Bird issues for an environmental assessment of a wind energy project at Lingan, Cape Breton Island, Nova Scotia

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SUMMARY:
Birds and a proposed wind energy project at Lingan, Cape Breton Island

Bird use of the peninsula at Lingan was assessed by on the ground surveys during the spring and autumn migrations and breeding season in 2005. This information, combined with published sources, consultation with government biologists and local birders, and my experience birding in the industrial Cape Breton region for the past 15 years, was used to address questions on the impact of wind turbines on birds at the Lingan site. The assessment is based on the questions in the draft version of 'Wind Turbines and Birds: A Guidance Document for Environmental Assessment' prepared by the Canadian Wildlife Service in December 2003 (Kingsley and Whittam 2003). This project is a small project (fewer than 10 turbines) according to the CWS draft guidelines.

No species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), nor species listed as Red or Yellow in the General Status of Wild Species in Nova Scotia, were detected during spring or autumn surveys. No large concentrations of migrant birds were noted or expected.

Also, no species listed by COSEWIC were detected during the breeding season surveys. One species listed as Yellow in the General Status of Wild Species in Nova Scotia, Common Tern, was seen during breeding season surveys. The most significant bird issue during the breeding season is avoidance of the colony of Great Cormorants on the cliff overlooking Laffins Cove. Keeping turbines away from the Great Cormorant colony would minimize risk. I recommend placing them so that they are closer to the Lingan Power Plant than the Great Cormorant colony.

The birds observed to fly through the airspace of the proposed turbines included Herring Gull, American Crow, Double-crested Cormorant and Great Black-backed Gull. These are all large birds that are capable of avoiding tall objects by changing their flight paths.

Some nocturnal migrants such as sparrows and warblers do use this site during migration. Kills at wind turbines are associated with lights that attract them. Use of minimal lighting, including strobes with long OFF periods, would minimize mortality.

METHODS

Point Counts: On 16 and 22 May 2005 the site (Figure 1) was traversed from the old Lingan Colliery to the World War II gun emplacement and along the Nova Scotia Power fence line. Several forays into the woods of White Spruce, Trembling Aspen and White Birch were made. From this reconnaissance, seven locations, representing all terrestrial habitats on the site (see Figures 3-7, 10) were selected for five minute point counts for the spring, breeding season and autumn surveys (Figures 1; Table 1). From three locations (Figure 1 points A, C and F and Figures 5, 8, 9) scans could be made of the surrounding waters. All birds detected while walking (and birding) between the point count locations were also recorded. Therefore each survey includes 7 five-minute point counts and all birds detected during the 2-3 hours taken to traverse the whole area. Throughout the surveys attention was paid to any birds flying overland at the height of the wind turbines and whether there were flight paths that would potentially intersect with the locations of the turbines.

Figure 1: Map showing proposed site of Lingan wind energy project and the associated anemometer tower in the context of Indian Bay and Lingan Bay on Cape Breton Island. A through G are the representative points selected for point counts of birds during spring and autumn migration and breeding season bird surveys. A to E is about 1.5 km.

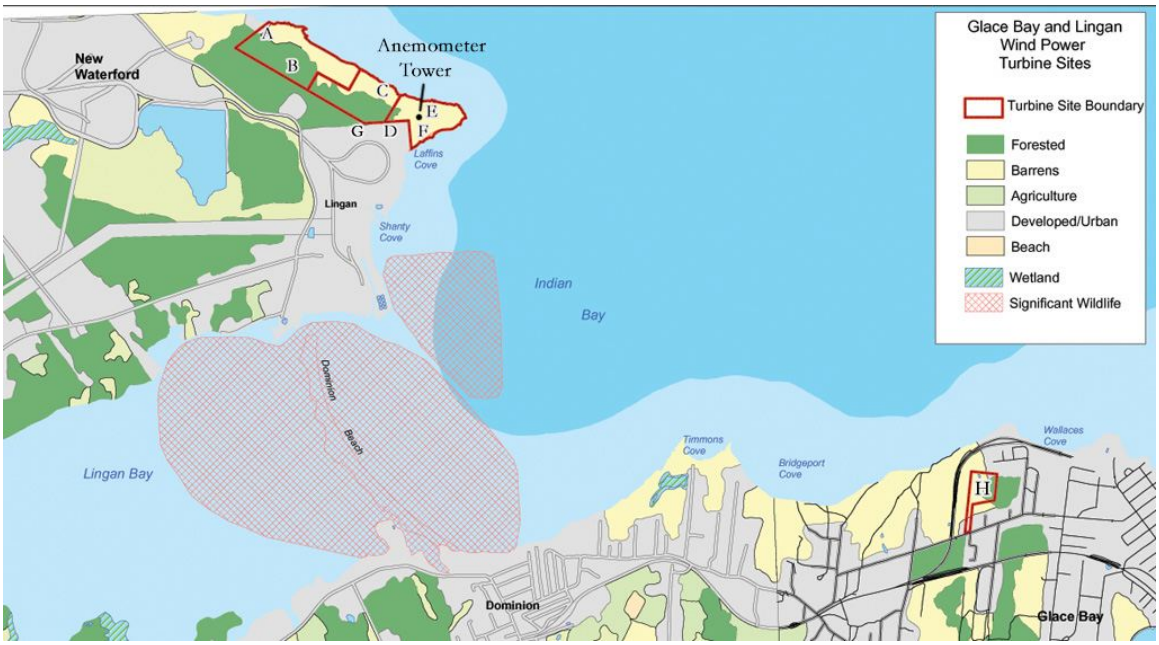


Table 1: Latitude and longitude (dd° mm.000') of the locations A through G for point counts at the Lingan site (see map in Figure 1).

Point	Description	Latitude	Longitude
A	End of grassy road just west of ventilation shaft for old Lingan Colliery	46° 14.931'	60° 02.850'
B	Along cut line in woods	46° 14.795'	60° 02.560'
C	Along coast	46° 14.725'	60° 02.750'
D	Along track to gun emplacement from anemometer tower	46° 14.555'	60° 01.885'
E	Overlooking power plant and cormorant nesting cliff	46° 14.471'	60° 01.921'
F	Near northeast corner of Nova Scotia Power fence	46° 14.556'	60° 02.038'
G	Along Nova Scotia Power fence in mixed woods	46° 14.555'	60° 02.207'

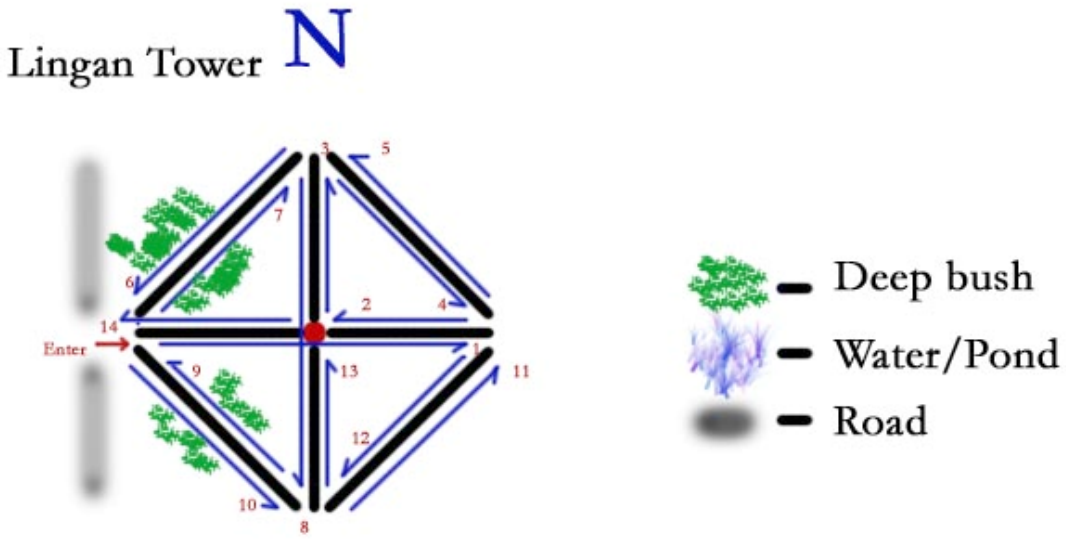
Spring Migration Surveys: On 22 and 28 May 2005 five-minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started early in the morning (before 7:00) to coincide with maximum bird activity.

Breeding Season Surveys: On 08 and 28 June 2005 five minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started early in the morning (before 5:30) to overlap with maximum bird activity.

Autumn Migration Surveys: On 17 September and 25 October 2005 five-minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started after 8:00 since fall migrants are more active mid-morning than just after dawn.

Anemometer Tower Checks: The location of the anemometer tower with guy wires is shown between points D, E and F in Figure 1. Each of the guy wires and the perimeter was walked twice to survey for birds killed by colliding with the wires (Figure 2). Eight surveys were done, at least a week apart, during the breeding season, 08 June to 30 July 2005, and another seven during fall migration, 24 September and 29 October 2005.

Figure 2: Sketch of protocol to check for bird carcasses under the anemometer tower at the proposed Lingan wind energy facility.



Species of conservation concern: Lists of species of special conservation concern maintained by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC www.speciesatrisk.gc.ca), the Nova Scotia Department of Natural Resources (The General Status Ranks of Wild Species in Nova Scotia www.gov.ns.ca/natr/wildlife/genstatus) and the Atlantic Canada Conservation Data Centre (ACCDC) (www.accdc.com/products/lists) were reviewed and compared with sightings on site and the habitats available. All species listed as Threatened or Special Concern by COSEWIC, those listed as Red or Yellow in the General Status Ranks of Wild Species in Nova Scotia and all those ranked as S4 or lower in Nova Scotia by the ACCDC are noted. S5 species are considered 'demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions'. S4 species are considered 'Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g. watch list). (100+ occurrences)'. S3 species are considered 'Uncommon throughout its range in the province, or found only in a restricted range,

even if abundant in at some locations. (21 to 100 occurrences)'. S2 and S1 species are rarer than any of these, but none were found on this site.

Consultation: Limited consultations with residents, private individuals and groups near the site have been undertaken. Terry Power, wildlife biologist with the NS Department of Natural Resources, Coxheath, Becky Whittam of Bird Studies Canada, Sackville, New Brunswick and coauthor of the draft guidelines for assessing the impact of wind projects on birds and Dan Busby, research scientist, Canadian Wildlife Service, Sackville, New Brunswick were consulted about the project.

Questions from 'Wind Turbines and Birds: A guidance document for environmental assessment' (Kingsley and Whittam 2003):
This document outlines protocols for assessing the impact of wind energy installations on birds in Canada. Presently it is under review. As the most recent version the questions in this version will be addressed. Here are the questions, from pages 46-48, that will be addressed for this project:

Breeding Birds:
What avian species breed at the site? What is the relative abundance of species breeding at the site?
What avian species breed in the surrounding area? Are any of the breeding birds found on or off-site considered Species at Risk? Do bird colonies occur in the area? If so how close, and what species? Do raptor nests occur in the area? If so what species? Do breeding birds commute through or near the area and if so in what direction is the movement? Do any species present have aerial courtship displays?
What is the expected amount and type of human presence during the breeding season?
What habitat occurs in the surrounding area? What types of habitat will be lost or altered? How much of each habitat type will be lost or altered?

Migrating Birds:
What is the species composition of birds that migrate through the area? Are any of the migrating birds found on or off-site considered species at risk? What is the approximate number of migrants that use the area? How does this number compare to other nearby sites?
Questions about altitude of migrants not required because of the small size of the project.
Are there significant staging areas nearby?
If significant numbers of birds stage in the area of the proposed wind project, what activities taking place nearby could increase potential risk of bird collision with turbines and associated structures?

RESULTS

Overview:

Fifty-three species of birds were found during the 6 surveys between 22 May and 25 October 2005 (Table 2). No species listed by the Committee on the Status of Endangered Species in Canada (COSEWIC) were found. One species listed as Yellow in the General Status of Wild Species in Nova Scotia, Common Tern, was seen during breeding season surveys. The most significant bird issue identified was avoidance of the colony of Great Cormorants on the cliff overlooking Laffins Cove. More details on the species found and their status in Nova Scotia are given under the summaries for Spring and Autumn migration and breeding season.

Table 2: Summary of birds of the Lingan site during the spring migration, breeding and autumn migration periods in 2005. The maximum number of individuals (or nests as noted) detected during one survey is reported.

	Spring	Breeding season	Autumn
Common Loon			1
Northern Gannet	20+		8
Great Cormorant	50+ nests	50+ nests	43
Double-crested Cormorant	20	50	15
Great Blue Heron		1	
American Black Duck	2	1	
Long-tailed Duck			1
Common Eider		6	5
White-winged Scoter		3	
Red-breasted Merganser			1
Bald Eagle			1
Merlin	1	1	
Ruffed Grouse	1		
Greater Yellowlegs	1		
Herring Gull	300+	100+	130
Iceland Gull	6	1	
Great Black-backed Gull	100	40	39
Ring-billed Gull			30
Bonaparte's Gull			30
Common Tern		2	
Black Guillemot	78	70	
Rock Pigeon	1		
Belted Kingfisher	2	1	

Table 2 Cont'd:	Spring	Breeding season	Autumn
Northern Flicker	1		2
Alder Flycatcher		10	
Bank Swallow		70	
Blue Jay	2	1	7
American Crow	5	15	20
Common Raven	1	4	2
Black-capped Chickadee	2	2	7
Veery		1	
American Robin	3	4	1
Cedar Waxwing		1	
European Starling	3	1	12
Blue-headed Vireo	1	2	
Red-eyed Vireo		3	
Yellow Warbler		7	1
Magnolia Warbler		4	1
Yellow-rumped Warbler	24	4	4
Palm Warbler	6		
American Redstart		1	1
Northern Waterthrush		1	
Common Yellowthroat		6	8
Savannah Sparrow	5	3	4
Song Sparrow	8	15	40+
Lincoln's Sparrow	4		2
Swamp Sparrow			3
White-throated Sparrow	7	10+	60
Dark-eyed Junco	2		3
Common Grackle	8	4	
Purple Finch	1	1	
White-winged Crossbill		65+	
American Goldfinch	10	12+	

Birds of spring migration:

Thirty-one species of birds were recorded during surveys on 22 and 28 May 2005. Numbers are included in the following annotated list. No species listed by COSEWIC as endangered, threatened or of special concern were detected. No species listed Red or Yellow in General Status Ranks of Wild Species in Nova Scotia were detected.

Four species, Great Cormorant, Merlin, Black Guillemot and Greater Yellowlegs are ranked as S4 (widespread and fairly common but of long term concern) or S3 (uncommon throughout province) by the AC CDC. All other species are ranked in the most common, widespread category, S5.

Great Cormorant, S4, Merlin S3S4, and Black Guillemot S3 all breed on the site. Therefore discussion of these is in the breeding season section.

Greater Yellowlegs is ranked as S2B as a breeding bird and S5M as a migrant. A few breed in bogs on the Cape Breton Highlands Plateau at the extreme southern edge of its breeding range, hence the S2 rank. Undoubtedly the individuals detected at Lingan are part of the much larger population that migrates through, which is ranked S5.

Annotated list of 31 species of birds recorded during spring migration surveys 22 and 29 May 2005 at Lingan, Nova Scotia. ACCDC rankings for those ranked S3 and S4 are noted. All other species are S5.

Northern Gannet, more than 20 fishing offshore on 22 May, fewer offshore on the 29th.

Great Cormorant, at least 50 nests east of E on the cliffs along Laffins Cove. This area is called the nesting cliffs hereafter. Also 6 roosting at point beyond gun emplacement. ACCDC S4B.

Double-crested Cormorant, up to 20 around nesting cliff, a similar number either roosting along coast on north side or flying along the north coast. There will be a few nests on the edges of the Great Cormorant colony.

American Black Duck, two flying along coast at A on 29 May.

Merlin, one flying towards paved road near A. S3S4B.

Ruffed Grouse, one drumming between road and A on 29 May.

Greater Yellowlegs, one foraging in small pond between A and B and another calling near D on 29 May. S2B, S5M.

Herring Gull, a few hundred both 22 and 29 May. Most were associated with fishing boats offshore. More than 100 roosting either at the end of the point or along north shore. Each day 5-15 sighted flying overland through area where turbines could be erected.

Iceland Gull, six flying or foraging offshore on 22 May.

Great Black-backed Gull, about 100 both 22 and 29 May. Many were associated with fishing boats offshore. More than 40 roosting either at the end of the point or along

north shore. Each day a few sighted flying overland through area where turbines could be erected.

Black Guillemot, 78 adults on the 22nd and 75 on the 29th. They were concentrated between C and the tip of the point and off E in Laffins Cove. S3.

Rock Pigeon, 1 flying in to nesting cliff on 22 May. They probably nest on these cliffs.

Belted Kingfisher, two flying over near G on 29 May.

Northern Flicker, heard near B on 22 May and near G on 29 May.

Blue Jay, two heard, one at E, one at F on 29 May.

American Crow, up to five heard and seen during surveys.

Common Raven, one seen at E on 29 May.

Black-capped Chickadee, two calling near B on 22 May, another calling near F on 29 May.

American Robin, only one heard on 22 May and three on 29 May.

European Starling, one flying in to cliff near E on 22 May. Probably nest in crevices along this cliff. Three seen between D and E on 29 May.

Blue-headed Vireo, one singing between road and A on 29 May.

Yellow-rumped Warbler, two singing on 22 May, near A and G. Eight singing and another 16 seen in a variety of places on 29 May. Many of these were probably late migrants delayed by the weather of the past two weeks.

Palm Warbler, one singing on 22 May near E, six seen between D, F and G on 29 May. These were probably late migrants delayed by the weather over the past couple of weeks.

Savannah Sparrow, two singing each day. Males holding territories in the low heathy vegetation along the coast from A all the way to the tip of the point.

Lincoln's Sparrow, four along track from road to A on 29 May.

Song Sparrow, three singing on 22 May and 11 on 29 May. Males holding territory in the shrubby vegetation all the way from A to the anemometer tower.

White-throated Sparrow, only two singing on 22 May, at least seven on 29 May. Males holding territory along the edges of the spruce woods.

Dark-eyed Junco, two singing at B on 22 May.

Common Grackle, eight flew over low at E on 29 May and six flew over F on 22 May.

Purple Finch, one singing near B on 22 May 2005.

American Goldfinch, about 10 seen or heard each day. Most near D and F.

Questions and answers from the Canadian Wildlife Service draft guidelines, December 2003, for spring migration:

What is the species composition of birds that migrate through the area?

The small flocks of warblers (Yellow-rumped and Palm) found on 29 May were migrating through, as were the Lincoln's Sparrows on 22 May. Certainly the Northern Gannets fishing offshore were migrating north to their nesting colonies on Bonaventure Island, Quebec and Cape St. Marys Newfoundland. The gull concentrations were likely taking advantage of the food provided by waste bait from lobster fishers rather than migrating.

Many (most) of the birds detected in May nest in the area (e.g. Great Cormorant, Black Guillemot, Herring Gull, Merlin, Black-capped Chickadee, Song Sparrow, Savannah Sparrow, American Goldfinch).

In the two days of surveys I did not detect any large concentrations of migrants. Concentrations would be weather related and I suspect that in some years there would be small concentrations of kinglets, warblers, vireos and sparrows. This is similar to virtually all locations along the coast of eastern Cape Breton Island. This location is not known for concentrations of migrants.

Are any of the migrating birds found on or off-site considered species at risk?

No species listed by COSEWIC or on the Red or Yellow lists for Nova Scotia were detected. Comments on species ranked S3 and S4 by ACCDC are included in the breeding season section.

What is the approximate number of migrants that use the area?

Very few migrants (fewer than 50 passerines) were detected during two days of surveys at a time of year when many passerines (flycatchers, warblers, vireos) would be expected to pass through.

How does this number compare to other nearby sites?

I would expect to see more migrants under similar weather conditions at locations such as Schooner Pond, about 15 km east. Similar numbers would be expected in inland locations such as Petersfield Provincial Park, Tower Road Sewage Lagoon and at other headlands such as Point Aconi. All of these locations are within 25 km.

Questions about altitude of migrants not required because of the small size of the project.

Are there significant staging areas nearby?

Yes. Lingan Bay (2.5-5km away) hosts a few hundred Canada Geese, several hundred Greater Scaup, and dozens of Ring-necked Ducks, Common Goldeneye and Red-breasted Mergansers from late March until early May. As well, a hundred or more Double-crested Cormorants and a few hundred gulls (Herring, Great Black-backed, Ring-billed, Bonaparte's) forage over Lingan Bay and roost on the exposed sand flats at low tides.

If significant numbers of birds stage in the area of the proposed wind project, what activities taking place nearby could increase potential risk of bird collision with turbines and associated structures?

There appears to be little movement of ducks and geese between Lingan Bay and the north shore of the proposed site. The waterfowl tend to exit the bay following the channel by the wharf at Lingan and then roost on the ocean beyond the Power Plant. Gulls do fly over the Power Plant and then overland to the ocean on the north shore. Double-crested Cormorants do as well, but much less frequently than gulls. There is little evidence suggesting that these species are susceptible to colliding with turbines (see Kerlinger 2005). Gulls and cormorants should be able to notice the turbines and use alternate routes. Birds have become accustomed to the two tall smoke stacks at the Nova Scotia Power Plant, between the staging areas and the open water in which gulls and cormorants forage.

The mudflats of Lingan Bay and Dominion Beach are not significant staging areas for shorebirds in the spring, but they are in the autumn migration. This is considered in the autumn migration section.

Birds of the breeding season:

Thirty-eight species of birds were recorded during the surveys on 08 and 28 June 2005. Numbers are included in the following annotated list. No species listed by COSEWIC as Endangered, Threatened or Special Concern were detected.

One species, Common Tern, is listed as Yellow in the Nova Scotia general status ranks and S3 by the ACCDC. Yellow are 'species that are not believed to be at risk of immediate extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk'. There is a small (<10 nests) colony about 2.5 to 3 km away near the parking areas in Dominion Beach Provincial Park. Adults forage offshore and it is unlikely they will fly close to the proposed wind turbines.

Great Cormorant is ranked as S4. There is a significant nesting colony along the cliffs on the south side facing Lingan Bay. About 30% of the North American population nests around Cape Breton Island (McCorquodale et al. 2004). The Lingan colony is an average sized colony and has been reasonably stable in numbers at least over the past 15 years (Bredin et al. 1997). Adults forage at sea and rarely fly over land. All cormorants seen flying over the peninsula were Double-crested Cormorants. Keeping turbines away from the cliff directly above the colony on Laffins Cove would reduce the small risk of interactions with turbines.

Merlin is ranked as between S3 and S4 as a breeding bird. They regularly breed on coastal headlands between Point Aconi and Schooner Pond. My estimate is that 6-10 pairs nest between Point Aconi and Schooner Pond (about 40 km of coast). The site between the old Lingan Colliery and the Lingan Power Plant is a typical breeding site.

Black Guillemot is ranked as S3. There are at least 50 pairs that nest along the rocky coast at Lingan. Rocky shorelines from Gabarus through to Louisbourg, Scaterie Island, Cape Perce and west to the Bird Islands all support numerous nesting pairs. The Bird Islands probably support a few hundred nesting pairs (McCorquodale et al. 2004). The recent estimates form Bird Islands (McCorquodale et al. 2004) and the numbers found here would be half the Nova Scotia population estimated by Erskine (1992). This suggests that the population is higher than previously thought, likely because the remoter rocky coastlines of Cape Breton have been relatively poorly surveyed for birds. These birds forage at sea and are never seen flying over the peninsula. Therefore risk of collision with turbines is negligible.

The other 34 species were ranked in the most common and widespread category, S5.

Annotated list of 38 species of birds recorded during breeding season surveys 08 and 28 June 2005 at Lingan, Nova Scotia. ACCDC rankings for those ranked S3 and S4 are noted. All other species are S5.

Great Cormorant, at least 50 nests (probably closer to 100 along whole cliff near E). A few flying in and out of nests. None seen flying over land. S4B.

Double-crested Cormorant, 30 to 50 on the surveys. Most flying to and from nesting cliff near E. Others roosting on headlands along the coast or flying along coast. Each morning a couple flew inland through potential wind turbine sites.

Great Blue Heron, one being chased by gulls near nesting cliff 08 June.

American Black Duck, one in ocean near C on 28 June.

Common Eider, six flying about 100 m offshore from A on 08 June.

White-winged Scoter, three flying more than 100 m offshore from C on 08 June

Merlin, one calling inland from C on 08 June. S3S4B

Herring Gull, more than 100 each day. Concentrations around nesting cliff, around lobster boats offshore and roosting on headlands. Each day 5-10 flew inland through potential wind turbine sites. Many of those roosting or following boats were young birds (1-3 years old).

Iceland Gull, one immature flying along coast between B and C on 08 June.

Great Black-backed Gull, 30-40 each day with concentrations roosting on headlands, flying over nesting cliffs and offshore following lobster boats. The vast majority were young birds (1-3 years old).

Common Tern, 2 flying along coast near C on 08 June and foraging between nesting cliff and power plant on 28 June. A few have nested along lagoon in Dominion Beach Provincial Park. S3B. Yellow.

Black Guillemot, 50-70 seen on water from C and E both days. At this time of year many would be either away foraging or at the nests, suggesting at least 75 -100 pairs nesting along this stretch of coast. They nest in crevices in jumbled rock at bases of cliffs. S3.

Belted Kingfisher, one flying over water between E and power plant.

Alder Flycatcher, 10 singing males on 08 June and five on 28 June. Nest in the scrubby alders between the coast and the spruce woods.

Bank Swallow, more than 70 flying around the upper parts of the cormorant nesting cliff on 08 June. They nest in the softer soil at the tops of such cliffs along this coast. None seen on 28 June, therefore not likely nesting there this year. It is likely they will nest nearby most years.

Blue Jay, one stop F on 08 June.

American Crow, 10-15 seen and heard both days. Each day a few (2-4) flying through potential sweep of turbine blades. Nest nearby and forage widely over the site, seen at all of the point counts over the two days. The higher numbers compared to spring counts are likely due to recently fledged young.

Common Raven, a pair seen near power plant both days and likely another pair near anemometer tower and gun emplacement 08 June.

Black-capped Chickadee, two seen between F and G on 08 June. Likely nest here.

Veery, one singing between main road and A on 08 June. The alder swale here is similar to nesting habitat in the Alder Point and Frenchvale areas of Cape Breton.

American Robin, up to four singing each morning. Several pairs nest along edge of woods.

Cedar Waxwing, one seen at F on 08 June.

European Starling, one along coast near B on 28 June and another flew low over G the same day. A few likely nest both in cavities at the power plant and in crevices along the cliffs near the power plant.

Blue-headed Vireo, two singing at B on 08 June. A couple of pairs nest near B and inland from C.

Red-eyed Vireo, three singing at A and B on 28 June. A few pairs nest in the birch near B and likely G.

Yellow Warbler, 5 to 7 heard singing or seen both days. Likely about 10 pairs nesting, especially in alders and willows.

Magnolia Warbler, four heard singing or seen both days. A few pairs nest near B and the woods between C and G and near F.

Yellow-rumped Warbler, up to 4 heard singing or seen between F and G. A couple of pairs nest here.

American Redstart, a couple of pairs in deciduous shrubs between F and G.

Northern Waterthrush, one singing between road and A on 08 June.

Common Yellowthroat, a half dozen heard singing or seen both days. Nest in alders between coast and spruce woods.

Savannah Sparrow, three singing on heath between A and C.

Song Sparrow, up to 15 heard singing or seen both days. Recorded at all points except G.

White-throated Sparrow, 10 on 08 June and six on 28 June. At least one at each point count over the two days.

Common Grackle, four flew over low near B.

Purple Finch, one singing at B on 28 June.

White-winged Crossbill, more than 65 flying low over tops of stunted Spruce near F on 08 June.

American Goldfinch, more than 12 on 08 June along the edge of the woods, only two on 28 June. Several pairs undoubtedly nest here in July.

Questions from Draft Guidelines, December 2003 on breeding birds:

What avian species breed at the site?

All of the species in the above annotated list, except Great Blue Heron, Common Eider, White-winged Scoter, Iceland Gull and Common Tern, nest either on the site or within a hundred metres. White-winged Crossbill only nest when there is a large crop of spruce cones, hence would not nest in 2005. The large number seen were migrants moving through, not nesting birds. Common Terns nest about 2.5-3 km away. Great Blue Herons nest within 10 kms.

What is the relative abundance of species breeding at the site?

The two most common species nesting on the site are Great Cormorant and Black Guillemot (more than 50 pairs each). Next, with an estimated 10-20 pairs, would be Double-crested Cormorant, Herring Gull, Song Sparrow, White-throated Sparrow, Yellow Warbler, Common Yellowthroat roughly in decreasing order of abundance. All other species would have fewer than ten pairs, most only one or two pairs, nesting on or within a hundred metres of the site.

What avian species breed in the surrounding area?

Are any of the breeding birds found on or off-site considered Species at Risk?

Piping Plover (COSEWIC Endangered) have nested along Dominion Beach. The tip of the beach is about 2 km from the closest part of the site. Efforts to stabilize the beach by embedding old Christmas trees in the sand in the late 1980s and early 1990s were reasonably successful. This reduced sand movement by waves and therefore reduced its quality for Piping Plovers. They have not nested there in the past 15 years (since the late 1980s).

Short-eared Owls (COSEWIC Special Concern) have nested on the more extensive grassy areas behind the dunes at Glace Bay, about 10km east (Erskine 1992). Occasionally Short-eared Owls are seen at Dominion, more frequently in the autumn than the breeding season (Bredin et al. 1997). The relatively small area of beach grass and the number of people who walk the beach daily, throughout the year, make this beach less suitable for these owls.

Do bird colonies occur in the area? If so how close, and what species?
There is a Great Cormorant colony with at least 50 nests, probably closer to 75 nests, on the site. Associated with this colony are about 20 nests of Double-crested Cormorant and about 20 nests of Herring Gulls. The rocky cliffs surrounding the peninsula support a loose colony of at least 50, probably closer to 100, nests of Black Guillemot.

Do raptor nests occur in the area? If so what species?
No nests were found. A Merlin was seen on half the visits and undoubtedly nests in the thicker spruce woods in the southwest or across the road near the Lingan Power Plant ash dump. The size of the site and location suggest that larger raptors such as Red-tailed hawks and Northern Goshawks would not have enough room for a territory.

Do breeding birds commute through or near the area and if so in what direction is the movement?
Most of the commuting I saw was of young gulls between Lingan Bay and the ocean on the north shore. Each of the four mornings I saw a few (10-20 birds in total) Herring Gulls, Great Black-backed Gulls, Double-crested Cormorants and American Crows (in decreasing order of abundance) fly across the peninsula at the height that turbine blades would be turning. These birds flew both from Lingan Bay towards the ocean and from the ocean to Lingan Bay.

Do any species present have aerial courtship displays?
None were detected. The two most likely species would be American Woodcock and Wilson's Snipe. It is possible that a couple of pairs of woodcock breed in the alders close to the old ventilation shaft of the Lingan Colliery. However the wooded habitat they prefer is very limited on the site. There is not sufficient wetland habitat for Wilson's Snipe to nest on the site.

What is the expected amount and type of human presence during the breeding season?
There is significant evidence of All Terrain Vehicle (ATV) use of the heathy areas along the coast from the old Lingan Colliery to the World War II gun emplacement. I expect that people occasionally (fewer than 20 per week) walk and drive ATVs along the coast. Significant disruption of breeding birds will only occur if people spend time directly over the nests on the cliffs. Based on where the ATV trails are, this does not appear to have been a problem in the past.

What habitat occurs in the surrounding area? What types of habitat will be lost or altered? How much of each habitat type will be lost or altered?
The area surrounding the site has had significant industrial use (coal mine, power plant and ash dump for power plant) in the past 50 years. Most of the area is forested with a mix of White Spruce, White Birch and Trembling Aspen. Many areas have soil poor enough that tree growth is limited and often restricted to alders.

The wind turbines and associated infrastructure (access routes) will remove some breeding habitat, primarily young forest of alder, White Birch, White Spruce and Red

Maple. A few pairs of common species such as White-throated Sparrow, Magnolia Warbler, Yellow Warbler and Alder Flycatcher will be displaced.

Recommendation: Nesting birds are concentrated along the cliffs of Laffins Cove (Figure 1). The major species, Great Cormorant, has its major North American population on Cape Breton Island. The birds nest on the cliffs and forage offshore, minimizing likelihood of colliding with wind turbines. However I still suggest keeping wind turbines away from this cliff. If turbines are kept west of the anemometer tower and in line with the Lingan Power Plant, there should be minimal impact on the nesting Great Cormorants. Putting turbines between the cormorant nests and the north shore would significantly increase the risk of collisions during extreme winds or fog.

Birds of autumn migration:

Thirty species of birds were recorded during surveys on 17 September and 25 October 2005. Estimates for each species are included in the following annotated list.

No species listed by COSEWIC as Endangered, Threatened or Special Concern were detected. No species on the Red or Yellow lists from the General Status Ranks of Wild Species in Nova Scotia were detected.

One species, Great Cormorant, ranked S4 by ACCDC, was found. This species was considered in the breeding season section.

Annotated list of 30 species of birds recorded during spring migration surveys 17 September and 25 October 2005 at Lingan, Nova Scotia. ACCDC rankings for those ranked S3 and S4 are noted. All other species are S5.

Common Loon, one offshore from A on 25 October

Northern Gannet, 8 fishing offshore from E and F on 25 October.

Great Cormorant, only 1 immature on cliffs on 17 September, 43 roosting on cliffs 25 October. ACCDC S4B.

Double-crested Cormorant, 5-10 flying along shore between A and C on both 17 September and 25 October. Two roosting on nesting cliff on 17 September and 5 there on 25 October. Both days 2 or 3 were flying across peninsula at the height of wind turbine blades.

Long-tailed Duck, 13 offshore between A and C on 25 October.

Common Eider, three offshore near C and 2 near F on 25 October.

Red-breasted Merganser, 1 offshore at F on 17 September.

Bald Eagle, 1 adult perched at shoreline near C on 25 October.

Herring Gull, a few (<15) between A and E on both 17 September and 25 October. A couple of these flew over peninsula at height of wind turbine blades. About 120 foraging in water towards power plant from F on 17 September.

Great Black-backed Gull, fewer than 20 flying along coast and offshore between A and E on 17 September and 25 October. About 39 foraging offshore from F on 17 September with other gulls.

Ring-billed Gull, 19 fishing just offshore from C and at least 30 foraging near power plant (offshore from F) on 17 September.

Bonaparte's Gull, 30 foraging near power plant (offshore from F) on 17 September and 5 offshore at A on 25 October.

Black Guillemot, surprisingly none detected on either autumn survey.

Northern Flicker, 2 near anemometer tower on 17 September.

Blue Jay, 7 near anemometer tower on 17 September and 1 near A on 25 October.

American Crow, 20 in various locations on 17 September and 5 on 25 October. A few flew over peninsula at height of wind turbine blades.

Common Raven, 1 on 17 September and 2 on 25 October all near A.

Black-capped Chickadee, 3 on 17 September and 7 on 25 October in various locations with spruce trees.

American Robin, 1 near anemometer tower on 25 October.

European Starling, 10-12 on both 17 September and 25 October including one roosting on guy wires of anemometer tower.

Yellow Warbler, 1 on 17 September near the anemometer tower.

Magnolia Warbler, 1 near G on 17 September.

Yellow-rumped Warbler, 4 on 17 September between E and G.

Common Yellowthroat, 8 on 17 September between D and G.

American Redstart, 1 near A on 17 September.

Savannah Sparrow, 4 near A on 17 September.

Song Sparrow, more than 40 on 17 September including 1 singing near A and more than 20 at E.

Lincoln's Sparrow, 2 at E on 17 September.

Swamp Sparrow, 3 near E on 17 September.

White-throated Sparrow, about 60 on 17 September including more than 35 at E and 14 in shrubbery near A.

Dark-eyed Junco, 3 on 25 October.

Questions and answers from the draft guidelines, December 2003, for autumn migration:

What is the species composition of birds that migrate through the area?

Small mixed flocks of warblers (e.g. Yellow-rumped, Magnolia, Common Yellowthroat and American Redstart) move through in September.

Larger mixed flocks of sparrows (e.g. White-throated, Swamp, Song and Lincoln's) also move through from mid-September into October.

Few migrating seabirds (e.g. Northern Gannet, Common Eider, Long-tailed Duck) were detected. By mid-November migrants returning from northern nesting grounds (e.g. Long-tailed Duck, Common Goldeneye, Iceland Gull) would be more numerous than the numbers detected on these surveys.

In the two days of surveys I did not detect any large concentrations of migrants or any raptors. Concentrations would be weather related and I suspect that in some years there would be small concentrations of kinglets, warblers, vireos and sparrows. Cold fronts stimulate passerines to leave northern areas and then southerly winds will ground the migrants. If the two coincide during a peak migration time a fallout of migrants can occur. There is little about this site to suggest it will have more frequent fallouts or more birds than any other stretch of eastern Cape Breton Island. This location is not known as a place that concentrations are frequent.

In late October of 2005 Hurricane Wilma displaced many birds from the Caribbean and the southeastern United States to coastal Cape Breton (e.g. Caspian Tern, Laughing Gull, Chimney Swift, Barn Swallow). Although I did not see any at Lingan, many coastal locations from Cape North to Ingonish to Sydney to Donkin to River Bourgeois, harboured storm blown birds. Undoubtedly some Chimney Swifts and swallows spent time foraging along the headlands and shoreline at Lingan. Foraging was undoubtedly tough for these displaced Chimney Swifts and swallows because their prime food, flying insects, are not plentiful in October or early November. That is why they live here in July and August and not usually in October and November. As well they were stressed from a day or two of unplanned flying in stormy weather before they arrived. Some survived for more than three weeks despite the harsh conditions. Displaced, stressed individuals such as these, have a higher probability of colliding with wind turbines and being killed than individuals of regular migrant species such as White-throated Sparrows and Common Yellowthroats. They take more risks when foraging because of their stressed condition. Interestingly the populations consequences would be minimal because these stressed individuals are unlikely to find their way back to the normal wintering grounds in the Caribbean or northern South America.

Are any of the migrating birds found on or off-site considered species at risk?

No species listed by COSEWIC or on the Red or Yellow lists for Nova Scotia were detected. Comments on the species ranked S4 by ACCDC, Great Cormorant, are included in the previous section.

What is the approximate number of migrants that use the area?
The survey of 17 September detected almost 100 sparrows and a dozen warblers. With appropriate weather conditions these numbers could be double for sparrows and five times higher for warblers. The number of days each autumn with appropriate weather conditions during the peak periods of migration would be 0 to 3 or 4. For most days of fall migration fewer than 25 sparrows and 10 warblers would be moving through.

How does this number compare to other nearby sites?
I would expect to see more migrants under similar weather conditions at locations such as Schooner Pond, about 15 km east. Similar numbers would be expected in inland locations such as Petersfield Provincial Park, Tower Road Sewage Lagoon and at other headlands such as Point Aconi. All of these locations are within 25 km.

Questions about altitude of migrants not required because of the small size of the wind project.

Are there significant staging areas nearby?
Yes. Lingan Bay (2.5-5km away) hosts a few hundred Canada Geese, several hundred Greater Scaup, and dozens of Ring-necked Ducks, Common Goldeneye and Red-breasted Mergansers from mid-November. As well a hundred or more Double-crested Cormorant and a few hundred gulls (Herring, Great Black-backed, Ring-billed, Iceland, Bonaparte's, Black-headed) forage over Lingan Bay and roost on the exposed sand flats at low tides through the fall.

The mudflats of Lingan Bay are an important staging area for shorebirds from mid-July through September. The most common species (up to 100 individuals a day) are Black-bellied Plover and Semipalmated Plover. Other frequently occurring species, with maximum daily counts of a few to dozens, include Greater Yellowlegs, Lesser Yellowlegs, White-rumped Sandpiper, Least Sandpiper, Sanderling, Willet, Ruddy Turnstone, Pectoral Sandpiper, Dunlin and Semipalmated Sandpiper. Rarer species such as Curlew Sandpiper and Marbled Godwit have been seen in the past ten years.

If significant numbers of birds stage in the area of the proposed wind project, what activities taking place nearby could increase potential risk of bird collision with turbines and associated structures?

There appears to be little movement of ducks and geese between Lingan Bay and the north shore of the proposed site. Waterfowl (especially Canada Goose, Greater Scaup and Red-breasted Merganser) tend to exit the bay following the channel by the wharf at Lingan and then roost on the ocean beyond the Power Plant. Gulls do fly over the Power Plant and then overland to the ocean on the north shore. Double-crested Cormorants do as well, but much less frequently than gulls. There is little evidence suggesting that these species are susceptible to colliding with turbines (see Kerlinger 2005). Gulls and cormorants should be able to notice the turbines and use alternate routes. The birds are used to the presence of two tall smoke stacks at the Nova Scotia Power Plant between the staging areas and the open water where gulls and cormorants forage.

The mudflats in Lingan Bay are significant for staging shorebirds during the autumn migration. The flight paths into and out of the area are not well understood. Shorebirds have not had a history of colliding with wind turbines. There are no obvious reasons to suggest that their flight paths would intersect with the two proposed wind turbines. As with waterfowl, they have coexisted with two tall smoke stacks at the Nova Scotia Power Plant for decades.

During both spring and fall migrations there will be a few days, because of weather conditions, when concentrations of warblers, vireos, kinglets and sparrows are on the Lingan site. The mixed woods and shrubby vegetation will shelter most of these birds. There are no obvious reasons to suggest that their flight paths would intersect with the two proposed wind turbines. As with waterfowl, they have coexisted with two tall smoke stacks at the Nova Scotia Power Plant for decades with no obvious problems.

Tower Surveys:

The guy wires of the anemometer tower (Figure 7) were walked 8 times in June and July and 6 times in September and October (Figure 2) to check for bird carcasses that were potentially killed by collision with the tower or the wires. No carcasses were found during these surveys (Table 3). Clayton D'Orsay conducted the tower surveys.

Table 3: Summary of carcasses found during ground checks for carcasses under the anemometer tower at Lingan, Cape Breton Island.

Tower check survey date	Carcasses found
08 June 2005	0
23 June 2005	0
28 June 2005	0
02 July 2005	0
08 July 2005	0
16 July 2005	0
23 July 2005	0
30 July 2005	0
17 September 2005	0
24 September 2005	0
02 October 2005	0
07 October 2005	0
14 October 2005	0
22 October 2005	0
29 October 2005	0

These surveys were initiated because towers with guy wires are known to kill birds. The rationale was that if one anemometer tower was killing birds this would indicate that wind turbines could pose a significant threat. No bird carcasses were found.

The anemometer tower had no lighting. Lights contribute to bird mortality at man-made structures. Similar ground checks were undertaken through the summer and fall of 2005 at three communications towers with lights on the coast at Port Caledonia about 6 km east of Lingan. At these towers two carcasses were found, one Leach's Storm-petrel and one Yellow-rumped Warbler. The first was undoubtedly a storm blown bird, since this species spends all their time at sea. Since only the fleshless skull was found it is likely that the mortality happened months earlier. The warbler was found in October during fall migration.

Habitats within 1 km, potential bird use and habitat loss:

Much of the area within 1 km of the Lingan site is regrowth of alder, White Birch, White Spruce and Red Maple (Figure 12). This is similar to what covers much of the proposed wind facility site as well. This area was subject to significant disturbance during the past 100 hundred years as it is between the old Phalen colliery and the Lingan Power Plant. A railway that brings coal to the power plant and the ash dump associated with the power plant contribute to the landscape. Garbage from households is omnipresent in the vegetation close to the road and adjacent to ATV tracks further from the paved road.

Birds typical of such habitat (e.g. Blue-headed Vireo, Magnolia Warbler, Yellow Warbler, White-throated Sparrow) nest in small numbers. Removal of a few hectares for a wind project will remove some nesting habitat. The species affected are all common and widespread on Cape Breton Island.

Industrial activities at Lingan provide two sites frequently used by birds. Ash dump lake (Figure 11) is a freshwater roosting site for gulls (e.g. Herring and Great Black-backed) from mid-April through December. Wind turbines could present a small risk to those individuals who fly from the coast across the peninsula to the lake. However based on observations in North America and from offshore wind farms in Europe, gulls are not very susceptible to colliding with turbines (see Kerlinger 2005). It is likely that flight paths would be modified and therefore risks minimized.

Birds concentrate at the warm water outflow from the Lingan Power Plant (Figure 9) in the winter. Through the winter 500-1000 Greater Scaup, several hundred gulls (a few 100 Herring, plus dozens of Iceland, Great Black-backed and Black-headed) and a few other ducks (Bredin et al. 1997) forage here. Wind turbines on the headlands are not likely to influence these birds other than some gulls that commute to the ocean across the peninsula. As noted above these are likely to alter their flight paths and avoid the turbines.

Potential of other species of conservation concern (within 5 km):

Two ducks listed as Special Concern by COSEWIC, Harlequin Duck and Barrow's Goldeneye (listed Red and Yellow respectively by General Status Ranks of Wild Species in Nova Scotia), do occur along the eastern coast of Cape Breton. The former occurs largely at rocky points such as Point Michaud and the latter in Sydney Harbour (off North

Sydney, Sydney River and Wentworth Park in Sydney). Three winters of bird surveys of ducks at the Lingan Power Plant did not detect these species (Bredin et al. 1997) nor am I aware of birders seeing them in the past 15 years in this location. Therefore they are not likely to be affected by this project.

Piping Plovers (COSEWIC Endangered) nested on Dominion Beach in the 1980s. A beach stabilization program likely altered the character of the beach and they have not nested since before 1990. This beach is checked annually by birders and frequently by government agencies involved in the international Piping Plover nesting survey. Even if they did still nest on this beach, 1-3 km from the proposed towers, there would be little chance of a negative impact.

A Short-eared Owl (COSEWIC Special Concern) was seen on one of more than 30 surveys at Lingan Power Plant in the mid-1990s. They do occur in extensive grassy dunes as close as Glace Bay and Port Morien, 15 and 30 km away. There was special attention to potential nesting habitat for Short-eared Owls. No suitable habitat was detected. The grassed dunes at Dominion Beach, 1-3 km distant, are unlikely to be used for nesting because of the daily traffic of a few dozen walkers, dogs and joggers.

Peregrine Falcon (COSEWIC Threatened for *anatum)* may forage in the area. They are most frequently seen during fall migration in eastern Cape Breton. The concentrations of shorebirds and ducks appear to provide suitable prey. However, there are more sightings (still not annually) at Schooner Pond, 20 km to the east, and Point Michaud 80 km to the southwest.

The wind blown spruce-fir habitat favoured by Bicknell's Thrush (COSEWIC Special Concern) is not found in this section of Cape Breton. Ipswich Sparrow (*princeps* subspecies of Savannah Sparrow) (COSEWIC Special Concern) occurs in very small numbers in both spring and fall in eastern Cape Breton. They frequent sandy beaches and accompanying dunes on their way to and from nesting grounds on Sable Island. Wind turbines in unsuitable habitat are unlikely to have any influence on the stray individuals that may end up a km or two away along Dominion Beach.

Consultation with Canadian Wildlife Service:
Advice on the protocol I was using for pre-construction monitoring was sought from Dan Busby, Senior Wildlife Biologist, Canadian Wildlife Service, Sackville, NB.

He made three important points
i) point counts are not sufficient on their own
ii) attention must be paid to species that fly through turbine height air space and
iii) turbine lighting is critical for nocturnal migrants.

During my surveys I emphasized five minute point counts for spring migration, breeding season and autumn migration surveys. However they were not the only source of bird data during the surveys. Searching particular habitats is essential to find species with particular habitat requirements. I walked the entire site in mid-May to select locations for

point counts that I felt were representative of all terrestrial habitats (Figures 3-10). In addition, the seven were situated so that I walked within 200 m of more than 90% of the site during each survey. I kept track of all birds heard or seen while walking between the point counts. Therefore I feel this approach had a very good chance of detecting most species that nested on the site.

I counted all birds seen or heard at the point counts, therefore these are considered unlimited distance point counts. The limitation is that these data cannot be used to estimate density. The advantage is more birds are recorded.

A suggestion was made to do longer point counts, e.g. 30 minutes, of birds that traveled through the airspace of the proposed turbines. This was not done, but special attention while walking between points and while at point counts was paid to birds flying at these heights. Five species were seen flying at these heights. In order of abundance (most to least) the species were Herring Gull, Double-crested Cormorant, American Crow, Great Black-backed Gull and Blue Jay. Most were Herring Gulls in May and early June when lobster fishers provided food on the ocean and the gulls traveled to either the ash dump lake or Lingan Bay to roost.

I did not detect concentrations of migrants at the site, during either spring and fall migration. Undoubtedly there are larger numbers of migrants for a few days in both spring and fall. Nocturnal migrants do collide with turbines (see compilation by Kerlinger 2005). Lighting on towers can attract nocturnal migrants and increase the risk of collision. No carcasses were found under the unlit anemometer tower. Using minimal lighting, maximizing OFF time and using white strobes will all assist in keeping mortality of nocturnal migrants to a minimum.

Winter:
In winter Greater Scaup, American Black Ducks and gulls concentrate at the warm water outflow from the Lingan Power Plant. A few Black-capped Chickadees, Red-breasted Nuthatches and Downy Woodpeckers will use the birch-spruce woods. Long-tailed Ducks, Common Eider, Red-breasted Merganser and Common Goldeneye will forage offshore when ice conditions permit. Little interaction between these woodland and sea birds and the turbines is expected.

Final comment:
Bird mortality can be minimized by careful site selection and minimizing lighting on wind turbines. Recent peer reviewed publications (e.g. Osburn et al. 2000; Johnson et al. 2002; Barrios and Rodriguez 2004), reviews for government agencies (e.g. Kingsley and Whittam 2003), environmental consulting firms (e.g. Kerlinger 2005) and environmental assessments (e.g. Kerlinger 2003; Anemos Energy Corporation 2004) support this view. Minimal lighting on the towers and avoidance of the Great Cormorant colony are two sensible approaches to minimize bird mortality at this location.

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Figure 3: Looking southeast from A towards Lingan Power Plant. Notice shrubby alders with interspersed White Spruce.

Figure 4: Looking southwest from B into the denser woodland of White Birch, White Spruce and Red Maple.

Figure 5: Open heathy vegetation along coast near C. Notice extensive rutting from All Terrain Vehicles.

Figure 6: Looking from D towards the anemometer tower, E and the end of the peninsula. Notice the shrubby White Spruce and alders.

Figure 7: The base of the anemometer tower showing guy wires and looking towards E and the end of the peninsula.

Figure 8: Looking from F to nesting cliffs along the shores of Laffins Cove.

Figure 9: Looking from top of nesting cliff towards Lingan Power Plant. A low ceiling results in the tops of the stacks being shrouded in fog.

Figure 10: Looking toward G along the path from D showing White Spruce, Red Maple and White Birch woods.

Figure 11: A view form the lake at the ash dump back towards the Lingan Power Plant. Gulls roost on this freshwater lake.

Figure 12: A view from road toward lake at the ash dump, alders and lots of garbage.