Keeyask Generation Project

Vegetation Rehabilitation Plan

KEEYASK

Hydropower Limited Partnership

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KEEYASK GENERATION PROJECT

VEGETATION REHABILITATION PLAN

Prepared by

Keeyask Hydropower Limited Partnership

WINNIPEG, MANITOBA

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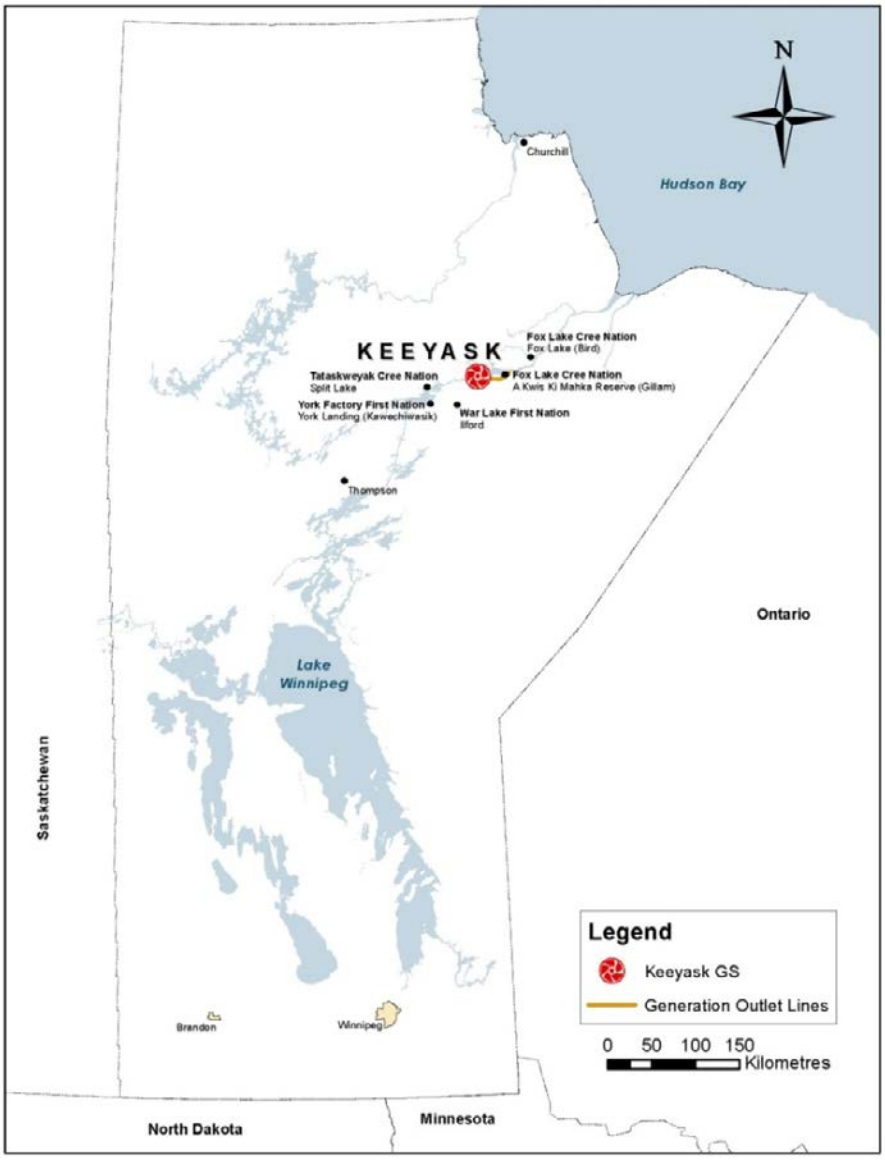
PREFACE

KEEYASK ENVIRONMENTAL PROTECTION PROGRAM

An Environmental Protection Program (the Program) has been developed to mitigate, manage and monitor potential environmental effects described in the *Keeyask Generation Project: Response to EIS Guidelines* during the construction and operation phases of the Keeyask Generation Project (the Project) shown on Map 1. The Program includes a collection of plans grouped in the following categories: Environmental Protection Plans, Environmental Management Plans and Environmental Monitoring Plans.



Map 1: Location of Keeyask Generation Project

Figure 1 lists all of the plans included in the Program. It also demonstrates how the Program will be managed. The Keeyask Hydropower Limited Partnership (the Partnership) has delegated authority to Manitoba Hydro to manage construction and operation of the Project including implementation of the Program. The organizational structure of the Partnership for this aspect of the Project includes a Monitoring Advisory Committee (MAC), which includes participants from each of the Keeyask Cree Nations (KCNs) and Manitoba Hydro. Manitoba Hydro will be guided on the implementation of the Program by the MAC, the Partnership Board of Directors and ongoing discussion with Regulators.

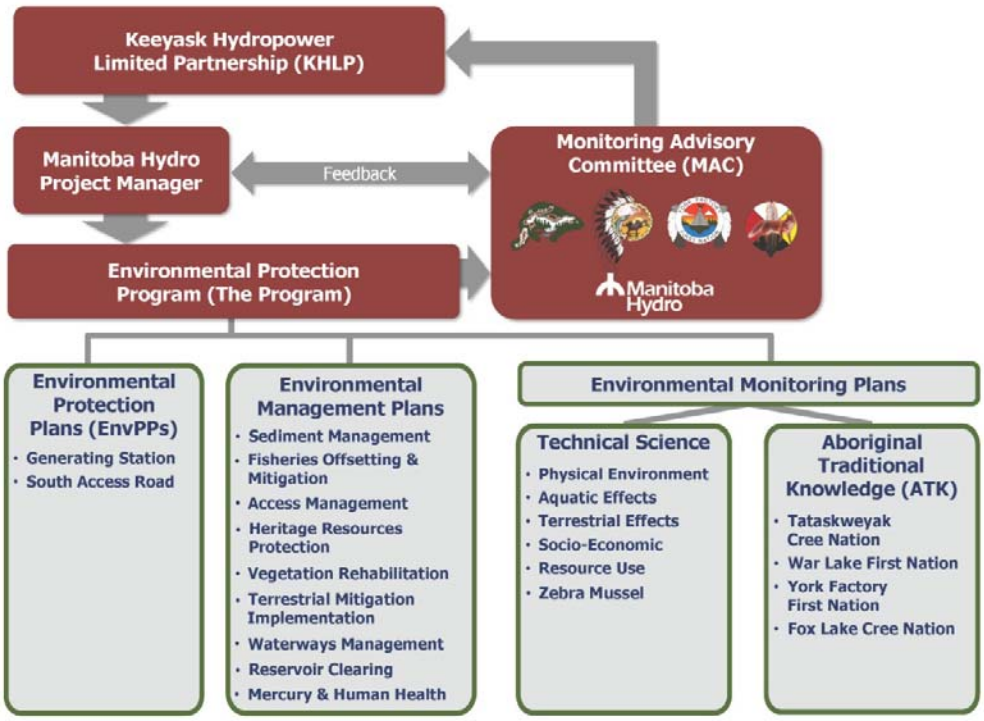


Figure 1: Environmental Protection Program

The Environmental Protection Plans (EnvPPs) provide detailed, site-specific environmental protection measures to be implemented by the contractors and construction staff to minimize environmental effects from construction of the generating station and south access road. They are designed for use as reference documents providing the best management practices to meet or exceed regulatory requirements. EnvPPs are organized by construction activity, highlighting measures to reduce the impact of a specific work activity (e.g., tree clearing or material placement in water). Contractors' compliance with the EnvPPs is a contractual obligation. Under Manitoba Hydro's construction site management, a Site Environmental Lead will be responsible for monitoring compliance and determining when corrective actions are required.

The Environmental Management Plans focus on minimizing effects on specific environmental parameters. They outline specific actions that must be taken during construction and in some cases into the operational phase to mitigate Project effects. The management plans include monitoring to determine success of the actions taken and to determine other actions that need to be undertaken (adaptive management). Implementation of these plans will involve Manitoba Hydro's staff, the KCNs, specialized consultants and contractors under the direction of the Project Manager.

The Environmental Monitoring Plans are designed to measure the actual effects of the Project, test predictions or identify unanticipated effects. During the course of the environmental assessment, numerous requirements for monitoring were identified. There will be both technical science monitoring and Aboriginal Traditional Knowledge (ATK) monitoring undertaken. The technical science monitoring will be conducted by Manitoba Hydro and specialized consultants contracted by Manitoba Hydro, who will in turn hire members of the KCNs to work with them to fulfil the monitoring activities. Manitoba Hydro will also have contracts with each of the KCNs to undertake ATK monitoring of the project.

The activities that occur and the results generated from the Environmental Protection Program will be discussed at MAC meetings. The MAC is an advisory committee to the Partnership Board of Directors and will review outcomes of the programs and, if appropriate provide advice and recommendations to the Partnership on additional monitoring or alternative mitigation measures that may be required. The MAC will provide a forum for collaboration among all partners. On behalf of the Partnership, the MAC will also ensure that the outcomes of the Environmental Protection Program are communicated more broadly on an annual basis to Members of the KCNs, regulators and the general public.

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1.0 INTRODUCTION

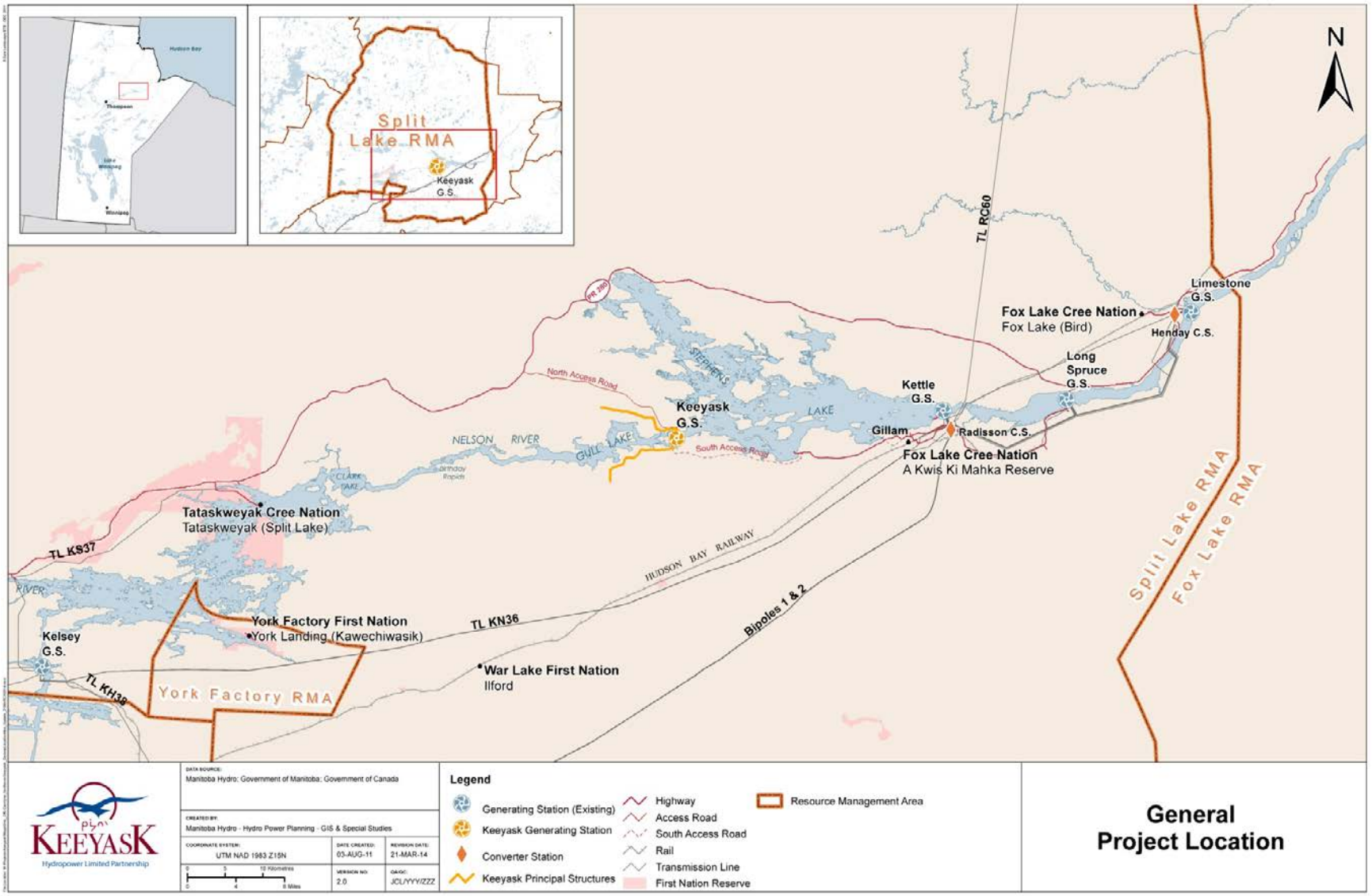
This document describes the Vegetation Rehabilitation Plan for the Keeyask Infrastructure Project (KIP) and the Keeyask Generation Project (KGP). Both projects are located at Gull Rapids on the lower Nelson River in northern Manitoba, immediately upstream of Stephens Lake. They are entirely within the Split Lake Resource Management Area. KIP and KGP are approximately 725 kilometres (km) northwest of Winnipeg, 35 km upstream of the existing Kettle Generating Station, where Gull Lake flows into Stephens Lake, 60 km east of the community of Spilt Lake, 180 km east-northeast of Thompson and 30 km west of Gillam (Map 2).

The Keeyask Infrastructure Project (KIP) was constructed between 2012 and July 2014. It consisted of a start-up camp, a 25-km all weather access road called the North Access Road (NAR), and the Phase 1 of the main camp on the north side of Gull Rapids. It also included use of a number of aggregate quarries to obtain the necessary materials required for construction.

The Keeyask Generation Project (KGP) is a 695-megawatt (MW) hydroelectric generating station and associated infrastructure. Examples of the latter include dykes, cofferdams, quarries, excavated material placement areas, Phase 2 of the main camp, numerous work areas, access trails and an approximately 35 km all-weather access road, called the South Access Road (SAR). The SAR will run from the Keeyask Generating Station to the town of Gillam, Manitoba.

When the KGP is complete, the combination of the north and south access roads will replace the section of PR280 from the Keeyask turn-off to the town of Gillam.

This Vegetation Rehabilitation Plan (VRP) encompasses revegetation activities related to both KIP and KGP, hereafter referred to as “the Projects”. Areas that were required for construction but are not required for operation of the generating station or long-term maintenance of the associated infrastructure, such as the dams and dykes, as well as the NAR and the SAR, will be rehabilitated based on the framework outlined in this plan.



Map 2: Keeyask Generation Project Location

2.0 GOALS, OBJECTIVES AND COMMITMENTS

2.1 GOALS

The Keeyask Vegetation Rehabilitation Plan provides the framework to achieve the following key goals:

- Restore native habitat types that were lost or disturbed during construction;
- Revegetate highly altered sites to a native habitat type that can be successfully established given the post-construction site conditions;
- Maintain the criteria of less than 10% loss of priority habitat types in the Keeyask area. For example, areas of priority habitat types that are disturbed for the Projects that have cumulative effects approaching 10% loss will be rehabilitated to maintain less than 10% loss;
- Increase the abundance of species that have special social or economic importance for the partner First Nations to the extent that is ecologically reasonable; and
- Demonstrate respect for Askiy – by replacing priority habitats, successful rehabilitation will help to restore harmony and balance with Mother Earth in the Keeyask area.

2.2 OBJECTIVES

The objectives of this Vegetation Rehabilitation Plan are to:

- Describe the areas affected by construction of the Projects (with the caveat that the full extent of the disturbance will not be known until the Project is fully constructed);
- Describe the approach for determining rehabilitation treatments for specific, disturbed areas;
- Describe the rehabilitation treatment options for regenerating vegetation in disturbed areas, including methods for site preparation that will contribute to revegetation success;
- Describe how the rehabilitation will be implemented; and
- Describe how the rehabilitated areas will be monitored, the process for how improvements, if required, will be made, and how and to whom the results will be reported.

2.3 REHABILITATION COMMITMENTS

Through the planning and licensing phases of the Projects, the Keeyask Hydropower Limited Partnership (KHLP) made commitments regarding rehabilitation of the construction site. The *Environment Act* licences (EAL) for the Projects also stipulate rehabilitation requirements.

Rehabilitation will be planned and implemented to fulfill the commitments and EAL requirements. The KHLP made the following commitments related to rehabilitation with respect to the Projects:

- Reclamation (decommissioning & site preparation) measures and vegetation species selection will be undertaken as determined by regulatory requirements, site conditions and management objectives. Consideration will be given to feasibility, practicality, effectiveness and management requirements;
- Rehabilitation measures will give preference to rehabilitating the most affected priority habitats using approaches that "go with nature";
- Construction areas that are not required for operation will be decommissioned and rehabilitated, where practicable;
- Revegetation efforts will commence in an area when it is confirmed that it is no longer needed for construction;
- As soon as is practicable, permanent access road slopes and disturbed areas will be seeded to produce low vegetation ground cover;
- Except for existing resource-use trails, Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100m of the Project footprint will be revegetated to minimize the risk of invasive plants, accidental fire and other access-related effects;
- Reclamation and re-vegetation programs will be initiated for the vacated sites and borrow sites to control/prevent erosion, re-establish wildlife habitat, and create buffer zones;
- Tree and tall shrub propagules used for rehabilitation will be of local provenance. Most other propagules will also likely be of local provenance since the majority will come from stockpiled materials that are later spread;
- Where seeding is used as a rehabilitation or erosion control measure, the seed mixture will only contain native species and/or non-invasive introduced plant species;
- Access road slopes and disturbed areas will be rehabilitated with native plants with low quality food value for caribou, black bear, moose, and small mammals, where practicable, to minimize attraction and the risk of collisions and harvest opportunities;
- Temporarily cleared areas and excavated materials placement areas will be rehabilitated to native habitat types, where feasible, to improve caribou and small mammal habitat;
- With consideration of other planned rehabilitation measures (e.g. revegetation efforts within temporary Project footprint components), some areas of open and flat habitat will be retained at locations deemed to be suitable nesting habitat for common nighthawks; and
- Temporary Project footprints will be rehabilitated to provide enhanced prey availability to raptors inhabiting the Keeyask Area.

The Province of Manitoba issued *Environment Act* Licence No. 2592R for KIP and No. 3107 for the Keeyask Generation Project.

Clause 28 of the KIP licence pertains to revegetation and states the Licencee shall:

"a) immediately following construction, revegetate erosion prone areas with a mixture of native plant species and/or where necessary for erosion control purposes, non-invasive grasses and herb mixtures; and
b) not exceed recommended amounts of nitrogen and phosphorous when fertilizing restored areas."

Clauses 10, 15 and 47 of the Keeyask Generation Project Licence pertain to rehabilitation and state:

Clause No. 10:

"The Licencee shall submit an access route inventory and decommissioning and rehabilitation plan for all access routes created or improved in association with the Development";

Clause No. 15:

"Reclamation of individual borrow pits shall occur as they are no longer in use for the Development, unless otherwise approved by the Director"; and

Clause No. 47:

"The Licencee shall revegetate soil in areas of the Development exposed by construction with a mixture of native or introduced grasses or legumes. Native species shall be used to revegetate areas where native species existed prior to construction. Exposed areas shall be revegetated as quickly as possible following construction to prevent soil erosion and the establishment of noxious weeds."

3.0 TERRESTRIAL HABITAT PRE AND POST CONSTRUCTION

3.1 PRE-CONSTRUCTION ENVIRONMENT

During the environmental assessment studies to prepare the *Keeyask Generation Project: Response to EIS Guidelines* (EIS), the terrestrial habitat types in the area surrounding Keeyask were analysed to determine what was present prior to construction and to gain an understanding of what would be affected by the Project. The term habitat type refers to the forest-stand species composition, understory species, ground cover and soil type, for a specific location.

A variety of habitat types are found in the Keeyask area and the two most common habitat types found cover 52% of the land (Map 3). The most common habitat type is black spruce (*Picea mariana*) on thin peatland, which comprises approximately 32% of the area. The second most common habitat type is black spruce on shallow peatland, which covers 20% of the area (see Map 3).

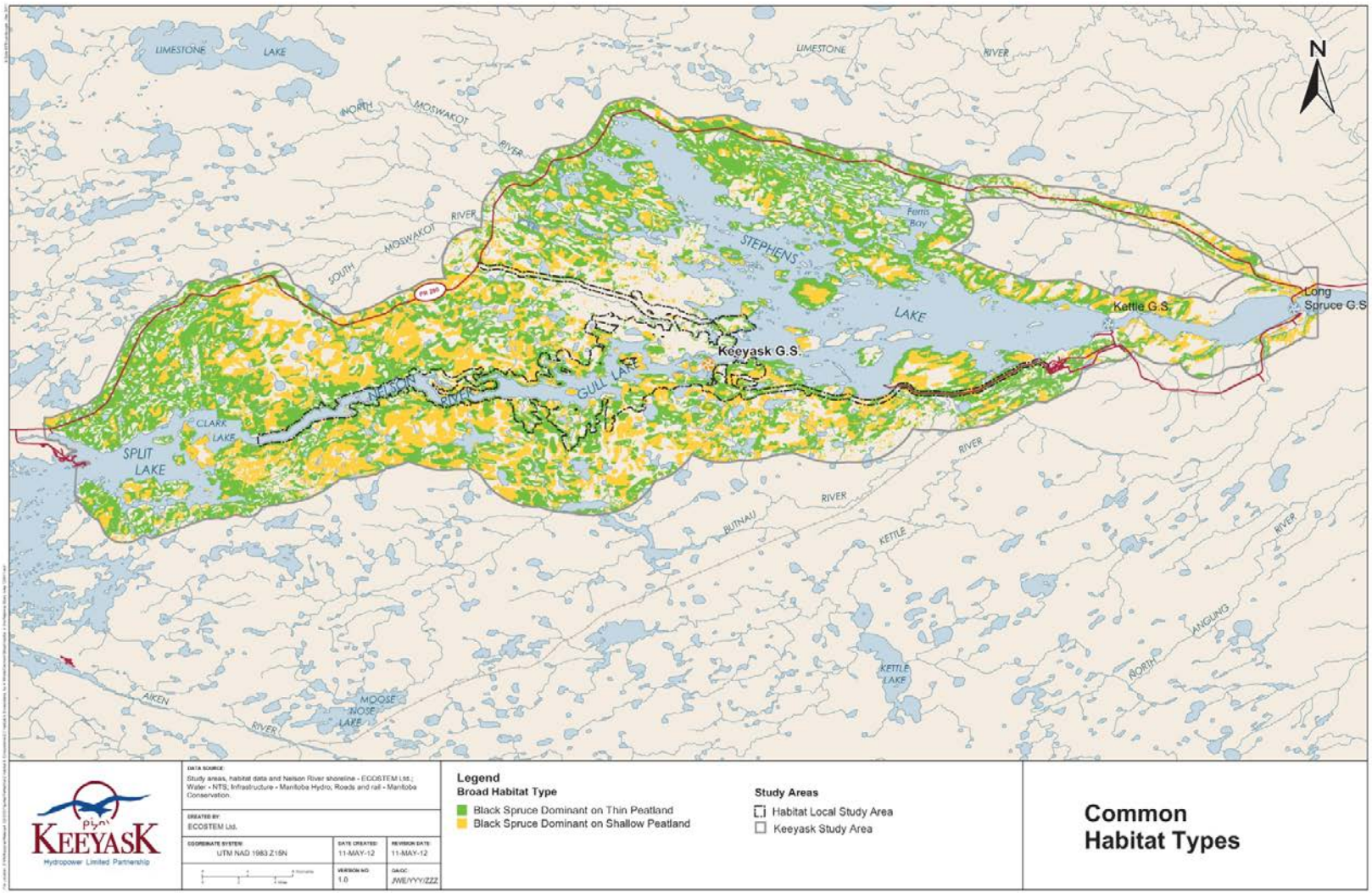
The “black spruce on thin peatland” habitat type in the Keeyask area (shown on Map 3) typically has a surface organic layer that is 23 cm thick on average, but the thickness is highly variable. The organic layer is generally comprised of peat mosses (*Sphagnum* spp.) and feathermosses. The vegetation is characterized by a black spruce dominated overstorey in a sparsely treed woodland stand structure that ranges from 7 m – 12 m in height.

The “black spruce forest on shallow peatland” habitat type (shown on Map 3), typically occurs on flat to gently sloping areas with very moist and poorly drained peatlands, including blanket veneer bogs and peat plateau bogs. The surface organic layer thickness is highly variable, but is 71 cm on average. The vegetation composition is dominantly black spruce in both the canopy composition and understory tree species.

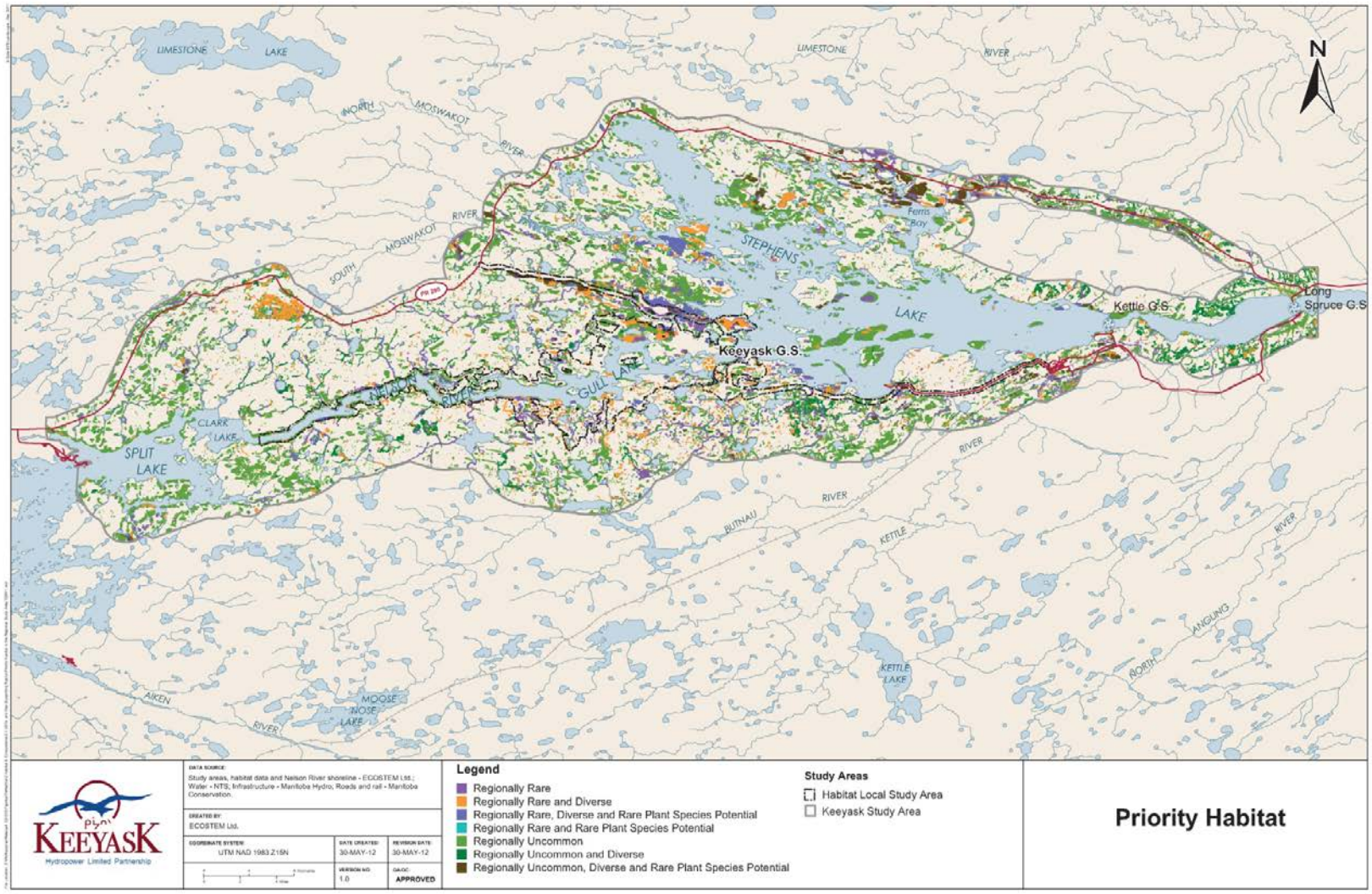
Aside from the two, main habitat types described, there are 43 priority habitat types that are found in the Keeyask area that, when combined, cover approximately 30% of the land area (Map 4). Priority habitat types are particularly important for one or more ecological reason(s), including being regionally rare or uncommon, being highly diverse, being highly sensitive to disturbance, and having a high potential to support rare plants species. Habitat types may also be considered priority if they are highly valued by people.

In 2013, there was a widespread forest fire in the Keeyask area. Black spruce are well adapted to natural fire disturbance, so black spruce habitat types destroyed by the fire will regenerate over time into the same or similar habitat types. As such, the percentage of most habitat types in the Keeyask area post-fire regeneration will be similar to the habitat types presented above.

The areas designated for use during the Projects were planned to avoid priority habitat, where feasible. Mineral material is required for construction, so priority habitat types that occur on mineral sites will be disturbed, particularly jack pine and black spruce on mineral soil habitat types. Other priority habitat types may be disturbed as well and this will be evaluated as described in Section 4.0. Overall, the common habitat types (black spruce on thin and shallow peatland) are those that will be most affected by the Projects.



Map 3: Common Habitat Types in the Keeyask Area



Map 4: Priority Habitat in the Keeyask Area

3.2 TERRESTRIAL HABITAT AFFECTED BY CONSTRUCTION

The KIP is now complete and the total terrestrial area that requires rehabilitation is known. Table 1 shows the total terrestrial footprint area that was anticipated to be required to construct the KIP was 1025 ha (Table 1). The total area that was actually disturbed during KIP is 546 ha. The area that must be rehabilitated is 491 ha when those areas that will be permanently inundated after flooding or covered by the road are removed.

Table 1: KIP Areas to be Rehabilitated[1]

	Predicted Terrestrial Area Required For KIP (ha)	Actual Area Used for KIP	Area Requiring Rehabilitation (ha)
KIP Borrow Sources	389	152	152
Camp and Work Areas (including Start-up Camp & Main Camp)	401	208	181
NAR (road, slopes, right of way)	235	186	158
TOTAL	**1025**	**546**	**491**

Out of the 546 ha disturbed for KIP shown in Table 1, approximately 15% were jack pine habitats and 30% were black spruce habitats. The remaining areas were locations where there was young regeneration (primarily black spruce) resulting from forest fires that occurred between 1996 to 2002. The young regeneration areas comprised approximately 53% of the 546 ha that was disturbed.

Calculating the terrestrial area that will be rehabilitated before the KGP is complete is not possible, as the extent of the areas to be disturbed is uncertain.

A footprint of greater than 13,500 ha is licensed for construction of the KGP and much of it will be inundated with water in the reservoir and, therefore, will not require rehabilitation. It is estimated that an additional 1000 ha will be covered with permanent structures and/or required to operate the generating station and NAR/SAR (which will become PR 280), which will also not require rehabilitation.

[1] Areas presented are rounded off to whole numbers; therefore the areas rehabilitated may vary slightly as a result.

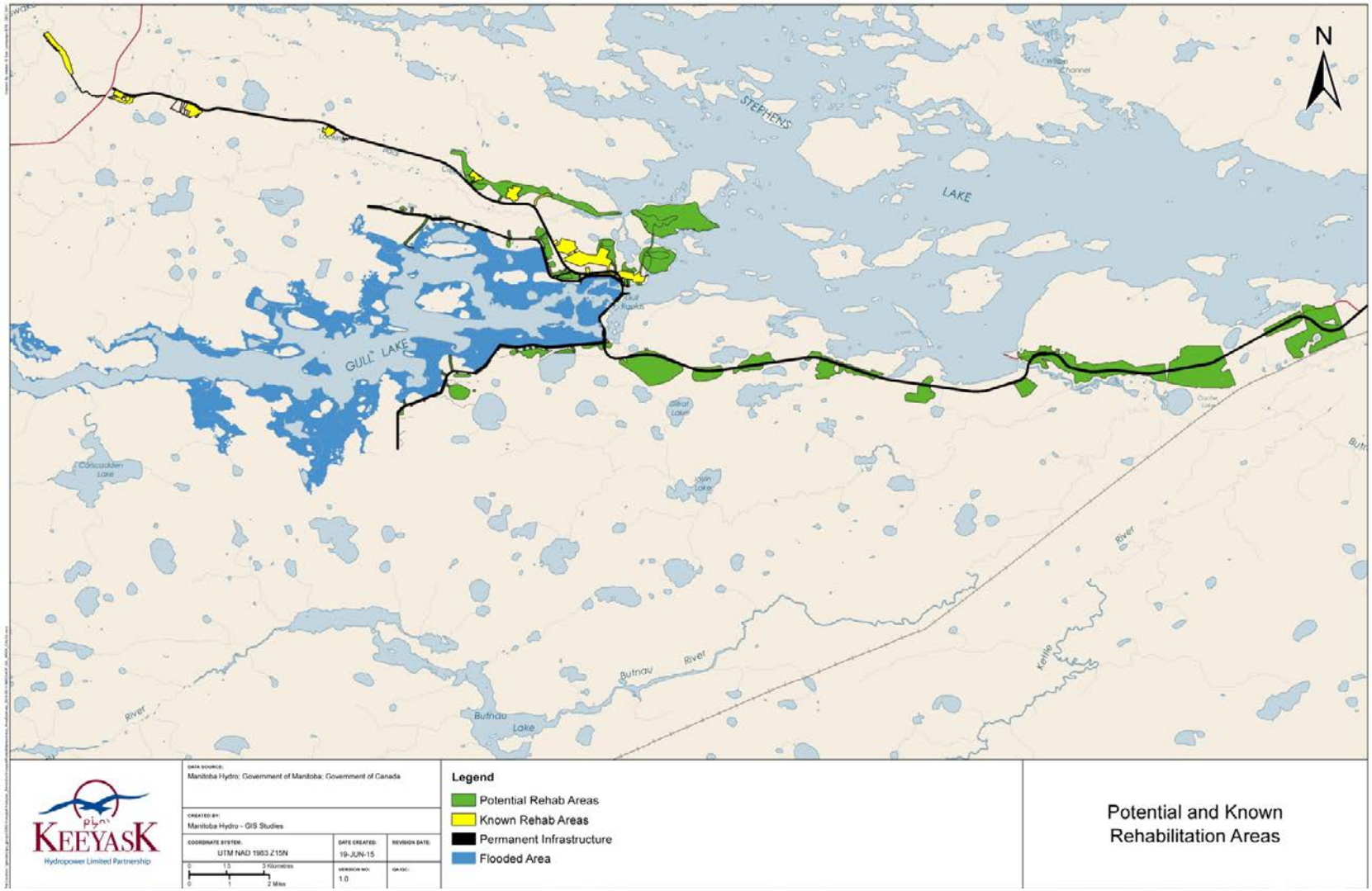
Table 2 shows the terrestrial areas that are licensed for use that could potentially be used during construction and require rehabilitation at the end of the KGP. Table 2 also provides a high-level prediction of the areas that will require rehabilitation based on the percentage of the allotted areas disturbed during KIP as well as engineering estimates made during the project planning phase. These numbers are provided as a rough estimate and will change in the future.

Table 2: Estimated Keeyask Areas to be Rehabilitated

	Licensed Terrestrial Area that could Require Rehabilitation (ha)	Percent Usage (%)	Predicted Rehabilitation Area (ha)
G.S. Borrow Sources	942	30	283
SAR Borrow Sources	1148	45	517
SAR Slopes & Disturbed Areas	311	100	311
G.S. Roads & Road Corridors	108	100	108
Excavated Material Placement Areas	207	100	207
TOTAL	**2716**		**1426**

Of the 2716 ha that may be disturbed and require rehabilitation, it is estimated that 75% of the area is comprised of black spruce. The remaining 25% of the land is comprised of young black spruce regeneration (11%), jack pine (4%) tamarack (3 %), and a combination of low vegetation and shrublands (7%). Areas disturbed to access granular and impervious material (borrow sources) will likely account for the largest amount of affected jack pine and black spruce forest, respectively.

Map 5 illustrates the areas that are already known or anticipated to require rehabilitation after the Projects are complete. It is understood the “potential rehabilitation areas” shown on Map 5 may change as the KGP progresses.



Map 5 : Potential and Known Rehabilitation Areas

4.0 REHABILITATION APPROACH

Rehabilitation of the Projects will begin during the construction phase of the Keeyask Generation Project on sites that are no longer needed for construction. Starting early is beneficial to take advantage of the organic material that was stripped and stockpiled, as reducing the amount of time organic material is stockpiled increases the likelihood that seed stock within organic stockpiles is viable and will germinate. Also, revegetating a site with native species shortly after it is disturbed decreases the potential for invasive species to establish and proliferate.

Best efforts will be made to re-establish the habitat types that existed prior to construction (see Section 3.1). If priority habitat types are affected, rehabilitation is intended to maintain cumulative effects to below 10% loss of the historical area of each priority habitat type in the Keeyask area. Where post-construction site conditions are dramatically altered, native habitat types that are appropriate for the conditions will be established, giving preference to the most affected priority habitat types. Plant species that are important to the KCNs will be incorporated into habitat restoration, where feasible. Permanent Project features that are left with bare soil, such as areas where sight lines are required for dam safety purposes, will also be revegetated with plant species that are appropriate for the site. A rehabilitation "target" will be determined for areas based on the above criteria. For the majority of the areas, the aim will be to restore forest habitat types, which will take decades to achieve.

The condition of areas such as temporary construction camps, temporary roads and borrow areas that are no longer needed, will be assessed through site surveys. Site-specific soil preparations and revegetation treatments[2] will be developed for each site. Rehabilitation treatments at a given site will be prescribed[3] based on the pre-construction environment and the post-construction use, as well as thorough site surveys and analysis to determine what is most suitable for the post-construction site conditions. Site surveys will be a key step in determining the most effective options for maximizing rehabilitation success by analyzing the surface material type, soil moisture regime, and the degree of compaction. Assessing the slope of the landscape, and proximity to principal infrastructure such as dams and dykes, will also determine what treatment(s) will be used. Site surveys will be undertaken at sites as they become available for rehabilitation.

[2] For the purpose of this document, the term "treatment" refers to a method or activity to rehabilitate disturbed sites, such as planting trees or soil preparation.

[3] A rehabilitation prescription refers to single, or multiple, treatments to be applied to a specific site based on the conditions of that site. Therefore, a prescription is site-specific and will determine how the rehabilitation goal will be achieved, whereas a treatment is one of several options that could be prescribed.

Following the site-survey, additional information will be collected in relation to a specific area requiring rehabilitation and may include reviewing aerial photography, digital ortho imagery (DOI) and geographic information systems (GIS). These tools will be used in conjunction with site survey data, site-use (construction) data, and Aboriginal Traditional Knowledge (ATK), which will be obtained through a consultation process, to determine the appropriate rehabilitation prescription for a specific site.

Once the above information is obtained, the specifics on how the site needs to be prepared (grading, sloping, incorporating stockpiled organic material, etc), the vegetation to be planted (trees, grass, etc.) and the specifics for how it will be planted (seed application rates, tree spacing) can be finalized. The information will be included in spatially accurate polygons to assist with plan execution, including determining seed volumes, seed collection, scheduling site preparation work, scheduling tree planting, ordering trees and shrubs for planting for a given area, etc.

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5.0 REHABILITATION TREATMENTS

This section describes rehabilitation treatments that will potentially be used at the Keeyask site. It is based on the current understanding of the landscape, anticipated impacts and post-construction site conditions.

5.1 SITE PREPARATION

Site preparation, as required, will be carried out to promote revegetation and will commence once a given site has been fully decommissioned by the construction contractor.

5.1.1 TYPICAL CONSTRUCTION WORK AREAS

Typical construction work areas include those that were completely stripped of organic material and used for various construction activities such as the camps, borrow areas, parking lots, access roads, staging areas, etc.

Depending on site conditions, site preparation is these areas may consist of scarification, decompaction, grading and/or contouring, spreading previously stockpiled organic material over the site and incorporating it into the soil. Only the organic material that was stockpiled during site clearing and stripping activities will be used for site rehabilitation; no additional material (soil, etc.) will be brought to the Keeyask site.

Site preparation will occur after each site has been decommissioned, in the spring or fall prior to the scheduled revegetation treatment. The latter will likely occur in June of any given year.

5.1.1.1 AREAS WITH LOW COMPACTION – VEGETATION AND ORGANICS REMOVED

Areas of low compaction include access trails where placing and packing of granular material was not required, and other areas where traffic was low. In these areas, stockpiled organic material (e.g., topsoil and peat) will be spread over the surface to a depth of approximately 10 cm. The material will be mixed into the top 20 cm of the exposed surface material on site using mechanical methods such as harrowing or discing. Following mixing, an additional 10 cm of organic material, as well as any available, stockpiled tree debris, will be spread over the site. It should be noted that the extent of spreading and layering organic material over a site will be dependent on the amount of material available at the time of rehabilitating a particular site.

5.1.1.2 AREAS WITH HIGH COMPACTION - VEGETATION AND ORGANICS REMOVED

Sites that are highly compacted include areas where granular material has been packed, such as haul roads, the camp and work areas. The compressed mineral material at these sites will be decompacted to at least 50 cm using a sub-soiler with tines that are spaced to a maximum of 1m apart. The sub-soiler will be dragged perpendicular to all slopes (generally follow elevation contours), where feasible, to reduce the potential for erosion caused by vertical gullies running downslope.

Stockpiled organic material will be spread over the area to a depth of approximately 10 cm. The organic material will be mixed into the top 20 cm of the exposed surface material on site using mechanical methods, such as harrowing or discing. Following mixing, an additional 10 cm of organic material, as well as any available, stockpiled tree debris, will be spread over the site. It should be noted that the extent of spreading and layering organic material over a site will be dependent on the amount of material available at the time of rehabilitating a particular site.

5.1.2 UNSTABLE SLOPES - VEGETATION AND ORGANICS REMOVED

Site surveys will include assessing the stability of slopes at the various rehabilitation sites. If a slope is determined to be unstable, site-specific slope stabilization methods will be implemented. Methods used during slope stabilization could include grass seeding of native species via mechanical seeding or hydroseeding (see Section 5.3).

5.1.3 EXCAVATED MATERIAL PLACEMENT AREAS

The excavated material placement areas (EMPAs) outside of the dyke lines will be gently sloped (approximately 10% slope) and covered with stockpiled organic material, which will provide erosion protection and promote the establishment of natural vegetation. Depending on the nature of the EMPAs after construction is complete, the rehabilitation plan may prescribe additional revegetation treatments, where appropriate.

5.1.4 CLEARED AREAS (ORGANIC LAYER IN PLACE)

In areas where the trees and brush were removed and the organic layer was left in place, site preparation will not be as extensive and may not be required at all if there is sufficient natural regeneration of the target species (to be determined during the site survey). In the absence of natural regeneration of target species, the site will be roughened to disturb and expose the topsoil where feasible.

5.2 REVEGETATION

Revegetation at a specific location will comprise re-establishing native habitat types appropriate for post-construction conditions. In some locations, the target habitat type will be the same as what was there prior to the Projects. In other locations where construction has dramatically altered the site conditions, it will not be feasible to rehabilitate the area to the pre-construction habitat type, so a native habitat type suitable for the conditions will be prescribed.

5.2.1 NATURAL REGENERATION

Natural regeneration is a viable means to rehabilitate native habitat in some of the disturbed areas. In locations where only vegetation was cleared and a native seed source exists nearby, natural regeneration will be appropriate and may be facilitated by site preparation methods described in Section 5.1.4.

Burned areas at Keeyask that consist of dead wood and other biological legacies will benefit from natural regeneration where construction activities do not further disturb the site. Stand properties, such as forest gaps, may also be mimicked, where practical, to facilitate natural stand characteristics.

5.2.2 TREE PLANTING

Generally, areas where the organic layer was stripped off of the top, stockpiled and then spread back and incorporated as described in Section 5.1.1 will be planted with seedlings.

As outlined in Section 3.2, the native species that will be disturbed and thus replanted at Keeyask are predominantly black spruce and jack pine. In locations where the pre-existing habitat was dominated by black spruce, the post-construction site conditions may be more supportive of a jack pine habitat types. This is a consequence of the site consisting of more granular soils after construction (e.g., borrow sites), or where there is a deficit of organic material to accommodate site preparation to support a black spruce forest.

5.2.2.1 PROCUREMENT OF NATIVE TREE SEED AND SEEDLINGS

Manitoba Hydro will undertake cone collection to obtain native seed required to grow the large volume of seedlings that are estimated to be required for rehabilitation. Cones will be harvested from black spruce and jack pine trees that are native to Manitoba Seed Zone #7 (Nelson River Seed Zone), as it is defined by Manitoba Conservation and Water Stewardship. The cones will be picked by hand from treetops and limbs that are salvaged from trees being cleared at the Keeyask site, or at other locations of commercial timber operations. Community members from the Keeyask Cree Nations will be employed to harvest the cones.

The cones will be transported to a forest nursery where the seed will be extracted from the cones, cleaned and tested for viability using standard seed-testing methods. Depending on the amount and quality of the seed extracted, additional seed may be purchased to supplement that obtained during the cone harvest project. The nursery will sow the seed in a staged approach to grow overwinter container stock seedlings. Seedlings will be produced to coincide with construction areas becoming available and prepared for revegetation. Orders for seedlings will account for an expected percentage of mortality based on the previous year's planting.

5.2.2.2 TREE PLANTING PROCEDURE

Manitoba Hydro will supervise all tree-planting activities. Work will take place typically throughout June of any given year and members from the Keeyask Cree Nations will be hired to plant the seedlings.

Tree planting on prepared sites will comprise a 2 metre by 2 metre spacing to achieve a density of 2500 stems/ha, which satisfies the provincial rehabilitation requirements (Manitoba Conservation 2013). A large portion of the jack pine seedlings will be planted on a 1 metre by 1 metre spacing to achieve a density of 10,000 stems/ha, which is more representative of a natural jack pine forest stand. The above spacing was recommended to be suitable for the Projects by the regional forester from Manitoba Conservation and Water Stewardship (B. Holmes pers. Comm. 2014).

In areas where the vegetation was removed but the organic layer remains intact (Section 5.1.4), tree planting will only be completed if there is insufficient natural regeneration occurring. Tree planting in this situation will not have a pre-determined spacing but will be done to fill gaps and not crowd any natural regeneration that may be occurring.

Tree planting on slopes where stabilization methods were applied (Section 5.1.2) will take place in the spring following the completion of the stabilization work, or later, to allow sufficient time for plant material used for stabilization purposes to root.

Throughout the rehabilitation project, all of the sites planted will be revisited and any large gaps will be replanted where the seedlings did not survive.

5.3 GRASS SEEDING

Grass seed will be applied on access road slopes and disturbed areas to stabilize slopes (Section 5.1.2) and provide cover as far as the forest edge. In areas where there are dam safety requirements that restrict the type of vegetation that can be planted, grass seeding will be used as the primary rehabilitation treatment. All grass seeding around dams or dykes will adhere to the Canadian Dam Association's Dam Safety Guidelines (2007). Typically, seeding will take place in the spring.

5.3.1 SEED

The grass seed mixtures used will comprise native species founds in the Keeyask area and be prescribed by Manitoba Hydro in consultation with the Project's Terrestrial Biologist. Seed mixtures will be selected that best suit the location, climate, and soil conditions where they are being applied.

Grass seed mixtures will meet the requirements of the Canadian *Seeds Act* for Canada Certified #1 seed for certified cultivars, or Canada Common #1 for common cultivars. Contractors will be required to use seed that meets the following seed purity requirements:

- Noxious weed seeds, as classified by the Canadian *Seeds Act*, must not exceed the following limits for number of seeds per 25 grams: 0 for prohibited noxious weeds; 0 for primary species; 1 for secondary species; and 25 for total noxious seeds; and
- The seed mixture must not include alfalfa or sweet clover.

Commercial seed suppliers will provide seed analysis certificates verifying the above criteria are met before seeding takes place.

5.3.2 HYDROSEEDING

"Hydroseeding" is a planting process that uses a slurry of seed and mulch. The slurry is transported in a tank and sprayed over prepared ground.

If hydroseeding is selected as the appropriate method for establishing grass cover, the mulch, fertilizer, and organic product(s) selected will be based on site-specific conditions. The chosen product will:

- Provide a sufficient, organic base layer, especially where organic material is lacking on a particular rehabilitation area;
- Provide sufficient fertilizer to promote and sustain seed;
- Contain binding agents, where required, to protect the seed and hold it in place through weather events such as heavy rain, snow and high winds;
- Not contain growth or germination inhibiting factors;
- Form a "blotter-like" ground cover that will allow for the retention and percolation of water;
- Have properties enabling it to be evenly dispersed and suspended when agitated in water; and
- Contain fertilizers that have been manufactured within 365 days prior to sale and transportation, and that meet the requirements of the Canadian *Fertilizers Act* and associated regulations.

An approved hydroseeding machine will be used to distribute the mixtures evenly across the application area. This will likely be a large unit that can hold 10 to 15m^3. In less accessible areas, a smaller, mobile unit that can be pulled behind a bobcat or flex track may be used.

5.4 TRADITIONAL PLANTS

A plant workshop was held with the Keeyask Cree Nations in 2013 and provided ideas on how traditional plant knowledge could be incorporated into vegetation rehabilitation. Many berry species such as blueberries *(niskimin; Vaccinium myrtilloides, V. uliginosum)*, strawberries (*Fragaria virginiana)*, cloudberries *(Rubus chamaemorus)*, red and black currants or gooseberries *(osápómina; Ribes* spp*.)*, dewberries *(Rubus pubescens)*, cranberries *(Vaccinium vitis-idea, V. oxycoccos),* crowberries *(Empetrum nigrum)*, bear berries (*Arctostaphylos uva-ursi*, *A. alpina),* were mentioned by the participants as important species to be included when developing the rehabilitation prescriptions. Another species of importance discussed was the wild rose *(okiniy; Rosa acicularis*). The cultural use of the petals as a bug repellant was also communicated.

A rehabilitation workshop was held in November 2015 at which members of the Keeyask Cree Nations identified sweet flag (*Acorus calamus*), Labrador tea (*Ledum groenlandicum*) and wild mint (*Mentha arvensis)* as additional plant species to those identified in 2013 that should be included in future rehabilitation at the site.

Through ongoing ATK studies and rehabilitation planning discussions among the KCNs during the KGP, locations and species of traditional plants to be incorporated into project rehabilitation will be determined, as well as whether planting or natural regeneration is required.

6.0 REHABILITATION SCHEDULE

As described in Section 4.0, rehabilitation of the Projects will begin during the construction phase of the Keeyask Generation Project on sites that are no longer needed for construction. Currently, it is likely that rehabilitation will start as early as the summer of 2015 and will continue throughout the construction phase and after. The current schedule is for construction to be complete in November 2022. The final stages of construction include decommissioning the various work areas and the main camp. For this reason, rehabilitation will continue beyond 2022 by a year or more after the last areas are decommissioned. It cannot be stated with certainty when rehabilitation efforts related to the Projects will be complete. There are many factors, some of which are unforeseen, which could alter the construction schedule and, in turn, alter the rehabilitation work. Monitoring the success of rehabilitation will continue for many years into operation and is describe in detail in Section 7.0.

7.0 REHABILITATION MONITORING

The Terrestrial Effects Monitoring Plan (TEMP) describes the objectives, study design, methods and reporting related to monitoring rehabilitation. Monitoring will verify this plan and the subsequent site specific prescriptions are implemented as intended. It will also verify the success of rehabilitation at restoring the intended habitat types and restoring ecologically appropriate vegetation.

In general, the rehabilitation implementation surveys will occur in the year following each year when revegetation occurs. The intent of the surveys is to confirm plant survival and overall success of the revegetation treatments. Each rehabilitation location will be sampled annually for five years to confirm survival of plantings. For example, high plant mortality can occur during a hot, dry summer. Where vegetation planted covers less than 50% of the area treated after 5 years, it will be determined if further rehabilitation activities are required, e.g. more planting.

Recovery success surveys will commence starting two years after rehabilitation of a broad area is complete (e.g., borrow sources). The frequency and timing of surveys will be scheduled based on results from the rehabilitation implementation surveys and the habitat type rehabilitated. Annual surveys will continue at each location until it is apparent that vegetation and soils will achieve the rehabilitation targets. Additional surveys will be conducted in years 15 and 25 of operation to provide a comprehensive evaluation of success to date.

8.0 REPORTING

A report on rehabilitation monitoring will be undertaken through the TEMP (see Section 7) and will be produced during the winter after each year when field studies occur. The report will be submitted to Manitoba Conservation and Water Stewardship as per *Environment Act* Licence 3107, Clause 20.

The reports will summarize the activities and general findings from the preceding year. The annual report will include data analysis comprised of basic descriptive statistics. Any major, unanticipated events and/or recommendations for changes to the rehabilitation work will be noted. A synthesis report on rehabilitation will be produced after construction completion and at years 5, 10, 15 and 25 of operation as outlined in the TEMP.

9.0 REFERENCES

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