S A A R

Environmental Limited

Natural Environment Technical Report
Hogs Back Above Water Pit Application
Lot 31, Concession 3, Township of Southgate, County of Grey

February 23, 2022

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1 ABSTRACT

The study site contains one of seven sinuous esker formations documented in a portion of the planning area, the Dundalk Region, identified as earth science areas of natural and scientific interest (ANSI). Part of the esker has been extracted during past borrow pit operations and much of it has been cleared. A new owner is seeking formal licence under the Aggregate Resources Act for an above water pit. The long narrow esker runs north-south across the lands with an adjacent provincial wetland to the east and west. The wetland is setback from extraction and enhanced after extraction through reforestation of a link between the two large wetlands.

The ANSI is both an identified aggregate resource and an earth science area of natural and scientific interest. Our report delves into the representative amount of this feature in the planning area to determine if PPS natural heritage policies can be met. Two rehabilitation options (A and B) are provided for the post extraction environment. Option A reforests a meadow to link east and west PSW units which are also captured in the Bruce County Map Schedules as natural heritage system core areas. Invoking tree planting to create a forest corridor will link these two forest core areas. This can facilitate wildlife corridor travel, and provide slight carbon sequestering and oxygen input from trees in response to global warming concerns noted in the PPS. Option B creates the link with less intensive plantings and shares human recreational campground activity on the south part of the lands. The planning merits of this proposed use will be evaluated in a planning report under separate cover as part of the Planning Act approval process.

SAAR characterized the habitats and wildlife on and near (120m) the site, then assessed the potential for esker extraction to impact ecological features and functions. We provided mitigation and monitoring of key indicator wildlife species to track presence/absence of PSW values in the future, and shaped Rehabilitation Plan options for a net gain in biological diversity over time by planting native species and removing invasive species.

Recommended monitoring is stepped, in tune with the extraction phasing, such that IF an indicator guild of species (i.e. Veery for forest interior adjacent breeding birds, Spring Peeper for wetland indicator breeding amphibians) is degraded in amount, compared to our baseline during extraction, additional mitigative measures are invoked at that time. These include increasing the setback distance from the ecological feature, providing mitigation for the specific concern (i.e. mufflers for back-up beeper on trucks if noise is perceived to be correlated to reduced forest indicator species).

Performance criteria using indicator species documented in the adjacent PSW provide a mechanism to ensure no negative impact to the features and functions the PSW is known for. Values identified in the PSW wetland evaluation record for the broader wetland complex included winter cover for wildlife, waterfowl, colonial waterbirds and regionally rare Showy Lady's-slipper. Most of these values occur in other portions of the larger wetland complex however the conifer cover in both nearby PSW east and west units is conserved and setback from the extractive activity, maintaining the winter cover for wildlife and suitable habitat for the regionally rare Showy Lady's-slipper. SAAR refined the existing provincial mapping in this regard by ground truthing, and attended the site to discuss wetland limits with SVCA.

SAAR concluded that extracting a portion of the esker above water can occur, with enhanced biodiversity guided by the Rehabilitation Plan, meeting the PPS policy tests of no negative impact and complying with the Grey County Official Plan (GCOP) natural heritage system (NHS) environmental objectives. Forestation efforts to shape a treed corridor between the east and west treed cores during rehabilitation can likely exceed the environmental objectives to "maintain" functionality and connectivity of the NHS.

2 INTRODUCTION

SAAR Environmental Limited was retained by H. Bye Construction Limited to prepare a Natural Environment Technical Report (NETR). The report is required by the Province to determine whether extraction can take place without negative impact as defined in the Provincial Policy Statement, namely, the degradation or destruction of the feature or function (ANSI, PSW) the area is known for.

SAAR relied upon the team hydrogeologist in regard to characterizing the earth science ANSI, while we evaluated the living features. SAAR surveyed the wildlife and habitats at different seasons on the study site and 120 adjacent lands. Seasonal observations began in 2019 with growing season wildlife breeding surveys completed in 2020 and brief specific update visits in 2021. The study approach was discussed and circulated to review agencies including the Saugeen Valley Conservation Authority (SVCA), MNRF, County of Grey, First Nations as well as the Grand River Conservation Authority. Team hydrogeologists at GSS liaised with MNRF on the earth science esker, including submission of preliminary information on the proposed gravel pit, followed by a technical memorandum providing information on the ANSI and the preliminary proposal (See Appendix A of GSS, 2021).

SAAR conducted our seasonal fieldwork, reviewed our field results, and the field results of ecological features and functions in the Provincial PSW record (1984) to first determine feasibility of the proposed use and then tailor mitigation, monitoring and progressive rehabilitation to the site conditions.

3 LOCATION

The site is located on part of Lot 31, Concession 3, Southgate Township (formerly Proton) in the County of Grey, Ontario. The parcel is 41.17 hectares (101.74 acres) on 46365 Southgate Road 4 north of Highway 89. Nearby rural hamlets include Keldon and Kingscote (See Key Map below). On a landscape level the site falls between Collingwood and Guelph and is located northeast of Mount Forest, Ontario.

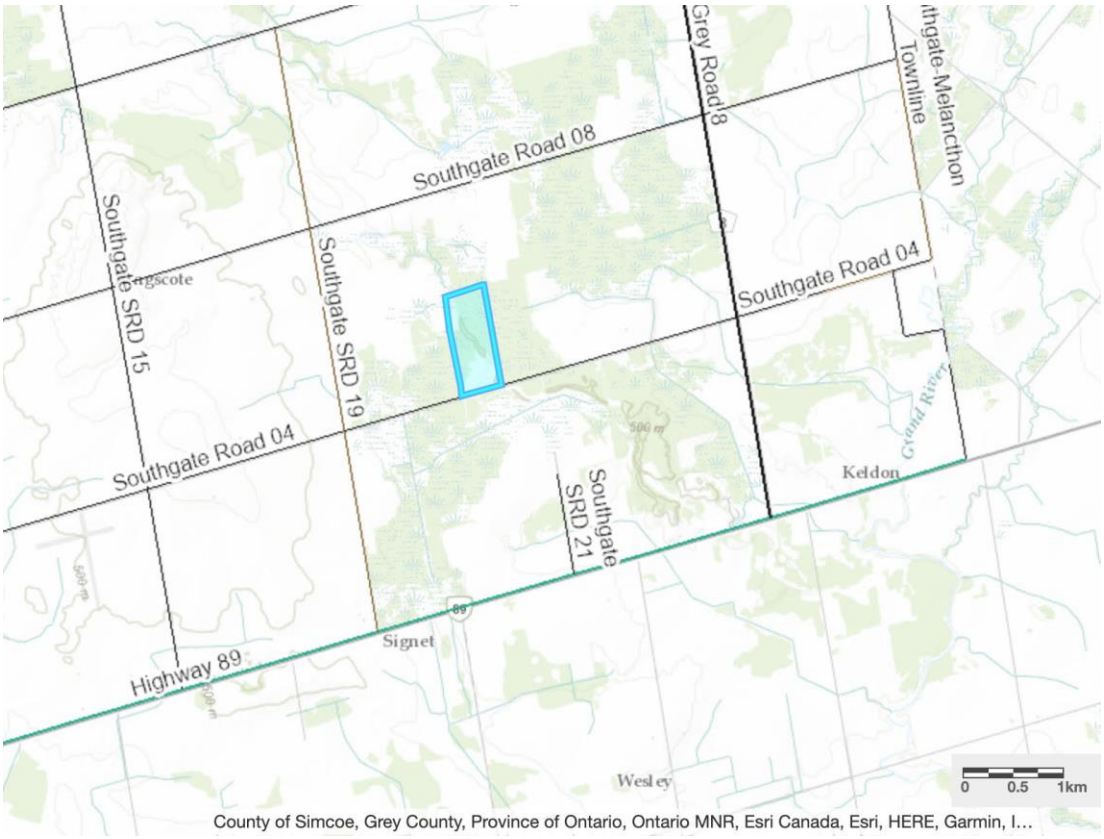


Figure 1: Key Map

3.1 SITE AND SURROUNDINGS

The study site supports open lands, treed lands on the east and west sides and is punctuated by a long esker. The esker formation is known as the Keldon Esker, and is the southern portion of a longer esker that continues north off the study site. It is one of a number of esker formations in the planning area detailed further in the NETR.

3.1.1 WHAT IS AN ESKER?

An esker is a narrow steep sided band of sand and gravel. This type of glacial deposit is found in many parts of Canada. In southern Ontario the eskers are best seen in southeastern Grey County and east of Peterborough. They can curve and have gaps in the deposit or dips along the top known as tunnel valleys. These landforms are former beds of meltwater streams located in glaciers; shaped like a tube slide in a park or an ice tunnel in a winter fort. The esker is a glacial stream bed left after the ice block melts. Glacial retreat could be a chaotic event with ice chunks falling during changing temperatures; Heart Lake in the Brampton esker is an example of a kettle lake that was created by an ice chunk falling into the esker stream bed. These glacial stream beds can be quite long; the longest in southern Ontario at 160km is the Boulter esker running from Mattawa to Washago near Orillia.

3.1.2 SITE SPECIFIC

The esker on the study site is a narrow ridge with sloped sides (65-100m wide) running north-south across the lands. The top of the esker is 496m at the north, and 503m at the centre (GSS, 2021).

Remains of the prior borrow pit operation are evident on the site including the excavation, clearing, and a small building at the south end of the worked esker. Some of the lands southwest of the study site are in current agricultural operation for corn crop, with the fallow field portions of the study site itself fallow and succeeding in parts to shrub succession. Land to the north of the study site is pastured open meadow, while much of the easterly and westerly lands are forested. To the southeast across Southgate Road 4 there is an existing licensed below water pit (MNRF ID 4875 in: GSS, 2021).

3.2 SURFACEWATER

The esker landform is oriented in a north-south direction, situated between two large wetlands. The wetlands fall within 120 metres, and we evaluated any potential surfacewater connections during our assessment of potential impact of removing an esker on nearby wetland hydrology. The esker has no observed drainage such as side slope seepage or toe of slope surfacewater features.

Surface water was flowing during peak spring and fall periods in the west PSW. This was a meandering flow while in the wetland vegetation, but more sheetflow across the northwest quadrat open fields toward the dug pond and north fencerow flowing northerly. This is in agreement with GSS review of the west PSW unit surface drainage predominantly flowing north (MNRF Ontario Flow Assessment Tool (OFAT), with the southerly part of the west PSW draining southerly. Both GSS and SAAR field ground truthing confirms drainage on either side of Southgate Road 4 approximately 1km west of the study site entrance. There is no visible culvert but it may be buried.

Additional surfacewater was noted on 120m adjacent lands to the northeast of the study site, also travelling north. The east PSW unit supported standing water in pockets of thicket and treed swamp but with no distinct flow pattern.

The majority of surface drainage on the study site flows north (GSS, 2021, SAAR, 2020/21), thus mostly in the Saugeen Valley Conservation Authority watershed of the Saugeen River vs. less southerly flow toward the Grand River Conservation Authority (GRCA) watershed.

3.3 GROUNDWATER

The Dundalk Till Plain physiographic unit formed during the last glacial retreat, leaving the glacial outwash sandy material that we call drumlins and eskers today. GSS describes the background geological events that formed the esker on site in their technical appendices (GSS, 2021). SAAR reviewed existing field research on potential hydrology of eskers to assess whether removal of the aggregate could impact shallow groundwater contribution – if any – to the adjacent wetlands (See Literature).

GSS borehole data on site does not indicate a relationship between the esker material (e.g. aquifer) and the adjacent wetlands. Borehole site data measured the location of groundwater during eight different sampling periods in 2020 and 2021 (October, November 2020, March,May,July,November 2021). Groundwater depth was measured to be 1.5m, 1.81m, 0.8m depths below ground elevation at various locations near the esker landform.

Water levels were also monitored at the above noted test well locations. Three of the test wells (M1-3) monitored water levels continuously. Data is helpful to our impact assesment Section 10.0 of the NETR evaluating future health of the adjacent wetland units after extraction. A key factor safeguarding continued potential shallow groundwater movement, and possible contribution, to either wetland is the mitigation of remaining 1.5m above the water table for all phases of proposed extraction for the above water pit.

4.0 PROPOSED USE

A licence to extract aggregate above the water table is sought under the Aggregate Resources Act for a portion of an esker. The esker landform has been previously disturbed at the southern end by a borrow pit. The esker parallels a smaller esker ridge that falls both on and east of the site.

GSS calculated the available volume of aggregate material on the esker. Based on average 0.3m depths of topsoil, the estimated in situ volume of aggregate is 160,000 cubic metres. Using the in situ density of 2.1 tonnes/m3 for sand and gravel material yielded GSS an estimated volume of 336,000 tonnes of aggregate.

The sand and gravel would be removed by heavy machinery such as excavators and be placed in dump trucks along a haul road created along the esker as it is being removed; thus the floor of the pit would include the haul road as the esker material on the long narrow landform is removed. The site would have heavy equipment noise through the work week with eight hour workdays.

There will be no stationary crushers on site, only mobile crushers and screening plants will be used to process aggregate. The aggregate will not be washed on the site, thereby removing added noise associated with the washing process. There will be no storage of fuel on the site. There is no water diversion, drainage or storage of water proposed as the pit will remain a minimum of 1.5m above the water table.

4.1 NEED

Determining need is a provincial vs. local determination established by MARPS (Mineral Aggregate Resource Policy Statement). This document identifies all the nearby eskers including the Keldon Esker North on site as significant sand and gravel resources (GSS, 2021), Sand and Gravel Resource 1 and Sand and Gravel Resource Areas of Primary Significance (ARIP, 1981).

ARIP 51 (1981) identified this pit as MTC No. D4-61, indicating that it was likely to have been a wayside pit under the Ministry of Transportation and Communications, evident on MNRF 2002 Ontario Base Mapping. The ARIP 51 report noted face height of the pit was 3-5m with 40-50% gravel resource (ARIP in: GSS, 2021). The Aggregate Resources Act (1989) resource rent returns a production levy of 4 cents per tonne to the municipality for aggregate material leaving the site for market.

Color Plate 1: Sand and gravel edge at historical borrow pit activity on the southern portion of the esker

How long would this resource be available for the industry? Although the length of time the pit operates is governed by economic factors such as demand for the product in roadworks projects and economy, the lifespan of the above-water pit can be estimated at a minimum of four years using the GSS calculations; assuming a maximum annual tonnage limit of 100,000 tonnes per year from the estimated resource of 336,000 tonnes of aggregate on the site.

5 POLICY AND REGULATIONS

5.1 PROVINCIAL POLICY STATEMENT

The PPS defines natural heritage by these seven categories:

- significant wetlands (including significant coastal wetlands);
- significant habitat of endangered and threatened species;
- significant Areas of Natural and Scientific Interest (ANSIs);
- significant woodlands (south and east of the Canadian Shield);
- significant valleylands (south and east of the Canadian Shield);
- significant wildlife habitat (SWH); and
- fish habitat

Two of the seven categories of natural heritage are located on the study site, a significant ANSI and a significant wetland; Keldon Esker ANSI and Keldon Swamp Provincially Significant Wetland.

The NETR assesses whether the proposed above water pit can meet the test of no negative impact. This is intuitively met through setback from the wetland and mitigative measures such as the minimum setback distance to limit extraction 1.5m above the water table.

The competing interests of the natural heritage and aggregate resource PPS policies are reviewed within the summary statement included as part of the licence application. The NETR assesses the biological framework of the ANSI; representation of the ANSI feature within the planning area.

5.2 UPPER AND LOWER TIER OFFICIAL PLANS

5.2.1 TOWNSHIP OF SOUTHGATE

The site aggregate is shown as primary aggregate resource area in the Township of Southgate Official Plan, Schedule C Environmental Constraints (2009).

5.2.2 COUNTY OF GREY

Land Use Schedules of the Grey County Official Plan recognize a mosaic of areas including rural, wetland, hazard land and mineral resources.

The upper tier mapping does not capture as much of the Keldon Esker on site; just the southeast corner as High Potential Mineral Aggregate Resources (Map 2, Schedule B, Grey County O.P., 2019). Since other parts of the Keldon Esker ANSI off site were identified as High Potential aggregate, the PSW may have been the reason for not including the rest of the esker; also, the borrow pit activity and tree removal may have been taken as a sign of exhausted resource.

Official Plan map schedules also identify natural areas including cores and openings. This natural heritage system information is tied to the Grey County Natural Heritage Study. The introduction of the

study confirms that conformity with the Provincial Policy Statement was a key trigger for the study, noting the PPS section (2.1.3) recognizes a natural heritage system will vary in size and form in settlement areas, rural areas and prime agricultural areas, enabling identification of the NHS in Grey County to take into account the settlement, agriculture, resource use, tourism and recreation.

The larger core areas selected during desktop exercises were 1000 hectare areas (NHS Background Paper, 2015) to be refined at lower site specific scales (NHS, p.40,45) when a development application is made. The broad mapping is to be used at a County level, similar to significant woodland map layers (OP S. 2.8.1) detailing how the desktop exercise is also subject to site level refinement. This is detailed further in our analysis found within Section 10.0 of the NETR.

5.3 CONSERVATION AUTHORITIES

The Saugeen Valley Conservation Authority (SVCA) provides comments on natural heritage matters to Grey County and the Municipality of Southgate via a Memorandum of Understanding. Watershed jurisdictions for the SVCA and the Grand River Conservation Authority (GRCA) are illustrated below along with the provincial wetland limit and unevaluated wetlands on record. Note these were ground truthed on site on different occasions with SAAR, GSS, SVCA, and on one occasion with the proponent. The GSS reporting details the refined field observations that the majority of the site water is received by the SVCA watershed. Thus they are the key review circulation point.

The NETR provides site specific ground truthing tie in of the PSW limits at ten measurement points on the study site, and setback from sensitivities documented during our seasonal surveys. This is detailed in our impact assessment section. SAAR conducted ground truthing which included a joint site inspection with SVCA staff for wetland limit discussion.

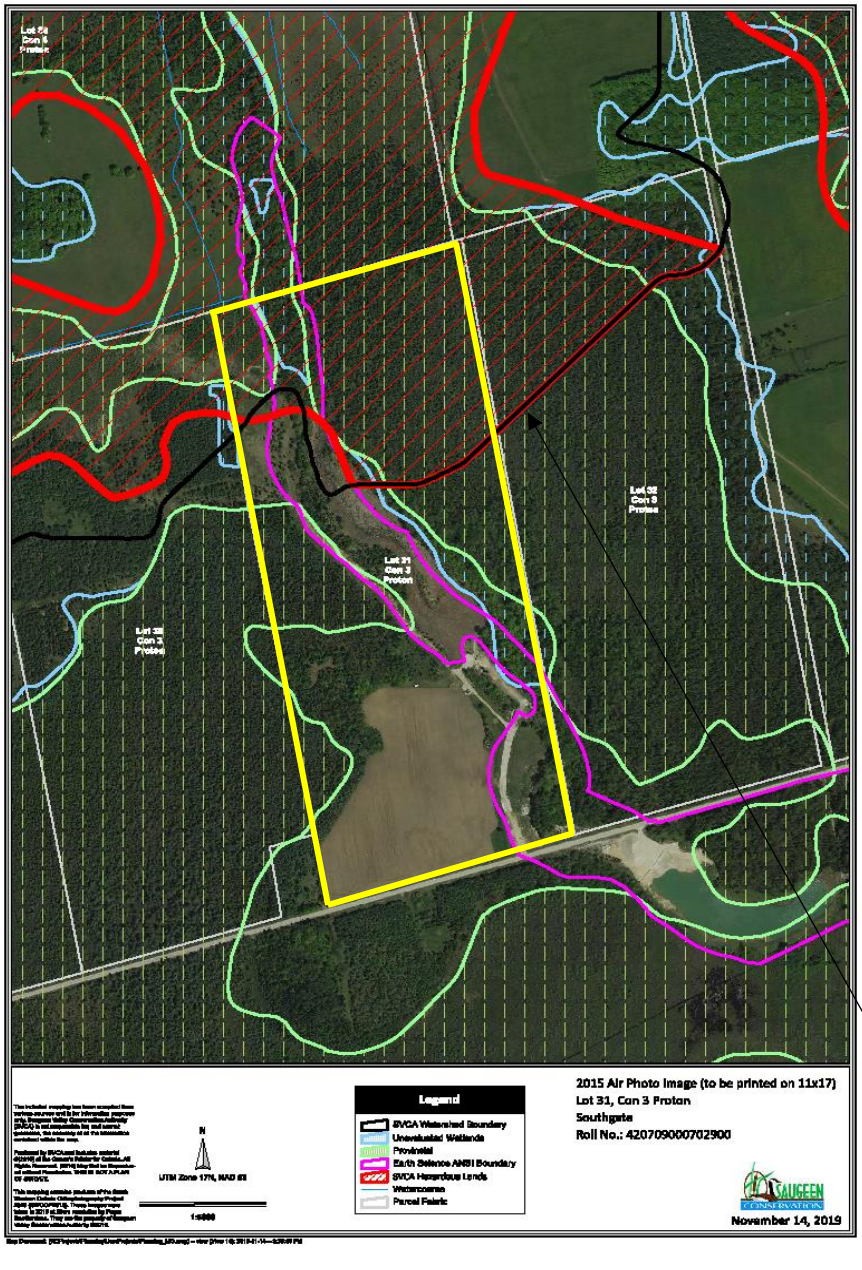


Figure 2: SVCA and GRCA watershed divide in relation to provincial wetland feature

6 SITE AND SURROUNDINGS

The site provincial wetland forests, agricultural lands and a portion of partly mined esker landform, oriented in a northwest – southeast angle across the parcel. The esker was mined in sections previously for a borrow pit, with some vegetation removal on surface. Wetland, farmland and esker formation(s) continue off this parcel (N,S,E), a southern ridge under extraction license.

6.1 ECOLOGICAL REGION

In 1959 Professor Hill at the University of Toronto designated main groupings of vegetation and ecology based upon landform and wildlife characteristics to develop a relative measure of conservation values

throughout Ontario. The local geography and ecology are of critical importance to interpreting wildlife observations appropriately with respect to habitat so that inappropriate conservation status is not applied.

The Site falls within Ecoregion 6E (Lake Simcoe-Rideau) and specifically into the lower level Eco-district 6E-5. Eco-districts support characteristic vegetation communities that have grown in response to local soil, climate, elevation and geological landform features.

Figure 3: Ecoregions of Ontario with the 6E Lake Simcoe-Rideau Region and Eco-district 6E-5

It is helpful to examine where existing protected wildlife core areas, corridors and links between them fall on the landscape relative to the study area to integrate where possible wildlife corridor movement across lands, and review which conservation targets have been met.

Measurement tools to report and assess natural heritage in the NETR follow the Planning Act Provincial Policy Statements on natural heritage, as well as traditional values where known for clan animals and current science.

6.2 PHYSIOGRAPHY AND ANSI

The esker and surrounding lands are part of a rolling plain known as the Dundalk Till Plain (Chapman and Putnam, 1984). Glacial retreat left a number of long striations on the landscape which are the present day

eskers and kame moraine till deposits. For greater detail on physiography and geology refer to the GSS report submitted under separate cover which speaks further on the Aggregate Resources Inventory Reporting by the Province for Proton Township as well (ARIP 51, 1981 in GSS, 2021).

During the ice age Proton Township was covered in a submass of a main glacier, retreating and leaving till described as Tavistock Till. During warm and cold fronts, the glacier retreated and advanced, leaving two different ages of this till. The earlier is known as Tavistock, the later deposit as Elma Till. Geologists feel the Elma melted in place as it was at the end of the glacial stage and warming.The meltwaters flowed through the ice and those drainage sloughs in glacier are the eskers of today on the ground.

6.2.1 ANSI

The Tavistock Till covered the south and central part of the township, while the later Elma Till ridges covered the southwest and central parts of old Proton Township where there are presently extraction sites. Portions of these eskers, such as the Egerton Esker and the Keldon Esker, were designated as earth science areas of natural and scientific interest (ANSI). The esker formations extend beyond Grey County, into Wellington and Dufferin County (Mountview in Wellington, Riverview and SHrigley eskers in Dufferin). The latter two have not been identified as ANSI. GSS (2021) note two additional eskers southwest of the Mountview and Riverview Eskers, known as Riverbank and Riverstown eskers. Part of the Riverstown Esker is designated as an ANSI.

The landform features reviewed and refined by the Provincial study team included:

NAME	STATUS	MAP	UTM	COUNTY	TWP
Allan Park Crevasse Fillings	ANSI-N	41A/02	5059,48905	Grey	Bentick
Allan Park Ice-Margin Delta	ANSI-N	41A/02	5014,48914	Grey	Bentinck
Arkwright Drumlins	ANSI-N	41A/06	4850,49240	Bruce	Arran
Barney Lake Shorelines	ANSI-N	41H/04	4480,50070	Bruce	St. Edmunds
Egerton Esker	ANSI-N	41A/02	5350,48790	Grey	Proton
Eugenia Lake Drumlins	ANSI-N	41A/08	5420,49040	Grey	Artemesia
Hatherton Esker	ANSI-N	41A/08	5520,49020	Grey	Osprey
Hopeville Drumlins	ANSI-N	41A/02	5360,48830	Grey	Proton
Keldon Esker	ANSI-N	41A/01	5470,48765	Grey	Proton
Keldon Esker-N. Extension	ANSI-N	41A/01	5410,48830	Grey	Proton
Maryville Lakes(L.Algonquin)	ANSI-N	41A/11	4840,49380	Grey	Amabel
Saugeen Kame Terraces	ANSI-N	41A/02	5210,48875	Grey	Egremont
Shrigley Esker	ANSI-N	41A/01	5555,48975	Dufferin,Gre	Melancton/Os
Skipness Drumlins	ANSI-N	41A/11	4850,49355	Bruce	Amabel
Sucker Ck Valley-Cape Rich	ANSI-N	41A/10	5250,49470	Grey	St. Vincent/
Tara Moraine & Esker	ANSI-N	41A/06	4873,48199	Bruce	Arran
Tara Moraine(A)	ANSI-N	41A/06	4910,49260	Bruce,Grey	Arran,Derby
Topcliff Crevasse Fillings	ANSI-N	41A/02	5264,48903	Grey	Glenelg,Egre
Williscroft Moraine	ANSI-N	41A/06	4820,49140	Bruce	Elderslie

The Provincial authors found discrepancies in historical literature base and existing landform interpretation, making refinements including his preference to use the Saugeen and Grand River watershed boundary near Wellington and Grey County to mark separation of advancing ice sheets, noting also that mapping through the Elma-Tavistock area was simplistic, and suggesting esker segments may instead be end moraines deposited into water. Notwithstanding geologist interpretations on eskers vs. end kame moraines, the purpose of our background review was to determine whether the Keldon Esker ANSI on site was a) a stand alone example of esker landform such that removing a portion of it would compromise the geology theme targets of the ANSI program (See Section 6.3).

6.3 REPRESENTATION

Using the ANSI selection criteria of representation, condition, diversity, ecological considerations, special features, and being aware that the MNRF goals (2009) guide that ANSI status is to capture the best examples of earth science features and processes for an environmental theme (Ontario's Natural Heritage Areas, 2009), the review of background information for the Keldon Esker on site confirms it is one of a number of elongated eskers in the municipality and eco-district. During our search of background information SAAR did not locate the ANSI scoring rationale for ranking this esker provincial vs. regional, etc. (ANSI Identification and Verification Procedure, MNRF, 2011).

From a representation viewpoint, the esker is one of a number of esker landforms in the planning area. The Province designated the site esker, and others, in and beyond Southgate Township. It thus appears the esker on the study site does not represent the `best` representative earth science ANSI in this geological theme.

Figure 4 illustrates other esker formations near and in this catchment basin portion of the planning area.

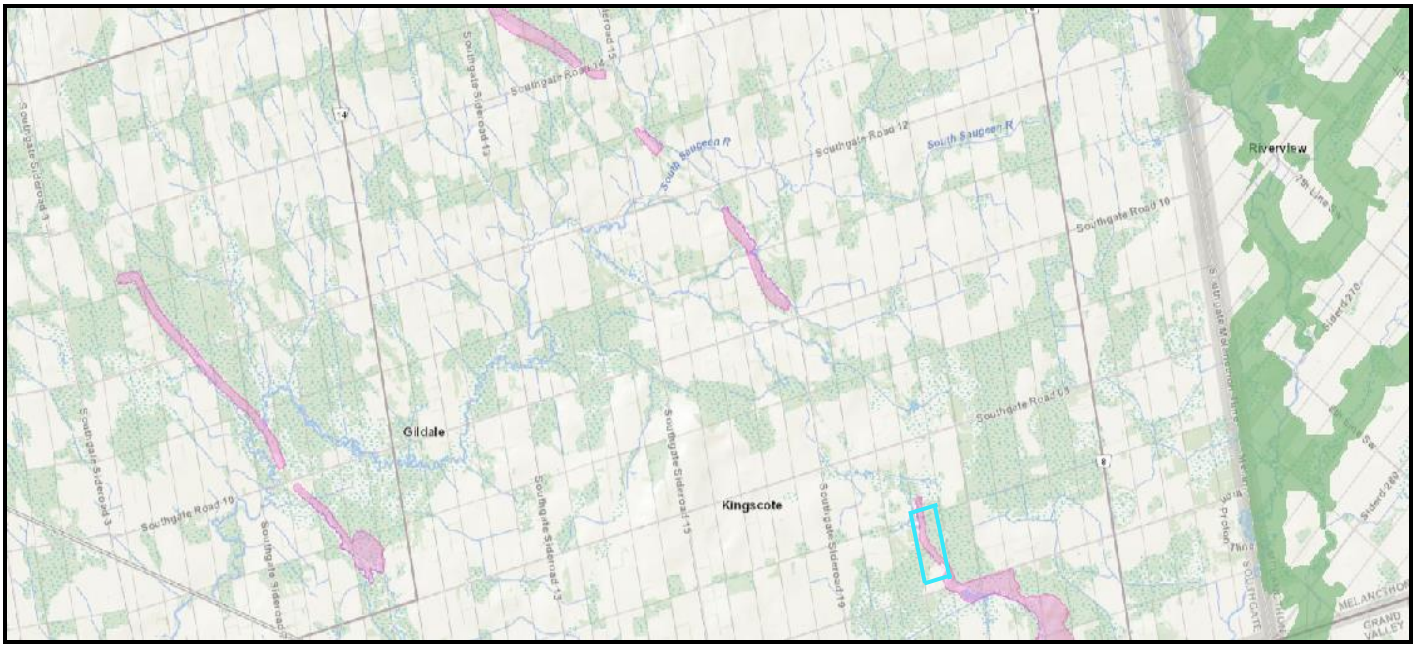


Figure 4: Regional view of earth science ANSI

6.4 CUMULATIVE EFFECTS

A landscape approach, as well as a site level approach, has been undertaken to describe possible effects of extracting a portion of the esker as it may relate to future wildlife movement across the parcel and/or use of various habitats on and near the parcel. This is explored in the impact assessment section of the report including the southerly adjacent existing extraction site in the assessment.

Color Plate 2: View of the south and central portion of the cleared Keldon Esker on site in 2020.

Color Plate 3: Previous vegetation removal for borrow pit activity with young successional Aspen forest east of the esker can be seen in this photograph taken looking north across the esker

Color Plate 4: Forested north end of esker has greater setbacks from easterly PSW for interior birds (Authors note: that is a dog not a bear hiding behind the trees).

The northerly esker is mirrored by another parallel esker formation omitted on some mapping. The additional ridge had some minor drainage and diverse moss species under forest cover.

6.5 PROVINCIAL WETLAND

The Keldon Swamp Wetland Complex is located within a drainage basin of documented disturbance types which included roads, cattle access, channelization and drainage (PSW Record, S.2.3.2). The agricultural component within the broader catchment basin of the wetlands was estimated to be 40-60% (PSW Record, S. 3.3.1.2).

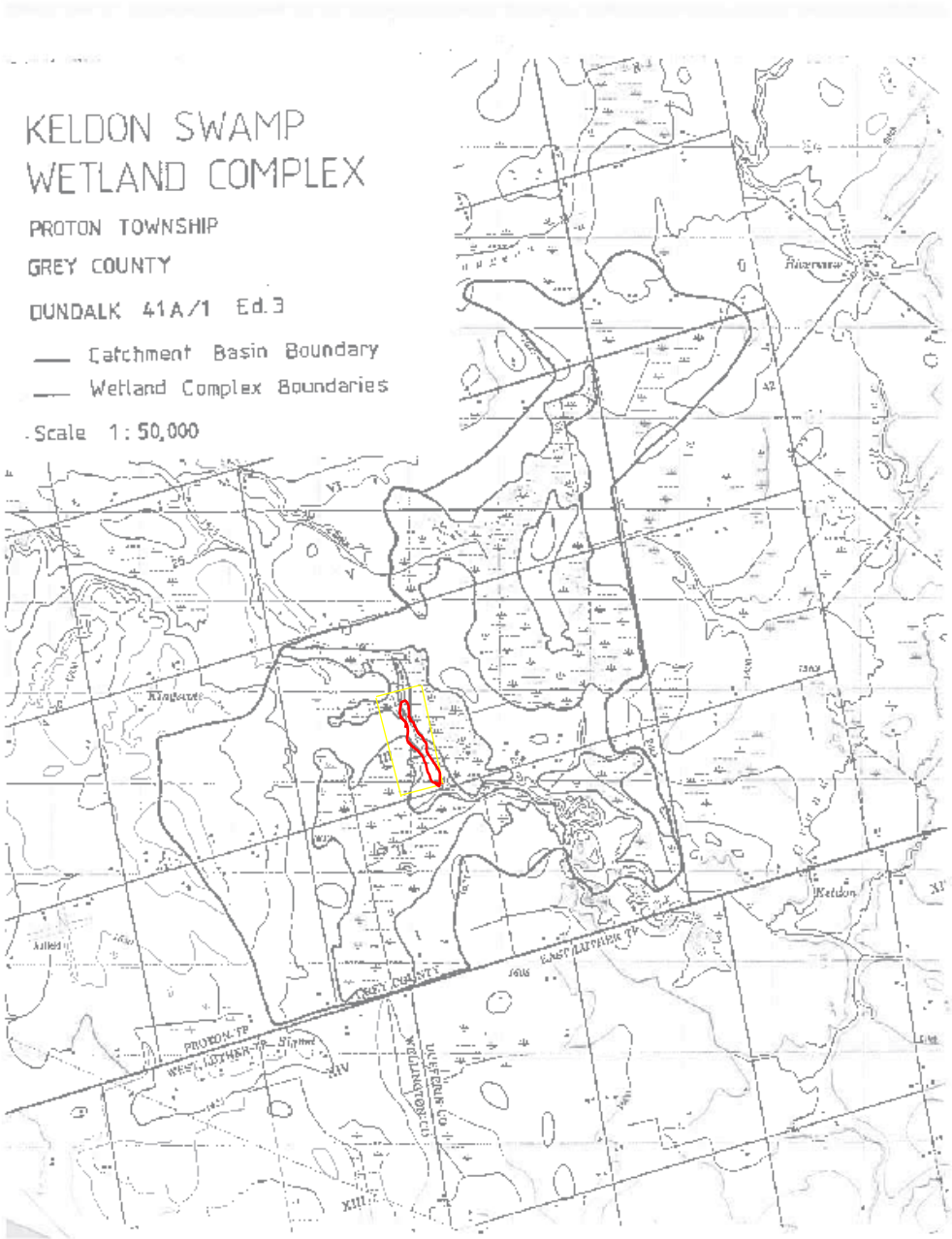


Figure 5: Parcel and proposed extraction limit relative to catchment basin and wetland complex

The catchment basin supplying the wetland habitat with infiltration as well as shallow groundwater and direct surfacewater via intermittent creek features is 24 square kilometers (5930 acres), outflowing to other similar wetland vegetation within 0.5km (PSW record). Gildale and Proton Swamp are two wetlands located downstream of Keldon Swamp PSW within 10km.

The Keldon Swamp PSW is large, at 873 hectares (2157 acres) receiving rain events in a large catchment basin of 24 sq.km (5930 acres). The Keldon Swamp PSW covers 36% of the catchment basin (PSW Record). To put the proposed land use into context, the area being sought for the above water pit (5.77 ha) represents 0.24% of the catchment basin.

6.6 PSW FEATURES AND FUNCTIONS

The Keldon Swamp Wetland Complex is predominantly swamp vegetation (87%) with 13% marsh. During the wetland evaluation exercise conducted by the Province seven sample areas were measured for total dissolved solids. This is a good metric for nutrient that can be replicated at the same sampling areas for future monitoring of water quality (X TDS=280 mg/l).

Ecological values scored in the PSW record (MNRF, 1984) over the broad wetland included the Showy Lady's-slipper *Cypripedium reginae* which Joe Johnson, an expert botanist and biologist, recognized as regionally rare. Further values identified in the PSW record were:

- winter cover for wildlife
- waterbird staging
- production of colonial waterbirds
- migratory waterfowl

These values are assessed in the impact assessment portion of the report to address sustainability during and after extraction.

6.7 HYDROLOGY

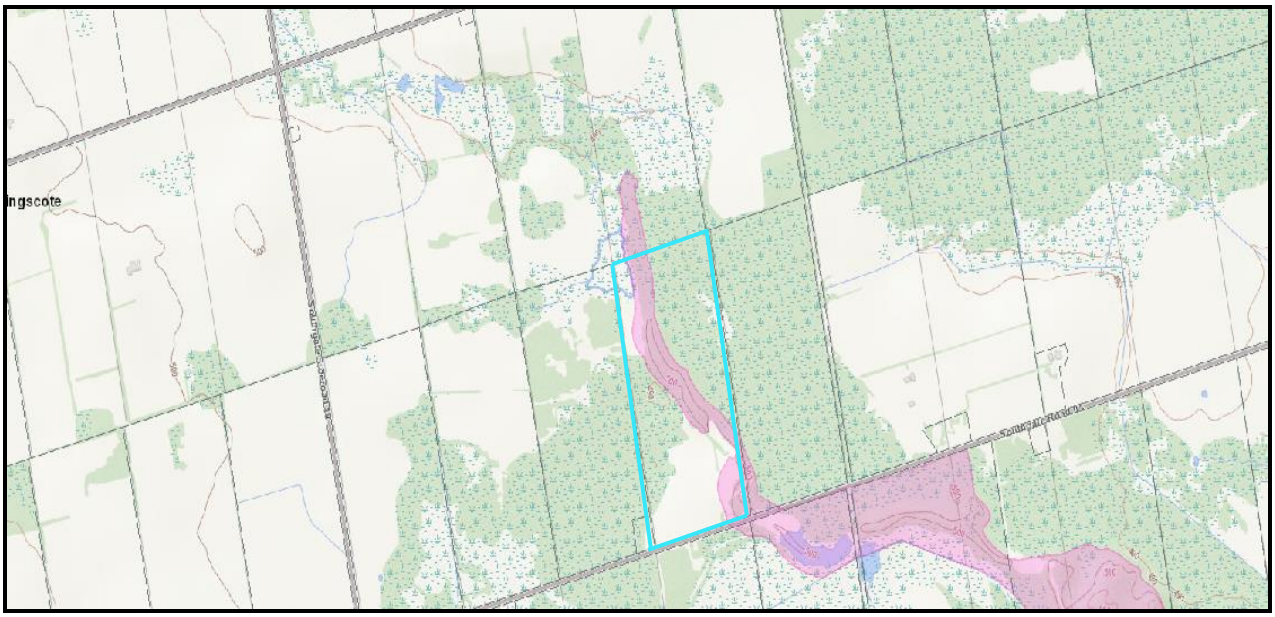


Figure 6: Surfacewater drainage

The broad brush mapping depicts surfacewater drainage. There are a number of areas of overland storm runoff that appear channelized as noted in the PSW Record, which on the whole were seasonally dry by summer but carried rain events spring and fall.

7 RESULTS

7.1 BACKGROUND DATA

Before conducting our fieldwork, we consulted existing information sources for potential rare species, provincial wetlands, ANSI, and other sensitive areas. Background information helped guide study scope along with SVCA discussion on study approach.

After seasonal surveys natural heritage were assessed using lower and upper tier environmental policy and technical guidelines to determine if the quantity, quality and type of nature meets thresholds established for “significance”. Some of these provincial and federal measuring tools are:

Species at Risk Act (SARA, 2002)

Endangered Species Act (ESA 2007)

Significant Wildlife Habitat for EcoRegion 6E Schedules (MNRF, 2015 with updates)

Provincial Policy Statement (PPS, 2020)

Township of Southgate Official Plan (2001)

Grey County Official Plan (2010)

Natural Heritage Reference Manual (MNRF, 2012+updates)

Natural Heritage Information Centre (NHIC) database for rare species and habitats

Conservation Authorities Act Ontario Regulation

Inter-disciplinary studies (e.g. GSS hydrogeology study)

Atlas Projects (e.g. Breeding Bird, Herpetofaunal and Mammal Atlas)

Relevant current science

7.2 SEASONAL INVENTORIES

Wildlife surveys were conducted at peak concentration times for particular species such as early spring for amphibian evening breeding chorus song, mid summer early mornings for bird song, spring and fall for large mammal migration, and so on. The fieldwork follows specific Provincial and or Federal survey standards such as attending the study site in the early morning on two occasions in June, separated by fifteen (15) days to discern breeding birds more readily from those that may be just passing by.

Site visits are summarized below in Table 1.

Table 1 Site Inspections

DATE	SURVEY TYPE	TIME / DURATION	WEATHER CONDITIONS
April 30,2020	Migration and Early Herptiles	Dusk for AMWO Till midnight for Whip-poor-will	6 Celcius at 7pm, clear Beaufort 1 (Wind Scale 0-5)
May 20	ELC1 Herptile Evening Chorus to 500m	12-2pm Dusk - midnight	18 Celcius Beaufort 0
June 14	SAR Surveys BB I Survey Grassland Nesters Nightjar Survey	4 hours 1 of the 4 hours	10 Celcius at 6 a.m. slight cloud Beaufort 1
July 1, 24	BB II Survey ELC II Roving Surveys	8-9am 10am-2pm	Beaufort 0 Beaufort 2 Potential Animal Den located in sandbank
August 4 October 20 December 16	SAR Surveys ELC III Black Bear I Black Bear II	4 hours 2 hour surveillance 1 hour surveillance	27 Celcius Beaufort 2 Potential Den Surveillance, no sign No sign

October and November 2021 site inspections at excavation

7.2.1 HERPETOFAUNA

SAAR surveyed for frogs, salamanders, turtles and snakes. Surveys included inventory by distinctive frog sounds in appropriate seasons at dusk up to 1 am on nights with low to no wind (Beaufort scale) for best acoustics.

Key areas of the PSW with appropriate standing water for breeding and egg maturation were surveyed in the spring for herptiles. The two areas are located along a riparian forested creek feature (NE), and a treed swamp with marsh components meeting a wet meadow (NW) as indicated on the following mapping.

Results by area are reported on below:

Area 1 (NE)

Wood Frog	Spotted Salamander
Spring Peeper	Grey Hyaline Tree Frog
Leopard Frog	Green Frog
Western Chorus Frog	Eastern Garter Snake

Area 2 (CW)

Northern Ribbonsnake (Central, cart trail and west

Eastern Red-backed Salamander

Spring Peeper

7.2.2 VEGETATION

Current and historical aerial photography was assessed.

Figure 7: 1954 indicates more open and deciduous habitats east of the esker (green) vs. present day

The greater extent of farming is also evident versus present day vegetation. Vegetation communities were ground-truthed with boots on the ground reconnaissance surveys in 2020 to determine the extent and type of present day vegetation. The Provincial wetland evaluation record of 1984 noted half of the catchment basin of the PSW Wetland Complex was farmed.

Plant species were identified both in the field and in the lab if seed (achene) characteristics or moss specimens required magnification. Plant community descriptions follow the standard provincial **Ecological Land Classification (ELC) Community Unit** terminology of Lee, Bowles et al., (1998); this dichotomous ranking key is aimed to offer a provincial standard to identify, map and assess relative abundance of different vegetation types across the province for conservation purposes.

Vegetation communities are numbered on Map 1 ELC Vegetation below.

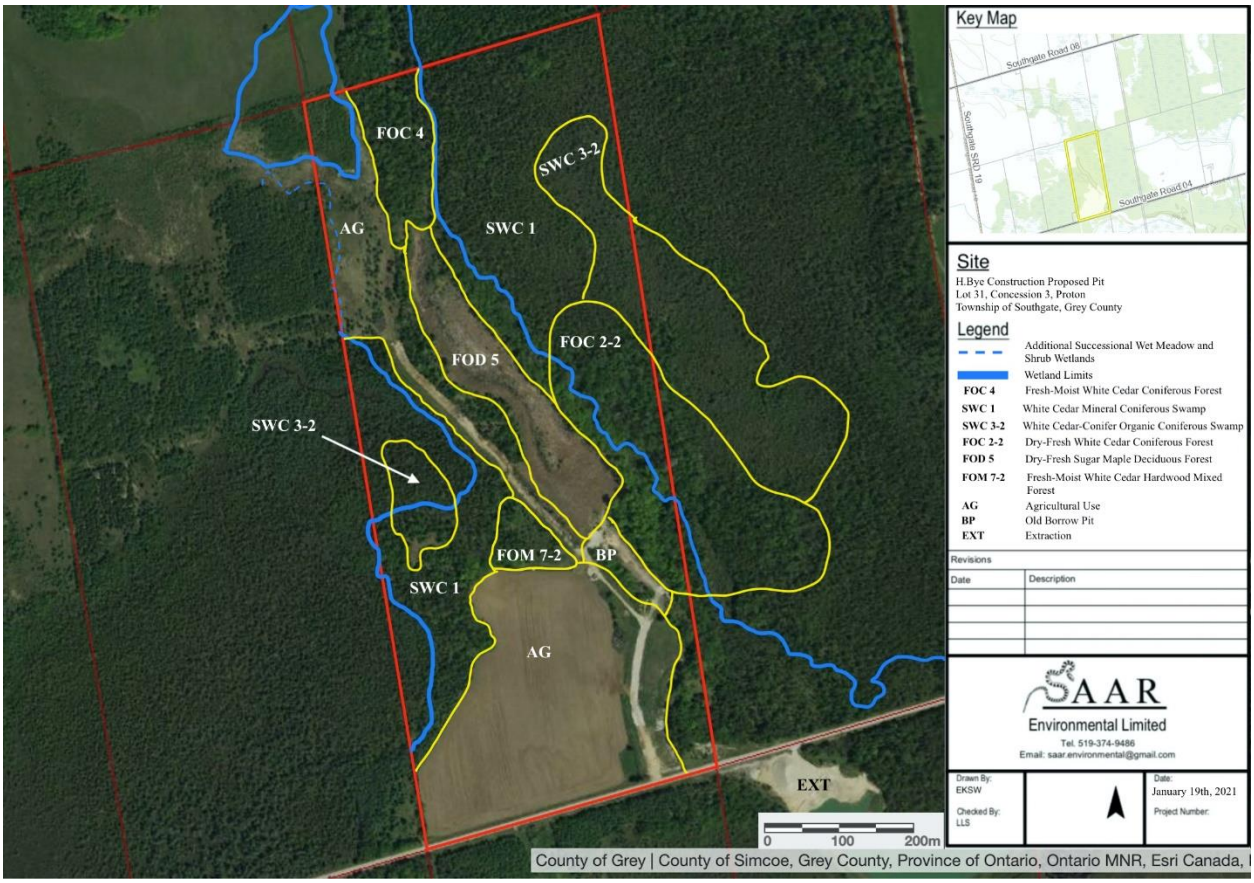


Figure 8: Vegetation Community Types

AG Agricultural Use
FOD5 Dry-Fresh Sugar Maple Deciduous Forest Historical
FOC2-2 Dry-Fresh White Cedar Coniferous Forest
FOC4 Fresh-Moist White Cedar Coniferous Forest
SWC1 White Cedar Mineral Coniferous Swamp
SWC3-2 White Cedar-Conifer Organic Coniferous Swamp

Vegetation communities are described on the following pages with selected photographs from our Photographic Diary.

ANTH Anthropogenic man made habitats

Man made habitat on and near the study area includes external roads, farm fields, borrow pit cleared sections of the esker landform and historical farm roads. Bordering these openings are plants including Coltsfoot, Butter & Eggs, Sweet Clover, Wild Carrot, Dandelion, Cow Vetch, Chenopodium alba, Curly Dock, Common Mullein, Bull Thistle, Common Plantain, Orange Hawkweed, Yellow Hawkweed, Chickory grading to Poison Ivy when closer to the PSW easterly edge.

Color Plate 5: Disturbed area of historical borrow pit activity at south end of esker

Historically FOD5 Dry-Fresh Sugar Maple Deciduous Forest

Succeeding into FOM

Based on aerial photography and young seedlings on the cleared esker top, the esker appears to have supported a deciduous tree cover of Sugar Maple and American Beech.

Present day the successional species include this measure of young Sugar Maple with White Birch, Trembling Aspen-White Birch-White Cedar-Balsam Fir-Balsam Poplar and ground covers including abundant and tall Common Mulleins as below amidst Honeysuckle, Daisies, Goldenrod.

Color Plate 6: Common Mullein spears amidst Trembling Aspen succession on top of esker

FOC2-2 Dry-Fresh White Cedar Coniferous Forest

The predominantly coniferous forest band supports White Cedar-White Spruce-Balsam Fir-White Birch with Trembling Aspen trailing out of the assemblage.

Pockets of the more easterly PSW organic coniferous forest (SWC3-2) do insert themselves into the drier conifer forest as fingers but the main Black Ash deciduous treed swamp elements fall further east.

Color Plate 7: Looking east from cleared esker top to Poplar edge before White Cedar east PSW unit

SWC3-2 White Cedar-Conifer Organic Coniferous Swamp

The broad PSW treed conifer forest grades into interesting smaller habitats of thicket swamps (SWT3) and also treed deciduous swamp pockets of Black Ash; these fell below 0.5ha ELC map standards to map. These Black Ash habitat mosaics are mentioned here because of the wildlife diversity we observed at the ecotones between these elements when conducting field transects walking from one habitat type into another. For example, the thicket swamp elements (SWT3) were supported on organic substrate, sometimes an indication of persistence over time, and animal support over time. The insect rich habitat included damselflies such as River Jewel-wing on weak drainage, Common Ebony Jewel-wing, bluets; common Marsh Bluets in the ash treed swamp opening. Drainage, when sufficient flow in the rainy season, flowed northerly.

Color Plate 8: Reindeer lichen persists in the more boreal character of the treed swamp along with White-throated Sparrow and Brown Creeper avifauna.

FOC4 Fresh-Moist White Cedar Coniferous Forest

The northerly portion of the esker does not appear to have been altered and supports conifer (White Cedar) and varying subdominant tree species including White Ash-Balsam Poplar- White Birch-Sugar Maple.

SWC1 White Cedar Mineral Coniferous Swamp

The treed swamp units have a dominant White Cedar base with associated White and Black Spruce, Tamarack and occasional White Birch at disturbed edges.

Color Plate 9: On top of the cleared esker looking southwest to west PSW unit

AG Agricultural Uses

The northwest quadrat of the study site supports fallow farm fields. Our field surveys note the incursion of the west PSW into the grassy meadow, and an ephemeral small pond.

The wetland habitat near the pond is small in area, relative to ELC mapping, but we flag this due to diversity found there; dragonflies included Common Green Darner, Four-spotted Skimmer, White-faced Meadowhawk, Twelve-spotted Skimmer. *Carex brunnescens, C.retrorsa, C. lupulina* are supported in shrub swamp edges of the westerly PSW unit, and some have been windblown and/or distributed by wildlife at the seasonal pond including *Scirpus atrovirens, S. cyperinus. Elymus hystrix,* Canada Blue-joint grass, rushes (*Juncus effusus, S. cyperinus).*

SAAR identifies this habitat in the rehabilitation plan as a candidate area to enhance with wetland and butterfly nectar plantings for the Species of Concern status Monarch butterfly on site.

Milkweed is already present and supporting Monarch on the study site, however enhancement will increase the existing number of the insects using the site over time based on our past planting projects.

Color Plate 10: Looking northeast from the cleared esker top across the wet meadow to west PSW unit

The other agricultural clearing on the parcel is located at the southwest quadrat and is often in active crop such as corn (2020). Remnant hedgerow specimen trees such as the one noted below served as a perch for Cedar Waxwings and Eastern Phoebe. Dead standing and or stub trees should be retained where nto presenting a safety hazard.

Color Plate 11: Dead standing trees were used as perches by Cedar Waxwings and Eastern Phoebe

7.2.3 BATS

Bat habitat has been evaluated on site, and conserved using the habitat approach guided by the federal recovery strategy for some of the bat species that are of conservation status. SAAR also followed the MNRF Draft Bat Roost Survey Guidelines and noted where potential roost trees such as dead standing trees, stub trees, cracked trees and existing cavity trees were abundant. The most recent MOECP Draft of the Bat Roost Survey Guidelines was reviewed in July of 2021 and incorporated into a fall 2021 inspection; none of the sample plot areas (12.6m radius) supported the ten or more potential roost trees with signs of decay.

Candidate roost trees in lesser quantities were identified in the coniferous treed swamps and deciduous Black Ash treed swamp elements, as well as bats at dusk and dawn.

This habitat is an abundant vegetation type of the east PWS unit, setback and conserved from extractive activity on the esker. Thus there is no anticipated need for greater triage of mitigation measures such as creating habitat such as installing bat boxes that we have implemented for other types of land uses that can compromise bat habitat quality and quantity.

The federal recovery strategy recommends that for the conservation status bat species efforts be made to identify hibernaculae, swarming sites and maternity sites as regulated habitat, and include feeding and roosting habitat resources associated with these critical habitats. Maternity habitat should include the roost site and similarly, any integrated nearby area of food required.

Foraging habitat: Foraging habitat is important for multiple life stages and processes and is therefore included within habitat recommendations for these components (i.e., maternity roosts, hibernacula and swarming sites).

Hibernacula and swarming sites: It is recommended that all known hibernacula and swarming sites for Little Brown Bat, Northern Long-eared Bat and Tri-colored Bat be prescribed as habitat in a habitat regulation, with the exception of any sites which are no longer suitable (e.g., structure collapsed or destroyed, access blocked to prevent bats from entering, permanently flooded) and any anthropogenic structures resided in by humans. It is further recommended that foraging and roosting resources within 2,600 m of a hibernaculum and/or swarming site be identified as habitat in the habitat regulation. The area should extend 2,600 m from all known or suspected entrances of a hibernaculum, or total underground extent of a hibernaculum, if known, and/or the concentrated area of swarming activity.

Maternity sites: For Little Brown Bat, Northern Long-eared Bat and Tri-colored Bat, it is recommended that maternity habitat be identified based on the contiguous ecosite or contiguous anthropogenic site where all known observations of roosting adult females and juveniles between May 15 and July 31 have been made, unless the habitat is no longer suitable or bats are no longer roosting at the site. Maternity sites may also be identified based on any feature where two or more Little Brown Bat, Northern Long-eared Bat or Tri-colored Bat have been observed in, or observed to exit from, the feature, between May 15 and July 31. It is further recommended that foraging areas within 2,400 m of the boundary of a maternity site for Little Brown Bat, 450 m of the boundary of a maternity site for Northern Long-eared Bat, and 920 m of the boundary of a maternity site for Tri-colored Bat be identified as supporting foraging habitat in the habitat regulation, with the combined maternity roosting and foraging habitat not exceeding 1,800 ha, 63 ha, and 265 ha in total, respectively.

SITE EFFECTS

There is no hibernaculae habitat on site for the migrant bats such as mine shafts or caves.

The treed swamp elements of forest and marsh can provide foraging habitat as well as abundant softwood tree cavities for maternity roost sites, and the potential effect of extraction activity on adjacent lands to the PSW has been considered here. The removal of a portion of the esker can occur without negative impact to bat habitat due to separation distance.

7.2.4 BREEDING BIRDS

SAAR reviewed background information available including the Breeding Bird Atlas for this atlas block. We also referenced our own prior field notes which indicated Common Snipe, American Woodcock and Whip-poor-will which required dusk and moonlit surveys following CWS and BSC (Canada Wildlife Service and Bird Studies Canada) nightjar protocols, in particular during moonlight.

Early spring attendance confirmed returning Woodcock, Common Snipe, Upland Sandpiper and warblers en route to more northern range such as the Palm Warbler. See Appendices for species lists.

7.2.5 BLACK BEAR

Bear move more in evenings than daytime, and can climb when seeking fruit, nut and buds in trees. Bear also hide young up trees until they return from foraging (en sensu, Banfield, 1974). It is also easy to 'miss' seeing a black bear because they are large ranging mammals, roaming around twenty kilometers for females and up to ten times this distance for larger males.

SAAR noted an excavation in the sand base of the north esker and inspected the area at key seasonal times for any sign of black bear, badger, skunk, fox. There was no sign of denning in 2019 or 2020, and October inspection in 2021 confirmed fox track and scat near the opening. We suggest it prudent to inspect this area again in spring of 2022 to ensure the fox continued to use the area vs. larger mammals. The size of the opening renders it rather small for black bear denning, based on other active sites, but it remains prudent to follow up in this regard.

Color Plate 12: Northerly sandy vein of esker limit with excavation.

This location was inspected on a number of different seasonal visits for potential bear, badger and/or fox activity. Two of the fall inspections found no activity (2019, 2020), with fox scat and track during the most recent October 2021 inspection. This excavation is located at the northwest corner of the esker.

7.6 INSECTS

Species of Concern observed were the Monarch butterfly in meadow habitat on milkweed and odonates within the PSW (Appendices Species List). All habitat support for observed Monarch can be conserved through constraint.

The host milkweed and nectar forbs are included in Option B (Rehabilitation Plan).

8 NATURAL HERITAGE FEATURES

The Provincial Policy Statement (PPS) describes natural heritage in seven categories:

a) significant wetlands
b) habitat of endangered species and habitat of threatened species;
c) significant Areas of Natural and Scientific Interest (ANSIs);
d) significant woodlands (south and east of the Canadian Shield);
e) significant valleylands (south and east of the Canadian Shield);
f) significant wildlife habitat;
g) fish habitat, and, more recently significant coastal wetlands.

8.1 FISH HABITAT

Fish habitat, as defined by the Fisheries Act, c. F-14, includes the spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes. The Act also includes a broader definition of fish as shellfish, crustaceans, and marine mammals at all stages of their life cycles. The Natural Heritage Areas Mapping (MNRF, 2015a), and The Official Plan, were searched for the presence of fish habitat on or within 120 m of the Site.

Although there are no navigable channels on or near site as defined by the Fisheries Act, there is drainage. The overland flow in the northwest quadrat did support cyprinids in spring but not summer.

Thus, a 15m setback from field drain to the dug pond and northerly to the fencerow drainage is required.

8.2 SIGNIFICANT WETLANDS AND COASTAL WETLANDS

Wetlands are defined in the PPS (OMMAH, 2014) as lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. There are four major wetland types, which are classified as swamps, marshes, bogs, and fens. A significant wetland is defined as an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the province, as amended from time to time (OMMAH, 2014). Accordingly, it is the responsibility of the MNRF to both identify and classify wetlands as significant in Ontario.

A large wetland complex of provincial status known as the Keldon Swamp Wetland Complex falls east and west of the esker sought for aggregate. Seasonal surveys establish setbacks and timing mitigation from valued ecosystem components of the PSW, and no extractive activity enters the PSW. The extraction is for an above water pit, thus no reasonable concern for altering groundwater is anticipated. See GSS hydrogeology report submitted under separate cover for detail on this aspect of investigation.

Wetland setbacks range from 15 to 30 metres depending upon needs of the supported ecology.

8.3 SIGNIFICANT WOODLANDS

Woodlands are defined as “treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities, and the sustainable harvest of a wide range of woodland products. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial levels,” (OMMAH, 2014).

The County of Grey Official Plan policy on significant woodland notes that ``no development or site alteration may occur within Significant Woodlands or their adjacent lands unless it has been demonstrated through an Environmental Impact Study, as per section 2.8.7 of this Plan, that there will be no negative impacts on the natural features or their ecological functions. The adjacent lands are defined in section 6.19 of this Plan``.

SAAR finds the forest east of the esker meets all three of the following Grey OP criteria:

a) Proximity to other woodlands i.e. if a woodland was within 30 metres of another significant woodland, or

b) Overlap with other natural heritage features i.e. if a woodland overlapped the boundaries of a Provincially Significant Wetland or an Area of natural and Scientific Interest, or

c) Interior habitat of greater than or equal to eight (8) hectares, with a 100 metre interior buffer on all sides.

The study site esker is flanked to the east by a sizeable forest patch well over the 40 hectare standard recommended as a significant woodland area. The east forest also contains in part, a PSW. We find this is considered an overlap with other natural heritage features noted in b) above. The easterly forest also meets a) above as the northeast tip of the forest patch connects via a hardwood block to the next large forest extending easterly off the study site parcel. This in part shaped our suggested rehabilitation plan to further bolster forest cover between the east and west PSW complexes on the study site by reforestation effort.

Also, whether using the specific 200m interior buffer metric tool for interior forest birds (Province, EcoRegion 6E SWH Criteria for interior forest bird SWH), or the 100m interior buffer of c) above for significant woodland calculation irregardless of interior values, the east forest patch meets interior forest criteria established by the Province.

This has been detailed in the NETR, and the significant woodland in part shapes the type and location of shrub and tree plantings to achieve a forested corridor over time between PSW units through the opportunity of the Rehabilitation Plan.

8.4 SIGNIFICANT VALLEYLANDS

The PPS (OMMAH, 2014) and lower and upper tier Official Plans, reflecting the PPS, describe valleylands as “a natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year”. To be considered significant, valleylands must be ecologically important in terms of representation or amount, and must contribute to the quality and diversity of an identifiable geographic area or natural heritage system (OMMAH, 2014).

Development and Site alteration may be permitted in significant valleylands if it has been demonstrated that there will be no negative impacts on the feature or its ecological function.

Valleylands were not encountered on or 120m from the site.

8.5 SIGNIFICANT AREAS OF NATURAL AND SCIENTIFIC INTEREST

Significant Areas of Natural and Scientific Interest (ANSI) are defined as areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education.

The site is bisected by an earth science ANSI known as the Keldon Esker ANSI. This landform is fragmented on the landscape, with a portion that continues north of the site known as the Keldon Esker North ANSI.

The esker portion sought for extraction was assessed for current condition (borrow pit disturbance), broader geological ANSI theme criteria within the eco-district (other eskers?) and possible impact to adjacent PSW after extraction in other sections of the report (S.10).

SAAR reviewed the history of the landforms on the site, captured well in the Ontario Geological Survey (OGS) reporting of past glaciation activity during the quaternary era. We confirmed that a number of esker formations were created, and that the Keldon Esker is not the only or best representative example of this era within the township; the Keldon Esker has natural breaks in the ridge – and man made breaks for extraction, an example of a previously disturbed esker.

8.6 SIGNIFICANT WILDLIFE HABITAT

Wildlife habitat is defined as areas where plants, animals and other organisms live and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual life cycle and areas that are important to migratory or non-migratory species (OMMAH, 2014). Wildlife habitat is referred to as significant if it is ecologically important, in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System (OMMAH, 2014). Development and Site alteration within significant wildlife habitat is not permitted under the PPS (OMMAH, 2014), and the applicable Official Plans.

SAAR confirmed the following SWH on and/or adjacent to the parcel:

Forest interior breeding bird habitat NE (Veery), also Special Concern Eastern Wood Pewee

Northern Ribbonsnake foraging and breeding habitat CW up to and including brush pile on cart trail

Potential large mammal den NW sandbank at northerly portion of esker, current fall 2021 sign of fox

Savannah Sparrow grassland bird in decline 150m NW of parcel in open grassland

Boreal affinity non-vascular mosses on riparian creek (NE and also near the parallel east esker off site)

Northern Ribbonsnake	Specially Protected Reptile Special Concern	OFWCA SARA	15m setback from esker
Monarch Butterfly	Species of Concern	SARA	Habitat constraint

Although “Special Concern” listed species do not receive species or habitat protection under the Species at Risk Act (SARA) the necessary elements of their life cycle needs have been reviewed by SAAR and this information informs both the Operation Plan setbacks, and the future Progressive Rehabilitation Plan. This action is taken to help avoid an upgrading in species listings, accommodating reasonably for all.

An example of this is the habitat requirement of the Northern Ribbonsnake. The wetland habitat yields the food crop (amphibians, insects) required by the snake, and provides by the hummocky topography and deadfallen vegetation structure abundant hibernaculae options. Thus the key parts of their life cycle requirements are met. Typically in built out areas domestic pets can prey upon the snake, however this relatively remote land does not provide cats and dogs, limited to raccoon predators.

The cart trail to the west of the esker, if altered or extensively used, could be a potential impact due to road mortality (vehicle – snake collisions). The proposed access to the aggregate along the esker will not use this farm cart trail; the resource would be accessed along the actual esker, extracting from the northern license limit and travelling along the cut base of the esker itself. Thus the ribbonsnake is not at reasonable risk of vehicle collision; this snake is not a known climber of sandy cut banks and we do not anticipate it climbing the sloped edges of the esker landform onto the active extraction area.

The Monarch butterfly resources of milkweed are found in profusion in the fallow field edges, with specimen milkweed also on the disturbed top of esker from what appeared to be prior borrow pit clearing activity. The host plant and nectaring plants used by the Monarch form part of the planting list for the final outer slope edges (base 1m height above ground level) and are included in the Rehabilitation Plan.

The forest block also met criteria for Significant Wildlife Habitat support using the 200m metric from forest edge for interior forest birds (Provincial EcoRegion SWH Schedule) and our field survey results. The east forest block supported interior forest species, and provides abundant interior for the Veery and other birds censused there.

8.7 HABITAT OF ENDANGERED AND THREATENED SPECIES

The PPS (OMMAH, 2014) defines the significant habitat of endangered or threatened species as the habitat, as approved by the MNRF, that is necessary for the maintenance, survival and/or the recovery of a naturally occurring or reintroduced population of endangered or threatened species, and where those areas of occurrences are occupied or habitually occupied by the species during all or any part(s) of their life cycle.

Species, conservation rank, regulatory statute and location on/off the study site are:

Bobolink	Threatened Conservation Status	ESA	150m NW off site

8.8 SEASONAL CONCENTRATION AREAS

No seasonal concentration of waterfowl, winter deer yarding, etc. was documented on, or within 120m of the proposed licence area.

The wetland record for the broader Keldon Swamp PSW documents colonial waterbirds (e.g. Great Blue Heron possible within the catchment basin, species was not noted in the wetland record), however this type of wildlife concentration did not occur on or adjacent to the site.

Migration activity was recorded by SAAR, in low number, and included American Woodcock, Common Snipe, Upland Sandpiper, Black Duck and Provincial abundance criteria for these species in EcoRegion 6E were not met.

8.9 WILDLIFE CORRIDORS

PPS 2.1.2 The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.

8.9.1 BLACK BEAR

An additional spring site inspection is recommended at the excavated structure to confirm whether the fox sign in October 2021 is followed consistently by fox in spring of 2022 or other mammals such as the black bear, badger, skunk.

9.0 TRADITIONAL SIGNIFICANCE

It appears that circa-lunar rhythms that wildlife entrain themselves to can also be echoed in historical uses across north America by first nations. Uses can include the harvest of wild rice, sweet grass, ginseng, grouse, bear, white cedar and more.

SAAR included such searches in our seasonal inventories. Our findings agree with the original MNRF PSW surveys regarding no suitable habitat for wild rice; areas of standing water in the marsh components and shrub swamp are shallow without substantial flow and no wild rice was observed on or within 120m of the proposed licence area. Sweet grass was potential in the habitats but not located. Treed wetlands did not provide suitable sloped aspect hills dry enough to support ginseng, although Ruffed Grouse was supported on the lands, and constrained from the extractive activities through setback. White Cedar is abundant throughout the catchment basin and beyond, and is not subject in this manner to loss of representative value, nonetheless it is not removed in substantive amount because the dense cedar component is found within the provincial wetland which is constrained and setback.

9.1 LANDSCAPE

The traditional socio-economic uses are a sacred trust that the written word I suggest may not fully capture. However some measure of quantitative analysis is included here by the author with full respect in order to expand the existing paradigm of “significance” measuring for wildlife species and habitats currently presented in the Planning Act.

This is for ultimate purposes of evaluating natural heritage in a more robust manner that accommodates for both cultures. Thus SON clan animals are treated as “significant” in an even handed sense similar to the Planning Act “significant” quantitative tools for natural heritage. What can be viewed as “weedy” species, if useful for medicinal and/or spiritual use, were inventoried and conserved from licence area.

Examples of these common status flora in Ontario, on site, are Dandelion, Chickory, Knapweed and the cart trail west of the esker supports these flora which are constrained from aggregate activity. Portage and walking routes to access seasonal concentrations of wildlife for harvest were and are important, and these access points were searched for during our surveys. There is a cart trail system that appears to be agriculture based to access long term farm fields. This is supported by the added notes from original PSW surveyors (2008) indicating crop and pasture within the basin, the historical aerial photography indicating greater extent of farmed fields and openings, and present day evidence of farming such as the corn crop on the southwest perimeter of the lands.

9.1.2 PLANTS AND ANIMALS

Ethnobotany records for south central Ontario include long term harvest of fish, timber, maple sugar production, plant gathering for medicine and spiritual cultural events as well as foods. Many of the herbs noted in early Midewin medicine practices are present within this catchment basin and others in the southcentral Ontario range, here in the treed wetland forest types setback from extraction. The Rehabilitation Plan would not install nut bearing trees used by the black bear for instance, such as Red Oak, American Beech, Black Walnut, Basswood and others, to avoid human camping and bear conflicts.

A measure of herbs for concoctions are supported in coniferous habitats on site (FOC) of White Cedar and Balsam Fir and include plantain, beebalm, solomons seal and wild lily of the valley. Coniferous treed swamp is retained as it is captured within the PSW limits as well as the additional candidate PSW lands ground truthed in sections by SAAR (2020, See ELC Map).

9.1.2.1 ETHNOGRAPHIC ACCOUNTS

Midewiin records were reviewed for historical reference and plant uses to inform the Rehabilitation Plan planting detail. Records from first nations interviews were transcribed by an anthropologist from early medicine women known as Midewiin or Mide.

9.1.2.2 CONTEMPORARY ACCOUNTS

Emma Helen Blair (1969) notes the traditional calendar which names lunar months by seasonal wildlife events. For example, September is referred to as Trout moon, November Herring Moon, March Carp moon (Blair in: Koening, 2007). Seasonal wildlife surveys on the study site captured the key moon phase triggers for species including salamander breeding and nightjar surveys.

9.1.2.3 HARVEST OF PLANTS AND ANIMALS

A robust traditional verbal history of travel and use of traditional territory can include harvest of plants for food and medicine as well as harvest of fur bearers for skins, food and medicine.

Published uses by aboriginal first peoples in central Ontario include seasonal collection of White Cedar to make wreaths, use of Black Ash outer and inner bark (cambium) for basket weaving, harvest of fur bearers including beaver, muskrat, porcupine for diverse uses including crafts, clothing, food and medicine. Porcupine quill is used for instance in making intricate jewelry including quill boxes.

10 IMPACT ASSESSMENT

Rehabilitation Plans include reforestation to provide a net gain in this respect over time; the esker gap between the provincial wetland lobes would be filled in over time with vegetation for a safe, wider treed movement corridor and breeding habitat for wildlife, increasing the present day interior forest area.

This section of the NETR looks at site level effects, such as noise, dust, lighting, as well as landscape level effects such as multiple aggregate sites nibbling in a cumulative sense over time and impacting the resources on a longer time scale. These possible effects are discussed in the following section.

10.1 HYDROLOGY EFFECTS

Removing part of the esker, approximately 5.77 hectares (14.25 acres), represents 2.5% of the inferred drainage area (GSS, 2021).

10.1.1 STORMWATER RUNOFF

Biologists and engineers liaised on hydrology, hydrogeology and the different stages of site alteration, as well as the notes and conditions for the final Rehabilitation Plan. One of the aspects of potential effect to adjacent PSW elements is the contribution of overland stormwater flow. This can introduce changes in wetland surfacewater quality and quantity and has been explored below.

Site alteration steps include first removing topsoil and subsoil in the areas where the sand and gravel is not exposed. SAAR has observed storm runoff during this stage of site clearing for various land use activities, with mitigative measures employed to maintain surfacewater quality and quantity on site.

It is our understanding from discussion with GSS that once topsoil and subsoil is removed, the underlying sand and gravel can likely increase infiltration due to the porosity of the material on site. Thus less runoff from stripped areas rather than more, and this sounds counter-intuitive given also the esker slopes. So discussion ensued, and SAAR appreciated from GSS the following factors mitigating risk:

- at least 0.3 m of topsoil and subsoil will be stripped in advance of the extraction
- this leads to a minimum 0.3 m high vertical wall of soil at the east and west margins of the stripped areas
- the narrow esker landform itself, coupled with meeting the high vertical wall described above, aids in restricting runoff down the esker slopes, and enhances infiltration

SAAR AND GSS decided during our liaison on this matter that a note would be added to the Operational Plan to the effect of:

“To reduce the potential for surface runoff to the adjacent wetlands from areas that have been stripped, stripping shall occur no more than 150 m in advance of the working face. Shallow swales shall be constructed at the east and west margins of the stripped area to direct excess runoff in a southerly direction toward the area of extraction, where it will infiltrate into the pit floor.”

Team engineers recommended a suite of monitoring conditions to be captured on Operational Plan notes as summarized from the GSS (2021) hydrogeology report to ensure continued water quality and quantity.

The pit floor would have a generally south to north slope of approximately 0.005. Thus, storm water at margins of the stripped vegetation would flow northerly rather than southerly toward the pit floor. In this location the surface flow is managed by infiltration; shallow swales designed at margins of the stripped areas will facilitate this. The shape of the esker, compared to many traditional pits and/or quarries, is a long narrow strip of aggregate; this assists in controlling the runoff since the aggregate can only be mined in a northerly direction. The esker shape makes it easier to control, and monitor, the area of stripping. This site condition, clarified during team liaison with GSS, which promotes both reduction in typical storm runoff and enhanced infiltration at the stripped areas, is consistent with post-extraction conditions evaluated in the water budget (GSS Hydrogeology Report, 2021) considered to have a negligible effect on the adjacent wetlands.

10.1.2 MONITORING

- Existing site monitoring wells (MW1-4), staff gauges (SG1-3) and piezometer P1 would be monitored for one year after issuance of the hydrogeology report capturing a minimum three spring events (March-May) and one event each in summer and fall
- The above sampling would continue after pit approval a minimum three times per year in spring, summer and fall for the first three years of extraction
- GSS would then prepare a summary report of monitoring data and review with MNRF to determine whether the monitoring information is sufficient at that time

SAAR reviewed the monitoring program recommended, and finds it sufficient to characterize and confirm whether the adjacent PSW hydrological regime is sufficiently maintained to continue providing seasonal conditions for wildlife use at surfacewater drainage and vernal areas of high water table and/or spring and fall precipitation collection areas.

We find the water monitoring coupled with our recommended ecological indicator wildlife species monitoring provides a robust characterization of possible extraction effects on wildlife.

10.2 OTHER EXTRACTION SITES

When reviewing the extent of existing similar land uses across the township, this is limited and specific to adjacent lands of the proposed licence, sustainable. This is based on:

- Observed wildlife corridor function presently near and in the existing southern licence (SE of esker) flowing across the road onto the treed portion of the other extraction site

The February 2020 GSS memo indicated that ARIP 51 (1981) identified 3 licensed pits within the Keldon Esker in Proton Township and also 4 licensed pits in the esker after 1981. There is also at least 1 additional pit nearby but not on the esker. Detail on these extraction areas is provided below.

Licence detail includes licence 4877 (Township of Southgate), 5112 (Jerry Jack), 4953 (1765508 Ontario Inc.), and 4875 (Town of Grand Valley). The closest licensed pit (4875) of potential to be considered a possible cumulative impact to natural heritage features such as wildland forest corridor cover, is south of Southgate Road 04 also on the Keldon Esker ANSI. There is currently a gravel-pit pond at this below-water licence; the site is approved for below-water extraction to 485masl (ARIP 51 in GSS, 2021).

The esker landform, after a “break” in the landform with agrarian land use, continues north between Southgate Road 10 and Grey Road 9. MNRF mapped this part of the Keldon Esker as Keldon Esker

Northern Extension under separate ANSI designation, perhaps acknowledging the fragmentation and other land uses.

10.3 TREE LOSS

The key provincial criteria used to assess woodland loss is the amount of regional forest cover.

Southgate is 23% forested; 14,899 hectares of forest over the 64,561 hectare municipal lands, and the County is 44.6% forested (Grey County data, 2021).

From a tree loss perspective, much of the esker top of bank tree cover was removed during prior borrow pit activity. Assuming the 5.77 hectares is fully under tree cover – which it is not – for a worst case scenario the 5.77 hectare area to be removed represents 0.04% of the tree cover in the planning area (14,899 hectares of tree cover in the lower tier planning area, the municipality).

This analysis confirms no negative impact to regional woodlands. Required rehabilitation under the ARA can yield a net gain in future forest area. SAAR is recommending that a link be created between the east and west PSW forested core areas through reforestation efforts (See Appendix A Rehabilitation Plan Options). The extractive land use thus offers us the opportunity to plant a forested link to facilitate safer wildlife travel across this portion of the landscape. Wildlife currently leaving the protection of forest cover, like the fox on and near the site, subject themselves to the risk of predation in the currently open fallow farm field at the north end of the study site.

Specific to removing a portion of an earth science provincial earth science areas of natural and scientific interest (ANSI), SAAR assessed the OGS (Ontario Geological Survey) field data record of provincial and regional ANSI to confirm the amount of other esker landform in the planning area. Representation is a guiding tenet to evaluate for natural heritage features (MNRF Provincial Natural Heritage Reference Manual) before considering removal. Our analysis confirmed that a handful of other esker landform remains in the planning area after extraction of a portion of the esker on the study site.

We find no cumulative effects on provincial wetland firstly given the available setback of extractive activity from the esker, and secondly based on the life cycle requirements of the ecology supported in the PSW.

The features and functions the entire PSW is known for include:

- Winter cover for wildlife (e.g. White-tailed deer, Ruffed Grouse, Snow-shoe Hare)
- Regionally rare Showy Lady`s-slipper
- Colonial Waterbird Feeding
- Waterfowl

10.3.1 CONDITION OF ESKER

The proposed area of sand and gravel extraction is directed to the portion of esker previously cut, and disturbed; vegetation was removed a few decades ago, and reflects this by the early succession vegetation on the esker present day. Vegetation includes Aspen, young Maple further north, and weedy ground cover including Chickory, Mullein and others.

Trees on the side flanks of the esker landform are separated from the PSW east and west units by the esker landform and distance. The esker landform is abutted by cart trails and open meadows and thus not part of a significant contiguous woodland unit.

10.3.2 SIGNIFICANT WOODLAND CALCULATIONS

The Province does not invoke forest patch size standards for conservation when forest cover is greater than 30%, but does when below this threshold as is the case with the Municipality of Southgate. We reference the County of Grey Official Plan in this regard for the methodology to assess significance.

Criteria to assess woodland significance is provided by the Grey County Official Plan (S.2.8.4) developed with assistance from the MNRF. The Official Plan criteria for woodland significance are laid out below to illustrate the steps taken in our analysis.

1. "Woodland must be either greater than or equal to forty (40) hectares in size outside of settlement areas, or greater than or equal to four (4) hectares in size within settlement area boundaries. If a woodland fails to meet the size criteria, a woodland can also be significant if it meets any two of the following three criteria:

a) Proximity to other woodlands i.e. if a woodland was within 30 metres of another significant woodland, and,

b) Overlap with other natural heritage features i.e. if a woodland overlapped the boundaries of a Provincially Significant Wetland or an Area of Natural and Scientific Interest, or

c) Interior habitat of greater than or equal to eight (8) hectares, with a 100 metre interior buffer on all sides" (County of Grey Official Plan).

1. The woodland is not located within a settlement area, thus the size standard of 40 hectares is to be assessed. Are forest patches (Treed Areas A and B, Figure 9) 40 hectares or larger in size?

   Yes when measuring the entirety of the forest patch beyond parcel limits.

a) Treed Area B is proximate to another significant woodland (within 30m of SVCA Block)

b) Treed Areas A and B both overlap other natural heritage features, supporting in parts the Provincially Significant Wetland and the ANSI, and,

c) Treed Areas A and B support 8 or more hectares of forest interior using the 100m treed edge buffer *

*****Using contiguous forest patch extending off site, without the 20m road gaps, Treed Area A is approximately 329ha with a 75ha interior, while Treed Area B is 230ha with a 37ha interior.

Following the Grey County OP dichotomy above, tree cover meets the criteria for Significant Woodland.

Figure 9: Key Map of Significant Woodland A and B Analysis

Both the east and west PSW units met the definition of woodland in the Grey County OP:

"WOODLANDS means land that is one hectare or more in area with at least:

a) 1000 trees, of any size, per hectare;

b) 750 trees, measuring over five (5) centimetres/1.96 inches in Diameter at DBH, per hectare;

c) 500 trees, measuring over twelve (12) centimetres/4.72 inches, in Diameter at DBH, per hectare; or

d) 250 trees, measuring over twenty (20) centimetres/7.87 inches in Diameter at DBH, per hectare;

e) But does not include a cultivated fruit or nut orchard or a plantation established for the purpose of producing Christmas trees.

The O.P. permits cutting of woodland areas within “Significant Woodland” to facilitate mineral aggregate operation “where it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. If this can be demonstrated, cutting of the woodland should be minimized and the woodland area cleared for extraction shall be progressively rehabilitated back to a woodland” (2013 O.P., p. 58 (10).

Thus, where treed areas met the Significant Woodland criteria, and where sections of forest support significant species meeting “Significant Wildlife Habitat” criteria for the interior forest bird values, these areas have been setback with broader dimensions, assessed for aggregate activity effects, and mitigated.

Figure 10: Lower level calculation, accommodating for any 20m gaps as guided by Provincial Technical Documents, including Southgate Road 4 and internal farm roads.

This site level analysis still yields abundant interior forest greater than 8 hectares (greater than 50ha) and continues to confirm significant woodland by the area of the forest cover alone (75ha vs. 40ha standard).

The forest block also met criteria for Significant Wildlife Habitat support using the 200m metric from forest edge for interior forest birds (Provincial Eco-Region SWH Schedule) and our field survey results.

The Grey County Natural Heritage System core area criteria were also used to assess site conditions. The NETR confirmed area gaps between the east and west forests and wetlands of past and current agrarian use. This includes a cart trail that accesses northerly pastured lands off site. The open areas exceed the criteria (0.5ha area and 100m separation between cores). We confirmed the east and west forests are separated by more than 100m at numerous points. The openings meet the NHS terminology of a gap and have been identified as a restoration opportunity area in the rehabilitation plan.

11 ECOLOGICAL CRITERIA

Interior forest is identified using 120m edge effects based on field observations of introduced flora, bird diversity and species composition as well as the level of incursion into the forest by humans for recreational use.

The site and surrounding lands do contain conservation status birds such as the Special Concern Eastern Wood Pewee, and interior forest breeding birds. We evaluate the possible effects of esker extraction on these forest, and wetland values for the two areas meeting Significant Wildlife Habitat provincial criteria in the following section.

This ecology layer informs the final limit of extraction, and the progressive rehabilitation notes for the Operation Plan.

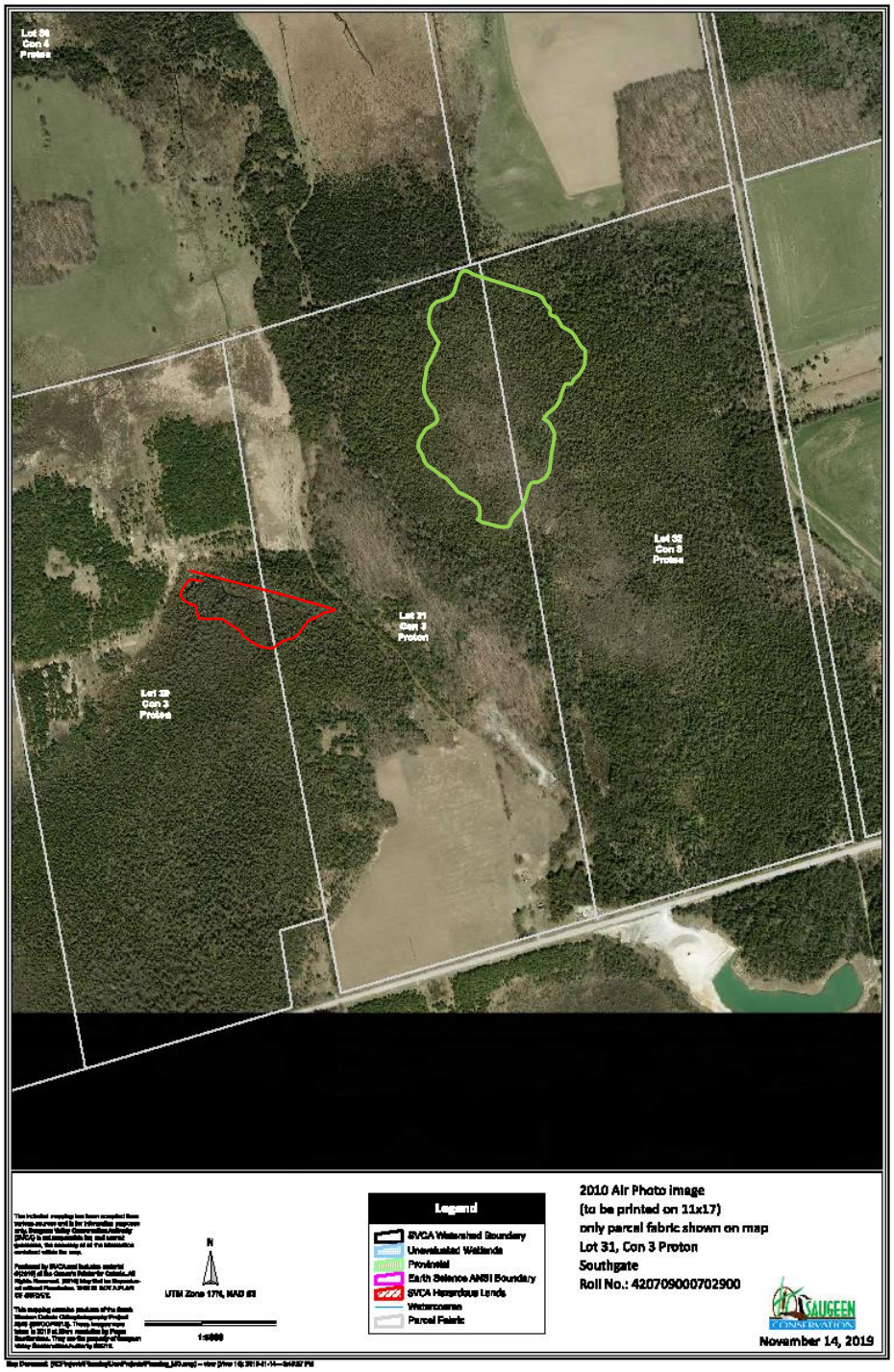


Figure 10: Significant Wildlife Habitat areas that met PPS, MNRF criteria included habitat for Northern Ribbonsnake, forest interior breeding birds and potential black bear (wildlife use at a burrow was later confirmed to be eastern fox in 2021).

The northeast (green) area captures the observed functional habitat support of the interior for Eastern Wood Pewee, Veery, Wood Thrush, Ruffed Grouse, Pileated Woodpecker and more.
The central west wetland (red) area captures the observed functional habitat support of the Northern Ribbonsnake, Spotted Salamander and migrating Spring Peeper, Chorus Frogs and a few Wood Frogs.

Veery

These birds of moist forests nest on the ground, making them more vulnerable to predators. Forested wetlands yield summer insects to feed on, also amphibians, with fruit later in summer.

Flora recommended for Rehabilitation Plan A of use to this bird as foodstuffs include:

- Pincherry
- Honeysuckle
- Staghorn Sumac
- Alternate-leaved Dogwood
- Elderberry

The breeding location was in White Spruce with Trembling Aspen, Large-tooth Aspen and Red Oak (FOM) NE of the north section of esker. There were a few forest openings which often prompt successional re-growth of forest elements. This is a positive effect for Veery because the diverse vertical forest layer of vegetation (forbs, shrubs, sapling trees, tall shrubs through to tall trees) provides greater areas to hide their ground nest on the forest floor.

Although this bird can have a second brood we confirmed one breeding event based on male display and female presence through breeding months in the same habitat. Manitoba setback guidelines were also consulted as well as Ontario protocols (CWS) to evaluate what other researchers are recommending for setback distances from various sensitive species for different levels of disturbance. Disturbance categories for assessing setback distance ranged from low through high:

“Low
e.g.: foot traffic; occasional/infrequent/short-term small vehicle (<1 ton) or ATV use; operating oil or gas wells without flaring; operating pipelines

Medium
e.g.: trucks>1 ton (gravel, oil, grain), regular/frequent/long-term small vehicle (<1 ton) or ATV use, pipeline construction (diameters <1 foot), operating compressor station or battery without flaring

High
e.g., road construction, roads, drilling rigs, mines and quarries, construction of compressor station or battery, forest harvest, large diameter pipeline construction, seismic exploration, blasting, rock crushing, asphalt batching, gravel pit, operating compressor station or battery or oil/gas well with flaring”

11.1 FOREST BIRDS

In many cases it will difficult to identify the exact location of a nest, and intensive efforts to do so may disturb breeding birds and/or their nests. In such cases, determining the main home range, territory and/or song perches through auditory song/call surveys and low-intensity visual observation, are recommended to determine the approximate location of nest sites. The setback distance should then be applied to this approximate location. SAAR followed this approach since the early morning bird chorus recorded during roving surveys was invoked to document ecology without high disruption.

Taking the life cycle requirement research, applied science, and location of the breeding Veery and other interior forest birds into consideration, SAAR recommended a noise setback of 50m from the limits of the Significant Wildlife Habitat for the interior forest breeding birds including the Veery at the NE PSW.

11.1.1 EASTERN WOOD PEWEE

This bird was heard calling in forest at the NE woodland, but not nesting. Since there is potential for nesting, the aggregate noise, dust, lighting effects have been considered and setback.

The Pewee is considered a “Species of Special Concern” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). It did not meet criteria for population decline to raise status to Threatened; the EWPW does not have a small restricted total population (See below range). NatureServe ranked the EWPW as ‘globally secure’ (G5) and the IUCN Red List respectively ‘Least Concern’.

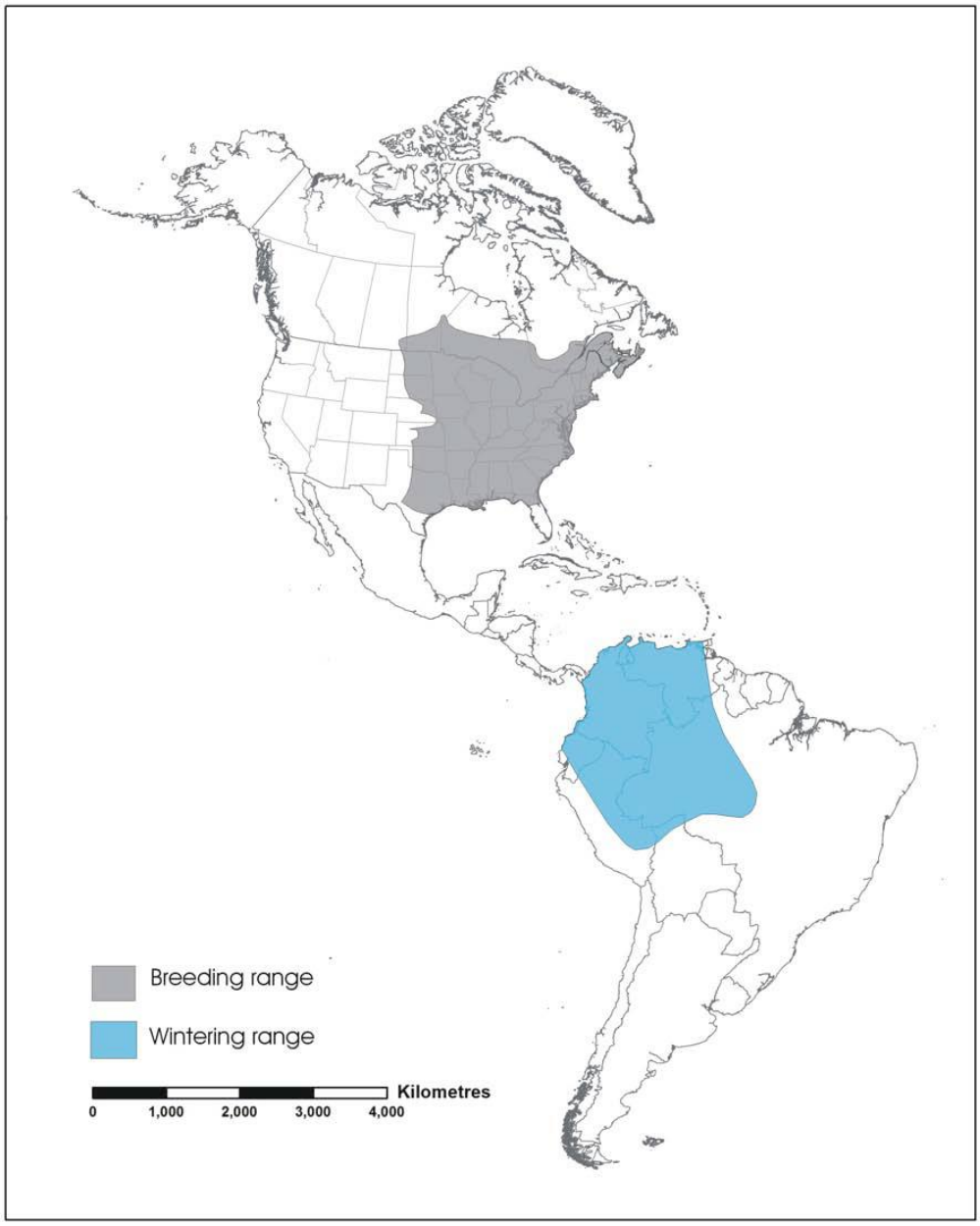


Figure 11: Range of the Eastern Wood Pewee (COSEWIC 2012).

COSEWIC describe the Eastern Wood Pewee (EWPW) as a most common and widespread songbird of North American eastern forests, resilient to many kinds of habitat change similar to other birds that forage on flying insects; a mobile food source.

Monitoring and survey programs yield different results of rebounding or declining numbers for the estimated 217,500 breeding pairs in Canada. The EWPW decline is not understood but COSEWIC noted it may be linked to loss or degradation of wintering habitat in South America (COSEWIC, 2012). COSEWIC notes the EWPW occupies the mid canopy at forest clearings and edges of hardwoods in summer more than mixed forests where canopy layers are absent or sparse.

There are no contiguous hardwood forest patches on site but the mixed forest and openings provides for some potential nest habitat for the bird. We confirmed the bird during early morning bird song surveys but had no nest evidence.

Looking at the habits and needs of the EWPW, it is a bird that colonizes new habitats in spring – not site tenacious – and arrives in late May advertising through bird song and behavior to attract a mate.

Potential for the EWPW can be maintained over time through standard mitigation:

- Consistent loud noise could affect the ability of the male EWPW to be heard singing or seen, potentially affecting securing a mate, courting and breeding. This would again be true later if the pair or different pair attempted a second brood
- Removing or degrading surfacewater input to wetlands could affect insect clutches produced off the wet land and limit one part of the Pewee food base. Other insects COSEWIC reports the bird is known to hawk from the air include species from Diptera, Homoptera, Lepidoptera, Hymenoptera, Coleoptera, Orthoptera, Plecoptera and Ephemeroptera
- Removing mixed forest with no shrub canopy layers and some forest openings; one field study in southern Ontario noted territories for the bird averaged 1.76ha +- 0.24ha for 26 pairs in deciduous forest, and 27 pair in pine plantation (Falconer, 2010)
- Clearing some forest increases the existing forest edge effects. The EWPW is not prone to predation from the edge invaders such as the Brown-headed Cowbird and this potential effect is not a substantial risk for this insectivore; i.e. it is breeding in natural openings within the forest that exert edge effects and support observed predators already; Raccoon, American Crow, Red Squirrel, American Blue Jay, Brown-headed Cowbird.

EWPW MITIGATION

- In Canada, EWPW nests and eggs are protected under the *Migratory Birds Convention Act.* A biologist must inspect the site before extraction to confirm presence/absence of an active nest, a standard BMP

- Falconer (in: COSEWIC) recommended maintaining mature trees greater than 40cm dbh in deciduous forests, and > 32cm dbh in pine plantations. This configuration is not on site but larger poplar stands are present, adjacent to the esker, and are retained with the design of accessing the esker material on the esker landform itself vs. the external trails at the base of the esker

- COSEWIC research summaries also recommend selection cuts to create small openings in forest canopy; intuitive as openings and linear openings in particular offer insects a flight path, and their predators, be they birds or bats, a runway to capture them. We've examined the habitat which already provides natural openings, thus selection cuts are not required

We reviewed thesis material for a worst case scenario of immediate bothering of bird nests; hikers in forests vs. our site of vehicles on an esker beside a forest. The applied research was helpful, showing that hiking trails, when setback from the forest nests to 65m, resulted in increased nest success for some forest birds like the Rose-breasted Grosbeak, but not the EWPW. The Pewee favored forest openings by the trails.

This plasticity of the EWPW to hikers, trails and forest openings suggests our setbacks and retention of the PSW forest cover – inherent with its natural forest openings from blow downs – continues to provide the habitat required and used by the Special Concern EWPW bird and other forest bird assemblages.

Indirect effects of extractive activity could include night lighting and machinery noise and these have been examined and potential risk met with recommended mitigative measures.

Although these elements (EWPW, Veery) are not originally what the PSW is known for, nor the earth science ANSI feature, they are ecological features supported in the adjacent PSW. Thus we assessed the feasibility of the proposed land use relative to some of these indicator species to evaluate whether the above water pit meets the PPS test of no negative impact.

11.1.2 WOOD THRUSH

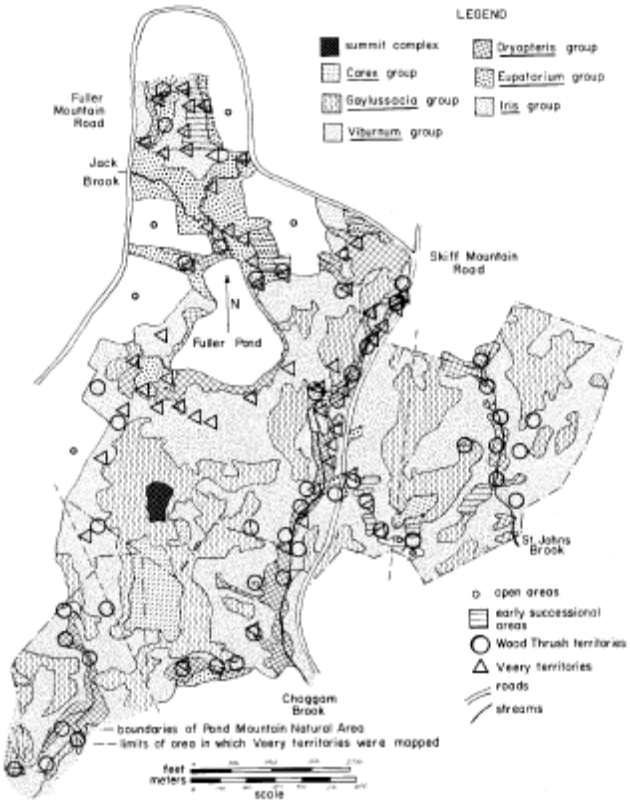
Field studies have statistically measured little effects on nest success due to silvicultural openings; openings in managed landscapes such as clearcut borders did not elevate nest predation rates (Schlossberg et al., 2008). Creating early successional shrub habitat clearings at forest edges had little effect on Wood Thrush nest success (Schlossberg op cit), consistent with some previous studies reporting that clearcut borders have little effect on nest success in adjacent mature forests (Hanski et al. 1996, Schmiegelow and M€onkk€onen, 2002, Gram et al. 2003). Edge-related nest predation may be less pronounced in extensively forested landscapes. The studies that did report, conversely, on edge-related nest predation near clearcuts were of ground nesters, not above ground nesters like the Wood Thrush.

Habitat characteristics of 55 Wood Thrush and 61 Veery territories in western Connecticut were examined quantitatively to determine preferred habitat features and interspecific habitat differences. Both species tended to select sites with the wettest ground. Proximity to water and density of understory cover may have been important to a lesser degree. Wood Thrushes required trees greater than about 12 m in height, perhaps for use as song perches. The major habitat difference was the absence of Wood Thrushes from thickets and early successional woods, which contained Veeries. In mature w00aha, Veeries occupied sites which, on average, had cooler microclimates, as reflected in abundances of certain plant species.

Trees are retained and setback in the PSW; tree height is a factor when courting perching and singing for the wood thrushes; Wood Thrushes sing their prolonged evening serenades from the tops of tall trees while Veeries sing mostly between heights of 2 and 8 m, even in mature woods (Eaton 1914, Forbush 1929, Bertin, 1977).

PRESENCE/ABSENCE

In regard to the study site, SAAR documented Veery acoustic song approximately 160m from the northeast PSW limits. We have recommended monitoring for presence/absence of Veery on a two year rotation.



Bertin (1977) field results of Wood Thrush and Veery habitat use

The Wood Thrush nests and often calls in mature deciduous moist to wet forests, but also uses early successional shrubland after fledging.

Seminal field studies have shown that creating such openings assists in this regard, and does not result in a negative effect on nest success IF the regional landscape is one of large mature woodland. That is the case for this study site as well; the early succession patches that exist present day on some portions of the esker and in the adjacent open meadows, are located amidst a mosaic rubric of older and large forest blocks.

The science coupled with our field observations of the Wood Thrush inform the Rehabilitation Plan options which include a measure of native shrub plantings confirmed on site.

11.1.3 BLACK-THROATED GREEN WARBLER

SAAR also confirmed Black-throated Green Warbler (BTGW) in the boreal coniferous character moist forests of the PSW. The BTGW selects conifers over deciduous trees (n=34 vs. 7, Peck & James, 1987) on branches. Our field data includes most further out on the coniferous (Hemlock-Cedar-Spruce-Pine) branches with substantial cups, Peck and James finding nests also near the tree trunk. It is important to maintain the natural forest floor materials for such nest making; bark strips, mosses, lichen, feather, fur, hair, needle duff.

11.1.4 CANADA WARBLER

This natural forest floor becomes more important for ground nesting birds such as potential Canada Warbler in the PSW. Forest floor structure such as the tree stumps, deadfallen trees, rock fissures, slash piles all provide structure for nest building activity close to or on the ground as the Canada Warbler will use mossy ground cover, mossy hummocks. In this manner a recreational campground after use may be a greater safeguard to forest structure than for instance an estate residential subdivision with less chance of “nervous landscaping” since the lands are not in private ownership.

A key 2006 field experiment by Schieck and Song with a healthy sample size for biostatistical analysis of 110,427 point counts from 32,287 unique survey locations, allowed for non-parametric statistics to model local-level (150-m radius circular buffers) and stand-level (564-m radius circular buffers) habitat associations of the Canada Warbler. Warblers were most associated with older deciduous forests near small incised streams, and more deciduous tree cover at a stand level. There was little evidence that local-scale fragmentation (i.e. edges created by linear features) influenced Canada Warbler abundance. The authors recommended retaining large older deciduous forest stands as a silvicultural management practice to conserve Canada Warbler habitat, specifically stands adjacent to streams through increased riparian setback widths during timber management activities.

Canada Warblers were detected in early seral forest in this study, typically in areas of thick shrubby regrowth near wet areas or areas with larger patches of residual forest within harvest areas with thick, shrubby regrowth rather than one or few residual trees (Schieck and Song, 2006; personal observation). However, such detections were uncommon (see also Schieck et al. 2000, Schieck and Song 2006), and this forest class was unlikely to support a particularly large number of birds. Overall, the habitat associations observed in the study suggested loss of older forest and loss of forested riparian areas may be partially responsible for observed declines of the Canada Warbler in Alberta’s BBS data. Forest conversion, particularly along the southern fringe of the boreal forest, is the biggest threat to birds in the western boreal forest (NABCI 2012). As of 2010, 21% of Alberta’s Boreal Plains Ecozone, which encompasses the majority of Alberta’s northern forest, has been altered by human activity, more than half of which constitutes habitat loss to agriculture (ABMI 2012). Canada Warblers in the study responded negatively to habitat conversion from forest to most nonforest types at the local scale.

SITE APPLICATION

The habitat documented during the aforementioned published field experiments does exist in the east PSW unit, but is limited to pockets of Black Ash pockets. The habitat, as well as the entire PSW, is setback from extraction activity.

The PSW units and adjacent lands also provide other older deciduous tree assemblages of possible value for the forest bird (Poplar, Ironwood, Green Ash) but generally low level wetlands with no slope relief; the esker on site is not a forested unit nor a wetland habitat, and does not offer these habitats. Deciduous tree composition however in the PSW for instance of Trembling Aspen groves was noted, and provided with an extended distance setback from extraction; 30m vs. the general 15m.

Creating forest openings could benefit mature-forest and early-successional birds given observed fledgling success. Powell et al. (2000) detected no differences in wood thrush (*Hylocichla mustelina*) demography between landscapes in which thinning or burning took place and landscapes in which these practices did not occur.

The field research provides reason to be satisfied with complete conservation limits of all PSW forested units with setbacks (15m-30m variable) for the interior forest patches of PSW units to continue supporting the above life cycle requirements of forest interior species.

POTENTIAL IMPACT ON HABITAT

Based on our prior field experience the habitat of the Canada Warbler is characterized by moist ground cover of mosses. Forest floor structure includes vertical layering such as fern canopy, shrub and tree canopy, stumps, deadfallen logs in treed swamp with leaf and moss cushion forest floor. Structure is used by the bird for both nest building but also courtship displays.

Since habitat the bird can use is located in adjacent lands PSW coniferous forest, in particular any patches of deciduous black ash, SAAR explored whether the proposed extractive activity could reduce baseflow contribution of water currently (if currently) directed to the PSW wetlands.

This included evaluating the team engineering data and summaries that characterize the existing water table, as noted below. GSS concluded little to no fluctuation of the water table, and given the 1m separation above the water table for the proposed extraction, we find no negative impact to any potential groundwater contribution to the wetland units that do support possible habitat.

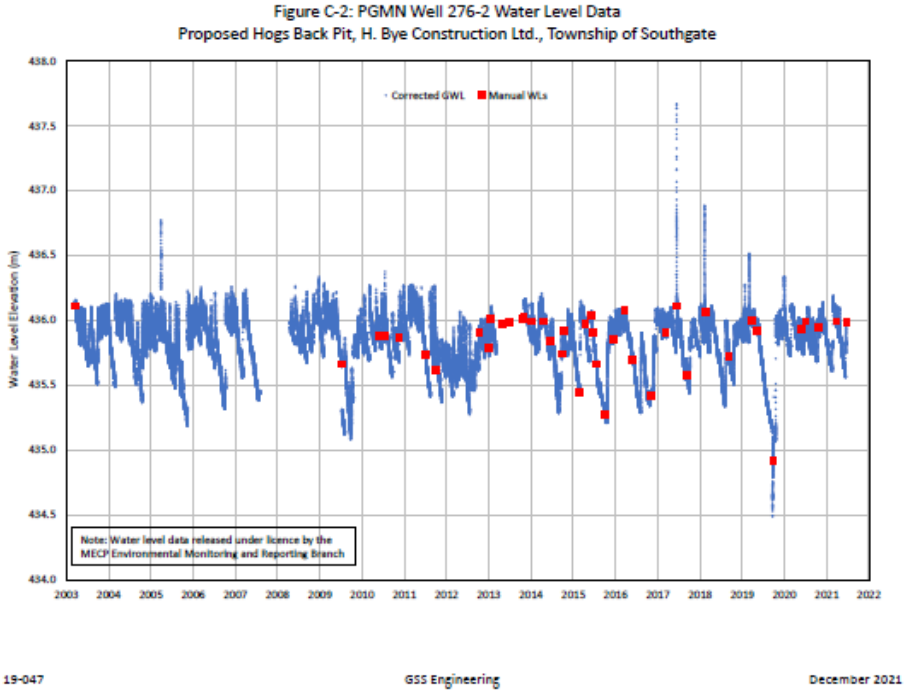


Figure 12: Groundwater level fluctuation is not extreme (Full Size Chart in GSS, 2021).

11.2 UNCOMMON CHARACTERISTICS CRITERIA

Given the boreal like coniferous treed woodlands, and supported boreal affinity indicator species such as the Brown Creeper, the moss, lichen and bryophyte components of the deeper interior forest flanking riparian features may qualify as uncommon within this more southerly positioned eco-district.

The areas of organic wetland and meandering surface drainage in PSW units, both east and west PSWs, is setback from extraction (i.e. 25m-90m) and sustained for the post extraction environment.

The sole potential impact we have observed at another extraction site during peer review audit is one of dust settling on the vegetation. The locations of the mosses, lichens and Eleocharis are buffered by shrub and tree screens so this does not present a realistic concern at the pit operation as proposed.

Phoenix Feather Moss Pleurozium schreberi appears Black Spruce dependent, in NE PSW unit
Common Haircap Moss Polytrichum commune along riparian drainage northeast of esker
Graceful Peat Moss Sphagnum girgensohnii * in organics of both east and west PSW units
Gray Reindeer Lichen Cladina (Cladonia) rangiferina on Balsam Fir not Black Spruce dependent but found in both the wetland and adjacent upland coniferous and mixed forest
Dwarf Scouring Rush Equisetum scirpoides NE wetland quadrat off secondary esker, regionally rare

11.2.1 DUST

Haul route surface dust suppression is recommended for the potential wildlife situated closer than the above noted mosses, lichen and rush. We have observed airborne dust to be a deterrant to herptile life; basking, travelling, feeding snakes, amphibians. Dust can settle onto amphibians, snakes, crayfish within the wetlands; some of the species such as a number of salamanders, can be impacted if they are breathing in part through their skin membranes. This type of potential impact can be mitigated.

Dust suppression is suggested to limit dust entry and settling on adjacent forested wetland wildlife such as watering trucks.

11.2.2 WILDLIFE CORRIDORS

There is potential for wildlife to cross the entire site. In particular, our field observations included White-tailed deer at the east toe of slope esker landform. The White-tailed deer were observed crossing Concession Road 04 into vegetation within the existing southern licenced area during winter track survey.

The PSW units are recommended to be buffered with 15-30m setbacks from the future extractive activities.

Natural heritage reference manuals and guidelines to complement the Planning Act Provincial Policy Statement Natural Heritage Policy indicate corridor widths of 50m (PPS, NHRM 2015). Larger ranging mammals in forest blocks of Banff, Alberta, were reviewed to reference attaining maximum corridor width wherever possible for continued passage (Bow Corridor Ecosystem Advisory Group, Wildlife Corridor and Habitat Patch Guidelines for Bow Valley, 2012). This is in line with the NHRM corridor widths of 50m. Specific to black bear needs for large ranging travel across landscapes, we reviewed Brody's field surveys of 18 radio-collared bear at 1310 locations, monitored from 1982 to 1983, found male summer home range averaged 3205 ha and 6931 in the fall. Females used smaller areas, 872 hectares in the summer and 1712 in fall.

Bears used 50-70 year old Oak glades with acorn mast value. Although their findings and management prescriptions focus on a large federal land holding (The National Forest) Brody set timber management prescriptions to target regenerating 10% of the area each decade to provide a stable food supply for bear.

11.3 CLAN ANIMALS

SON spiritual clan animals known as dodems and/or totems (McGee, 1987) include black bear. Therefore we took a close look at available literature on habitat use. Bear cover all types of habitats, forested and open meadow but are often not observed when travelling in the evening.

An excavation was observed at the northwest end of the esker. The excavation is quite narrow based on other denning habitat observed for bear.

No wildlife were documented using the hole in 2019 or 2020. The 2021 October inspection confirmed fox track and scat. We found no current sign of bear at the potential den structure however recommend an additional spring field check for presence/absence and type of use in the event the excavation is taken by another animal such as a badger, woodchuck, skunk.

11.3.1 MITIGATION FOR BLACK BEAR

Bear scat has been studied during other fieldwork, and indicates that black bear have twigs and stalks along with berries, and will also burrow for food sources such as moles and shrews. We have observed bear feeding on blueberries, moles, shrews (Short-tailed Shrew) and skink in Muskoka, pawing into decaying fallen logs for insects, salamanders and Iris tubers, Goldthread and potato grubs. Bear can also seek out honeybee nests in tree cavities and locate wasps and ants in burrows for nectar. Fruit and nut sources include Elderberry, Hazelnut, Beechnut, Oak and Blackberry. Black bear are opportunistic feeders and their diet can also include crayfish and fish.

Given the contiguous forested wetlands size and mast elements in some of the woodland assemblages (American Beech, Sugar Maple) we note the PSW units and upland mosaics are candidate black bear migration, feeding and potential denning habitat, regardless of a lack of direct visual confirmation of bear. It is likely they will cover the terrain of the Keldon Swamp Wetland Complex including the site.

A treed corridor would allow wildlife travel sheltered by a tree screen, screening them from predators vs. the open meadows between the PSW units present day. The pit would offer the opportunity through the required Rehabilitation Plan to install such a vegetated link between the east and west PSW units at the north portion of the landscape.

11.3.1.1 NOISE

The heavy equipment used to move the sand and gravel resource from the site will require front-end loaders, gravel trucks, chain-saws for final stripping of vegetation as the extraction process moves northerly on the esker landform. All of the activity proposed will create noise.

Noise will have an impact on wildlife. Some mammal and bird species will disperse deeper into forest interior during noise events, some will remain. The effort to establish a new territory is a cost to a bird, for example, because there is often an inhabitant in neighboring woodlands where carrying capacity may have already been reached, leaving no space and a fight to establish a territory. Initial dispersal of some

species, such as observed for American Goldfinch (Sober, pers. obs.) reverts 1-2 seasons after some forms of development activity (i.e. subdivision example). Species returned after disturbance.

Machinery effects can be mitigated in part by:

Mitigating muffler heavy equipment noise (by added muffler support) to limit noise at peak interior forest breeding bird time (June) can be considered. This maximizes the chances of site tenacious birds staying on or near this parcel and maintaining a baseline productivity of breeding pairs.

Restricting high voltage lights from the area is prudent given the potential for large ranging mammals crossing the terrain post extraction and in winter months during active licence period when site is not attended for extraction activity.

Further mitigation for the licence area to be considered includes:

- Restricting heavy machinery operation outside of dusk and dawn through limiting maximum work day to 7:00am – 6:00pm summer hours. This avoids dusk and dawn when noise affect wildlife more in the absence of other ambient daytime noise

- Restricting stockpiling to two month periods to avoid colonization by cavity nesting wildlife (e.g. Belted Kingfisher)

11.4 MITIGATION SUMMARY

Table 2 summarizes key mitigation and suggested implementation via the ARA Operation Plan notes.

TABLE 2: MITIGATION SUMMARY

NATURAL HERITAGE	MITIGATION	IMPLEMENTATION
Rehabilitate extraction area with re-forestation joining east and west PSW units over time for a 200m depth wildlife corridor	Plant native shrub and tree species including species used by SON	Rehabilitation Plan
Conserve Monarch Butterfly optimal habitat on parcel	Enhance existing milkweed areas used by Monarch with targeted nectar source plantings	Rehabilitation Plan
Nocturnal and crepuscular forest wildlife conservation	Restrict night lights. If security lights are required for machinery yard, use downward directed "hooded" lights	Operation Plan Notes
Perching, courting, display Cavity nesting birds or bats	Retain dead standing and or stub trees at PSW forest edges (east PSW) unless they present a safety hazard	Operation Plan Notes
Conserve Eastern Wood Pewee (EWPW)	EWPW are protected under the Migratory Bird Convention Act. A qualified biologist must inspect the site before site preparation to confirm presence/absence of active nests	Operation Plan Notes
Conserve forest breeding birds	Limit construction noise by restricting heavy machinery outside of dusk and dawn, to maximum workdays of 7:00am – 6:00pm, restricting peak noise where possible from May 15-June 30 peak bird breeding	Operation Plan Notes
Interior Forest Veery	SWH area at the NE corner of East PSW receives a 50m noise setback (the area is well distanced from extraction)	

Indicator Species Monitoring	Monitor presence/absence in NE significant wildlife habitat area for continued use by Veery and Eastern Wood Pewee on a two year rotation. This includes describing PSW vegetation in two 1m square sample quadrats	Operation Plan Notes
Northern Ribbonsnake support West PSW Unit	Mitigate dust on site Conserve foraging and hibernaculae optimal habitat By maintaining 15m wetland setback	Operation Plan Notes
Conserve potential bank nesters	Avoid creating long term stockpiles; if over 90 day storage the stockpile should be inspected for cavity nesting wildlife (e.g., Belted Kingfisher) Avoid disturbance during peak bird nesting (April 1-August 1) unless inspection by a qualified biologist clears the area for removal. If a nest(s) is identified, then the stockpile shall be cordoned off with temporary fencing or suitable alternative and left undisturbed until the nest has been vacated. Refer to Notes 3, 16 on operation plan.	Operation Plan Notes

12 CONCLUSIONS

After seasonal fieldwork on field ecology at and near the site, and associated research on the geological landform feature, SAAR concluded that excavating the south part of the esker for aggregate material can conform to the Aggregate Resources Act with mitigation outlined in the NETR. The esker material can be removed without degrading or removing the easterly or westerly core treed wetlands, conforming to the environmental objectives of the Grey County Official Plan. Indeed the rehabilitation plan details future tree corridor creation, and corridor widths conforming to widths detailed in the County NHS study (NHS, 2017). The land use offers the opportunity to create a forest linkage over time across an open gap between these two large forested core areas through the Operation Plan Notes and compliance monitoring under the Aggregate Resource Act via MNRF Aggregate Officer compliance reporting. This level of forestation effort is likely to increase functionality and connectivity of the NHS beyond "maintaining" it (GCOP).

The test of meeting no negative impact to the identified ecological features and functions can be met with the proposed access and extraction method, mitigation for ecology variables and monitoring of efficacy. Specific to extraction near an identified core area in Grey County map schedules, we have provided seasonal wildlife survey fieldwork that confirms the disturbed esker can be removed, and lands forested to link the existing two forest patches; achieving the PPS goal of balancing the various land uses without allowing development into an actual core. This opportunity does not diminish core woodland values but respects them through rehabilitation linking two core areas.

Rare species (SAR, ESA), wetlands and wildlife corridor linkages have been evaluated at a landscape scale as well as the site level. Complying with aim of ARA – location on robust road network in reasonable proximity to material demand urban centres such as Toronto while distant from neighbors for visual impact and/or property value depreciation potential concerns. The site is remote enough, and sheltered by forest cover, to have natural buffers for noise and attenuation for dust. A water truck would be a mitigating tool for dust if required. The proposed haul route does not appear to conflict with potential safety hazards such as elementary and secondary school crossings. As well, the location of the proposed licence limits does not preclude any resource based environmental or traditional continued use of the area, if there were such a use; e.g. hiking on adjacent lands, hunting, medicinal herb collection and/or recreational camping.

In regard to natural heritage the previously disturbed esker 'borrow pit' areas can be re-visited without negatively impacting persistent wildlife. Adjacent wetlands would continue to receive baseflow contribution from shallow and deep groundwater as the extraction is recommended to remain a minimum of 1.5m above the water table. The GSS hydrogeology monitoring data and impact assessment found no potential impact to local groundwater and surfacewater resources from the above water table pit. SAAR concurs that the minimum separation distance of 1.5m will be established between the bottom of the pit and the location of the high water table, protecting the shallow and deep groundwater resource potential contribution to adjacent PSW.

Rehabilitation, guided by the ARA progressive rehabilitation notes on the Operation Plan, will seek to return the ground level elevation to a 200m deep forested corridor at the north end of the site. This would be accomplished through a combination of directed plantings, and natural succession over time, and link the east and west PSW units presently isolated from eachother by the esker and open meadow. Rehabilitation options are detailed in Appendix A.

Please direct any questions or comments to the undersigned.

Sincerely,

Senior Biologist, SAAR Environmental Limited

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Appendix A

REHABILITATION PLAN OPTIONS

1.0 REHABILITATION PLAN

A number of rehabilitation options are provided for consideration.

OPTION A CREATE LINK FOR WILDLIFE CORRIDOR AT NORTH OPENING

Option A creates a wildlife corridor by reforesting a gap at the north end of the parcel between the east and west PSW units. This option bolsters wildlife connectivity – both avian and terrestrial –across the landscape and offers slight carbon sequestering and oxygen input from addition of tree cover to meet global warming policy in the PPS.

OPTION B EXPLORES RECREATIONAL CAMPING WHILE PROVIDING NARROWER LINK

The planning report submitted under separate cover can speak to the planning merits of a future holiday destination for the expanding settlement area of Dundalk and surrounding region. In light of covid restricted international destinations the site may provide for a greener short distance trek that assists with the state of global warming as well, consistent with the PPS Parts 1 and 4 speak to a clean and healthy environment, and efficient development patterns that achieve among other things, “better adaptation and response to the impacts of a changing climate, which will vary from region to region”.

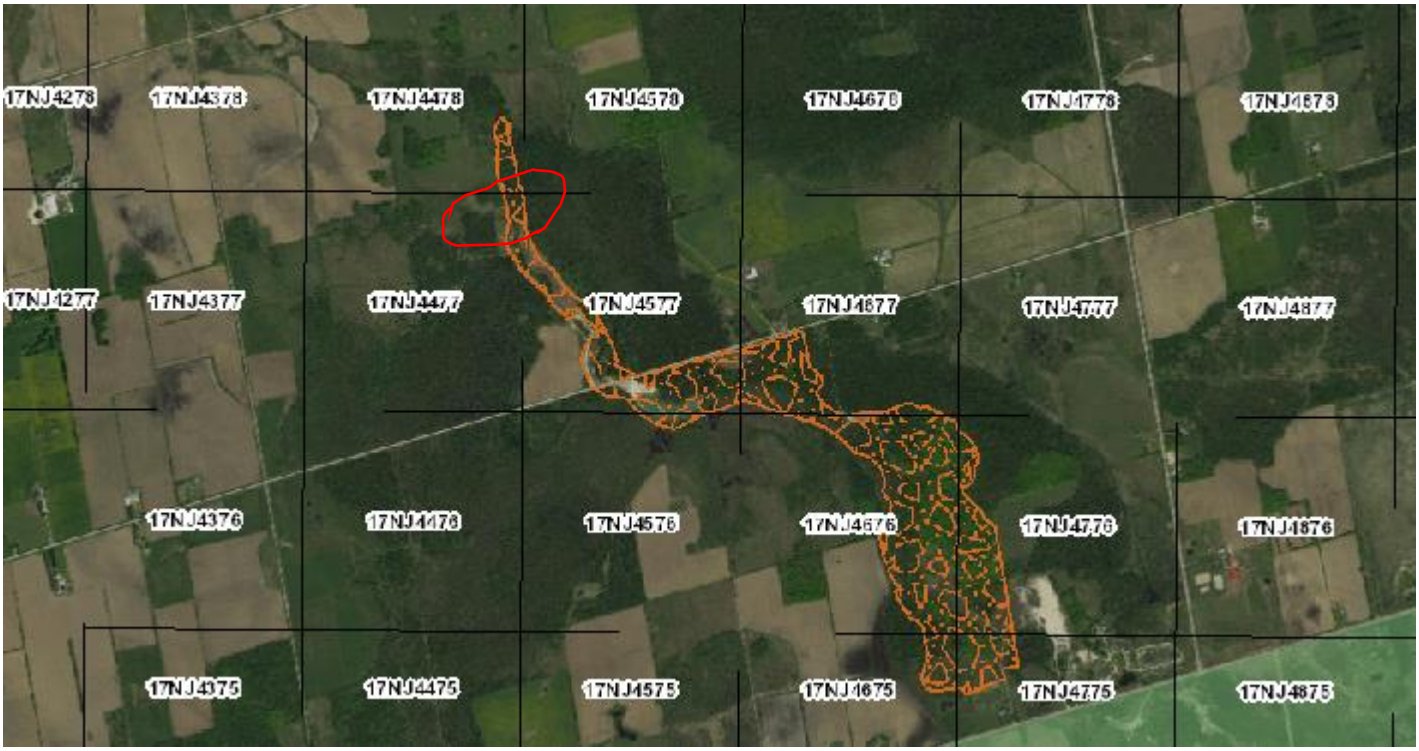
Specific detail regarding native flora for each option follow.

OPTION A REFOREST OPENING BETWEEN EAST AND WEST PSW UNITS

The north end of the parcel provides an open meadow with limited hedgerow units between the larger forested blocks east and west of the esker. The east and west larger forests are part of the Keldon PSW and can benefit from a vegetated linkage that screens wildlife crossing this portion of the landscape.

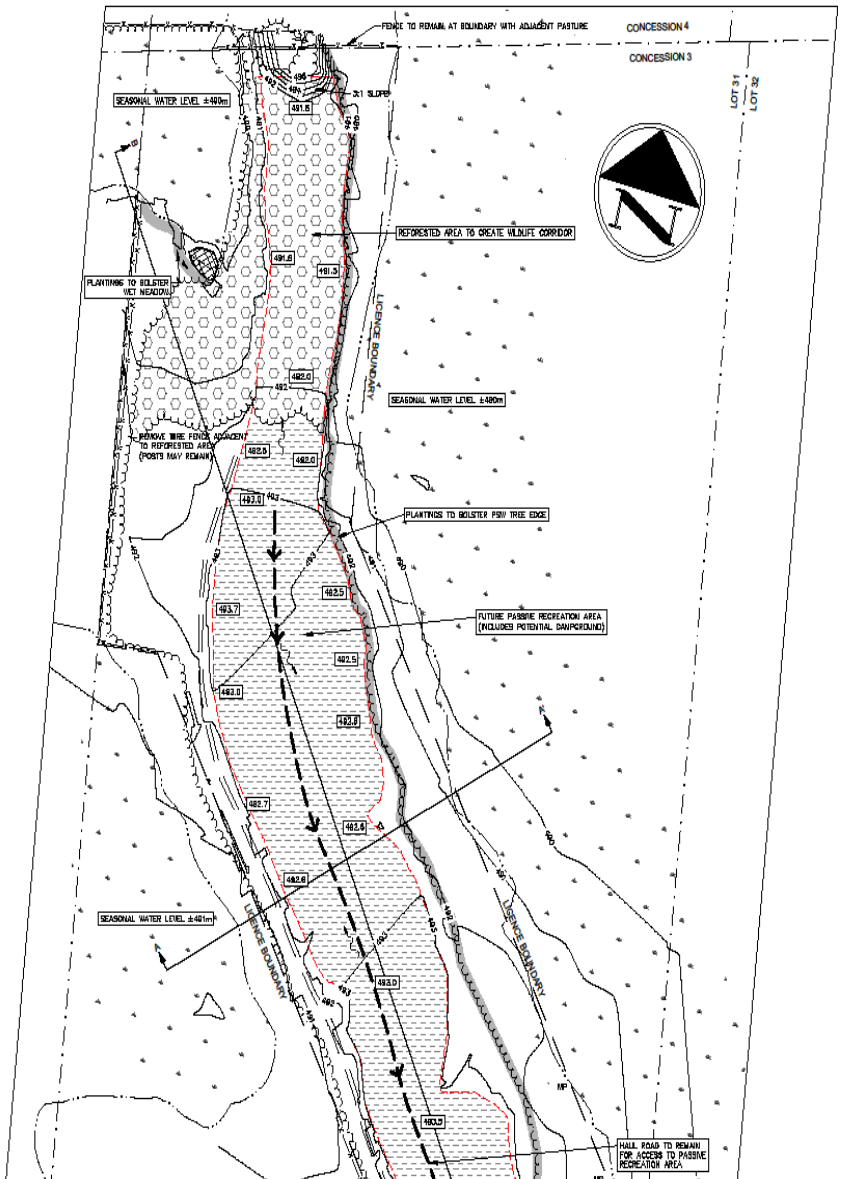
Option A provides for a wider linkage for wildlife (200m) through reforestation efforts, along with nectar forbs in the west wetland meadow near the ephemeral pond for avifauna and insect food.

The general gap in forest cover is illustrated below for reviewers in Sketch 1 and 2.



Sketch 1 illustrates the general location of the opening between the east and west PSW units where wildlife travel is more likely to occur than the farmed opening beside Southgate Road 4 based on ground truthing.

Rehabilitation detail is illustrated on the GSS site plan below.


FENCE TO REMAIN AT BOUNDARY WITH ADJACENT PASTURE
CONCESSION 4
CONCESSION 3
LOT 31
LOT 32
SEASONAL WATER LEVEL ±490m
2:1 SLOPE
491.6
491.8
491.3
REFORESTED AREA TO CREATE WILDLIFE CORRIDOR
PLANTINGS TO BOLSTER WET MEADOW
LICENCE BOUNDARY
492.0
SEASONAL WATER LEVEL ±490m
REMOVE WIRE FENCE ADJACENT TO REFORESTED AREA (POSTS MAY REMAIN)
492.5
492.0
PLANTINGS TO BOLSTER PSW TREE EDGE
492.5
493.7
FUTURE PASSIVE RECREATION AREA (INCLUDES POTENTIAL CAMPGROUND)
492.5
493.0
492.8
492.7
492.6
492.6
SEASONAL WATER LEVEL ±491m
LICENCE BOUNDARY
LICENCE BOUNDARY
493.0
493.5
HAUL ROAD TO REMAIN FOR ACCESS TO PASSIVE RECREATION AREA

The north portion of the esker, and extending westerly into existing open meadow, is the candidate reforestation area. The future revegetation would be a combination of directed plantings and natural succession over time, and attain a 200 metre treed corridor width for wildlife.

The southern portion of the extracted esker would be passive recreation. Full size drawings are submitted by GSS with the operation plan.

PLANTING STOCK

Tree and shrub species for consideration based on site soil profiles taken, existing tree assemblages and value to observed wildlife on and near the site are:

Cornus stolonifera	Red-osier Dogwood
Prunus pennsylvanica	Pincherry
Ostrya virginiana	Ironwood
Thuja occidentalis	White Cedar
Tillia americana	Basswood
Ulmus americana	White Elm
Populus tremuloides	Trembling Aspen

Cedar would be placed in the wet meadow margins with Trembling Aspen starter crops, grading out of the observed evidence of clay and iron precipitate mottles onto the upland portions of the meadow. This mineral soil with a higher sand component would support the recommended mast tree species for black bear consideration.

OPTION B BOLSTER PSW TREE EDGE EAST OF ESKER + NW INTERMITTENT POND

Option B plants land bordering the easterly PSW unit as the esker is extracted northerly in a progressive rehabilitation manner, following the equipment as it proceeds north on the esker during extraction.

Option B provides less reforestation widths for the top link restoration between the PSW units because it marries the future occasional passage of wildlife across the landscape with the southerly human use of a campground, thus attracting wildlife to a larger extent is discouraged with this scenario.

The wet meadow elements at the NW quadrat would also be installed with Option B, and could be in place during any of the proposed extraction phases. Option B for that area would consist more (60%) of nectar wetland plants for wetland insect support, including Special Concern Monarch butterflies on site, and 40% shrub and tree species bordering the surfacewater feature and intermittent pond.

We suggest timing for vegetation installation at the NW quadrat follow the esker East shrub and tree installations since the east plantings may play a more important role in overland sediment control on the post extraction site.

If a general privacy berm is required along the roadside to shield the aggregate operation for ARA purposes, the vegetation list prepared for Option A can also be drawn from for shrub and tree installation on a roadside privacy berm.

WET MEADOW DRAINAGE TO INTERMITTENT POND

Cladium mariscoides	Smooth Sawgrass
Juncus effusus	Common Rush
Danthonia spicata	Poverty Oat Grass
Solidago sempervirens	Swamp Goldenrod
Eupatorium maculatum	Joe-Pye-Weed
Solidago ptarmicoides	Upland White Aster
New England Aster	Aster nova-angliaea
Campanula rotundifolia	Harebell
Achillea millefolium	Yarrow
Asclepias *incarnata*	Swamp Milkweed
Scirpus rubrotinctus	Panicled Bulrush
S. atrovirens	Green Bulrush

Broadcast seed in the wet meadow area and around the ephemeral pond.

Seedmix will establish over time and bolster support of birds and insects including the observed Special Concern Monarch butterfly.

GENERAL NOTES FOR REHABILITATION PLAN STANDARDS

1.0 PLANTING SPECIFICATIONS

1.1 All plant material is guaranteed by the owner for a period of two years after installation

1.2 Plant local native plants, no invasives. SVCA has species lists if a guide is required

1.3 To achieve maximum wildlife value, mimic nature by planting in clusters vs. straight lines

2.0 SEED SOURCE

Native seed collected in local eco-district and/or propagated by local nurseries, some tree and shrub species may be available at Saugeen Valley Conservation Authority Arbour Day annual sales. Our planting crews have had good success with survival rates when purchasing stock from SVCA.

2.1 INVASIVE SPECIES CONTROLS

Restrict ornamental plant installation at the campground. Limit an increase in the invasive species already present by using aggregate from the site wherever possible for future uses, and avoiding or restricting infill material imported from off site, and in particular, out of local vicinity (i.e. outside of this eco-district). Remove invasives when installing native plant material

3.0 PLANTING SPECIFICATIONS

Client to accept site inspection audit by one or any combination of the SVCA, SAAR and the municipality up to two growing seasons after installation to gauge planting success and determine if replacement stock is required in any area(s)

Appendix B

SPECIES LISTS

Latin Name	Common Name	Mitigation
Equisetaceae	**Horsetail Family**	
Equisetum arvense	Field Horsetail	
E. fluviatile	Water Horsetail	
Lycopodaceae	**Clubmoss Family**	
Lycopodium digitatum	Fan Clubmoss	
L. clavatum	Stag-horn Clubmoss	
L. obscurum	Ground Pine	
Dennstaedtiaceae	**Bracken Family**	
Pteridium aquilinum	Bracken Fern	
Dryopteridaceae	**Wood Fern Family**	
Diplazium pycnocarpon	Glade Fern	
Dryopteris intermedia	Interrupted Fern	
D. marginalis	Evergreen Wood Fern	
Onoclea sensibilis	Sensitive Fern	
Thelypteridaceae	**Marsh Fern Family**	
Thelypteris palustris	Marsh Fern	
Onocleaceae	**Ostrich Fern Family**	
Matteuccia struthiopteris	Ostrich Fern	
Athriaceae	**Ladyfern Family**	
Athrium filix-femina	Lady Fern	
Myricaceae	**Bayberry Family**	
Myrica gale	Sweetgale	
Cupressaceae	**Cypress Family**	
Thuja occidentalis	White Cedar	
Taxaceae	**Yew Family**	
Taxus canadensis	Canada Yew	
Pinaceae	**Pine Family**	
Abies balsamea	Balsam Fir	
Larix laricina	Tamarack	
Picea glauca	White Spruce	
Pinus strobus	White Pine	
Pinus sylvestris	Scots Pine	
Tsuga canadensis	Eastern Hemlock	
Poaceae	**Grass Family**	
Agrostis gigantea+	Redtop	+ = Introduced species

Agrostis stolonifera	Creeping Bent Grass	
Dactylis glomerata+	Orchard Grass	
Danthonia spicata	Poverty Oat Grass	
Elymus repens	Quackgrass	
Phalaris arundinaceae	Reed Canary Grass	
Glyceria canadensis	Rattlesnake Grass	
Glyceria striata	Fowl Manna Grass	
Phleum pratense	Timothy	
Leerzia oryzoides	Cutgrass	
Cyperaceae	**Sedge Family**	
Carex albursina	White Bear Sedge	
Carex aurea	Golden Sedge	
Carex arctata	Drooping Woodland Sedge	
Carex bebbii	Bebb's Sedge	
Carex compacta	Sedge	
Carex gracillima	Graceful Sedge	
Carex brunnescens	Brownish Sedge	
Carex flava	Yellow Sedge	
Carex flava	Yellow Sedge	
Carex lacustris	Lake Sedge	
Carex retrorsa	Retrorse Sedge	
Scirpus atrovirens	Common Bulrush	
Scirpus rubrotinctus	Panicled Bulrush	
Scirpus cyperinus	Woolgrass	
Juncus effusus	Soft Rush	
J. tenuis	Slender Rush	
Bromus inermis	Smooth Brome	
Lemnaceae	**Duckweed Family**	
Lemna minor	Lesser Duckweed	
Nymphaceae	**Water Lily Family**	
Nuphar variagata	Yellow Pond Lily	
Potamogeton natans	Pondweed	
Juncaceae	**Rush Family**	
J effusus	Common Rush	
J. tenuis	Poverty Rush	
Liliaceae	**Lily Family**	
Hemerocallis fulva+	Orange Day Lily	
Lilium michiganense	Michigan Lily	

Mainthemum canadensis	Wild Lily of the Valley	
Streptopous amphlexifolius	Twisted Stalk	
Trillium grandiflorum	White Trillium	
Violaceae	**Violet Family**	
Viola canadensis	White Violet	
Viola sororia	Wood Violet	
Geraniaceae	**Geranium Family**	
Geranium robertianum	Herb Robert	
Primulaceae	**Primrose Family**	
Lysimachia ciliata	Fringed Loosestrife	
Salicaceae	**Willow Family**	
Populus balsamifera L.	Balsam Poplar, Balm of Gilead	
Populus grandidentata	Large Toothed Aspen	
P. tremuloides	Trembling Aspen	
Salix discolor	Pussy Willow	
Salix lucida	Shining Willow	
S. petiolaris	Slender Willow	
	Bebb's Willow	
Betulaceae	**Birch Family**	
Alnus incana	Speckled Alder	
B. papyrifera	White Birch	
Corylus cornuta	Beaked Hazel	
Ostrya virginiana	Ironwood	
Fagaceae	**Beech Family**	
Fagus grandifolia	American Beech	
Quercus rubra	Red Oak	
Ulmaceae	**Elm Family**	
Ulmus americana L.	White Elm	
Polygonaceae	**Buckwheat Family**	
Rumex crispus	Curly Dock	
Ranunculaceae	**Crowfoot Family**	
Ranunculus acris L.	Tall Buttercup	
Anemone canadensis	Canada Anemone	
Anemone quinqefolia	Wood Anemone	
Anemone virginiana	Tall Thimbleweed	
Aquilegia canadensis	Wild Columbine	
Hepatica acutiloba	Sharp-lobed Hepatica	
Thalictrum dioecum	Early Meadow-rue	

Rosaceae	**Rose Family**	
Agrimonia gyrosepala	Agrimony	
Amelanchier canadensis	Serviceberry	
Amelanchier spicata	Dwarf Serviceberry	
Aronia melanocarpa	Chokeberry	
Crataegus macrosperma	Large-fruited Hawthorn	
Fragaria virginiana	Common Strawberry	
Geum aleppicum	Yellow Avens	
G. canadensis	White Avens	
Prunus pensylvanica	Pincherry	
Spiraea alba	Narrow-leaved Meadowsweet	
Prunus serotine	Black Cherry	
Prunus virginiana	Chokecherry	
Rosa acicularis	Prickly Wild Rose	
Rubus fruticosus	Blackberry	
R. strigosus	Wild Red Raspberry	
Frageria virginiana	Wild Strawberry	
Potentilla simplex	Cinquefoil	
P. anserina	Silverweed	
P. recta	Sulphur Cinquefoil	
Malus pumila	Common Apple	
Apiaceae	**Umbellifer Family**	
Daucus carota	Wild Carrot	
Anthriscus cerefolium	Chervil	
Pastinaca sativa	Parsnip	
Sium suave	Water Parsnip	
Leguminosae	**Bean Family**	
Lotus corniculatus+	Birds-foot Trefoil	
Meliotus alba+	White Sweet Clover	
Trifolium pratense+	Red Clover	
Vicia cracca L+	Cow vetch	
Anacardiaceae	**Cashew Family**	
Rhus radicans	Poison ivy	
R. typhina	Staghorn Sumac	
Aceraceae	**Maple Family**	
Acer saccharum	Sugar Maple	
Rhamnaceae	**Buckthorn Family**	

Rhamnus cathartica	Common Buckthorn	
R. alnifolia	Alderleaf Buckthorn	
Adoxaceae	**Elderberry Family**	
Sambucus canadensis	Common Elderberry	
Rubiaceae	**Madder Family**	
Galium palustre	Marsh Bedstraw	
Typhaceae	**Cattail Family**	
Typha angustifolia	Narrow-leaved Cattail	
Vitaceae	**Grape Family**	
Vitus riparia	Frost Grape	
Tiliaceae	**Linden Family**	
Tilia Americana	Basswood	
Araliaceae	**Ginseng Family**	
Aralia nudicalis	Wild Sarsaparilla	
Aralia racemosa	Spikenard	
Cornaceae	**Dogwood Family**	
C. alternifolia	Alternate-leaved Dogwood	
C. canadensis	Bunchberry	
C. sericea	Red-osier Dogwood	
Oleaceae	**Olive Family**	
Fraxinus americana	White Ash	
F. pennsylvanica	Green Ash	
F. nigra	Black Ash	
Grossulariaceae	**Gooseberry Family**	
Ribes americanum	Wild Currant	
Ribes cynosbati	Wild Gooseberry	
Asclepiadaceae	**Milkweed Family**	
Asclepias syriaca	Common Milkweed	
A. incarnata	Swamp Milkweed	
Boraginaceae	**Borage Family**	
Hydrophyllum virginianum	Virginia Waterleaf	
Myosotis arvensis+	Forget-me-not	
Echium vulgari	Common Viper's Bugloss	
Hypericaceae		
Hypericum perforatum	Perforated St. John's Wort	
Lamiaceae	**Mint Family**	
Clinopodium vulgare	Wild Basil	
L. uniflorus Michx.	Northern Bugleweed	

Mentha arvensis L.	Wild Mint	
Lycopus americanus	Water Horehound	
Monarda fistulosa	Wild Bergamot	
Prunella vulgaris L.	Heal's All	
Satureja vulgaris	Dogmint	
Onagraceae	**Primrose Family**	
Circeae canadensis	Enchanter's Nightshade	
Oenothera biennis	Common Evening Primrose	
Scrophulariaceae	**Figwort Family**	
Linaria vulgaris	Butter and Eggs	
Verbascus thapsus	Common Mullein	
Fabaceae	**Pea Family**	
Lotus corniculatus	Bird's-foot Trefoil	
Plantaginaceae	**Plantain Family**	
Plantago lancealata	English Plantain	
Plantago major	Common Plantain	
Caprifoliaceae	**Honeysuckle Family**	
Diervilla lonicera	Bush Honeysuckle	
Valeriana officinalis	Valerian	
Viburnum lentago	Nannyberry	
V. acerifolium	Maple-leaf Viburnum	
Polygalaceae	**Milkwort Family**	
Polygala seneca	Seneca Snakeroot	
Balsaminaceae	**Touch-me-not Family**	
Impatiens capensis	Spotted Touch-me-not	
Caryophyllaceae	**Pink Family**	
Silene vulgaris	Bladder Campion	
Campanulaceae	**Bellflower Family**	
Campanula aparinoides	Marsh Bellflower	
Brassicaceae	**Cabbage Family**	
Erucastrum gallicum	Dog Mustard	
Apocynaceae	**Dogbane Family**	
Apocynum cannabinum	Indian Hemp	150m off site NW Poisonous
Asparagales	**Orchidaceae**	
Epipactis helleborine	Broad-leaved Helleborine	

Iridaceae	**Iris Family**	
Iris versicolor	Blue Flag	
Asteraceae	**Aster Family**	
chillea millefolium	Yarrow	
Ambrosia artemisifolia	Common Ragweed	
Anaphalis margaritaceae	Pearly Everlasting	
Antennaria neglecta	Field Pussytoes	
Arctium minus	Common Burdock	
Aster ciliolatus	Fringed Aster	
Aster macrophyllus	Large Leaved Aster	
Aster novae-angliae	New England Aster	
Aster puniceus	Purple-stemmed Aster	
Bellis perennis	Common Daisy	
Bidens cernua	Nodding Beggarticks	
Centaurea nigra	Black Knapweed	
Chrysanthemum leucanthemum+	Oxeye Daisy	
Cichorium intybis+	Chickory	
Cirsium arvense	Creeping Thistle	
Cirsium vulgare	Bull Thistle	
Erigeron annuus	Annual Daisy Fleabane	
Eupatorium maculatum	Joe-pye-weed	
Eupatorium perfoliatum	Boneset	
Centuaurea stoebe	Spotted Knapweed	
Hieracium aurantiacum	Orange Hawkweed	
H. caespitosum	Yellow Hawkweed	
Prenanthes altissima	White Lettuce	
Rudbeckia hirta	Black-eyed Susan	
Senecio aureus L.	Golden Ragwort	
Solidago altissima	Tall Goldenrod	
S. canadensis	Canada Goldenrod	
S. hispida	Hairy Goldenrod	
S. rugosa	Rough Goldenrod	
Taraxacum officinale	Dandelion	
T. pratensis	Goat’s Beard	
Tussilago farfara	Coltsfoot	
Eupatorium maculatum	Spotted Joe Pye Weed	

BIRDS

Birds recorded during both June surveys are noted as likely breeders on or near the site (B). Migrant birds are denoted with “M”. Adjacent lands sightings are “ADJ” with compass direction. FL indicates flight.

American Robin	B
American Goldfinch	B
Starling	FL
Purple Finch	FL
Mourning Dove	B
Blue Jay	B
Red-winged Blackbird	B
American Woodcock	M WEST MEADOW
Chipping Sparrow	B
Swamp Sparrow	B
White-throated Sparrow	B
Baltimore Oriole	B
Eastern Kingbird	B
Ruby-throated Hummingbird	B
Common Grackle	B
American Crow	B
American Raven	FL
American Phoebe	B
Black-capped Chickadee	B
Red-breasted Nuthatch	B
White-breasted Nuthatch	B
Brown Creeper	B
Cedar Waxwing	B
Ruffed Grouse	B
Northern Flicker	B
Hairy Woodpecker	B
Downy Woodpecker	B
Pileated Woodpecker	B N
Rose-breasted Grosbeak	B
American Redstart	B
Common Yellowthroat	B
Chestnut-sided Warbler	B
Red-eyed Vireo	B
Ovenbird	B
Black-throated Blue Warbler	B ADJ E
Black-throated Green Warbler	B ADJ E
Scarlet Tanager	B
Veery	B (ADJ E, MID ESKER, d=85m from outer PSW Limit)
Winter Wren	B
Killdeer	B
Canada Goose	B (Egg attempt on road)
Ring-billed Gull	FL
Gray Catbird	B
Mourning Dove	B
Savannah Sparrow	B NW ADJ MEADOW Grassland Bird in Decline d=150m
White-crowned Sparrow	FL
Tree Swallow	FL

MAMMALS

White-tailed deer
Black bear possible, no 2020/2021 activity at excavation. Fox track in 2021.
Red Squirrel
Woodchuck
Striped Skunk
Raccoon
Snowshoe Hare
Coyote
Red Fox
Eastern Chipmunk
Winter 2020 Large Cat (Bobcat or feral large cat, NE) Poor print
Mink NE creek 30m off esker north tip in PSW
Potential for wolf, no sign
Short-tailed Shrew
Deer Mouse
Meadow Vole
Meadow Jumping Mouse
Domestic cattle within 120m

HERPETOFAUNA

Wood Frog

Leopard Frog

Spring Peeper

Chorus Frog

Tree Frog

Green Frog

American Toad

Eastern Gartersnake

Northern Ribbonsnake (West PSW, 15m into PSW)

Spotted Salamander

Red Eft phase of Eastern Newt

BATS

Big Brown Bat

Potential habitat in PSW for Northern Long-eared Bat

ODONATES (DRAGONFLIES AND DAMSELFLIES)

E. erbium	Marsh Bluet
Lestes disjunctus	Common Spreadwing
Libellula pulchella	Twelve-spotted Skimmer
Sympetrum rubicundulum	Ruby-faced Meadowhawk
Sympetrum vicinum	Autumn Meadowhawk

BUTTERFLIES

Great Spangled Fritillary	European Skipper
Pearl Crescent	White Admiral
Monarch	Viceroy
Comma	Common Sulphur
Viceroy	Swallowtail
Northern Pearly Eye	Common Spreadwing
Pearl Crescent	

FUNGI

Turkey-tail Polypore
Brown Roll-rim
Artists Conch
Witches Butter Jelly Fungi
Waxy Cap

MOSSES IN PSW EAST

Delicate Fern Mosses	*Thuidium delicatulum and Thuidium recognitum*
Knight's Plume Moss	*Ptilium crista-castrensis* under black spruce
Phoenix Feather Moss	*Pleurozium schreberi* under black spruce
Stair-step Moss	*Hylocomium splendens* under black spruce
Shaggy Gooseneck Moss	*Rhytidiadelphus triquetrus* under black spruce
Juniper Haircap Moss	*Polytrichum juniperinum*
Common Haircap Mosses	*Polytrichum commune, Brachythecium (salebrosum*)
Golden Foxtail Mosses	*Brachythecium (salebrosum), B. rutabulum or campestrum*
Sword Moss	*Callicladium haldanianum*
Graceful Peat Moss	*Sphagnum girgensohnii*

LICHENS IN BOTH PSW

Candle-flame Lichen	*Candelaria concolor* on tree trunks
Star Rosette Lichen	*Physcia stellaris* "
Hammered Shield Lichen	*Parmelia sulcata* "
Hooded Rosette Lichen	*Physcia adscendens* "
Elegant Sunburst Lichen	*Xanthoria (Rusavskia) elegans* throughout
Boreal Oakmoss	*Evernia mesomorpha* on branches
Common Powderhorn	*Cladonia coniocraea* (Hunter's Horn Lichen)
Gray Reindeer Lichen	*Cladina (Cladonia) rangiferina* on branches