Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
37	15	*Purple Finch	*Haemorhous purpureus*	S4S5B S3S4N
32	7	Common Grackle	*Quiscalus quiscula*	S5B
33	8	Red-breasted Nuthatch	*Sitta canadensis*	S4S5
31	8	Swamp Sparrow	*Melospiza georgiana*	S5B
26	7	Hairy Woodpecker	*Dryobates villosus*	S5
24	25	Black-throated Green Warbler	*Setophaga virens*	S5B
24	14	Blue-headed Vireo	*Vireo solitarius*	S5B
18	1	American Crow	*Corvus brachyrhynchos*	S5
16	**3**	**Olive-sided Flycatcher**	***Contopus cooperi***	**S2B SARA: SC NSESA: T**
16	8	*Canada Jay	*Perisoreus canadensis*	S3
16	23	Black-throated Blue Warbler	*Setophaga caerulescens*	S5B
15	2	Golden-crowned Kinglet	*Regulus satrapa*	S5
15	4	Northern Parula	*Setophaga americana*	S5B
13	12	Alder Flycatcher	*Empidonax alnorum*	S5B
12	3	American Redstart	*Setophaga ruticilla*	S4S5B
11	13	Canada Goose	*Branta canadensis*	S4N
10	37	Common Raven	*Corvus corax*	S5
9	8	Downy Woodpecker	*Dryobates pubescens*	S5
8	11	*Yellow-bellied Flycatcher	*Empidonax flaviventris*	S3S4B
8	4	Least Flycatcher	*Empidonax minimus*	S4S5B
8	8	Winter Wren	*Troglodytes hiemalis*	S5B
7	4	*American Kestrel	*Falco sparverius*	S3B
7	0	Double-crested Cormorant	*Phalacrocorax auritus*	S4B SARA: NAR
6	**9**	**Canada Warbler**	***Cardellina canadensis***	**S3B SARA: T NSESA: E**
6	**3**	**Evening Grosbeak**	***Coccothraustes vespertinus***	**S3S4B S3N SARA: SC NSESA: V**
5	21	*Ruby-crowned Kinglet	*Regulus calendula*	S3S4B
5	0	American Black Duck	*Anas rubripes*	S5
5	5	Lincoln's Sparrow	*Melospiza lincolnii*	S4B
5	10	Red-eyed Vireo	*Vireo olivaceus*	S5B
4	1	Red-tailed Hawk	*Buteo jamaicensis*	S5 SARA: NAR
4	1	Pileated Woodpecker	*Dryocopus pileatus*	S5

Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
4	1	Tree Swallow	*Tachycineta bicolor*	S4B
3	1	Northern Waterthrush	*Parkesia noveboracensis*	S4B
3	1	Red-winged Blackbird	*Agelaius phoeniceus*	S4B
2	0	Bald Eagle	*Haliaeetus leucocephalus*	S5 SARA: NAR
2	0	Brown Creeper	*Certhia americana*	S5
2	0	Common Loon	*Gavia immer*	S4B S4N SARA: NAR
1	**0**	**Common Nighthawk**	***Chordeiles minor***	**S3B SARA: T NSESA: T**
1	**0**	**Eastern Wood-Pewee**	***Contopus virens***	**S3S4B SARA: SC NSESA: V**
1	0	*Blackpoll Warbler	*Setophaga striata*	S3S4B
1	0	*Gray Catbird	*Dumetella carolinensis*	S3B
1	0	*Northern Harrier	*Circus hudsonius*	S3S4B SARA: NAR
1	0	*Veery	*Catharus fuscescens*	S3S4B
1	0	American Woodcock	*Scolopax minor*	S5B
1	2	Belted Kingfisher	*Megaceryle alcyon*	S5B
1	0	Blackburnian Warbler	*Setophaga fusca*	S4B
1	0	Broad-winged Hawk	*Buteo platypterus*	S5B
1	1	Ruby-throated Hummingbird	*Archilochus colubris*	S5B
1	0	Sharp-shinned Hawk	*Accipiter striatus*	S5 SARA: NAR
1	0	Spruce Grouse	*Falcipennis canadensis*	S4
1	2	White-winged Crossbill	*Loxia leucoptera*	S4S5
1	0	Wood Duck	*Aix sponsa*	S5B
1	0	Yellow Warbler	*Setophaga petechia*	S5B
0	2	*Pine Siskin	*Spinus pinus*	S3
0	14	*Red Crossbill	*Loxia curvirostra*	S3S4
0	1	Savannah Sparrow	*Passerculus sandwichensis*	S4S5B,S5M
0	1	Swainson's Thrush	*Catharus ustulatus*	S4B,S5M
0	1	White-breasted Nuthatch	*Sitta carolinensis*	S4
0	**4**	**Chimney Swift**	***Chaetura pelagica***	**S2S3B,S1M SARA: T NSESA: E**
0	**1**	**Rusty Blackbird**	***Euphagus carolinus***	**S2B SARA: SC**

Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
				NSESA: E
2974	**1844**	**Total**		

Notes:
Bold indicates Species at Risk.
* indicates Species of Conservation Concern.
Legal protection status refers to the protection status under the *Species at Risk Act* (SARA) and the *Nova Scotia Endangered Species at Risk Act* (NSESA) as of December 2021.
Special Concern (SC), Vulnerable (V), Threatened (T), Endangered (E), Not at Risk (NAR)
*The winter survey occurred outside of the typical window for winter bird surveys (i.e., in April 2021). Additional surveys are planned for January and February 2022. Following their completion an addendum will be provided to NSECC.
**S-Ranks as of December 2022

The most frequently observed bird in both 2021 and 2022 during the Spring Migration Surveys was the White-throated Sparrow, which is not unexpected given the fragmented and early successional nature of much of the LAA. Overall, the majority of birds detected within the LAA during the Spring Migration Point Counts are ranked S4 or S5 by the AC CDC, indicating that their populations within Nova Scotia are considered 'Apparently Secure' or 'Secure'.

Between both the 2021 and 2022 Spring Migration Stop-Over Point Counts, seven SAR and 12 SoCC were detected, which includes species such American Robin and Purple Finch, which have non-breeding populations in Nova Scotia that are considered vulnerable by the AC CDC. Three of the seven SAR (Olive-sided Flycatcher, Canada Warbler, and Evening Grosbeak) were detected during Spring Migration Stop-Over Point Count surveys conducted in both 2021 and 2022. Two of the seven SAR (Common Nighthawk and Eastern Wood-Pewee) were only detected during Spring Migration Stop-Over Point Counts conducted in 2021, and a further two SAR (Chimney Swift and Rusty Blackbird) were only detected during Spring Migration Stop-Over Point Counts conducted in 2022. A detailed discussion of detected SoCC and SAR is available in **Section 3.1.7**.

Spring Diurnal Watch Counts Results

A summary of the behaviours observed and the range of estimated pass heights and distances for the 30-bird species that were observed during the Spring Diurnal Watch Counts is presented in **Table 21**.

TABLE 21: SUMMARY OF SPECIES OBSERVED DURING THE SPRING MIGRATION DIURNAL WATCH COUNTS (2021, 2022)

Common Name	Scientific Name	S-Rank and Conservation Status	Est. Distance(s) (m)	Pass Height(s) (m)	Observed Behaviour(s)
Alder Flycatcher	*Empidonax alnorum*	S5B	local	n/a	Calling
American Black Duck	*Anas rubripes*	S5B, S5N	1000	<50	Passing

Common Name	Scientific Name	S-Rank and Conservation Status	Est. Distance(s) (m)	Pass Height(s) (m)	Observed Behaviour(s)
American Goldfinch	*Spinus tristis*	S5	0-50	50-100	Passing
*American Kestrel	*Falco sparverius*	S3B, S4S5M	0-250	50-100	Passing, calling
Bald Eagle	*Haliaeetus leucocephalus*	S5	1000-3000	50-250+	Circling, passing, soaring
Belted Kingfisher	*Megaceryle alcyon*	S4S5B	100	<50	Calling
Black-capped Chickadee	*Poecile atricapillus*	S5	100	<50	Passing
Blue Jay	*Cyanocitta cristata*	S5	250-500	<50	Passing
Canada Goose	*Branta Canadensis*	SUB, S4N, S5M	500	50-100	Passing
*Canada Jay	*Perisoreus canadensis*	S3	local	n/a	Calling
Common Grackle	*Quiscalus quiscula*	S5B	1000	50-100	Passing
Common Raven	*Corvus corax*	S5	500-3000	100-250+	Circling, passing, soaring
Double-crested Cormorant	*Phalacrocorax auritus*	S5B	2000	100-250	Passing
Evening Grosbeak	***Coccothraustes vespertinus***	**S3B, S3N, S3M SARA: Special Conservation NSESA: Vulnerable**	**local**	**100-250**	**Passing**
Hermit Thrush	*Catharus guttatus*	S5B	100	n/a	Singing
Herring Gull	*Larus argentatus*	S5	500	100-250	Passing
*Northern Goshawk	*Accipiter gentilis*	S3S4	1000	100-250	Circling
Northern Harrier	*Circus hudsonius*	S4B, S4S5M	100	<50-250	Passing
Olive-sided Flycatcher	*Contopus cooperi*	S3B **SARA:** Special Concern **NSESA:** Threatened	250	n/a	Singing
Osprey	*Pandion haliaetus*	S4S5B, S5M	2000	100-250+	Circling
Purple Finch	*Haemorhous purpureus*	S4S5B, S3S4N, S5M	0-50	50-250	Passing
*Red Crossbill	*Loxia*	S3S4	local	50-100	Passing

Common Name	Scientific Name	S-Rank and Conservation Status	Est. Distance(s) (m)	Pass Height(s) (m)	Observed Behaviour(s)
	curvirostra				
Red-breasted Nuthatch	*Sitta canadensis*	S4S5	local	n/a	Calling
Red-tailed Hawk	*Buteo jamaicensis*	S5	1000-2000	50-250+	Circling, passing, perched, soaring
Red-winged Blackbird	*Agelaius phoeniceus*	S4B	0-100	50-100	Passing
Ruffed Grouse	*Bonasa umbellus*	S5	0	n/a	Drumming
Tree Swallow	*Tachycineta bicolor*	S4B	250	50	Passing
*Turkey Vulture	*Cathartes aura*	S2S3B, S4S5M	2000	50-100+	Soaring, passing
White-throated Sparrow	*Zonotrichia albicollis*	S4S5B, S5M	100	n/a	Singing
Yellow-rumped Warbler	*Setophaga coronata*	S5B	local	<50	Passing

Notes:
Bold indicates a species is considered a SAR
* indicates a species is considered a SoCC

Many of the bird species that were observed during the day appeared to be resident species or passing by the site. Birds of prey were observed hunting and scavenging within the LAA during the daylight hours. Several SAR and SoCC were identified during the Diurnal Watch Counts, including American Kestrel (S3B) and Turkey Vulture (S2S3B; i.e., they have breeding populations in Nova Scotia that are considered to be 'Vulnerable' and 'Vulnerable to Imperiled' by the AC CDC, respectively).

Summary and Data Assessment

Over the two years of observation, 80 bird species have been identified using habitat within the LAA during spring migratory periods of 2021 and 2022 through incidental observation and the formalized Spring Migration Survey Program. A comparative summary of bird diversity and abundance recorded at the 22-point count locations that were surveyed in both the 2021 and 2022 field season is provided in **Table 22**.

TABLE 22: SUMMARY OF BIRD DIVERSITY AND ABUNDANCE BETWEEN 2021 AND 2022

Point Count Location		Survey Route #1											
		1	2	3	4	5	6	7	8	9	10	11	12
Diversity	# Species 2021	23	31	34	26	26	25	21	25	17	24	27	24
	# Species 2022	25	27	28	28	25	23	18	21	25	17	21	26
Abundance	# Birds 2021	81	96	103	64	90	82	67	95	44	98	115	94
	# Birds 2022	82	87	93	97	75	65	68	73	83	58	89	76

Point Count Location		Survey Route #2											
		13	14	15	*16	17	*18	19	20	21	22	23	24
Diversity	# Species 2021	24	23	24	**n/a**	22	**n/a**	23	20	24	27	27	30
	# Species 2022	26	29	25	11	23	25	18	21	21	28	28	28
Abundance	# Birds 2021	86	93	87	**n/a**	78	**n/a**	73	71	74	82	100	98
	# Birds 2022	71	79	61	58	73	66	73	86	69	81	86	101

Note: Point Count locations were surveyed on five occasions in 2021 and four occasions in 2022
* survey location was established in 2022, there was no data collected in 2021 at this location
Total Diversity: 64 in 2021 and 63 in 2022
Total Abundance: 1871 in 2021 and 1726 in 2022

In general, bird diversity and abundance often increase as the spring progresses in Nova Scotia due to more bird species returning from their wintering grounds. Similarly, the results of the Spring Migratory Point Count Surveys indicated that within the LAA, bird diversity was observed to increase throughout the spring migratory period until mid-May and remained consistent between 2021 and 2022.

*Radar and Acoustic Monitoring

While some level of migration was observed on most nights in 2022, a large proportion of the migratory activity observed in each season was limited to 6 nights (The 4th, 5th, 12th, 14th, 23rd and 26th of May). Also, most activity was observed during times with little to no precipitation and when favourable tailwinds were present. These findings are typical to other radar and acoustic studies completed in Nova Scotia (e.g., Peckford and Taylor, 2008). When examining nights when large numbers of targets were detected (i.e., when most of the migration occurred) the bulk of the migratory movements were detected above the RSA (200 m or greater above ground level) and there tended to be fewer of targets at lower altitudes (i.e., within the RSA).

Statistical models provided evidence that the total number of birds per hour was related to tailwind assistance (at 'surface'), time of night (sunset, sunrise, and middle of the night) and weather (temperature, surface pressure and relative humidity). The most important differences can be attributed to different behaviours through the night. The radar detected fewer targets around sunset (migration initiation) and sunrise (landing/stopover), compared to the detections observed during the middle of the night (continued migration). The periods immediately following sunset and before dawn seeing comparatively fewer targets may suggest that birds are not using the Project area as a stopover location.

50.3% of Nocturnal Flight Call detections were identified as within the Sparrows species group, followed by Warblers at 49.6%. Numerous Common Nighthawk calls were detected in late May and were recorded in similar numbers at dusk, night, and dawn. Because the species is known to call repeatedly during the night (Brigham et al. 2020), resulting in a high probability of double counting, the counts of NFCs were not considered as separate detections. Given the time of year observed, and because calls were somewhat consistent

around dawn and dusk, these are likely individuals that are breeding in the area. The Common Nighthawk is ranked S3B for vulnerable breeding population. Canada Warbler calls (ranked S3B) were also detected in the Spring acoustic monitoring study. For more information on avian SAR, see **Section 3.1.7.4**.

Overall, the same observed patterns of activities were consistent across study years. The observations were in general alignment with radar and acoustic monitoring completed in other areas of Nova Scotia in that migration was focused on a few nights during the season when tailwinds were light to moderate.

3.1.5.2.3 Summer Program

Approach and Methodology

During the 2021 and 2022 peak nesting season (i.e., June 1 – July 15), a breeding bird survey program was conducted to identify species and estimate the abundance of birds that breed in the LAA with particular attention paid to their habitat requirements and habitat availability within the LAA. This survey was also supplemented by targeted nocturnal breeding bird surveys conducted in 2021 for species that may breed in the area, but that are typically only detectable at night, or during twilight hours, such as Nightjars (i.e., Common Nighthawk and Eastern Whip-Poor-Will) and nocturnal breeding owls.

Breeding Bird Point Count Surveys

Point Counts were conducted along the survey routes established for the Migratory Point Count surveys. Within the general search area, all birds seen or heard within 10-minute interval surveys were recorded.

Breeding bird surveys were conducted during the summer months following the same survey routes established for the spring and fall Migration Stop-Over Point Counts, which are shown on **Figure 12**.

For the breeding bird surveys, each survey route was completed twice each year, once early and once late, within the targeted peak breeding window. Special consideration was given to complete a portion of the survey within the June full moon phase to appropriately assess for the Common Nighthawk. **Table 23** below summarizes the survey dates of the Breeding Bird Surveys conducted in 2021 and 2022.

The use of targeted playback (i.e. broadcasting recorded bird sounds) was used occasionally at the discretion of the observer during the Breeding Bird Survey to detect possible SAR or SoCC in their vicinity. This would occur to either confirm a possible detection (when there was uncertainty) or to simply elicit a response from particular species when surveying appropriate habitat. The detrimental impact of playback recordings on breeding birds is noted, and, as such, the use of playback recordings was limited and employed sparingly to avoid undue disturbance to breeding birds.

TABLE 23: TIMING OF BREEDING BIRD SURVEYS

Point Count Location	Surveyed Dates
Point Count Survey Route 1 – 2021	June 2 and June 24, 2021
Point Count Survey Route 2 – 2021	June 2 and June 24, 2021
Point Count Survey Route 3 – 2021	June 3 and June 29, 2021
Point Count Survey Route 4 – 2021	June 3 and June 25, 2021
Point Count Survey Route 1 – 2022	June 8 and July 14, 2022
Point Count Survey Route 2 – 2022	June 8 and July 14, 2022
Targeted Breeding Nocturnal Owl Surveys – 2021	May 10, 2021
Targeted Breeding Nightjar Survey – 2021	June 21, 2021

Targeted Breeding Nocturnal Owl Survey

A breeding nocturnal owl survey was conducted on May 10, 2021 within the recommended survey window of mid-March to mid-May (Takats et al. 2001; Birds Canada 2019). This survey was conducted from eight (8) pre-determined Nocturnal Survey Locations (NSL) within the Study Area, which are shown on **Figure 11**. The methods employed for the breeding nocturnal owl survey were heavily based on the protocols described in *Guidelines for Nocturnal Owl Monitoring in North America* (Takats et al. 2001), as well as the *Nova Scotia Nocturnal Owl Survey: Guide for Volunteers* (Birds Canada 2019) and consist of periods of silent listening and multi-species playback.

Targeted Breeding Nightjar Survey

A targeted Breeding Nightjar Survey was conducted on June 21, 2021, with special consideration given to completing this survey within seven days of the June full moon phase when nighthawks are most active and readily detectable. The full moon phase occurred on the night of June 24, 2021. This survey was conducted from the same eight (8) pre-determined Nocturnal Survey Locations (NSL), as shown on **Figure 11**. The methodology employed for the breeding common nighthawk survey was heavily based on the protocols described in the *Canadian Nightjar Survey Protocol* (Bird Studies Canada 2019) and consists of periods of silent listening and targeted playback.

Eastern Whip-poor-wills are most vocal during clear nights in June when the moon is at least half full, and can repeat their characteristic “whip-poor-will” call up to 100 times without stopping! They begin calling about 30 minutes after sunset, and call for about 90 minutes each night. Common Nighthawks become active approximately 30 minutes before sunset, and remain active until 60 or 90 minutes after sunset.

Results

Breeding Bird Point Counts Survey

During the Breeding Bird Point Count Surveys completed in 2021 and 2022, over 2000 birds comprised of over 80 species were identified. Of these, approximately 1,400 individual birds comprised of 66 species were recorded during the point counts completed in 2021, and

approximately 900 individual birds comprised of 53 species were recorded during the point counts completed in 2022.

The bird species detected and their estimated abundance in both years from the Breeding Bird Point Count Surveys is summarized in **Table 24**.

TABLE 24: TOTAL ABUNDANCE OF BIRDS DETECTED DURING BREEDING BIRD POINT COUNT SURVEY

Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
170	108	Common Yellowthroat	*Geothlypis trichas*	S5B
140	95	White-throated Sparrow	*Zonotrichia albicollis*	S5B
119	64	Hermit Thrush	*Catharus guttatus*	S5B
86	37	Magnolia Warbler	*Setophaga magnolia*	S5B
79	55	Palm Warbler	*Setophaga palmarum*	S5B
75	39	Ovenbird	*Seiurus aurocapilla*	S5B
63	21	Alder Flycatcher	*Empidonax alnorum*	S5B
62	30	Black-and-White Warbler	*Mniotilta varia*	S5B
47	52	Mourning Dove	*Zenaida macroura*	S5
46	39	Chestnut-sided Warbler	*Setophaga pensylvanica*	S5B
43	25	Dark-eyed Junco	*Junco hyemalis*	S4S5
40	18	Blue Jay	*Cyanocitta cristata*	S5
26	24	American Goldfinch	*Spinus tristis*	S5
26	17	Nashville Warbler	*Oreothlypis ruficapilla*	S4S5B
26	31	Yellow-rumped Warbler	*Setophaga coronata*	S5B
25	**9**	**Olive-sided Flycatcher**	***Contopus cooperi***	**S2B SARA: SC NSESA: T**
21	32	Cedar Waxwing	*Bombycilla cedrorum*	S5B
20	18	*Yellow-bellied Flycatcher	*Empidonax flaviventris*	S3S4B
20	7	American Redstart	*Setophaga ruticilla*	S4S5B
20	25	Black-capped Chickadee	*Poecile atricapillus*	S5
20	19	Northern Flicker	*Colaptes auratus*	S5B
20	20	Red-eyed Vireo	*Vireo olivaceus*	S5B
18	21	*American Robin	*Turdus migratorius*	S5B S3N
17	11	Yellow-bellied Sapsucker	*Sphyrapicus varius*	S4S5B
16	10	Song Sparrow	*Melospiza melodia*	S5B
15	**2**	**Canada Warbler**	***Cardellina canadensis***	**S3B SARA: T NSESA: E**
15	11	Black-throated Green Warbler	*Setophaga virens*	S5B
13	11	*Purple Finch	*Haemorhous purpureus*	S4S5B S3S4N
11	10	Black-throated Blue Warbler	*Setophaga caerulescens*	S5B

Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
10	4	Blue-headed Vireo	*Vireo solitarius*	S5B
10	6	Northern Parula	*Setophaga americana*	S5B
9	9	*Canada Jay	*Perisoreus canadensis*	S3
9	5	*Red Crossbill	*Loxia curvirostra*	S3S4
9	10	Red-breasted Nuthatch	*Sitta canadensis*	S4S5
7	6	Hairy Woodpecker	*Dryobates villosus*	S5
6	2	Least Flycatcher	*Empidonax minimus*	S4S5B
6	2	Lincoln's Sparrow	*Melospiza lincolnii*	S4B
5	2	American Crow	*Corvus brachyrhynchos*	S5
5	2	Common Grackle	*Quiscalus quiscula*	S5B
5	1	Swamp Sparrow	*Melospiza georgiana*	S5B
4	0	Golden-crowned Kinglet	*Regulus satrapa*	S5
3	**8**	**Common Nighthawk**	***Chordeiles minor***	**S3B SARA: T NSESA: T**
3	**0**	**Evening Grosbeak**	***Coccothraustes vespertinus***	**S3S4B S3N SARA: SC NSESA: V**
3	2	Ruffed Grouse	*Bonasa umbellus*	S5
3	0	White-winged Crossbill	*Loxia leucoptera*	S4S5
2	3	*American Kestrel	*Falco sparverius*	S3B
2	0	*Veery	*Catharus fuscescens*	S3S4B
2	0	Common Raven	*Corvus corax*	S5
2	2	Downy Woodpecker	*Dryobates pubescens*	S5
2	1	Ruby-throated Hummingbird	*Archilochus colubris*	S5B
2	2	Winter Wren	*Troglodytes hiemalis*	S5B
1	0	*Gray Catbird	*Dumetella carolinensis*	S3B
1	1	*Pine Siskin	*Spinus pinus*	S3
1	0	Swainson's Thrush	*Catharus ustulatus*	S4B,S5M
1	0	American Woodcock	*Scolopax minor*	S5B
1	0	Brown Creeper	*Certhia americana*	S5
1	0	Common Loon	*Gavia immer*	S4B S4N SARA: NAR
1	0	Eastern Phoebe	*Sayornis phoebe*	S4B
1	0	Mourning Warbler	*Geothlypis philadelphia*	S4B
1	1	Northern Waterthrush	*Parkesia noveboracensis*	S4B
1	1	Pileated Woodpecker	*Dryocopus pileatus*	S5
1	0	Red-tailed Hawk	*Buteo jamaicensis*	S5 SARA: NAR

Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
1	0	Spruce Grouse	*Falcipennis canadensis*	S4
1	0	Tree Swallow	*Tachycineta bicolor*	S4B
1	0	Wood Duck	*Aix sponsa*	S5B
1	0	Yellow Warbler	*Setophaga petechia*	S5B
0	**4**	**Chimney Swift**	***Chaetura pelagica***	**S2S3B,S1M SARA: T NSESA: E**
0	3	Ruby-crowned Kinglet	*Corthylio calendula*	S4B,S5M
0	**2**	**Barn Swallow**	***Hirundo rustica***	**S3B SARA: T NSESA: E**
0	1	Chipping Sparrow	*Spizella passerina*	S4B,S5M
1423	**941**	**Total**		

Notes:
Bold indicates Species at Risk.
* indicates Species of Conservation Concern.
Legal protection status refers to the protection status under the *Species at Risk Act* (SARA) and the *Nova Scotia Endangered Species at Risk Act* (NSESA) as of December 2021.
Special Concern (SC), Vulnerable (V), Threatened (T), Endangered (E), Not at Risk (NAR)
*The winter survey occurred outside of the typical window for winter bird surveys (i.e., in April 2021). Additional surveys are planned for January and February 2022. Following their completion an addendum will be provided to NSECC.
**S-Ranks as of December 2022

Common Yellowthroat, White-throated Sparrow, and Black-throated Green Warbler were the most abundantly observed birds during the Breeding Bird Point Count surveys conducted in 2021 and 2022. Overall, the majority of the birds detected within the LAA during the Breeding Bird Point Count Surveys are ranked S4 or S5 by the AC CDC indicating that they are considered 'Apparently Secure' or 'Secure', respectively.

Between both the 2021 and 2022 Breeding Bird Point Counts, six SAR and nine SoCC were detected, which includes species such American Robin and Purple Finch which have non-breeding populations in Nova Scotia that are considered vulnerable by the AC CDC. Three of the six SAR (Olive-sided Flycatcher, Canada Warbler, and Common Nighthawk) were detected during Breeding Bird Point Count Surveys conducted in both 2021 and 2022. One of the six SAR (Evening Grosbeak) was only detected during Breeding Bird Point Counts conducted in 2021, and the remaining two SAR (Chimney Swift and Barn Swallow) were only detected during Breeding Bird Point Counts conducted in 2022. A detailed discussion of detected SoCC and SAR is available in **Section 3.1.7.**

The Breeding Bird Point Count Survey was designed to be completed during both the early and late 'peak breeding season' in order to compare the bird species diversity across this period. Each survey location was surveyed twice in each year (2021 and 2022) from June 1 to July 15, and from June 15 to July 15. Overall, the number of bird species detected during

Breeding Bird Point Count Surveys remained similar throughout breeding periods and years, ranging from 44 to 49 species detected during each period.

Results

Targeted Nocturnal Breeding Owl Survey

During the Targeted Breeding Nocturnal Owl survey, which was conducted on May 10, 2021, nine individuals consisting of three species were detected. Two species of nocturnal owl were detected (Great Horned Owl and the Northern Saw-whet Owl), as well as another species commonly detected during nocturnal surveys (American Woodcock). No SAR or SoCC bird species were detected during the 2021 nocturnal breeding owl surveys. The results of the targeted Nocturnal Breeding Owl Survey are summarized in **Table 25** below.

TABLE 25: RESULTS OF THE 2021 BREEDING NOCTURNAL OWL SURVEY

Survey Location	Number Detected	Common Name	Scientific Name	Estimated Distance (m)	Estimated Direction	S-rank
1	1	American Woodcock	*Scolopax minor*	n/a	n/a	S5B
2	1	Great Horned Owl	*Bubo virginianus*	500	S	S4
3	1	Northern Saw-whet Owl	*Aegolius acadicus*	500	SW	S4B
4	1	Northern Saw-whet Owl	*Aegolius acadicus*	250	W	S4B
5	1	Northern Saw-whet Owl	*Aegolius acadicus*	500	SW	S4B
5	1	Great Horned Owl	*Bubo virginianus*	1000	W	S4
6	1	Northern Saw-whet Owl	*Aegolius acadicus*	500	N	S4B
7	1	Northern Saw-whet Owl	*Aegolius acadicus*	100	NNW	S4B
8	1	Northern Saw-whet Owl	*Aegolius acadicus*	500	SW	S4B

Targeted Breeding Nightjar Survey Results

During the Targeted Breeding Nightjar Survey, which was conducted on June 21, 2021, two individual Common Nighthawks were detected, one each at Nocturnal Survey Locations #6 and #7. The detection at Survey Location #6 was estimated to be 500 m away, with an estimated direction of southwest. The other detection was estimated to be 250 m away, heading east. The Common Nighthawk is a SAR and is discussed further in **Section 3.1.7**.

3.1.5.2.4 Fall Migration Program

Approach and Methodology

During the fall migration period, the same survey methods were used as during the Spring Migration Surveys; Migration Stop-Over Point Counts and Diurnal Watch Counts. The former determines the number and species of birds that land in the Study Area during the fall period of migration, while the latter examines the number, species, altitude and behaviour of birds flying over the study area during the daytime. The general methods for migration point counts and diurnal watch counts are described in the sections below.

Fall Migration Stop-Over Point Count Surveys

Point Counts were conducted at the same locations as the spring Migration Stop-over Point Count Surveys, as determined following a preliminary desktop assessment of the habitat types present within the LAA. Locations were selected to both maximize site coverage, as well as to target habitats similar to where WTGs or other infrastructure will be located. To extend coverage of representative habitats across the LAA, the Point Count locations were grouped into established survey routes, which can be surveyed within one morning period, that were selected to maintain consistency across seasonal surveys. The locations of point counts and the survey route groupings are shown on **Figure 12**.

Point counts were ten minutes in length during which all birds seen or heard were recorded. Spring Migration Point Counts typically began 30-60 minutes after sunrise, as many birds become active later in the morning in response to the colder dawn temperatures during this season.

During the 2021 Fall Migration Stop-Over Point Count Survey, four survey routes that consisted of eight unique point count locations were completed on five occasions each between August 24 and October 18 for a total of 160-point counts completed. During the 2022 Fall Migration Stop-Over Point Count Survey, two survey routes consisting of 12 unique point count locations were completed on four occasions each between August 30 and October 14 for a total of 96-point counts completed. **Table 26** summarizes the dates the surveys were conducted in the spring of 2021 and 2022.

TABLE 26: FALL MIGRATION SURVEY DATES

Point Count Location	Surveyed Dates
Point Count Survey Route 1 – 2021	August 24, Sept. 13, Sept. 21, Oct. 6, and Oct. 18, 2021
Point Count Survey Route 2 – 2021	August 24, Sept. 13, Sept. 21, Oct. 6, and Oct. 18, 2021
Point Count Survey Route 3 – 2021	August 26, Sept. 11, Sept. 22, Oct. 7, and Oct. 15, 2021
Point Count Survey Route 4 – 2021	August 26, Sept. 11, Sept. 23, Oct. 7, and Oct. 15, 2021
Point Count Survey Route 1 – 2022	August 31, Sept. 9, Sept. 30, and Oct. 14, 2022
Point Count Survey Route 2 - 2022	August 30, Sept. 9, Sept. 30, and Oct. 14, 2022
Diurnal Watch Count Location -2021	August 19, August 26, Sept. 14, Sept. 23, and Oct 6, 2021
Diurnal Watch Count Location -2022	August 3, August 30, Sept. 9, and Sept. 30, 2022

Fall Migration Diurnal Watch Counts

As with the spring migration surveys, Diurnal Watch Counts were also conducted as a part of the fall migration surveys and from the same Diurnal Watch Count location shown in **Figure 11**. These counts were conducted in order to identify species, approximate altitude and the behaviour of birds flying over the Study Area during the daytime, and to determine species abundance.

Similar to the Spring Diurnal Watch Counts these surveys were often conducted following the completion of Migration Stop-Over Point Counts and therefore typically began during the

mid-morning and continued into the early afternoon. However, in contrast to the spring surveys, some of the Fall Diurnal Watch Counts were scheduled for the morning and evening hours of the day.

Diurnal Watch Counts were recorded in 30-minute blocks of observations, whereby all birds seen or heard were recorded according to their species, location and altitude relative to the observer (not to the point over which they were flying), flight direction, and number of individuals.

Fall Radar and Acoustic Monitoring

Targeted Timing: Fall migration period (July to November)

Occurred: between July 16 and October 31, 2021 and July 8 and November 10, 2022.

Purpose: To gather information regarding the abundance, species, approximate altitude and behaviour of birds flying over the study area during the nighttime.

The location of the radar was chosen based on access to the Project area, site security and clear sight lines. The radar was deployed within the northern portion of the Project area, approximately 1,500 m from the nearest proposed turbine.

A network of acoustic sensors (Audiomoths™) were placed throughout the Project area, with one placed at the radar unit, and 9 throughout the project area. This distribution of sensors allows for sampling of nocturnal migrants throughout the Project area. The sensors were placed a minimum of approximately 500 m apart to reduce the potential for duplicate sampling of airspace.

The sensors were programmed to begin recording approximately one hour before the end of evening civil twilight and finish recording one hour after the beginning of morning civil twilight and placed in open areas with a clear view of the sky. The detection range of each recording unit is estimated to be up to approximately 100 m for nocturnal flight calls (NFCs) of migratory birds (primarily passerines).

Methodology is further detailed in Appendix G.

Results

Migration Stop-Over Point Count Survey

Between 2021 and 2022 Fall Migration Stop-Over Point Count surveys, a total of 3,550 birds comprised of 69 species were identified. During the fall of 2021, 2,385 birds comprised of 66 species were recorded compared to 1,165 birds comprised of 50 species in fall 2022. It is noted that 43 species were recorded in both 2021 and 2022 Fall Migration Stop-Over Point Count surveys. A summary of bird species and their abundance recorded during the Fall Migration Stop-Over Point Count surveys conducted in both 2021 and 2022 is presented in **Table 27**.

TABLE 27: TOTAL ABUNDANCE OF BIRDS DETECTED DURING FALL MIGRATION STOP-OVER POINT COUNT SURVEYS

Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
239	31	American Goldfinch	*Spinus tristis*	S5
231	134	Blue Jay	*Cyanocitta cristata*	S5
179	101	Dark-eyed Junco	*Junco hyemalis*	S4S5
173	119	Palm Warbler	*Setophaga palmarum*	S5B
142	84	Yellow-rumped Warbler	*Setophaga coronata*	S5B
136	143	Black-capped Chickadee	*Poecile atricapillus*	S5
134	78	*American Robin	*Turdus migratorius*	S5B S3N
112	26	*Purple Finch	*Haemorhous purpureus*	S4S5B S3S4N
103	44	Common Yellowthroat	*Geothlypis trichas*	S5B
100	51	White-throated Sparrow	*Zonotrichia albicollis*	S5B
80	47	Northern Flicker	*Colaptes auratus*	S5B
59	8	Golden-crowned Kinglet	*Regulus satrapa*	S5
53	18	*Canada Jay	*Perisoreus canadensis*	S3
50	0	White-winged Crossbill	*Loxia leucoptera*	S4S5
48	49	Cedar Waxwing	*Bombycilla cedrorum*	S5B
46	27	Hermit Thrush	*Catharus guttatus*	S5B
41	11	Red-breasted Nuthatch	*Sitta canadensis*	S4S5
38	14	Common Raven	*Corvus corax*	S5
35	5	Swamp Sparrow	*Melospiza georgiana*	S5B
34	12	Hairy Woodpecker	*Dryobates villosus*	S5
28	2	American Crow	*Corvus brachyrhynchos*	S5
23	5	Mourning Dove	*Zenaida macroura*	S5
22	1	*Pine Siskin	*Spinus pinus*	S2S3
22	10	*Red Crossbill	*Loxia curvirostra*	S3S4
21	10	*Ruby-crowned Kinglet	*Regulus calendula*	S3S4B
21	14	Song Sparrow	*Melospiza melodia*	S5B
20	16	Downy Woodpecker	*Dryobates pubescens*	S5
19	17	Black-throated Green Warbler	*Setophaga virens*	S5B
19	8	Pileated Woodpecker	*Dryocopus pileatus*	S5
14	12	Black-and-White Warbler	*Mniotilta varia*	S5B
14	8	Red-eyed Vireo	*Vireo olivaceus*	S5B

Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
11	3	*American Kestrel	*Falco sparverius*	S3B
11	5	Ruffed Grouse	*Bonasa umbellus*	S5
10	10	Blue-headed Vireo	*Vireo solitarius*	S5B
10	1	Red-tailed Hawk	*Buteo jamaicensis*	S5 SARA: NAR
8	13	*Blackpoll Warbler	*Setophaga striata*	S3S4B
8	**0**	**Evening Grosbeak**	***Coccothraustes vespertinus***	**S3S4B S3N SARA: SC NSESA: V**
7	1	Spruce Grouse	*Falcipennis canadensis*	S4
6	6	Magnolia Warbler	*Setophaga magnolia*	S5B
6	5	Nashville Warbler	*Oreothlypis ruficapilla*	S4S5B
5	**0**	**Chimney Swift**	***Chaetura pelagica***	**S2B S1M SARA: T NSESA: E**
5	1	Northern Parula	*Setophaga americana*	S5B
5	1	Ovenbird	*Seiurus aurocapilla*	S5B
4	**0**	**Olive-sided Flycatcher**	***Contopus cooperi***	**S2B SARA: SC NSESA: T**
3	0	Bald Eagle	*Haliaeetus leucocephalus*	S5 SARA: NAR
3	0	Broad-winged Hawk	*Buteo platypterus*	S5B
3	1	Brown Creeper	*Certhia americana*	S5
3	0	Hooded Merganser	*Lophodytes cucullatus*	S5B
2	0	*Gray Catbird	*Dumetella carolinensis*	S3B
2	0	Lincoln's Sparrow	*Melospiza lincolnii*	S4B
2	1	Merlin	*Falco columbarius*	S5B SARA: NAR
2	**0**	**Peregrine Falcon - anatum/tundrius**	***Falco peregrinus pop. 1***	**S1B SNAM SARA: NAR NSESA: V**
2	0	Ruby-throated Hummingbird	*Archilochus colubris*	S5B
2	2	Sharp-shinned Hawk	*Accipiter striatus*	S5 SARA: NAR
1	0	American Redstart	*Setophaga ruticilla*	S4S5B

Number Detected in 2021	Number Detected in 2022	Common Name	Scientific Name	S-rank and Conservation Status
1	0	*Bay-breasted Warbler	*Setophaga castanea*	S3S4B
1	0	*Black-billed Cuckoo	*Coccyzus erythropthalmus*	S3B
1	0	Black-throated Blue Warbler	*Setophaga caerulescens*	S5B
1	0	Common Grackle	*Quiscalus quiscula*	S5B
1	0	*Northern Harrier	*Circus hudsonius*	S3S4B SARA: NAR
1	0	Savannah Sparrow	*Passerculus sandwichensis*	S4S5B
1	0	Swainson's Thrush	*Catharus ustulatus*	S4B,S5M
1	0	Winter Wren	*Troglodytes hiemalis*	S5B
0	3	Belted Kingfisher	*Megaceryle alcyon*	S4S5B
0	1	Common Loon	*Gavia immer*	S4B SARA: NAR
0	3	Canada Goose	*Branta canadensis*	SUB,S4N,S5M
0	1	Osprey	*Pandion haliaetus*	S4S5B,S5M
0	1	Red-winged Blackbird	*Agelaius phoeniceus*	S4B
0	1	*Solitary Sandpiper	*Tringa solitaria*	SUB,S3S4M
2385	**1165**	**Total**		

Notes:
Bold indicates Species at Risk.
* indicates Species of Conservation Concern.
Legal protection status refers to the protection status under the *Species at Risk Act* (SARA) and the *Nova Scotia Endangered Species at Risk Act* (NSESA) as of December 2021.
Special Concern (SC), Vulnerable (V), Threatened (T), Endangered (E), Not at Risk (NAR)
*The winter survey occurred outside of the typical window for winter bird surveys (i.e., in April 2021). Additional surveys are planned for January and February 2022. Following their completion an addendum will be provided to NSECC.
**S-Ranks as of December 2022

Overall, the majority of the birds detected using habitats within the LAA during the Fall Migration Stop-Over Point Count Surveys are ranked S4 or S5 by the AC CDC, indicating that their populations within Nova Scotia are considered 'Apparently Secure' or 'Secure', respectively.

Between both the 2021 and 2022 Fall Migration Stop-Over Point Count Surveys, four SAR and 13 SoCC were detected, which includes species such as American Robin and Purple Finch which have non-breeding populations in Nova Scotia that are considered vulnerable by the AC CDC. All four SAR (Evening Grosbeak, Chimney Swift, Olive-sided Flycatcher, and Peregrine Falcon) were detected During Fall Migration Stop-Over Point Count surveys completed in 2021, but not in during Fall Migration Stop-Over Point Count Surveys conducted in 2022. A discussion of detected SoCC and SAR is available in **Section 3.1.7.3**.

Results

Migration Diurnal Watch Count

During the Fall Migration Diurnal Watch Counts, 35 bird species were identified and the most common behaviour observed was “passing”. The same four SAR identified during the Fall Point Counts (Evening Grosbeak, Chimney Swift, Olive-sided Flycatcher, and Peregrine Falcon) were observed passing or soaring during the Fall Diurnal Watch Counts.

A summary of the behaviours and estimated pass heights of the bird species that were observed during the Fall Migration Diurnal Watch Counts is presented in **Table 28**.

TABLE 28: SUMMARY OF SPECIES OBSERVED DURING THE FALL MIGRATION DIURNAL WATCH COUNTS (20212022)

Common Name	Scientific Name	S-Rank	Est. Distance (m)	Pass Height (m)	Observed Behaviours
American Goldfinch	*Spinus tristis*	S5	150-250	<50-100	Passing
*American Kestrel	*Falco sparverius*	S3B,S4S5M	local, 1000	100	Calling, soaring
*American Robin	*Turdus migratorius*	S5B,S3N	50-250	<50	Passing
Bald Eagle	*Haliaeetus leucocephalus*	S5	1000-3000	100-250+	Passing, circling
Black-and-White Warbler	*Mniotilta varia*	S5B	local, 50	n/a	Singing
Blue Jay	*Cyanocitta cristata*	S5	50	n/a	Calling
Blue-headed Vireo	*Vireo solitarius*	S5B	local	n/a	Singing
Broad-winged Hawk	*Buteo platypterus*	S5B	1000-2000	100-250+	Passing
Canada Goose	*Branta canadensis*	SUB,S4N,S5M	1000-2000	100-250	Passing
*Canada Jay	*Perisoreus canadensis*	S3	local	n/a	Calling
*Cape May Warbler	*Setophaga tigrina*	S3B,SUM	50	n/a	Singing
Cedar Waxwing	*Bombycilla cedrorum*	S5B	0-500	<50-100	Passing, feeding

Common Name	Scientific Name	S-Rank	Est. Distance (m)	Pass Height (m)	Observed Behaviours
Chimney Swift	***Chaetura pelagica***	**S2S3B,S1M SARA: Threatened NSESA: Engandered**	**500**	**<50**	**Passing**
Common Grackle	*Quiscalus quiscula*	S5B	500	<50	Passing
Common Raven	*Corvus corax*	S5	500-3000	<50-250+	Passing, circling, soaring, calling
Common Yellowthroat	*Geothlypis trichas*	S5B	local, 50	n/a	Singing
Downy Woodpecker	*Dryobates pubescens*	S5	50	n/a	Calling
Evening Grosbeak	***Coccothraustes vespertinus***	**S3B, S3N, S3M SARA: Special Concern NSESA: Vulnerable**	**500**	**<50**	**Passing**
Hermit Thrush	*Catharus guttatus*	S5B	50	n/a	Singing
Herring Gull	*Larus argentatus*	S5	3000	250+	Passing
Mourning Dove	*Zenaida macroura*	S5	100	50-100	Passing
Northern Flicker	*Colaptes auratus*	S5B	50-500	<50	Passing
Olive-sided Flycatcher	***Contopus cooperi***	**S3B SARA: Special Concern NSESA: Threatened**	**200-250**	**50-100**	**Passing**
Ovenbird	*Seiurus aurocapilla*	S5B	250	50+	Singing, passing
Palm Warbler	*Setophaga palmarum*	S5B	50	n/a	Singing
Peregrine Falcon	***Falco peregrinus***	**S1B,SUM NSESA:**	**2000**	**0-100+**	**Soaring**

Common Name	Scientific Name	S-Rank	Est. Distance (m)	Pass Height (m)	Observed Behaviours
		Vulnerable			
Pileated Woodpecker	*Dryocopus pileatus*	S5	100	n/a	Calling
*Purple Finch	*Haemorhous purpureus*	S4S5B, S3S4N, S5M	0-50	50-100	Passing, singing
*Red Crossbill	*Loxia curvirostra*	S3S4	0	50	Passing
Red-breasted Nuthatch	*Sitta canadensis*	S4S5	100	n/a	Singing
Red-tailed Hawk	*Buteo jamaicensis*	S5	500-3000	50-250+	Passing, circling, perched, hunting, soaring
Ruby-crowned Kinglet	*Regulus calendula*	S4B, S5M	local	n/a	Singing
Sharp-shinned Hawk	*Accipiter striatus*	S5	0-2000	<50-500	Passing, soaring
*Turkey Vulture	*Cathartes aura*	S2S3B,S4S5M	2000	50-1000	Passing
Yellow-rumped Warbler	*Setophaga coronata*	S5B	0-50	<50	Passing

Notes:
Bold indicates a species is considered a SAR
* indicates a species is considered a SoCC
Legal protection status refers to the protection status under the Species at Risk Act (SARA) and the Nova Scotia Endangered Species at Risk Act (NSESA) as of December 2021.
Special Concern (SC), Vulnerable (V), Threatened (T), Endangered (E), Not at Risk (NAR)
*The winter survey occurred outside of the typical window for winter bird surveys (i.e., in April 2021). Additional surveys are planned for January and February 2022. Following their completion an addendum will be provided to NSECC.
**S-Ranks as of December 2022

Fall Summary and Data Assessment

Over the two years of observation, 70 bird species have been identified using habitat within the LAA during fall migratory period of 2021 and 2022 through incidental observation and the formalized Fall Migration Survey Program**.** A comparative summary of bird diversity and abundance recorded at the 22-point count locations that were surveyed in both the 2021 and 2022 field season is provided in **Table 29**. In general, the diversity of bird species is similar across study years and there was a 50% decrease of bird abundance from 2021 to 2022.

TABLE 29: SUMMARY OF BIRD DIVERSITY AND ABUNDANCE BETWEEN 2021 AND 2022

Point Count Location		Survey Route #1 - 2022											
		1	2	3	4	5	6	7	8	9	10	11	12
Diversity	# Species 2021	28	23	28	25	22	25	19	22	23	20	19	22

	# Species 2022	11	26	21	12	13	14	21	17	18	21	16	17
Abundance	# Birds 2021	87	69	119	61	47	62	68	56	94	78	57	65
	# Birds 2022	23	62	51	58	40	53	59	63	50	75	45	58

Point Count Location		Survey Route #2 - 2022											
		13	14	15	*16	17	*18	19	20	21	22	23	24
Diversity	# Species 2021	21	19	22	n/a	20	n/a	20	24	18	16	27	23
	# Species 2022	15	17	14	10	21	20	15	16	17	17	15	16
Abundance	# Birds 2021	140	61	84	n/a	80	n/a	48	73	69	37	60	63
	# Birds 2022	36	51	40	32	53	60	50	50	34	38	44	42

Note: Point Count locations were surveyed on five occasions in 2021 and four occasions in 2022
* survey location was established in 2022, there was no data collected in 2021 at this location
Total Diversity: 57 in 2021 and 49 in 2022
Total Abundance: 1578 in 2021 and 1075 in 2022

Radar and Acoustic Monitoring

While some level of migration was observed on most nights, a large proportion of the migratory activity observed in each season was limited to a few nights. Also, most activity was observed when favourable tailwinds were present. These findings are typical to other radar and acoustic studies completed in Nova Scotia (e.g., Peckford and Taylor, 2008). When examining nights when large numbers of targets were detected (i.e., when most of the migration occurred) the bulk of the migratory movements were detected above the RSA (200 m or greater above ground level) and there tended to be fewer of targets at lower altitudes (i.e., within the RSA).

Statistical models provided evidence that the total number of birds per hour was related to tailwind assistance (at 'surface'), time of night (sunset, sunrise, and middle of the night) and weather (temperature, surface pressure and relative humidity). The most important differences can be attributed to different behaviours through the night. The radar detected fewer targets around sunset (migration initiation) and sunrise (landing/stopover), compared to the detections observed during the middle of the night (continued migration). The periods immediately following sunset and before dawn seeing comparatively fewer targets may suggest that birds are not using the Project area as a stopover location.

Compared to the results of the spring Nocturnal Flight Call monitoring, the fall study detected far more migratory birds. (1,268 compared to 11,238). The majority (89%) of calls were from the Warbler species group. During the Fall Nocturnal Flight Call monitoring, Canada Warbler calls were the only SAR NFCs detected (ranked S3B for vulnerable breeding population). For more information on avian SAR, see **Section 3.1.7**.

Overall, the same observed patterns of activities were consistent across study years. The observations were in general alignment with radar and acoustic monitoring completed in other areas of Nova Scotia in that migration was focused on a few nights during the season when tailwinds were light to moderate.

3.1.5.3 Assessment Conclusions

Mature forest habitat within the LAA was identified in relation to Project infrastructure. Mature forests were chosen as a habitat indicator for birds as they offer nest sites, perches, and provide sources for cavities that enhance the habitat for many forest birds (Treyger 2019). 920 ha of forested habitats were identified as habitat for birds and they generally consisted of a mixture of mature coniferous forest, mature deciduous forest and mature mixed-wood forest.

A total of 103 bird species and approximately 11,700 individual birds were recorded during the course of all bird survey types, and including incidental observations made during other biophysical surveys, during both the 2021 and 2022 field seasons. A complete list of all species detected is presented in **Appendix F**.

Overall, habitat to support a healthy bird community throughout the year appears to exist within the LAA. The LAA has abundant forest and shrub dominant habitat to support breeding of many forest-nesting bird species. Habitats within the LAA are exposed to high winds and it is likely that resident bird species would favour habitat present within areas of lower winds.

It is likely that existing site land uses (e.g., recent forestry activities, trail recreational vehicle use) have influenced the bird community dynamics as a result of vegetation clearing and the generation of noise. There are existing cleared areas within the LAA which limit shelter to high winds and have likely contributed to the lower bird species diversity and abundance observed during the winter months within the LAA.

When examining differences in detections within nights, most radar and acoustic activity was observed during the middle portion of the night. While some unknown percentage of migrants are likely stopping over at the Project area, given the consistency in distribution of activity within nights the data suggest that a large proportion of migrants are not utilizing the area for staging during migration. However, it should be noted that it is possible that migrants are landing earlier in the night.

Also, most activity was observed when favourable tailwinds were present and with little to no precipitation. These findings are typical to other radar and acoustic studies completed in Nova Scotia (e.g., Peckford and Taylor, 2008; Hemmera 2021). As is typically seen on similar studies in Nova Scotia, the intensity and duration of the spring migration season is much less compared to the fall.

3.1.6 Bats and Bat Habitat

Scope of VEC

Bats have been identified as one of the biophysical VECs because of their relationship with other biological and physical components addressed as VECs, as well as the potential impacts on bats that the Project can have during all phases of the Project. The Proponent understands that one of the key environmental concerns associated with wind projects is the potential for effects on bats (e.g., barotrauma, collisions, and modifications to flight

paths). As such, the Proponent and Dillon consulted with the Nova Scotia Department of Natural Resources and Renewables (NSDNRR) to develop and undertake a robust bat survey program to identify how the Potential Development Area (PDA) is currently utilized by bats. Natural environment surveys for the Project were conducted for VECs that were identified based on an understanding of the environmental features of the Project area, the nature of the Project, and the potential interactions that may occur between the Project and the environment/VECs.

The LAA for bats and bat habitat includes a 120 m buffer area encompassing the access roads and a 1000 m buffer around each proposed WTG location (**Figure 14**). The LAA was defined to align with the Ontario Ministry of Natural Resources and Forestry Bat Survey Protocol advice to identify bat habitat components that may extend to or within 120 metres of a project location, and in recognition that confirmed habitat can extend as much as 1000 metres beyond an identified point location (OMNR 2011, OMNR 2017).

The following surveys protocols and guidance were considered in the design and implementation of the biophysical assessments for bats and bat habitat for the Project:

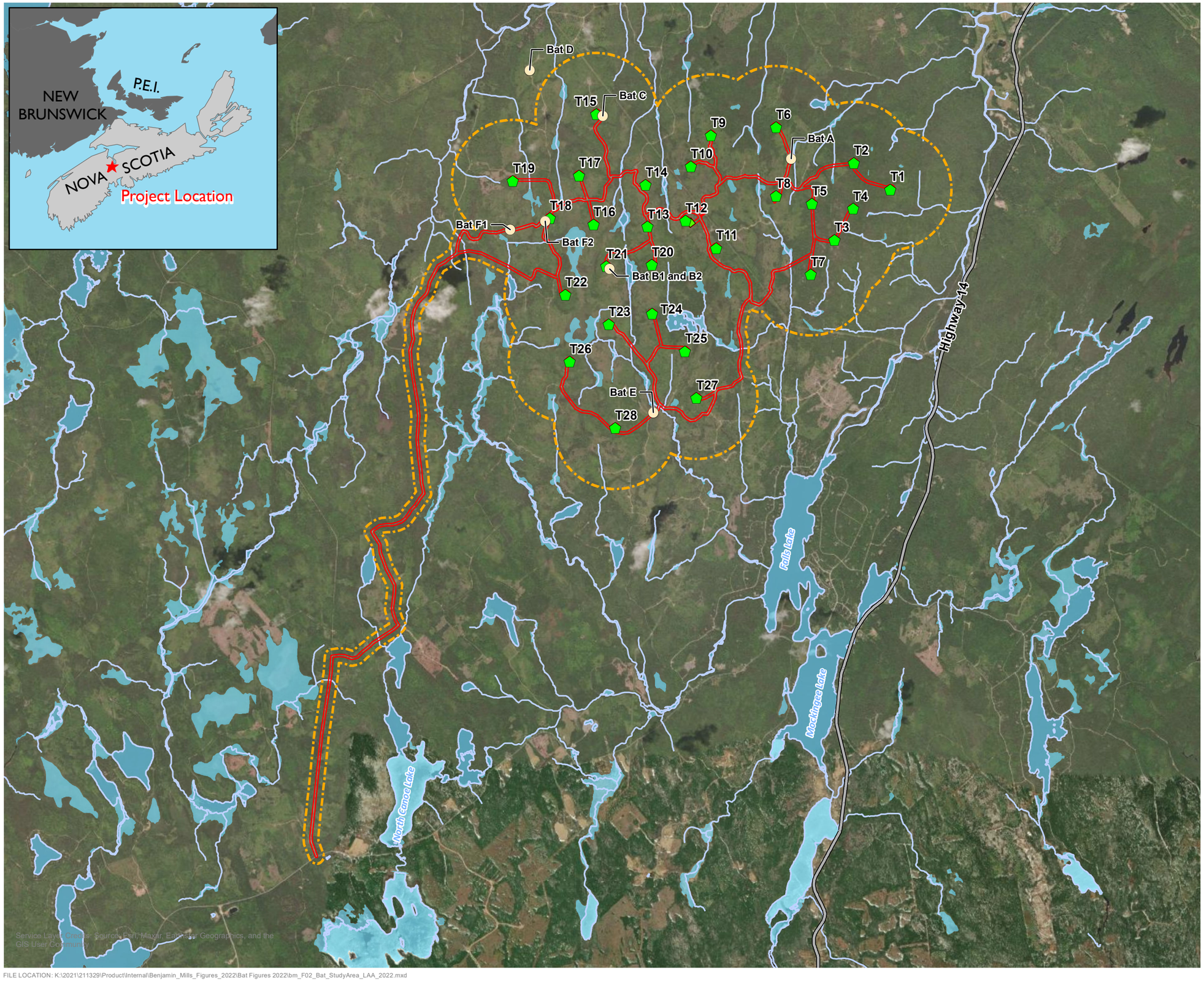
- During consultation, Nova Scotia Department of Natural Resources and Renewables (NSDNRR) recommended two survey periods: a spring period (May 1 to June 30), and a fall period (August 15 to October 31) (GNS 2022);
- According to the Ontario Ministry of Natural Resources and Forestry Bat Survey Protocol (OMNRFF 2017), acoustic monitoring for breeding bats should occur in the evenings between June 1 and June 30 in order to capture the full suite of migratory and resident bat species that may be present on site;
- The 2009 Pre-Construction Bat Survey Guidelines for Wind Farm Development in New Brunswick (NBDNRE 2009) require acoustic bat surveys for a minimum of one year prior to construction during both the breeding season (June 1 to June 30) and the late summer – early fall migratory period (August 15 to September 15). The guidance advises 40 hours of surveys distributed over a minimum of 10 nights, having a minimum of 4 hours/night for each of the breeding and fall migration season (NBDNRE 2009); and
- The 2009 NBDNRE guidelines require additional pre-construction bat acoustic survey effort if the proposed wind facility and surrounding areas contain high risk habitat features (i.e., within 5 km of a known hibernacula, or potential cave or abandoned mine; within 500 m from a coast line or other major water bodies; or located on or near forested ridge habitats).

The scope of work included surveys conducted over the two survey periods (May 1 to June 30 and August 15 to October 31) over the years 2021 and 2022:

- Background and desktop analysis;
- A high-level assessment of suitable maternity roosting habitat; and
- Pre-construction acoustic monitoring surveys designed to capture the entirety of the breeding season and extend through the fall to capture the migration period. This approach allowed for collection of data which could capture bat activity levels during the

vulnerable periods (i.e., breeding and migration) while considering seasonal and temporal variations. The monitoring of two breeding and two migratory periods (2021 and 2022) allowed for a more detailed understanding of the local bat movements and activities in the area.

The SAR assessment is comprised of a review of two custom AC CDC reports and the SAR detected during the various field assessments. Details regarding approach, methodology and results of the bat SAR assessment are presented in **Section 3.1.7.5.**



Natural Forces

BENJAMINS MILL WIND PROJECT

STUDY AREA AND LOCAL ASSESSMENT AREA FOR BATS

FIGURE 14

- Proposed Turbine Location
- Proposed Substation Location
- Bat Meter Locations
- Potential Development Area (PDA)
- Local Assessment Area (LAA)
- Highway
- Watercourse
- Waterbodies

0 0.25 0.5 1 km

SCALE 1:60,000

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON CONSULTING, NSDNRR, NATURAL FORCES

MAP CREATED BY: DU
MAP CHECKED BY: KB
MAP PROJECTION: NAD 1983 UTM ZONE 20N

DILLON CONSULTING

PROJECT: 21-1329

STATUS: DRAFT

DATE: 2022-12-14

FILE LOCATION: K:\2021\211329\Product\Internal\Benjamin_Mills_Figures_2022\Bat Figures 2022\bm_F02_Bat_StudyArea_LAA_2022.mxd

3.1.6.1 Desktop Screening for Priority Species

Approach and Methodology

Prior to conducting field work, a high-level desktop screening for priority bat species and habitats within the LAA was completed. The purpose of the screening was to aid in the planning of the field surveys and identify targeted species surveys to include in the bat biophysical assessments. The priority species screening included consultation with NSDNRR wildlife biologists and a desktop analysis, which includes data obtained from a site-specific report provided by the Atlantic Canada Conservation Data Centre (AC CDC).

Readily-available information from reputable sources was reviewed to evaluate the potential for bat SAR and SoCC within the LAA. Dillon completed a review of the following sources and data lists for the purpose of characterizing existing conditions at the Project site:

- Atlantic Canada Conservation Data Centre (AC CDC) reports for a list of historical observations of rare fauna and flora within 10 km of the Project centre (AC CDC 2021; 2022);
- The Recovery Strategy for the little brown myotis (*Myotis lucifugus*), the northern myotis (*Myotis septentrionalis*), and the tri-coloured bat (*Perimyotis subflavus*) in Canada (ECCC 2018);
- A review of known caves, mines, and other bat hibernacula (i.e., areas where bats hibernate) was conducted (Moseley 2007; NSDNR 2017); and,
- Available mapping was consulted to develop a list of terrestrial habitat types with the potential to be impacted by Project activities and was used to inform the selection of monitoring stations. Approximate extents of different habitat types in the assessment area are presented on **Figure 4**.

Site-specific AC CDC reports were generated on May 10, 2021 and September 22, 2022 and include rare and sensitive species historical observations that were reported within 100 km of the Study Area. As of May 2014, the AC CDC was mandated by the Nova Scotia Department of Lands and Forestry (NSDLF) to consider records of certain species as "location-sensitive", including bat hibernacula. This was done in an attempt to reduce the risk that these species will be exploited; as such, the precise locations of these are not openly distributed. The AC CDC does, however, provide information regarding the presence of “location-sensitive” species or features occurring with a defined study area. (e.g., within a 10 km search radius from the PDA centre).

Results

According to the site-specific AC CDC reports, bat hibernaculum and bat species historical occurrences have been recorded within 10 km of the PDA centre (**Appendices I** and **J**). **Table 30** summarizes the historical observations of bat SAR and SoCC within 100 km of the PDA reported by the AC CDC.

TABLE 30: RARE AND/OR ENDANGERED BATS WITHIN 100 KM OF THE PDA CENTRE (AC CDC 2021; 2022)

Common Name (*Scientific Name)*	S-rank and Conservation Status	Observations	Distance from PDA Centre to the closest observation (km)
Little Brown Myotis (*Myotis lucifugus*)	S1, Endangered (SARA and NS ESA)	**694**	**9.2**
Northern Myotis (*Myotis septentrionalis*)	S1, Endangered (SARA and NB ESA)	**84**	**17.8**
Tricolored Bat (*Perimyotis subflavus*)	S1, Endangered (SARA and NS ESA)	**200**	**17.8**
Hoary Bat* (*Lasiurus cinereus*)	S1S2B,S1M (no SARA, NS ESA, or COSEWIC listing)	63	17
Vespertilionidae family. Bat species*	S1S2 (no SARA, NS ESA, or COSEWIC listing)	420	6.7

Bold indicates a species is considered a SAR
* indicates a species is considered a SoCC
S-rank refers to the Sub-national (Provincial) rank provided by the AC CDC and includes the following: S1 Critically Imperiled, S2 Imperiled, S3 Vulnerable, S4 Apparently Secure, S5 Secure and SU Unrankable. Rankings are frequently paired with the following breeding status qualifiers: B Breeding, N Non-breeding and M Migrant

Species associated with the MYOTID species group of bats (which include little brown myotis, northern myotis, and tri-coloured bat) were detected during the 2021 and 2022 bat surveys. These bats are known to inhabit much of Nova Scotia, and all three are listed as Endangered under both the federal SARA and the NS ESA. Additionally, all three migratory bat SoCC currently undergoing assessment by COSEWIC (i.e., Silver-haired Bat, Eastern Red Bat, and Hoary Bat) were detected at the site in 2021.

For more details regarding the SAR assessment for bats, see **Section 3.1.7**.

3.1.6.2 Bat Maternity Roost Suitability Assessment

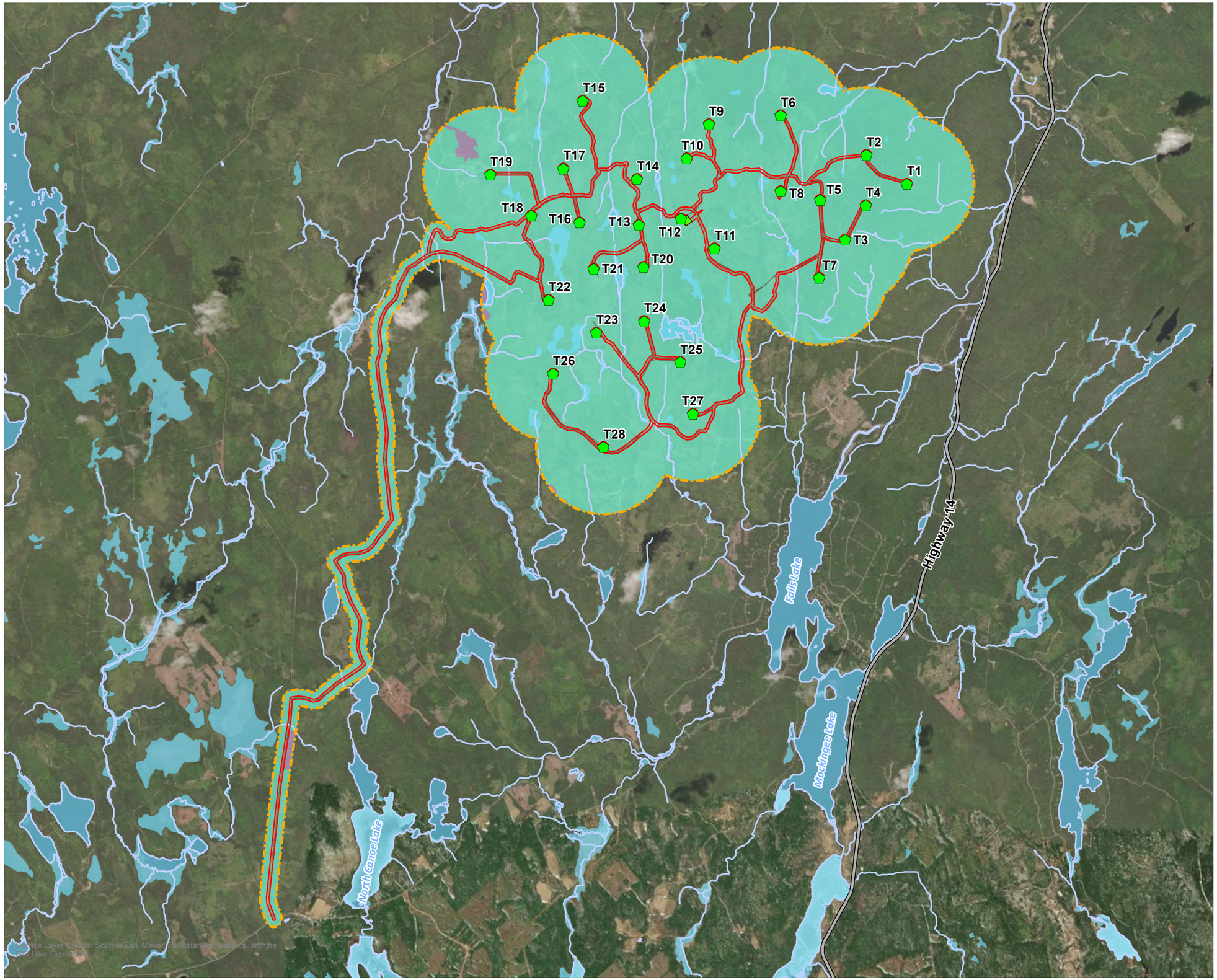
Approach and Methodology

To date, only hibernacula sites (and not maternity-roosting sites) have been designated as critical habitat for bats (ECCC 2018). Hibernacula are used by SAR bats to survive when temperatures decline and insects are unavailable (ECCC 2018) and therefore are necessary for the ongoing survival and eventual recovery of these species. The importance of maternity roosts to the survival and recovery of these three species of bats is evident; however, the locations of the vast majority of maternity roosts are currently either unknown or undocumented, or the data are unavailable to ECCC. The criteria for identifying which maternity roosts would be considered as critical habitat would likely consider species, number of individuals using the roost, whether the roost is within a WNS-affected area, and the number of other known maternity roosts in the vicinity (ECCC 2018).

The Bat Maternity Roost Suitability Assessment is a desktop survey based on Phase 1 Bat Habitat Suitability Assessment as identified in the 2017 Ontario Ministry of Natural Resources and Forestry Bat Survey Protocol (OMNRFF 2017) for methods for evaluating wildlife habitat significant to bats. Available digital forestry data and Google Earth imagery were used to evaluate the potential for suitable bat maternity within the LAA. According to the OMNRFF 2017 Protocol, areas of suitable habitat for maternity roosts can be screened based on the presence of mixedwood forests or hardwood forests and the presence of snags or cavity trees with ≥ 25 cm diameter at breast height (dbh). Ecological Land Classification (ELC) mapping was used to identify the locations of forests with ≥25 cm dbh within 1,000 m surrounding the PDA (OMNRFF 2017).

Results

Little brown myotis and northern myotis are known to form roosts in forests and swamps with softwood trees (Foster and Kurta 1999). The locations of mixedwood or hardwood forest stands with average dbh large enough are shown on **Figure 15**, based on available digital forestry data. Although the stand boundaries were reviewed using and Google Earth imagery and observations from the field surveys conducted in 2021 and 2022, there are active forestry practices in the area and the forest stands are expected change. With the exception of a stand identified along an existing road (Hingley Road), none of the desktop-identified stands with average dbh over 25 cm were identified within the PDA.



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BENJAMINS MILL WIND PROJECT

ASSESSMENT OF POTENTIAL SUITABLE BAT MATERNITY ROOST STANDS

FIGURE 15

- Proposed Turbine Location
- Proposed Substation
- Potential Development Area (PDA)
- Local Assessment Area (LAA)
- Highway
- Watercourse
- Waterbodies
- Forest (Average DBH > 25 cm)
- Forest (Average DBH < 25 cm)

0 0.25 0.5 1 km

SCALE 1:55,000

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON CONSULTING, NSDNRR, NATURAL FORCES

MAP CREATED BY: DU
MAP CHECKED BY: KB
MAP PROJECTION: NAD 1983 UTM ZONE 20N

DILLON CONSULTING

PROJECT: 21-1329
STATUS: DRAFT
DATE: 2022-12-14

FILE LOCATION: K:\2021\211329\Product\Internal\Benjamin_Mills_Figures_2022\Bat Figures 2022\bm_F03_Bat_Potential_Suitable_Maternity_Roost_Stands_2022.mxd

3.1.6.3 Field Assessment

Approach and Methodology

Acoustic bat data were collected from eight acoustic survey stations in 2021 and 2022. The acoustic survey stations were installed at locations within the LAA that were selected to capture the data in representative terrain and habitat types, as well as capture locations that were in proximity to the proposed WTG locations (**Figure 14**). According to the OMNRFF (2017) Bat Survey Protocol, monitoring for breeding bats should occur in the evenings between June 1 and June 30 in order to capture the full suite of migratory and resident bat species that may be present on-site. Through the environmental assessment consultation process, NSDNRR recommended including two survey periods: a spring period (May 1 to June 30) and a fall period (August 15 to October 31).

Each survey station consisted of either a Wildlife Acoustics SM3BAT, SM4BAT or miniBAT (Wildlife Acoustics 2018, 2022a, 2022b) ultrasonic bat detector; that was equipped with an omni-directional microphone. The detection range for acoustic monitors is affected by humidity, temperature, source directionality, and background noise; in general, most bat species can be detected at a distance of 30 m with an estimated likely maximum of 100 m for a very loud, low frequency bat pointing directly at the sensor in perfect conditions (Wildlife Acoustics 2022c). Bat detectors were programmed as followed

- Trigger Frequency Minimum: 16 kHz;
- Trigger Frequency Maximum: 192 kHz;
- Trigger Level: Automatic (12dB);
- Sample Night: from dusk to 5 hours after dusk; and
- Gain Level: Automatic (12dB).

The 2021 initial acoustic detectors were mobilized on May 28, 2021 and demobilized on October 20, 2021, and programmed to collected bat activity from June 1 through to October 15 (inclusive) in accordance with the aforementioned parameters. The 2022 acoustic bat detectors were programmed to record bat calls from May 1, 2022 through October 31 (inclusive). The analysis focused on the breeding period (i.e., early May to June 30) and the migratory period (i.e., from August 15 to October 31). The periods of monitoring for each station within the survey dates are summarized in **Table 31**.

The acoustic monitoring program involved the collection of data within the entire height range of the proposed wind turbine blade sweep area (e.g., 25m – 110m) where feasible. To achieve this, two stations were associated with the existing meteorological tower (MET): one at ground level (< 2 m high) and one approximately 30 m above ground as a mechanism to capture activity data within the blade sweep area. The remaining six acoustic monitoring stations were mounted at ground level (<2 m high) and the locations of stations were selected in order to capture activity data in the vicinity of turbines and representative habitat types, giving representative coverage of the LAA.

The deployment periods varied through the survey program for reasons such as meter malfunctions, meter relocation and the addition of a survey location during the fall migratory period. A minimum of one year is required for a pre-construction survey in New Brunswick (NBDNRE 2009) In addition to this, following the recommendations provided by NSDNRR on the EARD, two years of survey data were collected in order to ensure sufficient coverage of multiple seasons. **Table 31** includes a spatial description and the periods of monitoring for each monitoring station relative to the PDA.

TABLE 31: SUMMARY TABLE OF BAT MONITORING STATIONS AND THEIR LOCATION IN THE STUDY AREA

Acoustic Station ID	Description	Habitat	Monitoring Periods:
Bat A	**Elevation:** 1.8 m **Equipment:** Wildlife Acoustics SM3BAT/SM miniBAT	Located in an open area on the northeast corner of the subject property. Habitat includes some small immature birch trees, and next to a sizable cliff of bedrock outcropping, which could be a potential bat roosting location.	June 1 -October 15, 2021, Early May – October 31, 2022
Bat B (Ground Level)	**Elevation**: 1.8 m **Equipment**: Wildlife Acoustics SM3BAT	Attached to the MET tower near the centre of the LAA in a relatively flat and open area that was recently clear-cut with minimal re-vegetation	June 1 -October 15, 2021, Early May – October 31, 2022
Bat B (Elevated via MET Tower)	**Elevation**: 30 m **Equipment**: Wildlife Acoustics SM3BAT	Attached to the MET tower near the centre of the LAA in a relatively flat and open area that was recently clear-cut with minimal re-vegetation	June 1 -October 15, 2021, Early May – October 31, 2022
Bat C	**Elevation:** 1.8 m **Equipment:** Wildlife Acoustics SM3BAT	Located in an open area that was part of a clear-cut hardwood stand. The area is revegetated by immature deciduous trees and shrubs.	N/A in 2021 (Location added to 2022 field program to increase coverage of representative habitats), Early May – October 31, 2022
Bat D	**Elevation:** 2.3 m **Equipment:** Wildlife Acoustics SM3BAT	Located in an open area that was part of a clear-cut hardwood stand in the northwest corner of the subject property. The area is revegetated by immature deciduous trees and shrubs.	June 1 -October 15, 2021, N/A in 2022 (Location discontinued in favour of locations added to program in 2022)
Bat E	**Elevation:** 1.8 m **Equipment:** Wildlife Acoustics SM3BAT/ SM miniBAT	Located in an open area adjacent to a treed swamp and a watercourse. South of the subject property.	June 1 -October 15, 2021, N/A in 2022 (Location discontinued in favour of locations added to program in 2022)
Bat F1	**Elevation:** 1.8 m **Equipment:** Wildlife Acoustics SM3BAT/ SM miniBAT	Located in an open area next to the road with exposed boulders and adjacent to mature softwood trees. East side of the subject property.	June 1 -October 15, 2021, N/A in 2022 (Location discontinued in favour of locations added to program in 2022)
Bat F2	**Elevation:** 1.8 m	Located in an open area next to the road with exposed boulders and	N/A in 2021 (Location added to 2022 field program to

Acoustic Station ID	Description	Habitat	Monitoring Periods:
	Equipment: Wildlife Acoustics SM3BAT/ SM miniBAT	adjacent to mature softwood trees. East side of the subject property.	increase study coverage of representative habitats), Early May – October 31, 2022

Bat acoustic data was analyzed using the automated software Kaleidoscope Pro (Wildlife Acoustics 2022d) with the following settings:

- Minimum number of pulses = 2;
- Division Ratio = 8;
- Time Expansion Factor = 1;
- Duration = 2 – 500 ms; and
- Frequency Range = 16 – 120 kHz.

Using the automated species identification feature provided by Kaleidoscope Pro, each acoustic file was first identified to species and species groups (where possible), or identified as either NOID (i.e., pulses recorded but unable to identify species) or NOISE (i.e., no pulse recorded). Species/species groups were identified based on maximum frequency, minimum frequency, call duration and shape (Jones and Siemers 2010).

When bats are far from the detectors or at an angle that reduces detectability, calls can become fragmented where the higher frequency components of the calls are not recorded. This confounds the ability to differentiate several species with overlapping call parameters reliably. For example, several Myotis species can be differentiated based on the maximum frequency of their calls but not the minimum frequency (Agranat 2012). Although call shape can also aid in differentiating Myotis species, shape varies considerably with habitat structure. Bats modify their calls for better long-distance detection in more open habitats and to reduce interference from echoes generated in more cluttered habitat (i.e., within woodlands) (Jones and Siemers 2010). As such, based on the auto ID generated by Kaleidoscope Pro, each of the acoustic files (including NOISE and NOID) was manually reviewed and subsequently classified as follows (van Zyll de Jong 1985):

- LANO/LABO – Silver-haired bat (abbreviated LANO) and eastern red bat (abbreviated LABO). Both of these species are migratory and were assessed together as a group based on similarities of their calls. Silver-haired bats produce calls with a constant frequency (CF) tail around 22 – 25 kHz. Although eastern red bats produce calls with a minimum frequency between 30 – 35 kHz, they also produce calls with lower minimum frequencies within the range of Silver-haired Bats; therefore, these species were grouped together. Although Big Brown Bat (abbreviated EPFU) also produces calls with a CF similar to silver-haired bat and are generally reported as EPFU/LANO, given the few sightings reported to date in Nova Scotia, all potential EPFU/LANO calls were assumed LANO; hence the species grouping of LANO/LABO. Both Silver-haired bat and eastern red bat are considered migratory species.
- LACI – Hoary bat (abbreviated LACI) is a migratory bat with calls that are reliably differentiated from all other species. Hoary Bat calls have lower frequency (ranging from 25 to 18 kHz) and are noticeably longer in duration compared to other bat species known to occur within the LAA.
- MYOTID SSP – (abbreviated MYOTID) is a species group that includes resident (i.e., non-migratory) bat species in Nova Scotia including little brown myotis, northern myotis, and the tri-colored bat. Unlike the migratory species outlined above, the Myotid species group

of bats produce shorter duration calls with a minimum frequency between 40 – 45 kHz, and maximum frequencies ranging between 120 kHz and 80 kHz. Occasionally, Myotis calls can have a minimum call frequency of 35 kHz.

These classifications are justified ecologically, as hoary bats are typically confined to more open habitat, the LANO/LABO group typically forage in the open and along woodland edges, and the MYOTID SSP are the most agile and therefore may be found in more cluttered environments, near water bodies, and along woodland edges (van Zyll de Jong 1985).

2021 Results

In 2021, 31 bat passes were detected during the breeding period (recorded June 1 through July 31 in 2021). The 31 passes comprised of 21 myotid bats species (i.e., resident species) and 10 migratory bats. A total of 115 bat passes were recorded in 2021 between August 1 and October 15 (targeting the fall migration period for migratory bats), 37 bat passes were from migratory bat species.

The total number of bat passes per species/species group and per month in 2021 is presented in **Figure 16**. As illustrated in **Figure 16**, the MYOTID species group accounted for 68% (or 99 bat passes) of the 146 bat passes recorded during the survey period, of which 69% (or 68 bat passes) of the 99 MYOTID passes occurred during the month of August alone. Based on the automated species identification feature provided by Kaleidoscope Pro (Wildlife Acoustics), the majority of the MYOTID passes (94 passes, or 95%) were from the little brown myotis; the remaining five passes were identified as tri-coloured bat. These two-bat species are considered to be resident species on Nova Scotia and are listed as Endangered under both the federal SARA and the NS ESA

Migratory bats recorded in 2021 included 21 passes from either silver-haired bats or eastern red bats, which were assessed together as a group based on similarities of their passes (abbreviated as LANO/LABO), and 26 passes from hoary bats (abbreviated as LACI).

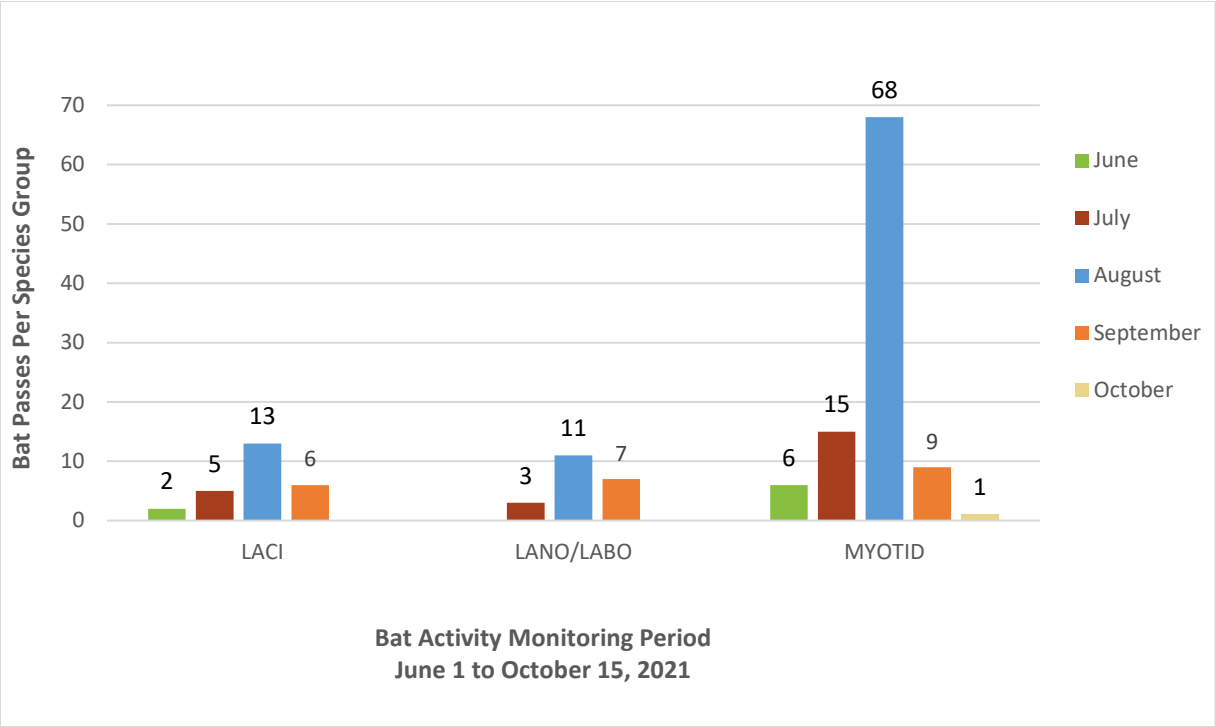


FIGURE 16: BAT PASSES RECORDED IN 2021 BY SPECIES AND SPECIES GROUPING

2022 Results

In 2022, 33 bat passes were detected during the breeding period (recorded May 1 through July 31, 2022). The 33 passes comprised of 25 myotid bats species (i.e., resident species) and 7 migratory bat passes. A total of 39 bat passes were recorded in 2022 between August 1 and October 31 (targeting the fall migration period for migratory bats), 22 passes were from migratory bat species.

The total number of bat passes per species/species group (and broken down by migratory and non-migratory species) per month in 2022 is presented in **Figure 17**. As illustrated in **Figure 17**, the MYOTID species group accounted for 60% (or 43 bat passes) of the 72 bat passes recorded during the survey period, of which 28% (or 12 bat passes) of the 43 MYOTID passes occurred during the month of August. Based on the automated species identification feature provided by Kaleidoscope Pro (Wildlife Acoustics), all of the MYOTID passes were from the little brown myotis. These three-bat species are considered to be resident species on Nova Scotia and are listed as Endangered under both the federal SARA and the NSESA.

Migratory bats recorded in 2022 included 21 passes from either silver-haired bats or eastern red bats, which were assessed together as a group based on similarities of their passes (abbreviated as LANO/LABO), and 8 passes from Hoary Bats (abbreviated as LACI).

TABLE 32: BAT PASSES BY SPECIES/SPECIES GROUP AT ALL MONITORING STATIONS - 2022

Species Group	May	June	July	August	September	Total
LACI	1	0	0	5	2	**8**
LANO/LABO	3	0	3	9	6	**21**
MYOTID	7	9	10	12	5	**43**
Total	**11**	**9**	**13**	**26**	**13**	**72**

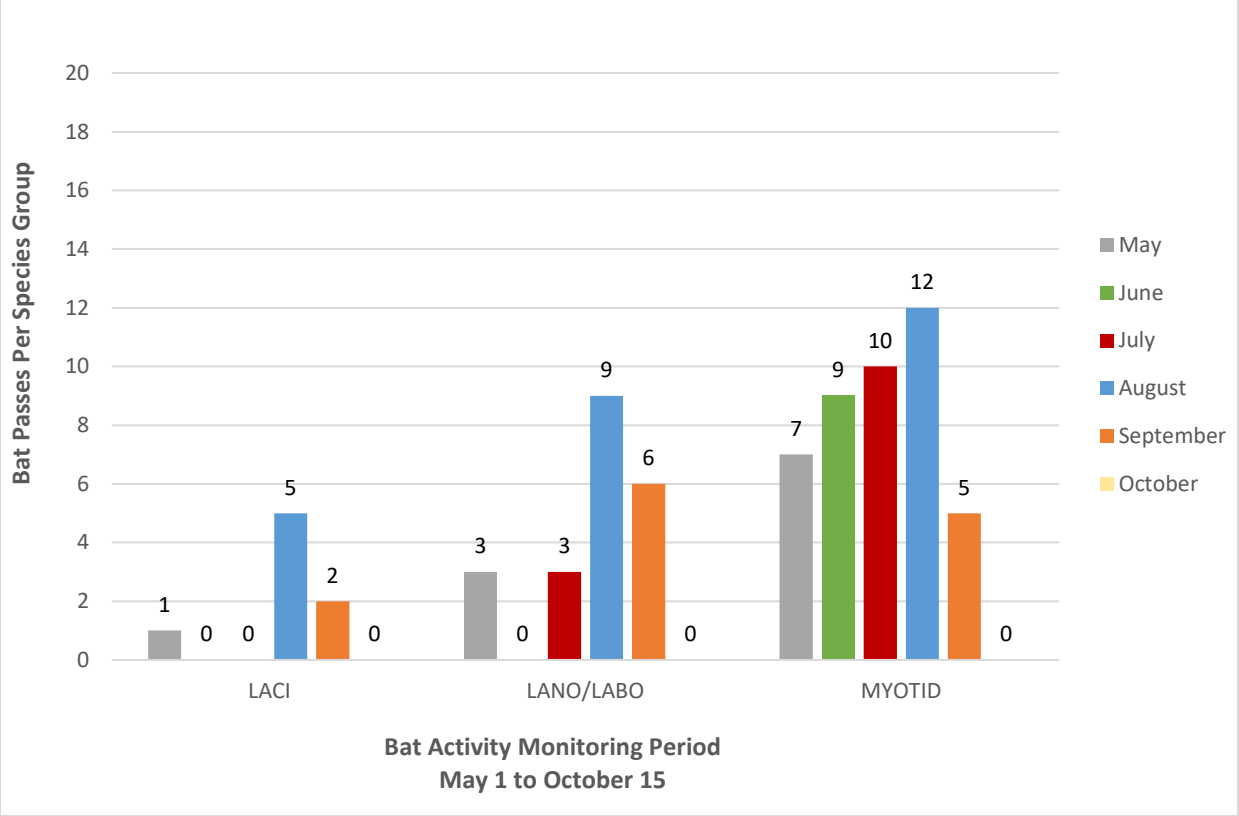


FIGURE 17: BAT PASSES RECORDED IN 2022 BY SPECIES AND SPECIES GROUPING

3.1.6.4 Assessment Conclusions

Based on data collected in 2021, peak bat activity was recorded between August and September 2021. Of the 146 bat passes recorded during the June 1 to October 15, 2021 monitoring period, 79% (or 115 bat passes) were recorded between August 1 and October 15, 2021. The month of August alone was responsible for 63% (or 92 bat passes) of the 146 recorded bat passes. Fewer bat passes were recorded during the 2022 monitoring season, less than half of the number recorded in 2021 (72 in 2022 vs 146 in 2021). The monthly percentage of passes in 2022 also presented a more even distribution, with more activity recorded in May and August (15% and 17% respectively).

The comparatively high number of passes recorded during the month of August, 2021 may be attributed to the differences in station locations between monitoring years. As described in **Table 31**, acoustic stations Bat D, E, and F were discontinued in 2022 due to changes in the PDA. These three stations accounted for 45 of the 92 bat passes recorded in August 2021. The new monitoring locations chosen to reflect the PDA in 2022 may not have been in areas of as high bat activity as those three stations from 2021.

The following bat species/species groups were detected during the 2021/2022 bat acoustic survey program:

- Silver-haired bat and eastern red bat, (these species were assessed together as a group based on similarities of their passes);
- Hoary bat; and
- Myotid bat species (i.e., little brown myotis, northern myotis, and tri-coloured bat)

Species associated with the MYOTID species group of bats (which include little brown myotis, northern myotis, and tri-coloured bat) are known to inhabit much of Nova Scotia, and all three are listed as Endangered under both the federal SARA and the NS ESA. Critical habitat for little brown myotis, northern myotis, and/or tri-coloured bat (e.g., hibernacula) were not identified within the PDA. Hibernating bats are known to travel several hundreds of kilometres between overwintering and breeding locations. However, only approximately one third of detections of SARA-listed bats detected during the two-year acoustic monitoring program were during the breeding season (i.e., 47 passes or 33% of SARA-list bat species detected occurred May1-July-31 in 2021 and 2022).

All three migratory bat SoCC currently undergoing assessment by COSEWIC (i.e., Silver-haired Bat, Eastern Red Bat, and Hoary Bat) were detected at the site between 2021 and 2022. The locations of two mixed-wood or hardwood forest stands with average dbh large enough support bat maternity roosting were identified using and Google Earth imagery and observations from the field surveys conducted in 2021 and 2022. There are active forestry practices in the area and the forest stands are expected to change. Based on the information available, maternity roosts within 1,000 m of the WTGs are considered to be possible but unlikely. The majority of detections were recorded in the late summer/fall as bats move towards swarming and overwintering sites.

Based on Dillon's experience on similar bat acoustic programs throughout the country, the total number of bat passes (during the breeding period, fall migration, and entire survey period) are considered very low. Population benchmark guidelines for bats within Nova Scotia are not currently available; therefore, an assessment of how the bat populations in the PDA compare to the regional area is subjective and based on professional opinion only. As discussed above, drastic bat population declines that have occurred throughout Nova Scotia due to a fungal infection (i.e., white nose syndrome, or WNS) that appears to severely affect cave-dwelling hibernating bats. It is believed that mortalities affecting up to 90% of populations result from interference with hibernation and starvation during the winter

period. The syndrome was first observed in 2006 in New York and has been since confirmed in Ontario, Québec, New Brunswick and Nova Scotia (EC 2014).

3.1.7 Species At Risk

The proposed Project is located in a primarily forested area that has the potential to provide habitat for some species at risk (SAR) and species of conservation concern (SoCC) wildlife populations. Natural Forces is committed to protecting SAR, SoCC, and their habitat as important features and VECs related to the proposed Project.

Approach and Methodology

Priority species and habitats for targeted species surveys were identified through a desktop analysis following the recommendations described in "A Guide to Addressing Wildlife Species and Habitat in an EA Registration Document". Surveys were conducted in 2021 and 2022 to characterize site-specific environmental conditions for wildlife and vegetation within and around the PDA.

For this Addendum, the following definitions of SAR and SoCC apply:

- **Species at Risk** (abbreviated SAR): A species that is determined to be Endangered, Threatened, or Vulnerable/Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Nova Scotia Endangered Species Act (NSESA), or the federal Species at Risk Act (SARA); and,
- **Species of Conservation Concern** (abbreviated SoCC): Those species that are not SAR but are identified as regionally vulnerable or imperilled by the Atlantic Canada Conservation Data Centre (AC CDC) (i.e., those species with AC CDC S-ranks of S1: Critically imperiled in province; S2: Imperiled in province; and S3: Vulnerable in province of Nova Scotia.

Dillon reviewed readily-available information from reputable sources. The information was reviewed to evaluate the potential for flora and fauna SAR and SoCC within 100 km of the Project. Dillon completed a review of the following sources and data lists for the purpose of characterizing existing conditions at the Project site:

- Custom AC CDC reports (AC CDC 2021 and 2022; refer to **Appendix I** and **J**, respectively);
- The federal SAR registry;
- The provincial Endangered Species registry;
- Publicly-available governmental Geographic Information Systems (GIS) map layers and databases;
- High resolution aerial photography;
- Second Maritimes Breeding Birds Atlas (MBBA; Stewart et al. 2015); and
- Nova Scotia Provincial Landscape Viewer mapping resource.

Other available background information sources and mapping reviewed to identify and assess SAR and SoCC and their habitats within the LAA included:

- Provincial Parks and Protected Areas mapping;
- Environmentally Sensitive Areas (ESAs) database;

- Listed species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC);
- Listed species under the federal Species at Risk Act (SARA) or the Nova Scotia Endangered Species Act (ESA);
- Atlas of Breeding Birds of the Maritime Provinces (MBBA; Stewart et al. 2015);
- Important Bird Areas (IBAs) of Canada;
- Federally-designated Migratory Bird Sanctuaries;
- Provincially-identified Deer Wintering Areas (DWAs); and
- Identified Protected Natural Areas and Wildlife Management Zones (WMZ).

In addition to the desktop study, during field surveys, priority species were targeted and following field surveys, the priority species found within the LAA were assessed for their likelihood to be found throughout the LAA. Recommendations described in "*A Guide to Addressing Wildlife Species and Habitat in an EA Registration Document*" (NSE 2009) were consulted when planning field surveys to include the assessment for potential SAR and SoCC within the LAA. Various biophysical surveys were conducted between the months of April to October, 2021 and February to November, 2022 to characterize site-specific environmental conditions for flora and fauna within and around the LAA. Incidental observations of SAR were recorded in concert with all field surveys.

Results

Following the results of the 2021 and 2022 biological VEC surveys and reviews of two custom AC CDC Reports (2021 and 2022), lists of historical SAR and SoCC flora and fauna detected at or within 10 km of the Project site were compiled. **Table 33** and **Table 34** present the SAR and SoCC (detected or reported within 10 km of the Project), respectively. The 2021 and 2022 AC CDC results for SAR or SoCC within 100 km of the Project site are included in **Appendix I** and **Appendix J**, respectively.

TABLE 33: SPECIES AT RISK DETECTED IN FIELD SURVEYS OR REPORTED WITHIN 10 KM OF THE PDA IN 2021 AND 2022 AC CDC REPORTS.

Common Name (*Scientific Name*)	Legal Protection Status	S-RANK	Field Surveys Observations	AC CDC Reported Distance	Preferred/Nesting Habitat at Project Site
INVERTEBRATES					
Monarch *(Danaus plexippus)*	SARA: SC COSEWIC: E NSESA: E	S2?B, S3M	--	4.0 ± 0.0	No
MAMMALS					
Little Brown Myotis (*Myotis lucifugus)*	SARA: E COSEWIC: E NSESA: E	S1	Observed during bat surveys	Bat hibernaculum or bat species occurrence AC CDC report within 10 km.	No
Moose (*Alces americanus*)	NSESA: E	S1	--	1.8 ± 0.0	Yes

Common Name (*Scientific Name*)	Legal Protection Status	S-RANK	Field Surveys Observations	AC CDC Reported Distance	Preferred/Nesting Habitat at Project Site
Northern/ Long-eared Myotis (*Myotis septentrionalis*)	SARA: E COSEWIC: E NSESA: E	S1	Observed during bat surveys	Bat hibernaculum or bat species occurrence AC CDC report within 10 km.	No
Tri-colored Bat (*Perimyotis subflavus*)	SARA: E COSEWIC: E NSESA: E	S1	Observed during bat surveys	Bat hibernaculum or bat species occurrence AC CDC report within 10 km.	No
REPTILES					
Eastern Painted Turtle (*Chrysemys picta picta*)	SARA: SC COSEWIC SC	S4	--	5.2 ± 0.0	Yes
BIRDS					
Bank Swallow (*Riparia riparia*)	SARA: T COSEWIC: T NSESA: E	S2S3B	--	6.4 ± 7.0	Limited
Barn Swallow (*Hirundo rustica*)	SARA: T COSEWIC: SC NSESA: E	S2S3B	Observed during bird surveys	6.4 ± 7.0	Limited
Bobolink (*Dolichonyx oryzivorus*)	SARA: T COSEWIC T NSESA: V	S3S4B	--	6.4 ± 7.0	Limited
Canada Warbler (*Cardellina canadensis*)	SARA: T COSEWIC: SC NSESA: E	S3B	Observed during bird surveys	3.9 ± 7.0	No
Chimney Swift (*Chaetura pelagica*)	SARA: T COSEWIC: T NSESA: E	S2B,S1M	Observed during bird surveys	3.9 ± 0.0	No
Common Nighthawk (*Chordeiles minor*)	SARA: T COSEWIC: SC NSESA: T	S3B	Observed during bird surveys	3.9 ± 7.0	Yes
Eastern Wood-Pewee (*Contopus virens*)	SARA: SC COSEWIC SC NSESA: V	S3S4B	Observed during the bird surveys	3.9 ± 7.0	Yes
Evening Grosbeak (*Coccothraustes vespertinus*)	SARA: SC COSEWIC SC NSESA: V	S3S4B,S3N	Observed during bird surveys	3.9 ± 7.0	No
Olive-sided Flycatcher (*Contopus cooperi*)	SARA: T COSEWIC: SC NSESA: T	S3B	Observed during bird surveys	3.9 ± 7.0	No
Peregrine Falcon - anatum/tundrius (*Falco peregrinus pop. 1*)	SARA: SC NSESA: V	S1B SNAM	Observed during bird surveys	--	Potential

Common Name (*Scientific Name*)	Legal Protection Status	S-RANK	Field Surveys Observations	AC CDC Reported Distance	Preferred/Nesting Habitat at Project Site
Rusty Blackbird (*Euphagus carolinus*)	SARA: SC COSEWIC: SC NSESA: E	S2B	Observed during bird surveys in wetland	3.9 ± 7.0	Yes
Solitary Sandpiper (*Tringa solitaria*)		SUB, S3, S4M	Observed during bird surveys		
PLANTS and LICHENS					
Frosted glass-whiskers (*Sclerophora peronella Atlantic pop.*)	SARA: SC COSEWIC: SC	S1?	Observance on a hardwood tree in a mixedwood forest	--	Limited
Wrinkled Shingle Lichen (*Pannaria lurida*)	SARA: T COSEWIC: T NSESA: T	S1S2	--	8.1 ± 13.0	Limited
Black-foam Lichen (*Anzia colpodes*)	SARA: T COSEWIC: T NSESA: T	S3	--	5.3 ± 0.0	Yes

Notes:
1. S-rank refers to the Sub-national (Provincial) rank provided by the Atlantic Canada Conservation Data Centre (AC CDC). S-Ranks are as followed: S1: Critically imperiled in province; S2: Imperiled in province; S3: Vulnerable in province; S4: Apparently secure, uncommon but not rare in province; S5: Secure: Common, widespread and abundant in province. S#S# = a numeric range rank used to indicate any range of uncertainty about the status of the species or community. B= Breeding, N = Nonbreeding, M = Migrant, U = Unrankable, ? = Inexact or Unknown (AC CDC 2021). S-Ranks are as of December 2022.
2. Status refers to listings of E: Endangered, T: Threatened, V: Vulnerable or SC: Special Concern on Schedule 1 of the federal *Species at Risk Act* (SARA), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the *Nova Scotia Endangered Species Act* (NSESA).
3. Species at Risk are those species whose status is E, T or V/SC.
4. The 2021 winter survey occurred outside of the typical window for winter bird surveys (i.e., in April 2021).

TABLE 34: SPECIES OF CONSERVATION CONCERN DETECTED IN FIELD SURVEYS OR REPORTED WITHIN 10 KM OF THE PDA IN AC CDC REPORTS.

Common Name (*Scientific Name*)	S-Rank	Field Survey Observation	AC CDC Reported Distance
INVERTEBRATES			
Eastern Tailed Blue (*Cupido comyntas*)	S3?	--	6.3 ± 3.0
Juvenal's Duskywing (*Erynnis juvenalis*)	S3S4	--	7.5 ± 7.0
Pepper and Salt Skipper (*Amblyscirtes hegon*)	S2S3	--	6.4 ± 7.0
MAMMALS			
Fisher (*Martes americana*)	S3	Observed on a Benjamins Mill logging road in May 2021.	--

Common Name (*Scientific Name*)	S-Rank	Field Survey Observation	AC CDC Reported Distance
BIRDS			
American Kestrel (*Falco sparverius*)	S3B	Observed during the bird surveys.	3.9 ± 7.0
American Robin (*Turdus migratorius*)	S5B, S3N	Observed during the bird surveys.	--
Baltimore Oriole (*Icterus galbula*)	S2S3B	--	6.4 ± 7.0
Bay-breasted Warbler (*Setophaga castanea*)	S3S4B	Observed during the bird surveys in.	5.2 ± 0.0
Black-backed Woodpecker (*Picoides arcticus*)	S3S4	--	3.9 ± 7.0
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	S3B	Observed during the bird surveys.	--
Blackpoll Warbler (*Setophaga striata*)	S3S4B	Observed during the bird surveys.	--
Boreal Chickadee (*Poecile hudsonicus*)	S3	Observed during the bird surveys.	3.9 ± 7.0
Brown-headed Cowbird (*Molothrus ater*)	S2B	--	6.4 ± 7.0
Canada Jay (*Perisoreus canadensis*)	S3	Observed during the bird surveys.	3.9 ± 7.0
Cape May Warbler (*Setophaga tigrina*)	S2B	Observed during the bird surveys.	--
Cliff Swallow (*Petrochelidon pyrrhonota*)	S2S3B	--	7.9 ± 7.0
Eastern Kingbird (*Tyrannus tyrannus*)	S3B	--	3.9 ± 7.0
Gray Catbird (*Dumetella carolinensis*)	S3B	Observed during the bird surveys.	7.0 ± 0.0
Indigo Bunting (*Passerina cyanea*)	S1?B	--	7.9 ± 7.0
Killdeer (*Charadrius vociferus*)	S3B	--	3.9 ± 7.0
Nelson's Sparrow (*Ammospiza nelsoni*)	S3S4B	--	6.4 ± 7.0
Northern Goshawk (*Accipiter gentilis*)	S3S4	Observed during the surveys.	3.9 ± 7.0
Northern Harrier (*Circus hudsonius*)	S3S4B	Observed during the bird surveys.	7.5 ± 7.0
Pine Siskin (*Spinus pinus*)	S2S3	Observed during the bird surveys.	3.9 ± 7.0

Common Name (*Scientific Name*)	S-Rank	Field Survey Observation	AC CDC Reported Distance
Purple Finch (*Haemorhous purpureus*)	S4S5B,S3S4N	Observed during the bird surveys.	--
Red Crossbill (*Loxia curvirostra*)	S3S4	Observed during the bird surveys.	4.6 ± 0.0
Red-breasted Nuthatch (*Sitta canadensis*)	S3	Observed during the bird surveys.	3.9 ± 7.0
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	S2S3B	--	3.9 ± 7.0
Ruby-crowned Kinglet (*Regulus calendula*)	S3S4B	Observed during the bird surveys.	3.9 ± 7.0
Scarlet Tanager (*Piranga olivacea*)	S2B	--	6.4 ± 7.0
Spotted Sandpiper (*Actitis macularius*)	S3S4B	--	3.9 ± 7.0
Swainson's Thrush (*Catharus ustulatus*)	S3S4B	Observed during the bird surveys.	3.9 ± 7.0
Turkey Vulture (*Cathartes aura*)	S2S3B	Observed during the bird surveys.	--
Veery (*Catharus fuscescens*)	S3S4B	Observed during the bird surveys.	3.9 ± 7.0
Wilson's Snipe (*Gallinago delicata*)	S3B	--	3.9 ± 7.0
Yellow -bellied Flycatcher (*Empidonax flaviventris*)	S3S4B	Observed during the bird surveys.	3.9 ± 7.0
Great Cormorant (*Phalacrocorax carbo*)	S2S3B, S2S3N	--	6.8 ± 0.0
American Bittern (*Botaurus lentiginosus*)	S3S4B, S4S5M	--	9.0 ± 7.0
Tennessee Warbler (*Leiothlypis peregrina*)	S3S4B, S5M	--	6.8 ± 0.0
PLANTS and LICHEN			
Drummond Moss (*Drummondia prorepens*)	S3?	--	8.6 ± 5.0
Acadian Jellyskin Lichen (*Leptogium acadiense*)	S3S4	2021 Observance on a hardwood tree in hardwood and mixedwood forests.	--
Black Rock-wafer Lichen (*Phylliscum demangeonii*)	S2?	--	5.2 ± 0.0
Blistered Tarpaper Lichen (*Collema nigrescens*)	S3	2021 Observance on a hardwood tree in a mixedwood forest.	5.3 ± 0.0
Blue Vervain (*Verbena hastata*)	S3	--	6.4 ± 7.0
Dwarf Bilberry (*Vaccinium cespitosum*)	S3	--	3.0 ± 0.0
Eastern Candlewax Lichen (*Ahtiana aurescens*)	S2S3	--	5.1 ± 2.0

Common Name (*Scientific Name*)	S-Rank	Field Survey Observation	AC CDC Reported Distance
Large Round-Leaved Orchid (*Platanthera macrophylla*)	S2	--	6.5 ± 1.0
Lesser Sulphur-cup Lichen (*Cladonia deformis*)	S2S3	--	7.7 ± 4.0
Mixed-up Pixie-cup (*Cladonia mateocyatha*)	S2S3	--	4.0 ± 6.0
Muehlenbeck's Bryum Moss (*Bryum muehlenbeckii*)	S1?	--	2.4 ± 0.0
Salted Shell Lichen (*Coccocarpia palmicola*)	S3S4	--	5.1 ± 0.0
Shaggy Fringed Lichen (*Anaptychia palmulata*)	S3S4	2021 Observance on a hardwood tree in a mixedwood forest.	--
Silvery-flowered Sedge (*Carex argyrantha*)	S3S4	--	7.7 ± 1.0
Triangular-valve Dock (*Rumex triangulivalvis*)	S2	--	9.7 ± 5.0
Valley Oakmoss Lichen (*Evernia prunastri*)	S3S4	--	3.9 ± 2.0
Hooker's Orchid (*Platanthera hookeri*)	S3	--	3.9 ± 0.0
Powdered Fringe Lichen (*Heterodermia speciosa*)	S3S4	2021 Observance on a hardwood tree in a mixedwood forest.	--
Fertile Shield Lichen (*Parmelia fertilis*)	S2S3	--	5.3 ± 0.0
Corrugated Shingles Lichen (*Fucsopannaria ahlenri*)	S3	--	5.3 ± 0.0
Leathery Moonwort (*Carex argyrantha*)	S3S4	--	5.3 ± 10.0
Daisy-leaved Moonwort (*Botrychium matricariifolium*)	S3S4	--	9.0 ± 10.0

Notes:
1. S-rank refers to the Sub-national (Provincial) rank provided by the Atlantic Canada Conservation Data Centre (AC CDC). S-Ranks are as followed: S1: Critically imperiled in province; S2: Imperiled in province; S3: Vulnerable in province; S4: Apparently secure, uncommon but not rare in province; S5: Secure: Common, widespread and abundant in province. S#S# = a numeric range rank used to indicate any range of uncertainty about the status of the species or community. B= Breeding, N = Nonbreeding, M = Migrant, U = Unrankable, ? = Inexact or Unknown (AC CDC 2021). S-Ranks are as of December 2022.
2. Species of Conservation Concern are those species that are not SAR but are identified as regionally vulnerable or imperilled by the Atlantic Canada Conservation Data Centre (AC CDC) (i.e., those species with AC CDC S-ranks of S1, S2 or S3).

The following sections outline the results of VEC-specific SAR assessments. The assessments provide a description of the preferred habitat conditions for reported SAR/SoCC and compare them to the environment at the Project site. This provides a deeper understanding of the likelihood of encountering the species at the Project site.

3.1.7.1 Vegetation SAR Assessment

Targeted lichen surveys were conducted in habitats with available epiphytic lichen habitat (e.g., forested wetlands with mature trees and upland habitats with mature hardwood trees) on April 27 and May 5, 2021 and September 9 and November 10, 2022 by biologists experienced with lichen identification. Similar to the vegetation surveys, GPS locations and tracks of the random meander paths of the lichen specialists were tracked throughout the dedicated surveys. Terrestrial habitats and observations of rare lichens were also reported on an incidental basis in concert with other targeted field surveys (i.e., wetlands, watercourses, and wildlife and wildlife habitat) throughout 2021 and 2022.

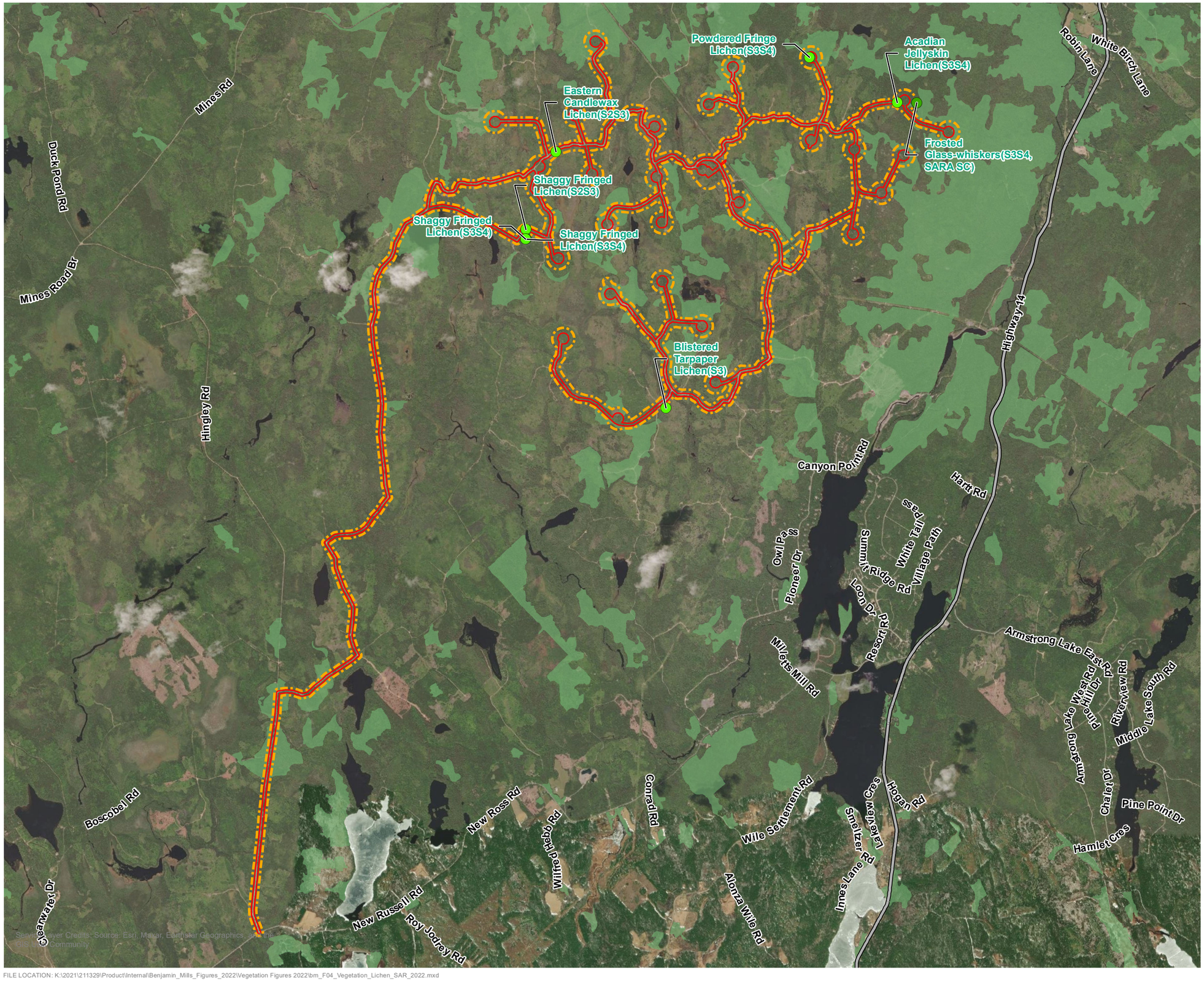
The AC CDC reports included 25 historical records of rare plant speciesTwo recordings of SAR were identified: Black-foam Lichen (*Anzia colpodes*) and Wrinkled Shingle Lichen (*Panaria lurida*). **Table 33** and **Table 34** summarize the historical observations of SAR and SoCC within 10 km of the PDA, as reported by the AC CDC and field surveys.

During the 2021 and 2022 field seasons, one SAR lichen, five SoCC lichen, and two vascular plant SoCC were identified. The locations were recorded and are presented in **Figure 18**.

- **Frosted Glass-whiskers** (*Sclerophora peronella* – Atlantic population) is listed as Special Concern under SARA and COSEWIC and ranked by AC CDC as S3S4 (vulnerable/apparently secure) in Nova Scotia.
- **Acadian Jellyskin Lichen** (*Leptogium acadiense*) is ranked by AC CDC as S3S4 (vulnerable/apparently secure) in Nova Scotia.
- **Blistered Tarpaper Lichen** (*Collema nigrescens)* is ranked by AC CDC as S3 (vulnerable) in Nova Scotia.
- **Eastern Candlewax Lichen** (*Ahtiana aurescens*) is ranked by AC CDC as S2S3 (imperiled/vulnerable) in Nova Scotia
- **Powdered Fringe Lichen** (*Heterodermia speciose*) is ranked by AC CDC as S3S4 (vulnerable/apparently secure) in Nova Scotia.
- **Shaggy Fringed Lichen** (*Anaptychia palmulata*) is ranked by AC CDC as S3S4 (vulnerable/apparently secure) in Nova Scotia.

Vascular plant SoCC observed include:

- **Meadow Horsetail** (*Equisetum pratense*) is ranked by AC CDC as S3S4 (vulnerable/apparently secure) in Nova Scotia. This plant was observed commonly in swamps and wet meadows throughout the LAA .
- **American beech** (*Fagus grandifolia*) is ranked by the AC CDC as S3S4 (vulnerable/apparently secure) in Nova Scotia and was found to be common through hardwood dominated forests of the LAA.



Natural Forces

BENJAMINS MILL WIND PROJECT

VEGETATION AND LICHEN SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

FIGURE 18

- Potential Development Area (PDA)
- Local Assessment Area
- Highway

Plant Observations

- Species at Risk
- Species of Conservation Concern
- American Beech (Fagus grandifolia) (common in hardwood forests)

0 0.25 0.5 1 km

SCALE 1:50,000

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON CONSULTING, GEONB, NATURAL FORCES

MAP CREATED BY: DU
MAP CHECKED BY: KB
MAP PROJECTION: NAD 1983 UTM ZONE 20N

DILLON CONSULTING

PROJECT: 21-1329

STATUS: DRAFT

DATE: 2022-12-14

FILE LOCATION: K:\2021\211329\Product\Internal\Benjamin_Mills_Figures_2022\Vegetation Figures 2022\bm_F04_Vegetation_Lichen_SAR_2022.mxd

Potential Habitat for Plant and Lichen SAR

A total of three lichen SAR were observed on the Project site during the 2021 and 2022 field surveys and AC CDC reports. All of which are typically found growing on the bark of mature hardwood trees. Frosted Glass Whiskers Atlantic population (*Sclerophora peronella*) was the only SAR lichen identified during biological field surveys. It is listed as Special Concern (SARA and COSEWIC) and ranked by the AC CDC as S3S4 for vulnerable to apparently secure.

Habitat for lichen SAR is limited to areas of the site that have not been previously harvested such as the Crown land at the north of the Project site. All three SAR lichen are considered rare and sensitive. Therefore, no construction activity will be done within a 100 m radius of the observations (Nova Scotia Department of Natural Resources and Renewables – Special Management Practices: At Risk Lichens).

Black-foam Lichen (*Anzia colpodes*) is listed as threatened by COSEWIC and is not common in Nova Scotia. The lichen is a leafy lichen that grows in rosettes across the trunks of mature deciduous trees and requires moisture supplied by nearby wetlands or watercourses. Although potential for habitat that this lichen is present within the LAA (e.g., in mature hardwood forest stands the vicinity of wetlands, lakes, and streams), none was observed during the lichen surveys or incidentally during other biophysical surveys conducted between 2021 and 2022.

Frosted Glass-whiskers (*Sclerophora peronella*) is a small arboreal lichen that is listed as Special Concern under SARA and COSEWIC and ranked by AC CDC as S3S4 (vulnerable/apparently secure) in Nova Scotia. A protected zone within a 100 m radius of the observed location of the lichen is required based on NSDNRR At-Risk Lichens-Special Management Practices (NSDNRR, 2018). The project layout was revised to accommodate the buffer for the protection of this SAR lichen following its identification in 2021.

3.1.7.2 Terrestrial Wildlife SAR Assessment

Excluding fish, birds and bats, which are reported separately, moose and Monarch Butterfly were the only fauna SAR with historical observations within 10 km of the centre of the PDA, as reported by the AC CDC (2022). Terrestrial SoCC detected in the AC CDC reports include Pepper and Salt Skipper, Juvenal's Duskywing and Eastern Tailed Blue.

Based on the results of the terrestrial wildlife observations completed in 2021 and 2022, all populations of wildlife found within the PDA are secure according to the AC CDC (2022); however, the fisher is ranked as S3 by the AC CDC. Potential habitat exists within the terrestrial LAA for Mainland Moose. Observations of mammal and herptile species encountered during field studies only included species that are considered to be native to Nova Scotia and no invasive wildlife species were encountered. **Table 33** and **Table 34** summarize the historical observations of bird SAR and SoCC within 10 km of the PDA, as reported by the AC CDC and field surveys.

Potential Habitat for Terrestrial SAR

Mainland Moose (*Alces americanus*) are listed as Endangered by the NS ESA. Moose can reside in a variety of forest habitats; however, they require an abundance of mature forest for security and thermal cover, as well as areas of interspersed young deciduous trees and shrubs for browsing (NSDNRR 2021). Although not encountered, Mainland Moose were reported by the AC CDC as being observed within 10 km of the Project site and potential habitat is available at the site. Field biologists were aware of the potential for moose to be present in the LAA and instructed to record signs of moose if encountered. Such signs include scat, tracks, high browse and shed antlers; however, there were no observations or signs of moose reported during the 2021 and 2022 field surveys.

A Fisher (*Pekania pennanti*) was observed on a logging road in May 2021. This species is ranked S3 for vulnerable. Fishers can be found in mixed forests throughout Nova Scotia with a preference for forests with large areas of continuous overhead cover and suitable denning sites (e.g., hollow trees, brush and rock piles) (Sabean 1989). Suitable habitat is available within the site, however, the proposed Project layout was designed to minimize the alteration of forest habitats. The majority of the PDA is located in areas that have already been heavily cut by forestry practices, which are unsuitable for Fishers.

A Monarch Butterfly (*Danaus plexippus*) recording was listed by the 2022 AC CDC report within 4 km of the Project site. Monarchs are designated as an Endangered species (COSEWIC, NSEA), and of Special Concern (SARA) with a ranking of S2B by the AC CDC. This AC CDC designation refers to its breeding population and the S2 designation alludes to a limited and Imperiled standing. Based on the desktop report, monarchs will prefer open habitat in the Atlantic region. Monarchs are not expected to use the area to any significant extent (breeding), given that there are no records of milkweed within the PDA. Monarchs may likely migrate through the LAA on an occasional basis.

3.1.7.3 Aquatic SAR Assessment

Table 33 and **Table 34** summarize the historical observations of bird SAR and SoCC within 10 km of the PDA, as reported by the AC CDC and field surveys. No fish SAR were observed in the 2021 and 2022 field studies and no records of fish SAR within 10km of the Project were identified in either AC CDC reports. An eastern painted turtle was observed in an isolated pond adjacent to an access road in May 2022.

Due to the nature of aquatic species habitats and ranges, the area for this assessment uses a 20 km distance from the Project. The assessment of potential habitat for aquatic SAR and SoCC near the Project identified the following species within 20 km of the Project, during field studies or identified through AC CDC screening:

- Eastern Painted Turtle (*Chrysemys picta picta*);
- Brook trout (*Salvelinus fontinalis*);
- Atlantic salmon – Inner Bay of Fundy population (*Salmo salar pop. 1*);
- Striped bass – Bay of Fundy population (*Morone saxatilis pop. 2*);
- Striped bass – population not identified (*Morone saxatilis*);

- American eel (*Anguilla rostrata*);
- Alewife (*Alosa pseudoharengus*); and
- Atlantic sturgeon (*Acipenser oxyrinchus*)

Potential Habitat for Aquatic SAR

Eastern Painted Turtle (*Chrysemys picta picta*) is listed as Special Concern (SARA and COSEWIC) and ranked by the AC CDC as S4. Suitable overwintering habitat requires shallow water bodies with deep sediment (COSEWIC 2018). This species was detected within 6 km of the Project site according to AC CDC records and one observance was reported during the 2022 surveys. During their active season, eastern painted turtles typically occupy slow moving, relatively shallow, and well-vegetated wetlands and water bodies with abundant basking sites and organic substrate (Ernst and Lovich 2009) and are known to be semi-tolerant of human-altered landscapes (COSEWIC 2018). Painted Turtles nest in areas with an open canopy (e.g., shorelines of lakes and wetlands) and they overwinter in wetlands and the shallow bays of lakes (Ernst and Lovich 2009). Suitable nesting habitat includes open sloped areas with sandy-loamy and/or gravel substrate that is generally within 1200 m of a waterbody (COSEWIC 2018). Suitable habitat for nesting, basking and overwintering was observed on the Project site during the 2021 surveys.

During the habitat assessments carried out in the fall of 2022, a brook trout (*Salvelinus fontinalis*) was confirmed at WC-5-DS and potential habitat is present for this species within watercourses throughout the PDA. Brook trout is a SoCC that is considered by the AC CDC to be vulnerable in Nova Scotia (ranked S3) but are not currently protected under SARA or NS ESA. Brook trout are freshwater fish with a preference for cool, freshwater environments but spend parts of their life cycle in a variety of habitats from small headwater streams to large lakes (NSDFA 2005).

Atlantic salmon (*Salmo salar pop. 1*), a SAR, are anadromous species with adults migrating from the ocean to spawn in freshwater rivers, generally in the same river where they were born. Salmon rivers or streams are generally large, clear, and cool, with riverbeds composed of gravel, cobble and boulder substrates (DFO 2010). Atlantic salmon are divided into unique populations based on genetic distinction and range. The Inner Bay of Fundy population of Atlantic salmon identified within 14.4 km of the Project (AC CDC, 2022) are listed as Endangered (SARA and COSEWIC) and are considered imperiled provincially by the AC CDC (ranked S1). The Inner Bay of Fundy population of Atlantic salmon have been identified throughout the Avon River watershed (DFO 2022). Inner Bay of Fundy Atlantic salmon are not expected to inhabit watercourses evaluated within the Study Area based on the low pH recorded at the watercourses. However, the two tributaries of Avon River (WC-2 and WC-3) would be acceptable habitat for Atlantic salmon based on substrate and other habitat factors. Watercourses that may be impacted by the final design will undergo additional detailed assessments to ensure that potential impacts to the species are considered and appropriately mitigated. Information and data collected during field surveys on potential fish-bearing watercourses is presented in **Section 3.1.4.**

Striped bass (Bay of Fundy Population - *Morone saxatilis pop. 2*) is a SAR that is presently considered to be Endangered by COSEWIC and their breeding and non-breeding populations are considered by AC CDC to be in between imperiled and vulnerable (both ranked S2S3). Striped bass are an anadromous species migrating from brackish or salt water to fresh water for spawning (DFO 2014). The Bay of Fundy population is known to travel further upriver than other known populations to find spawning habitat in Nova Scotia. WC-1, WC-4, and WC-5 DS are larger, faster moving watercourses within the Study Area and may provide suitable spanning habitat for striped bass based on their *in-situ* water quality readings (e.g., dissolved oxygen) and having a moderate current.

American eel (*Anguilla rostrata*) is a SAR that is presently listed as Threatened by COSEWIC and their non-breeding population is considered by AC CDC to be vulnerable in Nova Scotia (ranked S3N). American eel are habitat generalists that can be found in freshwater, estuaries, and coastal marine waters that are accessible to the Atlantic Ocean (COSEWIC 2012). American eel are a catadromous species that spend most of their life cycle in freshwater, returning to the Sargasso Sea to spawn (COSEWIC 2012). The effects of past development activities (e.g., layout of access roads and installation of the culverts) may presently be limiting the productivity of fish and fish habitat. Due to being generalists, these fish could realistically be found in any of the watercourses in the Project area that do not have barriers.

Alewife populations in Nova Scotia are considered by AC CDC to be vulnerable (ranked S3B), thus classifying them as a SoCC. This species is anadromous and spawning usually takes place in lakes or slow-moving portions of rivers in the late spring (DFO 2016). The watercourses assessed within the study area are generally fast-flowing due to the steep topography of the site. Although the watercourses within the PDA are unlikely to provide suitable habitat for alewife, however, many of the watercourses are connected to lakes and larger watercourses downstream of the PDA that could support this species.

Atlantic sturgeon (*Acipenser oxyrinchus*) is a SAR that is listed as Threatened by COSEWIC and their non-breeding population is considered by AC CDC to be between imperiled and vulnerable (ranked S2S3N). Sturgeon are large, long-lived, late maturing anadromous fish that frequents estuarine environments. They prefer rocky-gravel or hard clay as substrate for spawning and typically choose areas with depth greater than three meters and strong currents (DFO 2014). This rules out all of the watercourses in the Study Area as suitable habitat for sturgeon spawning.

3.1.7.4 Avian SAR Assessment

Priority bird species that were observed during the field surveys included nine SAR and 14 SoCC. A summary of the locations and season(s) in which they were identified, the survey type used, and comments on whether they are likely to be breeding in the LAA is provided in **Appendix H**. The nine bird SAR observed during field surveys include the following:

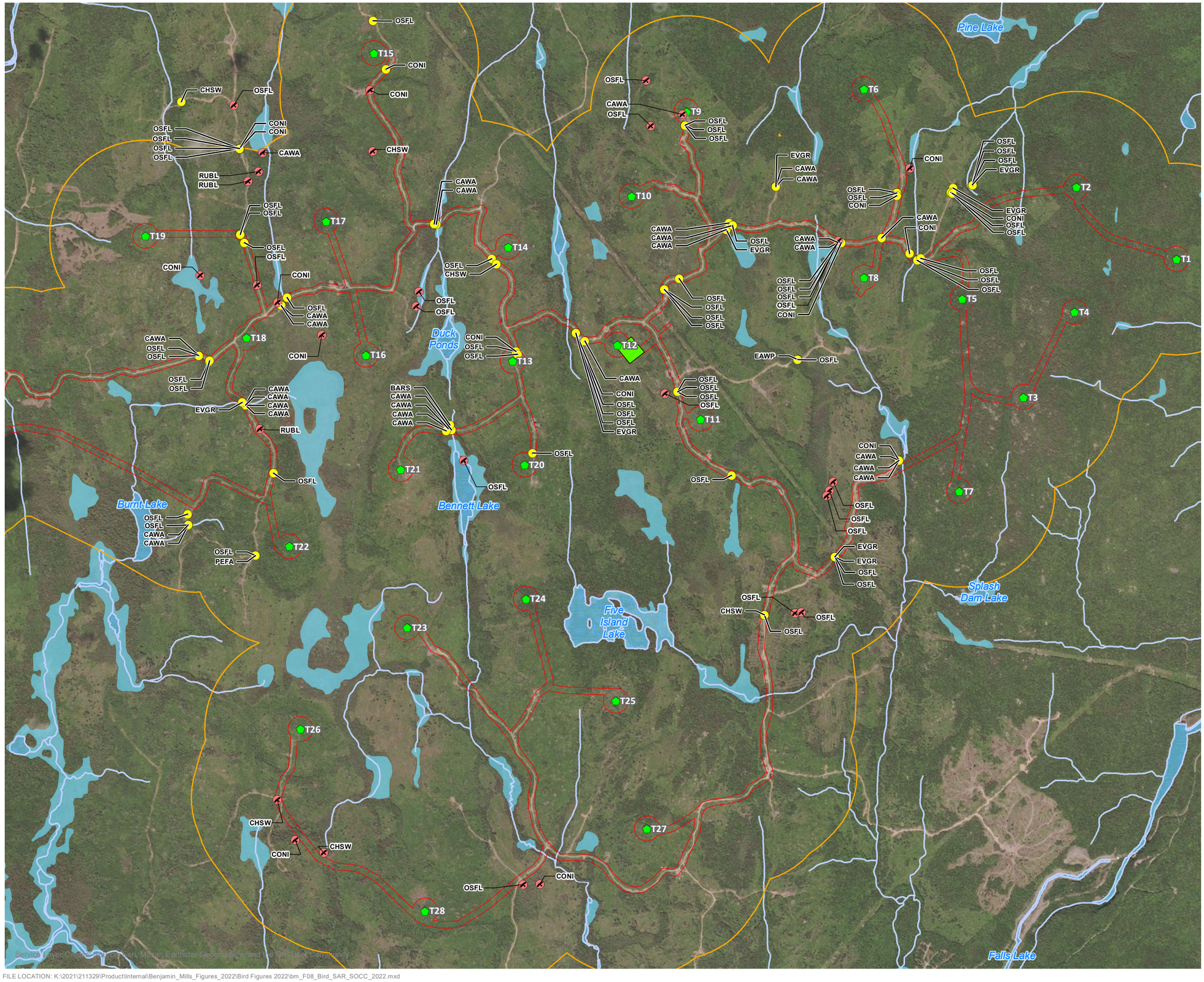
- Barn Swallow (*Hirundo rustica*);
- Canada Warbler (*Cardellina canadensis*);
- Chimney Swift (*Chaetura pelagica*);

- Common Nighthawk (*Chordeiles minor*);
- Eastern Wood-Pewee (*Contopus virens*);
- Evening Grosbeak (*Coccothraustes vespertinus*);
- Olive-sided Flycatcher (*Contopus cooperi*);
- Peregrine Falcon (*Falco peregrinus anatum/tundrius*); and
- Rusty Blackbird (*Euphagus carolinus*)

Based on the most recent AC CDC report, 32 rare bird species have historical observations within 10 km of the Project (**Appendix J**). 10 of the 32 rare bird species are considered SAR:

- Bank Swallow (*Riparia riparia*);
- Barn Swallow (*Hirundo rustica*);
- Bobolink (*Dolichonyx oryzivorus*);
- Canada Warbler (*Cardellina canadensis*);
- Chimney Swift (*Chaetura pelagica*);
- Common Nighthawk (*Chordeiles minor*);
- Eastern Wood-Pewee (*Contopus virens*);
- Evening Grosbeak (*Coccothraustes vespertinus*);
- Olive-sided Flycatcher (*Contopus cooperi*); and
- Rusty Blackbird (*Euphagus carolinus*)

Table 33 and **Table 34** summarize the historical observations of bird SAR and SoCC within 10 km of the PDA, as reported by the AC CDC reports and field surveys. The locations of bird SAR and SoCC are shown on **Figure 19**.



Natural Forces

BENJAMINS MILL WIND PROJECT

LOCATIONS WHERE BIRD SPECIES AT RISK WERE OBSERVED

FIGURE 19

- Incidental Observations of Species at Risk (SAR)
- Species at Risk (SAR)
- Proposed Turbine Location
- Proposed Substation Location
- Local Assessment Area (LAA)
- Potential Development Area (PDA)
- Watercourse
- Waterbodies
- Wetland

Bird Species
CAWA - Canada Warbler
CHSW - Chimney Swift
CONI - Common Nighthawk
EVGR - Evening Grosbeak
OSFL - Olive-sided Flycatcher
RUBL - Rusty Blackbird

0 0.25 0.5 1 km

N W E S

SCALE 1:22,000

MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON CONSULTING, GEONB, NATURAL FORCES

MAP CREATED BY: GAM
MAP CHECKED BY: KR
MAP PROJECTION: NAD 1983 UTM ZONE 20N

DILLON CONSULTING

PROJECT: 22-4064
STATUS: DRAFT
DATE: 2022-12-14

FILE LOCATION: K:\2021\211329\Product\Internal\Benjamin_Mills_Figures_2022\Bird Figures 2022\bm_F08_Bird_SAR_SOCC_2022.mxd

tend to nest in older growth and second-growth conifer-dominated forests. They primarily prey on insects and their larvae during the breeding season, on a wide variety of seeds and the leaf buds of many deciduous tree and shrub species over winter. Evening grosbeaks were identified during the 2021 and 2022 surveys. Potential breeding habitat for the evening grosbeak does exist in forested areas with mature trees present on the Project site.

Olive-sided Flycatcher (*Contopus cooperi*) is listed as Threatened (SARA and NSESA), Special Concern (COSEWIC) and ranked by the AC CDC as S3B for vulnerable in Nova Scotia for the breeding population. This species nests in open, forested areas, often with many conspicuous perches. Olive-sided Flycatchers were detected within the Project site and suitable nesting habitat does exist. Olive-sided Flycatchers were detected in the 2021 and 2022 surveys and suitable nesting habitat does exist within the LAA

Peregrine Falcon - anatum/tundrius (*Falco peregrinus*) is listed as Special Concern (SARA), Vulnerable (NSESA) and ranked by the AC CDC as S1B for critically imperiled in Nova Scotia for the breeding population. They typically nest on cliff ledges along coasts, and major rivers and are known to reuse nesting location. This species has been known to nest on tall buildings, apparently finding them suitable replacements for cliffs. Two Peregrine Falcons were observed at the Project site during the fall migratory surveys. Although this species was not detected during the breeding season, there are numerous bedrock outcroppings that could provide potential nesting habitat for Peregrine Falcons.

Rusty Blackbird (*Euphagus carolinus*) is listed as special concern (SARA and COSEWIC), endangered (NSESA) and ranked by the AC CDC as S2B for imperiled in Nova Scotia for the breeding population. Rusty blackbirds nest in conifer-dominated forests, wetlands, bogs and wet meadows. This species may occur within the Project site as suitable nesting habitat does exist. During the 2021 bird surveys, 2 Rusty Blackbirds were detected during the spring migration window in wetlands (i.e., on May 5, 2021).

Bank Swallow (*Riparia riparia*) is listed as threatened (SARA and COSEWIC), endangered (NSESA) and ranked by the AC CDC as S2B for imperiled in Nova Scotia for the breeding population. Bank swallows are a colonial breeder that is found across Nova Scotia in lowlands along rivers, streams and ocean coasts and nest around vertical, or near vertical cliffs or banks. These birds are aerial insectivores catching nearly all their prey in flight which requires open areas. This species was detected within 10 km of the Project site according to AC CDC records; however no observances were reported during the 2021 surveys. Suitable habitat for bank swallows is limited and they are not expected to occur frequently at the site.

Barn Swallow (*Hirundo rustica*) is listed as threatened (SARA and COSEWIC), endangered (NSESA) and ranked by the AC CDC as S3B for vulnerable in Nova Scotia for the breeding population. Barn Swallows typically inhabit open areas near human settlements and land uses including parks, ball fields, golf courses and agricultural fields where they forage for flying insects. These birds will typically construct their nests on human-made structures, and rarely in more natural locations such as cliffs, caves or hollowed trees. Barn swallows are migratory and winter in Central and South America. This species was detected within 10 km of the Project site according to AC CDC records and twice during the 2022 Breeding Bird Point

Count Survey; however no observances were reported during the 2021 surveys. Suitable habitat for bank swallows is limited and they are not expected to occur frequently at the site.

3.1.7.5 Bat SAR Assessment

As mentioned previously, species associated with the MYOTID species group of bats (Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Perimyotis subflavus*)) were the most common group detected during the 2021 and 2022 bat surveys. These bats are known to inhabit much of Nova Scotia, and all three are listed as Endangered under both the federal SARA and the NS ESA. They are also all ranked by the AC CDC as S1 for critically imperiled in Nova Scotia. Additionally, all three migratory bat SoCC currently undergoing assessment by COSEWIC (i.e., Silver-haired Bat, Eastern Red Bat, and Hoary Bat) were detected.

Potential Habitat for Bat SAR

Critical habitat for little brown myotis, northern myotis, and/or tri-coloured bat includes any site where hibernation by these bat species has been observed at least once between 1995 and 2018 (ECCC 2018). Hibernacula are required for these bats to survive when ambient temperatures decline and insects are unavailable (Ontario Ministry of Natural Resources 2010, COSEWIC 2013). Hibernacula for these species can include caves, abandoned mines, hand-dug wells, cellars, tunnels, rock crevices, or tree root hollows where light and noise levels are low and can support relatively stable temperatures (2-10˚C) and high humidity levels (>80 %) (ECCC 2018). Maternity roosts are used for giving birth and rearing young and are considered to be important habitat but are not yet officially recognized as critical habitat (ECCC 2018).

Critical habitat for bats in Atlantic Canada is mapped but the locations are not shared publicly. The AC CDC did not identify any known bat hibernacula within 5 km of the Project site (AC CDC 2021; 2022). Based on the Environment and Climate Change Canada (ECCC) Recovery Plan for little brown myotis, northern myotis, and tri-coloured bat (ECCC 2018), which uses a 10 km x 10 km grid to buffer known locations of hibernacula, critical bat habitat is present approximately 6 km east of the nearest Project WTG location.

The Little Brown Myotis is the most common bat species in Nova Scotia and is the most likely species to occur in the area; however, Northern Myotis may also be present, but in lower numbers. Both species are expected to occur with patchy distribution reflecting favourable habitat conditions and, in particular, available insect food sources. Habitat requirements for these bats include winter hibernacula such as caves or old mine openings that maintain a relatively stable temperatures (2-10˚C) and high humidity levels (>80 %) throughout the winter, as well as summer day-roosting and maternity-roosting habitat such as abandoned woodpecker cavities, loose bark, knot holes, cracks or hollows. Bats exhibit high site fidelity to known hibernacula in the region, although, there are no known hibernacula within the LAA for the Project. Summer day-roost and maternity-roost sites may occur in suitable tree features, such as abandoned woodpecker cavities, loose bark, knot holes, cracks or hollows. Additionally, bats may also use cavities and crevices in or on human infrastructure as

roosting sites. However, most of the time roost sites are mature trees (dead or alive) with a large hollowed-out cavity or cavities.

3.1.7.6 Environmentally Sensitive or Managed Areas

No existing or candidate protected areas occur within or in the vicinity of the proposed project. The ~1,100 ha block of Crown land that overlaps with a portion of the eastern end of the proposed project contains multiple protection values and could potentially be of interest for protection to help meet government's 2021 legislated commitment to protect 20% of Nova Scotia's land and water by 2030; however, a review of the relative significance of this Crown land for potential protection and selection of candidate protected area sites across the province has not yet been undertaken.

Based on a desktop review, the following is a summary of environmentally sensitive or managed areas with 10 km of the Project site:

- The AC CDC report identified three managed areas and one environmentally sensitive area within 10 km of the Project Site:
  - The Falmouth Municipal Water Supply and the Falmouth Water Supply are located to the north and Mill Lakes Watershed is located to the north east of the Project, approximately seven and five kilometres from the nearest proposed WTG locations, respectively.
  - The Southern Bight Minas Basin Important Bird Area is located north west of the Project site and is approximately 4.1 km away from the nearest proposed WTG. Details of bird surveys are presented in **Section 3.1.4.3** and in **Appendix F**.
- Falls Lake and Mockingigh Lake of the Avon River Watershed are designated as habitat for significant habitat for a species of concern. Falls Lake is located approximately 2 km southeast of the nearest proposed WTG.
- The nearest Provincial Park (Falls Lake Provincial Park) is 4.3 km from the nearest proposed WTG.
- The nearest Provincially Protected Nature Reserves (Panuke Lake Nature Reserve) and Wilderness Areas (South Panuke Wilderness Area); are located >5 km from the nearest proposed WTG locations.
- There are no provincially identified Deer Wintering Areas (DWAs) or Protected Natural Areas (PNAs) within the Project site. However a DWA is located adjacent to the Project site, on the north side of the West Branch of the Avon River (within 10km).
- Lastly, no part of the Project site was identified as Core Habitat or federally identified Critical Habitat with respect to species listed as Endangered or Threatened under either the federal SARA or provincial NSESA.

During the winter, White-tailed Deer congregate in high density groups in areas with which provide shelter from the prevailing wind, offer maximum exposure to the sun and offer cover as well as access to vegetation for browse (NSDNR 2012). DWAs are identified by NSDNRR for identifying areas for special management practices in Nova Scotia. Although no designated DWAs on the Project site, there is potential for deer to winter in uncut forested areas, generally located on the east side of the Project site.

An analysis of biodiversity values and land-scape scale ecological connectivity was conducted to evaluate the Project's contribution to habitat fragmentation. This analysis takes into consideration the movement within and between the aforementioned sensitive or managed areas. Refer to **Section 4** for the complete analysis.

3.2 Effects of the Undertaking on the Environment

Standard mitigation has been identified for the anticipated interactions and/or effect in relation to each VEC in an attempt to prevent the interactions from occurring if possible, or to reduce the magnitude, geographic extent, frequency, duration, reversibility, or ecological/socioeconomic context of the interaction. Best management practices (based on industry guidelines and regulatory guidance documents) have been proposed as mitigation measures. In addition, several acts, codes, regulations and guidelines may require appropriate actions be conducted as mitigation measures prior to or during the interaction.

The federal and provincial legislation and codes that could apply to the Project include (but may not be limited to):

- *Canadian Environmental Protection* Act and regulations (ECCC 1999);
- *Species at Risk Act* (ECCC 2002);
- *Transportation of Dangerous Goods Act* and regulations (TC 1992);
- Nova Scotia *Environment Act* and regulations (NSECC 1994-95);
- Nova Scotia *Water Resources Protection Act*, and regulations (NSECC 2000);
- Nova Scotia *Endangered Species Act*, and regulations (NSECC 1998a);
- Nova Scotia *Fisheries and Costal Resources Act* (NSECC 1996);
- Nova Scotia *Wilderness Areas Protection Act* (NSECC 1998b), and regulations;
- *Fisheries Act* (FA 1985); and
- Contingency Planning Guidelines (NSECC 2021).

The following sections outline the various potential interactions between the Project and each VEC, the proposed mitigation measures for these interactions as well as unplanned events, and the potential cumulative and residual effects of the Project. A residual environmental effect is an environmental effect of a project that remains, or is predicted to remain, after mitigation measures have been implemented (GOC 2022).

3.2.1 Mitigation for Unplanned Events

Over the course of the different phases of the Project, as with any development, there is the potential for unplanned events. These include but are not limited to accidents, malfunctions, and severe weather events. The risks and potential interactions can be challenging to predict.

The Proponent has taken this potential risk into consideration and developed a series of mitigation measures and best practices to limit and prevent impacts on VECs by such incidents. The mitigation measures for unplanned events, listed in **Table 35**, will be followed by the Proponent and all contractors.

During construction and decommissioning, a direct release of a contaminating substance (e.g., fuel or sediment) into the environment could result in a negative effect of the Project on the watercourse and fish habitat VEC. The mitigation measures for unplanned events listed in **Table 35** are anticipated to limit the potential effect as a result of an unplanned event, such as a spill, to be of a small magnitude, of short duration and localized.

TABLE 35: PROPOSED MITIGATION MEASURES FOR UNPLANNED EVENTS

Unplanned Events	Mitigation Measures for Unplanned Events
Potential accidents, malfunctions, severe weather events, among other incidents	1) Proper wetland protection and erosion and sediment control measures following the Environmental Management and Protection Plan (**Appendix O**) will be installed and checked regularly during the construction phase and prior to, and after, storm events to ensure they are continuing to operate properly to minimize potential effects to adjacent habitat. 2) Work during storm events will be avoided. 3) Chemicals and petroleum products will be managed in accordance to manufacturer specifications and stored more than 30 m from a watercourse or wetland. 4) Equipment shall be kept in good working order and maintained so as to reduce risk of spills/leaks and to avoid water contamination. 5) Frequent inspection of equipment will minimize the likelihood of fluids leaking into wetlands. 6) If contaminated soil is encountered, it will be reported to NSECC and managed utilizing the Nova Scotia Contaminated Site Regulations. 7) Mats and other means to avoid disruption of the wetlands will be used during necessary tree clearing. 8) Visual monitoring of silt or sedimentation within watercourses will occur during construction after heavy weather events. 9) Refueling, oiling, and maintenance of equipment will be completed in specifically designated areas located at least 30 m away from any watercourse, wetland, or well to minimize potential effects that could arise in the event of a spill. 10) No stockpiling of materials will occur within 30 m of a wetland or watercourse. 11) Spill response kits must be readily available for each piece of equipment, on site workers are required to be knowledgeable on emergency spill response protocols and initiate corrective measures immediately to minimise any impacts to the surrounding environment. 12) Where applicable, secondary containment and limited quantities of chemicals and fuels required to be stored on site shall be in an area away from the surrounding terrestrial environment, or direct pathways (i.e., ditches) to the surrounding environment, all chemicals and fuels will be stored in appropriate containers designed for the reduction of potential spills or leaks. 13) Work entailing use of toxic or hazardous materials, chemicals, or otherwise creating hazard to life, safety of health, will be conducted in accordance with National Fire Code of Canada to minimize the potential for spills or fires.

3.2.2 Terrestrial Habitats and Vegetation

It is possible that interaction with vegetation and lichen could occur during each phase of the Project, as well as due to unplanned events. The Project's impact on vegetation is

predicted to be minor in terms of significance of environmental effect. A significant environmental effect would result if a considerable change to vegetation was the result of Project activities.

Without mitigation, the Project has the potential to cause a reduction of vegetation and lichen habitat due to linear infrastructure and turbine foundations. While the construction and decommissioning phases present the potential for negative impact, impacts are temporary or reversible, most notably when the decommissioning phase has concluded and land reclamation activities restore the Project site to its previous state. The potential impacts of the Project to vegetation and lichens include the following:

- The potential for direct loss of vegetation through Project activities including vegetation clearing and grubbing activities during the construction, operational phase, as well as during the eventual Project decommissioning and site reclamation activities.
- The potential for indirect loss of riparian or wetland vegetation communities resulting from the introduction of sediment due to Project activities around waterways and wetlands.
- The potential introduction or spread of invasive species on and off site through plant matter attached to construction and maintenance equipment.
- The potential loss or disturbance to SAR/SoCC plants and lichens during construction and decommissioning phases of the Project or from required maintenance during the operational phase.

Field vegetation surveys were completed in 2021 and 2022 to identify and target the major habitat types within the vegetation LAA. Following a review of the initial biophysical surveys completed in 2021, the proposed Project layout was redesigned to further minimize the potential impacts of the Project on VECs, including vegetation species.

Information collected during field surveys has covered all habitat types. Habitat types are outlined in **Section 3.1.1.** One SAR and five SoCC lichens were identified in the Terrestrial LAA. As a result of the field survey findings, the PDA was modified so that no clearing within 100 m of the identified SAR lichen will occur, as recommended by NSDRR (NSDRR 2018).

It is unlikely that the identified SAR and SoCC species will be directly disturbed due to their locations with respect to the PDA. However, if additional species are located, a buffer an appropriate setback will be applied surrounding the plant of SoCC or SAR. The setback distance will be determined based on the species habitat requirements and applicable guidance under the SARA and NSESA.

To further reduce the likelihood of interactions between any phase of the Project to vegetation or lichens, the proposed mitigation measures summarized in **Table 36** will be implemented.

TABLE 36: POTENTIAL INTERACTIONS AND PROPOSED MITIGATION FOR TERRESTRIAL HABITATS AND VEGETATION

Potential Interactions with Vegetation	Proposed Mitigation Measures

Potential Interactions with Vegetation	Proposed Mitigation Measures
Direct loss of vegetation due Project activities including clearing and grubbing during construction, decommissioning and site reclamation activities. Direct loss of vegetation due to maintenance clearing during operations.	1) Proper vegetation management measures following the Environmental Management and Protection Plan (**Appendix O**) will be instated. 2) The Project footprint will be limited to that which is necessary to enable the Project to be carried out. 3) Existing roads and trails will be utilized to limit disturbance outside the Project footprint and minimize the amount of flora to be cleared. 4) Vegetation will be retained where possible. 5) Following the construction and decommissioning phases of the Project, revegetation with native species will be promoted in consultation with the landowner. 6) Vegetation control measures during the operational phase will be minimized to the extent possible.
Indirect loss of riparian or wetland vegetation communities due to introduction of sediment from Project activities around waterways and wetlands during construction and decommissioning.	Mitigation measure #5 is also applicable. Additionally, the following measures will be implemented: 7) The removal of riparian zone vegetation will be limited to the extent possible. 8) Vehicle cleaning will occur away from any watercourse/wetland. Cleaning will also occur as vehicles leave the site to ensure that invasive species already present are not spread to other areas.
Introduction or spread of invasive species on and off site due to plant matter attached to equipment during construction and decommissioning.	Mitigation measure #8 is also applicable. Additionally, the following measures will be implemented: 9) Heavy equipment will be properly cleaned and visually inspected prior to mobilizing to site to avoid potential introduction of exotic and invasive species.
Loss or disturbance to SAR/SoCC plants and lichens due to clearing and grubbing during construction, decommissioning. Loss or disturbance to SAR/SoCC plants and lichens due to required maintenance during operations.	Mitigation measure #6 is also applicable. Additionally, the following measures will be implemented: 10) Frosted Glass-whiskers is listed as Special Concern through SARA; A 100 m buffer will be set around Frosted Glass-whiskers and the road layout will be adjusted to avoid this buffer area 11) The locations of the SAR and SoCC plants will be avoided by adjusting utility pole alignment to buffer these species, where

Potential Interactions with Vegetation	Proposed Mitigation Measures
	feasible, or spanning their locations by utility poles and refraining from clearing vegetation in their vicinity. 12) The locations of SAR plants will be avoided by adjusting utility pole alignment to buffer these species. 13) Where feasible, the locations of SoCC plants will be avoided by adjusting utility pole alignment or spanning their locations by utility poles and refraining from clearing vegetation in their vicinity. 14) Glyphosate will not be used in vegetation management for the Project. 15) Onsite workers will be familiarized with the SAR/SoCC identified by the field studies prior to any site activities taking place. 16) Work in waterways will be minimized where feasible. 17) Project activities will maintain a 50m riparian (streamside) buffer of any waterways where SAR species have been observed. 18) Specimens will be marked with flagging tape and GPS location will be provided to onsite workers to ensure they avoid work in the setback area. 19) Efforts will be made to maintain mature vegetation along the edges of the development area particularly in riparian areas. 20) If a new SAR/SoCC is identified during Project activities, a buffer will be maintained and additional mitigation will be developed in consultation with NSDNRR.

Residual Environmental Effects

The Project will be developed in such a way as to minimize the area of disturbance within the Project site and natural revegetation of the site will be promoted at the earliest opportunity. The majority (approximately 34%) of the PDA has been already disturbed due to previous site activities, including several generations of forestry activities, which are unrelated to the Project. The final Project layout will consider appropriate buffers for any identified SAR/SoCC. Project siting has minimized the flora footprint from the access roads, crane pads, turbine foundation, and substation by making use of existing infrastructure and disturbed areas. Land cleared for construction that is not needed for the operational phase of the Project will be restored to the extent possible and is anticipated to naturally regenerate.

Given current knowledge as informed by the desktop assessment, biophysical assessments, and previous site activities, significant potential impacts to vegetation communities are not anticipated as a direct result of the Project with the appropriate implementation of the mitigation measures presented. Any revisions to the Project footprint will consider the

locations of the SAR and SoCC plants and avoid them to the extent possible by adjusting utility pole alignment to buffer these species, where feasible, or spanning their locations by utility poles and refraining from clearing vegetation in their vicinity.

Additionally, following the construction and decommissioning phases of the Project, natural revegetation with native species will be promoted in consultation with the landowner to minimize the potential for habitat loss and invasive species spread.

With the proposed mitigation measures employed, the significance of residual effects on flora is predicted to be minor; however, post-construction monitoring and adaptive management plans should include monitoring the effects on the SAR lichen, Frosted Glass-whiskers (*Sclerophora peronella*) identified at the site. Other monitoring or biophysical assessments are not recommended.

3.2.3 Terrestrial Wildlife

The proposed Project is located within an area that has been extensively used for forestry practices. The PDA was selected to incorporate previously harvested areas (clear-cuts or strip-cuts) that are now in different stages of natural regeneration and avoid (to the extent possible) undisturbed forest habitat.

It is possible that interaction with terrestrial wildlife could occur during each phase of the Project, as well as due to unplanned events. The Project's impact on terrestrial wildlife (excluding birds and bats, which are evaluated in their separate reports) is predicted to be negligible in terms of the significance of the environmental effect. A significant environmental effect would result if a considerable change to wildlife populations such as a decline in abundance and/or a change in distribution, beyond which natural recruitment (i.e., reproduction and immigration from unaffected areas) would not return the population to its former level within several generations.

In addition, the Project layout was designed to minimize interactions with wetlands and water bodies by siting all WTGs outside of the 30m buffer. Disturbance of habitat as a result of this Project will be minimized by employing above-mentioned proposed mitigation measures. The potential for a significant environmental effect on wildlife and wildlife habitat as a result of Project activities is considered to be negligible following the mitigation measures presented below.

To further reduce the likelihood of interactions between any phase of the Project and wildlife, the mitigation measures, summarized below in **Table 37** will be followed.

TABLE 37: POTENTIAL INTERACTIONS AND PROPOSED MITIGATION FOR TERRESTRIAL WILDLIFE

Potential Interactions with Wildlife	Proposed Mitigation Measures
Short-term, reversible disturbance of potential foraging fauna and habitat and fauna during construction and	1) The Project footprint will be limited to that which is necessary to enable the Project to be carried out. 2) Vegetation will be retained where possible to maintain

Potential Interactions with Wildlife	Proposed Mitigation Measures
decommissioning due to increased human presence, noise and anthropogenic footprint.	wildlife habitat. 3) Following the construction and decommissioning phases of the Project, revegetation with native species will be promoted in consultation with the landowner. 4) Existing roads and trails will be utilized to limit disturbance outside the Project footprint and minimize the interactions with wildlife and wildlife habitat. 5) The site and working areas will be kept clean of food scraps, and waste will be removed from the site routinely to minimize wildlife encounters. 6) Reduced speeds, dust suppression, and noise and lighting restrictions will be implemented to minimize disturbance to wildlife in the PDA. 7) To minimize disruptions of fauna activity at night, Project construction activities will be limited to daylight hours when possible. 8) Construction activities within 30m of a watercourse will be limited where feasible to minimize impacts to wildlife's use of watercourses and movement in corridors. 9) In the case of wildlife encounters, the following will be implemented: (1) no attempt will be made by any worker at the Project site to chase, catch, divert, follow or otherwise harass wildlife by vehicle or on foot; (2) equipment and vehicles will yield the right-of-way to wildlife; and (3) if a SAR is encountered during activities, work around the SAR will cease until a biologist is dispatched to assess the situation and appropriate mitigation is applied. 10) All workers will be familiarized and will adhere to the Nova Scotia *Endangered Species Act* and the federal *Species at Risk Act*. 11) Erosion and sediment control measures will be installed and checked regularly during the construction phase and prior to, and after, storm events to confirm they are continuing to operate properly to minimize potential effects to adjacent habitat.
Short-term, reversible loss of potential breeding and foraging habitat due to linear infrastructure and crane pads during construction and decommissioning. Long-term, reversible loss of potential breeding and foraging habitat due to linear infrastructure during operations.	Mitigation measures #1-4 are also applicable. Additionally, the following measures will be implemented: 12) Control measures to manage and prevent the spread of invasive plant species will be applied to each phase of the Project. 13) Glyphosate will not be used in vegetation management for the Project. 14) No fences that would impede movement of large terrestrial wildlife will be built, and any of built fences will not cut off viable habitat for wildlife. 15) Decommissioning/reclamation activities following the Project will be undertaken to improve interconnections between landscapes in the PDA.

Residual Environmental Effects

The effects of the Project activities on terrestrial wildlife are expected to be limited to only the Project footprint. Disturbance of fauna habitat as a result of the Project will be minimized though the proposed mitigation measures listed above and through turbine and infrastructure siting. Noise associated with the construction may deter wildlife, but potential effects are expected to be short term. With the proposed mitigations, residual interactions of the Project with terrestrial fauna species are anticipated to be short in duration and non-substantive, as they are already occurring in an area with ongoing anthropogenic activities including, but not limited to, recreation and forestry.

In consideration of the above and planned mitigation, the residual environmental effects of the Project on terrestrial wildlife (excluding birds and bats, which are evaluated in their separate reports) is predicted to be negligible in terms of the significance of the environmental effect. A significant environmental effect would result if a considerable change to wildlife populations such as a decline in abundance and/or a change in distribution, beyond which natural recruitment (i.e., reproduction and immigration from unaffected areas) would not return the population to its former level within several generations. No follow-up or monitoring is proposed to monitor environmental interactions with wildlife and wildlife habitats, unless required under permit from NSECC.

3.2.4 Wetlands

The proposed WTG locations and transmission/collector line poles are not predicted to directly interact with identified wetlands as none were delineated within the proposed footprint of these structures. As currently designed, the PDA has crossings of wetlands with linear infrastructure for access roads and collector lines. The access road and collector network utilize the existing access road network that is in place for current forestry operations and many of the crossing have existing culverts that will be maintained, negating the need for working within the watercourses; however, potential alterations (e.g., infilling) may be required for wetlands within the final layout of the Project.

In order to mitigate risk to wetlands, all WTGs will be set back at least 30 m from wetlands. During construction of the collector network, care will be taken to avoid wetlands as much as feasible, and all attempts will be made to span watercourses with poles. Best management practices for erosion and sediment control will be implemented to monitor potential impacts to wetlands. If wetland areas or function are affected, the Project will also adhere to the *Nova Scotia Wetland Conservation Policy* Mitigation Sequence to prevent the net loss of wetland area and function (NSE 2019). As described in the Nova Scotia Wetland Conservation Policy, monitoring and an adaptive approach are essential for the following three sequence stages to ensure net loss is prevented:

a) Avoidance of adverse effects;
b) Minimization of unavoidable adverse effects; and
c) Compensation for adverse effects that cannot be avoided (NSE 2019).

The goals of this policy are taken into account in the continuous planning of the Project in conjunction with all other site considerations. Further consultation and discussions with NSECC and NSDNRR will be requested for assessment of WSS status, permitting requests, and compensation measures. Overall, transitioning to renewable energy will help reduce the effects of climate change. This may have a positive impact on the long-term population growth and viability of wetlands and the ecosystems they support in Nova Scotia.

Although direct impacts to wetlands are minimized as much as feasible in the siting phase, some minor infilling will likely be required for certain wetlands adjacent to existing forestry roads. A change in wetland size and/or function could occur during the construction of access roads or site restoration in the areas of the wetlands that may require clearing. This could alter the vegetation, increase erosion rates or alter natural drainage patterns in proximity to the aquatic receptors and/or alter the functions of a wetland. Loss of wetland area or function (i.e., hydrological regime, habitat and water quality maintenance) could occur due to the clearing of trees and vegetation within the wetlands.

The potential interactions of the Project on wetlands and the proposed mitigative measures are summarized in **Table 38**.

TABLE 38: POTENTIAL INTERACTIONS AND PROPOSED MITIGATION FOR WETLANDS

Potential Interactions with Wetlands	Proposed Mitigation Measures
Silt run-off, flow alteration, and/or significant increase of water flow, nutrients or sediments into the wetlands due to clearing, grubbing, infilling and excavation during construction.	1) Work within 30 m of wetlands will be avoided to the extent feasible. 2) Where avoidance is not possible, disturbances will be minimized as much as feasible (i.e., limited to the area which is required to accomplish the Project objectives). 3) A wetland alteration approval will be applied for and obtained for work in any wetland, noting that work within wetlands will be avoided or minimized to the extent possible during the Project design phase. 4) Appropriate sediment erosion and run-off control measures (e.g. silt fencing, hay bales) will be implemented, following best management practices (**Appendix O**), to prevent sediment from leaving the site at all times. 5) Natural regeneration of the site will be promoted to aid in storm water retention and reduce run-off. 6) Vehicle traffic in the wetlands will be minimized by using alternate techniques (e.g. hand cutting vegetation) where possible. 7) Wetlands within the PDA of collector or transmission lines will be spanned with electrical poles where possible where feasible. 8) In consultation with NSECC, compensation will be implemented for net loss of wetland function during the wetland alteration permitting process. 9) Through the wetland alteration permitting process, should wetland monitoring be required, a plan will be developed in consultation with NSECC

Potential Interactions with Wetlands	Proposed Mitigation Measures
Partial or total loss of wetlands due to new roads and infrastructure during construction, impacting interconnectivity of adjacent wetlands within the same watershed.	Mitigation measures #1-8 presented above are also applicable to potential partial or total loss of wetlands.

Monitoring

Consultation with NSECC regarding the development of a post-construction monitoring program and compensation for selected wetlands will be conducted prior to development as part of the wetland alteration permit process.

Residual Environmental Effects

The Project will be developed in such a way as to avoid wetlands, minimize disturbance to wetlands where avoidance is not possible, and minimize the area of disturbance within the Project site. Avoidance through site design has been completed to the extent possible (i.e., avoiding wetlands where possible, spanning wetlands using overhead collection lines, and use of existing roads). In addition, following the construction and decommissioning phases of the Project, natural revegetation with native species will be promoted in consultation with the landowners to minimize the potential for habitat loss and invasive species spread. Given current knowledge as informed by the desktop assessment, biophysical assessments, and previous site activities, significant potential impacts to wetlands are not anticipated as a direct result of the Project with the appropriate implementation of the mitigation measures presented and with wetland compensation for unavoidable net loss of wetland function.

In consideration of the above and planned mitigation, the residual environmental effects of the Project on wetlands during all phases including unplanned events are not anticipated to be significant.

3.2.5 Watercourses and Fish Habitat

The proposed WTG locations are not predicted to directly interact with identified watercourses as none were delineated within the proposed footprint of these structures. The access road and collector network utilize the existing access road network that is in place for current forestry operations and many of the crossing have existing culverts that will be maintained, largely minimizing the need for working within the watercourses. Within the PDA, up to nine crossing locations with PDA and watercourses have the potential to require road or bridge upgrades to support the construction and maintenance of the Project.

In order to mitigate risk to watercourses, fish, and fish habitat, all WTGs were set back at least 30 m from watercourses. During construction of the collector network, care will be taken to avoid watercourses, and all attempts will be made to span watercourses with poles. Best management practices for erosion and sediment control will be implemented to monitor potential impacts to watercourses.

Without mitigation, watercourses with crossings within the PDA have the potential to be impacted during the construction and decommissioning phases of the proposed Project. Interaction may primarily occur during clearing and grubbing and access road widening, as well as during eventual infrastructure removal and site reclamation activities in the decommissioning phase. Potential interactions include increasing sediment load during earth works, from altering surface water drainage patterns.

While the construction and decommissioning phases present potential for negative impacts to watercourses within 30 m of Project-related activities, impacts are reversible as land reclamation activities restore the Project site to its previous state.

Though some studies exist (DFO 1998; DFO 2018), potential effects of sounds and vibrations associated with the construction (e.g. blasting) and daily operation of the proposed project to fishes occurring within the LAA and the impacts of seismic vibrations and anthropogenic sounds on the behaviour and health of fishes (and other wildlife) are not entirely clear. Best Management Practices for Pile Driving and Related Operations (DFO 2018) state that peak underwater pressures in excess of 30 kilopascals (kPa) are likely to adversely affect fish. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (DFO 1998) state that the detonation of explosives in or near water produces post-detonation compressive shock waves that can damage the swimbladders of fish and may kill or damage fish eggs and larvae when pressures exceed of 100 kPa (DFO 1998). The construction and decommissioning phases of the project are expected to temporarily increase noise and vibration due to potential blasting and an increase in heavy vehicle traffic on the Project site.

Studies on offshore wind energy turbines have indicated that underwater sound can be generated at levels that are detectable by fish (Mooney 2020). It remains unclear whether onshore WTGs generate underwater noise that has the potential to affect fish health and behaviours. Although not included as a study for the proposed Project, ambient underwater noise in the watercourses located near the PDA is expected to be present as a result of pre-existing site activity and the turbulent nature of the watercourses caused by the steep terrain. None of the proposed WTG locations have been sited within 250 m of watercourses with a high potential for fish to be present. Therefore, impacts to watercourses, fish habitat, and fish during operation are not expected and they are not discussed further.

During the operational phase, the generation of noise and vibration is not anticipated to affect fish. The PDA is situated on ridges that are broken up by steep valleys; and as a result, the flow regime in the watercourses of the PDA included reaches with natural turbulence and riffles, which would be likely to mask the noise generated during operations.

In consultation with ECC Water Resources Management Unit, a Surface Water Management Plan (SWMP) and an analysis of post-construction water flows have been developed by a qualified engineer to better understand and limit the interactions of the Project with the aquatic environment (**Appendix R**).

The potential interactions of the Project on watercourses and fish habitat and the proposed mitigative measures are summarized in **Table 39**.

TABLE 39: POTENTIAL INTERACTIONS AND PROPOSED MITIGATION FOR FISH AND FISH HABITAT

Potential Interactions with Fish and Fish Habitat	Proposed Mitigation Measures
Loss or damage to watercourses and fish habitat due to clearing, grubbing, and/or access road widening during construction and decommissioning. Loss or damage to watercourses and fish habitat due infrastructure removal during decommissioning and site reclamation activities.	1) The removal of riparian zone vegetation will be limited and minimized to the extent possible. 2) The use of heavy equipment within 30 m of a watercourse will be minimized to the extent possible. 3) The use of blasting within 30 m of a watercourse will be minimized to the extent possible 4) Construction activities near watercourses will comply with the applicable regulations and guidelines such as the *Fisheries Act* and will be carried out strictly in accordance with NSECC and DFO Approvals, Terms and Conditions, and Letters of Advice. 5) Where possible, watercourse crossings will be located in areas that exhibit a stable soil type where grades approaching the crossings will not be too steep and will span the watercourse. 6) Proper erosion and sediment control measures will be installed and checked regularly during construction and prior to, and after, storm events to ensure they are continuing to operate properly to minimize potential effects to adjacent habitat. These measures will be included in the Environmental Management and Protection Plan (**Appendix O**). 7) Sufficient staff and equipment to manage erosion and sediment control during storm events and other emergencies will be provided. 8) In-stream work will be timed to occur in the dry season and not during significant rainfall. Culverts will be designed and installed to prevent the creation of barriers to fish movement and maintain bankfull channel functions and habitat functions to the extent possible. 9) Prior to in-stream work, fish-outs will be completed to ensure no harm to resident fish species. Captured fish will be released outside of the work area. 10) Runoff will be controlled, and sediment will be prevented from leaving the site at all times. 11) Equipment shall be kept in good working order and maintained to avoid noise disturbances. 12) All workers will be familiarized with potential aquatic SAR and will adhere to mitigation measures for the protection of aquatic SAR as outlined within the Adaptive Management Plan (AMP; **Appendix Q**). 13) All workers will adhere to the provincial Nova Scotia Endangered Species Act and federal Species at Risk Acts. 14) A preliminary Surface Water Management Plan (**Appendix R**) has been developed by qualified engineers in consultation with ECC Water Resources Management Unit. Any further information compiled as part of this Plan will be shared with NSECC.

Monitoring
Construction activities near watercourses will comply with the applicable regulations and guidelines such as the *Fisheries Act* and will be carried out strictly in accordance with NSECC and DFO Notifications, Approvals, Terms and Conditions, and Letters of Advice.

Residual Environmental Effects

The Project will be developed in such a way as to avoid disturbance to watercourses where avoidance is not possible, and minimize the area of disturbance within the Project site. Avoidance through site design has been completed to the extent possible (i.e., avoiding watercourses where possible, spanning watercourses using overhead collection lines, and use of existing roads). In addition, following the construction and decommissioning phases of the Project, natural revegetation with native species will be promoted in consultation with the landowners to minimize the potential for habitat loss and invasive species spread.

Short-term, reversible disturbance to watercourses and fish habitat due to clearing, grubbing, and/or access road widening during construction and decommissioning were assessed above as a potential intersection between the Project and the watercourse and fish habitat VEC. After employing the proposed mitigation strategies in **Table 39**, these potential effects are anticipated to be temporary, of small magnitude and contained.

In consideration of the above and planned mitigation, the residual environmental effects of the Project on watercourses and fish habitat during all phases including unplanned events are rated not significant. No follow-up or monitoring is proposed to monitor environmental interactions with the watercourses and fish habitat, unless required under permit from NSECC.

3.2.6 Birds and Bird Habitat

During the 2021 and 2022 bird surveys, over 11,000 individual birds of over 103 different species were recorded within the LAA. The bird populations present in the assessment area were observed through the techniques of point counts, area searches/transects, radar and acoustic monitoring, and diurnal watch counts. Information on the existing state of birds and bird habitat based on information gathered and data collected during field surveys, as well as radar and acoustic monitoring is outlined in **Section 3.1.4.3**.

Without mitigation, the Project is anticipated to interact with birds and/or bird habitat and cause environmental effects in the following ways:

- Loss of habitat due to project infrastructure during construction, operation, and decommissioning;
- Temporary disturbance, or displacement from surrounding habitat, during Project construction and decommissioning activities due to increased human presence, noise, lighting and anthropogenic footprint;
- During operation there is a possibility that migrating birds could collide with the wind turbines and Project infrastructure. In addition, birds may alter their migration flyways and/or local flight paths to avoid wind turbines;

- Nocturnal migrant and night-flying seabirds that are most at risk of attraction to lights may be attracted to the operational lighting of the Project;
- Fog events can impair avian visibility, increasing the likelihood of mortality from collision with wind turbines; and
- Potential impacts as a result of unplanned events.

During operation, the key potential effect of the Project to birds will be potential impacts to flight paths of migrating birds. In addition, birds may alter their migration flyways and/or local flight paths to avoid wind turbines. Although the predicted mortality rate of birds due to collision and/or habitat loss cannot be accurately predicted prior to the operational phase, the implementation of robust post- construction biophysical assessments will improve our understanding of the potential interactions between wind projects and wildlife. The post-construction monitoring programs will aid in the identification of potential interactions and determination of when to implement certain mitigation measures (i.e., reporting to CWS or implementing a temporary shutdown) to reduce further impacts.

Through vegetation clearing and the construction of additional access roads and other linear infrastructure, the Project will decrease the availability of bird habitat by vegetation clearing within the required footprint.

During the construction and decommissioning phases interactions are possible as a result of disturbance caused by noise, the loss of habitat within the PDA, and the temporary disruption of nesting habitat (specifically for Common Nighthawks); however, the Project layout was designed with specific effort to minimize the disruption to terrestrial habitats and limit construction as much as feasible to areas that have previously been developed or are undergoing regular disturbance due to forestry or agricultural (i.e., blueberry fields and maple sugary) practices. Though initial loss of habitat will be during the construction phase, loss of habitat will continue throughout the operational phase, in addition to noise disturbances throughout the operational phase. Noise disturbances throughout the operational phase includes from the WTGs and noise from maintenance and post-construction monitoring.

Radar and acoustic monitoring programs were completed in 2021 and 2022 and are reported separately (add reference to report). The data from the radar and acoustic monitoring surveys suggest that during the spring season (and to a lesser extent during the fall) when high migration activity occurred, a subset of those nights showed relatively higher densities of migration within the Rotor Swept Area (RSA). However, there were other high-migration nights when the relative density of migration was greater above the RSA.

To further reduce the likelihood of interactions between any phase of the Project and birds and bird habitat, the mitigation measures, summarized below in **Table 40** will be followed.

TABLE 40: POTENTIAL INTERACTIONS AND PROPOSED MITIGATION FOR BIRDS AND BIRD HABITAT

Potential Interactions with Birds and Bird Habitat	Proposed Mitigation Measures

Potential Interactions with Birds and Bird Habitat	Proposed Mitigation Measures
Temporary disturbance of foraging fauna and loss of breeding and foraging habitat during Project activities due to increased human presence, noise and Project footprint.	1) Vegetation will be retained where possible to maintain bird habitat, and glyphosate pesticides will not be used. 2) The Project footprint will be limited to that which is necessary to enable the Project to be carried out. 3) Existing roads and trails will be utilized to limit disturbance outside the Project footprint and minimize the interactions with wildlife and wildlife habitat. 4) The Proponent will endeavor to conduct construction activities such as clearing and grubbing during a time period that does not coincide with when migratory and breeding birds would be in the area. 5) Reduced speeds will be employed in the vicinity of wildlife. 6) Tree and vegetation clearing will not be undertaken during the breeding bird season (Early April to late August) to the extent possible. Should clearing be required during the breeding bird season the proponent will consult with CWS for appropriate mitigation measures. 7) Should clearing and grubbing be required during the breeding season, it will only occur following approval and survey requirements developed and approved in consultation with NSNSDNRR. 8) Should a nesting migratory bird be identified within the work area, CWS will be notified and an appropriate no-work buffer zone (in consultation with CWS will be applied around the nest until the nest has been fledged. No flagging of the nest will occur to minimize chances of predation. 9) All workers will be familiarized with the SAR/SOCC that were identified as having the potential to occur on site through both field and desktop analysis prior to work commencing. 10) A reference document will be prepared to ensure workers are aware of potential SAR/SOCC in the Project area. 11) Stockpiling of fill and excavated materials will be minimized to deter the potential for nesting by bank swallows or other ground nesting species (e.g., common nighthawk). 12) Fill/excavation material piles will be at low angles, if left standing for long durations. 13) All workers will adhere to the *Migratory Birds Convention Act* and the *Migratory Birds Regulations*. 14) All workers will adhere to the provincial *Nova Scotia Endangered Species Act* and federal *Species at Risk Act*.
Behaviour alterations due to lighting during construction and operations.	15) To minimize disruptions with wildlife activity at night, the Project construction activities will be limited to daylight hours when possible. 16) Necessary construction lighting will be pointed downwards. 17) Lighting will be shielded downward. 18) Instruction will be given to maintenance staff to ensure all work lights are turned off upon leaving the site particularly during foul weather events.
Collision of migrating birds with wind turbines and Project	19) A comprehensive AMP will be developed and implemented in

Potential Interactions with Birds and Bird Habitat	Proposed Mitigation Measures
infrastructure during operations.	consultation with CWS and NSDNRR (**Appendix Q**). This includes the development of a follow-up avian mortality survey that will be conducted after the Project commissioning. 20) During the first year, post construction monitoring events will be targeted to capture the morning following nights with favorable tail wind conditions. 21) Blade feathering will be employed as required, and remote shutdown will be employed when appropriate. 22) Should unexpected negative impact to migration flyways occur, appropriate actions will be taken in consultation with CWS and NSDNRR. 23) Non-operational towers will be dismantled if not expected to be put back into operation.
Alteration of migration flyways and/or local flight paths to avoid wind turbines during operations.	Mitigation measures #19-23 are also applicable for potential migration flyways or flight paths.

Monitoring

A comprehensive AMP will be developed and implemented in consultation with CWS and NSDNRR (**Appendix Q**). A post-construction bird and bat mortality survey will be conducted for two consecutive years following commissioning. The result of the post-construction surveys will determine if further mitigation is required in consultation with CWS and NSDNRR. Post-construction monitoring will include targeted events to capture the morning following favourable tail wind conditions.

The Proponent has and will continue to work towards the development of a regional radar study in coordination with NSDNRR to better inform regional/ provincial level understanding of avian migration and how such information can better inform risk management in Project development.

Residual Environmental Effects

The Project will be developed in such a way as to minimize the area of disturbance within the Project site and revegetation of the site will be promoted at the earliest opportunity. The final Project layout will take into account appropriate buffers for any identified SAR/SoCC.

The predicted mortality rate of birds due to collision and/or habitat loss cannot be accurately predicted prior to the operation of the Project, however, it is expected that the mortality rate of birds from collision or habitat loss during Project operation, if at all, will be low. Mabee et al. (2006) reported that migration altitudes averaged 410 m a.g.l within the ground to 1.5 km altitude range, and nightly averages ranged from 214 to 769 m. It is important to note that the percent of targets detected in that study was relatively uniform between 0 and 500 m a.g.l., which would indicate that there isn't a greater risk of avian collision if turbine heights were increased to 200 m.

Horton (2016) indicates average heights of birds flight paths during migration recorded from multiple studies ranged between 119.8 m and 1135.6 m. As these are averages, night migrants were found both above and below these levels suggesting current wind energy facilities are already within this migration corridor and thus, using turbines with a maximum height range of 200 m does not pose a new risk. Erickson et al. (2014) indicated that bird mortality at wind energy facilities in North America account for at most 0.043 % of the population estimates for the species most affected by collision mortality; turbine collision mortality accounted for a lower rate than this for all other species and does not pose a threat to populations.

The avian nocturnal migration survey found that, while some level of migration was observed on most nights, a large proportion of the migratory activity observed in each season was only limited to only a few nights. When examining nights when large numbers of targets were detected (i.e., when most of the migration occurred) the bulk of the migratory movements were detected at around 500 m altitude and there tended to be fewer of targets at lower altitudes (i.e., within the Rotor Swept Area (RSA)).

The Proponent does not anticipate significant mortality rates for the proposed turbines at a maximum height of 200 m. The recommended post-construction monitoring for bird mortality during operation will verify the impact the Project has on migratory and breeding birds. With the proposed mitigation measures employed, the significance of residual effects on migratory and breeding birds is predicted to be minor. Should the post-construction surveys indicate something different, the Proponent will follow the Adaptive Management Plan and engage regulatory authorities in applying additional mitigative measures.

A comprehensive Adaptive Management Plan will be developed and implemented in consultation with CWS and NSDNRR. This includes the development of a follow-up avian mortality survey that will be conducted after the Project commissioning. With the proposed mitigation measures employed, the significance of residual effects on migratory and breeding birds is predicted to be minor and limited to the Project site. Should the post-construction surveys indicate something different, the Proponent will follow the Adaptive Management Plan and engage regulatory authorities in applying additional mitigative measures.

3.2.7 Bats and Bat Habitat

Based on Dillon's experience on similar bat acoustic programs throughout the country, and in consideration of the survey level of effort (i.e., number of monitoring stations), the total number of bat passes (during the breeding period, fall migration, and entire survey period) are considered very low for both 2021 and 2022.

Anticipated effects to bats can be predicted based on the nature of the Project and effects to bats on similar projects in the region. It is possible that interaction with bats and bat habitat could occur during each phase of the Project, as well as due to unplanned events. Key environmental concerns for bats include the potential for habitat loss during the construction phase of the Project and potential mortality of bats due to collision during the

operational phase. Industry standards, technology and more robust biophysical assessments are improving the understanding of the potential interactions between wind projects and wildlife. Without mitigation, the Project is anticipated to interact with bats and/or bat habitat and cause environmental effects in the following ways:

- Temporary disturbance, or displacement from surrounding habitat, during Project construction and decommissioning activities due to increased human presence, noise and anthropogenic footprint;
- Loss of habitat due to Project infrastructure and crane pads during construction, operation, and decommissioning;
- Fatalities due to barotrauma or collisions with turbine towers or blades or the transmission line infrastructure during the operation; and
- Modifications to existing flight paths as bats avoid the PDA or are attracted to the area by tower lights during the operation.

Under *SARA*, general prohibitions apply regarding any SARA-listed bat (or other) species to the Proponent, staff and contractors. Personnel associated with all phases of the Project are to be made aware that no person shall:

- Kill, harm, harass, capture or take an individual SAR;
- Possess, collect, buy, sell or trade an individual, or any part or derivative; and
- Damage or destroy the residence of one or more individuals.

To further reduce the likelihood of interactions between any phase of the Project and bats and bat habitat, the mitigation measures, summarized below in **Table 41** will be followed.

TABLE 41: POTENTIAL INTERACTIONS AND PROPOSED MITIGATION FOR BATS AND BAT HABITAT

Potential Interactions with Bats and Bat Habitat	Proposed Mitigation Measures
Temporary disturbance, or displacement from surrounding habitat, during Project construction and decommissioning activities due to increased human presence, noise and anthropogenic footprint. Loss of habitat due to Project infrastructure and crane pads during construction, operation, and decommissioning.	1) The Project footprint will be limited to that which is necessary to enable the Project to be carried out. 2) Vegetation will be retained where possible to maintain bats and bat habitat. 3) Any revegetation of a reclaimed site must be either naturally occurring or using native local vegetation in consultation with the landowner. 4) Existing roads and trails will be utilized to limit disturbance outside the Project footprint and minimize the interactions with bats and bat habitat. 5) Workers, particularly the on-site environmental monitor, will be familiarized with the bat SAR/SoCC identified as having the potential to occur on site prior to work commencing. 6) Should a bat SAR/SoCC be identified during Project activities, a buffer will be maintained, and additional mitigation measures will be developed in consultation with NSDNRR. 7) Bat SAR observations will be submitted to the AC CDC,

Potential Interactions with Bats and Bat Habitat	Proposed Mitigation Measures
Fatalities due to barotrauma or collisions with turbine towers, blades or the transmission line infrastructure during operations.	following the directions on how to contribute data found at http://AC CDC.com/en/contribute.html 8) A comprehensive AMP (**Appendix Q**) will be developed and implemented in consultation with NSDNRR and CWS, including a follow up bat mortality survey to be conducted after the Project commissioning, and appropriate actions to be taken should there be a significant negative impact to bats. 9) Non-operational towers shall be dismantled if not expected to be put back into operation. 10) Lighting requirements will meet, but not exceed, Transport Canada standards to minimize the potential impacts to migratory birds.
Modifications to existing flight paths, as bats avoid PDA or are attracted to tower lights during operations.	Mitigation measures #8-10 are also applicable for potential modifications to existing flight paths.

Monitoring

A comprehensive AMP will be developed and implemented in consultation with CWS and NSDNRR (**Appendix Q**). A post-construction bird and bat mortality survey will be conducted for two consecutive years following commissioning. The result of the post-construction surveys will determine if further mitigation is required in consultation with CWS and NSDNRR. Post-construction monitoring will include targeted events to capture the morning following favourable tail wind conditions.

Residual Environmental Effects

The mitigation measures will minimize or prevent habitat loss, disturbance, or displacement of bats from surrounding habitat during Project construction and decommissioning activities by limiting noise and prioritizing development within areas of existing anthropogenic disturbances.

Disturbance of bat habitat has the potential to occur during the construction and operation phases of the Project. However, due to the low number of bat passes recorded at the Project site, limited predicted impacts to the habitat, the implementation of planned mitigation, and careful development of contingency and emergency response plans, it is anticipated that effects related to the Project will not be substantive.

Fatalities due to barotrauma or collisions with turbine towers or blades or the transmission line infrastructure during the operation will be monitored. Post-construction monitoring for bat mortality during operation will also verify the effect the Project has on bats. Should a significant amount of bat mortality be observed following the post construction surveys, the

Proponent will follow the Adaptive Management Plan (**Appendix Q**) and engage regulatory authorities in applying additional mitigation measures.

3.2.8 Species At Risk

The Project is located in a primarily agricultural and forested area that has the potential to provide habitat for some SAR and SoCC. The Proponent is committed to protecting SAR, SoCC and their habitat as important features and VECs related to the Project. A significant effect is considered to include the loss of SAR, SoCC and their habitats. SAR and SoCC either confirmed or that have the potential to be present within the PDA are listed in **Section 3.1.7**. Potential interactions and proposed mitigation measures for SAR and SoCC are dependent on the type of environment, flora or fauna encountered and are discussed is the following sections:

- **Section 3.2.2:** Potential interactions and proposed mitigation measures for plant SAR and SoCC
- **Section 3.2.3:** Potential interactions and proposed mitigation measures for terrestrial wildlife (excluding birds and bats) SAR and SoCC
- **Section 3.2.4:** Potential interactions and proposed mitigation measures for wetlands
- **Section 3.2.5:** Potential interactions and proposed mitigation measures for fish and aquatic SAR and SoCC
- **Section 3.2.6:** Potential interactions and proposed mitigation measures for bird SAR and SoCC
- **Section 3.2.7:** Potential interactions and proposed mitigation measures for bat SAR and SoCC

The Project layout was designed to avoid plant SAR and additional mitigation protecting other VECs would also protect SAR. The potential interactions of the Project on species at risk and the proposed mitigative measures are summarized in **Table 42**.

TABLE 42: POTENTIAL INTERACTIONS & PROPOSED MITIGATION FOR SPECIES AT RISK

Potential Interactions with Species at Risk	Proposed Mitigation Measures
Disturbance and/or loss of SAR or SoCC if present within the Project due to increased human presence, noise and anthropogenic footprint during construction, operation and decommissioning.	1) Should a SAR/SOCC be identified during Project activities, a buffer will be maintained and additional mitigation will be developed in consultation with NSDNRR. 2) All workers will be informed of known/suspected SAR and SoCC and will be familiarized with their appearances prior to starting work. 3) Wildlife protection measures following the Environmental Management and Protection Plan (**Appendix O**) will be instated. 4) SAR observations will be submitted to the Atlantic Canada Conservation Data Centre, following the directions on how to contribute data found at http://ACCDC.com/en/contribute.html

Residual Environmental Effects

The effects of the Project activities on species at risk are expected to be limited to the Project footprint that is required to meet Project objectives. Disturbance of flora and terrestrial fauna (excluding birds and bats) species at risk and their potential habitat as a result of this Project will be avoided or minimized by employing the proposed mitigation measures. With the proposed mitigation, the residual interactions of the Project with species at risk are anticipated to be short in duration are not anticipated to be substantive because they are limited to the construction and reclamation phases.

Residual effects of the Project during the operational phase are possible for bird and bat species at risk, especially migratory species. The Proponent does not anticipate significant mortality rates for the proposed turbines at a maximum height of 200 m. The recommended post-construction monitoring for bird and bat mortality during operation will verify the impact the Project has on these species. With the proposed mitigation measures employed, the significance of residual effects on bird and bat SAR is predicted to be minor. Should the post-construction surveys indicate something different, the Proponent will follow the Adaptive Management Plan and engage regulatory authorities in applying additional mitigative measures.

3.2.9 Cumulative Effects on VECs

Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions (Hegmann et al. 1999). Nearby wind energy projects to the Project include the South Canoe Lake Wind Energy Project, the Martock Ridge Wind Project and the Ellershouse Wind Project.

The South Canoe Lake Wind Energy Project is a 34-turbine project located approximately 8 km south-southwest of the Project. The Martock Ridge Wind Project (3 turbines) and the Ellershouse Wind Project (10 turbines) are located 8.6 km and 16 km east-northeast of the Project, respectively. The distances between these projects and the Project (i.e., outside of the LAAs for all VECs) suggests the potential for interaction between the residual effects of the combined projects is low. Regional population-wide effects due to the individual residual effects of each project could occur. However, population level impacts are unlikely, provided that highly sensitive or rare habitats, hibernacula, as well as concentration areas for species at risk, have been avoided by this Project.

Additional anthropogenic activities and developments near the Project include, but are not limited to:

- Historic and ongoing forestry activities within and adjacent to the Project area;
- Historic operation of pits and quarries within and adjacent to the Project area;
- Existing major transmission line corridor adjacent to the Project area;
- Existing telecommunication towers and associated infrastructure, including overhead power lines and access roads;
- Existing local roads, provincial roads, and Trans-Canada highway;
- Hunting activities within and adjacent to the Project area; and

- Operation of motorized vehicles (heavy equipment, passenger vehicles, and recreational vehicles including All Terrain Vehicles and snowmobiles) within and adjacent to the Project area.

A significant environmental effect would result if a considerable change to wildlife populations such as a decline in abundance and/or a change in distribution, beyond which natural recruitment (i.e., reproduction and immigration from unaffected areas) would not return the population to its former level within several generations.

Following two years of biophysical VEC assessments, it was determined that the residual cumulative environmental effects of the Project in combination with past, present, or reasonably foreseeable projects or activities on terrestrial wildlife, birds, bats, watercourses and fish habitats, and Species at Risk during all phases, including unplanned events, are rated low and not significant. Population and regional level impacts are unlikely, provided that highly sensitive or rare habitats, as well as concentration areas for species at risk, have been avoided by this Project.

Without mitigation measures, cumulative effects to vegetation and lichens could occur during the operational phase of the Project from the increased number of vehicles and use of roads. Cumulative effects could occur as a result of:

- Spreading invasive species to new habitats;
- Contributing sediment to wetlands and riparian communities by erosion from dirt roads and vegetation clearing; and,
- Removing protective buffers from sensitive vegetation and lichen species by further fragmenting the landscape by the clearing of additional corridors.

The WESP-AC functional assessment considered existing stressors on the assessed wetlands. Existing stressors affect the degree to which the wetland is or has recently been altered by, or exposed to risk from, human-related factors that degrade its ecological condition and/or reduce its capacity to perform the functions listed in this document (Adamus 2018). Without mitigation measures, cumulative effects to wetlands could occur as a result of:

- Contributing to a change in the aberrant timing of water inputs through the addition road fill within or downgradient from the wetland that interferes with surface or subsurface flow in/out of the wetlands or the ditching of tributary channels.
- Contributing sediment loading from the contributing area caused by erosion from timber harvest, dirt roads and vegetation clearing.
- Contributing to existing soil or sediment alteration within the wetland by building or modifying access roads that are not graded to the natural contour.

The above mitigation measures were carefully developed to prevent residual impacts to wetlands as a result of the Project. Therefore, in consideration of the above and planned mitigation, the residual cumulative environmental effects of the Project in combination with

past, present, or reasonably foreseeable projects or activities on wetlands during the phases including unplanned events are rated not significant.

In order to further reduce to potential for residual impacts to biophysical VECs during the Project phases, there will be a concerted effort to use existing cleared corridors found on site, to limit over story removal, and vegetation management. Furthermore, the broader threat of climate change will have many negative impacts to VECs. Although the Project may not necessarily have measurable climate effects with local impacts on the environment, the societal transition to renewable energy is a positive action which may support long term population growth through a reduction in climate change.

4 Biodiversity Values and Ecological Connectivity

This section serves to fulfill the following request from the Minister's AIR:

7. *In consultation with ECC Protected Areas and Ecosystems Division provide an analysis of potential impacts to biodiversity values and land-scape scale ecological connectivity from habitat fragmentation. Identify any associated mitigation measures.*

4.1 Background

Connectivity refers to the movement of organisms and processes and the features that affect this movement (Stewart and Neily 2008). Ecological connectivity refers to a landscape's ability to facilitate the unimpeded movement of ecological resources, such as water, flora and fauna, through resource patches and corridors (Brooks 2003). Ecological connectivity considers both the structural components (i.e., the spatial structure) and functional components (i.e., how a particular organism reacts to the spatial structure) of the landscape (Brooks 2003). Ecological resources and wildlife movement without excessive risk is of critical importance to maintaining biodiversity at all levels. The presence of human disturbances can significantly impact a landscape's ability to allow movement; therefore, ecological connectivity has been identified as a Valued Environmental Component (VEC) for the Benjamins Mill Wind Project and is addressed in this Addendum.

Landscapes are large areas that function as ecological systems and respond to a variety of natural and anthropogenic influences Elements are smaller ecosystems that make up landscapes and are typically described by their potential vegetation (e.g., forest type) and physical features (e.g., soil, landform). The type of elements within a landscape help determine historical vegetation patterns and promote an understanding of present distributions and potential habitat development (NSDNRR 2015a). When assessing the biodiversity values and factors contributing to ecological connectivity, it is important to consider how the distribution of naturally occurring factors has been classified and mapped.

The Ecological Land Classification for Nova Scotia divides the province into different spatial units based on a variety of ecological attributes for Integrated Resource Management planning (Stewart and Neily 2008). There are 5 levels of Ecological Land Classification, each providing ecologically relevant information at different scales (Neily et al. 2017):

- Ecozone: It is the broadest level, describing ecological features at a continental scale. Canada is divided into 18 terrestrial ecozones, with all of Nova Scotia being located within the Atlantic Maritime Ecozone;
- Ecoregion: Subdivision of the ecozone characterized by ecological responses to regional climate. There are nine ecoregions in the province, with the Project being located in the Western ecoregion (700), about 2 km south from the Valley and Central Lowlands ecoregion (600) and about 9 km from the Eastern ecoregion (400).
- Ecodistrict: Subdivision of an ecoregion characterized by distinctive assemblages of landform, relief, surficial geological material, soil, water bodies, vegetation, and land uses. There are 39 ecodistricts in the province of Nova Scotia. The Project is located in the eastern side of the South Mountain (720) ecodistrict. In the southernmost portion of the

Project, there is about 2 km of the access road located in the northeastern part of the LaHave Drumlins (740) ecodistrict. Other ecodistricts adjacent to the South Mountain within 50 km of the Project include Central Lowlands (630), Valley Slope (710), Rawdon/Wittenburg Hills (410) and St. Margaret's Bay (760).

- Ecosection: Subdivision of an ecodistrict which presents specific physical features like topographic patterns, soil texture and soil drainage. Dominant ecosections can be found several times in an ecodistrict. Ecosections and ecosites are not coded uniquely to higher orders, as they can be found throughout Nova Scotia in different ecodistricts.
- Ecosite: Smallest management classification, showing ecosystems that have similar moisture and nutrient regimes and vegetation as expressed by slope or slope position.