Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Wood Thrush	*Hylocichla mustelina*	Not Listed	Not Listed	Threatened	Undetermined
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Not Listed	Not Listed	Not Listed	Yellow

Source: ACCDC 2012

[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012; [4]NSDNR 2010

Field surveys were completed to characterize the year round, pre-construction (baseline) bird community. Surveys were designed to capture changes in the diversity and abundance of bird species in the Project site coinciding with such important events as breeding and migration. All field surveys were based on a previously developed methodology designed for COMFIT wind projects, in consultation with officials from NSDNR and CWS, and in accordance with protocols outlined in the document “Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds” (CWS 2007).

Detailed results and methodologies for bird surveys are provided in Appendix G.

Winter Bird Survey
Ten area searches were conducted at or near the Project site on February 27, 2013 (Drawing 8.8). A total of 11 species were identified, including 35 individual birds (Tables G1/2, Appendix G). Pine Grosbeak (*Pinocola enucleator*) and Common Raven (*Corvus corax*) were the most frequently observed and abundant species.

Spring Migration Surveys
Spring migration surveys were conducted on May 1, May 8, and June 5, 2012. A total of 32 stopover count surveys were conducted at 11 locations within the Project site boundaries (Drawing 8.8).

A total of 571 birds were detected during spring migration surveys comprising 57 species (Tables G 3/4, Appendix G). White-throated Sparrow (*Zonotrichia albicollis*) and Yellow-rumped Warbler (*Dendroica coronata*) were the most frequently observed and most abundant species. Hermit Thrush (*Catharus guttatus*), Palm Warbler (*Dendroica palmarum*) and Golden-crowned Kinglet (*Regulus satrapa*) were also abundant during the spring migration surveys.

Breeding Bird Surveys
Eleven point count locations were surveyed on June 15 and again on June 24, 2013 (Drawing 8.8). A total of 379 individual birds, representing 46 species, were observed during these point counts (Tables G5/6, Appendix G). Of these, three species are considered ‘confirmed’ breeders (Common Yellowthroat, Dark-eyed Junco and Spruce Grouse), 24 species are considered ‘probable’ breeders (based upon the observance of breeding pairs and/or the establishment of permanent territories),18 species are considered ‘possible’ breeders (Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season), and one species was observed without breeding evidence (a Common Merganser flying over the site) (MBBA 2006). Black-throated Green Warbler (*Dendroica virens*) was the most frequently observed and abundant species, while Magnolia Warbler (*Dendroica magnolia*) and White-throated Sparrow were also abundant during the surveys.

A total of 89% of observed species were passerines. Non-passerine bird species observed included birds of prey (Barred Owl, *Strix varia;* Red-tailed Hawk, *Buteo jamaicensis*), woodpeckers (Hairy Woodpecker, *Picoides villosus*; Northern Flicker, *Colaptes auratus;* and Pileated Woodpecker, *Dryocopus pileatus)*, and a single hummingbird (Ruby-throated Hummingbird, *Archilochus colubris*), upland game bird (Spruce Grouse, *Falcipennis canadensis*) and waterfowl species (Common Merganser, *Mergus merganser*).

Fall Migration Surveys
A total of 32 fall migration surveys were completed at 13 locations across November 27, 2012, September 16, 2013, and 16 October, 2013 (Drawing 8.8). A total of 307 birds were detected, during fall migration surveys, comprising 41 species (Tables G7/8, Appendix G). Golden-crowned Kinglet (*Regulus satrapa*) and Black-capped Chickadee (*Poecile atricapillus*) were the most abundant species and the most frequently observed species. American Goldfinch (*Spinus tristis*), Blue Jay (*Cyanocitta cristata*), Common Raven (*Corvus corax*) and Dark-eyed Junco (*Junco hyemalis*) were also frequently observed. Eighty-seven percent of bird species observed were passerines including 10 species of warblers, and five species of sparrows. Non-passerine species observed include birds of prey (Red-tailed Hawk, *Buteo jamaicensis*), upland game birds (Ruffed Grouse, *Bonasa umbellus*) and woodpecker species (Downy Woodpecker, *Picoides pubescens*; Hairy Woodpecker, *Picoides villosus*; Northern Flicker, *Colaptes auratus*).

Bird Survey Summary
The Project site is situated in a landscape featuring mature softwood and mixed wood stands, interspersed with cutovers of varying age and freshwater lakes. A high degree of fragmentation has resulted in large areas of transitional/edge habitat which can support a relatively dense bird population, although in such instances diversity can be limited.

The bird community at the Project site reflects both its habitat character and inland location.

As is the case in much of Nova Scotia, the winter bird community at the Project site is limited in terms of diversity and abundance. Resident species were dominant, accounting for 71% of the individuals observed. The intact forest stands appear to support a rather dense woodpecker community, which may suggest that individuals have concentrated in these areas as a result of habitat fragmentation. Pileated Woodpecker (*Dryocopus pileatus*) and Barred Owl (*Strix varia*) are indicative of mature forest conditions. Winter visitors were absent, and the only nomadic finch species observed was Pine Grosbeak. In the winter months, this species feeds primarily on mountain-ash berries, and winter densities of Pine Grosbeak in Nova Scotia vary greatly from year to year in response to fluctuating food availability in northern boreal forests (Pittaway 2013). Pine Grosbeaks were observed infrequently across Nova Scotia in late winter 2013 (NSBS 2013), so the presence of this species at the Project site during this period suggests that suitable American mountain ash (*Sorbus americanus*) berry crops persist in the many clearings and cutovers at the Project site.

The arrival of spring migrants at the Project site occurred in pulses consistent with patterns observed throughout the region. By early-May, the bird community at the Project site is dominated by early migrants, particularly those favoring early successional habitats or tolerant of openings within forest stands, including American Robin (*Turdus migratorius*), White-throated Sparrow (*Zonotrichia* *albicollis*), Hermit Thrush (*Catharus guttatus*), Palm Warbler (*Dendroica palmarum*), and Yellow-rumped Warbler (*Dendroica coronata*).

The main migrant pulse, including most of the wood warblers, does not arrive at the Project site until mid-May. Overall, the spring migrant passerine community represents a mix of forest-birds such as Black-and-white Warbler (*Mniotilta varia*), Blackburnian Warbler (*Dendroica fusca*), and Northern Parula (*Parula americana*) and early succession favored/tolerant species such as Chesnut-sided Warbler (*Dendroica pensylvanica*), Common Yellowthroat (*Geothlypis trichas*), Nashville Warbler (*Vermivora ruficapilla*), and Winter Wren (*Troglodytes troglodytes*). In general, those species associated with clearings, edges, and disturbed areas are present at higher densities, which reflects the relative availability of habitat at the site.

Four American Black Ducks (*Anas* rubripes) were the only waterfowl observed during spring migration surveys, and it is likely that individuals move between a series of freshwater lakes on the landscape. While it is possible that these local flyways may encompass the Project site, no significant migratory movements of waterfowl were observed in the vicinity of the Project site.

Over 86% of those species observed during spring migration surveys, including migrants and residents, were also observed during the breeding season, which suggests that the majority of species using the Project area as stop-over habitat during migration remain to establish breeding territories. The Project site supports a diverse and abundant breeding bird community, likely due to the diversity of habitat types available. Regenerating cutovers, roadside shrubs, and open wetlands provide habitat for early-succession associated species, such as Palm Warbler, Common Yellowthroat, Magnolia Warbler, Alder Flycatcher, and White-throated Sparrow. This guild is the dominant feature of the breeding bird community at the Project site. Mature softwood habitat is also abundant, although fragmented, which explains the relatively high breeding densities of Blackburnian Warblers, Black-throated Green Warblers (*Dendroica virens*), and Golden-crowned Kinglets (*Regulus satrapa*). Less common species that breed among the coniferous tree-tops, such as Bay-breasted Warbler (*Setophaga castanea*) and Cape May Warbler (*Setophaga tigrina*), were not observed. Species associated with mature hardwoods, such as Black-throated Blue Warbler (*Dendroica caerulescens*) and Ovenbird (*Seiurus aurocapilla*), were observed at lower densities consistent with the relative availability of this habitat type at the Project site. The presence of Pileated Woodpecker and Barred Owl suggests that trees of adequate size, as well as standing deadwood, are present in intact stands to support a reasonably vibrant cavity nesting community which also includes small to moderate densities of Black-capped Chickadee (*Poecile atricapillus*), Red-breasted Nuthatch (*Sitta canadensis*), and common woodpecker species.

Representative boreal species, including Gray Jay (*Perisoreus canadensis*) and Spruce Grouse (*Falcipennis canadensis*), were observed in the Project site's northern extent where conifers occur in association with wetland habitats.

The fall bird community at the Project site was characterized by typical flocks of migrant passerines and resident species. During this season, Nova Scotia receives an influx of Golden-crowned Kinglets and Black-capped Chickadees from northern breeding grounds, which is consistent with the marked increase in the numbers of both these species observed at the Project site. These species are joined by small numbers of migrant warblers, as well as nomadic Red-breasted Nuthatches, to form characteristic mixed flocks during September. Multiple such mixed flocks were observed at the Project site, primarily in scrubby regrowth along existing logging roads, although all were small in size and were dominated by Black-capped Chickadees and Golden-crowned Kinglets. Almost all migrant warblers, with the exception of a handful of straggler Palm Warblers and a single Mourning Warbler (*Oporornis philadelphia*), had already passed through the site by mid-October. Migrant sparrows, with the exception of limited numbers of Dark-eyed Junco (*Junco hyemalis*) and White-throated Sparrow (*Zonotrichia albicollis*), were relatively scarce at the Project site, even during the peak of sparrow migration through Nova Scotia (*i.e.*, October). Survey results, therefore, do not suggest that the Project site is located within a major flyway for migrant passerines.

The lack of open water wetlands and water bodies or agricultural fields at the Project site accounts for the absence of waterfowl species during the fall migratory period. Since no waterfowl were observed flying over the site, survey results also do not suggest that the Project site is located within a major flyway for migrant waterfowl.

Multiple species of nomadic finch were observed at the site during the fall season, including American Goldfinch (*Spinus tristis*), Evening Grosbeak (*Coccothraustes vespertinus*), Pine Siskin (*Spinus pinus*), Purple Finch (*Carpodacus purpureus*), Red Crossbill (*Loxia curvirostra*), and White-winged Crossbill *(Loxia leucoptera*). While some of these individuals may represent local breeders, the diversity observed nonetheless suggests that cone crops in the intact softwood stands at the Project site and on the general landscape are sufficient to attract wandering seed specialists, particularly Red and White-winged Crossbills.

It should be noted that the late fall survey (November) was conducted in the year prior to the remainder of the fall surveys, which may introduce a bias due to between year variation. For instance, relatively low abundances of birds in November may have been related to the sampling year, although results in terms of abundance and diversity were not outside of the expected range for this time of year.

Overall, there were 67 different bird species identified at the Project site during surveys conducted throughout the year, including 13 SOCI (Table 8.13, Drawings 8.9A-D).

Table 8.13: Bird SOCI identified at the Project Site

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]	Survey(s) Observed
Black-backed Woodpecker	*Picoides arcticus*	Not Listed	Not Listed	Not Listed	Yellow	Spring
Blackpoll Warbler	*Dendroica striata*	Not Listed	Not Listed	Not Listed	Yellow	Fall
Canada Warbler	*Wilsonia Canadensis*	Threatened	Endangered	Threatened	Red	Spring, Breeding
Eastern Wood-Pewee	*Contopus virens*	Not Listed	Vulnerable	Special Concern	Yellow	Spring
Golden-crowned Kinglet	*Regulus satrapa*	Not Listed	Not Listed	Not Listed	Yellow	Spring, Breeding, Fall
Gray Catbird	*Dumetella carolinensis*	Not Listed	Not Listed	Not Listed	Red	Fall

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]	Survey(s) Observed
Gray Jay	*Perisoreus Canadensis*	Not Listed	Not Listed	Not Listed	Yellow	Winter, Spring, Breeding, Fall
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened	Red	Spring, Breeding
Pine Grosbeak	*Pinicola enucleator*	Not Listed	Not Listed	Not Listed	Red	Winter
Pine Siskin	*Spinus pinus*	Not Listed	Not Listed	Not Listed	Yellow	Spring, Fall
Ruby-crowned Kinglet	*Regulus calendula*	Not Listed	Not Listed	Not Listed	Yellow	Spring, Breeding, Fall
Wilson's Snipe	*Gallinago delicate*	Not Listed	Not Listed	Not Listed	Yellow	Spring
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Not Listed	Not Listed	Not Listed	Yellow	Breeding

[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012; [4]NSDNR 2010

Of the SOCI listed in Table 8.13, the following three species are listed under either *SARA* or NS *ESA*:

- Canada Warbler;
- Eastern Wood-Pewee; and
- Olive-sided Flycatcher.

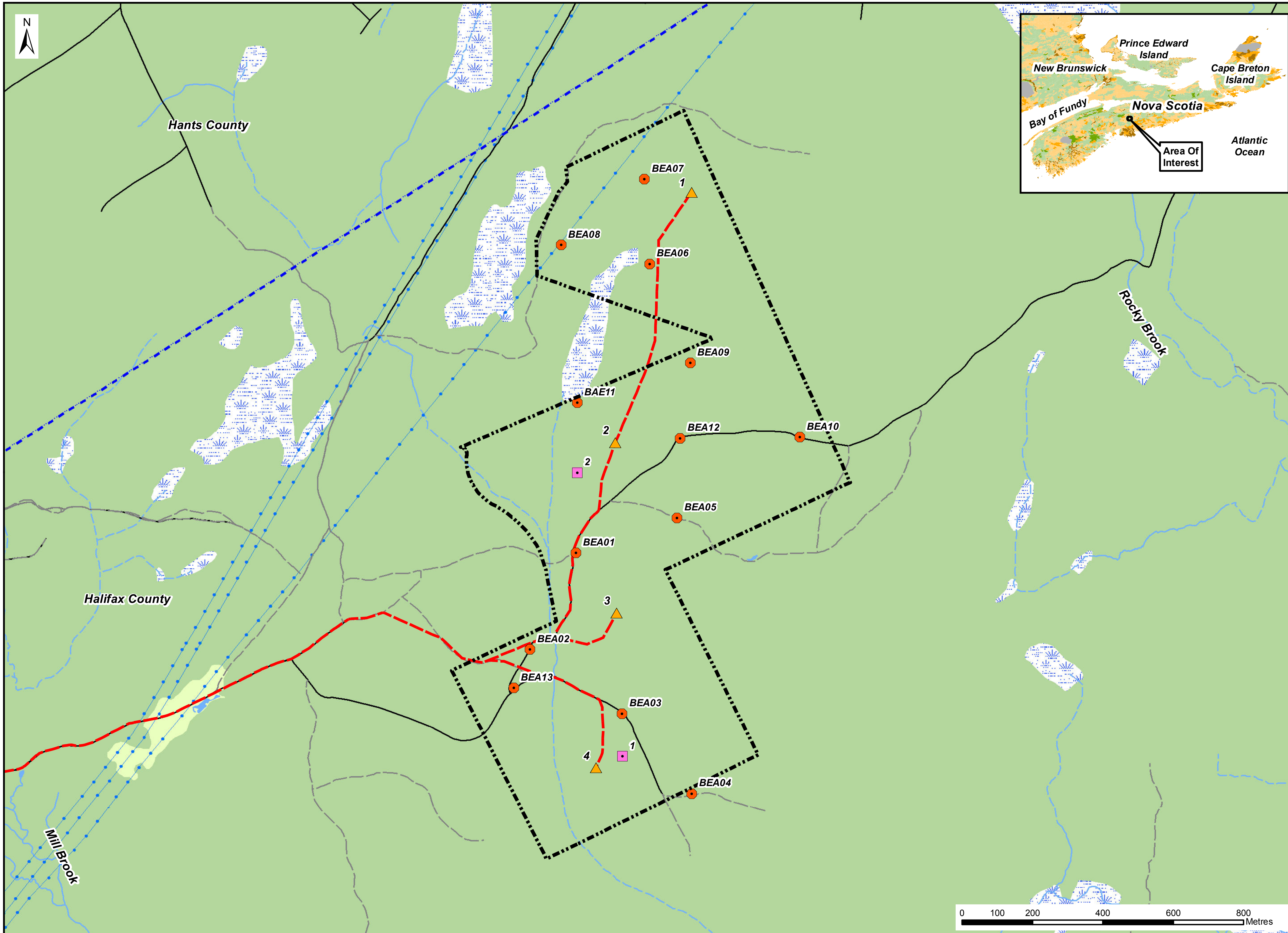
The likelihood of these species to be impacted by the Project is evaluated below.

Canada Warbler

The Canada Warbler uses a wide range of forest types that have a well-developed shrub layer and a structurally-complex forest floor (COSEWIC 2008b). In Nova Scotia, highest breeding densities are achieved in poorly drained areas such as treed and shrub swamps (BAMP 2013a).

Three male Canada Warblers (representing a minimum of 1 individual) were detected during surveys completed on June 5, 15, and 24, 2013. In all cases, a male was observed singing at one survey location near a bog wetland adjacent to a mature softwood stand (“Bea11”, Drawing 8.8). Since a male was observed singing in this location on two occasions more than one week apart, it is considered to be a “probable” breeder (*i.e.*, “Territory” status) (MBBA 2012). Since Canada Warbler maintain a restricted territory during the breeding season (Reitsma *et al.* 2008), it is likely that the individual observed directly was in close proximity to an active nest. All individuals were detected over 150 m from the closest proposed turbine location.

An increased buffer distance will be maintained between turbine locations and delineated wetland edges where evidence of breeding was identified during surveys. This measure should ensure that Project effects on this species will be minimized. Refer to Section 13.2.2 for additional species-specific recommendations for mitigative measures.



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

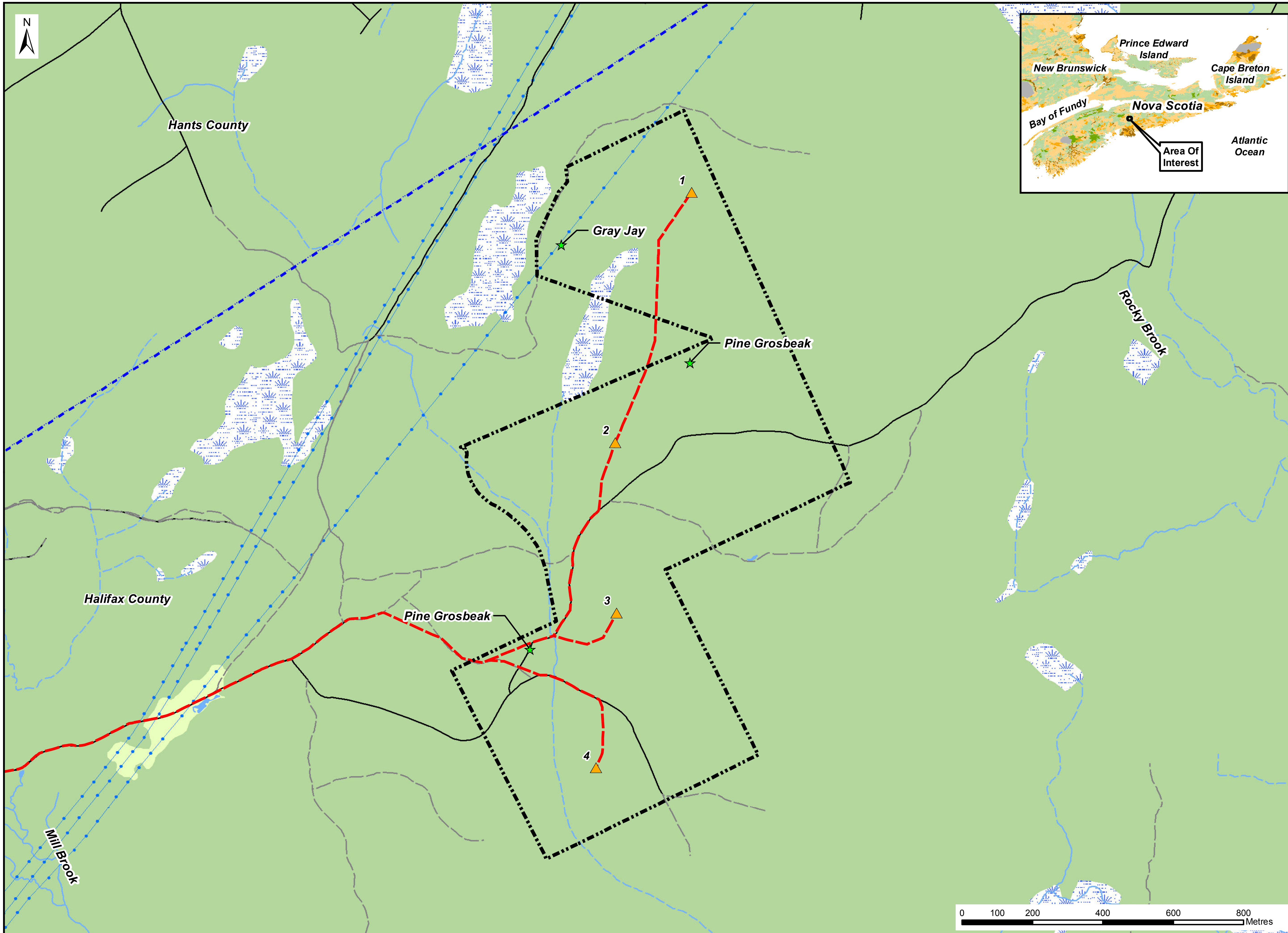
Legend:

- Project Site Boundary
- Proposed Turbine
- Proposed Access Road
- Bird Survey Locations
- Bat Detector Locations
- Building
- County Boundary
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Bird Survey and Bat Detector Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4563
Scale: 1:10,000	Drawing #: 8.8
Drawn By: G. Gregory	
Checked By: M. Smith	



Notes:

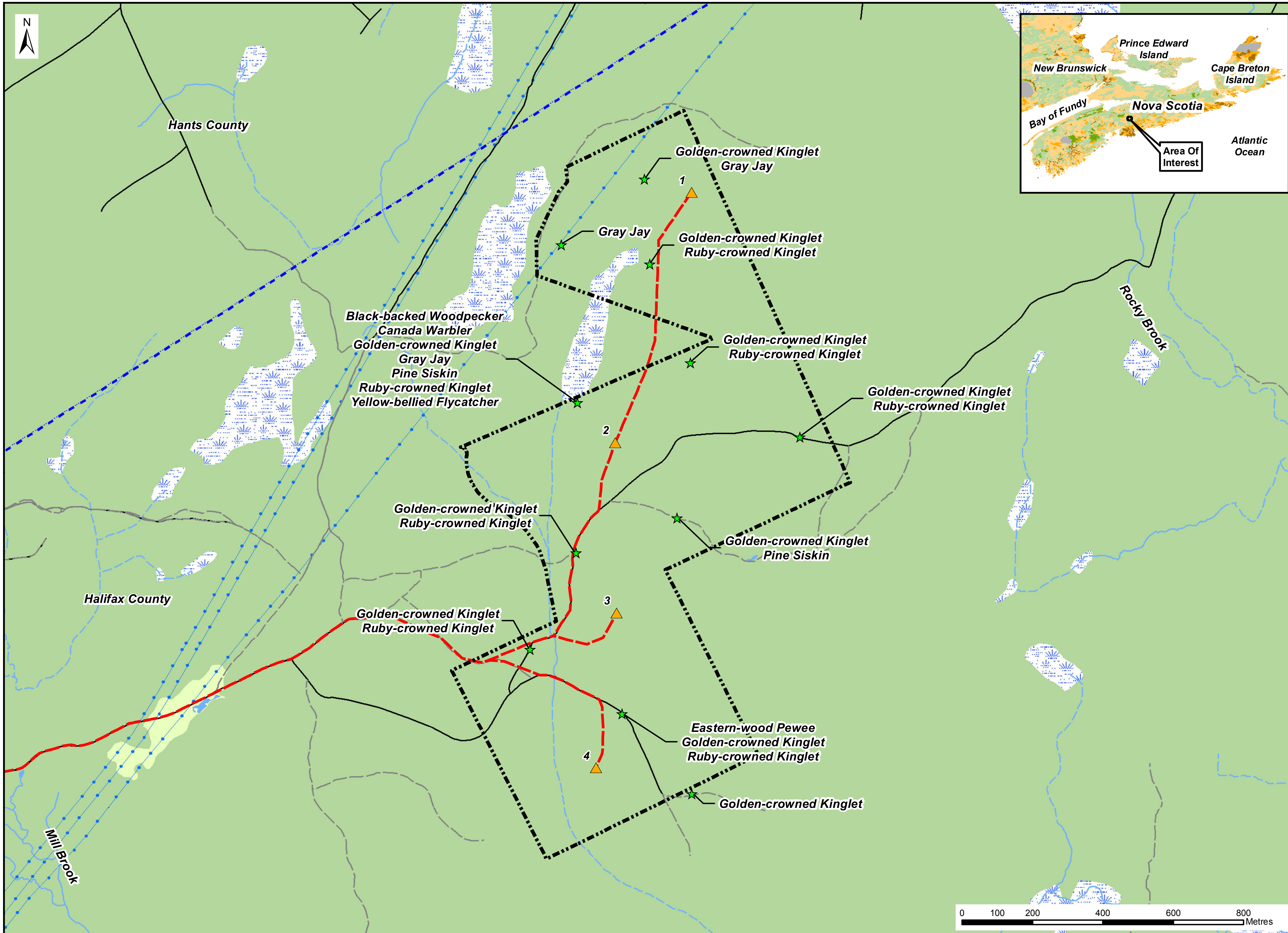
1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Project Site Boundary
- Proposed Turbine
- Proposed Access Road
- Winter Priority Bird Species Locations
- Building
- County Boundary
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Winter Priority Bird Species Locations

Date:	Project #:
October 2013	12-4563
Scale: 1:10,000	Drawing #: 8.9A
Drawn By: G. Gregory	
Checked By: M. Smith	



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

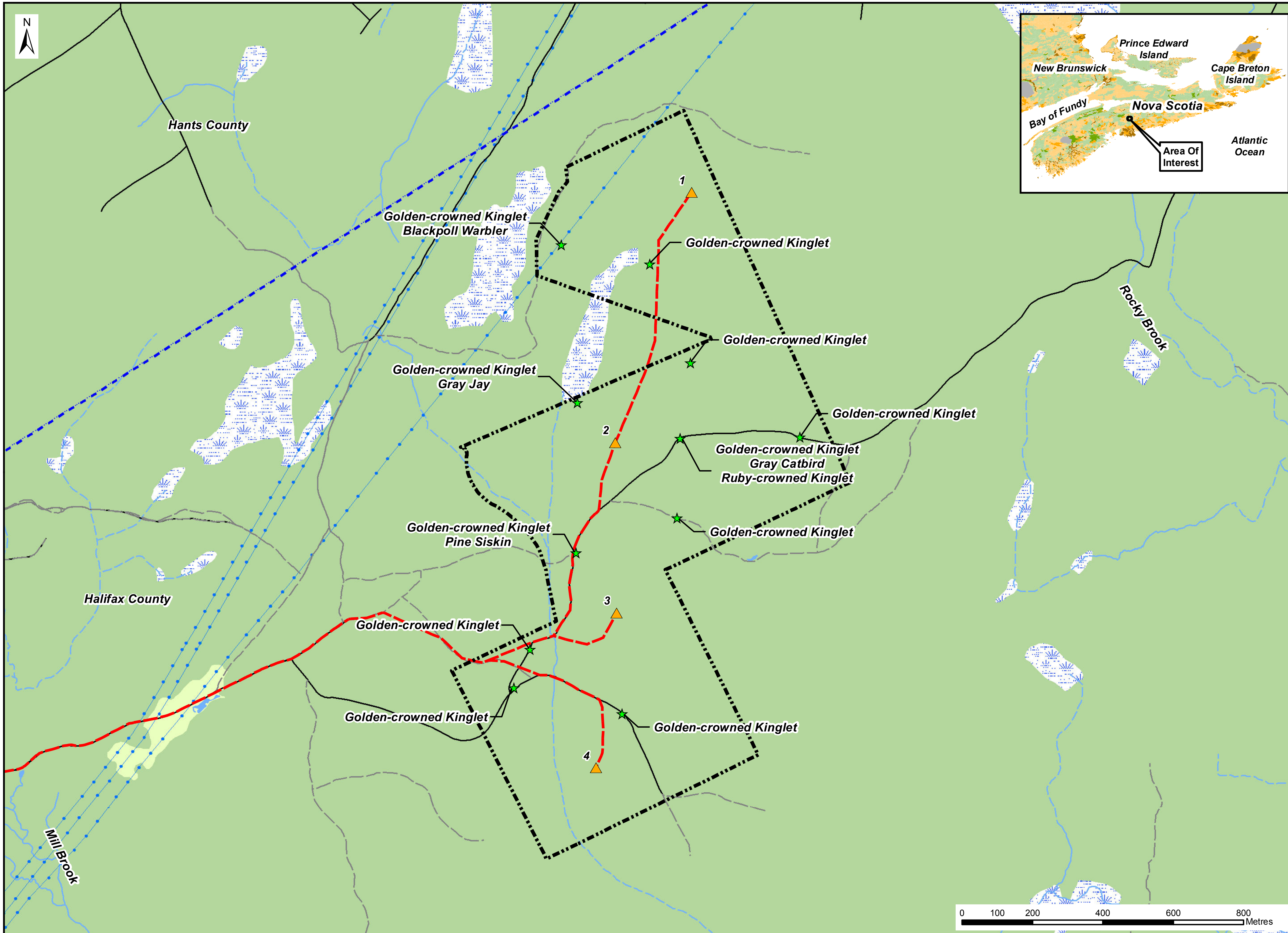
Legend:

- Project Site Boundary
- Proposed Turbine
- Proposed Access Road
- Spring Priority Bird Species Locations
- Building
- County Boundary
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Spring Priority Bird Species Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4563
Scale: 1:10,000	Drawing #: 8.9B
Drawn By: G. Gregory	
Checked By: M. Smith	



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Project Site Boundary
- Proposed Turbine
- Proposed Access Road
- Fall Priority Bird Species Locations
- Building
- County Boundary
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Fall Priority Bird Species Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4563
Scale: 1:10,000	Drawing #: 8.9D
Drawn By: G. Gregory	
Checked By: M. Smith	

Eastern Wood-Pewee

The Eastern Wood-Pewee is a forest insectivore exhibiting a wide range of habitat use, but generally found in deciduous forests in areas of lower canopy cover (*i.e.*, in mature forest near forest clearings and edges) (McCarty 1996). Mature hardwood and mixed wood stands are present at the Project site, and commercial forestry operations have resulted in an abundance of edges and adjacent patches of regenerating vegetation at varying successional stages.

One male Eastern Wood-Pewee was detected at the Project site on June 5, 2013, singing near a mature mixed-wood stand adjacent to a recent clear cut ("Bea03"; Drawing 8.8). Since this individual was only detected on one occasion and just prior to the documented breeding dates for Eastern Wood-Pewee in our region (MBBA 2012), no direct breeding evidence was obtained. However, it is possible that this individual was an early-arriving male and therefore a "possible" breeder on the Project site (*i.e*., "Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season") (MBBA 2012). It is important to note that Eastern Wood-Pewee has a loud and distinctive song which can be heard up to 200 m away (BAMP 2013b). The individual was heard over 100 m from the survey location so it is therefore difficult to determine a precise location of the potential breeding territory in this area.

It is possible that Project activities, specifically the construction of the access road to proposed turbine location 4, could disturb suitable breeding habitat and lead to temporary displacement of breeding Eastern Wood-Pewees. To minimize these potential effects, the detailed design of the final road layout will attempt to minimize disturbance to the intact mature, mixed wood stand that provides suitable breeding habitat for Eastern Wood-Peewee by utilizing existing forest roads and siting the turbine and crane pads in recently cutover areas

Refer to Section 13.2.2 for additional species-specific recommendations for mitigative measures.

Olive-sided Flycatcher

The Olive-sided Flycatcher favours early, post-fire landscapes or clearings and coniferous forest edges and openings like meadows, rivers, bogs, swamps and ponds (MTRI 2008). The Project site comprises several recently cut-over areas adjacent to coniferous forest stands, and some near wetlands and in the vicinity of proposed turbine locations.

Two male Olive-sided Flycatchers (representing a minimum of 1 individual) were detected during surveys on June 5 and 15, 2013, singing near a coniferous stand adjacent to open shrubby vegetation containing a power transmission line ("Bea08"; Drawing 8.8). A male was observed singing in this location on two occasions more than 1 week apart and is therefore considered to be a "probable" breeder (*i.e*., "Territory" status) (MBBA 2012). This individual was detected approximately than 400 m from the nearest proposed turbine location, and access roads will be constructed at least 250 m from the observation point. Project activities are therefore unlikely to impact Olive-sided Flycatcher.

Should unforeseen disturbance to breeding Olive-sided Flycatchers occur, the prevalence of available habitat at the Project site and in the general area, should ensure that alternative breeding habitat is available for Olive-sided Flycatcher. Refer to Section 13.2.2 for species-specific recommendations for mitigation measures.

The requirements as set out in the *MBCA* will be adhered to for all Project activities. Additional general mitigation measures for Project-related effects to avifauna are provided in Section 4.0. Additional mitigation for avifauna is provided in Section 13.

8.8 Bats

The Nova Scotia Significant Species and Habitats database (NSDNR 2012c) indicates 17 features related to bats and/or bat habitats within a 100 km radius of the Project site. All are classified in the database as "Species of Concern", and relate to Little brown myotis (*Myotis lucifugus*) (12) or bat hibernacula (5). The database identifies no records of bats within a 10 km radius of the Project site.

Moseley (2007) provided an overview of the known bat hibernacula in the caves and mines of Nova Scotia. This research indicates 15 known hibernacula within a 100 km radius of the Project site (Table 8.14).

Table 8.14 Known Bat Hibernacula within 100 km of the Project Site

Hibernacula	Distance from Project Site (km)	Direction
Cave of the Bats	18.47	NE
Centre Rawdon Gold Mine	19.87	N
Woodville Ice Cave	25.85	NW
Frenchman's Cave	27.17	W
Gayes River Gold Mine	27.84	NE
Miller's Creek Cave	30.97	NW
Black Brook	31.71	NW
Hayes Cave	36.11	N
Peddlar's Tunnel	40.24	NNW
Minasville Ice Cave	40.56	N
Walton Barite Mine	42.16	NNW
Cheverie Cave	46.96	NW
Lake Charlotte Gold Mine	55.18	SSE
Lear Shaft	62.02	N
The Ovens	79.7	SW
New Laing Adit	88.45	NE

Source: Moseley (2007)

The largest known hibernaculum in Nova Scotia is Hayes Cave, located in South Maitland over 36.1 km to the north (Moseley 2007). Up to 6,000 bats enter this cave in September and reside until June (Davis and Browne 1996), although preliminary results from 2012 suggest that white-nose syndrome has reduced the hibernating population to approximately 250 individuals (M. Elderkin, personal communication).

Table 8.15 presents bat species recorded within a 100 km radius of the Project site, according to ACCDC.

Table 8.15 Bat Species Recorded within a 100 km radius of the Project Site

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Hoary bat	*Lasiurus cinereus*	Not Listed	Not Listed	Not Listed	Undetermined
Little Brown Myotis	*Myotis lucifugus*	Not Listed	Endangered	Endangered	Yellow
Northern long-eared myotis	*Myotis septentrionalis*	Not Listed	Endangered	Endangered	Yellow
Tri-colored bat	*Perimyotis subflavus*	Not Listed	Endangered	Endangered	Yellow

Source: ACCDC 2012
[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012; [4]NSDNR 2010

The Little brown myotis, Northern long-eared myotis, and Tri-colored bat were added to the NS ESA list and declared endangered on July 11, 2013. A 90% population decline over the past two years has been attributed to white-nose syndrome; a disease caused by the fungus Geomyces destructans (NS ESA 2013). The disease has killed nearly 7 million bats in eastern North America in the past 8 years. White-nose syndrome is lethal and affects all bat species that congregate in caves and abandoned mines used for hibernation through the winter (NS ESA 2013).

Field surveys of bat migration/habitat use were carried out from August 23 to September 29, 2013 using two AnaBat SD2 Detectors (Titley Electronics, Columbia, Missouri). Data was not collected on the nights of September 16 and 17 due to a temporary equipment malfunction. Since insectivorous bats are known to utilise edge habitats during foraging (Furlonger *et al*. 1986), both detectors were deployed along the edge of regenerating cutover and intact forest stands (Table 8.16, Drawing 8.8). Due to their similarity, calls of Nova Scotia's two resident *Myotis* species (Little brown myotis and Northern long-eared myotis) can be difficult to reliably distinguish from one another (O'Farrell *et al*. 1999), so these calls were not identified to species.

Table 8.16 Bat Detector Location Details

Detector	Habitat Type	Turbine	Distance (m)
1	Edge of regenerating cutover and mid-aged to mature mixed wood	1	1,613.30
		2	890.75
		3	407.10
		4	82.29
2	Edge of regenerating cutover and mid-aged softwood	1	859.45
		2	137.37
		3	414.08
		4	840.35

8.8.1 Field Results

In total, 4,609 files were recorded, of which only 55 were determined to be bat generated ultrasound. The remaining files represented extraneous noise, which may have been due to moisture infiltration into the microphone housing. Most echolocation calls (69%) were associated with *Myotis* species bats (Little brown bat and Northern long-eared myotis) or were classified as unknown (Table 8.17). The majority of the unknown calls had frequency and slope characteristics consistent with *Myotis* species, but positive identifications were impossible due to degraded signal quality. Seventeen calls (31%) were attributed to Hoary bat, a migratory species known to occur in Nova Scotia.

Table 8.17: Number of Echolocation Calls Recorded at Project Site (Aug 23rd – Sept 29th)

Date	Detector 1			Detector 2	
	Myotis Species	Hoary Bat	Unknown	*Myotis* Species	Unknown
23-Aug-13	0	0	0	0	0
24-Aug-13	0	0	0	0	0
25-Aug-13	0	0	0	0	0
26-Aug-13	0	0	0	0	0
27-Aug-13	0	0	0	3	1
28-Aug-13	0	0	0	0	0
29-Aug-13	0	0	0	0	0
30-Aug-13	0	0	0	1	0
31-Aug-13	0	0	0	0	0
01-Sep-13	0	0	0	0	0
02-Sep-13	0	0	0	0	0
03-Sep-13	0	0	0	1	0
04-Sep-13	0	0	0	0	0
05-Sep-13	0	0	0	0	0
06-Sep-13	0	0	1	0	0
07-Sep-13	0	0	0	0	0
08-Sep-13	6	0	5	1	0
09-Sep-13	1	0	0	0	1
10-Sep-13	0	0	0	1	0
11-Sep-13	0	0	0	0	0
12-Sep-13	0	0	0	0	0
13-Sep-13	0	10	8	0	0
14-Sep-13	0	0	0	1	1
15-Sep-13	0	0	0	0	0
18-Sep-13	0	2	3	0	0
19-Sep-13	0	4	3	0	0
20-Sep-13	0	0	0	0	0
21-Sep-13	0	0	0	0	0
22-Sep-13	0	0	0	0	0
23-Sep-13	0	0	0	0	0
24-Sep-13	0	0	0	0	0
25-Sep-13	0	0	0	0	0
26-Sep-13	0	0	0	0	0

Date	Detector 1			Detector 2	
	Myotis Species	Hoary Bat	Unknown	*Myotis* Species	Unknown
27-Sep-13	0	0	0	0	0
28-Sep-13	0	0	0	0	0
29-Sep-13	0	1	0	0	0
Total	7	17	20	8	3

An average of 1.5 echolocation calls per night were detected during the monitoring period. Although overall activity was quite low, highest activity levels were observed in the period encompassing September 12 to September 19, which also coincides with when Hoary bats were present.

Bat species that were identified during field surveys or that have been recorded within a 100 km radius of the Project site were screened against the criteria outlined in the document "Guide to Addressing Wildlife Species and Habitat in an EA Registration Document" (NSE 2009b) to develop a list of priority species. These priority species include:

- Little brown myotis – "Yellow" (NSDNR), "Endangered" (COSEWIC);
- Northern long-eared myotis – "Yellow" (NSDNR), "Endangered" (COSEWIC); and
- Tri-colored bat – "Yellow" (NSDNR), "Endangered" (COSEWIC).

The Little brown myotis is the most common species in Nova Scotia, and is probably ubiquitous in the province (Broders *et al*. 2003). During the day, the Little brown myotis will roost in buildings, trees, under rocks, in wood piles, and in caves, congregating in tight spaces to roost at night (Fenton and Barclay 1980). As a non-migratory species, Little brown myotis hibernates from September to early or mid-May in abandoned mines or caves (Fenton and Barclay 1980; Moseley 2007).

ACCDC records indicate the closest Little brown myotis sighting to the Project site was 16±10 km away, however it is likely that some of the echolocation calls recorded during field studies were emitted by Little brown myotis.

The Northern long-eared myotis, although once considered uncommon throughout Nova Scotia (Moseley 2007), is likely ubiquitous in the forested regions of the province (Broders *et al*. 2003). This species is widely distributed in the eastern United States and Canada, and is commonly encountered during swarming and hibernation (Caceres and Barclay 2000). During the day, Northern long-eared myotis show a preference for roosting in trees, the characteristics of which have been shown to vary according to the reproductive status of bred females (Garroway and Broders 2008). Females appear to prefer shade tolerant deciduous trees over coniferous trees, whereas males roost solitarily in coniferous or mixed-stands in mid-decay stages (Broders and Forbes 2004). Northern long-eared myotis are also non-migratory and are typically associated with the Little brown myotis during hibernation, in caves or abandoned mines (Moseley 2007). Hibernation in this species is thought to begin as early as September and can last until May (as cited in Caceres and Barclay 2000).

ACCDC data indicates that the closest Northern long-eared myotis sighting to the Project site was 22±10 km away; however, it is likely that some of the echolocation calls recorded during field studies were emitted by Northern long-eared myotis.

Tri-colored bat, formerly known as the Eastern pipistrelle, is frequently observed in Nova Scotia, but has a restricted distribution focused in the interior of the southwest region of the province (Farrow and Broders 2011). Research conducted at Kejimkujik National Park found Tri-colored bats to be locally abundant, and results indicate that this population may represent the only breeding population of the species in Canada (Broders *et al.* 2003). In the summer months, the Tri-colored bat is concentrated in a geographic area bounded by Wolfville to the west, Halifax to the northeast, and Shelburne to the southeast (Quinn and Broders 2007). The species occurs throughout most of eastern North America, with Nova Scotia representing the northeastern extent of its range (Fujita and Kunz 1984).

Tri-colored bats require clumps of *Usnea* lichen for roosting; a habitat feature typically associated with mature spruce and balsam fir trees (Farrow 2007). This association suggests that the species may be negatively impacted by intensive forestry practices that remove roosting habitat (Farrow 2007). The species typically forages over water bodies, but also feeds over tree canopies (reviewed by Quinn and Broders 2007) and it appears that, unlike the Little brown myotis, Tri-colored bats stay active throughout the night, possibly as a means to reduce intraspecific competition (Broders *et al.* 2003). This species is non-migratory, and generally hibernates alone, or in small numbers, in caves or abandoned mines where it appears to show a preference for small side passages, rather than main passages (Fujita and Kunz 1984; Moseley 2007). Individuals show strong fidelity to specific hibernacula, although in Nova Scotia only 10 hibernating individuals have ever been recorded (Quinn and Broders 2007).

Tri-colored bat has been recorded at Frenchman's Cave, less than 30 km from the Project site, and ACCDC data indicates that the closest observation of this species to the Project site was 22±10 km away. The Project site is outside of the expected summer range of Tri-colored bat in southwestern Nova Scotia (Farrow 2007). Since Tri-colored bat was not detected during field studies, it is unlikely that this species occurs at the Project site, either during the breeding season or during late-summer movements to hibernacula.

9.0 SOCIO-ECONOMIC ENVIRONMENT

9.1 Local Demographics and Industry

The area surrounding the Project site is sparsely populated by the small community of North Beaver Bank. The Project site is located on land within the HRM which is home to many long established communities including Halifax, Dartmouth, Bedford, Sackville and others. The HRM reported a population of 390,096 in 2011 (Statistics Canada 2011). The nearest population centers to the Project site are Enfield (11.6 km), Lantz (16.9 km) and Hammonds Plains (21.9 km).

9.1.1 Demography

Population statistics for HRM and the Enfield from the 2011 census are summarized in Table 9.1.

Table 9.1 Population in HRM County and Enfield

Population Statistics	HRM	Enfield
Population in 2011	390,096	3,892
Population in 2006	372,679	3,415
Population change from 2006-2011 (%)	4.7	14.0
Total private dwellings in 2011	177,160	1,541
Land area (square km)	5,490.28	4.53
Population density per square kilometer	71.1	859.1

Source: Statistics Canada 2011

The age distribution in HRM and Enfield (Table 9.2) reveal slightly younger populations with a median age of 39.9 years and 36.5 years, respectively compared to the median age of the Province of Nova Scotia (43.7) (Statistics Canada 2011).

Table 9.2: Age in HRM and Enfield

Age Statistics	HRM	Enfield
0 - 14 years	59,605 (15.3 %)	845 (21.7 %)
15 - 64 years	279, 465 (71.6 %)	2,690 (69.2 %)
65+ years	51,025 (13.1 %)	355 (9.1 %)
Total Population	**390,095 (100 %)**	**3,890 (100%)**

Source: Statistics Canada 2011

9.1.2 Health Care and Emergency Services

Halifax Regional Fire and Emergency has 59 fire stations across the region. The nearest station to the Project site is located at 1581 Beaver Bank Road (7.5 km to the south) (HRM 2013).

Emergency health services in the region include the Cobequid Community Health Center located in Lower Sackville, the QEII Infirmary located in Halifax, and the IWK Health Centre located in Halifax.

9.1.3 Industry and Employment

Employment and unemployment rates for February 2013 in Halifax County (includes North Beaver Bank) Economic Region indicate that the unemployment rate was 6.4%, which is lower than the provincial average of 9.9% (Statistics Canada 2013). With regard to employment rates, the Halifax County employment rate of 64.6% was found to be higher than the provincial rate of 56.6% (Statistics Canada 2013).

A breakdown of the labour force within HRM is provided in Table 9.4. The highest proportion of workers in HRM falls into the “other services” category (25.0%). While Statistics Canada does not specifically list tourism as an industry, it likely falls under the “other services” heading. Other significant industries include business services, health care and social services (Statistics Canada 2006).

Table 9.4: Labour Force by Industry in HRM

Total	Total HRM
Total experienced labour force 15 years +	210,080
Other services	52,485
Business services	43,480
Retail trade	25,045
Health care and social services	24,480
Educational services	16,355
Finance and real estate	13,540
Construction	11,580
Manufacturing	11,015
Wholesale trade	8,630
Agriculture and other resource-based industries	3,475

Source: Statistics Canada 2006

A review of businesses located within 5 km of the Project site is provided in Table 9.5.

Table 9.5: Local Businesses and Proximity to Project Site

Business	Distance and direction to Project site*
Ivy Meadows	2.9 km southwest of Project site, on Knowles Crescent
ESSO	4.4 km southwest of Project site, on Beaver Bank Road
Halifax Radio Control Club	4.7 km northwest of Project site, on Beaver Bank Road

*All distances measured from center of the Project site, using the most direct route.

Economic effects as a result of the Project will include job creation and increased revenue for the HRM.

It is estimated that the Project will result in approximately $15 million in investments into the province of Nova Scotia. It is estimated that the Project will result in millions of dollars in contracts with Nova Scotia companies for the delivery of equipment and construction materials, as well as professional development, construction and operational services.

Job Creation
Elements of job creation throughout the lifespan of the Project include:

- Project Development- During the development phase of the Project, Nova Scotian professionals will deliver a variety of services, including: civil and electrical engineering services, legal services, financial services, environmental and biological survey services, archaeological services, land and community relations services, website development, and many others. As this project is one of many COMFIT projects being developed in the Province, it is difficult to precisely estimate the number of full-time-equivalent jobs that are created through the development of this Project alone, however it is known that dozens of professionals within Nova Scotia will render their services as part of the development of the Project.

- Construction - Though the construction phase of the Project is relatively short, it will require significant manpower for realization. Much of the construction employment will come through contracting and subcontracting of Nova Scotia construction firms. This will likely include significant elements of civil and electrical construction. During the construction phase, it is estimated that 30 people will be temporarily employed by the Project.
- Operations and Maintenance - Operational wind projects require long-term operations and maintenance professionals to be located either on-site or within short driving distance of the Project. It is generally anticipated that a team of two operations and maintenance technicians can maintain regular operations and maintenance service on approximately a dozen turbines. Once constructed, it is anticipated that the Project will be one of several projects which share long-term operations and maintenance teams to ensure project performance. The jobs associated with operations and maintenance are long-term, steady, stable, and high-paying jobs

In addition to the direct investments that the Project would bring to Nova Scotia's economy, a suit of auxiliary economic benefits can also be expected. It has previously been demonstrated that investments in wind power developments can result in significant indirect ancillary benefits to local communities. Workers that are directly involved with the development would contribute to local economies by redistributing wealth to a variety of goods and services such as hotels, restaurants, and grocery stores (USDE 2008).

Tax Revenue

As outlined in the *Wind Turbine Facilities Municipal Taxation Act* (2006), the HRM will receive tax revenues per MW on an annual basis and as such, the royalty will annually increase as the Consumer Price Index rises. Property taxes to be paid to the municipality over the lifespan of the Project are estimated at $950,000.

Investment in the Local Community

Through a Community Dividend, the proponent is committed to sharing the economic benefits of the Project with the surrounding community. The Project will direct 1% of the annual gross revenues to a local community liaison committee that will decide how it can be used for the betterment of the community. It is estimated that over the lifetime of the Project the Community Dividend will invest more than $750,000 in the local community.

9.2 Land Use and Value

The property on which the proposed wind farm is to be built is privately owned "Resource Forest" land owned by Barrett Lumber Company Limited. The Project site is surrounded by "Resource Forest", "Provincial Forest", "Commercial Forest", "Residential Taxable" and "Resource Taxable" lands (Service Nova Scotia 2013).

Potential effects on property values is often a concern of neighboring residents due largely to anecdotal reports from appraisers of drastic declines in property values following the nearby installation of a wind energy facility (as reviewed in Gulden 2011). Despite these concerns, a number of rigorous and statistically defensible studies have concluded that wind energy developments have had no significant effect on surrounding property values.

Prior to 2013, the most comprehensive study on the impact of wind farms on property values had been completed by Hoen *et al.* (2009). This research analyzed data on nearly 7,500 sales of single family homes situated within 10 miles (16 km) of 24 existing wind farms in the United States. Eight different hedonic pricing models failed to generate statistically significant evidence that property values for houses located within 10 miles of wind farms are influenced by the developments. Subsequent research by the same laboratory but employing further analyses confirmed these results (Hoen *et al*. 2010).

Carter (2011) analyzed home transactions in a rural landscape surrounding small (1-4 turbines) wind energy developments, while employing a hedonic model to statistically control for variables affecting all real estate transactions such as square footage, age of home, and school zone. This study concluded that proximity to the wind farms did not impact average selling price of homes; in fact, in one case, homes closer to a wind farm sold for significantly higher than those elsewhere (Carter 2011).

A study by Hinman (2010) tracked property transactions in communities located close to a 240-turbine wind farm for an eight year period that spanned pre-development and operation stages. Hinman (2010) found that before project approval, property values in the area decreased. This was attributed to a fear of the unknown effects that the development would have; an effect known as anticipation stigma. However, once the development became operational, property values recovered. This recovery was attributed to a greater understanding of the operational effects of the development. Anticipation stigma, however, was not detected in a similar study in Colorado (Laposa and Mueller 2010), in which it was concluded that the announcement of a large wind energy development did not significantly reduce the selling prices of homes surrounding the proposed development.

Until very recently, the primary limitation of previous research on the effects of wind energy facilities on surrounding home values has been that research has been based on relatively small sample sizes (data sets) of relevant home-sale data. The inability to account for the complexity of the various factors which affect property values has also been cited as a limitation to previous studies. In particular, data had been limited for homes located within about a half mile (800 m) of turbines, where impacts would be expected to be the largest: Hinman (2010) (n~11); Carter (2011) (n~41). This is in part due to the fact that setback requirements generally result in wind facilities being sited in areas with relatively few houses, limiting the number of sales transactions available to be analyzed (Hoen *et al.* 2013). Although these smaller datasets are adequate to examine large impacts (e.g., over 10%), they are less likely to reveal small effects with any reasonable degree of statistical significance.

A recent study published in August 2013 by Berkeley National Laboratory (principal authors) was conducted to address these gaps in data, and included the largest home-sale data set to date. Researchers collected data from 51,276 home sales spanning 27 counties in nine states, related to 67 different wind facilities (Hoen *et al*. 2013). These homes were within 10 miles of 67 different wind facilities, and 1,198 of the sales analyzed were within 1 mile (1.6 km) of a turbine, giving a much larger data set than previous studies have collected. The data span the periods well before announcement of the wind facilities to well after their construction (Hoen *et al.* 2013).

Two types of models were employed during the study to estimate property-value impacts: (1) an ordinary least squares (OLS) model, which is standard for this type of study, and (2) a spatial-process model, which accounts for spatial variability. These models allow the researchers to control for home values before the announcement of a wind facility (as well as the post-announcement, pre-construction period), the spatial dependence of unobserved factors effecting home values, and value changes over time. A series of robustness models was also employed to add an additional level of confidence to the study results.

Regardless of model specification, the results of the study revealed no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods. Therefore, the authors conclude that if effects do exist, either the average impacts are relatively small (within the margin of error in the models) and/or sporadic (impacting only a small subset of homes) (Hoen *et al*. 2013).

Research has consistently demonstrated that, in a variety of spatial settings and across a wide temporal scale, sale prices for homes surrounding wind energy facilities are not significantly different from those attained for homes sited away from wind energy facilities.

9.3 Recreation and Tourism

Existing outdoor recreation in the area includes hunting, fishing, ATVing, and hiking. Lost Creek Golf Club and Oakfield Golf and Country Club are located within 10 km of the Project site. The Halifax Radio Control Club is located approximately 4.7 km northwest of the Project site.

The 2011 Nova Scotia Visitor Exit Survey Community Report outlines the total trips (stopped or stayed) to communities in Nova Scotia, to particular tourist regions, as well as capture rates of communities within tourist regions (NSDERDT 2011). Table 9.6 shows the total trips (people who stopped for at least 30 minutes or stayed overnight) that were made to Sackville, Bedford and Halifax, as well as their capture rate (the percentage of parties that stopped in a specific community compared to other communities within the region) out of the total number of parties who visited the tourism region.

Table 9.6: Communities Visited in Nova Scotia

Region/Community	Total Trips (% who stopped or stayed)	Capture Rate (%)
HRM	**79%**	
Bedford	18%	22%
Halifax	68%	87%
Sackville	10%	12%
Peggy’s Cove	16%	60%
Mahone Bay	11%	42%
Lunenburg	13%	49%

Source: Nova Scotia Department of Economic and Rural Development and Tourism 2011

The data shows tourism in Sackville and Bedford are not major economic drivers. Comparatively, Halifax is by far the more popular destination.

It is difficult to determine with certainty how tourists will react to a wind development. Wind farms are objects of fascination for many and thus can generate tourism for the local community. Some wind farms have upwards of 60,000 visits a year and the benefits of even drawing a fraction of that amount of visitors to a community can be felt by many businesses including shops, restaurants and hotels (CanWEA 2006). Pincher Creek, Alberta developed a 19 MW wind farm in 1993, since that time tourism revenue from visitors from as far away as Russia has generated $5,000 in annual sales of clothing and souvenirs branded with the “Naturally Powerful Pincher Creek” logo (CanWEA 2006).

A 2002 study by Market and Opinion Research International interviewed tourists visiting Argyll and Bute, Scotland and asked them about their attitudes towards the presence of wind farms in the area. Of those who knew about the surrounding wind farms (40% of those interviewed), 43% felt that wind farms had a positive effect on the area, 43% felt it made no difference, and 8% felt it had a negative effect (Market and Opinion Research International 2002).

The turbines will consist of a small footprint on privately owned land. Therefore, no impacts are expected to the broader recreational community.

10.0 CULTURAL AND HERITAGE RESOURCES

10.1 Archeological Resource Impact Assessment

Davis MacIntyre and Associates Limited conducted an ARIA for the Project. The purpose of the ARIA was to determine the potential for historic and pre-contact period archeological resources within the Project site through background research.

No archaeological resources were encountered during the field reconnaissance and the background study, as well as the predictive modeling, indicated that the Project site was, in fact, of low potential for archaeological resources (Davis MacIntyre and Associates Ltd. 2013). Much of the Project footprint was located in recent clear cut fields, which the exception of the access road between turbine 1 and 2, and turbine 1 itself. The most substantial watercourse identified during the field reconnaissance was less than 2 m wide and less than 20 cm deep, unproductive, and not navigable (Davis MacIntyre and Associates Ltd. 2013).

The ARIA was forwarded to the NS Department of Communities, Culture and Heritage. The response letter is provided in Appendix H, confirming that no significant archaeological material will be disturbed by the Project.

11.0 OTHER CONSIDERATIONS

11.1 Shadow Flicker

Shadow flicker can occur when rotating blades cast flickering shadows during times of direct sunlight. The magnitude of shadow flicker is determined by the position and height of the sun, wind speed and direction, geographical location, time of year, cloud cover, turbine hub height and rotor diameter, and proximity to the turbine (CanWEA 2011).

For shadow flicker to occur, the following criteria must be met:

1. The sun must be shining and not be obscured by clouds/fog.
2. The source turbine must be operating.
3. The wind turbine must be situated between the sun and the shadow receptor.
4. The wind turbine must be facing directly towards, or away from, the sun such that the rotational plane of the blades (*i.e.,* rotor plane) is perpendicular to the azimuth of incident sun rays. For this to occur, the wind direction would have to be parallel to the azimuth of the incident sun rays throughout the day.
5. The line of sight between the turbine and the shadow receptor must be clear. Light-impermeable obstacles, such as vegetation, tall structures, etc., will prevent shadow flicker from occurring at the receptor.
6. The shadow receptor has to be close enough to the turbine to be in the shadow.

There are no municipal, provincial, or federal guidelines related to shadow flicker, but many jurisdictions (including NSE) have adopted the industry standard of no more than 30 hours of shadow flicker per year, or no more than 30 minutes of shadow flicker on the worst day of the year at receptor locations (*e.g.*, dwellings, cottages/camps, hospitals, schools, and daycares). These guidelines were developed in Germany to prevent excessive annoyance to neighbours of wind energy developments and are now included under that country's *Federal Emission Control Act* (as cited in Haugen 2011).

Shadow flicker can be mitigated by siting wind turbines at sufficient distance from residences likely to be affected. Flicker effects have been reported to occur only within ten rotor diameters of a turbine (Office of the Deputy Prime Minister 2004). A Land Use Planning for Wind Energy document was developed by EDS Consulting for Manitoba in 2009. The report suggests that at 500 m and more, shadow flickers occurs only at sunrise and sunset and at distances exceeding 900 m shadow flicker is considered to be insignificant (EDS 2009). Based on a conservative approach, with a blade diameter of 100 m, the potential shadow flicker effect could be felt up to 1,000 m from a turbine.

Desktop resources and site reconnaissance was used to develop a list of potential shadow flicker receptors. No structures were identified within 1 km of a proposed turbine location.

Due to the distance between Project infrastructure and potential receptors, no adverse impacts to residential receptors are expected.

11.2 Electromagnetic Interference (EMI)

The rotating blades and support structures of wind turbines can interfere with various types of electromagnetic signals emitted from telecommunication and radar systems (RABC and CanWEA 2012). In response to this phenomenon, the Radio Advisory Board of Canada (RABC) and CanWEA developed guidelines for assessing the EMI potential from a wind turbine development. These guidelines outline a consultation based assessment protocol that establishes areas, called "consultation zones", around transmission systems, based on the type and function of the system.

Consultation with relevant agencies was completed and results are provided in Table 11.1.

Table 11.1: Radar, Navigation and Communications Consultation Results

Signal Source	Operator	Required/ Suggested Consultation Zone Radius	Consultation Results
Air defense and air control radar systems/radar communications	DND	100 km	No objections or concerns.
Maritime vessel traffic system radars	Canadian Coast Guard	60 km	No objections or concerns.
VHF omnidirectional range	Nav Canada	15 km	Although potential impacts were identified (see correspondence in Appendix I), all were determined to be acceptable by Nav Canada.
Primary air traffic control surveillance radar		80 km (primary surveillance) 10 km (secondary surveillance)	
Weather radar	EC	50 km	No objections or concerns.

Aeronautical obstruction clearance was also obtained from Transport Canada and is provided in Appendix I, along with relevant correspondence from the above operators. Should any modifications be made to the Project design, additional consultation will be required.

11.3 Visual Impacts

Predicted View Plane

To assess the potential impact on visual aesthetics in the local area, representative photos were taken from vantage points within the community to complete a Visual Impact Assessment.

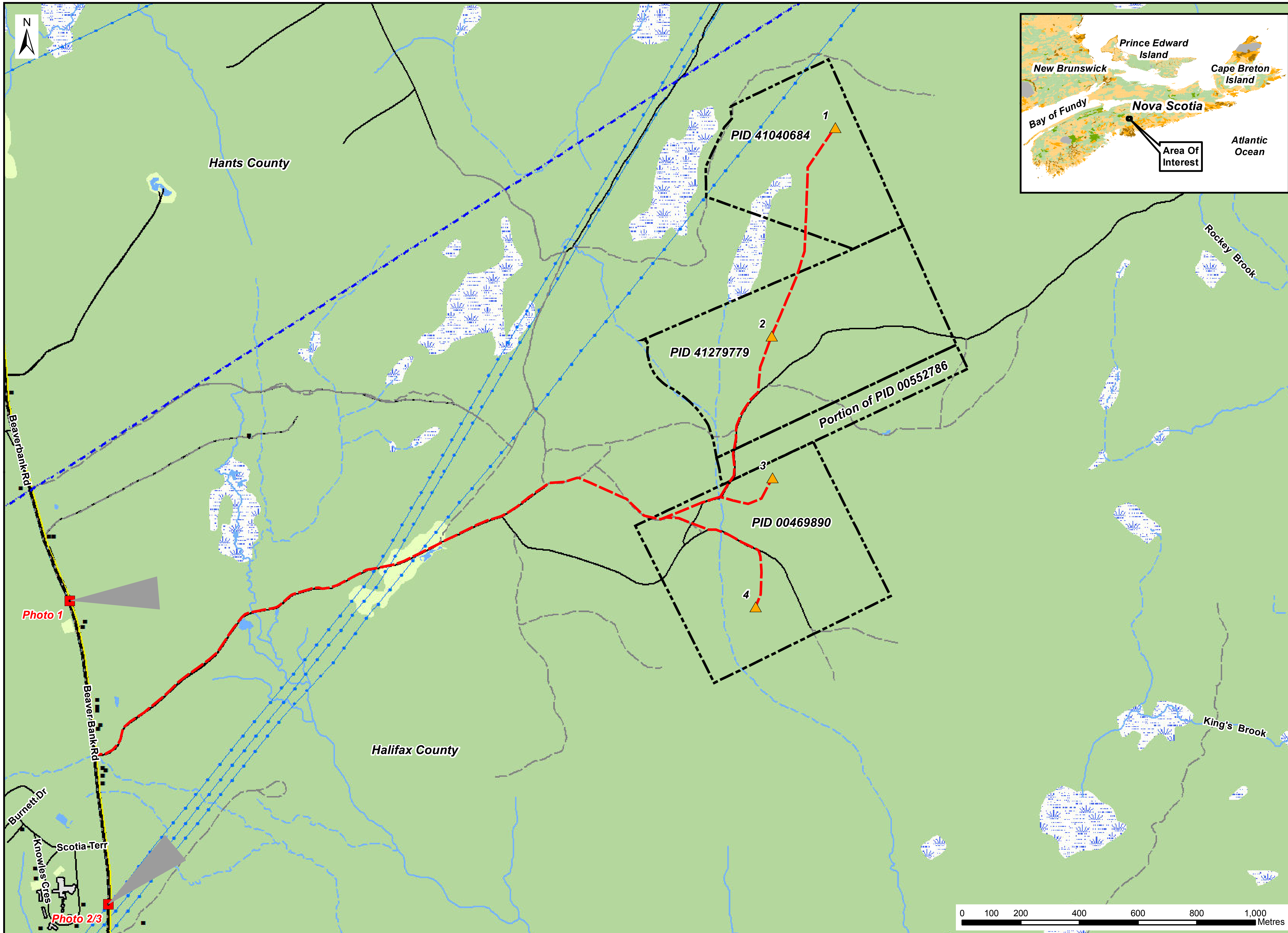
Photographs were collected at two points of high visibility in the local community along Beaver Bank Road approximately 2.5 km from the nearest proposed turbine location. Geographical Information System software was used to plot the photo locations and construct bearing lines to assist in the construction of a 3D model. Views captured in the photographs were recreated in the 3D model, and .jpeg files were exported. Digital photographs were overlaid on the model renderings, aligned by matching the dominant ridge line. Proposed turbine locations and specifics regarding the height of the turbines were used to position and model the proposed turbines. Simulated wind turbines were added to the digital photographs consistent with the location and scale represented in the 3D renderings

Photos were taken from two locations as shown in Drawing 11.1. Simulated results are provided in Figures 11.1-11.3.

Figure 11.1: View looking east/northeast across a clearing along Beaver Bank Road.

Figure 11.2: View looking northeast, from Beaver Bank Road along the cleared NSPI transmission corridor, near the Ivey Meadows long-term care facility.

Figure 11.3: Simulated sunrise appearance from the same viewpoint as 11.2.



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Proposed Turbine
- Visual Assessment Location
- Proposed Access Road
- Project Site Boundary
- Building
- County Boundary
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area
- Cleared Area

Visual Assessment Locations

Strum
CONSULTING

Date: October 2013	Project #: 12-4563
Scale: 1:12,000	Drawing #: 11.1
Drawn By: H. Serhan	
Checked By: M. Smith	

11.4 Sound

Sound from wind turbines comes from two general sources: the mechanical equipment, and the sound from the interaction of the air with the turbine parts, primarily the blades (NSDE 2008). In modern turbine designs, much of the mechanical noise is mitigated through the use of noise insulating materials. Aerodynamic noise, however, is a product of the turning of turbine blades and is thus an unavoidable aspect of wind power operations. Turbines can emit noises of different frequencies, and an individual's perception of the noise can depend on hearing acuity and tolerance for particular noise types (NRC 2007). Furthermore, the propagation of sound from the turbine source to a receptor, such as a residential dwelling, is influenced not only by the sound power level emitted from the turbine, but also by local factors such as distance to the receptor, topography, and weather conditions (Hau 2006). For example, increases in wind speed result in increases in ambient, natural noise (from vegetation movement) that can mask the sounds emitted from the turbine(s) (NRC 2007).

Nova Scotia has no specific sound guidelines for wind farms; however, through the EA process, NSE requires that predicted noise levels at identified residential receptors (as well as camps/cottages, daycares, hospitals and schools) not exceed 40 dBA. As this guideline is intended to be protective of human sleep disturbance, 40 dBA does not apply to commercial or vacant lot receptors. This guideline was used in the current sound assessment for the Project.

Acoustic Assessment

An acoustic assessment was conducted for the Project to predict sound pressure levels at identified receptors within a 2 km radius of the proposed turbine locations. The assessment was completed using the WindPro v. 2.9 software package. For the purposes of this model, receptors included all structures identified in the provincial topographic mapping, as well as any additional identifiable structures based on aerial imagery. No attempt to distinguish sheds and outbuildings from dwellings or cottages was made. The model followed ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method and calculations, and was based on the following input information:

- UTM coordinates for the wind turbines;
- 1/1 Octave band sound power level data, provided by the manufacturer;
- UTM coordinates for receptors (all structures within a 2 km radius of the Project site were evaluated – 1 receptor in total);
- A wind speed of 8 m/s, the speed at which the highest sound power level output is achieved (based on test data from the manufacturer); and
- Topographic data for the surrounding area.

The ISO 9613-2 calculation method assumes meteorological conditions that are ideal for noise propagation, including a ground temperature of 10°C and 70% relative atmospheric humidity. A ground factor of 0.7 was applied to the model, representing predominantly porous ground (*i.e.*, capable of vegetative growth) interspersed with hard surfaces (*e.g.,* water).

Just one receptor was identified within a 2 km radius of the proposed turbine locations. Modeling results predicted a sound level at this receptor of 30 dBA, well below the 40 dBA guideline. Mapping illustrating the predicted sound levels relative to receptors is provided in Drawing 11.2. Excessive noise resulting from turbine operation is therefore not expected to be an issue at any existing dwellings/residences. Detailed results are provided in Appendix J.

A literature review related to infrasound is provided in Appendix C.

12.0 CONSULTATION AND ENGAGEMENT

12.1 Public Consultation

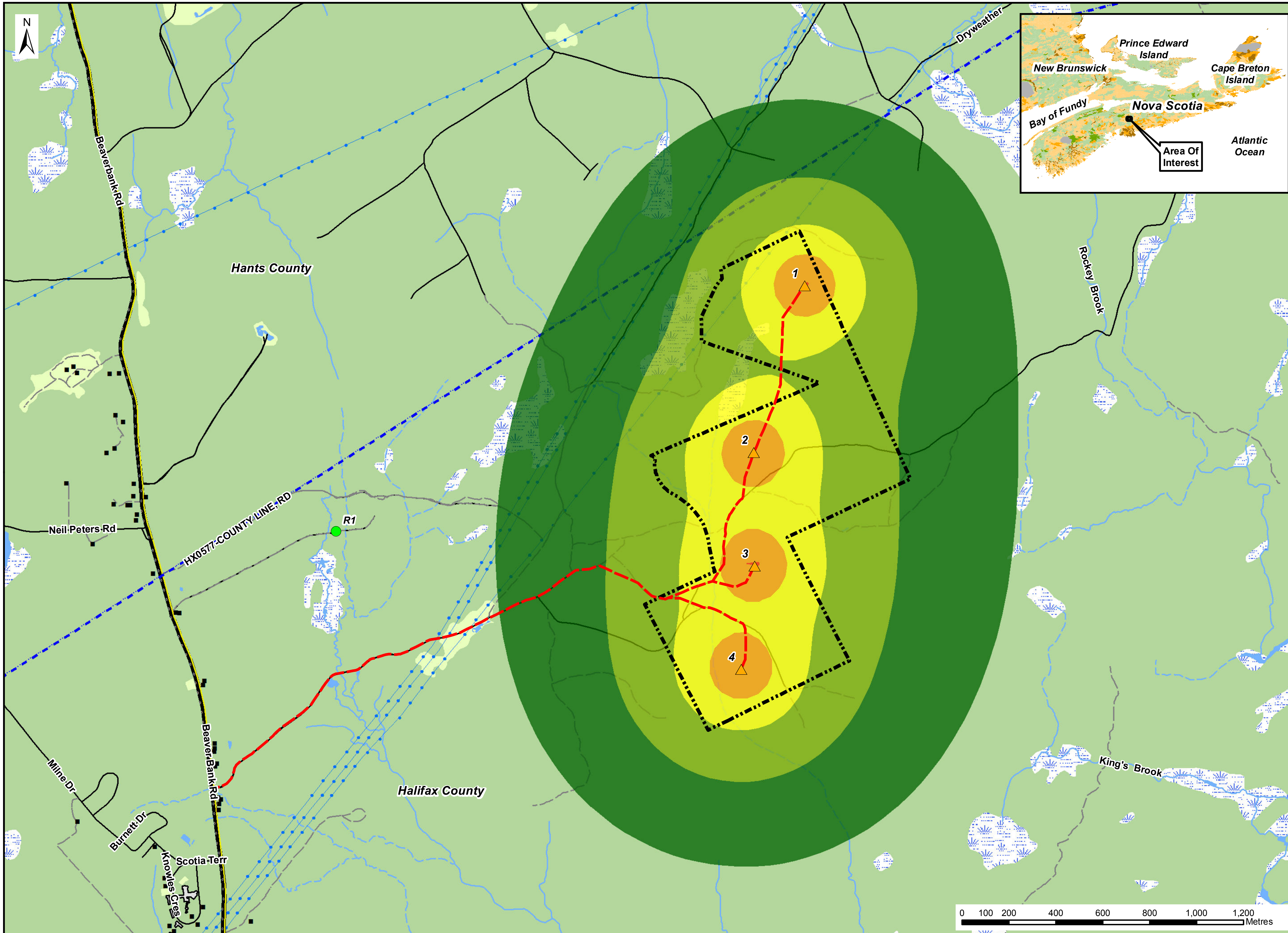
A summary of the consultation for this Project is provided in Table 12.1. Detailed information on the open house event and the website is provided below.

Table 12.1: Consultation Meetings and Events

Date	Stakeholder	Activity
March 12, 2012	CWS and NSDNR	Bird monitoring protocol provided to CWS and NSDNR.
April 24, 2012	CWS	Received written feedback from CWS regarding the bird monitoring program.
June 13, 2012	NSDNR	Phone conversation with DNR staff to discuss bat monitoring and timing.
December 5-7, 2012	NSDNR	Provided moose monitoring protocol to NSDNR staff and incorporated feedback into protocol.
February 18, 2013	NSDNR	Received feedback on moose protocol update.
March 8, 2013	Community	Letter to all land owners within ~3km of the Project site (a Project map and an open house invitation was provided).
March 19, 2013	Community	Open House event held at the Beaver Bank Kinsac Community Centre – attended by approximately 35 members of the public.
May 15, 2013	Community	SWFI staff met with the Board of the Beaver Bank Community Awareness Association
May 23, 2013	Community	SWFI staff set up a Project information booth at Beaver Bank Community Awareness Association Annual Townhall meeting (100+ attendees). Gay Harley (Community Coordinator for SWFI) joined the Board of the BBCAA.
July 22, 2013	NSE EA Branch and NSDNR	Met with NSE and NSDNR staff to discuss the Project.
September 13, 2013	NSE EA Branch and NSDNR	Met with NSE and NSDNR staff to discuss the Project.

Open House Event

One community open house event was held at the Beaver Bank Kinsac Community Centre on March 19, 2013 to inform the public about the Project and to hear local comments and concerns. The open house featured posters that provided information about the Project and associated studies that were underway. Copies of the posters and newsletter from the open house are provided in Appendix K. Attendees had the opportunity to speak one-on-one with Project team members and submit written comments and/or questions.



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Project Site Boundary
- Proposed Turbine
- Proposed Access Road
- Existing Noise Receptors

Sound Modeling Results

Predicted Sound Level (dBA)

- 35
- 40
- 45
- 50
- 55
- Building
- County Boundary
- Active Railroad
- Retired Railroad
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Building
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Sound Modeling Results

Strum CONSULTING

Date: October 2013	Project #: 12-4563
Scale: 1:12,000	Drawing #: 11.2
Drawn By: G. Gregory	
Checked By: M .Smith	

The Project Team will continue to help address any concerns raised by local citizens over the duration of the Project's development.

Website

A website for the Project has been developed and can be accessed at: http://www.scotianwindfields.ca/wind/projects/north-beaverbank-community-wind-project. The website provides an overview of the Project, provides access to the featured posters presented at the first open house, shares information on upcoming meetings, and Project news, as well as allows interested public to pose questions to the Project team.

12.2 Aboriginal Engagement

Preliminary Project details were submitted to the Kwilmu'kw Maw-klusuaqn Negotiation Office on March 27, 2012 and on May 23, 2012. Information was also provided to the NS Office of Aboriginal Affairs on June 14, 2012. Details included a Project map, description of the work undertaken to date, and invitation to comment. No response from either organization has been received to date.

12.3 Review of Public Concerns

Issues and concerns raised by the public and other stakeholders throughout the consultation process can be grouped into five broad categories which have been assessed throughout the EA.

Concerns include:

- Potential effects from sound generated by wind turbines;
- Potential effects on property values on lands near the Project site;
- Potential effects to the visual landscape around the Project site;
- Potential effects to birds and other wildlife from the construction and operation of wind turbines; and
- Concerns regarding public health and safety.

Sound

Residents living near the Project site expressed concerns over the potential for noise during construction and decommissioning phases of the Project, as well as annoyance from noise generated by turbine blades during operation.

Sound modeling was completed to ensure that sound levels generated by operating turbines at all existing receptors will comply with the NSE standard of 40 dBA (exterior of the residence).

Additional details regarding sound assessment methodology and results are provided in Section 11.4. Infrasound is considered in the Human Health Literature Review provided in Appendix C.

Property Values

Potential effects on property values have been identified as a concern of neighboring residents. A review was completed on available literature related to the effect of wind farms on surrounding property values and a discussion is provided in Section 9.2.

Visual Landscape
Photos taken from locations near the Project site were used to create simulated images of the view plane for public viewing. Additional details and results of the visual assessment for the Project are provided in Section 11.3.

Birds and Wildlife
The public has raised concerns about mortality of birds and bats resulting from collisions with wind turbines. Sensory disturbances, as well as habitat loss for birds, bats and other forms of wildlife are also common concerns.

Extensive desktop and field studies have been completed to assess birds, bats and other wildlife and associated habitats at or near the Project site. Extensive consultation has been ongoing with NSDNR and CWS to ensure due diligence is practiced with regards to wildlife. The Proponent has committed to ongoing monitoring as requested by these agencies.

Details on wildlife methodology and results for fish, terrestrial fauna, birds, and bats are provided in Sections 8.3, 8.6, 8.7 and 8.8, respectively.

Public Health and Safety
The public is often concerned about the potential for effects to health and safety from wind turbines. In addition to sound levels, common concerns include infrasound, shadow flicker and the risk of ice throw. Due to the distance between Project infrastructure and potential receptors, no adverse shadow flicker impacts to residential receptors are expected.

A literature review regarding additional potential for effects to health and from wind turbines was also completed. The main findings of this review are provided in Appendix C.

13.0 EFFECTS ASSESSMENT

Based on the discussion in Section 7, the following have been identified as VECs:

- SOCI (fauna);
- Avifauna; and
- Bats.

To ensure all relevant issues and concerns related to the proposed Project are identified, an interaction matrix was used to evaluate the interactions between the Project phases and the VECs (Table 13.1). The potential for accidents and malfunctions is also considered for each Project phase.

Table 13.1: Interaction Matrix

Project Phases/Activities	Fauna SOCI	Avifauna	Bats
Site Preparation and Construction			
Land Surveys for Placement of Roads, Turbines and Associated Works		X	
Geotechnical Investigations	X	X	
Placement of Sedimentation and Erosion Control Measures			
Clearing of Trees and Grubbing Areas for Construction	X	X	X
Access Road Upgrading and Construction	X	X	X
Laydown Area and Turbine Pad Construction	X	X	X
Transportation of Turbine Components			
Turbine Assembly	X	X	X
Grid Connection			
Removal of Temporary Works and Site Restoration			
Commissioning			
Operation and Maintenance			
General Operation and Maintenance	X	X	X
Vegetation Management	X	X	
Decommissioning			
Dismantling and Removal of Turbines from Project Site	X	X	X
Removal of Turbine Foundations to Below Grade and Reinstatement of Topsoil	X	X	X
Reinstatement of Lands	X	X	X
Removal and Disposal of Collection System, Conductor and Poles	X	X	X
Removal of All Other Equipment and Stabilization of Lands	X	X	X

13.1 Environmental Effects Analysis Methodology

The completion of the environmental effects analysis involves consideration of the following elements:

- Description of potential negative environmental effects;
- Mitigation measures;
- Residual effects;
- Significance of residual environmental effects; and
- Monitoring or follow up programs.

This EA is structured to include proposed mitigation to reduce or eliminate potential adverse environmental effects. The determination of significance of adverse environmental effects is based on post-mitigation (residual) effects, rather than unmitigated potential effects. The significance of