic life for indefinite exposure periods (>7d exposures for fish and invertebrates, 24h exposures for aquatic plants and algae).
10. For the following equations, hardness is expressed as CaCO₃ in mg/L and the calculated guideline is in µg/L; however for the tables below the guideline values were further modified to be expressed in mg/L .
Cadmium Guideline = $10^{(0.86[\log(\text{hardness})] - 3.2)}$ µg/L; **Copper** Guideline = $e^{(0.8545[\ln(\text{hardness})] - 1.465)}$ * 0.2 µg/L; **Lead** Guideline = $e^{(1.273[\ln(\text{hardness})] - 4.705)}$ µg/L; **Nickel** Guideline = $e^{(0.76[\ln(\text{hardness})] + 1.06)}$ µg/L

Sample No.	Hardness	Cadmium	Copper	Lead	Nickel
H1	6.33	0.000003	0.00200	0.001	0.025
H2	9.77	0.000004	0.00200	0.001	0.025
H2(DUP-2)	11.60	0.000005	0.00200	0.001	0.025
H3	85.40	0.000029	0.00207	0.003	0.085
H4	6.10	0.000003	0.00200	0.001	0.025
H5	6.61	0.000003	0.00200	0.001	0.025

BOLD	- Exceedance of MWQSOG Freshwater Aquatic Life Criteria
<u>UNDERLINE</u>	- Exceedance of CCME Freshwater Aquatic Life Criteria

**TABLE 6
VEGETATION SPECIES LIST
HAY POINT PEAT MINE DEVELOPMENT**

Species		Status		
Common Name	Scientific Name	Provincial (S)	COESWIC	National (G)
Non Vascular Species				
Mosses				
Broom moss	<i>Dicranum</i> spp.	-	-	-
Feathermoss	<i>Pleurozium schreberi</i>	SNR	-	G5
Hair-cap moss	<i>Polytrichum</i> spp.	-	-	-
Peat moss	<i>Sphagnum</i> spp.	-	-	-
Lichen				
Boreal cup lichen	<i>Cladonia borealis</i>	SNR	-	G5
Grey reindeer lichen	<i>Cladina rangiferina</i>	SNR	-	G5
Pixie-cup	<i>Cladonia</i> spp.	-	-	-
Vascular Species				
Woody Specimens - Trees				
Black spruce	<i>Picea mariana</i>	S5	-	G5
Tamarak	<i>Larix laricina</i>	S5	-	G5
Woody Specimens - Shrubs				
Bog rosemary	<i>Andromeda glaucophylla</i>	S4	-	G5
Common Labrador tea	<i>Ledum groenlandicum</i>	S5	-	G5
Creeping snowberry	<i>Gaultheria hispidula</i>	S5	-	G5
Leatherleaf	<i>Chamaedaphne calyculata</i>	S5	-	G5
Mountain cranberry	<i>Vaccinium vitis-idaea</i>	S5	-	G5
Narrowleaf white meadowsweet	<i>Spiraea alba</i>	S5	-	G5
Pale laurel	<i>Kalmia Polifolia</i>	S5	-	G5
Small cranberry	<i>Vaccinium oxycoccos</i>	S5	-	G5
Grassy Species				
Lake-bank sedge	<i>Carex lacustris</i>	S5	-	G5
Herbaceous				
Bladderwort	<i>Utricularia</i> spp.	-	-	-
Blue flag	<i>Iris versicolor</i>	S4	-	G5
Cloudberry	<i>Rubus chamaemorus</i>	S5	-	G5
Northern pitcherplant	<i>Sarracenia purpurea</i>	S5	-	G5
Roundleaf sundew	<i>Drosera rotundifolia</i>	S5	-	G5
Three-leaf solomon's-plume	<i>Maianthemum trifolium</i>	S5	-	G5

Notes:

Provincial Status (S-Rank): S1= Very rare throughout range, S2= Rare throughout range, S3= Uncommon throughout range, S4= Widespread and apparently secure, S5= Abundant and secure, SNR = Rank not yet assigned.

Global Status (G-rank): G1= Critically Imperiled, G2= Imperiled, G3= Vulnerable, G4= Apparently Secure, G5= Secure, G#G# indicates range of uncertainty in status

COSEWIC descriptors - = No protection designation assigned

**TABLE 7
WILDLIFE SPECIES LIST
HAY POINT PEAT MINE DEVELOPMENT**

Species			Status		
Common Name	Scientific name	Observation	Provincial (S)	COESWIC	National (G)
Avian (Birds)					
Anseriformes					
Canada goose	<i>Branta canadensis</i>	observed	S5B	-	G5
Common merganser	<i>Mergus merganser</i>	observed	S5B	-	G5
Charadriiformes					
Lesser yellowlegs	<i>Tringa flavipes</i>	observed	S5B	-	G5
Falconiformes					
Northern harrier	<i>Circus cyaneus</i>	observed	S4B	NAR	G5
Gruiformes					
Sandhill crane	<i>Grus canadensis</i>	auditory	S5B	PS	G5
Passeriformes					
Alder flycatcher	<i>Empidonax alnorum</i>	auditory	S5B	-	G5
Black-capped chickadee	<i>Poecile atricapillus</i>	auditory	S5	-	G5
Chipping Sparrow	<i>Spizella passerina</i>	auditory	S5B	-	G5
Common Raven	<i>Corvus corax</i>	observed	S5	-	G5
Connecticut warbler	<i>Oporornis agilis</i>	auditory	S4S5B	-	G4
Dark-eyed junco	<i>Junco hyemalis</i>	auditory	S5B	-	G5
Gray jay	<i>Perisoreus canadensis</i>	observed	S5	-	G5
Hermit thrush	<i>Catharus guttatus</i>	auditory	S5B	-	G5
Least flycatcher	<i>Empidonax minimus</i>	auditory	S5B	-	G5
Pine siskin	<i>Carduelis pinus</i>	auditory	S5	-	G5
Ruby-crowned kinglet	<i>Regulus calendula</i>	auditory	S5B	-	G5
Savannah sparrow	<i>Passerculus sandwichensis</i>	auditory	S5B	PS	G5
Piciformes					
Downy woodpecker	<i>Picoides pubescens</i>	observed	S5	-	G5
Hairy woodpecker	<i>Picoides villosus</i>	observed	S5	-	G5
Amphibians					
Gray treefrog	<i>Hyla versicolor</i>	auditory	S4S5	-	G5
Northern leopard frog	<i>Rana pipiens</i>	observed	S4	SC,NAR	G5
Mammals					
Moose	<i>Alces americanus</i>	observed	S5	-	G5
Northern grey wolf	<i>Canis lupus</i>	dung	S4	NAR	G4

Notes:

Provincial Status (S-Rank): S1= Very rare throughout range, S2= Rare throughout range, S3= Uncommon throughout range, S4= Widespread and apparently secure, S5= Abundant and secure.

Global Status (G-rank): G1= Critically Imperiled, G2= Imperiled, G3= Vulnerable, G4= Apparently Secure, G5= Secure, G#G# indicates range of uncertainty in status

Status modifiers: B = For a migratory species, rank applies to the breeding population in the province,

COSEWIC descriptors - = No protection designation assigned

SC = Special Concern; Likely to be come endangered due to combination of identified threats

NAR = not at risk of extinction

PS = Status applies only to a portion of the species' range

TABLE 10

CATEGORIES OF ADVERSE BIOPHYSICAL, SOCIO-ECONOMIC AND CULTURAL EFFECTS

Adversity Category	Biophysical	Socio-Economic	Physical and Cultural Heritage
Negligible	Effect on the population or a specific group of individuals at a local project area and/or over a short period in such a way as to be similar to small random changes in the population due to environmental irregularities but having no measurable effect on the population as a whole.	Effect of either very short duration or affects a small group of people or which occurs in the local project area in a manner similar to small random changes to extraneous irregularities, but having no measurable effect on the population as a whole.	Effect on physical and cultural heritage resources of short duration and in the local project area. The effect on physical and cultural resources is not detectable. The resources are not publicly recognized or protected by legislation.
Minor	Effect on a specific group of individuals in a population in the project area and/or over a short period (one generation or less), but not affecting other trophic levels or the integrity of the population itself.	Effect either of short-term duration or affects a specific group of people in the local project area but not necessarily affecting the integrity of the entire group itself.	Effect on physical and cultural heritage resources of short duration but over the adjacent local area. The effect on physical and cultural resources is minor or repairable. The resources are publicly recognized but not protected by legislation.
Moderate	Effect on a portion of a population that results in a change in abundance and/or distribution over one or more generations of that portion of the population or any population dependent upon it, but does not change the integrity of any population as a whole. The effect may be localized.	Effect either of medium-term duration (which affects one or two generations and/or the portion of the population dependent upon it) or affects a moderate portion of the population without affecting the integrity of the population as a whole.	Effects on physical and cultural heritage resources of moderate duration. Resources affected over the adjacent local area. The effect on physical and cultural resources is reversible. The resources are protected by legislation.
Major	Effect on a whole stock or population of a species in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural recruitment would not return that population or species dependent upon it, to its former level within several generations.	Effect either of long duration (lasting several generations) or affecting an entire definable group of people in sufficient magnitude to cause severe change in economic, physical or psychological well-being or long established activity patterns that would not return to pre-project levels or patterns within several generations.	Effect on physical and cultural heritage resources of long duration. Resources affected over large regional area. There is an irreversible effect on physical/cultural resources. The resources are protected by legislation.

TABLE 11
CRITERIA AND RATINGS FOR EVALUATING SIGNIFICANCE

Criteria	Rating		
	1	2	3
a) Societal value of the affected environmental components – includes nature and degree of protection provided	Not valuable (no designation)	Moderately valuable (designated or protected locally, regionally or provincially)	Highly valuable (designated or protected nationally or internationally)
b) Ecological value – includes rarity and uniqueness, fragility, importance within ecosystem, importance to scientific studies	Not valuable	Moderately valuable	Highly valuable
c) Duration – length of time the project activity will last	Short-term (less than 1 year)	Moderate (between 1 and 100 years)	Long-term (more than 100 years)
d) Frequency – rate of reoccurrence of the project activity causing the effect	Rarely (less than once per year)	Sporadically (less than once per month)	Frequently (more than once per week)
e) Geographic extent – area over which the effect will occur	Single point	Localized	Regional or greater
f) Magnitude – predicted disturbance compared to existing conditions	No measurable disturbance	Measurable disturbance but no loss of function	Measurable disturbance with loss of function
g) Reversibility – time the environmental component will take to recover after the source of the effect ceases	Less than a year	Between 1 and 100 years	Irreversible

TABLE 12

ENVIRONMENTAL EFFECTS ANALYSIS SUMMARY FOR THE PROPOSED PEAT DEVELOPMENT

Environmental Effect	Adversity (Table 10)	Mitigation Measures	Follow-up	Significance (S)* (see Table 11)								
				a	b	c	d	e	f	g	S	
Microclimate												
Changes in airflow, wind speed and snow deposition pattern	Minor	-Install snow fences to control snow deposition on the property if required	-Observe for changes in airflow patterns and snow deposition periodically	1	2	2	2	2	2	2	N	
Air Quality												
Increased fugitive dust from site preparation, construction, operation and reclamation activities	Moderate	-Use approved dust suppressant -Minimize peat handling activities during high wind events -Reduce exposed peat area (harvesting fields and peat stockpiles) to prevailing winds -Control vehicle speeds -Instruct employees on proper harvest equipment operation to minimize dust -Cover loads being hauled from the site -Re-vegetate harvested areas -Utilize windbreaks (tree and brush barriers)	-Observe site periodically for fugitive dust levels -Perform inspections of local area for accumulated dust -Track public complaints	2	1	2	3	2	2	1	N	
Increased levels of NO _x , SO ₂ , greenhouse gases and VOCs from equipment and vehicle emissions during site preparation, peat harvesting and transporting activities, construction materials and fuel use	Minor	-Use low sulphur fuels -Require a high standard of maintenance of equipments and vehicles -Limit unnecessary long-term idling -Use appropriate fuel dispensing equipment	-Perform periodic inspections of air quality during construction -Record maintenance of heavy equipment -Require submission of MSDSs for all products used	2	1	2	3	2	2	1	N	
Increased releases of carbon dioxide into the atmosphere from clearing and peat-harvesting activities	Minor	-Minimize the areas cleared -Prepare and implement a reclamation plan that restores the area to a carbon sink condition	-Adhere to licence terms and conditions	3	1	2	3	2	1	2	N	

Table 12 Cont'd

Environmental Effect	Adversity (Table 10)	Mitigation Measures	Follow-up	Significance (S)* (see Table 11)								
				a	b	c	d	e	f	g	S	
Soils												
Loss and disturbance of surface soil during site preparation and harvesting activities	Major	<ul style="list-style-type: none"> -Minimize the surface area disturbed -Leave non-commercial peat reserves in place -Prepare and implement a Mine Closure plan to restore the area to natural conditions 	-Monitor annually and report on implementation of progressive restoration activities	1	2	2	3	2	3	3	N	
Contamination of soils from leaks and accidental spills and releases of fuel or other hazardous substances	Moderate	<ul style="list-style-type: none"> -Prevent leaks, spills and releases -Provide ULC Certified double-walled fuel storage tanks with spill prevention and leak detection -Require drip trays for equipment -Designate fuel storage and re-fueling areas -Ensure equipment arrives to site in good condition -Provide spill clean-up equipment and materials -Provide an emergency spill response plan 	<ul style="list-style-type: none"> -Perform periodic inspections for leaks, spills and releases -Ensure construction and operation crews adhere to designated areas -Remediate and record fuel spills and releases -Adhere to licence terms and conditions -Update the emergency spill response plan periodically 	3	1	2	1	1	2	1	N	
Surface Water												
Loss of small ponds and intermittent creeks due to site drainage for peat harvesting operations	Moderate	<ul style="list-style-type: none"> -Minimize the area disturbed -Formulate a drainage plan to maintain the natural drainage patterns -Maintain water levels on adjacent undisturbed lands -Prepare and implement a mine closure plan to restore predevelopment water levels 	<ul style="list-style-type: none"> -Perform periodic inspections of surface waters -Report annually on implementation of the mine closure activities 	1	2	2	3	2	3	1	N	
Modified surface water runoff flow rate due to site drainage and land profiling activities during construction	Moderate	-None proposed	-Monitor discharge flow rates from peat development according to licence terms and conditions	2	1	2	3	2	2	1	N	

Table 12 Cont'd

Environmental Effect	Adversity (Table 10)	Mitigation Measures	Follow-up	Significance (S)* (see Table 11)							
				a	b	c	d	e	f	g	S
Increased suspended sediment levels in surface water	Moderate	-Direct drainage water into sedimentation ponds equipped with floating booms before discharging by an outlet to existing drainage system	-Collect surface water samples from each outlet monthly for analysis of suspended sediment levels -Clean drainage ditches and sedimentation ponds on a regular basis -Perform periodic inspections for evidence of erosion -Adhere to licence terms and conditions -Conduct additional water monitoring if required in consultation with Manitoba Conservation	3	2	2	3	2	2	1	N
Alteration of surface water chemistry of downstream receiving waters	Minor	-Use a sedimentation pond to control the discharge rate of drainage water into the existing drainage system -If necessary, install a limestone or carbonate-lined drainage ditch to increase pH of draining bog water	-Collect surface water samples from each outlet monthly for pH analysis	3	2	2	3	2	1	1	N
Contamination of surface water from leaks and accidental spills and releases of fuels or other hazardous substances	Moderate	-Prevent leaks, spills and releases -Provide secondary containment for fuel storage -Require drip trays for equipment -Provide spill clean-up equipment and materials -Prepare an emergency spill response plan	-Perform periodic inspections for leaks, spills and releases -Update the emergency response plan periodically -Remediate and record fuel spills and releases -Adhere to licence terms and conditions	3	2	2	1	1	2	2	N

Table 12 Cont'd

Environmental Effect	Adversity (Table 10)	Mitigation Measures	Follow-up	Significance (S)* (see Table 11)								
				a	b	c	d	e	f	g	S	
Groundwater												
Contamination of groundwater from leaks and accidental spills and releases of fuels or other hazardous substances	Minor	<ul style="list-style-type: none"> -Ensure new supply well in staging area is properly sealed at ground level -Prevent leaks, spills and releases -Provide secondary containment for fuel storage -Require drip trays for equipment -Provide spill clean-up equipment and materials -Prepare an emergency spill response plan 	<ul style="list-style-type: none"> -Perform periodic inspections for leaks, spills and releases -Update emergency response plan periodically -Remediate and record fuel spills and releases -Adhere to licence terms and conditions 	3	1	2	1	1	1	2	N	
Vegetation												
Loss and disturbance of terrestrial vegetation during site preparation and construction	Moderate	<ul style="list-style-type: none"> -Minimize loss and disturbance of vegetation -Protect vegetation along the perimeter of the cleared areas from blow-down -Limit construction activities to designated areas -Utilize timber removed from site -Re-vegetate disturbed or reclaimed areas -Ensure workers are aware of rare grass pink orchid outside project area 	<ul style="list-style-type: none"> -Perform periodic inspections for vegetation stress and mortality around the cleared area -Perform periodic inspections for invasion of nuisance or weed species -Report annually on restoration activities implemented -Monitor the grass pink orchid prior to construction and 1 and 3 years after 	1	2	2	3	2	2	2	N	
Impairment of vegetation from dust accumulation during operation	Minor	<ul style="list-style-type: none"> -Control dust using approved suppressant -Curtailed construction and operation during high wind events 	<ul style="list-style-type: none"> -Perform periodic inspections of local area for accumulated dust 	1	2	2	2	2	1	1	N	
Risk of fire during construction and operation	Major	<ul style="list-style-type: none"> -Prepare and implement an emergency response plan -Provide fire suppression equipment on-site (extinguishers, shovels, hose, pumping equipment, etc.) -Notify Manitoba Conservation immediately if a fire or explosion occurs 	<ul style="list-style-type: none"> -Examine fire fighting equipment twice a month -Conduct periodic testing, evaluation and updating of the emergency response plan -Provide employee education and training in the use of this equipment regularly 	2	3	1	1	3	2	2	N	

Table 12 Cont'd

Environmental Effect	Adversity (Table 10)	Mitigation Measures	Follow-up	Significance (S)* (see Table 11)								
				a	b	c	d	e	f	g	S	
Wildlife / Habitat												
Loss and disturbance of wildlife habitat during site preparation activities	Minor	-Minimize loss and disturbance to vegetation -Limit construction to area designated -Limit operation activities to areas disturbed during construction -Re-vegetate disturbed or reclaimed areas	-Perform periodic inspections during construction and operation -Maintain re-vegetated areas -Ensure adherence to environmental guidelines and protocols	1	2	2	2	2	2	2	2	N
Loss and disturbance of large, small and burrowing mammals during construction and operation activities	Minor	-Minimize the area of disturbance by limiting construction to designated areas -Limit operation activities to areas disturbed during construction -Maintain habitat around the QL's -Implement a closure plan to restore wildlife habitat	-Adhere to licence terms and conditions -Maintain re-vegetated areas	1	2	2	3	2	2	2	2	N
Increased wildlife-vehicle interactions during peat transportation	Minor	-Operate trucks during daylight hours -Provide wildlife awareness information to drivers -Adhere to posted speed limits	-Maintain records of vehicle-wildlife interactions	1	1	2	3	3	1	2	2	N
Attraction of problem or nuisance animals	Minor	-Bear-proof garbage containers -Regular disposal of waste at existing waste facilities -Use animal deterrents such as noise-makers, reflectors and scents if required	-Maintain records of problem or nuisance wildlife -Adhere to licence terms and conditions	1	1	2	3	2	1	1	1	N
Loss and disturbance of migratory bird and waterfowl habitat	Minor	-Avoid ponds in the peatland development area -Minimize disturbance of vegetation around lakes with buffer zones -Limit construction to designated areas -Limit operation activities to areas disturbed during construction -Re-vegetate disturbed or reclaimed areas during and after operation	-Perform periodic inspections during construction and operation for signs of potential effects -Maintain buffer zones -Maintain re-vegetated areas	1	2	2	3	2	1	1	1	N

Table 12 Cont'd

Environmental Effect	Adversity (Table 10)	Mitigation Measures	Follow-up	Significance (S)* (see Table 11)							
				a	b	c	d	e	f	g	S
Disturbance of migratory and other bird nesting during construction activities	Minor	-Locate peat mining components away from critical migratory bird habitat -Schedule construction activities outside of critical nesting and rearing periods	-Perform periodic inspections of bird nesting and rearing activities -Observe bird nesting and rearing success -Adhere to licence terms and conditions	1	2	2	2	2	1	2	N
Loss and disturbance to amphibians and reptiles	Minor to Moderate	-Minimize the area of disturbance by limiting construction to designated areas -Limit operation activities to areas disturbed during construction -Minimize disturbance of vegetation around ponds by maintaining buffer zones	-Maintain records of on-site amphibian and reptile observations	1	2	2	2	2	1	2	N
Aquatic Biota / Habitat											
Disturbance to aquatic biota and habitat due to elevated levels of suspended sediment in peatland drainage water	Minor	-Use settling ponds	-Perform periodic inspections of sedimentation ponds for debris -Clean drainage ditches and sedimentation ponds on a regular basis -Monitor effluent on a regular basis	3	2	2	3	2	1	1	N
Disturbance of habitat due to construction activities involved in installation of culvert crossings	Moderate	-Follow the Manitoba Stream Crossing Guidelines for the protection of Fish and Fish Habitat -Follow best management practices (re: timing window, sediment/erosion control, revegetation, etc.) -Install the culvert such that low flow connectivity is maintained	-Perform periodic inspections of the installed culverts to ensure that fish passage is not blocked	3	2	1	1	1	2	1	N
Economic Conditions											
Creation of employment and introduction of money to the regional economy	Positive	-None proposed	-None proposed	3	1	2	3	3	1	2	N

Table 12 Cont'd

Environmental Effect	Adversity (Table 10)	Mitigation Measures	Follow-up	Significance (S)* (see Table 11)								
				a	b	c	d	e	f	g	S	
Business Opportunities												
Creation of jobs and contracts for construction and operation requirements	Positive	-None proposed	-None proposed	3	1	2	2	3	1	2	N	
Traffic												
Increased traffic may increase dust, the number of road kills, and it will require more road maintenance	Moderate	-Utilize dust control methods -Reduce speed and follow posted limits -Reduce the number of vehicles traveling during high wind events -Only travel during daylight hours -Provide wildlife information to drivers	-Monitor the number of vehicles traveling associated with mining peat production -Record public complaints and vehicle accidents -Consider further action as warranted	2	1	2	3	3	2	1	N	
Noise / Vibration												
Increased noise and vibration levels from construction and operation activities	Minor	-Muffle vehicles and equipment -Limit use of heavy machinery and transport trucks to daylight hours -Limit unnecessary long-term idling -Require a high standard of maintenance for heavy equipment	-Monitor and periodically track noise levels and public complaints	2	1	2	3	2	2	1	N	
Human Health												
Risk of adverse effects on public attitude and general health and well-being due to increased noise, vibrations and dust generated	Moderate	-Utilize dust control methods -Reduce number of vehicles travelling during high wind events -Drive according to road conditions -Adhere to posted speed limits -Operate transport trucks only during daylight hours	-Monitor dust levels -Track public complaints -Consider further action as warranted	3	1	2	3	2	2	1	N	
Risk of effects to worker health associated with poor indoor air quality from VOCs, carbon monoxide, propane gas, dust, refrigerants and moulds	Minor	-Provide adequate ventilation -Ensure a high standard of facility and equipment maintenance	-Conduct regular maintenance of the facility and equipment	3	1	2	2	2	2	1	N	

Table 12 Cont'd

Environmental Effect	Adversity (Table 10)	Mitigation Measures	Follow-up	Significance (S)* (see Table 11)							
				a	b	c	d	e	f	g	S
Potential threat to public and worker safety during construction and operation activities	Public - Negligible and Worker - Minor	-Locked gate signed with no trespassing -Warning signs for ditches and ponds -Compliance with Manitoba Workplace Safety and Health regulations -Develop and enforce standard operation procedure guidelines -Provide training to employees -Ensure visitors have reported in and are accompanied by an employee	-Record occurrence of workplace accidents -Update employee training and safety guidelines as required	3	1	2	3	2	2	1	N
Aesthetic Values											
Impaired aesthetic from new infrastructure (access road) and increased dust during peat mine operation from transport trucks	Minor	-Utilize dust control methods and cover loads during transport to and from the site -Re-vegetate the peat fields in accordance with provisions in the mine closure plan	-Observe dust and debris levels -Record public complaints -Take further action as warranted	2	1	2	3	2	2	1	N
Areas of Interest											
Disturbance and alteration to the Moose Creek WMA and the Peguis First Nation CIZ	Moderate	-Limit construction activities to designated areas -Mark maximum clearing width of the proposed development site -Protect adjacent trees from blow-down -Re-use timber from clearing	-Periodically inspect the site during construction for signs of potential disturbances -Ensure construction crews adhere to designated areas	3	1	2	3	2	2	2	N
Recreation / Tourism											
Increased truck traffic on Grindstone Road and resulting dust could cause decline in tourism to nearby recreational areas	Minor	-Utilize dust control methods -Cover loads during transport to and from the site -Reduce number of vehicles travelling during high wind events -Drive according to road conditions -Adhere to posted speed limits -Operate transport trucks only during daylight hours	-Track public complaints -Take further action as warranted	2	1	2	2	3	2	1	N

* S = significance

Y = significant - rated a "3" for at least four criteria, at least one of which must be criteria a or b; or rated "2" or "3" for all criteria

N = not significant

TABLE 13

PROJECT AND CUMULATIVE ENVIRONMENTAL EFFECTS FOR PROPOSED PEAT DEVELOPMENT

Project Activities	Residual Environmental Effects															
	Increased particulates	Increased greenhouse gases, SO ₂ , NO _x , etc.	Contamination of soils / surface water	Loss of soil	Loss of wetlands	Change in drainage pattern	Change in receiving water quality (TSS, pH, nutrients)	Loss and disturbance of terrestrial vegetation	Loss and disturbance of terrestrial wildlife & habitat	Loss and disturbance of birds/waterfowl & habitat	Loss and disturbance of aquatic biota & habitat	Increased traffic and deterioration of PR 234	Impacts to public safety / human health	Increased wildlife mortalities	Improved social conditions	Improved economic conditions
x Project effect (minor)																
X Project effect (moderate)																
P Project effect (major)																
o Cumulative effect (negligible)																
O Cumulative effect (minor)																
C Cumulative effect (major)																
Proposed Peatland Development Project																
Site preparation	x	x	x					x	x	x	x					
Construction	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Operation	x	x	x	X	x	x	x	x	x	x	x	X	x	x	x	x
Decommissioning	x	x	x			x									x	x
Other Projects and Activities (existing and known)																
Communities/Cottages: Blacks Point		o	o				o					o			o	
Commercial trucking on Grindstone Rd., PTH 8, and PR 234	o	o					o					O	o	o		o
Road Maintenance of on Grindstone Rd., PTH 8, and PR 234	o	o	o				o		o	o	o	o	o	o	o	
Recreation; hunting, fishing and camping									o	o	o	o			o	o

TABLE 14

MITIGATION MEASURES SUMMARY FOR THE PROPOSED PEAT DEVELOPMENT

Mitigation Measures	Design	Proposed	Regulatory	Management
Microclimate				
Install snow fences to control snow deposition on the property if required		•		
Air Quality				
Cover loads being hauled		•		
Use an approved dust suppressant and control vehicle speed		•		•
Limit peat handling activities during high wind events				•
Orient peat harvesting and stockpiles with prevailing winds	•	•		
Re-establish vegetation on disturbed areas		•		
Instruct employees on proper equipment operation to minimize dust				•
Require a high standard of maintenance for construction equipment and vehicles, use low sulphur-containing fuels and limit unnecessary idling				•
Use appropriate fuel dispensing equipment			•	•
Utilize windbreaks (tree and brush barriers)	•	•		
Implement a reclamation plan that addresses greenhouse gas emissions		•		•
Minimize the area cleared	•			
Soils				
Minimize the surface area disturbed	•			
Leave non-commercial peat reserves in place	•			•
Prepare and implement a mine closure plan			•	•
Prevent leaks, spills and releases	•			
Provide drip trays for equipment and spill clean-up equipment and materials	•			•
Prepare an emergency (spill) response plan		•		•
Comply with provincial fuel storage and dispensing regulations and storing hazardous materials in approved containers (secondary containment)			•	•
Provide ULC Certified double-walled fuel storage tanks with spill prevention and leak detection			•	•
Ensure equipment arrives to site in good condition				•
Designate fuel storage and refueling areas	•			•
Surface Water				
Limit surface area disturbance	•			
Maintain water levels on undisturbed areas		•		•
Implement a mine closure plan that restores predevelopment water levels			•	•

Table 14 Cont'd

Mitigation Measures	Design	Proposed	Regulatory	Management	
Direct drainage water into sedimentation ponds equipped with floating booms before discharging at a controlled rate	•	•			
Formulate a drainage plan to maintain the natural drainage patterns	•				
Prevent leaks, spills and releases and provide fuel storage secondary containment	•			•	
Provide drip trays for equipment and spill clean-up equipment and materials	•			•	
Prepare an emergency (spill) response plan		•		•	
Comply with provincial fuel storage and dispensing regulations and storing hazardous materials in approved containers (secondary containment)			•		
Groundwater					
Ensure proper seal at ground level of new supply well in staging area	•		•		
Prevent leaks, spills and releases	•				
Provide drip trays for equipment and spill clean-up equipment and materials	•			•	
Preparing an emergency (spill) response plan		•		•	
Comply with provincial fuel storage and dispensing regulations and storing hazardous materials in approved containers (secondary containment)			•		
Vegetation					
Restrict activities to designated areas	•				
Minimize vegetation loss or disturbance		•			
Protect vegetation along perimeter from blow-down		•			
Utilizing timber removed from site		•		•	
Re-vegetate disturbed and reclaimed areas during and after operation	•				
Use an approved dust suppressant and limit construction activity during high wind events	•	•		•	
Provide on-site fire suppression equipment		•		•	
Prepare an emergency fire response plan		•		•	
Notify Manitoba Conservation immediately in event of a fire				•	
Wildlife / Habitat					
Minimize habitat (vegetation) loss or disturbance		•			
Limit construction to designated areas and operation activities to areas disturbed during construction	•				
Locate peat mining components away from migratory bird/waterfowl habitat (such as ponds) and avoid critical nesting and rearing periods	•				
Minimize disturbance around ponds by retaining buffer zones	•				
Maintain habitat around the Quarry Leases		•			
Provide wildlife awareness information to drivers	•			•	

Table 14 Cont'd

Mitigation Measures	Design	Proposed	Regulatory	Management	
Implement a closure plan to revegetate disturbed and reclaimed areas during and after operation	•		•	•	
Transport peat during daylight hours, post signs to warn and educate drivers to avoid wildlife on the highway and adhere to posted speed limits				•	
Regular disposal of waste at existing waste facilities		•			
Animal deterrents such as noise makers, reflectors and scents if required		•			
Bear-proof garbage containers	•				
Aquatic Biota / Habitat					
Follow the Manitoba Stream Crossing Guidelines for the protection of Fish and Fish Habitat	•		•		
Follow best management practices		•		•	
Install culvert such that low flow connectivity is maintained	•				
Ensure culverts are large enough to permit fish passage	•		•		
Economic Conditions					
No mitigation proposed					
Business Opportunities					
No mitigation proposed					
Traffic					
Reduce wildlife interactions by traveling only during daylight hours and providing wildlife information to drivers		•		•	
Road dust control by approved dust suppressant, reducing speed, following posted limits and reducing the number of vehicles during wind events		•		•	
Noise and Vibration					
Require a high standard of maintenance for construction equipment and vehicles, muffle vehicles and equipment and limit unnecessary idling				•	
Human Health					
Limit dust generation by using water, reducing number of vehicles travelling during high winds, adhering to posted speed limits and driving according to road conditions		•	•	•	
Provide adequate ventilation of buildings and a high standard of facility and equipment maintenance	•			•	
Provide locked gate with no trespassing signs and warning signs of ditches and ponds	•				
Comply with Manitoba Workplace Safety and Health regulations			•	•	
Provide employee training and develop and enforce standard operation procedure guidelines			•	•	

Table 14 Cont'd

Mitigation Measures	Design	Proposed	Regulatory	Management	
Ensure all visitors have reported in and are accompanied by an employee				•	
Aesthetic Values					
Utilize dust control methods and cover loads during transport to and from the site		•			
Re-vegetate the peat fields in accordance with provisions in a reclamation plan	•				
Areas of Interest					
Limit construction activities to designated areas, mark maximum clearing width of the proposed development site, protect adjacent trees from blow-down and re-use timber from clearing	•	•			
Recreation/Tourism					
Limit dust generation by using water, reducing number of vehicles travelling during high winds, adhering to posted speed limits and driving according to road conditions		•	•	•	

TABLE 15
FOLLOW-UP SUMMARY FOR THE PROPOSED PEAT DEVELOPMENT

Follow-up	Inspecting	Monitoring	Record Keeping	Reporting
Microclimate				
Inspect airflow and snow deposition patterns	•			
Air Quality				
Observe fugitive dust levels during construction and accumulated dust during operation	•			
Perform periodic inspections of adjacent properties and access roads for dust and debris	•			
Track complaints from local residents			•	
Perform periodic inspections of air quality during construction	•			
Record maintenance of facility and equipment			•	
Require submission of MSDSs for all products used			•	
Adhere to licence terms and conditions	•			
Soils				
Conduct annual monitoring and report on implementation of the progressive restoration activities		•	•	•
Perform periodic inspections for leaks, spills and releases	•			
Ensure construction and operation crews adhere to designated areas	•			
Remediate and record fuel spills and releases	•		•	•
Update the emergency response plan periodically			•	
Adhere to licence terms and conditions	•			
Surface Water				
Perform periodic inspections of surface water bodies	•			
Report on implementation of the progressive restoration activities annually	•		•	•
Monitor surface water runoff flows from the development area		•	•	
Perform periodic inspections for evidence of erosion	•			
During operation collect surface water samples from each outlet monthly for analysis of TSS		•	•	
Conduct additional water monitoring as developed with Manitoba Conservation		•	•	•
Clean drainage ditches & sedimentation ponds on a regular basis	•			
Perform periodic inspections for leaks, spills and releases	•			

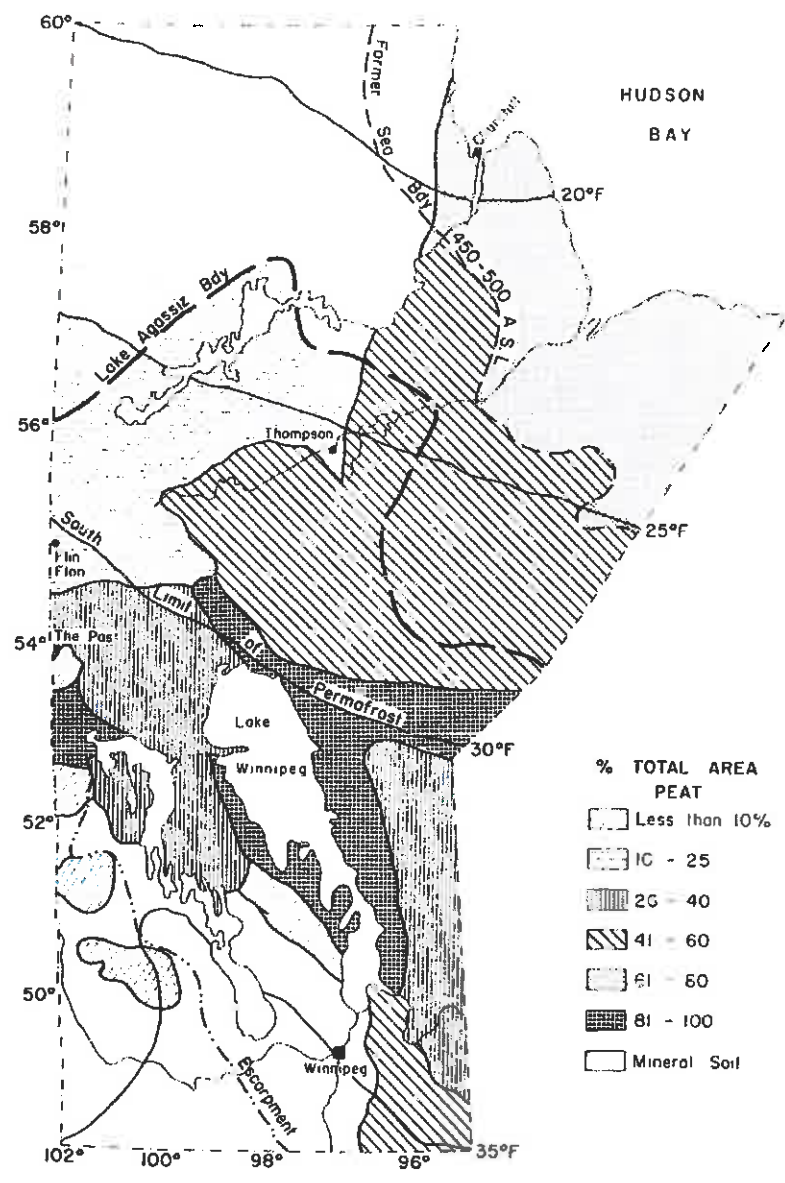
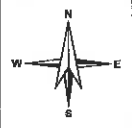
Table 15 Cont'd

Follow-up	Inspecting	Monitoring	Record Keeping	Reporting
Remediate and record fuel spills and releases	•		•	•
Update the emergency (spill) response plan periodically			•	
Adhere to licence terms and conditions	•			
Groundwater				
Perform periodic inspections for leaks, spills and releases	•			
Remediate and record fuel spills and releases	•		•	•
Update the emergency (spill) response plan periodically			•	
Adhere to licence terms and conditions	•			
Vegetation				
Perform periodic inspections for vegetation stress and mortality around cleared area and invasion of nuisance or weed species	•			
Conduct annual monitoring and report on implementation of the progressive restoration activities	•	•	•	•
Observe accumulated dust on plants during operation	•			
Conduct periodic assessments of fire risk and updates to emergency (fire) response plan			•	
Examine fire fighting equipment regularly	•		•	
Conduct employee training in the use of this equipment regularly			•	
Wildlife / Habitat				
Perform periodic inspections of habitat during construction and operation	•			
Maintain re-vegetated areas and buffer zones	•			
Ensure adherence to environmental guidelines and protocols	•			
Perform inspections of bird nesting and rearing activities and success	•			
Maintain records of vehicle-wildlife interactions			•	
Maintain records of problem or nuisance wildlife situations			•	
Maintain records of amphibians and reptiles observed on the site			•	
Adhere to licence terms and conditions	•			
Aquatic Biota / Habitat				
Perform periodic inspections of installed culverts to ensure no blockage of fish passage	•			
Perform periodic inspections of sedimentation ponds for debris	•			
Clean drainage ditches and sedimentation ponds regularly	•			
Monitor effluent discharged from ponds on a regular basis		•	•	•

Table 15 Cont'd

Follow-up	Inspecting	Monitoring	Record Keeping	Reporting
Economic Conditions				
No follow-up proposed				
Business Opportunities				
No follow-up proposed				
Traffic				
Monitor the number of vehicles travelling associated with the peat mining	•		•	
Record public complaints and vehicle accidents			•	
Monitor situation and take further action as warranted	•			
Noise and Vibration				
Observe and periodically track noise levels and public complaints	•		•	
Human Health				
Observe dust levels	•			
Track health complaints from local residents			•	
Monitor situation and take further action as warranted	•			
Conduct regular maintenance of the facility and equipment	•		•	
Record workplace accidents			•	
Update employee training and safety guidelines as required			•	
Aesthetic Values				
Inspect dust and debris levels	•			
Track public complaints			•	
Monitor situation and take further action as warranted	•			
Areas of Interest				
Inspect site during construction for signs of potential disturbances	•			
Ensure crews adhere to designated construction areas	•			
Recreation/Tourism				
Track public complaints			•	
Monitor situation and take further action as warranted	•			

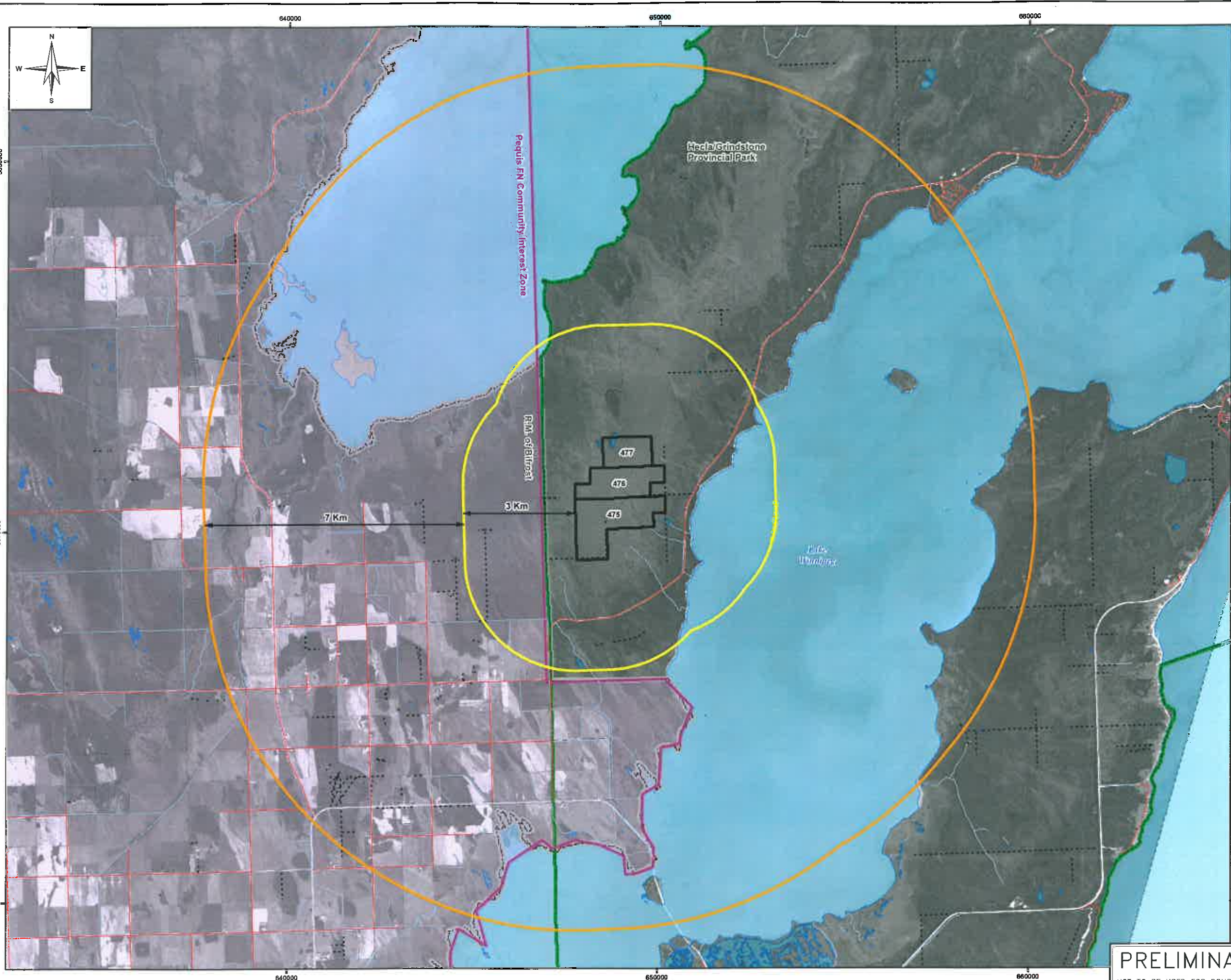
FIGURES



PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

0	11/10/23	ISSUED WITH FINAL REPORT	SFM
NO.	Yr/M/00	DESCRIPTION	BY
REVISIONS / ISSUE			
KGS GROUP		SUN GRO	
CONSULTING ENGINEERS		HORTICULTURE	
PROPOSED HAY POINT PEAT MINE DEVELOPMENT			
DISTRIBUTION OF PEATLAND IN MANITOBA			
OCTOBER 2011		FIGURE 01	0

Source: Smith, R.E. (1975) Organic Soil Resources in Manitoba and their Possibilities for Crop Production. Proceedings of the Seminar on Peat: A Resource in Manitoba's Agriculture and Industry.



LEGEND:

- Project Study Area
- Regional Study Area
- Quarry Lease
- Park Boundary
- Pequis FN Community Interest Zone
- RM Boundary
- River
- Outline
- Trail
- Road

- Notes:**
1. Image: SPOTS, from NRCAN (Natural Resources Canada), September 3, 2006.
 2. All units are metric and in metres unless otherwise specified. Transverse Mercator Projection, NAD 1983, Zone 14. Elevations are in metres above sea level (MSL).



SCALE: 1:100,000 METRIC 11"x17"

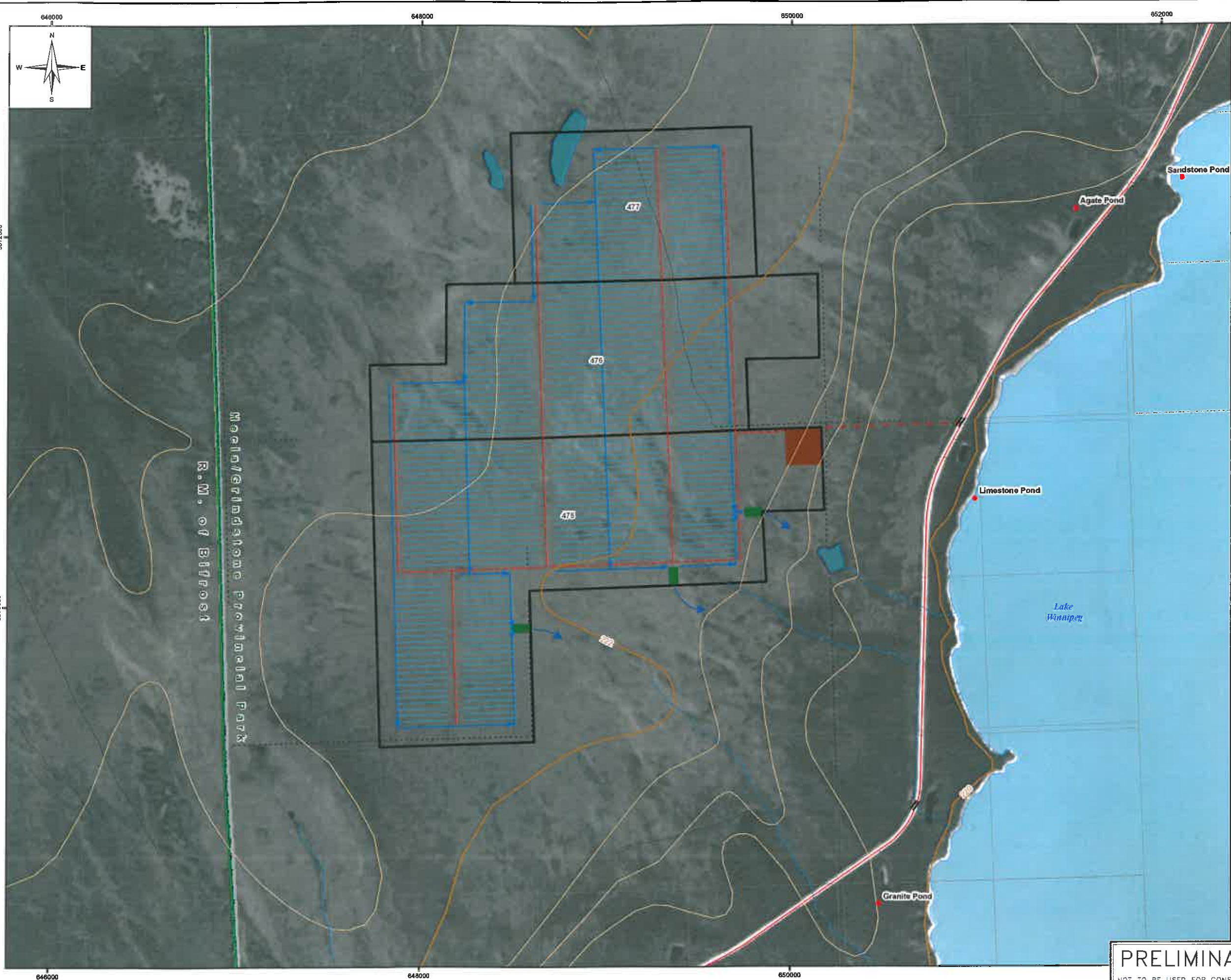
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PROPOSED HAY POINT PEAT MINE DEVELOPMENT

REGIONAL SITE LOCATION

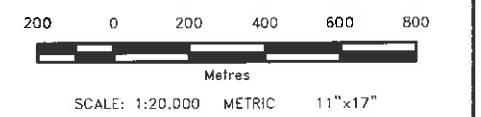
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION



LEGEND:

- Culvert Crossing
- Main Drainage Ditch/Flow Direction
- Field Drainage Ditch
- Access Road
- Bog Road
- Road
- Trail
- Existing Contour
- Unnamed Stream
- 2m Index Site Contour
- 0.5m Site Contour
- Quarter Section
- Quarry Lease
- Sedimentation Pond
- Staging Area
- Park Boundary
- RM Boundary
- Outlet Ditch/Flow Direction

- Notes:**
- Image: SPOT5, from NRCAN (Natural Resources Canada), September 3, 2006.
 - All units are metric and in metres unless otherwise specified. Transverse Mercator Projection, NAD 1983, Zone 14. Elevations are in metres above sea level (MSL)



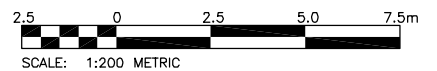
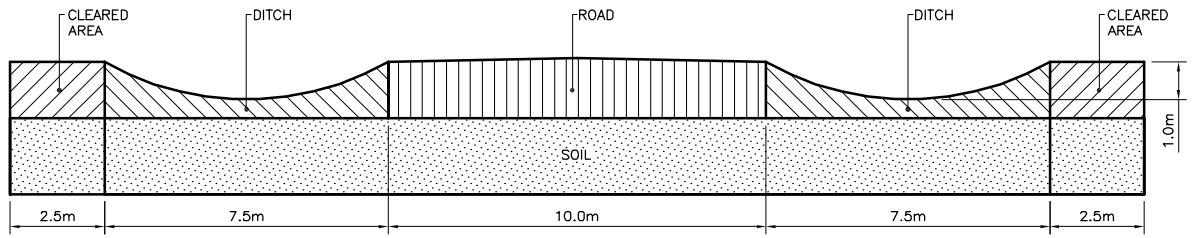
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KGS GROUP CONSULTING ENGINEERS
SUN GRO HORTICULTURE

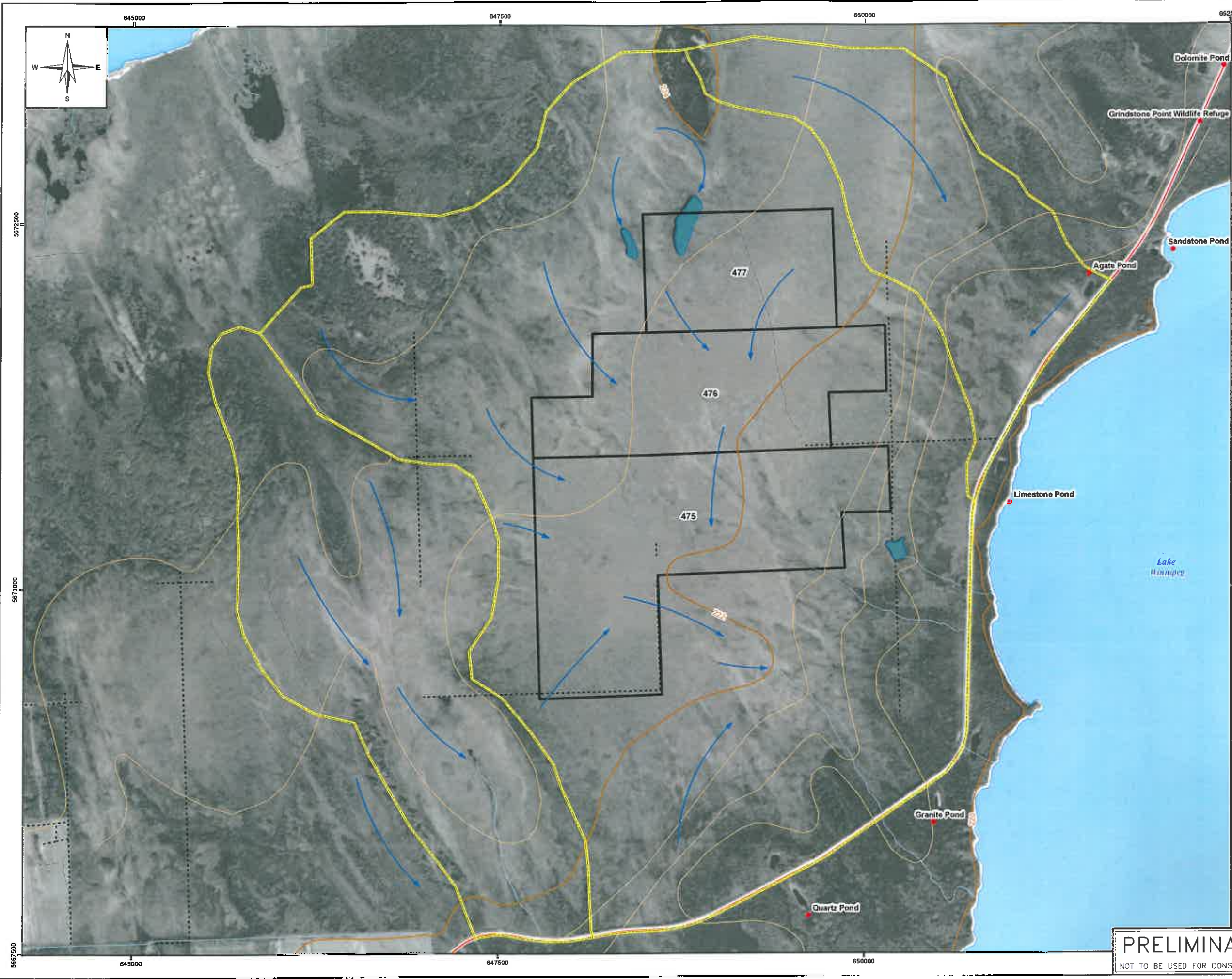
PROPOSED HAY POINT
 PEAT MINE DEVELOPMENT

GENERAL SITE DEVELOPMENT AREA

PRELIMINARY
 NOT TO BE USED FOR CONSTRUCTION



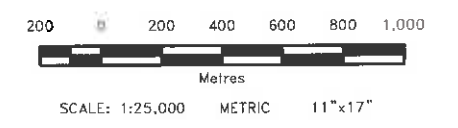
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REVISIONS / ISSUE			
KGS GROUP CONSULTING ENGINEERS		SUN GRO HORTICULTURE	
PROPOSED HAY POINT PEAT MINE DEVELOPMENT			
ROAD CONSTRUCTION LAYOUT			
OCTOBER 2011		FIGURE 04	REV: 0



LEGEND:

- 2m Index Site Contour
- 0.5m Site Contour
- Drainage Basin
- Quarry Lease
- Road
- - - Cutoffline
- Trail
- River
- Flow Direction

Notes:
 1. Image: SPOT5, from NRCAN (Natural Resources Canada), September 3, 2008.
 2. All units are metric and in metres unless otherwise specified. Transverse Mercator Projection, NAD 1983, Zone 14. Elevations are in metres above sea level (MSL)



NO.	YY/MM/DD	DESCRIPTION	BY
0	11/10/28	ISSUED WITH FINAL REPORT	SFM

REVISIONS / ISSUE

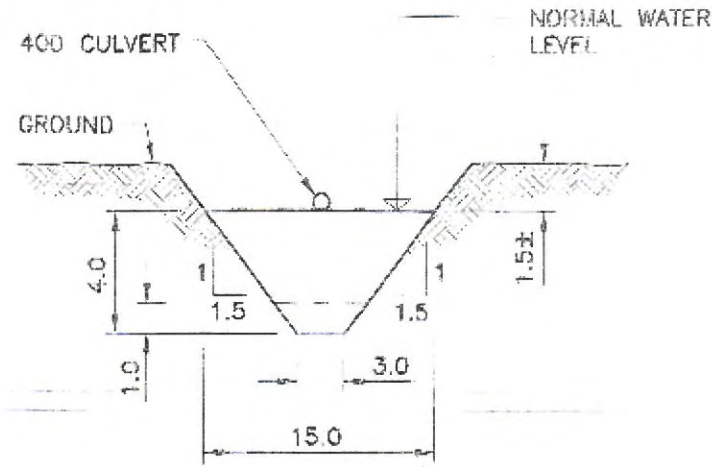
KGS
GROUP
CONSULTING
ENGINEERS

SUN GRO
HORTICULTURE

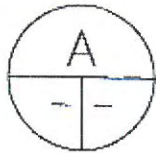
PROPOSED HAY POINT
 PEAT MINE DEVELOPMENT

SITE DRAINAGE AND
 SURFACE WATER FLOW PATTERN

PRELIMINARY
 NOT TO BE USED FOR CONSTRUCTION

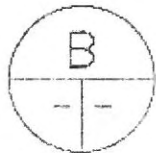
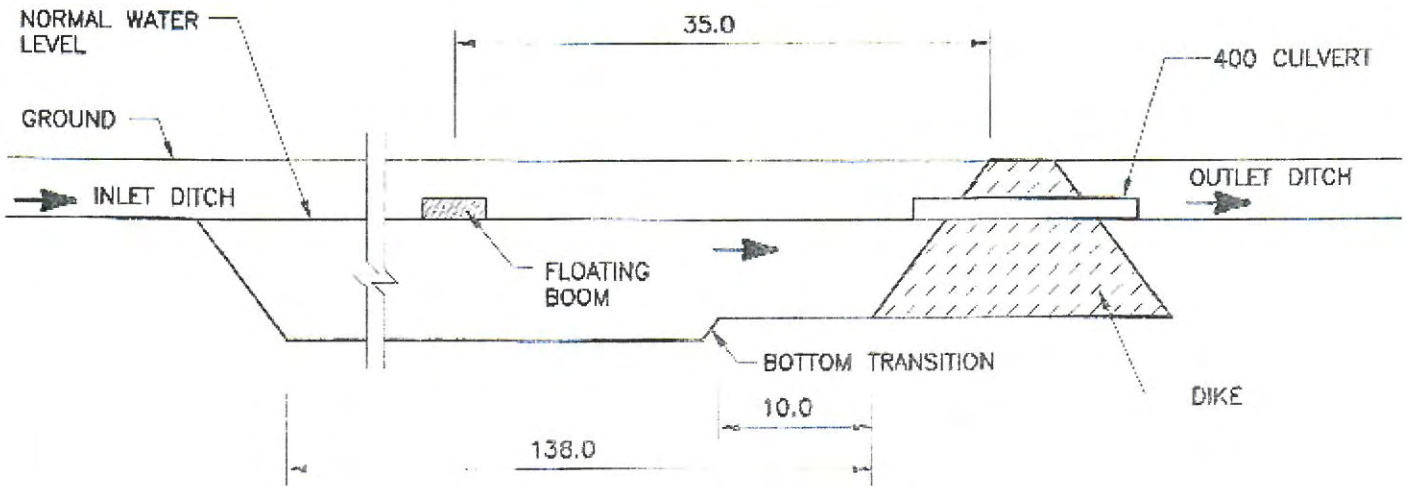


- NOTES:**
1. 5 YEAR RETURN PEAK FLOW = 0.148 m³/sec.
 2. 9.9 HOURS RETENTION TIME AT PEAK FLOW.
 3. RATIO OF POND LENGTH TO WIDTH = 9.2 : 1



END VIEW

HOR. 1 : 500, VER. 1 : 250



SIDE VIEW

HOR. 1 : 500, VER. 1 : 250

0	11/10/25	ISSUED WITH FINAL REPORT	DFM
NO.	YY/MM/ED	DESCRIPTION	BY

REVISIONS / ISSUE

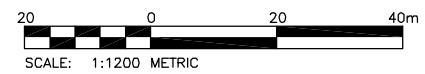
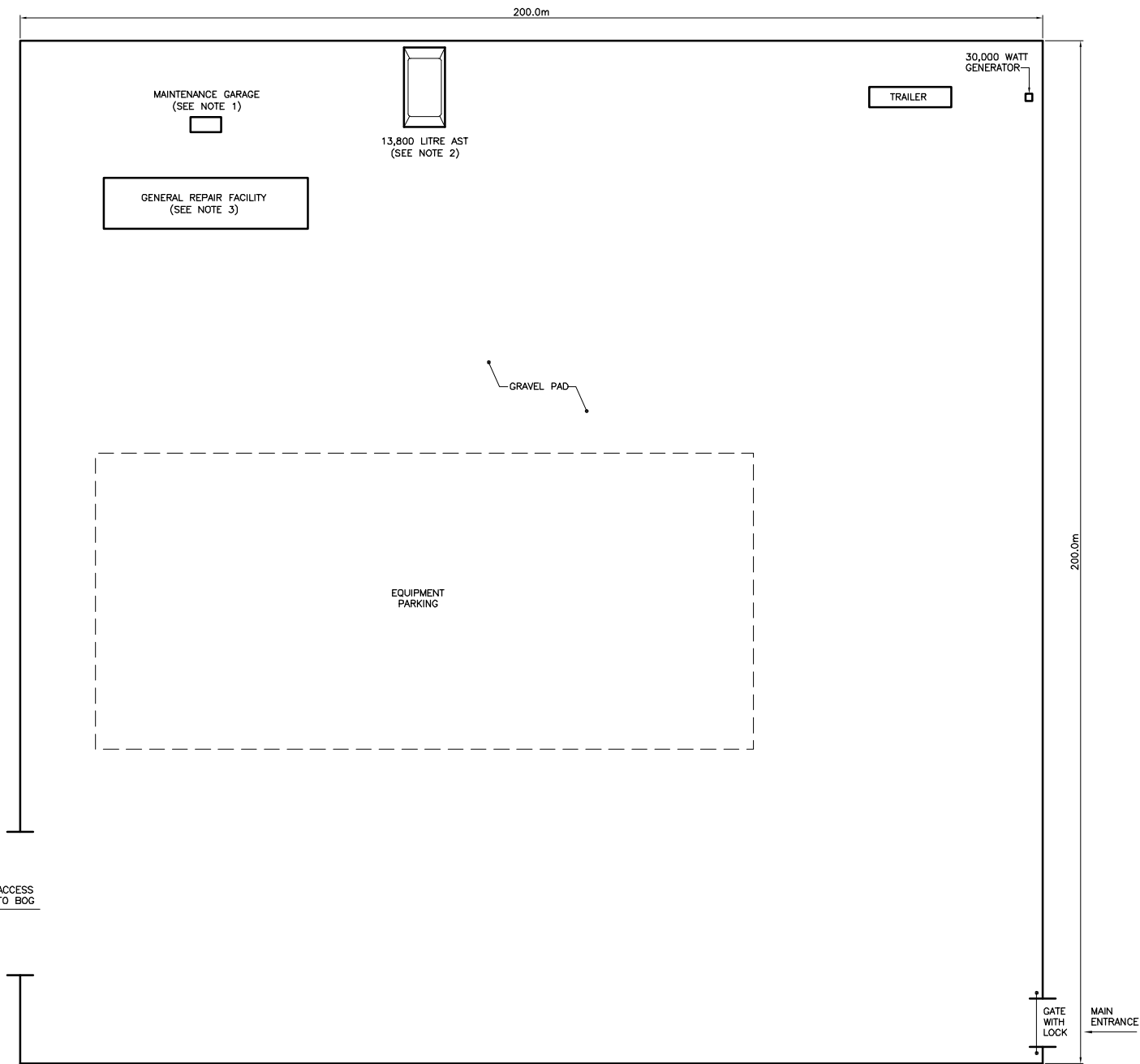
KGS
GROUP
CONSULTING
ENGINEERS

SUN GRO
HORTICULTURE

PROPOSED HAY POINT
PEAT MINE DEVELOPMENT

DETAILS OF
SEDIMENTATION PONDS

OCTOBER 2011	FIGURE 06	REV: 0
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0	11/10/28	ISSUED WITH FINAL REPORT	SFM
NO.	YY/MM/DD	DESCRIPTION	BY
REVISIONS / ISSUE			

KGS
GROUP
CONSULTING
ENGINEERS

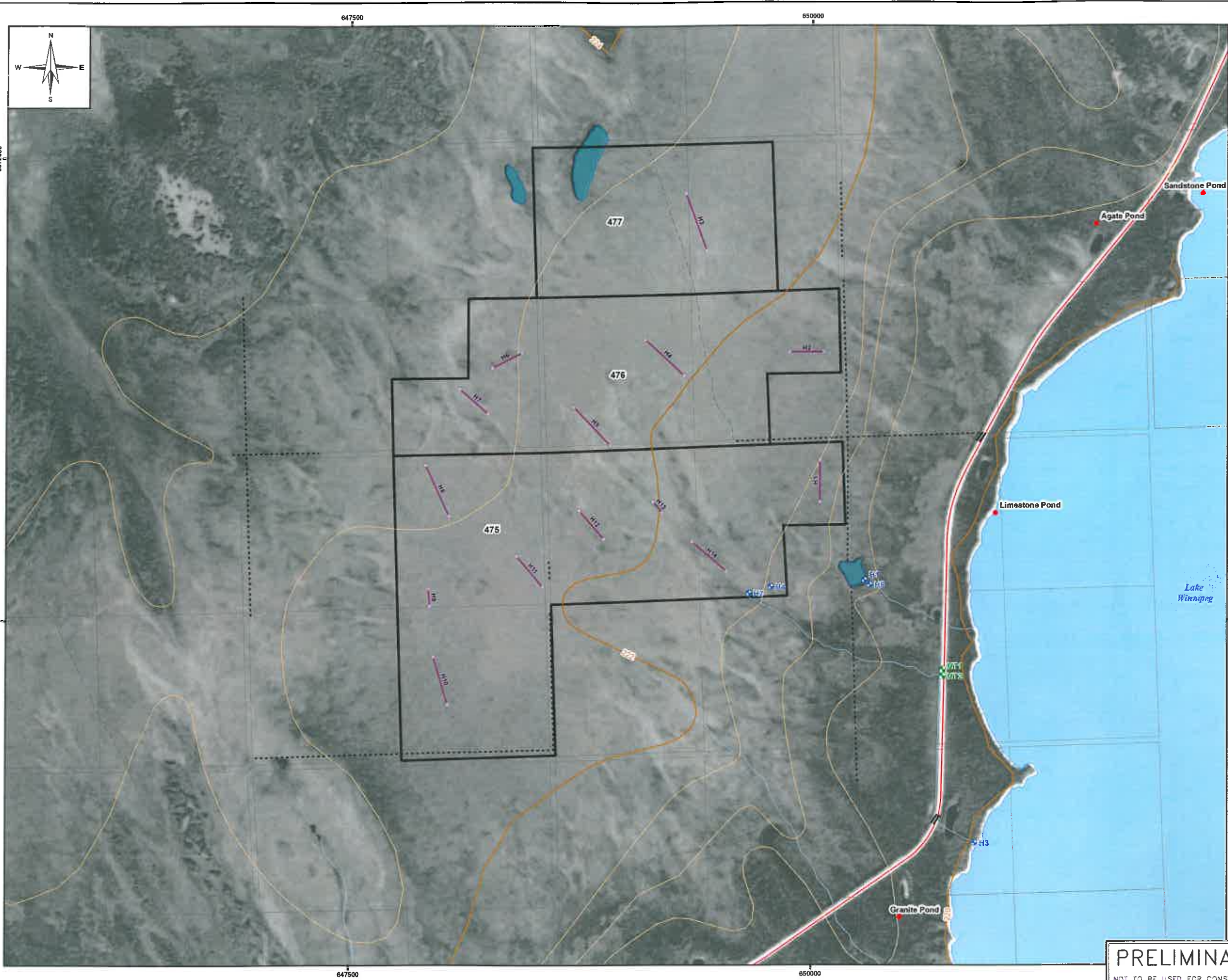
PROPOSED HAY POINT
PEAT MINE DEVELOPMENT

DETAILS OF
TYPICAL SITE PLAN

OCTOBER 2011	FIGURE 07	REV: 0
--------------	-----------	--------

NOTES:

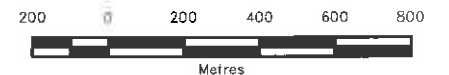
1. AT HAY POINT BOG AN 18m² STEEL CONTAINER WILL BE USED.
2. 2-2,420 LITRE PORTABLE ASTS WILL ALSO BE USED.
3. THE GENERAL REPAIR FACILITY IS A 400m² WOOD FRAMED BUILDING WITH A CONCRETE FOUNDATION.



LEGEND:

- Water Crossing
- Water Quality Sample Locations
- Fish Sampling
- Transect Point
- Transect Line
- Road
- Trail
- Cutline
- River
- 2m Index Site Contour
- 0.5m Site Contour
- Quarter Section
- Quarry Lease

Notes:
 1. Image: SPOTS, from NRCAN (Natural Resources Canada), September 3, 2006.
 2. All units are metric and in metres unless otherwise specified. Transverse Mercator Projection, NAD 1983, Zone 14. Elevations are in metres above sea level (MSL)



SCALE: 1:20,000 METRIC 11"x17"

NO.	YY/MM/DD	DESCRIPTION	BY
0	11/10/28	ISSUED WITH FINAL REPORT	SFM

REVISIONS / ISSUE

KGS
GROUP
CONSULTING
ENGINEERS

SUN GRO
HORTICULTURE

PROPOSED HAY POINT
 PEAT MINE DEVELOPMENT

2010 SAMPLING PROGRAM

PRELIMINARY
 NOT TO BE USED FOR CONSTRUCTION

APPENDICES

APPENDIX A
MINERAL RIGHTS - QUARRY LEASES



QUARRY LEASE

First Renewal

Quarry
Lease No. QL-475

THIS LEASE made in duplicate this 2nd day of May, 2002

BETWEEN:

Her Majesty the Queen in right of the
Province of Manitoba, represented by the
Minister of Industry, Trade and Mines

(the "Minister")

of the First Part

- and -

SUN GRO HORTICULTURE CANADA LTD.
BOX 100
ELMA MB R0E 0Z0

(the "Lessee")

of the Second Part

The parties agree as follows:

1. In this Lease:

(a) "Act" means The Mines and Minerals Act, Cap. M162 C.C.S.M., as amended, revised or substituted from time to time;

(b) "regulations" means regulations made pursuant to the Act, and as amended, revised or substituted from time to time;

2. Subject and pursuant to the Act and regulations, the Minister conveys to the lessee the exclusive right to explore for, develop, and produce the following quarry minerals, namely

PEAT AND PEAT MOSS-----

that are the property of the Crown and are found on or under the land described as:

FIRSTLY: THE EAST HALF OF SECTION EIGHTEEN IN THE TWENTY-FIFTH TOWNSHIP AND FIFTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA.



SECONDLY: THE NORTHWEST QUARTER AND LEGAL SUBDIVISIONS TEN, FIFTEEN AND SIXTEEN OF SECTION SEVENTEEN IN SAID TOWNSHIP AND RANGE.

THIRDLY: ALL THAT PORTION OF THE NORTH-SOUTH GOVERNMENT ROAD ALLOWANCE LYING BETWEEN SAID SECTIONS SEVENTEEN AND EIGHTEEN LYING TO THE SOUTH OF A STRAIGHT LINE DRAWN FROM THE NORTHEAST CORNER OF SAID SECTION EIGHTEEN TO THE NORTHWEST CORNER OF SAID SECTION SEVENTEEN WHICH LIES TO THE NORTH OF A STRAIGHT LINE DRAWN FROM THE SOUTHEAST CORNER OF SAID SECTION EIGHTEEN TO THE SOUTHWEST CORNER OF SAID SECTION SEVENTEEN.

(the "Lands") and being **247.673** hectares, more or less, for a term of 10 years, commencing the **12th day of May, 2002** renewable in accordance with the Act.

3. The Lessee shall comply with the Act and regulations; including, without restricting the generality of the foregoing, the payment of rent, royalty and rehabilitation levy prescribed thereunder.
4. The Lessee shall and does hereby indemnify and save harmless the Minister against any and all actions, suits, claims or demands that may be brought or made against the Minister for or by reason of any act or thing done or omitted to be done by the Lessee or its agents with respect to the Lands.
5. To be effective and binding, any waiver by the Minister of a breach by the Lessee of any term or condition of this Lease, the Act or the regulations must be in writing. Any such waiver shall extend only to the events of breach enumerated therein and shall not limit or affect the Minister's rights with respect to any other breach.
6. If the Lessee defaults, breaches, fails to perform or observe any term or condition of this Lease, the Act or the regulations, and any such event is not remedied within such notice period as the Minister may give, the Minister may cancel this Lease. Notwithstanding any such cancellation by the Minister, the rights of the Minister against the Lessee shall not be prejudiced and the Minister shall have the full remedies against the Lessee as if the Lease remained in full force and effect.
7. Any notice to a party hereto shall be in writing and may be delivered personally, sent by telegram, telex, telecopier or other means of electronic communication, or may be forwarded by mail subject to Canada Post confirmation of delivery to that party at the following address:

To the Minister:

Industry, Trade and Mines
Unit 360-1395 Ellice Avenue
Winnipeg, Manitoba
R3G 3P2

To the Lessee:

SUN GRO HORTICULTURE CANADA LTD.
BOX 100
ELMA MB R0E 0Z0



8. This lease shall be interpreted in accordance with the laws of Manitoba.
9. Any amendments to this Lease shall be in writing and signed by both parties.
10. The Lessee shall not assign this lease except with the prior written consent of the Minister which shall not be unreasonably withheld. Any obligations of the Lessee outstanding at the date of any assignment shall remain the responsibility of the Lessee, to the extent the obligations are not performed by the permitted assignee.
11. This Lease shall enure to the benefit of and be binding upon the heirs, executors, administrators, successors and permitted assigns of the parties.
12. Additional clauses:

Prior to development activities on site, details of the proposed drainage system, operating plans and processing shall be submitted for approval by the Director of Mines.



In witness whereof the Minister and the Lessee have executed this Lease on the dates shown below their respective signatures.

Signed, sealed and delivered
in the presence of:

Her Majesty the Queen in right
of the Province Of Manitoba

Witness

[Signature]

Minister of Industry, Trade and Mines

[Signature]

Date

May 17th 2002

Witness

Robert Smith

Lessee SUN GRO HORTICULTURE CANADA LTD.

Date

05/14/02

IN ACCORDANCE WITH SECTION 141(4) OF
THE MINES AND MINERALS ACT, THIS
LEASE IS HEREBY RECORDED AND
THIS STAMP SHALL CONSTITUTE
EVIDENCE OF FILING AND RECORDING.

May 28/02 L. Bennett



QUARRY LEASE NOS. QL-60, QL-66 TO QL-68 INCLUSIVE,
QL-113 TO QL-116 INCLUSIVE, QL-118, QL-119, QL-125, QL-252,
QL-475 TO QL-477 INCLUSIVE, QL-484, QL-485,
QL-590 TO QL-593 INCLUSIVE, QL-616, QL-646, QL-665,
QL-1040 TO QL-1043 INCLUSIVE, QL-1448, QL-1472, QL-1528,
QL-1529 AND QL-1695

APPENDIX "A"

PROVINCE OF MANITOBA

I hereby certify that Mortgage of Leases dated June 10, 2004, in the amount to the maximum principal amount of \$100,000,000 between Sun Gro Horticulture Canada Ltd. and Bank of Montreal was filed against Quarry Lease Nos. QL-60, QL-66 to QL-68 inclusive, QL-113 to QL-116 inclusive, QL-118, QL-119, QL-125, QL-252, QL-475 to QL-477 inclusive, QL-484, QL-485, QL-590 to QL-593 inclusive, QL-616, QL-646, QL-665, QL-1040 to QL-1043 inclusive, QL-1448, QL-1472, QL-1528, QL-1529 and QL-1695 in the Winnipeg Mining Recording Office of the Department of Industry, Economic Development and Mines on June 16, 2004 under Document No. 16779 in accordance with Subsection 217(1) of The Mines and Minerals Act.

A handwritten signature in black ink, appearing to read "N. Bennett", written over a horizontal line.

Mining Recorder



QUARRY LEASE

First Renewal

Quarry
Lease No. QL-476

THIS LEASE made in duplicate this 2nd day of May, 2002

BETWEEN:

Her Majesty the Queen in right of the
Province of Manitoba, represented by the
Minister of Industry, Trade and Mines

(the "Minister")

of the First Part

and -

SUN GRO HORTICULTURE CANADA LTD.
BOX 100
ELMA MB R0E 0Z0

(the "Lessee")

of the Second Part

The parties agree as follows:

1. In this Lease:

(a) "Act" means The Mines and Minerals Act, Cap. M162 C.C.S.M., as amended, revised or substituted from time to time;

(b) "regulations" means regulations made pursuant to the Act, and as amended, revised or substituted from time to time;

2. Subject and pursuant to the Act and regulations, the Minister conveys to the lessee the exclusive right to explore for, develop, and produce the following quarry minerals, namely

PEAT AND PEAT MOSS-----

that are the property of the Crown and are found on or under the land described as:

FIRSTLY: LEGAL SUBDIVISIONS ONE, TWO AND EIGHT OF SECTION NINETEEN IN THE TWENTY-FIFTH TOWNSHIP AND FIFTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA.



SECONDLY: THE SOUTHWEST QUARTER AND LEGAL SUBDIVISIONS TWO, SEVEN AND EIGHT OF SECTION TWENTY IN SAID TOWNSHIP AND RANGE.

THIRDLY: ALL THAT PORTION OF THE NORTH-SOUTH GOVERNMENT ROAD ALLOWANCE LYING BETWEEN SAID SECTIONS NINETEEN AND TWENTY LYING TO THE SOUTH OF A STRAIGHT LINE DRAWN FROM THE NORTHEAST CORNER OF THE SOUTHEAST QUARTER OF SAID SECTION NINETEEN TO THE NORTHWEST CORNER OF THE SOUTHWEST QUARTER OF SAID SECTION TWENTY WHICH LIES TO THE NORTH OF A STRAIGHT LINE DRAWN FROM THE SOUTHEAST CORNER OF SAID SECTION NINETEEN TO THE SOUTHWEST CORNER OF SAID SECTION TWENTY.

FOURTHLY: ALL THAT PORTION OF THE EAST-WEST GOVERNMENT ROAD ALLOWANCE LYING BETWEEN SAID SECTIONS NINETEEN AND TWENTY AND SECTIONS SEVENTEEN AND EIGHTEEN IN SAID TOWNSHIP AND RANGE AND ITS STRAIGHT PRODUCTIONS LYING TO THE EAST OF THE STRAIGHT PRODUCTION SOUTHERLY OF THE WEST LIMIT OF THE SOUTHEAST QUARTER OF SAID SECTION NINETEEN WHICH LIES TO THE WEST OF THE STRAIGHT PRODUCTION SOUTHERLY OF THE EAST LIMIT OF LEGAL SUBDIVISION TWO OF SAID SECTION TWENTY.

(the "Lands") and being 170.469 hectares, more or less, for a term of 10 years, commencing the 12th day of May, 2002 renewable in accordance with the Act.

3. The Lessee shall comply with the Act and regulations; including, without restricting the generality of the foregoing, the payment of rent, royalty and rehabilitation levy prescribed thereunder.
4. The Lessee shall and does hereby indemnify and save harmless the Minister against any and all actions, suits, claims or demands that may be brought or made against the Minister for or by reason of any act or thing done or omitted to be done by the Lessee or its agents with respect to the Lands.
5. To be effective and binding, any waiver by the Minister of a breach by the Lessee of any term or condition of this Lease, the Act or the regulations must be in writing. Any such waiver shall extend only to the events of breach enumerated therein and shall not limit or affect the Minister's rights with respect to any other breach.
6. If the Lessee defaults, breaches, fails to perform or observe any term or condition of this Lease, the Act or the regulations, and any such event is not remedied within such notice period as the Minister may give, the Minister may cancel this Lease. Notwithstanding any such cancellation by the Minister, the rights of the Minister against the Lessee shall not be prejudiced and the Minister shall have the full remedies against the Lessee as if the Lease remained in full force and effect.
7. Any notice to a party hereto shall be in writing and may be delivered personally, sent by telegram, telex, telecopier or other means of electronic communication, or may be forwarded by mail subject to Canada Post confirmation of delivery to that party at the following address:



To the Minister:

Industry, Trade and Mines
Unit 360-1395 Ellice Avenue
Winnipeg, Manitoba
R3G 3P2

To the Lessee:

SUN GRO HORTICULTURE CANADA LTD.
BOX 100
ELMA MB R0E 0Z0

8. This lease shall be interpreted in accordance with the laws of Manitoba.
9. Any amendments to this Lease shall be in writing and signed by both parties.
10. The Lessee shall not assign this lease except with the prior written consent of the Minister which shall not be unreasonably withheld. Any obligations of the Lessee outstanding at the date of any assignment shall remain the responsibility of the Lessee, to the extent the obligations are not performed by the permitted assignee.
11. This Lease shall enure to the benefit of and be binding upon the heirs, executors, administrators, successors and permitted assigns of the parties.
12. Additional clauses:

Prior to development activities on site, details of the proposed drainage system, operating plans and processing shall be submitted for approval by the Director of Mines.



In witness whereof the Minister and the Lessee have executed this Lease on the dates shown below their respective signatures.

Signed, sealed and delivered
in the presence of:

Her Majesty the Queen in right
of the Province Of Manitoba

Witness

Minister of Industry, Trade and Mines

Date

May 17th 2002

Witness

Lessee SUN GRO HORTICULTURE CANADA
LTD.

Date

05/14/02

IN ACCORDANCE WITH SECTION 141(3) OF
THE MINES AND MINERALS ACT, THIS
LEASE IS HEREBY RECORDED AND
THIS STAMP SHALL CONSTITUTE A
CERTIFICATE OF FILING AND RECORDING
May 28/02 K. Bennett

QL-476



QUARRY LEASE NOS. QL-60, QL-66 TO QL-68 INCLUSIVE,
QL-113 TO QL-116 INCLUSIVE, QL-118, QL-119, QL-125, QL-252,
QL-475 TO QL-477 INCLUSIVE, QL-484, QL-485,
QL-590 TO QL-593 INCLUSIVE, QL-616, QL-646, QL-665,
QL-1040 TO QL-1043 INCLUSIVE, QL-1448, QL-1472, QL-1528,
QL-1529 AND QL-1695

APPENDIX "A"

PROVINCE OF MANITOBA

I hereby certify that Mortgage of Leases dated June 10, 2004, in the amount to the maximum principal amount of \$100,000,000 between Sun Gro Horticulture Canada Ltd. and Bank of Montreal was filed against Quarry Lease Nos. QL-60, QL-66 to QL-68 inclusive, QL-113 to QL-116 inclusive, QL-118, QL-119, QL-125, QL-252, QL-475 to QL-477 inclusive, QL-484, QL-485, QL-590 to QL-593 inclusive, QL-616, QL-646, QL-665, QL-1040 to QL-1043 inclusive, QL-1448, QL-1472, QL-1528, QL-1529 and QL-1695 in the Winnipeg Mining Recording Office of the Department of Industry, Economic Development and Mines on June 16, 2004 under Document No. 16779 in accordance with Subsection 217(1) of The Mines and Minerals Act.

Mining Recorder



QUARRY LEASE

First Renewal

Quarry
Lease No. QL-477

THIS LEASE made in duplicate this 3rd day of May, 2002

BETWEEN:

Her Majesty the Queen in right of the
Province of Manitoba, represented by the
Minister of Industry, Trade and Mines

(the "Minister")

of the First Part

- and -

SUN GRO HORTICULTURE CANADA LTD.
BOX 100
ELMA MB R0E 0Z0

(the "Lessee")

of the Second Part

The parties agree as follows:

1. In this Lease:

(a) "Act" means The Mines and Minerals Act, Cap. M162 C.C.S.M., as amended, revised or substituted from time to time;

(b) "regulations" means regulations made pursuant to the Act, and as amended, revised or substituted from time to time;

2. Subject and pursuant to the Act and regulations, the Minister conveys to the lessee the exclusive right to explore for, develop, and produce the following quarry minerals, namely

PEAT AND PEAT MOSS-----

that are the property of the Crown and are found on or under the land described as:

FIRSTLY: THE NORTHWEST QUARTER AND LEGAL SUBDIVISIONS TEN AND FIFTEEN OF SECTION TWENTY IN THE TWENTY-FIFTH TOWNSHIP AND FIFTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA.



SECONDLY: ALL THAT PORTION OF THE NORTH-SOUTH GOVERNMENT ROAD ALLOWANCE LYING BETWEEN SAID SECTION TWENTY AND SECTION NINETEEN IN SAID TOWNSHIP AND RANGE LYING TO THE SOUTH OF A STRAIGHT LINE DRAWN FROM THE NORTHEAST CORNER OF SAID SECTION NINETEEN TO THE NORTHWEST CORNER OF SAID SECTION TWENTY WHICH LIES TO THE NORTH OF A STRAIGHT LINE DRAWN FROM THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SAID SECTION NINETEEN TO THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SAID SECTION TWENTY.

THIRDLY: ALL THAT PORTION OF THE EAST-WEST GOVERNMENT ROAD ALLOWANCE LYING BETWEEN SAID SECTION TWENTY AND SECTION TWENTY-NINE IN SAID TOWNSHIP AND RANGE AND THEIR STRAIGHT PRODUCTIONS WESTERLY LYING TO THE EAST OF A STRAIGHT LINE DRAWN FROM THE NORTHEAST CORNER OF SAID SECTION NINETEEN TO THE SOUTHEAST CORNER OF SECTION THIRTY IN SAID TOWNSHIP AND RANGE WHICH LIES TO THE WEST OF THE STRAIGHT PRODUCTION NORTHERLY OF THE EASTERN LIMIT OF LEGAL SUBDIVISION FIFTEEN OF SAID SECTION TWENTY.

(the "Lands") and being 103.29 hectares, more or less, for a term of 10 years, commencing the 12th day of May, 2002 renewable in accordance with the Act.

3. The Lessee shall comply with the Act and regulations; including, without restricting the generality of the foregoing, the payment of rent, royalty and rehabilitation levy prescribed thereunder.
4. The Lessee shall and does hereby indemnify and save harmless the Minister against any and all actions, suits, claims or demands that may be brought or made against the Minister for or by reason of any act or thing done or omitted to be done by the Lessee or its agents with respect to the Lands.
5. To be effective and binding, any waiver by the Minister of a breach by the Lessee of any term or condition of this Lease, the Act or the regulations must be in writing. Any such waiver shall extend only to the events of breach enumerated therein and shall not limit or affect the Minister's rights with respect to any other breach.
6. If the Lessee defaults, breaches, fails to perform or observe any term or condition of this Lease, the Act or the regulations, and any such event is not remedied within such notice period as the Minister may give, the Minister may cancel this Lease. Notwithstanding any such cancellation by the Minister, the rights of the Minister against the Lessee shall not be prejudiced and the Minister shall have the full remedies against the Lessee as if the Lease remained in full force and effect.
7. Any notice to a party hereto shall be in writing and may be delivered personally, sent by telegram, telex, telecopier or other means of electronic communication, or may be forwarded by mail subject to Canada Post confirmation of delivery to that party at the following address:



To the Minister:

Industry, Trade and Mines
Unit 360-1395 Ellice Avenue
Winnipeg, Manitoba
R3G 3P2

To the Lessee:

SUN GRO HORTICULTURE CANADA LTD.
BOX 100
ELMA MB R0E 0Z0

8. This lease shall be interpreted in accordance with the laws of Manitoba.
9. Any amendments to this Lease shall be in writing and signed by both parties.
10. The Lessee shall not assign this lease except with the prior written consent of the Minister which shall not be unreasonably withheld. Any obligations of the Lessee outstanding at the date of any assignment shall remain the responsibility of the Lessee, to the extent the obligations are not performed by the permitted assignee.
11. This Lease shall enure to the benefit of and be binding upon the heirs, executors, administrators, successors and permitted assigns of the parties.
12. Additional clauses:

Prior to development activities on site, details of the proposed drainage system, operating plan and processing shall be submitted for approval by the Director of Mines.



In witness whereof the Minister and the Lessee have executed this Lease on the dates shown below their respective signatures.

Signed, sealed and delivered
in the presence of:

Her Majesty the Queen in right
of the Province Of Manitoba

Witness

Minister of Industry, Trade and Mines

Date

May 17th 2002

Witness

Lessee SUN GRO HORTICULTURE CANADA LTD.

Date

05/14/02

IN ACCORDANCE WITH SECTION 141(3) OF
THE MINES AND MINERALS ACT, THIS
QUARRY LEASE IS HEREBY RECORDED.
THIS STAMP SHALL CONSTITUTE A
CERTIFICATE OF FILING AND RECORDATION.

May 28/02 W. Bennett
Minister of Industry, Trade and Mines



QUARRY LEASE NOS. QL-60, QL-66 TO QL-68 INCLUSIVE,
QL-113 TO QL-116 INCLUSIVE, QL-118, QL-119, QL-125, QL-252,
QL-475 TO QL-477 INCLUSIVE, QL-484, QL-485,
QL-590 TO QL-593 INCLUSIVE, QL-616, QL-646, QL-665,
QL-1040 TO QL-1043 INCLUSIVE, QL-1448, QL-1472, QL-1528,
QL-1529 AND QL-1695

APPENDIX "A"

PROVINCE OF MANITOBA

I hereby certify that Mortgage of Leases dated June 10, 2004, in the amount to the maximum principal amount of \$100,000,000 between Sun Gro Horticulture Canada Ltd. and Bank of Montreal was filed against Quarry Lease Nos. QL-60, QL-66 to QL-68 inclusive, QL-113 to QL-116 inclusive, QL-118, QL-119, QL-125, QL-252, QL-475 to QL-477 inclusive, QL-484, QL-485, QL-590 to QL-593 inclusive, QL-616, QL-646, QL-665, QL-1040 to QL-1043 inclusive, QL-1448, QL-1472, QL-1528, QL-1529 and QL-1695 in the Winnipeg Mining Recording Office of the Department of Industry, Economic Development and Mines on June 16, 2004 under Document No. 16779 in accordance with Subsection 217(1) of The Mines and Minerals Act.

Mining Recorder

APPENDIX B
MINE CLOSURE PLAN



**Bog Closure Plan
Hay Point Bog**

Sun Gro Horticulture Canada Ltd. (Developer)

August 2011

The following is prepared to comply with section 9 of the Mine Closure Regulation 67/99.

a) Proponent: Sun Gro Horticulture Canada Ltd.
Box 100
Elma, Manitoba
R0E 0Z0
Contact: Walter Amerongen
Phone: 204-426-2121
Fax: 204-426-2131
e-mail: waltera@sungro.com

b) Name of Project: Hay Point Bog Horticultural Peat Harvesting

c) The Hay Point Bog is located approximately 35 kilometers north of Riverton, Manitoba in sections 18, 19, 20 of township 025, range 05 EPM.

d) N/A

e) Mineral rights for the Hay Point Bog are held by Sun Gro under the following Quarry Leases:

QL-475, QL-476, QL-477

f) The Project Site is located on Crown Land and has no previous use.

g) No previous disturbances or other activities have occurred that could have resulted in contamination of the project site or land adjoining the site.

h) The Hay Point Bog is a raised bog and has a vegetative cover of black spruce, tamarack, ericaceous shrubs and sphagnum mosses. A gate will be installed and locked at night and whenever Sun Gro is not active at the site.

i) In order to harvest the bog, Sun Gro will have a staging area that is located close to the bog on mineral soil to be used as a base site to work from throughout the life of the bog harvesting operation. The location of the staging area is in the northwest section of QL 475 at EPM. The size of the staging area is 4 hectares (10 acres) or 200m by 200m. The staging area is used to park and/or store bog development equipment such as vacuum harvesters, wagons, tractors, harrows, crawler tractors, tools and parts trailer, fuel and employee parking. If the soil in the staging area becomes contaminated it will be removed and placed into a designated and

properly managed contaminated area so that it will not in perpetuity cause harm to public health or the environment.

j) Not applicable

k) Sun Gro's normal harvesting operation is as follows:

After the water table has been drawn down by the installation of the perimeter ditch, outlet ditch and lateral ditches, the peat surface is prepared for harvesting (summertime operation). This consists of removing the roots, stumps and embedded logs from the uppermost layer of the peat (the topspit).

The peat fields (areas located between the lateral ditches) are then rotovated or milled and shaped into a crown surface between the lateral ditches and left to dry by solar heat and natural air movement.

Once the peat is dry enough (about 40 to 55% moisture content) it is collected by a vacuum machine and stockpiled at the end of the lateral ditches or headland.

Spoon harrows are used to turn over the peat to increase exposure to the air and increase drying. Over the course of the summer, the harvesters and harrows will pass over the bogs numerous times and each summer they will vacuum a 6-10 cm layer of peat. The harvesting is weather dependent, and when the moisture content of the peat moss is acceptable, all efforts are made towards harvesting.

The ridge along the perimeter of the harvesting operation will be rototilled or milled under on a regular basis to prevent weed growth.

The CSPMA recommends that at least 1 m of peat be left on the bottom of the bog to help in restoration once harvest is complete.

The production levels are weather-dependent and approximately 6-10cm of the peat surface is expected to be harvested each summer.

l) The remaining life of the bog for harvesting is 35 years.

m) Not applicable

n) The Hay Point Bog water appears to flow southeast towards Lake Winnipeg.. The drainage system involves the following three components:

- a. The lateral or cross drainage ditches
- b. The perimeter ditch
- c. The outlet ditches

a. Lateral or Cross Drainage Ditches

Lateral or cross drainage ditches are ditches constructed across the area to be harvested. Their function is to lower the water level within the peat to facilitate harvesting operations. These ditches are approximately parallel to one another and spaced 30 m apart. As the peat is harvested, the ditches are lowered so that there is always a minimum of 1.5m of depth from the top of the peat surface to the bottom of the ditch. The ditches have an average top width of 1.5m and an average bottom width of 0.4m. The lateral ditches generally follow the topography of the land. Since the land is fairly flat or gently sloping, the ditches would also be fairly flat or have mild slopes. The lateral ditches have very small contributing drainage areas and therefore the discharges in the ditches are small. Thus, because of the flat slopes and the small discharges, the stream velocities in the ditches are well below erosion-causing velocities.

b. Perimeter Ditch

The perimeter ditch is constructed around the outside perimeter of the harvestable peat area. It provides an outlet for the cross drainage ditches. These ditches are constructed to a design slope. These ditches will have an average top width of 1.5 m and an average bottom width of 0.4 m.

c. Outlet Ditches

The outlet ditches are the ditches that drain water away from the perimeter ditch. These ditches continue until the elevation of the bottom of the ditch is equal to the top of the natural ground (ditch "day-lights-out").

The outlet ditches run southeast into Lake Winnipeg.

Construction and Maintenance of Drainage Ditches

All ditching will be done with either a ditching machine or a large tracked hoe. Ditches are constructed with a 0.4 meter bottom width and a 1.5 meter top. The ditch side slopes are

steeper than what is normally constructed on mineral type soils. Our experience has shown that these steep side slopes are stable in fibrous and/or peat type soils. Maintenance of the drainage ditches is done throughout the harvesting operation. Sun Gro will be responsible for maintenance and repair of all the drainage works involved with the bog operation to the time their reclamation works are completed. This would include:

- The correction of any erosion or silting problems.
- The correction of any icing problems.
- The cleaning out of the ditches should the capacity become reduced due to vegetative growth.
- The removal of debris that interferes with the passage of water.
- The removal of any beaver dams (if required) that are causing flow problems.

o) Not applicable

p) Not applicable

q) Not applicable

r) Storage and Handling of Fuel, Lubricants, Antifreeze

The long-term storage of fuel products is in the staging area. During harvesting operations, the use of fuel products for equipment will adhere to all applicable Provincial and Federal Regulations. Fuel, lubricants and other potentially hazardous materials shall be stored and handled within dedicated areas at work areas in full compliance with *The Dangerous Goods Handling and Transportation Act* and other regulatory requirements. The Team Leader will be in charge in the event of a spill. Materials required for spill containment and clean up will be available at the work area during pre-harvesting development and harvesting. In the event of a spill, the Team Leader shall be notified immediately and take action to contain the spill. A fuel storage facility (berms constructed around the double-walled fuel storage containers) will be in place.

Accidental Spill Response

In the event of a spill, the Team Leader shall be notified immediately and take action to contain the spill.

Garbage Handling

Garbage will be placed in proper storage containers, which are placed at designated areas in the plant yard. The garbage will be hauled to a local sanitary landfill site. Garbage will be cleaned up daily, so that wildlife is not attracted to the work site.

s) Site Reclamation Goals and Plans

Following closure and rehabilitation, the Hay Point Bog project site will return to its natural state as a functioning raised bog eco-system. The techniques were prepared to comply with the requirements of The Preservation and Reclamation Policy of the Canadian *Sphagnum* Peat Moss Association. This policy recommends that harvested peat land areas be restored to an environment similar to the one that existed before harvesting. This reclamation plan focuses on the procedures involved in establishing a productive wetland ecosystem and through wetland succession will again return to a functioning raised bog ecosystem. The Manitoba Peat Industry is committed to a policy of restoring the harvested bogs back to the wetland inventory. However, the peat industry recognizes that the land is managed by the Crown and that the Crown will specify the final end use (specify the goal of reclamation) of the land, including the on-site access road, the bog, and the drainage ditch.

Several of the goals of peat land restoration include:

- The restoration of harvested peat land to functioning wetland ecosystems
- The enhancement of wildlife values of restored peat land / wetland ecosystems
- The initiation of restoration as soon as harvesting is completed
- The integration of bog development with restoration and restoration goals
- The modification of ditch systems to retain runoff in abandoned sections
- The development of low cost, maintenance-free restoration methods
- The establishment of habitats that complement the regional landscape ecology
- The utilization of natural features such as bog ponds and upland islands.

t) Bog Restoration Procedures

The reclamation plan for the Hay Point Bog includes a combination of production field changes, on-bog runoff retention, topsoil application, and seeding or transplanting with higher plant species (including trees) if needed and as directed by Manitoba Conservation. Production field alterations are designed to facilitate wetland restoration and water fowl / water bird habitat enhancement. The methods are simple and cost-effective, and can be combined with routine maintenance.

After sections of production fields are abandoned, new shallow ponds should be placed at strategic locations in the bog to:

- help retain runoff on the bog
- fill lateral ditches to facilitate rewetting of abandoned areas
- provide habitat for waterfowl, other water birds, invertebrates, frogs, and salamanders,
- create wet areas that, if not filled with water, will provide good habitat for recolonization by sphagnum moss.

2. Level Production Fields

Abandoned production fields should be leveled or re-profiled (remove the crown in the center of the field) to rewet the entire field. This practice should be done in the fall when the bog is driest. The procedure can be combined with ditch filling where appropriate.

3. Fill Ditches

Ditches will be filled with ditch spoil to help retain water on the bog

An alternative to plugging ditches is widening some ditches to create broad, low habitat with a higher water table to facilitate sedge meadow development and *Sphagnum* moss regeneration. The microtopography will be comprised of alternating low, wet sedge/moss-filled depressions with raised, better-drained shrub and tree dominated blocks.

4 Topspit (Recycled bog surface)

Topspit removed from newly opened bogs provides a source of bryophyte spores and fragments that will regenerate, as well as higher plant seeds and live insects and invertebrates. Areas receiving recycled bog surface should have their production fields leveled and drainage ditches filled. The plant community types to be established following topspit application include ericaceous shrubs, moss lawn (*Sphagnum* moss dominated areas with a very high water table), and shrub heath. One to two years may be needed to rewet the bog before topspit can be applied.

Restoration Plan Plant Community Types

The plant community types to be restored on the Hay Point Bog are designed to have equal to higher ecological values than pre-development conditions. It will take time, however, for these values to be achieved. Studies have shown that plant species diversity is higher on naturally restored bogs than on undisturbed low-nutrient bogs (Famous et al. 1993). In general, the density of vertebrate populations and living biomass can be higher on reclaimed bogs.

Final Plant Community Types

Criteria and factors used to select plant community types for the restoration plan included:

- Predominance of wetland vegetation
- High potential for rapid establishment for erosion control
- Establishment on naturally restoring peat lands
- Probability of success a Practicability & Low cost to the producer
- Moderate wildlife values
- Role in the regional landscape ecology,

Important consideration will be given to the ease in which the plan can be implemented, low maintenance, and potential to work in concert with the production plan.

Plant Community Succession

When a harvested bog is recolonized by plants the vegetation goes through a series of changes over time as new species continue to arrive and earlier colonizers mature and / or die. Bare peat is usually first colonized by herbaceous plants which form meadow dominated ecosystems, regardless of nutrient level. Bryophytes may eventually dominate under some environmental circumstances. With time, woody species invade and/ or replace the herbaceous species to form shrub dominated ecosystems with or without a well-developed moss layer. When fully dominated by tall shrubs (above 1 m) they form a shrub thicket plant community type and when fully dominated by low shrubs (> 1 m) they form a shrub heath, similar in form and size to the naturally occurring vegetation prior to development. With time, trees will eventually dominate the bog surface where water table depths are low enough.

Three moisture scenarios will be present; wet, damp and dry sections. The wet locations include ditches, shallow ponds, widened ditches, and leveled fields located in topographic depressions. Damp sections include leveled fields, ditch margins, and the lower slopes of unlevelled production field crowns. Water tables may be near the surface during spring, early summer, late fall, and winter in damp sections. Dry locations include topographically high sections of leveled production fields and the crowns and upper slopes of unlevelled production fields.

Progressive Restoration

As areas become depleted of harvestable peat, they will be reclaimed. The outside edge of the harvestable peat area contains the shallowest peat (0.5 m). Since this area contains the shallowest peat, it will be the first area to be reclaimed. As other areas become depleted of harvestable peat, they will be reclaimed as well.

Once all harvesting has been completed, the road within the bog will be removed. The clay and geotextile matting will be removed and the underlying peat will be salvaged.

Wildlife Populations

The restoration plans are designed to restore and enhance preexisting wildlife values for nesting and migratory land birds, waterfowl, invertebrates, amphibians, and small and large mammals.

Nesting land birds and Water birds

The creation of interspersed emergent marsh, shrub meadow, shrub thicket, and forested habitat will increase bird species diversity and result in higher nesting densities. Most typical bog species will recolonize (palm warbler, Lincoln's sparrow, savannah sparrow, alder flycatcher and common yellowthroat) as well as non-bog edge and forest nesting species (magnolia warbler, white-throated sparrow, Wilson's warbler, and grey catbird).

Species diversity and nesting densities will increase because of the large increase in volume of foliage (leaves serving as feeding substrates for most bird species which are insect eating leaf gleaners), number of vegetation layers (ground, low shrub, tall shrub, and tree canopy), and number of habitat types. Diverse, restored habitat types collectively result in more 'niches' or places for birds to feed and breed.

The natural bog ponds will provide limited food for water birds, however they will serve primarily as resting and stopover areas for migrants. Black ducks, wood ducks, and green-winged teal are expected to utilize these ponds during the nesting season.

Small Mammals, Amphibians and Invertebrates

Small mammal, amphibian, and invertebrate populations will be restored through immigration from refugia, migration corridors and, for invertebrates, the addition of chopped, living bog surface (topspit). Undeveloped sections of bog surrounding ponds and in wet, shallow sections serve as refugia and migration corridors for small mammals, amphibians and invertebrates. Migration corridors can be identified prior to or during bog development or can be established during the restoration process.

u) Surface water quality will be monitored at the following locations:

- within the outlet ditch;
- at the overland flow site;

The monitoring would be conducted at least three to four times a year during the following events:

- the spring freshette;
- at the mid-summer when most chemical parameters with seasonal variability peak;

- during the autumn base flow; and
- when there is an above normal rainfall runoff event.

The chemical parameters that would be monitored are the chemical parameters that might be expected to show an effect as a result of peat land operation. The chemical parameters that would be monitored are:

- the metals iron and aluminum;
- the nutrients, dissolved organic carbon, ammonium and total dissolved phosphorous; conductivity;
- the anion sulphate;
- pH, alkalinity, BOD, and TDS.

Once reclamation begins, the water quality will move in the direction of where it was prior to operation.

v) Closure Cost

The closure cost of reclaiming the Hay Point Bog is approximately \$350,000. The financial assurance for the mine closure document "Mine Closure regulation 67/99 Mine closure guidelines financial assurance section 15 – Corporate financial test" will be considered to have been provided for the entire life of the mine as Sun Gro has a current D&B corporate credit rating of 5A2.

Appendix A

Sun Gro follows the Canadian Sphagnum Peat Moss Association Preservation and Reclamation Policy (CSPMA 1999). The Preservation and Reclamation Policy sets out the procedures for opening, harvesting and closing a bog.

The highlights of the policy are as follows:

Before Harvesting

- Reduce impact on environment
- Record flora and fauna
- Cooperate with environmental groups
- Choose bogs for reserves

During Harvesting

- Minimize acreage
- Leave buffer zone
- Leave layer of peat moss
- Design drainage so water levels can be restored

After Harvesting

- Primary goal: Restore bogs to wetlands
- Secondary goal: Reclaim bogs for beneficial crops

It is the Canadian Sphagnum Peat Moss Association's policy and Sun Gro's to leave a buffer zone of original vegetation around the outside of the peat land. Leaving a strip of undisturbed peat land is not very practical because the peat harvesting areas are smaller than they used to be. Leaving areas in the centre part of a peat land undisturbed is not economically feasible. There is increased cost associated with having to harvest around strips of land and not being able to harvest the undisturbed land is an economic loss.

Introduction

From an ecological perspective, peat land reclamation is broadly defined as the process of returning a disturbed peat land to a former or improved condition. Reclamation includes all efforts,

either natural or man induced, to return an abandoned harvested peat land to a functioning wetland system. In most cases, a wetland system will recolonize by typical peat land species either at an early stage or later stage of succession.

Sun Gro, along with the University of Manitoba has conducted reclamation trials at other peat harvesting locations in Manitoba (results are summarized in Section 3.6.2). As well, the University of Laval in Quebec, the University of Waterloo in Ontario and the University of Alberta in Edmonton have conducted several studies in Canada on peat land restoration forming the basis for the procedures proposed here.

The Bog Environment

One of the intended results of the reclamation of the Hay Point Bog is to restore the area to a *Sphagnum*-based bog. A bog in its mature state is defined by its location and appearance in the landscape, its species composition, and the environmental factors that influence its development. This shape is created by organic matter production that exceeds the rate of decay. Bogs have a high water holding capacity and they typically occur in flat sites such as infilled glacial lake basins in the cool temperate zones of the Northern Hemisphere.

Raised bogs are nutrient-poor environments and are ombrotrophic, which means they receive water and nutrients solely from inputs derived as precipitation. These areas are rather harsh environments as they are typically acidic, and as a result are species-poor in both plant and animal composition. *Sphagnum* mosses are considered the “key species” in peat land formation since their dominance is essential for peat bog formation.

Soil stratigraphy in a raised bog is functionally divided into two layers, the catotelm (lower black peat layer) and the acrotelm (upper brown or white peat layer). These layers form under different conditions and perform different functions in the bog environment. The catotelm is permanently waterlogged and composed of decayed peat material. It functions as an almost impermeable seal for the bottom of the bog and as the primary water storage unit forming the perched water mound. The acrotelm is the active layer of the bog ecosystem where most of the biotic activity occurs as well as the active hydrologic fluctuations. It is the most porous layer and is composed of living and slightly decomposed *Sphagnum* moss and has a high water holding capacity that helps regulate the water level of the bog (Price 1996). The functions of the acrotelm include providing a viable seed bank, protecting the catotelm from evaporation, providing additional water storage, and providing the location of biotic activity.

Assessment Process

The success of the restoration process of any wetland depends on satisfying two main conditions:

- Re-establishing environmental conditions suitable to the desired ecosystem, and
- Providing a source of propagule material of the desired species.

Wetland ecosystems are always evolving and thus each type of wetland represents a point along a continuum of development. For example, in the case of a raised bog, the original ecosystem often begins as an open water progressing through to a swamp, fen, fen carr and finally to a raised bog (Wheeler 1995). While attempting to return a site to its immediate previous state is the most desirable approach, it has been argued that it must be realized and accepted that returning a site to a somewhat earlier developmental stage is all that can be practically and economically achieved (Wheeler 1995). Therefore, the ultimate goal of this reclamation plan is to reclaim the disturbed peat land areas to a functioning wetland that will eventually succeed to a *Sphagnum* bog.

The Elma Demonstration Site

During the summer of 1996, black spruce saplings and jack pine saplings were planted at the site. A survey of the saplings indicated that 98% of the 4395 transplants on the site survived the first winter (Stewart *et al.* 1998). Transplant plugs (approximately 1 square m) of *Sphagnum*, *Polytrichum* and ericaceous shrubs were transplanted in 1996 as well. In 1997, a survey indicated that due to the highly exposed conditions and lack of maintaining the high water regime required for *Sphagnum* regeneration, the success of the bog transplant material was minimal. Only the ericaceous shrubs and some moss species survived on the site. The water level is low due to the drainage for on-going peat extraction adjacent to the site and until the hydrology can be restored, only the ericaceous species will survive.

In 1997, topsoil composed of *Sphagnum* and *Polytrichum* species, and ericaceous shrubs were transplanted onto the site from a site being cleared for harvest. The plant material survives today, but is limited by an insufficient supply of water.

In 1998, field corn and fall rye were planted onto the site in hope of providing shelter for transplants which were struggling under the dry, windy and hot environmental extremes. An intensive fertilization program was necessary for establishing the crops as nitrogen and phosphorus was

limited. The field corn was planted in windrows perpendicular to the prevailing winds. In 1999, field investigations indicated the field corn to be quite successful in trapping of wind-borne seeds. The fall rye crop provided sufficient cover and protection for many species as well.

Elma Restoration Site

In the summer of 1995, 18 square m of *Sphagnum* transplants were planted at the site. An October evaluation indicated that 'green' *Sphagnum* was still present. Black spruce and jack pine saplings were planted at the site as well.

In the summer of 1996, more black spruce and jack pine saplings were transplanted onto the site. An evaluation of the success of the trees on the sites indicated the trees had tripled in height and doubled in their bud count by the end of the 1996 growing-season (Stewart *et al.* 1998). The *Sphagnum* plots that were planted in 1995 were revisited and all plots had excellent growth, which was attributed to the raised and stabilized water table of the area.

In the summer of 1997, the success of the transplants on the Elma plantation site was high. After 27 months of growth, trees planted at the site quadrupled in height and bud count.

In the summer of 1998, the survival and growth of the trees planted in previous years was monitored. The survival success of the transplants was again found to be quite high. Trees growing on this site have suitable hydrological conditions, depth of peaty soil, and natural bog and weed species growing on the site provided shelter for the transplants. The species count of this site is approximately 90 species, which is remarkable as there are normally about 140 species in a bog (Stewart *et al.* 1998).

In the summer of 1999, on-site investigations indicated the *Sphagnum* plugs to have grown and have spread. The black spruce and jack pine transplants are still successful and natural revegetation of tamarack and bog birch is occurring.

h-iv-iii) Moss Spur

In the summer of 1995, approximately 29 square m of mixed *Sphagnum* species were transplanted in three different moisture regimes at the site. An October evaluation indicated all quadrats to have 'green' *Sphagnum* present. Black spruce saplings were transplanted throughout the site. The natural revegetation of tamarack and jack pine was observed throughout the site.

In the summer of 1996, there was variable success in the *Sphagnum* plots established at the site in 1995. More black spruce and jack pine saplings were planted. The trees planted in 1995 more than doubled in height and bud count.

In the summer of 1997, transplant survival decreased on the site as the trees suffered severe flood damage. The trees located on the drier sites were quite successful and had more than tripled in height and more than quadrupled their bud count on average (Stewart *et al.* 1998).

In the summer of 1998, the trees on the drier sites were still doing well.

In the summer of 1999, an on-site investigation indicated complete cover of vegetative species (mainly *Scirpus* and *Typha latifolia*) in the wetter areas. Black spruce transplants were growing well on high areas but the ground cover is less than 40%. Transplanted *Sphagnum* moss plugs are doing very well and are spreading. Natural establishment of orchids including *Arethusa bulbosa* (dragon's mouth orchid), a rare orchid in the province and *Spiranthes romanzoffiana* (hooded ladies'-tresses) is occurring.

Restoration Process

The main challenge in the restoration of harvested peatlands is overcoming the hydrophysical changes that have occurred due to the drainage of the bog and the loss of vegetative cover (Holtslag *et al.* 1998). The slow rate of natural revegetation on vacuum harvested peatlands is due to several factors. The drainage of the peatland alters the natural hydrology of the bog ecosystem by lowering the water table. The peat remaining in the bog after harvesting is more decomposed and is subject to shrinkage, oxidation and compression due to exposure from anaerobic to aerobic conditions (Price 1996). The water table on post-harvested sites is also more variable and fluctuates more so than on natural sites. The site is also subject to erosion by wind and water until cover is established. On bogs in which the vacuum-harvesting method was used to harvest the peat, the rate of revegetation tends to take a long time as the abandoned field has a rather flat topography. Studies on natural revegetation at vacuum-harvested sites show that revegetation is rather sparse with only a few species such as *Eriophorum* sp. and *Betula papyrifera* and *Betula populifolia* (Lavoie and Rochefort 1996).

The upper layer of vegetation known as the topsoil or the acrotelm containing the viable seed bank is removed during the harvesting process. The exposed peat layer now relies upon seed rain for their natural revegetation. However, natural regrowth by *Sphagnum*, the peat mosses

responsible for peat accumulation and formation of bogs, does not generally occur, even after many years of abandonment (Ferland and Rochefort 1997).

The hydrologic regime plays one of the most important roles in determining the revegetative success of the post-harvested peat land as water plays a critical role in the formation of raised bogs. A major hindrance to typical peat land vegetation re-establishment on abandoned peat fields is the lowered water table caused by drainage associated with peat harvesting. The building of the drainage system impacts the ecosystem by restricting the ability of a *Sphagnum* dominated vegetation type to re-establish. Case history studies of naturally revegetated peat lands indicate that water table depth determines plant community structure and the presence or absence of *Sphagnum* regeneration.

Sphagnum moss is the key species to restore peat land function as *Sphagnum* mosses are responsible for peat accumulation and bog formation. However, natural regrowth of *Sphagnum* mosses on abandoned sites generally does not occur, even after many years. Vascular plants tolerant of dry, acidic conditions usually recolonize abandoned sites. The re-establishment of *Sphagnum*-based vegetation on post-harvested fields is a desirable aim for ombrotrophic peat lands restoration because it is a necessary step to restore ecological values such as water filtration, carbon storage, and wildlife habitat (Ferland and Rochefort 1997). Therefore, to manage the peat land as a sustainable resource it is essential to restore the *Sphagnum* mosses.

Sphagnum moss is an ectohydric species and is dependent on high atmospheric humidity and wet conditions for growth and survival (Ferland and Rochefort 1997). If the drainage system is still in place, the hydrology of the peat land will not reflect the pre-harvest conditions and it will therefore be difficult to reestablish native peat land species. The most common method of rewetting the post-harvested peat land is to either block or fill the drainage ditches which run parallel and along the perimeter of the harvested field. The water table should remain between 0.5 – 1 m below the surface for the re-establishment of *Sphagnum* mosses (Quinty and Rochefort 1997a).

The surface topography can be restored to reflect the hummock and hollow form of a natural raised bog. The micro-relief provides varied microenvironments that can be advantageous for the establishment of bog vegetation, especially *Sphagnum* mosses. The hummocks act as windbreaks and the hollows act as collection basins for rain water and snow, which provides wet and humid conditions in which *Sphagnum* moss can become re-established (Rochefort *et al.*

1997). A study conducted by Rochefort and Campeau (1997) showed *Sphagnum* re-establishment is favoured in the depressions of an area with enhanced microtopography in comparison to flat areas seeded with *Sphagnum* diaspores at a similar density. They also showed that using a protective covering such as artificial covers, straw mulch, or companion species provide cover to effectively promote *Sphagnum* re-establishment.

Another possible reason for the low rate of natural revegetation of abandoned sites is that the remaining peat field is almost devoid of plants (Rochefort and Campeau 1997). The availability of species for recolonization is also a factor in the revegetation process. Harvested peat lands lose their viable seed bank and therefore depend on the seed rain for their natural revegetation. For some species, wind borne seeds enhance the recolonization process. Other species propagate by less mobile methods. Transplants of rhizomes could be considered as a method of recolonization of some species. Transplants of clumps of shrubs and herbs also are a potential method of recolonization (Campeau and Rochefort 1997).

Various experiments have been performed to introduce other bog species besides *Sphagnum* mosses. One important source of seeds is to trap the seed rain and help in the revegetation process. The seed rain has been a very important source of seed at the Elma bog sites in Manitoba as more than 90 species have revegetated the area by this method (J. Stewart, Pers. comm.). Black spruce and jack pine saplings were planted on site and have provided wind breaks for many species. The trees decrease wind turbulence allowing wind borne seeds to fall and establish. At the Elma Demonstration Site, a row of field corn was planted to help trap the seed rain. Both of these methods were successful in accelerating the revegetation process.

Protective mulches and windbreaks have also been used to maintain moist soil conditions on the peat soil surface. Protective mulch has proved to create conditions that will be favourable to the survival and growth of *Sphagnum* mosses. Without the protection of a mulch, the *Sphagnum* fragments dry very rapidly and die (Quinty and Rochefort 1997a). Straw mulch application is the most commonly used mulch in peat land restoration, and unlike some other mulches that have been used, straw can be left on-site and allowed to decompose naturally (Rochefort *et al.* 1997).

Sphagnum moss is able to regenerate vegetatively or asexually from leaf, stem and branch fragments referred to as diaspores (Rochefort *et al.* 1995). Rochefort *et al.* (1995) found that an external source of diaspores will significantly enhance *Sphagnum* establishment and mineral additions will help it to spread more rapidly. The external source of living *Sphagnum* moss, which

is collected from living bogs, is referred to as the 'topspit'. Campeau and Rochefort (1996) showed that only the surface layer (0-10 cm) of a peat profile contained enough viable material to be of practical use as a source of *Sphagnum* diaspores. Their results also indicate that a density of at least 450 plants per m² is needed to re-establish a *Sphagnum* carpet effectively within one growing season.

The use of companion species has also been shown to increase the success of *Sphagnum* diaspores in peat land reclamation. Good establishment of *Sphagnum* diaspores was obtained under a cover of cotton grass (*Eriophorum angustifolium*), which, of all companion species tested, was the most successful (Ferland and Rochefort 1997). The other companion species tested in this experiment were ericaceous shrubs and brown mosses. Ferland and Rochefort (1997) concluded that cotton grass enhanced *Sphagnum* establishment by modifying the microclimate, i.e., by keeping more moisture at the peat – air interface of the substratum and by providing shade. Cotton grass can also help stabilize the substratum with its interlacing rhizomes.

In summary, we know that harvested peat lands can be revegetated and the restoration process is largely dependent upon the hydrological regime of the area. To reclaim a harvested *Sphagnum* bog to a functioning *Sphagnum* bog will take time. The primary goal is to restore the water table (J. Stewart pers. Comm.). The most cost-effective revegetation method is the "assisted natural" method which involves natural seeding, with assistance to accelerate tree cover. Once the water table is stable, trees should be transplanted on the higher areas to slow down the wind and trap seed rain. Topdressing with topsoil dressings of *Sphagnum* species and other typical bog species can be planted in the wetter areas. If it is not possible to restore the natural water table then the focus should be on establishing black spruce transplants in order to speed the natural succession of the field (Stewart et. al 1998). Research is still ongoing and reclamation techniques are available which will facilitate the return of the harvested peat lands to functioning bogs.

Wildlife Habitat Enhancement

Very few studies have been done on bird populations in North American peat lands, let alone about their response to anthropogenic habitat changes such as peat harvesting (Desrochers *et al.* 1998). Desrochers *et al.* (1998) compared vegetation structure and bird species richness, abundance and assemblages between naturally revegetated and undisturbed bog sites. They found that certain plants and associated birds were recognized even in post-vacuum harvested sites where all the

live vegetation had once been removed. However, even though bird recolonization occurred in harvested sites, it differed from those in natural sites. Most of the differences in vegetation and bird occupancy were caused by the contrast between post-vacuum and other sites, as post-vacuum sites were sparsely vegetated and colonized by different sets of plant species (Desrochers *et al.* 1998). One species of particular interest was the palm warbler (*Dendroica palmarum*), because it was not only rarely found in post-harvesting sites, but is also known to depend primarily on peat lands in most regions (Wilson 1996). Given the current pressure on peat lands by agriculture, urban development, and peat harvesting, the status of the palm warbler points to the necessity of conserving large expanses of natural bog near harvested sites (Desrochers *et al.* 1998).

Famous *et al.* (1993) noted that bird species diversity tends to increase when restoration techniques increase the habitat diversity. Diverse, restored habitat types collectively results in more 'niches' or places for birds to feed and breed.

Establishment of waterfowl habitat is also a peat land reclamation option in certain circumstances (Clarke-Whistler and Rowsell 1983 IN Keys 1992). When the configuration of the base of the peat land is suitable, the drainage system can be blocked to create ponds or lakes. The sedimentation ponds, and junctions of main drains can be widened to create ponds for waterfowl.

SITE RECLAMATION GOALS AND PLAN

The techniques were prepared to comply with the requirements of The Preservation and Reclamation Policy of the Canadian *Sphagnum* Peat Moss Association (Appendix C). This policy recommends that harvested peat land areas be restored to an environment similar to the one that existed before harvesting. This reclamation plan focuses on the procedures involved in establishing a productive wetland ecosystem and through wetland succession will again return to a functioning raised bog ecosystem. The Manitoba Peat Industry is committed to a policy of restoring the harvested bogs back to the wetland inventory. However, the peat industry recognizes that the land is managed by the Crown and that the Crown will specify the final end use (specify the goal of reclamation) of the land, including the on-site access road, the bog, and the drainage ditch.

Several of the goals of peat land restoration include:

- The restoration of harvested peat land to functioning wetland ecosystems
- The enhancement of wildlife values of restored peat land / wetland ecosystems
- The initiation of restoration as harvesting is completed on this site

- The integration of bog development with restoration and restoration goals
- The modification of ditch systems to retain runoff in abandoned sections
- The development of low cost, maintenance-free restoration methods
- The establishment of habitats that complement the regional landscape ecology
- The utilization of natural features such as bog ponds and upland islands.

APPENDIX C
SITE PHOTOGRAPHS

HAY POINT HORTICULTURAL PEAT HARVESTING Environmental Assessment Proposal



Photo 1. The dry creek bed of Hay Creek, approximately 600 m upstream of the edge of the proposed development area.



Photo 2. Small unnamed creek just east of the proposed development area.



Photo 3. Confluence point between Hay Creek and Lake Winnipeg.



Photo 4. Peat from Hay point within development area.



Photo 5. Flooded drainage ditch along west side of Grindstone Rd.



Photo 6. Grate on upstream side of culvert at the water crossing under Grindstone Rd.; effectively blocking fish passage of large bodied fish.

APPENDIX D
SCIENTIFIC COLLECTION/WORK PERMIT

JUN 03 2010



Conservation

Parks & Natural Areas

200 Saulteaux Crescent, Manitoba R3J 3W3

T 204 945-4148 F 204 945-0012

Jessica.Elliott@gov.mb.ca

26 May 2010

Steve Offman, M.Sc.
Environmental Scientist
KGS Group
3rd Floor - 865 Waverley St.
Wpg. MB. R3T 5P4

Dear Mr. Offman:

As you requested here is the scientific research and collection permit for conducting an environmental impact assessment (EIA) for the proposed peat mine development of Hay Point Bog in Hecla/Grindstone Provincial Park. This EIA includes:

1. aquatic biota/habitat, vegetation, bird, wildlife and amphibian/reptile surveys - including the collection of necessary fish and vegetation specimens - to develop a general inventory and locate and identify provincially very rare (S1) or rare (S2) species that may be present;
2. water quality assessments to conduct baseline surface water quality monitoring in order to provide baseline site-specific water quality data in the nearby water bodies prior to any induced drainage.

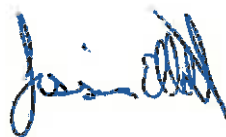
Prior to the start of activities, the District Park Supervisor is to be contacted to review your proposed itinerary and discuss applicable access, fire or backcountry travel restrictions that may be in effect, and areas and times when surveys and collecting may have to be restricted to avoid conflicts with other park users.

Please sign Work Permit and both copies of the Special Conditions. Keep one copy of the signed Special Conditions and make a photocopy of the Work Permit for yourself and return the rest to me for distribution and filing.

Manitoba
spirited energy

I trust that you will find this satisfactory and good luck with your study.

Sincerely;



Jessica Elliott

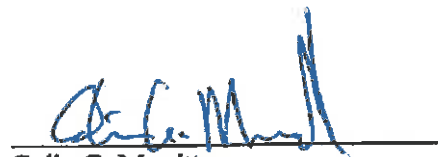
cc Tony Merkl
James Lockie –District Park Supervisor 378-2945

SCIENTIFIC RESEARCH PERMIT SPECIAL CONDITIONS DATED 17 MAY 2010
Steve Offman – KGS Group

PURPOSE: To conduct aquatic biota/habitat, vegetation, bird, wildlife and amphibian/reptile surveys - including the collection of necessary fish and vegetation specimens; and water quality assessments - including the collection of water samples; as part of an environmental impact assessment for the proposed peat mine development of Hay Point Bog in Hecla/Grindstone Provincial Park.

1. The permit is valid only for conducting aquatic biota/habitat, vegetation, bird, wildlife and amphibian/reptile surveys - including the collection of necessary fish and vegetation specimens; water quality assessments- including the collection of water samples; as part of an environmental impact assessment for the proposed peat mine development of Hay Point Bog in Hecla/Grindstone Provincial Park.
2. The permittee or designate shall have a copy of this permit and conditions, and of any additional permits that may be required by provincial or federal regulations, duly approved and authorised in his/her possession at all times while conducting research or collecting in a park or park reserve.
3. Prior to the start of activities in Hecla/Grindstone Provincial Park contact James Lockie, District Park Supervisor, to review your proposed itinerary and discuss applicable access, fire or backcountry travel restrictions that may be in effect, and areas and times when surveys and collecting may have to be restricted to avoid conflicts with other park users.
4. The collection of specimens is permitted subject to the following:
 - a) the collection of rare and endangered species is prohibited, unless the researcher also has a valid permit under the provincial *Endangered Species Act*, or the federal *Species at Risk Act*.
 - b) local populations, are not excessively depleted or damaged by such collection.
 - c) collected specimens not used for laboratory analyses are deposited in appropriate collections where they may be used for future research or educational study.
5. Collecting shall be conducted so as to minimise disturbance to adjacent vegetation and soil.
6. Access to study sites off major park roads shall be by foot.
7. There shall be no open fires or burning at any time, nor unnecessary destruction of vegetation.
8. Wildlife encountered in transit during the course of investigations shall not be harassed.
9. Particularly noteworthy observations such as rare species, previously unknown species, or species requiring unique management or protection shall be brought to the attention of Parks and Natural Areas Branch as soon as possible to facilitate planning activities in the park.
10. Upon completion of the project a report on study findings shall be forwarded to Parks and Natural Areas Branch for resource management and interpretative purposes.
11. The District Park Supervisor, on behalf of the Director of Parks and Natural Areas, may introduce additional conditions or controls as may become necessary during the course of the study.


Steve Offman
KGS Group


Colin G. Merritt
Enforcement Coordinator

Work Permit
Permis d'exploitation

Permit No./N° de permis			
WP	2010	P	HQ 007
YEAR ANNÉE	REGION RÉGION	DISTRICT DISTRICT	NUMBER NUMÉRO



This permit, issued under the authority of The Crown Lands Act, and/or The Wildfires Act, and, subject to all Acts and regulations in effect from time to time, authorizes/Le présent permis, délivré conformément à la Loi sur les terres domaniales, et/ou la Loi sur les incendies échappés, sous réserve des textes législatifs et des textes réglementaires en vigueur actuellement ou à l'avenir, autorise:

Name of permittee Nom du titulaire	Steve Offman -GKS Group		Contact name Nom de contact		
Address Adresse	3rd Floor - 865 Waverley St		City/Town Ville	Winnipeg	Province Province
Postal Code Code postal	R3T 5P4	Telephone No. N° de téléphone	[Business/Affaires] [Cell/Cellule]	204-896-1209	Fax No. N° de fax
					204-896-0754

to carry out an operation on the following described Crown (Manitoba) lands Other lands
à effectuer des travaux sur des terres domaniales (Manitoba) d'autres terres décrites ci-après

Hecla/Grindstone Provincial Park

for the purpose of: (describe purpose or objective of operation)/afin de: (décrire la raison des travaux)	Authority (enter # of permit, tender, contract, etc., if applicable)
conducting aquatic biota/habitat, vegetation, bird, wildlife & amphibian/reptile surveys, including the collection of necessary fish and vegetation specimens, and conducting water quality assessment including the collection of water samples	Autorisation (inscrire le n° de permis, de soumission, de contrat, etc., le cas échéant)

Subject to the following conditions: (attach list if additional space is required)/Sous réserve des conditions suivantes: (annexer une liste, s'il n'y a pas d'espace)

- This permit must be available at all times on the operation site, produced at the request of an Officer, and may be cancelled by an Officer without advance notice.
Ce permis doit pouvoir être présenté à tout moment sur le chantier si un agent demande à le voir, il peut être annulé par un agent préavis.
- as per attached appendix dated: (1) 17 May 2010 (3)
voir l'annexe en date du: (2) (4)
-
-
-

****THIS PERMIT AND THE RIGHTS AND PRIVILEGES GRANTED THEREUNDER ARE NOT TRANSFERABLE****
PERMIT EXPIRES MARCH 31 UNLESS AN ALTERNATE EXPIRY DATE IS SPECIFIED
****LE PRÉSENT PERMIS AINSI QUE LES DROITS ET PRIVILÈGES QUI S'Y RATTACHENT NE SONT PAS TRANSMISSIBLES****
EXPIRATION DU PERMIS 31 MARS SAUF SI UN AUTRE DATE D'EXPIRATION EST PRÉCISÉE

I hereby certify that the information given to obtain this permit is true and that I understand the conditions set out herein./Je certifie que les renseignements fournis pour l'obtention de ce permis sont exacts et que je comprends les conditions indiquées ci-dessus.	Date issued/Date de délivrance (y/m/d) (a/m/j)	
	2010-05-17	Signature of Issuing Authority/Signature de l'autorité émettrice
Signature of Permittee/Signature de l'utilisateur 	Expiry Date/Date d'expiration (y/m/d) (a/m/j)	Print Name/Lettres moulées Colin G. Merritt
	2011-03-31	for Minister of Conservation/pour le ministre des Conservation Issuing District or Office/District ou bureau émetteur HQ Operations

Not valid unless signed by permittee or authorized representative.
N'est valide que signé par le titulaire ou son représentant légal.

Copy To: PERMITTEE - DISTRICT - REGION
Copie: TITULAIRE - DISTRICT - RÉGION

MANITOBA WATER STEWARDSHIP
AQUATIC ECOSYSTEM SECTION

SCIENTIFIC COLLECTION PERMIT

Issued under the authority of the Fisheries Act (Manitoba) and the Fishing Licence Regulation and Fishing Licence Fee Regulation made thereunder.

Issued to: Steve Offman

of: KGS Group, 3rd Floor – 865 Waverly St., Winnipeg, MB. T 896-1209 F 896-0754

is hereby authorized to collect, transport and possess fish within the Province of Manitoba subject to the following conditions:

1. Release live fish only in the water from which they were taken.
2. Fish may not be sold, traded or bartered.
3. The use of chemicals and explosives as aids in collecting fish is prohibited.
4. This permit expires on 31-Oct-10 following date of issue.
5. A report must be submitted to Fisheries Branch, Box 40, 200 Saulteaux Crescent, Winnipeg, MB R3J 3W3 (email: Laureen.Janusz@gov.mb.ca) indicating; location, species, number and disposition of the collected specimens, by the end of February, 2011.
6. Project Title: Ranger Lakes and unnamed water bodies re Sun Gro Horticulture
7. Special Conditions: See attachment. Please contact appropriate district offices prior to commencing field activities.

Laureen Janusz

Issued by

Fisheries Biologist

Title

May 14, 2010

Date of Issue

Laureen Janusz

Steve Offman

Signature of Permittee

Permit Number: 34-10

Attachment to Scientific Collection Permit No. 34-10

- Permittee is authorized to capture fish to assess fish and fish habitat as part of an Environmental Act proposal.
- Only fish required for scientific purposes may be retained. All other fish must be released at site of capture, or, if dead, disposed of as approved by local Natural Resource Officer or Regional Fisheries staff. Dead fish must not be discarded along the shoreline as this contravenes section 36 of the federal *Fisheries Act*.
- Permit does not authorize the collection of any SARA species. Unless a permit is obtained from DFO, all SARA species are to be released immediately: size (fork length) and location must be noted in collection report.
- All sturgeon to be released alive immediately to the waters they were collected from once data is collected unless the retention of sturgeon is authorized by this permit. No sturgeon may be purposely killed without prior written approval of the Regional Fisheries Manager (RFM). Any incidental mortality must be reported to the RFM within seven days of the mortality occurrence. Data must be collected in a manner that does not cause undue stress or mortality to the sturgeon.
- Permittee may fish in the following waters: Ranger Lakes and unnamed drainage network within the Ramsay Point Bog and unnamed water body within Hay Point Bog.
- Permittee may use the following gear: backpack electrofisher, hoop nets, gill nets, seine net and minnow traps. All gear must be clearly marked with permittee's name and contact information.
- Given the potential to transfer introduced fish species and other unwanted biota that are now present in some water bodies there is to be no transfer of water and snails between sampling locations. The permittee must ensure all equipment and personal gear, if not new, has been cleaned, disinfected and visually inspected prior to first use and between water bodies (if warranted).
- Permittee is to immediately report (within 24 hours) to 1-877-867-2470 the date and location of any observations / incidental catch (on gear) of an aquatic invasive species (not including carp or rainbow smelt) or suspect AIS species or species not familiar to the area. In particular the Province is interested in rusty crayfish, spiny water flea and zebra mussels. Please retain a sample and or take close up digital images of the species. This information is to be included in the collection report. Please note confirmation of a species is not required prior to reporting.

- Permittee is to immediately report (within 24 hours) to Water Quality and Aquatic Habitat Protection (945-0002 or 945-8146) any observation of fish kills or fish exhibiting stress/disease in the waterbodies they are sampling. Retention of diseased/dead fish and/or digital images may be required. This information is to be included in the collection report.
- The permit covers employees who are working under the direction of the individuals identified on the permit. They must retain a copy of the permit if sampling on their own.
- The appropriate district office must be notified of collection activities prior to commencing.

APPENDIX E
GOVERNMENT CORRESPONDENCE

Shaun Moffatt

From: Loni Andres [LAndres@kgsgroup.com]
Sent: Thursday, September 30, 2010 1:34 PM
To: 'Shaun Moffatt'
Subject: FW: Lake Winnipeg - Water Quality Data Request
Attachments: Map of Stations near Grindstone Point.jpg; LakeWpgChemData.2010.LAndres_2010.09.10.xls; LAndres.September 10 2010.doc

From: Page, Elaine (WSD) [mailto:Elaine.Page@gov.mb.ca]
Sent: Friday, September 10, 2010 4:20 PM
To: Loni Andres
Subject: RE: Lake Winnipeg - Water Quality Data Request

Hi Loni. Please see attached for your data request. I have also attached a quick map of the sampling locations, and the station coordinates are also included in the data file. I have included the two most recent years of data (2008 and 2009) for four stations in the vicinity of Grindstone Point. Station 13B is the closest to your site of interest. However, if you are interested in looking at metals and ions data, your next best bet would be Station W13. An extended suite of chemistry variables are collected at this station, as it is a part of our long term water quality monitoring network on Lake Winnipeg.

We have very little data from the 1970s on Lake Winnipeg – much of the chemistry data has been collected intensively since 1999. The reference to the 1970s relates to a trend analysis on nutrient concentrations collected from 1978 to 1999 in rivers that are tributary to Lake Winnipeg. Interim nutrient reductions for Lake Winnipeg are based on the finding that nutrient levels have increased in the major tributary rivers from 1978 to 1999.

I hope these data will be helpful. Please give me a call or send an email if I can help out with anything else.

Thanks,

Elaine

Elaine Page (Shiplay)
Water Quality Modelling Specialist
Manitoba Water Stewardship
Suite 160, 123 Main Street
Winnipeg, Manitoba R3C 1A5
Phone: (204) 945-5344
Fax: (204) 948-2357

From: Loni Andres [mailto:LAndres@kgsgroup.com]
Sent: Friday, September 10, 2010 1:46 PM
To: Page, Elaine (WSD)
Subject: RE: Lake Winnipeg - Water Quality Data Request

Hi Elaine,

I think the most recent lab data and maybe 1970 (1970 levels are the targets for Lake Winnipeg right?) The routine chemistry, nutrients, major ions, and metals are the results that I am looking for, thanks. The area is west of Grindstone, near Beaver Creek provincial park.

Loni

From: Page, Elaine (WSD) [mailto:Elaine.Page@gov.mb.ca]
Sent: Friday, September 10, 2010 1:29 PM
To: LAndres@kgsgroup.com
Subject: Lake Winnipeg - Water Quality Data Request

Hi Loni. Thanks for your email. Nicole has asked me to respond on her behalf. We do have stations located near Grindstone Point. What years are you looking at? I just wanted to clarify that you would be interested in routine chemistry, nutrients, major ions, and metals. Is this correct?

Thanks,

Elaine

Elaine Page (Shiple)
Water Quality Modelling Specialist
Manitoba Water Stewardship
Suite 160, 123 Main Street
Winnipeg, Manitoba R3C 1A5
Phone: (204) 945-5344
Fax: (204) 948-2357

From: Loni Andres [mailto:LAndres@kgsgroup.com]
Sent: Friday, September 10, 2010 1:00 PM
To: Armstrong, Nicole (WSD)
Subject: Lake Winnipeg Water Quality

Hi Nicole,

I am currently writing an EAP for a proposed peat mine near the south basin of Lake Winnipeg. We are looking for water quality results for Lake Winnipeg, including general parameters and metal analyses, specifically of the surface water quality west of Grindstone Point. If you don't have any within that exact region I will take whatever you have for the south basin.

Regards,

Loni

*Loni Andres
Geo-Environmental Scientist
KGS Group
(204) 896-1209 ext.299*



Proposed
Development
Area

W13

13B

49S

44S

© 2010 Google
Image © 2010 DigitalGlobe
Image © 2010 TerraMetrics
Data: SIO, NOAA, U.S. Navy, NGA, GEBCO

96°35'33.30" W

**GENERAL WATER QUALITY
LAKE WINNIPEG**

Sample No.	Date	Parameters ⁽¹⁾																		
		pH (units)	EC (µS/cm)	Alkalinity as CaCO ₃	Bicarbonate as CaCO ₃	Carbonate as CaCO ₃	Hydroxide as CaCO ₃	Hardness as CaCO ₃	Sulphate	Ortho-phosphate as P	Ammonia	Nitrate & Nitrite (as N)	B O D	Total Phosphorus	Total Dissolved Phosphorus	Total Particulate Phosphorus	T.D.S.	T.S.S.	T.K.N.	Acidity
W13	3-Mar-08	7.81	250	83	-	-	-	105	28.8	-	<0.01	0.22	<1	0.095	0.067	0.028	168	1	0.4	-
	3-Mar-08	7.80	269	88	-	-	-	112	33	-	<0.01	0.23	-	0.109	0.08	0.029	184	2	0.5	-
	12-Jun-08	8.08	159	58	-	-	-	70	14	-	0.01	<0.01	-	0.032	0.011	0.021	118	6	0.6	-
	12-Jun-08	8.07	159	58	-	-	-	70	13.9	-	0.01	<0.01	1	0.032	0.013	0.019	99	6	0.6	-
	1-Aug-08	7.77	208	70	-	-	-	91	21.3	-	0.02	0.15	-	0.105	0.047	0.058	154	11	0.7	-
	1-Aug-08	7.79	207	70	-	-	-	91	21.3	-	0.03	0.09	<1	0.102	0.044	0.058	151	10	0.6	-
	28-Sep-08	7.86	192	67.9	-	-	-	83	18	-	0.02	0.11	-	0.091	0.047	0.044	134	10	0.3	-
	28-Sep-08	7.89	192	67.9	-	-	-	83	18.1	-	0.02	0.1	<1	0.099	0.046	0.053	139	10	0.3	-
	2-Feb-09	7.62	227	81.8	-	-	-	97	24.5	-	0.02	0.11	-	0.086	0.056	0.03	160	4	0.4	-
	2-Feb-09	7.64	216	79.8	-	-	-	92	21.8	-	0.02	0.09	<1	0.073	0.049	0.024	156	4	0.5	-
	4-Jun-09	7.98	218	78.5	-	-	-	91.6	27	0.0234	0.072	-	2.3	0.081	0.048	0.033	152	14	0.71	-
	4-Jun-09	8.08	216	78.8	-	-	-	97.3	26.3	0.0315	0.036	-	-	0.0674	0.0668	<0.001	154	16	0.64	-
	23-Jul-09	8.17	266	96.3	-	-	-	137	36.9	0.0815	0.0083	-	-	0.11	0.107	0.003	196	8	0.63	-
	23-Jul-09	8.17	277	96.6	-	-	-	131	37.5	0.0835	0.008	-	<1	0.108	0.0967	0.0113	190	8	0.74	-
	26-Sep-09	8.17	248	89.5	-	-	-	125	31.4	0.123	0.012	-	<1	0.136	0.0914	0.0446	188	12	0.67	-
26-Sep-09	8.16	248	89.3	-	-	-	124	28.9	0.087	0.0048	-	-	0.13	0.092	0.024	188	12	0.52	-	
13B	12-Jun-08	8.27	203	-	-	-	-	-	-	-	0.03	<0.01	1	0.044	0.016	0.028	-	7	0.6	-
	1-Aug-08	7.81	194	-	-	-	-	-	-	-	0.03	0.08	2	0.095	0.044	0.051	-	7	0.7	-
	28-Sep-08	8.11	234	-	-	-	-	-	-	-	0.02	0.07	<1	0.1	0.05	0.05	-	9	0.4	-
	6-Jun-09	8.22	250	-	-	-	-	-	-	0.0808	0.017	-	2.1	0.13	0.0851	-	-	11	0.55	-
	23-Jul-09	8.16	291	-	-	-	-	-	-	0.0867	0.0089	-	1	0.105	0.0912	-	-	<5	0.62	-
	26-Sep-09	8.14	212	-	-	-	-	-	-	0.114	0.006	-	<1	0.121	0.0756	-	-	14	0.54	-

**GENERAL WATER QUALITY
LAKE WINNIPEG**

Sample No.	Date	Parameters ⁽¹⁾																			
		pH (units)	E C (µS/cm)	Alkalinity as CaCO ₃	Bicarbonate as CaCO ₃	Carbonate as CaCO ₃	Hydroxide as CaCO ₃	Hardness as CaCO ₃	Sulphate	Ortho-phosphate as P	Ammonia	Nitrate & Nitrite (as N)	B O D	Total Phosphorus	Total Dissolved Phosphorus	Total Pariculate Phosphorus	T D S	T S S	T K N	Acidity	
49S	11-Jun-08	8.53	196	-	-	-	-	-	-	-	0.09	<0.01	2	0.037	0.015	0.022	-	4	0.8	-	
	11-Jun-08	8.52	196	-	-	-	-	-	-	-	0.03	<0.01	1	0.033	0.018	0.015	-	4	0.9	-	
	1-Aug-08	7.85	201	-	-	-	-	-	-	-	0.02	0.07	2	0.087	0.042	0.045	-	4	0.6	-	
	1-Aug-08	7.89	201	-	-	-	-	-	-	-	0.02	0.07	1	0.091	0.043	0.048	-	6	0.6	-	
	28-Sep-08	8.07	251	-	-	-	-	-	-	-	0.02	0.06	<1	0.083	0.053	0.03	-	6	0.2	-	
	28-Sep-08	8.06	246	-	-	-	-	-	-	-	0.02	0.06	<1	0.088	0.053	0.035	-	5	0.3	-	
	5-Jun-09	8.06	245	-	-	-	-	-	-	-	0.0732	0.036	-	2.2	0.101	0.0803	-	-	19	0.55	-
	5-Jun-09	7.53	244	-	-	-	-	-	-	-	0.073	0.024	-	2.5	0.102	0.0766	-	-	15	0.58	-
	26-Sep-09	8.11	200	-	-	-	-	-	-	-	0.0808	0.0068	-	1	0.113	0.0781	-	-	17	0.52	-
	26-Sep-09	8.10	187	-	-	-	-	-	-	-	0.113	<0.003	-	1	0.124	0.0747	-	-	18	0.56	-
44S	11-Jun-08	7.99	170	-	-	-	-	-	-	-	0.02	<0.01	<1	0.016	0.01	0.006	-	5	0.6	-	
	1-Aug-08	7.88	199	-	-	-	-	-	-	-	0.02	0.07	2	0.107	0.045	0.062	-	6	0.7	-	
	28-Sep-08	8.04	236	-	-	-	-	-	-	-	0.04	0.07	<1	0.137	0.048	0.089	-	14	0.4	-	
	5-Jun-09	7.99	257	-	-	-	-	-	-	-	0.0863	0.03	-	1.9	0.107	0.0915	-	-	11	0.62	-
	26-Sep-09	8.17	227	-	-	-	-	-	-	-	0.123	0.015	-	<1	0.123	0.0731	-	-	20	0.6	-

Notes:

Data Summary prepared using data provided by Manitoba Water Stewardship

"-" = No Data

E.C. = Electrical Conductivity

B.O.D. = Biochemical Oxygen Demand

T.K.N. = Total Kjeldahl Nitrogen

T.D.S. = Total Dissolved Solids

T.S.S. = Total Suspended Solids

1. All values are expressed in milligrams per litre (mg/L) unless indicated otherwise.

**METALS IN WATER
LAKE WINNIPEG**

Sample No.	Date	Parameter ⁽¹⁾																		
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Molybdenum
W13	3-Mar-08	0.4400	0.0005	0.00160	0.02300	<0.0002	-	0.02	<0.00004	-	<0.0001	0.0004	0.0002	0.0023	0.410	0.000200	0.009	10.400	0.01300	0.001
	3-Mar-08	0.5000	0.0004	0.00180	0.02500	<0.0002	-	0.03	<0.00004	-	<0.0001	0.0006	0.0002	0.003	0.470	0.000300	0.01	11.200	0.01600	0.001
	12-Jun-08	0.1400	0.0003	0.00100	0.01400	<0.0002	-	<0.01	0.000040	-	<0.0001	0.0004	<0.0002	0.0016	0.220	<0.0002	0.0048	6.570	0.01300	0.000
	12-Jun-08	0.1400	0.0004	0.00090	0.01300	<0.0002	-	0.01	<0.00004	-	<0.0001	0.0003	<0.0002	0.0014	0.200	<0.0002	0.0048	6.580	0.01300	0.000
	1-Aug-08	0.5300	0.0004	0.00170	0.02200	<0.0002	-	0.02	<0.00004	-	0.0001	0.0011	0.0005	0.0026	0.800	0.000500	0.0074	9.010	0.04400	0.001
	1-Aug-08	0.5400	0.0004	0.00170	0.02200	<0.0002	-	0.02	<0.00004	-	<0.0001	0.0012	0.0005	0.0026	0.800	0.000500	0.0073	8.990	0.04400	0.001
	28-Sep-08	0.4900	0.0004	0.00180	0.02200	<0.0002	-	0.01	<0.00004	-	<0.0001	0.0008	0.0003	0.0024	0.610	0.000400	0.0062	8.230	0.04700	0.001
	28-Sep-08	0.4900	0.0004	0.00170	0.02200	<0.0002	-	0.01	<0.00004	-	<0.0001	0.0009	0.0003	0.0023	0.620	0.000500	0.0063	8.240	0.05100	0.001
	2-Feb-09	0.4100	0.0003	0.00180	0.02200	<0.0002	-	0.02	<0.00004	-	<0.0001	0.0009	0.0003	0.0025	0.560	0.000300	0.0075	9.700	0.02000	0.001
	2-Feb-09	0.3500	0.0003	0.00170	0.02100	<0.0002	-	0.02	<0.00004	-	<0.0001	0.0007	0.0002	0.004	0.420	0.000400	0.0069	9.100	0.01300	0.001
	4-Jun-09	0.4080	<0.0002	0.00144	0.02630	<0.0002	-	0.018	0.000020	-	<0.0001	<0.001	0.00055	0.0023	0.411	0.000340	0.0082	9.240	0.02180	0.001
	4-Jun-09	0.3920	<0.0002	0.00148	0.02320	<0.0002	-	0.019	<0.00001	-	<0.0001	<0.001	0.00054	0.0021	0.371	0.000250	0.0083	9.910	0.02600	0.001
	23-Jul-09	1.0800	<0.0002	0.00166	0.03160	<0.0002	-	0.017	0.000020	-	0.00013	0.002	0.00049	0.003	1.130	0.000540	0.0107	13.700	0.04830	0.001
	23-Jul-09	0.7500	<0.0002	0.00158	0.02930	<0.0002	-	0.017	0.000010	-	<0.0001	0.0016	0.00041	0.0028	0.873	0.000530	0.011	13.200	0.04270	0.001
	26-Sep-09	1.1300	<0.0002	0.00212	0.04020	<0.0002	-	0.045	0.000040	-	0.00013	0.0015	0.00077	0.0043	1.060	0.000850	0.0166	12.300	0.07380	0.001
26-Sep-09	2.3100	<0.0002	0.00205	0.04370	<0.0002	-	0.036	<0.00001	-	0.00026	0.0032	0.00093	0.0036	1.800	0.000850	0.0221	12.500	0.07880	0.001	

Sample No.	Date	Parameter ⁽¹⁾																		
		Nickel	Phosphorus	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	Strontium	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
W13	3-Mar-08	0.0018	-	2.68	0.00220	<0.0004	-	<0.00002	9.30	-	<0.0002	<0.00002	<0.0001	<0.0002	0.012	-	0.0007	0.002	0.00300	<0.002
	3-Mar-08	0.0018	-	2.95	0.00240	<0.0004	3.81	<0.00002	10.20	0.07	<0.0002	<0.00002	<0.0001	0.0009	0.015	-	0.0007	0.003	0.00400	<0.002
	12-Jun-08	0.0010	-	1.50	0.00130	0.0006	0.58	<0.00002	5.20	0.05	<0.0002	<0.00002	<0.0001	<0.0002	0.006	-	0.0003	0.001	0.00500	<0.002
	12-Jun-08	0.0010	-	1.52	0.00130	<0.0004	0.57	<0.00002	5.20	-	<0.0002	<0.00002	<0.0001	<0.0002	0.005	-	0.0003	0.001	0.00300	<0.002
	1-Aug-08	0.0024	-	2.21	0.00290	0.0009	2.79	<0.00002	7.80	0.06	<0.0002	<0.00002	<0.0001	<0.0002	0.024	-	0.0005	0.002	0.00500	<0.002
	1-Aug-08	0.0023	-	2.17	0.00300	0.0009	2.83	<0.00002	7.80	-	<0.0002	<0.00002	<0.0001	<0.0002	0.025	-	0.0006	0.002	0.00600	<0.002
	28-Sep-08	0.0020	-	1.97	0.00270	0.0005	3.31	<0.00002	6.80	0.06	<0.0002	<0.00002	<0.0001	<0.0002	0.019	-	0.0005	0.002	0.00300	<0.002
	28-Sep-08	0.0020	-	1.96	0.00280	<0.0004	3.3	0.00014	6.80	-	<0.0002	<0.00002	<0.0001	<0.0002	0.021	-	0.0005	0.002	0.00300	<0.002
	2-Feb-09	0.0018	-	2.23	0.00230	<0.0004	3.79	<0.00002	7.90	0.06	<0.0002	<0.00002	0.0001	0.0005	0.017	-	0.0006	0.002	0.00300	<0.002
	2-Feb-09	0.0016	-	2.03	0.00200	<0.0004	3.44	<0.00002	7.40	0.06	<0.0002	<0.00002	0.0001	<0.0002	0.014	-	0.0006	0.002	0.00500	<0.002
	4-Jun-09	0.0023	-	3.57	0.00197	<0.001	-	0.0001	7.53	0.06	<0.0002	<0.0001	0.00029	<0.0006	0.015	<0.0002	0.00104	0.002	0.00510	0.001
	4-Jun-09	0.0024	-	3.75	0.00194	<0.001	4.89	<0.0001	8.02	0.06	<0.0002	<0.0001	0.00022	<0.0006	0.017	<0.0002	0.00112	0.003	<0.005	0.001
	23-Jul-09	0.0034	-	4.74	0.00385	<0.001	4.89	<0.0001	11.50	0.09	<0.0002	<0.0001	0.00033	<0.0006	0.039	<0.0002	0.00142	0.005	<0.005	0.001
	23-Jul-09	0.0031	-	4.49	0.00320	<0.001	-	<0.0001	11.00	0.09	<0.0002	<0.0001	0.00022	<0.0006	0.027	<0.0002	0.00136	0.004	<0.005	0.001
	26-Sep-09	0.0029	-	3.97	0.00410	<0.001	-	<0.0001	9.68	0.10	<0.0002	<0.0001	0.00034	<0.0006	0.045	<0.0002	0.00134	0.005	0.00660	0.002
26-Sep-09	0.0034	-	4.16	0.00609	<0.001	10.7	<0.0001	9.83	0.09	<0.0002	0.00017	0.00062	<0.0006	0.091	<0.0002	0.00137	0.007	0.00600	0.002	

Notes:
1. All values are expressed in milligrams per litre (mg/L).
Data Summary prepared using data provided by Manitoba Water Stewardship

Shaun Moffatt

From: Firlotte, Nicole (CON) [Nicole.Firlotte@gov.mb.ca]
Sent: Wednesday, May 04, 2011 2:08 PM
To: 'Steve Offman'
Subject: RE: WWW Form Submission - Hay Point Peat Mine Development
Attachments: FW: WWW Form Submission - Hay Point Peat Mine Development; Hay_Point_2011.xls

Steve,

Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's rare species database for UTM NAD 83 14 U 649295 5670451.

I am attaching an excel table summarizing these occurrences. The table includes columns for species at 2km and 10km from the coordinates, scientific and common names, the global (GRank) and provincial (SRank) rankings for each species as well as MB Endangered Species Act, COSEWIC and SARA designations. Further information on these ranking systems can be found on our website at <http://web2.gov.mb.ca/conservation/cdc/constranks.html> and these designations can be found at <http://web2.gov.mb.ca/laws/statutes/ccsm/e111e.php>, <http://www.cosewic.gc.ca/> and http://www.sararegistry.gc.ca/default_e.cfm.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre of the Wildlife and Ecosystem Protection Branch at the time of the request. These data are dependent on the research and observations of our scientists and reflects our current state of knowledge. An absence of data does not confirm the absence of any rare or endangered species. Many areas of the province have never been thoroughly surveyed, therefore, the absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. The information should not be regarded as a final statement on the occurrence of any species of concern, nor should it substitute for on-site surveys for species or environmental assessments. Also, because our Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request. We would be very interested in receiving a copy of any survey results you may undertake of the area to update our database.

Please contact the Manitoba CDC for an update on this natural heritage information if more than six months passes before it is utilised.

Third party requests for products wholly or partially derived from our Biotics database must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using data from our database, as the Manitoba Conservation Data Centre; Wildlife and Ecosystem Protection Branch, Manitoba Conservation.

If you have any questions or require further information contact me directly at (204) 945-6998. If you are conducting ground surveys within the area and encounter any rare species please provide us with this information to add to our data base.

Regards,
Nicole

Nicole Firlotte
Biodiversity Information Manager
Manitoba Conservation
945-6998

email: nicole.firlotte@gov.mb.ca

 Please consider the environment before printing this e-mail

From: Steve Offman [mailto:SOffman@kgsgroup.com]
Sent: May-04-11 8:19 AM
To: Firlotte, Nicole (CON)
Subject: MBCDC Species Info Request

Nicole,

As a follow up to my request submitted on Monday May 2, 2011 (Hay Point Peat Processing EAP), I was hoping to receive any species data ranging approximately 2 km from the coordinates indicated in the request form and a separate list with a range of approximately 10 km from the coordinates.

Last year you issued the attached file to Chris Penner who is working with us on this project. Could you please provide us with a similar dataset for the two distances mentioned above?

Thank you kindly for your time,

Steve

Steve Offman, M.Sc.
Environmental Scientist
KGS Group

3rd Floor - 865 Waverley St.
Wpg. MB. R3T 5P4

Office: 204-896-1209
Cell: 204-979-8964
Fax: 204-896-0754

From: Firlotte, Nicole (CON) [mailto:Nicole.Firlotte@gov.mb.ca]
Sent: June 14, 2010 2:41 PM
To: Chris Penner
Subject: RE:

Chris,

This is what I sent you. Let me know if you need anything else. What is the new job?

Regards,
Nicole

Nicole Firlotte
Biodiversity Information Manager
Manitoba Conservation
945-6998
email: nicole.firlotte@gov.mb.ca

 Please consider the environment before printing this e-mail

From: Chris Penner [mailto:cpenner@scatliff.ca]
Sent: Monday, June 14, 2010 2:36 PM
To: Firlotte, Nicole (CON)
Subject:

Nicole,

I found my e-mail! Thanks for your help

Regards

Chris

No virus found in this message.
Checked by AVG - www.avg.com
Version: 10.0.1325 / Virus Database: 1500/3612 - Release Date: 05/03/11

No virus found in this message.

2km	10km	EO ID	ELCODE	EO_NUM	SCIENTIFIC NAME	COMMON NAME	NAME CATEGORY	G RANK	S RANK	MB ESA	COSEMIC	SARA
	X	1866	ABNGA04010	22	Ardea herodias	Great Blue Heron	Ve tebrate Animal	G5	S4S6B			
X	X	182	PMCYP03AA0	6	Carex pedunculata	Stalked Sedge	Vascular Plant	G5	S3?			
	X	2453	PMCYP03B50	2	Carex prolecta	Necklace Sedge	Vascular Plant	G5	S2?			
	X	3125	AFCHA01140	13	Coregonus zenithicus	Shortjaw Cisco	Ve tebrate Animal	G3	S3			
X	X	3985	PMORC0020	2	Cyrtopodium arietinum	Ram's Head Lady's-slipper	Vascular Plant	G3	S2S3			
	X	5331	OGULLCOL11	62	Gull Colony		Animal Assemblage	GNR	SNR			
	X	6509	ABNYF04040	47	Melanerpes erythrocephalus	Red-headed Woodpecker	Ve tebrate Animal	G5	S2B		T	T Schedule 1
	X	154	PPDRY0P010	12	Onoclea sensibilis	Sensitive Fern	Vascular Plant	G5	S3S4			
	X	3252	ABNFD01020	67	Phalacrocorax auritus	Double-crested Cormorant	Ve tebrate Animal	G5	S5B		NAR	
X	X	2339	PMORC1Y0K0	2	Platanthera orbiculata	Round-leaved Bog Orchid	Vascular Plant	G5	S3			
	X	2452	PGTXA01020	3	Taxus canadensis	Canada Yew	Vascular Plant	G5	S3			
	X	6508	ABPBX16030	31	Wilsonia canadensis	Canada Warbler	Ve tebrate Animal	G5	S4B		T	

DATE: June 3, 2011

TO: Steve Offman
KGS Group
3rd Floor-865 Waverley St.
Winnipeg MB

FROM: Gordon Hill
Impact Assessment
Archaeologist
Historic Resources
Branch
Main Floor 213 Notre
Dame Avenue
Winnipeg MB
R3B 1N3
PHONE NO: (204) 945-7730

SUBJECT: HERITAGE RESOURCES

YOUR FILE:

HRB FILE: AAS-11-2438

HAY POINT PEAT BOG
17 TO 20-25-5 EPM

In response to your memo regarding the above-noted proposed project, I have examined Branch records for areas of potential concern. The potential to impact significant heritage resources is low, and, therefore, the Historic Resources Branch has no concerns with the project.

If at any time however, significant heritage resources are recorded in association with these lands during development, the Historic Resources Branch may require that an acceptable heritage resource management strategy be implemented by the developer to mitigate the affects of development on the heritage resources.

If you have any questions or comments, please contact me at 945-7730.

C. Gordon Hill



June 2, 2011

File No. 10-0293-01

Manitoba Water Stewardship
P.O. Box 6000
75 – 7th Avenue
Gimli, Manitoba
R0C 1B0

ATTENTION: Mr. Lyle Campbell
Regional Lands Manager

RE: Sun Gro Horticulture Canada Ltd.
Environment Act Proposal, Peatland Development, Hay Point Bog

3rd Floor
865 Waverley Street
Winnipeg,
Manitoba
R3T 5P4
204.896.1209
fax: 204.896.0754
www.ksgroup.com

Dear Mr. Campbell:

KGS Group is submitting this letter on behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro) as part of an Environment Act Proposal (EAP) for a peatland development of the existing Sun Gro quarry lease at Hay Point Bog. The entirety of the proposed development is within Hecla / Grindstone Provincial Park. You have been identified as a potential stakeholder and as such, KGS Group is issuing this letter to provide a brief description of the project and potential environmental concerns that will be considered during the Environment Act Proposal process.

The Environmental Assessment process will be carried out based on project information provided by Sun Gro and advice documents from Manitoba Conservation. Additional considerations will include environmental information acquired from literature and internet searches, publications by the peat industry and environmental organizations, contacts with federal and provincial government representatives, consultation with stakeholders, and site investigations which have been conducted by the project team.

The proposed peat development is in close proximity to Lake Winnipeg and is located along Grindstone Road approximately 11 km NE of the junction between Hwy 8 of Hwy 234. The bog contains one small unnamed lake and an ephemeral creek referred to as Hay Creek which drains into Lake Winnipeg. The spatial boundary of the environmental assessment will consist of the regional study area (1,659 ha) which includes the area within a 10 km radius of the quarry lease boundary. The project study area covers a 3 km radius surrounding the quarry lease boundary (Figure 1).

The scope of the project will include planning, designing, constructing, operating, maintenance and eventual decommissioning and restoration of the proposed peatland development at Hay Point Bog. The entire production lifespan of the proposed development is estimated to be 45 years. Hay Point Bog has over 45 years of peat capacity and can be harvested over this time starting once all licensing and permitting requirements have been fulfilled. As well, the project will include development of an access road, site drainage, on-site facilities and an on-

site stockpiling area. Major project activities will include providing access, clearing vegetation and surface soils, stockpiling unprocessed peat, excavating and trenching, transporting and restoring and reclaiming harvested peatland.

The assessment for the proposed development will include identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. This will consist of both direct and indirect biophysical and socio-economic effects, including cumulative environmental effects. The need for the project, alternatives, to the project and requirements for a follow-up will be considered in the assessment.

Potential environmental concerns being considered in the Environmental Act Proposal include air quality, soil integrity and quality, surface water quality, wetland health, groundwater quality, aquatic and terrestrial vegetation (with special emphasis on species of conservation concern), Wildlife (with special emphasis on species of conservation concern), fish and fish habitat, and social and economic conditions associated with the proposed development.

KGS Group would like to offer the Manitoba Water Stewardship the opportunity to provide any comments or concerns regarding the proposed development so that they can be addressed and incorporated into the EAP. We would appreciate any comments to be made available on or before July, 2, 2011 (30 day period). Any comments received after that date would be included into the final EAP submission to Manitoba Conservation who will post the document on the Public Registry for review. Should you have any questions, comments or concerns, please do not hesitate to contact the undersigned at (204) 896-1209, via e-mail at smoffatt@kgsgroup.com, or by mail.

Yours truly,



Shaun Moffatt, M.Sc.
Environmental Scientist

SO/jr



June 2, 2011

File No. 10-0293-01

Manitoba Conservation
P.O. Box 70
Riverton, Manitoba
R0C 2R0

ATTENTION: Mr. Jim Fisher
District Park Supervisor

RE: Sun Gro Horticulture Canada Ltd.
Environment Act Proposal, Peatland Development, Hay Point Bog

3rd Floor
865 Waverley Street
Winnipeg,
Manitoba
R3T 5P4
204.896.1209
fax: 204.896.0754
www.ksgsgroup.com

Dear Mr. Fisher:

KGS Group is submitting this letter on behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro) as part of an Environment Act Proposal (EAP) for a peatland development of the existing Sun Gro quarry lease at Hay Point Bog. The entirety of the proposed development is within Hecla / Grindstone Provincial Park. You have been identified as a potential stakeholder and as such, KGS Group is issuing this letter to provide a brief description of the project and potential environmental concerns that will be considered during the Environment Act Proposal process.

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Potential environmental concerns being considered in the Environmental Act Proposal include air quality, soil integrity and quality, surface water quality, wetland health, groundwater quality, aquatic and terrestrial vegetation (with special emphasis on species of conservation concern), Wildlife (with special emphasis on species of conservation concern), fish and fish habitat, and social and economic conditions associated with the proposed development.

KGS Group would like to offer the Manitoba Conservation the opportunity to provide any comments or concerns regarding the proposed development so that they can be addressed and incorporated into the EAP. We would appreciate any comments to be made available on or before July, 2, 2011 (30 day period). Any comments received after that date would be included into the final EAP submission to Manitoba Conservation who will post the document on the Public Registry for review. Should you have any questions, comments or concerns, please do not hesitate to contact the undersigned at (204) 896-1209, via e-mail at smoffatt@kgsgroup.com, or by mail.

Yours truly,

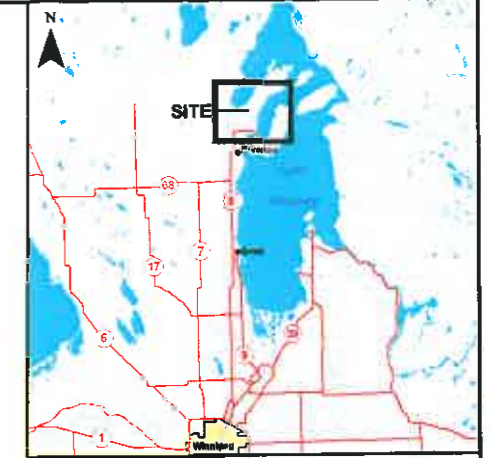
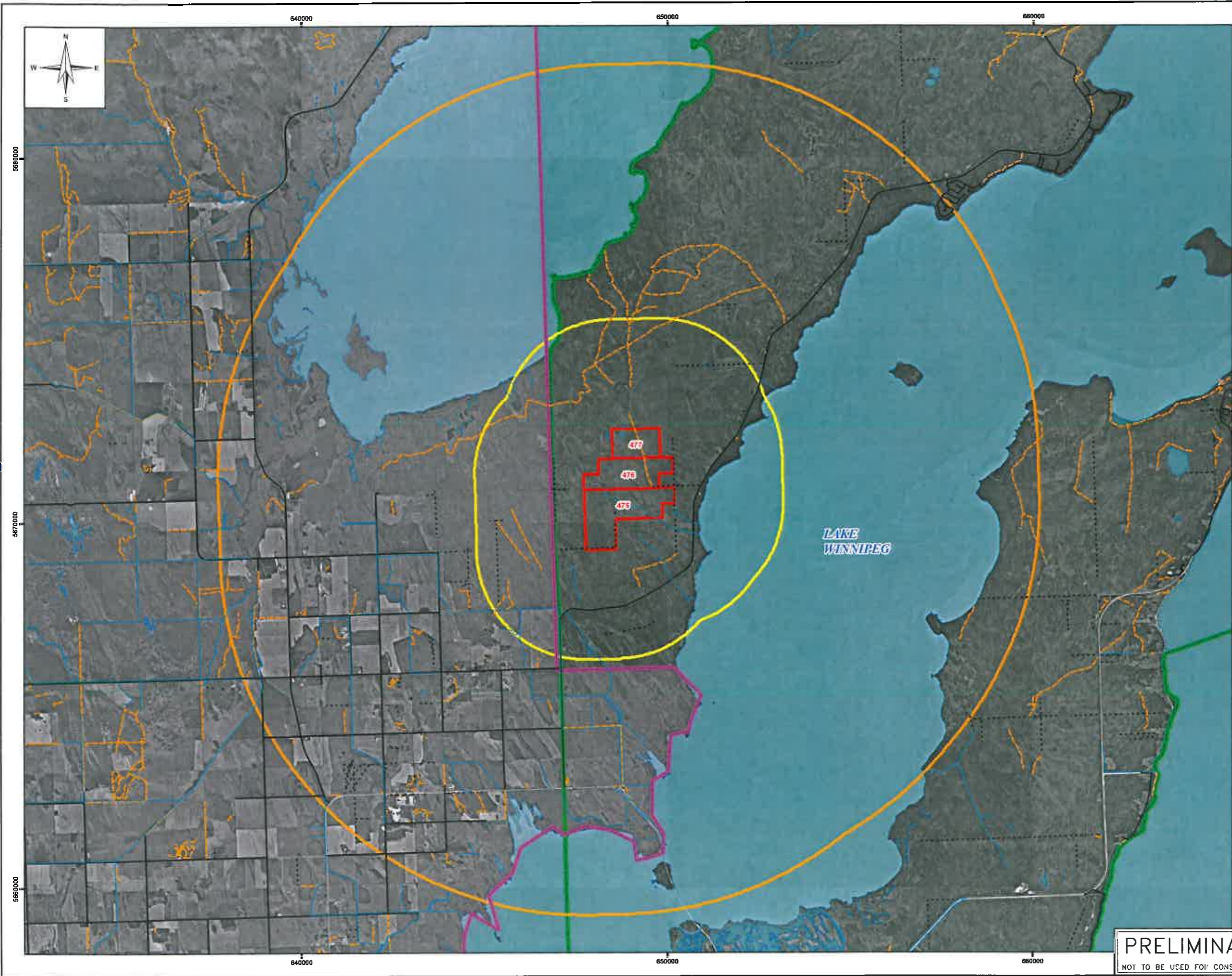


Shaun Moffatt, M.Sc.
Environmental Scientist

SO/jr

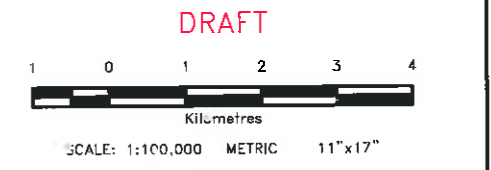
Portions of data presented are derived from the Province of Manitoba and are presented under the license agreement with the Province of Manitoba 2011. Owner's Name:

File Name: P:\Projects\2010\10-07-23-01\Draw\001\MapDocs\Revised\cutref\10-07-23-01 - Full.mxd
 11:37 AM 07/24/10



- LEGEND:**
- River
 - Road
 - Trail
 - Culline
 - Pequis FN Community Interest Zone
 - Project Study Area
 - Regional Study Area
 - Lake
 - Quarry Lease
 - Park Boundary

NOTES:
 1. ALL UNITS ARE METRIC AND IN METRES UNLESS OTHERWISE SPECIFIED.
 TRANSVERSE MERCATOR PROJECTION, NAD 1983, ZONE 14
 ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (MSL)



A	11, 05/31	ISSUED FOR INFORMATION	BAT
NO.	YY/MM/DD	DESCRIPTION	BY
REVISIONS / ISSUE			
HAY POINT PEAT BOG			
HAY POINT PROJECT STUDY AREA			
PRELIMINARY			
NOT TO BE USED FOR CONSTRUCTION			
MAY 2011		FIGURE 01	A

Shaun Moffatt

From: Elliott, Jessica (CON) [Jessica.Elliott@gov.mb.ca]
Sent: Tuesday, August 02, 2011 8:05 AM
To: smoffatt@kgsgroup.com
Subject: KGS Group TRANS No. 10-0293-01-00019 EAP Peat Mine Development
Follow Up Flag: Follow up
Flag Status: Red

Mr. Moffatt,

As the proposed development is within Hecla/Grindstone Provincial Park, Parks and Natural Areas Branch is providing comments separate from those already provided to you by the Central Region. The Branch has several concerns relating to the development of a peat mine within Hecla/Grindstone Provincial Park.

First, are the concerns of what impact such an operation will have to the wetland ecosystems outside of the mining area. The Branch is concerned that draining of the area of wetland from which peat is to be extracted will have further reaching consequences to the remaining intact wetlands and peat lands surrounding the operation. Namely the Branch is concerned that the water flow, water regime and/or water table within the larger wetland area will be impacted resulting in degradation of the surrounding wetland/peat land ecosystem as a whole or may even have further reaching consequences into the forested ecosystems and small lakes and ponds on/in? Grindstone.

Second, are concerns regarding improved access into wetlands that are currently inaccessible parts of the park that provide habitat for moose. Provincially there are concerns over moose populations and the Branch does not want to increase access points into these areas that could facilitate improved hunting access to moose. In the recent past groups have requested construction of recreation trails in the area of the proposed peat mine. These applications have been denied due to the potential negative consequences to moose populations that increased access in this area would have.

Third, are concerns regarding fire risks. Increased fire risk has been associated with this type of operation. The proposed peat mine development is directly up the prevailing winds from the cottaging area. As such there is a much greater potential that a fire in the peat mine development could spread to the cottaging area threatening life and property. There are hundreds of cottages in the Grindstone subdivision north of the proposed peat mine development and only one road in and out. This road runs past the proposed peat mine development.

Fourth, are concerns regarding degradation to existing park infrastructure, namely the roads. The only road in Grindstone is a narrow gravel road that is maintained by Manitoba Conservation. Increased traffic and heavy equipment/trucks accessing the peat mine development and hauling out peat will quickly degrade the road and result in increased road dust.

Fifth, are concerns regarding the safety and quality of experience of park visitors. Increased large truck traffic poses safety implications. Increased truck traffic, dust and the visual optics of having a large peat mining development off the road as you drive into the park will potentially decrease the positive visitor experience that Parks and Natural Areas Branch promotes and Manitobans and visitors to our province expect.

Lastly, Parks and Natural Areas Branch is concerned about how the site will be restored after the

proposed peat mining operation is complete. Restoration plans for other peat mining developments propose "restoring" the mined area to such things as a forest, lake, or cranberry farm. Such proposed types of "restoration" are not acceptable for a provincial park. Only restoration to as close to original state as possible will be permitted. This means a functional, natural wetland habitat that in time, as a result of succession, will become a peat producing wetland.

Regards;

Jessica

Jessica Elliott, M.E.Des.
Ecological Reserves and Protected Areas Specialist
Parks and Natural Areas Branch
Manitoba Conservation
Box 53, 200 Saulteaux Cres
Winnipeg MB R3J 3W3

fax: 204-945-0012

phone: 204-945-4148

email: Jessica.Elliott@gov.mb.ca



Before printing, think about the environment
Avant d'imprimer, pensez à l'environnement

APPENDIX F

**MANITOBA CONSERVATION DATA CENTRE
MID-BOREAL LOWLAND SPECIES OF CONCERN**



Manitoba Conservation Data Centre

Occurrence of Species by Ecoregion

[Return to Map](#)

Mid-Boreal Lowland

Animal Assemblage			
<i>Bat Colony</i>	GNR		SNR
<i>Snake Hibernaculum</i>	GNR		SNR
Invertebrate Animal			
<i>Strophitus undulatus</i>	G5		SNR
Terrestrial Community - Other Classification			
Boreal inland alkaline cliff sparse vegetation	GNR	Boreal Inland Alkaline Cliff SparseVegetation	S2
<i>Distichlis stricta-hordeum jubatum-puccinellia nuttalliana-plantago maritima saline herbaceous vegetation</i>	GNR	Alkali Grass-wild Barley-nuttall's Salt Meadow Grass-seaside Plantain SalineHerbaceous Vegetation	S2
<i>Inland lake cobble-gravel shore sparse vegetation</i>	GNR	Inland Lake Cobble-gravel Shore Sparse Vegetation	S3
<i>Thuja occidentalis-(picea mariana, abies balsamea)/alnus rugosa wetland forest</i>	GNR	Eastern White Cedar-(Black Spruce, Balsam Fir)/speckled Alder Wetland Forest	S2
Vascular Plant			
<i>Arethusa bulbosa</i>	G4	Arethusa	S2
<i>Botrychium multifidum</i>	G5	Leathery Grape-fern	S3
<i>Calopogon tuberosus</i>	G5	Swamp-pink	S2
<i>Carex communis</i>	G5	Fibrous-rooted Sedge	SNA
<i>Carex flava</i>	G5	Yellow Sedge	S2S3
<i>Carex garberi</i>	G5	Elk Sedge	S1?
<i>Carex hystericina</i>	G5	Porcupine Sedge	S3?
<i>Carex pedunculata</i>	G5	Stalked Sedge	S3?
<i>Carex projecta</i>	G5	Necklace Sedge	S2?
<i>Carex vulpinoidea</i>	G5	Fox Sedge	S3?
<i>Cypripedium arietinum</i>	G3	Ram's Head Lady's-slipper	S2S3
<i>Drosera anglica</i>	G5	Oblong-leaved Sundew	S3
<i>Drosera linearis</i>	G4	Slender-leaved Sundew	S2
<i>Dulichium arundinaceum</i>	G5	Three-way Sedge	S2
<i>Eleocharis engelmannii</i>	G4G5Q	Engelmann's Spike-rush	S1
<i>Eriophorum callitrix</i>	G5	Beautiful Cotton-grass	S2
<i>Galium aparine</i>	G5	Cleavers	SU
<i>Goodyera tessellata</i>	G5	Tesselated Rattlesnake Plantain	S2
<i>Gymnocarpium jessoense</i>	G5	Northern Oak Fern	S3S4
<i>Gymnocarpium robertianum</i>	G5	Limestone Oak Fern	S1
<i>Heteranthera dubia</i>	G5	Water Star-grass	S2
<i>Leucophysalis grandiflora</i>	G4?	Large White-flowered Ground-cherry	S3
<i>Liparis loeselii</i>	G5	Yellow Twayblade	S3S4

<i>Listera auriculata</i>	G3G4	Auricled Twayblade	S1
<i>Malaxis monophyllos</i>	G5	White Adder's-mouth	S2?
<i>Malaxis unifolia</i>	G5	Green Adder's-mouth	S2?
<i>Nymphaea odorata</i>	G5	Fragrant Water-lily	S2
<i>Onoclea sensibilis</i>	G5	Sensitive Fern	S3S4
<i>Parietaria pensylvanica</i>	G5	American Pellitory	S4
<i>Pellaea glabella ssp. occidentalis</i>	G5T4	Cliff-brake	S2
<i>Plantago maritima</i>	G5	Seaside Plantain	S2
<i>Platanthera lacera</i>	G5	Fringed Orchid	S2
<i>Platanthera orbiculata</i>	G5	Round-leaved Bog Orchid	S3
<i>Potamogeton strictifolius</i>	G5	Straightleaf Pondweed	S3
<i>Pyrola americana</i>	G5	Round-leaved Pyrola	S2
<i>Rhynchospora alba</i>	G5	White Beakrush	S3?
<i>Rhynchospora capillacea</i>	G4	Horned Beakrush	S2
<i>Taxus canadensis</i>	G5	Canada Yew	S3
<i>Thalictrum sparsiflorum</i>	G5	Few-flowered Meadow-rue	S2S3
<i>Vaccinium caespitosum</i>	G5	Dwarf Bilberry	S2
<i>Viola selkirkii</i>	G5?	Long-spurred Violet	S2
<i>Woodsia glabella</i>	G5	Smooth Woodsia	S2
Vertebrate Animal			
<i>Aechmophorus occidentalis</i>	G5	Western Grebe	S4B
<i>Ardea herodias</i>	G5	Great Blue Heron	S4S5B
<i>Aythya marila</i>	G5	Greater Scaup	S5B
<i>Charadrius melodus</i>	G3	Piping Plover	S1B
<i>Coregonus zenithicus</i>	G3	Shortjaw Cisco	S3
<i>Haliaeetus leucocephalus</i>	G5	Bald Eagle	S4S5B
<i>Ichthyomyzon castaneus</i>	G4	Chestnut Lamprey	S3S4
<i>Macrhybopsis storeriana</i>	G5	Silver Chub	S3
<i>Myotis lucifugus</i>	G5	Little Brown Myotis	S2N,S5B
<i>Nycticorax nycticorax</i>	G5	Black-crowned Night-heron	S3S4B
<i>Pelecanus erythrorhynchos</i>	G3	American White Pelican	S3S4B
<i>Phalacrocorax auritus</i>	G5	Double-crested Cormorant	S5B
<i>Rangifer tarandus caribou</i>	G5T4	Caribou	S4
<i>Sterna caspia</i>	G5	Caspian Tern	S3S4B
<i>Sterna forsteri</i>	G5	Forster's Tern	S4B
<i>Strix varia</i>	G5	Barred Owl	S3S4

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APPENDIX G
PUBLIC CONSULTATION



June 2, 2011

File No. 10-0293-01

Grindstone Cottage Owners Association
c/o box 4408
Stonewall, Manitoba
R0C 2Z0

ATTENTION: Mr. Bob Ralke

RE: Sun Gro Horticulture Canada Ltd.
Environment Act Proposal, Peatland Development, Hay Point Bog

3rd Floor
865 Waverley Street
Winnipeg,
Manitoba
R3T 5P4
204.896.1209
fax: 204.896.0754
www.ksgsgroup.com

Dear Mr. Ralke:

KGS Group is submitting this letter on behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro) as part of an Environment Act Proposal (EAP) for a peatland development of the existing Sun Gro quarry lease at Hay Point Bog. The entirety of the proposed development is within Hecla / Grindstone Provincial Park. You have been identified as a potential stakeholder and as such, KGS Group is issuing this letter to provide a brief description of the project and potential environmental concerns that will be considered during the Environment Act Proposal process.

The Environmental Assessment process will be carried out based on project information provided by Sun Gro and advice documents from Manitoba Conservation. Additional considerations will include environmental information acquired from literature and internet searches, publications by the peat industry and environmental organizations, contacts with federal and provincial government representatives, consultation with stakeholders, and site investigations which have been conducted by the project team.

The proposed peat development is in close proximity to Lake Winnipeg and is located along Grindstone Road approximately 11 km NE of the junction between Hwy 8 of Hwy 234. The bog contains one small unnamed lake and an ephemeral creek referred to as Hay Creek which drains into Lake Winnipeg. The spatial boundary of the environmental assessment will consist of the regional study area (1,659 ha) which includes the area within a 10 km radius of the quarry lease boundary. The project study area covers a 3 km radius surrounding the quarry lease boundary (Figure 1).

The scope of the project will include planning, designing, constructing, operating, maintenance and eventual decommissioning and restoration of the proposed peatland development at Hay Point Bog. The entire production lifespan of the proposed development is estimated to be 45 years. Hay Point Bog has over 45 years of peat capacity and can be harvested over this time starting once all licensing and permitting requirements have been fulfilled. As well, the project will include development of an access road, site drainage, on-site facilities and an on-

site stockpiling area. Major project activities will include providing access, clearing vegetation and surface soils, stockpiling unprocessed peat, excavating and trenching, transporting and restoring and reclaiming harvested peatland.

The assessment for the proposed development will include identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. This will consist of both direct and indirect biophysical and socio-economic effects, including cumulative environmental effects. The need for the project, alternatives, to the project and requirements for a follow-up will be considered in the assessment.

Potential environmental concerns being considered in the Environmental Act Proposal include air quality, soil integrity and quality, surface water quality, wetland health, groundwater quality, aquatic and terrestrial vegetation (with special emphasis on species of conservation concern), Wildlife (with special emphasis on species of conservation concern), fish and fish habitat, and social and economic conditions associated with the proposed development.

KGS Group would like to offer the Grindstone Cottage Owners Association the opportunity to provide any comments or concerns regarding the proposed development so that they can be addressed and incorporated into the EAP. We would appreciate any comments to be made available on or before July, 2, 2011 (30 day period). Any comments received after that date would be included into the final EAP submission to Manitoba Conservation who will post the document on the Public Registry for review. Should you have any questions, comments or concerns, please do not hesitate to contact the undersigned at (204) 896-1209, via e-mail at smoffatt@ksgroup.com, or by mail.

Yours truly,



Shaun Moffatt, M.Sc.
Environmental Scientist

SO/jr



June 2, 2011

File No. 10-0293-01

Lazer Grant LLP - Hecla Oasis Resort
300-309 McDermot
Winnipeg Manitoba
R3A 1T3

ATTENTION: Mr. Collin Legall
Receiving Agency

RE: Sun Gro Horticulture Canada Ltd.
Environment Act Proposal, Peatland Development, Hay Point Bog

3rd Floor
865 Waverley Street
Winnipeg,
Manitoba
R3T 5P4
204.896.1209
Fax: 204.896.0754
www.kgsgroup.com

Dear Mr. Legall:

KGS Group is submitting this letter on behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro) as part of an Environment Act Proposal (EAP) for a peatland development of the existing Sun Gro quarry lease at Hay Point Bog. The entirety of the proposed development is within Hecla / Grindstone Provincial Park. You have been identified as a potential stakeholder and as such, KGS Group is issuing this letter to provide a brief description of the project and potential environmental concerns that will be considered during the Environment Act Proposal process.

The Environmental Assessment process will be carried out based on project information provided by Sun Gro and advice documents from Manitoba Conservation. Additional considerations will include environmental information acquired from literature and internet searches, publications by the peat industry and environmental organizations, contacts with federal and provincial government representatives, consultation with stakeholders, and site investigations which have been conducted by the project team.

The proposed peat development is in close proximity to Lake Winnipeg and is located along Grindstone Road approximately 11 km NE of the junction between Hwy 8 of Hwy 234. The bog contains one small unnamed lake and an ephemeral creek referred to as Hay Creek which drains into Lake Winnipeg. The spatial boundary of the environmental assessment will consist of the regional study area (1,659 ha) which includes the area within a 10 km radius of the quarry lease boundary. The project study area covers a 3 km radius surrounding the quarry lease boundary (Figure 1).

The scope of the project will include planning, designing, constructing, operating, maintenance and eventual decommissioning and restoration of the proposed peatland development at Hay Point Bog. The entire production lifespan of the proposed development is estimated to be 45 years. Hay Point Bog has over 45 years of peat capacity and can be harvested over this time starting once all licensing and permitting requirements have been fulfilled. As well, the project will include development of an access road, site drainage, on-site facilities and an on-

site stockpiling area. Major project activities will include providing access, clearing vegetation and surface soils, stockpiling unprocessed peat, excavating and trenching, transporting and restoring and reclaiming harvested peatland.

The assessment for the proposed development will include identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. This will consist of both direct and indirect biophysical and socio-economic effects, including cumulative environmental effects. The need for the project, alternatives, to the project and requirements for a follow-up will be considered in the assessment.

Potential environmental concerns being considered in the Environmental Act Proposal include air quality, soil integrity and quality, surface water quality, wetland health, groundwater quality, aquatic and terrestrial vegetation (with special emphasis on species of conservation concern), Wildlife (with special emphasis on species of conservation concern), fish and fish habitat, and social and economic conditions associated with the proposed development.

KGS Group would like to offer the Lazer Grant LLP - Hecla Oasis Resort the opportunity to provide any comments or concerns regarding the proposed development so that they can be addressed and incorporated into the EAP. We would appreciate any comments to be made available on or before July, 2, 2011 (30 day period). Any comments received after that date would be included into the final EAP submission to Manitoba Conservation who will post the document on the Public Registry for review. Should you have any questions, comments or concerns, please do not hesitate to contact the undersigned at (204) 896-1209, via e-mail at smoffatt@kgsgroup.com, or by mail.

Yours truly,



Shaun Moffatt, M.Sc.
Environmental Scientist

SO/jr



June 2, 2011

File No. 10-0293-01

Hecla Tourism Association
P.O Box 76
Riverton, Manitoba
R0C 2R0

RE: Sun Gro Horticulture Canada Ltd.
Environment Act Proposal, Peatland Development, Hay Point Bog

3rd Floor
865 Waverley Street
Winnipeg,
Manitoba
R3T 5P4
204.896.1209
fax: 204.896.0754
www.ksgroup.com

Dear Sir or Madam:

KGS Group is submitting this letter on behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro) as part of an Environment Act Proposal (EAP) for a peatland development of the existing Sun Gro quarry lease at Hay Point Bog. The entirety of the proposed development is within Hecla / Grindstone Provincial Park. You have been identified as a potential stakeholder and as such, KGS Group is issuing this letter to provide a brief description of the project and potential environmental concerns that will be considered during the Environment Act Proposal process.

The Environmental Assessment process will be carried out based on project information provided by Sun Gro and advice documents from Manitoba Conservation. Additional considerations will include environmental information acquired from literature and internet searches, publications by the peat industry and environmental organizations, contacts with federal and provincial government representatives, consultation with stakeholders, and site investigations which have been conducted by the project team.

The proposed peat development is in close proximity to Lake Winnipeg and is located along Grindstone Road approximately 11 km NE of the junction between Hwy 8 of Hwy 234. The bog contains one small unnamed lake and an ephemeral creek referred to as Hay Creek which drains into Lake Winnipeg. The spatial boundary of the environmental assessment will consist of the regional study area (1,659 ha) which includes the area within a 10 km radius of the quarry lease boundary. The project study area covers a 3 km radius surrounding the quarry lease boundary (Figure 1).

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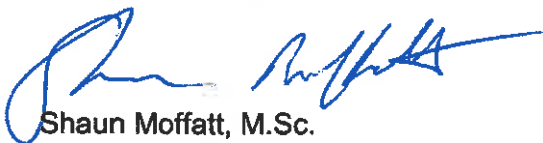
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The assessment for the proposed development will include identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. This will consist of both direct and indirect biophysical and socio-economic effects, including cumulative environmental effects. The need for the project, alternatives, to the project and requirements for a follow-up will be considered in the assessment.

Potential environmental concerns being considered in the Environmental Act Proposal include air quality, soil integrity and quality, surface water quality, wetland health, groundwater quality, aquatic and terrestrial vegetation (with special emphasis on species of conservation concern), Wildlife (with special emphasis on species of conservation concern), fish and fish habitat, and social and economic conditions associated with the proposed development.

KGS Group would like to offer the Hecla Tourism Association the opportunity to provide any comments or concerns regarding the proposed development so that they can be addressed and incorporated into the EAP. We would appreciate any comments to be made available on or before July, 2, 2011 (30 day period). Any comments received after that date would be included into the final EAP submission to Manitoba Conservation who will post the document on the Public Registry for review. Should you have any questions, comments or concerns, please do not hesitate to contact the undersigned at (204) 896-1209, via e-mail at smoffatt@ksgsgroup.com, or by mail.

Yours truly,



Shaun Moffatt, M.Sc.
Environmental Scientist

SO/jr

June 2, 2011

File No. 10-0293-01



3rd Floor
865 Waverley Street
Winnipeg,
Manitoba
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204.896.1209
fax: 204.896.0754
www.ksgsgroup.com

Manitoba Trappers Association
P.O. Box 598
Lac du Bonnet, Manitoba
R0E 1A0

ATTENTION: Ms. Cherry White

RE: Sun Gro Horticulture Canada Ltd.
Environment Act Proposal, Peatland Development, Hay Point Bog

Dear Ms. White:

KGS Group is submitting this letter on behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro) as part of an Environment Act Proposal (EAP) for a peatland development of the existing Sun Gro quarry lease at Hay Point Bog. The entirety of the proposed development is within Hecla / Grindstone Provincial Park. You have been identified as a potential stakeholder and as such, KGS Group is issuing this letter to provide a brief description of the project and potential environmental concerns that will be considered during the Environment Act Proposal process.

The Environmental Assessment process will be carried out based on project information provided by Sun Gro and advice documents from Manitoba Conservation. Additional considerations will include environmental information acquired from literature and internet searches, publications by the peat industry and environmental organizations, contacts with federal and provincial government representatives, consultation with stakeholders, and site investigations which have been conducted by the project team.

The proposed peat development is in close proximity to Lake Winnipeg and is located along Grindstone Road approximately 11 km NE of the junction between Hwy 8 of Hwy 234. The bog contains one small unnamed lake and an ephemeral creek referred to as Hay Creek which drains into Lake Winnipeg. The spatial boundary of the environmental assessment will consist of the regional study area (1,659 ha) which includes the area within a 10 km radius of the quarry lease boundary. The project study area covers a 3 km radius surrounding the quarry lease boundary (Figure 1).

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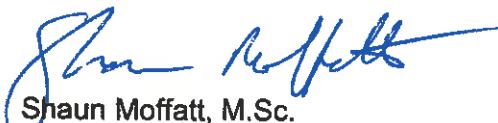
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The assessment for the proposed development will include identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. This will consist of both direct and indirect biophysical and socio-economic effects, including cumulative environmental effects. The need for the project, alternatives, to the project and requirements for a follow-up will be considered in the assessment.

Potential environmental concerns being considered in the Environmental Act Proposal include air quality, soil integrity and quality, surface water quality, wetland health, groundwater quality, aquatic and terrestrial vegetation (with special emphasis on species of conservation concern), Wildlife (with special emphasis on species of conservation concern), fish and fish habitat, and social and economic conditions associated with the proposed development.

KGS Group would like to offer the Manitoba Trappers Association the opportunity to provide any comments or concerns regarding the proposed development so that they can be addressed and incorporated into the EAP. We would appreciate any comments to be made available on or before July, 2, 2011 (30 day period). Any comments received after that date would be included into the final EAP submission to Manitoba Conservation who will post the document on the Public Registry for review. Should you have any questions, comments or concerns, please do not hesitate to contact the undersigned at (204) 896-1209, via e-mail at smoffatt@ksgsgroup.com, or by mail.

Yours truly,



Shaun Moffatt, M.Sc.
Environmental Scientist

SO/jr



June 2, 2011

File No. 10-0293-01

R.M. of Bifrost
P.O. Box 70
329 River Road
Arborg, Manitoba
R0C 0A0

ATTENTION: Mr. Reeve Harold Foster

RE: Sun Gro Horticulture Canada Ltd.
Environment Act Proposal, Peatland Development, Hay Point Bog

3rd Floor
865 Waverley Street
Winnipeg,
Manitoba
R3T 5P4
204.896.1209
fax: 204.896.0754
www.ksgroup.com

Dear Mr. Foster:

KGS Group is submitting this letter on behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro) as part of an Environment Act Proposal (EAP) for a peatland development of the existing Sun Gro quarry lease at Hay Point Bog. The entirety of the proposed development is within Hecla / Grindstone Provincial Park. You have been identified as a potential stakeholder and as such, KGS Group is issuing this letter to provide a brief description of the project and potential environmental concerns that will be considered during the Environment Act Proposal process.

The Environmental Assessment process will be carried out based on project information provided by Sun Gro and advice documents from Manitoba Conservation. Additional considerations will include environmental information acquired from literature and internet searches, publications by the peat industry and environmental organizations, contacts with federal and provincial government representatives, consultation with stakeholders, and site investigations which have been conducted by the project team.

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site stockpiling area. Major project activities will include providing access, clearing vegetation and surface soils, stockpiling unprocessed peat, excavating and trenching, transporting and restoring and reclaiming harvested peatland.

The assessment for the proposed development will include identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. This will consist of both direct and indirect biophysical and socio-economic effects, including cumulative environmental effects. The need for the project, alternatives, to the project and requirements for a follow-up will be considered in the assessment.

Potential environmental concerns being considered in the Environmental Act Proposal include air quality, soil integrity and quality, surface water quality, wetland health, groundwater quality, aquatic and terrestrial vegetation (with special emphasis on species of conservation concern), Wildlife (with special emphasis on species of conservation concern), fish and fish habitat, and social and economic conditions associated with the proposed development.

KGS Group would like to offer the R.M. of Bifrost the opportunity to provide any comments or concerns regarding the proposed development so that they can be addressed and incorporated into the EAP. We would appreciate any comments to be made available on or before July, 2, 2011 (30 day period). Any comments received after that date would be included into the final EAP submission to Manitoba Conservation who will post the document on the Public Registry for review. Should you have any questions, comments or concerns, please do not hesitate to contact the undersigned at (204) 896-1209, via e-mail at smoffatt@kgsgroup.com, or by mail.

Yours truly,



Shaun Moffatt, M.Sc.
Environmental Scientist

SO/jr

June 2, 2011

File No. 10-0293-01



Peguis First Nation
P.O. Box 10
Peguis, Manitoba
R0C 3J0

ATTENTION: Chief Glenn Hudson and Council

RE: Sun Gro Horticulture Canada Ltd.
Environment Act Proposal, Peatland Development, Hay Point Bog

3rd Floor
865 Waverley Street
Winnipeg,
Manitoba
R3T 5P4
204.896.1209
fax: 204.896.0754
www.ksgsgroup.com

Dear Chief Hudson:

KGS Group is submitting this letter on behalf of Sun Gro Horticulture Canada Ltd. (Sun Gro) as part of an Environment Act Proposal (EAP) for a peatland development of the existing Sun Gro quarry lease at Hay Point Bog. The entirety of the proposed development is within Hecla / Grindstone Provincial Park. However, the quarry leases extend to within 1.6 km east of the boundary between the park and the Peguis First Nation Community Interest Zone. As such, KGS Group is issuing this letter to provide a brief description of the project and potential environmental concerns that will be considered during the Environment Act Proposal process.

The Environmental Assessment process will be carried out based on project information provided by Sun Gro and advice documents from Manitoba Conservation. Additional considerations will include environmental information acquired from literature and internet searches, publications by the peat industry and environmental organizations, contacts with federal and provincial government representatives, consultation with stakeholders, and site investigations which have been conducted by the project team.

The proposed peat development is in close proximity to Lake Winnipeg and is located along Grindstone Road approximately 11 km NE of the junction between Hwy 8 of Hwy 234. The bog contains one small unnamed lake and an ephemeral creek referred to as Hay Creek which drains into Lake Winnipeg. The spatial boundary of the environmental assessment will consist of the regional study area (1,659 ha) which includes the area within a 10 km radius of the quarry lease boundary. The project study area covers a 3 km radius surrounding the quarry lease boundary (Figure 1).

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an on-site stockpiling area. Major project activities will include providing access, clearing vegetation and surface soils, stockpiling unprocessed peat, excavating and trenching, transporting and restoring and reclaiming harvested peatland.

The assessment for the proposed development will include identification, assessment and mitigation of adverse environmental effects of the project, and evaluation of the significance of residual environmental effects. This will consist of both direct and indirect biophysical and socio-economic effects, including cumulative environmental effects. The need for the project, alternatives, to the project and requirements for a follow-up will be considered in the assessment.

Potential environmental concerns being considered in the Environmental Act Proposal include air quality, soil integrity and quality, surface water quality, wetland health, groundwater quality, aquatic and terrestrial vegetation (with special emphasis on species of conservation concern), Wildlife (with special emphasis on species of conservation concern), fish and fish habitat, and social and economic conditions associated with the proposed development.

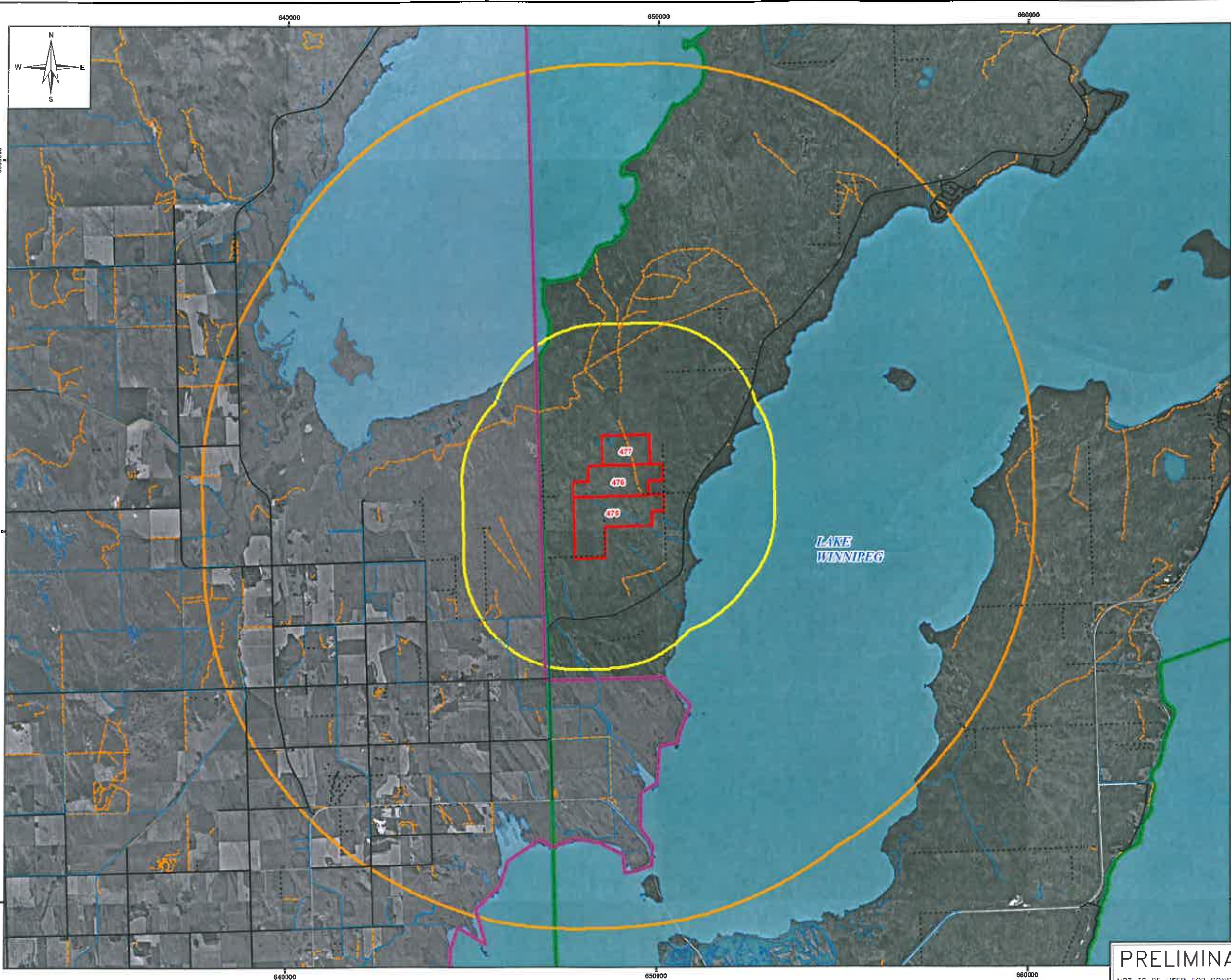
KGS Group would like to offer the Peguis First Nation the opportunity to provide any comments or concerns regarding the proposed development so that they can be addressed and incorporated into the EAP. We would appreciate any comments to be made available on or before July, 2, 2011 (30 day period). Any comments received after that date would be included into the final EAP submission to Manitoba Conservation who will post the document on the Public Registry for review. Should you have any questions, comments or concerns, please do not hesitate to contact the undersigned at (204) 896-1209, via e-mail at smoffatt@ksgsgroup.com, or by mail.

Yours truly,



Shaun Moffatt, M.Sc.
Environmental Scientist

SO/jr



LEGEND:

- River
- Road
- Trail
- Outline
- Pequis FN Community Interest Zone
- Project Study Area
- Regional Study Area
- Lake
- Quarry Lease
- Park Boundary

NOTES:

1. ALL UNITS ARE METRIC AND IN METRES UNLESS OTHERWISE SPECIFIED.
TRANSVERSE MERCATOR PROJECTION, NAD 1983, ZONE 14
ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (MSL)

DRAFT



SCALE: 1:100,000 METRIC 11"x17"

A	11/05/31	ISSUED FOR INFORMATION	BAT
NO.	YY MM DD	DESCRIPTION	By
REVISIONS / ISSUE			

KGS GROUP CONSULTING ENGINEERS
SUN GRO HORTICULTURE
 HAY POINT PEAT BOG

HAY POINT PROJECT STUDY AREA

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

APPENDIX H
INTERACTION MATRIX

