Adelaide Wind Power Project, Raptor Monitoring 2019

FINAL REPORT

February 24, 2020
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Prepared for:

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1.0 INTRODUCTION

1.1 BACKGROUND

Suncor Adelaide Wind Limited Partnership (Suncor) is operating the 18 turbine Adelaide Wind Power Project (the "Project") north of Strathroy, Ontario, in Middlesex County, Municipality of Adelaide Metcalfe (Figure 1**,** Appendix A). Post-construction mortality monitoring, in accordance with the project's Environmental Effects Monitoring Plan (EEMP), took place from 2015 through 2017.

Results of the annual monitoring programs exceeded provincial raptor thresholds set out in Condition I5 (3) of the Renewable Energy Approve (REA) in 2015-2017. This exceedance triggered Condition I8 in 2015 and I10 in 2016, which included:

- Two years of subsequent scoped mortality and cause and effect monitoring for raptors (undertaken in 2016 and 2017).
- Following the scoped monitoring, implementation of mitigation for the life of the facility (2018).
- Effectiveness monitoring at individual turbines for three years, following implementation of mitigation (2018).
- Increased reporting frequency to identify potential threshold exceedance (implemented in 2017).
- Additional behavioural studies (implemented in 2017).

A mitigation plan was created in 2016 and updated in 2018 (Stantec 2018) to detail mitigation measures and guide the additional monitoring programs.

Through consultation with the Ministry of Environment, Conservation and Parks (MECP) in 2019, an Enhanced Raptor Monitoring Plan (Appendix C) was developed and agreed upon. The intent of this Enhanced Raptor Monitoring Plan was to build upon the conclusions of the 2016 through 2018 monitoring, with the goal of providing insight into where and when operation mitigation would be effective for raptors.

The Enhance Raptor Monitoring Plan is to be implemented for a maximum of two years (2019 and 2020), the results of which will inform an Operational Mitigation Strategy for the Project.

1.2 PURPOSE

The purpose of this report is to provide details on the results of the first year of monitoring under the Enhanced Raptor Monitoring Plan with analysis of risk to raptors under various conditions.

2.0 EXISTING OPERATIONAL MITIGATION

2.1 OPERATIONAL MITIGATION

Currently, in Ontario, there is no guidance or established protocols on implementation of operational mitigation for raptors. This is likely due, in part, to a lack of empirical evidence that risk of raptor mortality is elevated during specific conditions (e.g. weather or seasonal; Allison et al. 2017). For this reason and as discussed with the Ministry of Natural Resources, operational mitigation was not undertaken at the Adelaide facility in 2019 but instead efforts were directed to collision risk abatement and enhanced monitoring, discussed below.

2.2 COLLISION RISK ABATEMENT

As both Turkey Vultures (Kirk and Mossman 1998), and to a lesser extent Red-tailed Hawks (Preston and Beane 2009), forage on carrion, an increase in carrion in the environment may lead to an increased risk of turbine collision. To address this risk, Suncor contacted a subset of Project landowners to discuss management of their deadstock to reduce attraction of vultures and raptors. In addition to landowner discussions, Suncor staff routinely observe local deadstock bins to assess vulture and raptor activity. No vultures or raptors were observed at a deadstock bin location in 2019.

3.0 METHODS

The Enhanced Raptor Monitoring Plan (Appendix C) was intended to build upon the analysis and conclusions of mortality and behavioral trends from previous years, with the goal of providing insight into where, when and how operation mitigation would be effective for raptors. The 2019 monitoring program included:

- Mortality monitoring at all turbines, once weekly from May through November
- Breeding territorial monitoring
- Fall migration monitoring
- Annual reporting to the Ministry of Natural Resources and Forestry

Approval of the Enhanced Raptor Monitoring Plan from MECP and the Ministry of Natural Resources and Forestry (MNRF) was received on September 10, 2019, with the enhanced monitoring commencing at the beginning of September. Prior to that date, the previously approved Raptor Monitoring Plan was ongoing in 2019.

3.1 MORTALITY MONITORING

Raptor mortality monitoring was conducted at all 18 turbines, comprised of approximately 10-minute surveys, targeted to be focused on large-bodied birds (i.e. raptors), which is consistent with the non-subset searches conducted 2015-2017. Searches were conducted within 50 m of turbines and involved walking in concentric circles. All vegetation classes within the 50 m radius were searched. Each turbine was searched once a month in May through August (as per the Raptor Monitoring Plan), and once a week in September through November (as per the Enhanced Raptor Monitoring Plan).

Weather parameters (temperature, wind speed and precipitation) were recorded on each day surveys were conducted. If a carcass was discovered, the following information was recorded:

- Searcher identification
- Species
- Turbine number
- Date and time it was found
- Sex (if possible to determine)
- Universal Transverse Mercator (UTM) coordinates
- State of decomposition
- Estimated days since death

- Injury sustained (if applicable)
- Distance and direction from the nearest turbine
- Substrate upon which the carcass was found
- Visibility class

Carcasses found in the field were photographed and collected for confirmation of species, if necessary.

Survey dates, times and weather conditions are provided below in Table B1, Appendix B.

3.2 BREEDING TERRITORIAL MONITORING

To determine potentially nesting raptor locations, a search within 1 km of each turbine located within the facility (i.e., Raptor Study Area, Figure 1**,** Appendix A) was conducted. Surveys took place in May 2019 and included driving all municipal and access roads in the Study Area looking for bulky stick nests for Red-tailed Hawks and evidence of Turkey Vulture use of barns and abandoned buildings.

The Enhanced Raptor Monitoring Plan calls for five additional surveys of identified nests, to assess territory size, observed interactions between raptors and to monitor if the nest remains active through the breeding season. Given the Enhanced Raptor Monitoring Plan was approved and commenced in September, the territorial monitoring observations were made as part of the fall migration monitoring (discussed below).

For each Red-tailed Hawk observation in proximity (i.e. within 1km) of potential nesting locations, an assessment was made as to whether the individual was a resident or a migrant moving through the area. Behaviors likely to be associated with residents included perching in proximity to the nest location, spending considerable time in the area, hunting behavior, or hawk observed in pairs (without agnostic behavior). Behaviors likely to be associated with migrant include flying at height or agnostic interactions with other raptors. For individuals where specific resident or migrant behaviors were not observed, a determination of resident vs migration was not made.

3.3 FALL MIGRATION MONITORING

The focus of the fall migration monitoring was on the active territories, mapping how migrant individuals move through or around active territories and examining interactions between resident and migration, with specific emphasis on recording high-risk behavior. Ten surveys were conducted from early September through early November, consisting of driving surveys across the wind farm and nest monitoring to map migration flight paths and record interactions between territorial and migrant raptors. Nest monitoring was conducted at probable nesting territory locations near turbines 12, 17 and 27 (Figure 2**,** Appendix A).

Details recorded during each survey included:

- Survey date and time
- Weather conditions
- Field personnel
- Species and age (if determined)
- Flight paths (including height)
- Raptor behaviour (soaring, flapping, gliding, hovering, or perched, including duration) and associated habitat

Incidental observations of all raptor species were also recorded, including details on location, species, number of individuals, behaviour and flight height.

Survey dates, times and weather conditions are provided below in Table B2**,** Appendix B.

4.0 RESULTS

4.1 MORTALITY MONITORING

A single raptor mortality was recovered during the 2019 mortality monitoring surveys conducted by Stantec in 2019. The raptor mortality was a Red-tailed Hawk, recovered on June 25, 2019 at turbine 9. The condition of the carcass suggested the mortality event had occurred earlier in the month.

4.2 BREEDING TERRITORIAL MONITORING

During the initial April survey to identify and map location of probable Red-tailed Hawk nests within 1km of turbines, three nests were identified. Nests were located near turbine 12, 17 and 27 (Figure 1, Appendix A). Observed behaviors of Red-tailed Hawks within 1 kilometer of probable nests is summarized in Table B3, Appendix B. Flight paths of each raptor are shown in Figure 2, Appendix A. Most individuals observed exhibited behavior characteristic of residents. Only two of the Red-tailed Hawk observations (October 22 and November 13) were assessed as being likely migrants. Interactions between resident and migrant Red-tailed Hawks were not observed in 2019. Likewise, interactions between resident Red-tailed Hawks and migrants of other raptor species were not observed.

4.3 FALL MIGRATION MONITORING

Flight patterns and behavioral observations of Red-tailed Hawks and Turkey Vultures are detailed below.

4.3.1 Red-tailed Hawks

Details of Red-tailed Hawk observations are provided in Table B4, Appendix B. The flight paths of each individual are shown in Figure 2, Appendix A.

Red-tailed Hawk observations were highest in late October – early November when temperatures were cool – cold. Wind speed did not seem to influence number of observations. October 22, 2019 and November 12, 2019 had the highest number of Red-tailed Hawk observations at seven each day. Red-tailed Hawks used flight paths that avoided turbines. Observations were evenly distributed across the windfarm. Flight path RT3 experienced the most activity with three usages by Red-tailed Hawks, followed by RT11, RT12 and RT18 with two usages each, as shown on Figure 3, Appendix A. Considering time of day, most Red-tailed Hawk observations were made mid-day (Figure 4, Appendix A).

4.3.2 Turkey Vultures

Details of Turkey Vulture observations are provided in Table B5, Appendix B.

Turkey Vulture observations were highest through September – early October when temperatures were warm – cool. Wind speed did not seem to influence number of observations. September 10, 2019 and October 8, 2019 had the highest number of Turkey Vulture observations at 109 and 126, respectively. Turkey Vultures tended to use flight paths that avoided turbines. Observations were evenly distributed across the windfarm. Flight path number TV7 experienced the most activity with 88 usages by Turkey Vultures, followed by TV44 and TV45 with 41 and 49 usages, respectively (Figure 5**,** Appendix A). Considering time of day, most Turkey Vulture observations were made mid-day (Figure 6**,** Appendix A).

4.3.3 Other Raptors

The Enhanced Raptor Monitoring Plan focused on Red-tailed Hawk and Turkey Vulture, as they were the predominant species observed during the mortality monitoring. However, observations of other species of raptors within the Project Boundary were recorded. Species include American Kestrel, Bald Eagle, Northern Harrier and one unknown raptor species. A summary of these incidental observations is provided in Table B6**,** Appendix B.

A total of 6 American Kestrel observations, 3 Bald Eagle observations and 13 Northern Harrier observations were made across the wind farm.

4.4 HAWK WATCH DATA

As per the Enhanced Raptor Monitoring Plan, data from the Hawk Migration Association of North America's Raptor Migration Database (Hawk Count 2019) was obtained to compare to observations within the Project. The Holiday Beach Hawk Watch station was selected for comparison, as it is the closest Ontario station that would be "downstream" (i.e. to the south) of the Adelaide Wind Power Project during fall migration. The Holiday Beach Hawk Watch station is approximate 150km to the southwest of the Project. It is expected that raptors passing through the Project during fall migration would subsequently pass through Holiday Beach a day or two later.

Daily numbers of Red-tailed Hawk and Turkey Vultures at Holiday Beach in 2019 are provided in Table B7 and Table B8, Appendix B, respectively. Red highlighting (add by Stantec) indicated the timing of peak migration of each species. As timing of migration can be dependent on weather conditions and variable from year to year, the long-term migration data was also obtained for Holiday Beach, which is show in Figure 7 and Figure 8**,** Appendix A.

5.0 DISCUSSION

5.1 BREEDING TERRITORIAL MONITORING

5.1.1 Evidence of Active Territories

Three potential Red-tailed Hawk nest locations were identified within the Study Area. The Red-tailed Hawk territory in proximity to turbine 12 has been active for several years. Although the location of the nest has moved, evidence of an active Red-tailed Hawk territory has been observed since 2016. During the current year (2019) one to two Red-tailed Hawk were regularly seen patrolling and hunting in the area, suggesting the territory likely remained active.

The stick nest and potential Red-tail Hawk territory near turbine 17 had not been identified in previous years. It is likely 2019 is the first year it was active. A Red-tailed Hawk was regularly observed in this location and on one occasion, a pair of Red-tailed Hawks, suggesting this territory was likely active in 2019.

A stick nest had previously been identified in proximity to turbine 27, but it was found to be inactive in previous years. During the current year, only one of the six Red-tailed Hawk observations, in proximity to turbine 27, showed behavior typical of a territorial bird. The results did not provide strong evidence this nest was active in 2019.

5.1.2 Wind Turbine Collision Risk

The risk of turbine collision may be affected by many factors, including behaviour, flight path, abundance, landscape, morphology, weather, vision, and whether the individual is a resident or breeding bird (Marques et al. 2014). Raptors, in particular Red-tailed Hawks, may be more susceptible to collisions when compared with other birds, potentially attributable to their foraging and flight behaviour (Hoover and Morrison 2005). However, Garvin et al. (2010) found some signs of turbine avoidance, where resident Red-tailed Hawks and Turkey Vultures changed flight height or direction within 100 m of a turbine. This suggests that resident birds may experience a lower risk of wind turbine collision, as they are familiar with the landscape and avoid the turbines (Drewitt and Landston 2008). The results of the 2019 breeding territorial monitoring support this conclusion, as flight paths (Figure 2**,** Appendix A) avoided turbines, in some cases showing a change in direction as raptors approach turbines.

During previous years of cause and effect monitoring at the Adelaide Wind Power Project it has been observed that raptor mortality was higher in proximity to an active Red-tailed Hawk nest. It was hypothesized this may have been attributed to interactions between resident Red-tailed Hawks and migrating raptors passing through their territory. Such interactions may result in distracted flight and increase risk of collision. During such interaction, the migratory birds, unfamiliar with the territory, may be at higher risk of turbine collision. Throughout the 2019 behavior surveys, interactions between resident Red-tailed Hawks and other raptors was not observed, although such behavior had been recorded during previous cause and effect monitoring at the Project.

The single mortality in 2019 occurred in June during the breeding season. The mortality occurred at turbine 9, which is a little more than a kilometer from the probable nest site near turbine 12. Observation of a pair of Red-tailed Hawks near turbine 12 later in the season suggest both members of the breeding pair were still present and as such, the mortality was likely of a Red-tailed Hawk passing through the territory. This observation supports the conclusion of previous years of monitoring, that non-resident raptors may be a higher risk of turbine collision.

5.2 FALL MIGRATION MONITORING

5.2.1 Fall Migration Patterns

Raptor observations during the 2019 fall migration monitoring were generally distributed across the Study Area. No areas of particular concentration were observed (Figure 2**,** Appendix A). Red-tailed Hawk flight path activity was relatively consistent across the Study Area (Figure 3**,** Appendix A). Although there was a slight concentration in Turkey Vulture activity at flight paths TV1 though TV11 (Figure 5**,** Appendix A), at the western end of the Study Area. Another year of fall migration monitoring is recommended to assess if Turkey Vulture activity at the west end of the Study Area is an evident trend.

The lack of evident concentration areas or spatial patterns of raptor activity across the Study Area could be expected, as there are no landscape features (e.g. lakeshores or ridges) within the Study Area that are likely to funnel or concentrate raptor migration activity (Newton 2007).

Increased numbers of Red-tailed Hawk observations during the fall migration monitoring were made in mid-October into mid-November. This generally aligns with the Hawk Watch data from Holiday Beach. The 2019 Hawk Watch data shows a concentration in Red-tailed Hawk migration in mid-November. The long-term trend at Holiday Beach (Figure 7**,** Appendix A), shows peak Red-tailed Hawk migration in mid-October through mid-November.

The fall migration monitoring observed daily counts of Turkey Vultures that were somewhat variable through September and October, with an evident drop in activity in November. This trend generally aligns with the Holiday Beach Hawk Watch data, which show peak migration of Turkey Vultures in October, dropping off in November (Figure 8**,** Appendix A).

Both Red-tailed Hawk (Figure 4**,** Appendix A) and Turkey Vultures (Figure 6**,** Appendix A) had an observed trend of higher flight activity during mid-day. This result agrees with the literature which finds raptor flight activity, in particular migratory flights, to be concentrated mid-day when temperatures are higher and thermals, which support raptors flight, are well developed (Newton 2007).

It is known that weather can affect raptor migration activity. In particular, wind direction can affect raptor migration. At hawk watch stations in southern Ontario, increased fall migration activity typically occurs during prevailing winds from the north or northwest (Hawk Count 2019). Winds blowing in the same direction of the raptor's migration decreases flight effort. As discussed above, temperature can also affect raptor migration, with warmer days providing strong thermals to help lift the raptors.

Considering the 2019 fall migration monitoring, there were two days with prevailing winds from the north, September 17 and November 12. Red-tailed Hawk activity was low on September 17 (although before the period of peak migration) and elevated on November 12, which may have been contributed to wind direction. Turkey Vulture activity was moderate and September 17 and low on November 12 (although November was after peak migration activity for this species). There was no evident trend in raptor activity with other weather conditions (wind speed and temperature). Overall, strong correlations between weather conditions and raptor activity was not observed, although another year of monitoring may provide additional trend analysis.

5.2.2 Wind Turbine Collision Risk

No raptor mortalities were observed during the fall migration period in 2019. As such, a comparison between mortality and migration behavior monitoring is not possible. However, an analysis of the behavior monitoring results are provided below, with comparison to previous years' mortality results, where possible.

The results of the fall migration monitoring did not identify any portions of the Study Area where raptor mortality would be expected to be higher. Numbers of Turkey Vulture observations were slightly elevated at the western end of the Study Area, in proximity to turbines 26 and 27. Additional monitoring in 2020 should help assess if this trend continues. However, Turkey Vulture mortality has not been observed at turbines 26 or 27 in the previous years of monitoring, suggesting there is no evidence of increased mortality risk in this area.

Observation from the 2019 fall migration monitoring and from the Holiday Beach Hawk Watch station show peak Turkey Vulture migration in October and peak Red-tailed Hawk migration from mid-October through mid-November. This October to mid-November timing window would be the expected period of increased Turkey Vulture and Red-tailed Hawk migration through the Study Area. However, this period does not align with observed raptor mortality at the Project. Considering the mortality monitoring results from 2015 through 2019, fall mortality has been observed earlier in the migration, with most in late August through September. This suggests that volume of migrating raptors alone is not an indicator of mortality risk.

Results of the 2019 fall migration monitoring show limited evidence of correlation between weather conditions and raptor activity. However, it is known from the literature that raptor migration is highest during prevailing winds from the north or northwest and at mid-day. The low raptor mortality in 2019 did not allow for an analysis of increased collision risk during these different weather conditions.

6.0 SUMMARY AND RECOMMENDATIONS

The goal of the Enhanced Raptor Monitoring Plan was to provide insight into where, when and how operation mitigation could be effective for raptors. Based on the results of the first year of enhanced monitoring under the Plan, mortality risk appears to be higher within active Red-tailed Hawk territories. The single observed raptor mortality in the 2019 program (a Red-tailed Hawk in June) was observed in proximity to one of the potential breeding territories. Monitoring results suggest it was of an individual passing through the territory. These results are consistent with previous years' results, which suggest potential risk of collision may be elevated within active Red-tailed Hawk territories.

The first year of Enhanced Raptor Mortality monitoring did not identify any areas of increased mortality risk during the fall migration period.

With regard to time of year, results from the 2019 monitoring and data from the Holiday Beach Hawk Watch station, provide insight into when raptor activity is expected to be elevated in the Study Area; specifically in October to mid-November and during conditions with prevailing winds from the north or northwest. However, results of the Project's post-construction monitoring program completed to-date (2015 to 2019) do not suggest raptors are at elevated risk of collision during this period. Correlations between other weather parameters and raptor activity were not evident.

Based on limited conclusions drawn from the first year of monitoring under the Enhanced Raptor Mortality Plan, a second year of monitoring is proposed, to provide a greater data set for trend analysis. In particular, as the second year will provide a full year of enhanced monitoring (May through November), with additional monitoring during the breeding season.

The ongoing Enhanced Raptor Mortality Plan monitoring is intended to meet the requirements of the REA triggered by the exceedance of the raptor mortality provincial threshold at the Adelaide facility recorded in 2015 through 2017 as well as inform adaptive mitigation measures, as required.

7.0 REFERENCES

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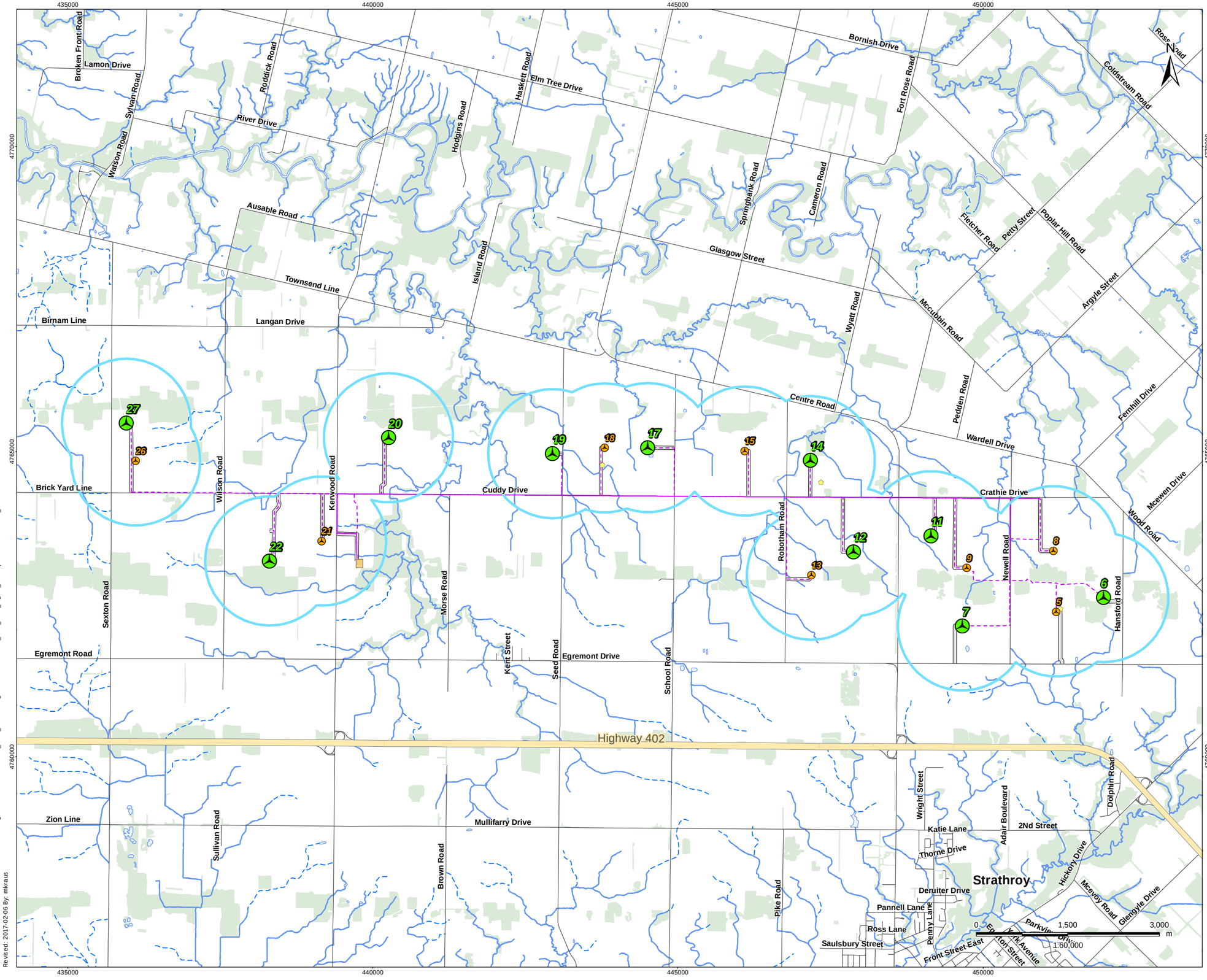
APPENDIX A
FIGURES



Legend

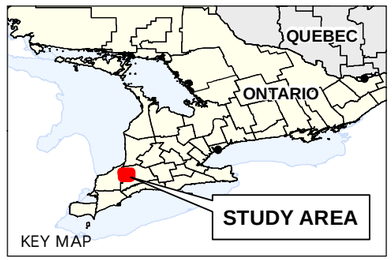
- Raptor Study Area

Project Components

- MET Tower
- Turbine Location
- Turbine Subset
- Access Road
- Collector Line
- Substation Constructible Area

Existing Features

- Expressway / Highway
- Road
- Watercourse
- Constructed Drain
- Waterbody



Notes

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Adelaide Wind Project

Figure No.

1

Title

Raptor Study Area

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435000

440000

4765000

TV1 TV2 TV3 TV4 TV5 TV6 TV7 TV8 TV9 TV10 TV11 TV12 TV13 TV14 TV15 TV16 TV17 TV19

RT1 RT2 RT3 RT4 RT6 RT7

27 26 21 22

Brick Yard Line

Cuddy Drive

Sexton Road

Wilson Road

Kenwood Road

N

0 425 850 m

1:17,000

Legend

- Project Boundary
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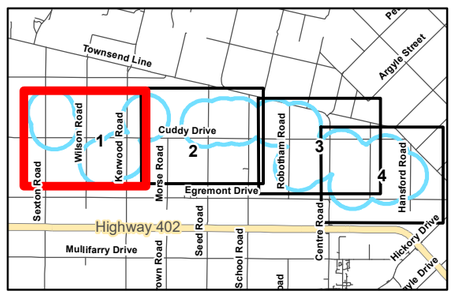
- Perch Location (RTHA)

Flight Paths (2019)

- Red Tailed Hawk (RTHA)
- Turkey Vulture (TUVU)



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Client/Project

Suncor Energy
Adelaide Wind Project

Figure No.

Tile 1

Title

Raptor Monitoring Flight Paths 2019

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445000

4765000

Centre Road

School Road

Seed Road

Cuddy Drive

Morse Road

TV16

TV18

TV19

TV20

TV21

TV22

TV23

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TV25

TV26

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RT11

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Revised: 2020-02-13 By: dharvey

Stantec

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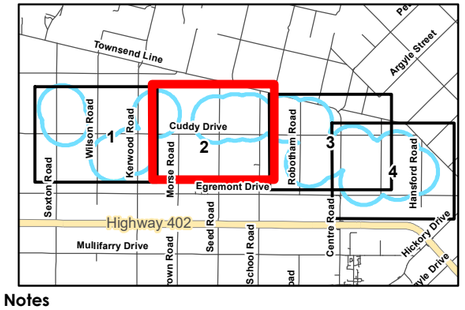

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Figure No.

Tile 2

Title

Raptor Monitoring Flight Paths 2019

450000

4765000

Wyatt Road
Petty Street
Petrolia Road
Argyle Street
Wardell Drive
Cuddy Drive
Crathie Drive
Robotham Road
Centre Road
Newell Road

TV28 TV29 RT11 TV30 TV33 RT12 TV32 TV31 TV34 RT14 TV42 TV35 TV36 RT18 TV37 RT16 TV38 RT17 TV40 TV39 RT15 TV41 RT19 TV43 RT20 TV44 RT21 RT22 TV46 TV45 RT23

15 14 13 12 11 9 7

R13

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Stantec

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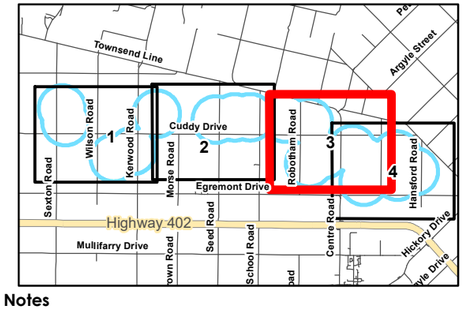

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Suncor Energy
Adelaide Wind Project

Figure No.

Tile 3

Title

Raptor Monitoring Flight Paths 2019

450000

Cuddy Drive
Crathie Drive
Centre Road
Newell Road
Hansford Road
Meewen Drive
Wood Road
Greystead Drive
Egremont Drive
Hickory Drive

TV35
TV42
TV46
RT25
RT22
TV47
RT18
TV40
TV39
RT19
RT24
RT23
TV43
TV45
RT20
TV44
TV49
RT21
TV48
R26

11
9
8
6
5
7

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1:17,000

N

450000

V:\01609\active\60960710\drawing\MXD\Terrestrial\Post_Con_Monitoring\2019\160961067_Fig01_Raptor_Mapbook_20200210.mxd
Revised: 2020-02-13 By: dharvey

Stantec

Legend

- Project Boundary
- Raptor Study Area

Project Components

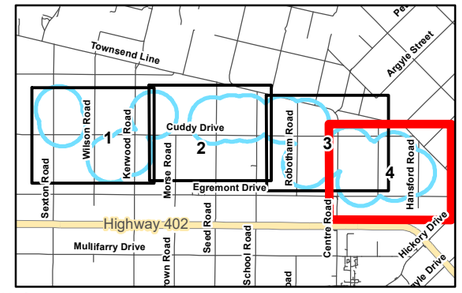
- MET Tower
- Turbine Location
- Proposed Turbine Location
- Access Road
- Collector Line
- Substation Constructible Area

Existing Features

- Expressway / Highway
- Road
- Watercourse
- Constructed Drain
- Waterbody
- Red Tailed Hawk Probable Nesting Territory (2019)
- Perch Location (RTHA)

Flight Paths (2019)

- Red Tailed Hawk (RTHA)
- Turkey Vulture (TUVU)



Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Orthographic Imagery provided by Suncore, 2011. Imagery taken in Spring 2010.

February 2020
160961067

Client/Project

Suncor Energy
Adelaide Wind Project

Figure No.

Tile 4

Title

Raptor Monitoring Flight Paths 2019

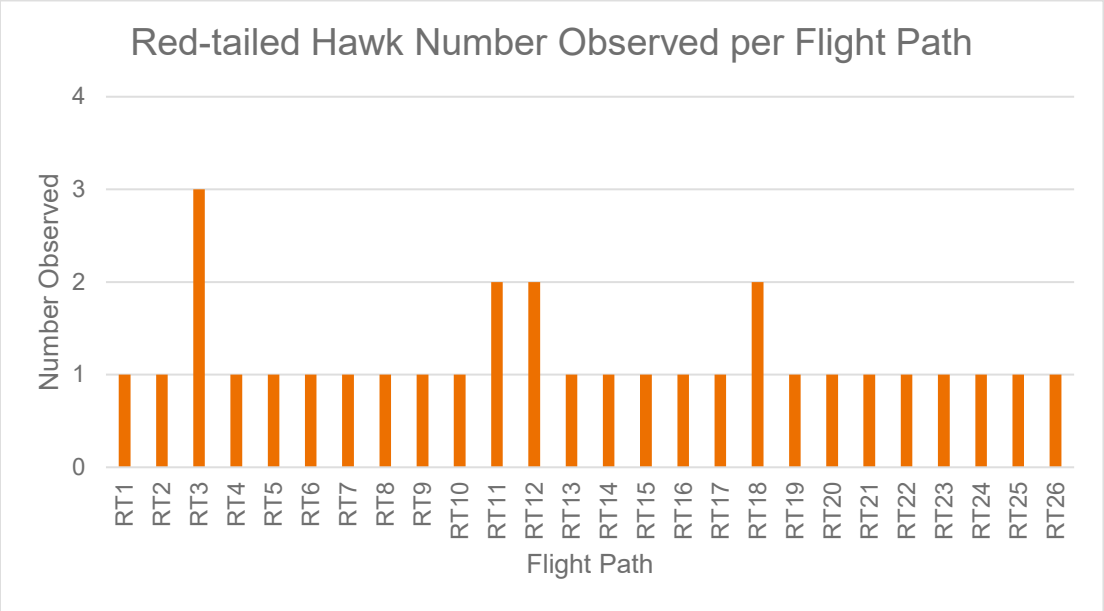


Figure 3: Total Red-tailed Hawk observations by Flight Path during fall migration 2019.

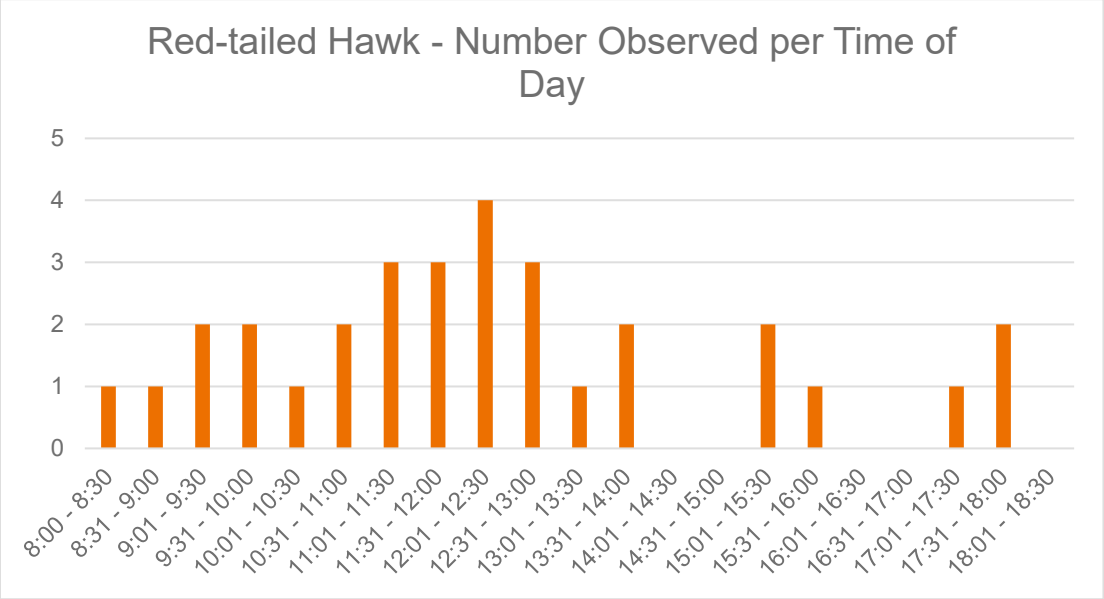


Figure 4: Summary of Red-tailed Hawk observation time of day during fall migration 2019.

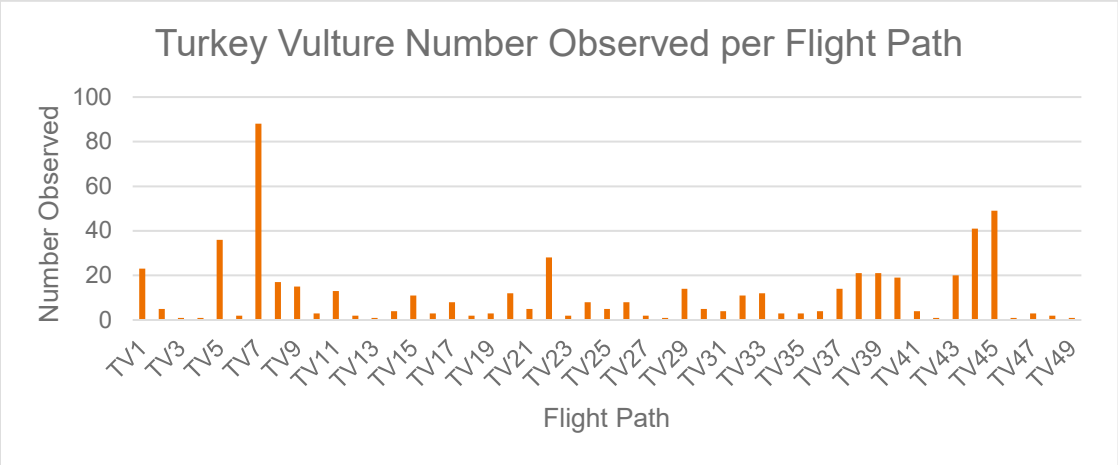


Figure 5: Total Turkey Vulture observations by Flight Path during fall migration 2019.

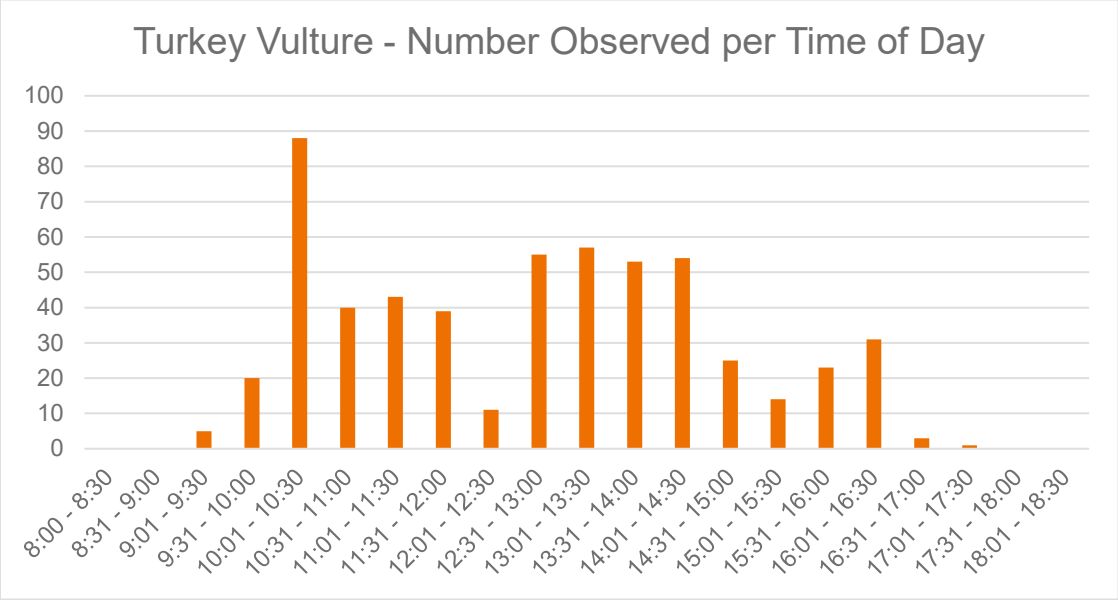


Figure 6: Summary of Turkey Vulture observation time of day during fall migration 2019.

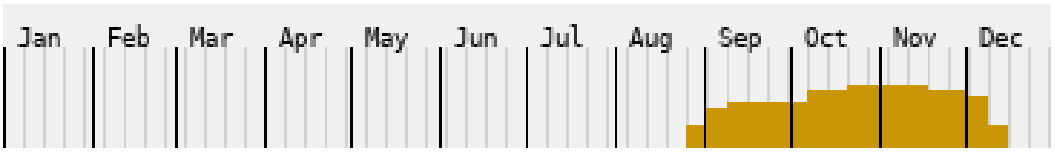


Figure 7: Summary of Red-tailed Hawk migration timing using long-term data from the Holiday Beach Hawk Watch station (1974-2019). Source: Hawk Count 2019.

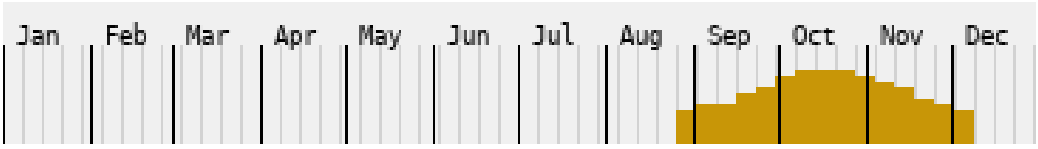


Figure 8: Summary of Turkey Vulture migration timing using long-term data from the Holiday Beach Hawk Watch station (1974-2019). Source: Hawk Count 2019.

APPENDIX B
TABLES

Table B1: Mortality Monitoring Dates, Times and Weather Conditions

Month	DATE/TIME	WEATHER					SURVEYORS
		Temp. (°C)	Wind (Beaufort Scale)	Wind Direction	Cloud (%)	PPT / PPT last 24 hours	
May	May 29, 2019 11:30 – 17:05	13	2	SW	100	None / rain	M. Straus
June	June 25, 2019 9:50 – 14:36	22	3	W	70	None / rain	K. Zupfer
July	July 24, 2019 11:00 – 17:30	21	2	NW	10	None / none	M. Straus
August	August 28, 2019 8:00 – 13:50	16	2	W	10	None / rain	K. Zupfer
September	September 6, 2019 8:21 – 13:50	13	1	SE	60	None / none	K. Zupfer
September	September 11, 2019 8:02 – 13:00	31	1	N	50	None / rain	K. Zupfer
September	September 20, 2019 9:45 – 14:00	21	2	SE	10	None / none	J. Brooks
September	September 25, 2019 10:15 – 14:10	22	3	SW	40	None / none	J. Brooks
October	October 3, 2019 9:40 – 14:00	10	3	E	100	Rain / rain	J. Brooks
October	October 8, 2019 10:00 – 17:00	11	2	E	0	None / none	K. Zupfer
October	October 15, 2019 10:00 – 16:30	7	2	SE	20	None / none	K. Zupfer
October	October 22, 2019 10:30 – 16:00	12	3	SW	75	None / rain	K. Zupfer
October	October 29, 2019 9:45 – 14:40	9	2	S	100	None / none	J. Brooks
November	November 6, 2019 7:4 – 14:00	-4	2	SW	50	None / rain	K. Zupfer
November	November 12, 2019 10:20 – 14:00	-7	3	N	100	Snow / snow	K. Zupfer
November	November 19, 2019 8:00 – 15:00	-2	1	NE	100	None / none	K. Zupfer
November	November 26, 2019 7:40 – 13:00	3	2	SW	15	None / none	K. Zupfer

Table B2: Fall Migration Monitoring Dates, Times and Weather Conditions

Survey #	Location of Survey	Date	Weather					Surveyor
			Temp. (°C)	Wind (Beaufort Scale)	Wind Direction	Cloud (%)	PPT / PPT last 24 hours	
1	Turbines: 12, 17, 27 and Driving Survey	September 10, 2019	23	3	SE	60	None / none	K. Zupfer
2	Turbines: 12, 17, 27 and Driving Survey	September 17, 2019	23	2	NE	5	None/ none	K. Zupfer
3	Turbine: 12 and Driving Survey	September 25, 2019	22	4	SW	40	None / none	J. Brooks
3	Turbines: 17, 27	September 26, 2019	19	3	W	5	None / rain	J. Brooks
4	Turbines: 17, 12, 27	October 1, 2019	28	3	SW	15	None / none	J. Brooks
4	Driving survey	October 3, 2019	10	3	E	100	Rain / rain	J. Brooks
5	Turbines: 17, 27 and Driving Survey	October 8, 2019	11	2	E	0	None / none	K. Zupfer
5	Turbine: 12	October 9, 2019	11	2	E	0	None / none	K. Zupfer
6	Turbines: 12, 27 and Driving Survey	October 15, 2019	7	2	SE	20	None / none	K. Zupfer
6	Turbine: 17	October 16, 2019	9	2	W	80	None / rain	K. Zupfer
7	Turbines: 12, 27 and Driving Survey	October 22, 2019	12	3	SW	75	None / rain	K. Zupfer
7	Turbine: 17	October 23, 2019	9	4	SW	25	None / none	K. Zupfer
8	Turbines: 12, 17, 27 and Driving Survey	October 29, 2019	12	3	SW	90	None / rain	K. Zupfer
9	Turbines: 12, 17, 27	November 5, 2019	5	4	W	60	None / rain	K. Zupfer
9	Driving Survey	November 6, 2019	-4	2	SW	50	None / rain	K. Zupfer
10	Turbine: 27 and Driving Survey	November 12, 2019	-7	3	N	100	Snow / snow	K. Zupfer
10	Turbines: 12, 17	November 13, 2019	-12	2	SW	50	None / snow	K. Zupfer

Table B3: Red-tailed Hawk Observations, Breeding Territorial Surveys 2019

Nest Location	Flight Path[1]	Date (2019)	Observed Behavior	Potential Resident or Migrant?
Turbine 12	RT14	Sept 25	1 adult in field north of turbine 12, flew away carrying prey headed north	Resident
	RT15	Oct 8	1 adult perched on fence post west of turbine 13, flew towards turbine 13 and perched again	Resident
	RT16	Oct 15	1 adult circled over woodlot south of turbine 12, then flew south	Unknown
	RT17	Nov 13	1 adult perched in tree in woodlot south of turbine 12, then flew south	Migrant
	RT18	Nov 13	2 adults circled over woodlot south of turbine 12	Resident
Turbine 17	RT7	Oct 23	1 adult perched in woodlot north of turbine 18, flew up from woodlot then back into woodlot	Resident
	RT8	Nov 12	1 adult perched in tree near end of access road to turbine 18	Resident
	RT9	Oct 29	1 adult perched in tree at end of access road to turbine 18, then flew south	Resident
	RT10	Sept 10	1 adult flew from south of turbine 17, circled over agricultural field, then headed north	Unknown
	RT11	Oct 22	2 adults circled over woodlot north of turbine 15, then flew west	Resident
Turbine 27	RT1	Oct 1	1 adult perched in woodlot north of turbine 27, then flew north while being chased by an American Crow	Resident
	RT1	Nov 12	adult circled over woodlot north of turbine 27, then heading south	Unknown
	RT2	Oct 22	1 adult circled high over woodlot north of turbine 27, then flew into woodlot	Migrant
	RT3	Oct 29	1 adult circled over woodlot north of turbine 27, then flew north of woodlot	Unknown
	RT3	Nov 12	1 adult flew over woodlot north of turbine 27 from east to west, then heading north	Unknown
	RT4	Nov 12	1 adult circled over woodlot north of turbine 27, then heading south	Unknown

[1] – Flight path # corresponds to flight paths on Figure 2, Appendix A

Table B4: Red-tailed Hawk Observations, Fall Migration 2019

Date (2019)	Survey Type	Total # Observed	Nearest Turbine	Flight Path[1] (# observed)	Flight Height (m)	Wind[2]	Temp.[3]
Sept 10	Nest Watch	1	17	RT10	30 – 100+	High, south east	Warm
Sept 17	Driving Survey	1	6	RT26	15	Medium, north east	Warm
Sept 25	Driving Survey	1	12	RT14	0 – 5	High, south west	Warm
Oct 1	Nest Watch	1	27	RT3	30	High, south west	Warm
Oct 8	Driving Survey	3	7 8 13	R21 R22 R15	80 – 100 60 – 80 10	Medium, east	Cool
Oct 15	Driving Survey & Nest Watch	3	7 12 14	RT20 RT16 RT13	30 70 20	Medium, south east	Cool
Oct 22	Driving Survey & Nest Watch	7	8 9 14 15 27	RT23 RT19 RT12 (2) RT11 (2) RT2	20 20 30 – 60 20 – 40 30 – 80	Medium, south west	Cool
Oct 23	Nest Watch	1	17	RT7	40	High, south west	Cool
Oct 29	Driving Survey & Nest Watch	3	18 18 27	RT5 RT9 RT3	5 15 30 – 60	High, south west	Cool
Nov 12	Driving Survey & Nest Watch	7	8 8 18 21 27 27 27	RT25 RT24 RT8 RT6 RT1 RT3 RT4	50 25 20 20 20 – 50 20 – 50 20 – 80	High, north	Cold
Nov 13	Nest Watch	3	12	RT17 RT18 (2)	20 50 – 100	Medium, south west	Cold

[1] – Flight path # corresponds to flight paths on **Figure 2**, Appendix A
[2] – Wind is measured using the Beaufort Scale (1 = low, 2 = medium, 3-4 = high)
[3] – Temperature is measured in degrees Celsius (cold = ≤ 0°C, cool = 1°C - 14°C, warm = ≥ 15°C)

Table B5: Turkey Vulture Observations, Fall Migration 2019

Date (2019)	Survey Type	Total Number Observed	Nearest Turbine	Flight Path[1] (# observed)	Flight Height (m)	Wind Speed and Direction[2]	Temp[3]
Sept 10	Driving Survey & Nest Watch	114	9 12 12 12 12 14 14 15 17 18 17 20 21 26 27 27 27 27 27	TV44 (6) TV36 (2) TV37 (2) TV38 (17) TV39 (4) TV34 (2) TV32 (9) TV29 (5) TV22 (16) TV26 (7) TV21 (4) TV17 (8) TV15 (4) TV9 (5) TV7 (6) TV2 (3) TV1 (2) TV5 (6) TV8 (6)	60 – 100 + 40 50 40 – 80 40 – 100 10 – 30 20 100 + 30 – 100 30 – 60 30 – 100 40 – 80 10 – 30 40 50 – 100 50 50 – 80 30 – 50 40 – 80	High, south east	Warm
Sept 17	Driving Survey & Nest Watch	73	12 12 14 14 15 18 17 17 21 26 27 27 27 27	TV39 (10) TV40 (6) TV32 (2) TV33 (9) TV30 (5) TV22 (3) TV26 (1) TV24 (2) TV15 (7) TV10 (3) TV1 (3) TV5 (5) TV7 (11) TV9 (6)	50 – 100 50 – 100 30 30 – 80 50 – 100 40 – 80 60 20 – 40 60 – 100 + 20 50 60 – 80 40 – 80 100+	Medium, north east	Warm
Sept 25	Driving Survey & Nest Watch	76	6 9 12 12 12 12 12 14	TV48 (2) TV44 (30) TV35 (3) TV36 (2) TV37 (2) TV38 (3) TV40 (8) TV33 (3)	20 40 – 80 40 30 40 40 – 60 60 10 – 40	High, south west	Warm

Table B5: Turkey Vulture Observations, Fall Migration 2019

Date (2019)	Survey Type	Total Number Observed	Nearest Turbine	Flight Path[1] (# observed)	Flight Height (m)	Wind Speed and Direction[2]	Temp[3]
			15 15 20 21 22 22 27	TV31 (3) TV29 (9) TV19 (3) TV16 (3) TV12 (2) TV13 (1) TV7 (2)	60 – 80 50 – 100 30 – 80 + 50 30 30-70 50 – 80		
Sept 26	Nest Watch	20	18 17 27 27 27 27 27	TV22 (2) TV25 (2) TV5 (4) TV2 (2) TV1 (2) TV8 (7) TV9 (1)	80 80 20 – 50 10 – 40 50 40 – 50 30	High, west	Warm
Oct 1	Nest Watch	36	12 12 12 12 18 27 27 27 27	TV37 (3) TV38 (1) TV40 (1) TV41 (1) TV22 (3) TV1 (7) TV5 (5) TV7 (14) TV8 (1)	50 – 80 50 60 50 50 – 80 50 – 80 50 – 80 60 – 80 40	High, south west	Warm
Oct 3	Driving Survey	32	9 12 15 17 26	TV43 (12) TV37 (7) TV28 (1) TV27 (2) TV11 (10)	50 – 80 50 – 80 60 60 – 80 10	High, east	Cool
Oct 8	Driving Survey & Nest Watch	134	5 7 8 18 17 17 17 27 27 27 27	TV45 (48) TV43 (8) TV47 (3) TV22 (3) TV25 (3) TV24 (3) TV23 (1) TV7 (49) TV5 (9) TV1 (6) TV4 (1)	20 – 80 10 – 40 10 – 50 40 60 60 – 80 < 10 30 – 80 20 – 60 100 + 20	Medium, east	Cool
Oct 9	Nest Watch	6	12 12	TV39 (3) TV40 (3)	60 40 – 80+	Medium, east	Cool

Table B5: Turkey Vulture Observations, Fall Migration 2019

Date (2019)	Survey Type	Total Number Observed	Nearest Turbine	Flight Path[1] (# observed)	Flight Height (m)	Wind Speed and Direction[2]	Temp[3]
Oct 15	Driving Survey & Nest Watch	39	6 7 8 12 12 18 20 20 22 27	TV49 (1) TV44 (5) TV46 (1) TV39 (3) TV41 (3) TV23 (1) TV18 (2) TV20 (12) TV14 (4) TV5 (7)	40 – 60 10 – 40 60 80 40 – 60 40 70 + 10 – 30 50 + 30 – 50	Medium, south east	Cool
Oct 22	Driving Survey & Nest Watch	24	11 14 15 20 22 26 26 27 27 27 27	TV42 (1) TV34 (1) TV31 (1) TV21 (1) TV14 (1) TV9 (3) TV11 (3) TV7 (5) TV1 (3) TV6 (2) TV8 (3)	30 20 20 30 10 40 + 20 50 + 20 – 40 10 – 40 30	Medium, south west	Cool
Oct 23	Nest Watch	3	17	TV24 (3)	40	High, south west	Cool
Oct 29	Driving Survey	3	22	TV14 (3)	40 +	High, south west	Cool
Nov 12	Nest Watch	1	27	TV3 (1)	30	High, north	Cold
Nov 13	Nest Watch	1	12	TV39 (1)	50	Medium, south west	Cold

[1] – Flight path # corresponds to flight paths on **Figure 2**, Appendix A
[2] – Wind is measured using the Beaufort Scale (1 = low, 2 = medium, 3-4 = high)
[3] – Temperature is measured in degrees Celsius (cold = ≤ 0°C, cool = 1°C - 14°C, warm = ≥ 15°C)

Table B6: Other Raptor Observations, 2019

Date (2019)	Species	Number Observed	Nearest Turbine
Sept 10	Bald Eagle	1	15
Sept 17	Bald Eagle	1	21
	Northern Harrier	2	17, 21
Sept 25	American Kestrel	1	13
	Bald Eagle	1	21
	Northern Harrier	1	18
Oct 3	American Kestrel	1	14
Oct 8	American Kestrel	1	13
	Northern Harrier	1	19
	Unknown Raptor sp.	1	11
Oct 15	American Kestrel	1	13
	Northern Harrier	1	21
Oct 22	Bald Eagle	1	14
	American Kestrel	2	13, 18
	Northern Harrier	3	8, 13, 20
Oct 29	Northern Harrier	2	8, 26
Nov 6	Northern Harrier	2	17, 19
Nov 13	Northern Harrier	1	18

Table B7: Summary of Turkey Vulture observations from Holiday Beach, fall migration 2019 (Hawk Count 2019).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Sept.	0	0	1	4	2	0	0	7	0	0	0	10	0	7	0	21	68	15	2	18	0	1	18	31	101	61	70	2	198	221	-
Oct.	303	578	250	6817	7830	328	769	1507	2713	1114	53	1618	1025	2440	1326	1620	5034	3212	2571	922	299	1315	639	2250	117	313	99	583	717	16	0
Nov.	840	601	542	189	427	219	260	692	218	108	0	173	61	10	98	247	235	116	1	0	4	62	23	1	0	11	1	13	2	41	-
	-Timing of peak migration, as identified by Stantec																														

Source: Hawk Count 2019

Table B8: Summary of Red-tailed Hawk observations from Holiday Beach, fall migration 2019 (Hawk Count 2019).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Sept	0	9	0	7	9	1	5	16	0	0	2	6	0	3	2	18	28	8	9	0	0	1	2	4	1	5	2	0	0	6	-
Oct	0	1	1	29	69	0	3	13	28	15	0	4	5	11	9	7	51	31	47	20	38	5	5	133	9	33	5	49	48	5	0
Nov	59	28	43	3	52	19	226	373	105	38	3	171	22	49	28	2414	279	168	7	6	30	167	26	7	5	11	0	101	9	61	-
	-Timing of peak migration, as identified by Stantec																														

Source: Hawk Count 2019

APPENDIX C
ENHANCED RAPTOR MONITORING PLAN

Stantec Consulting Ltd.
1-70 Southgate Drive, Guelph ON N1G 4P5

August 28, 2019
File: 160961067

Attention: John McGlynn, Senior Environmental Officer
Ontario Ministry of the Environment, Conservation and Parks
Southwest Region, London District Office
733 Exeter Road, London, Ontario

Dear Mr. McGlynn,

Reference: Adelaide Wind Power Project
Monitoring Plan for Raptors

Stantec Consulting Ltd. has been retained by Suncor Energy Inc. to conduct the ongoing post-construction monitoring of the Adelaide Wind Power Project. The Environmental Effects Monitoring Plan (EEMP) monitoring was completed in 2015 through 2017, with continued, ongoing post-construction raptor monitoring to address the raptor threshold exceedance.

On July 25, 2019, Suncor provided the Ontario Ministry of Environment, Conservation and Parks (MECP) with Stantec's proposed Enhanced Raptor Monitoring Plan. Comments from MECP and the Ministry of Natural Resources and Forestry (MNRF) were received August 26, 2019. The purpose of this letter is to respond to MECP and MNRF comments and to provide a revised Enhanced Raptor Monitoring Plan that addresses those comments.

1. *It has not been demonstrated that the proposed plan was developed by a qualified professional. Please identify the person(s) responsible for the development of the plan.*

The proposed plan was developed by Andrew Taylor from Stantec. Andrew has over 10 years of post-construction monitoring experience of wind power facilities, including studies specific to raptors mortality and behavioral impacts. Andrew's CV is attached.

2. *The intent of the additional monitoring option (i.e. option 2) is to provide more focused monitoring that would allow for an enhanced understanding of possible causes and/or trends related to the mortality occurring at the turbines to inform appropriate and effective mitigative actions.*

    a. *As such, please outline and include rationale as to how the proposed methodology would enhance or improve upon previous post-construction monitoring (i.e. mortality monitoring and scoped cause and effect monitoring).*

Based on the post-construction monitoring completed to-date (2015 through 2018) the following conclusions have been drawn, regarding trends in raptor mortality:

- In two years of monitoring (2016 and 2017), there appeared to be a potential correlation between the location of active raptor nests and the location of raptor mortality.

- Most raptor mortality has occurred during the breeding and fall migration; with variability from year to year.

- Otherwise, there has been a lack of identifiable trends in raptor mortality that would inform mitigatable conditions (e.g. timing or weather).

The Enhanced Raptor Monitoring Plan is intended to build upon these conclusions, with the goal of providing insight into where and when operation mitigation would be effective for raptors. Monitoring is proposed for May through November with an emphasis during the breeding and fall migration seasons, which corresponds to the timing of observed mortality during previous years of monitoring at this facility. Rational for each component of the Enhanced Raptor Monitoring Plan is provided below.

MORTALITY MONITORING

- The ongoing mortality monitoring is intended to provide additional information on mortality trends, beyond what has been collected from the previous years of studies.

- In addition, having mortality data in the same year of behavior studies is required to allow for a correlation between potentially high-risk behaviors and observed mortalities.

- Monitoring will be revised to occur at all 18 turbines on a weekly basis instead of only a subset, to allow a more comprehensive assessment of spatial mortality across the Project.

- We continue to propose once a week monitoring, as the monitoring is typically for larger-bodied raptors with high carcass persistence. The monitoring does not include searches for small-bodied birds or bats (which have shorter carcass persistence). As such, we believe the twice weekly monitoring typically of the full EEMP programs is not necessary to meet the goals of the enhanced raptor monitoring plan.

BEHAVIORAL STUDIES

Territorial Monitoring

- The territorial monitoring will be used to confirm the location of active nests and/or territories, which will allow:
    - An assessment of correlation between mortality data and proximity of active territories.
    - Conduct fall migration monitoring in proximity to active territories (see more details below).
- Territorial monitoring will look for interactions between territorial birds during the breeding season, with a focus on looking for potential high-risk behavior.

- In the event of a raptor mortality in proximity to an active territory, territorial monitoring may provide insight into whether the mortality was of the resident territorial pair, or an individual moving through the territory (i.e. determine if both individuals of the resident pair are still present).

- The initial spring, leave-off survey, will be used to determine the location of active nest in each year of monitoring. Rational for the additional five surveys, spread across the breeding season, is to confirm the territory remains active, provide additional survey effort to observe raptor interactions and to assess if observed mortalities are of the breeding pair.

Fall Migration Monitoring

- Resident birds typically remain on territory year-round and will interact with migratory raptors that pass through their territory.
- The Project site is not situated along a shoreline or major landscape formation (e.g. escarpment), as such, raptor migration is not expected to be concentrated in a particular area or along a specific feature.
- Focus of the fall migration monitoring will be on the active territories, mapping how migrant individuals move through or around active territories and examining interactions between resident and migration, with specific emphasis on recording high-risk behavior.
- Furthermore, the fall migration monitoring will be used to assess the hypotheses that there would not be distinct migration paths through the Project site, or if there are features that concentration movement (e.g. Ausable River valley to the north) are present and should be considered in a mitigation strategy.
- Survey effort has been increased to 10 surveys, spread throughout the fall migration period (i.e. late August through early November). This level of effort and survey period is based on consultation and advice from subject experts at Canadian Wildlife Services on other wind power projects in southern Ontario (e.g. Wolfe Island and Port Alma wind farms).

    b. Please describe and provide a rational as to how the enhanced monitoring intends to inform the development of an operational mitigation plan at the facility (i.e. what improved results will it yield to inform mitigative actions for raptors). See comments for consideration in red text in the original email below.

The goal of the Enhanced Raptor Monitoring Plan is to provide insight into where and when operation mitigation would be effective for raptors. Specific parameters that will be assessed using the Enhanced Raptor Monitoring Plan data including:

- Location
    - Results to-date suggest proximity to active nests may be a factor in raptor mortality and should be considered in a mitigation strategy.
    - Results of the fall migration monitoring will be assessed to determine if other spatial considerations (i.e. areas of concentrated raptor movement) should be used in developing a mitigation strategy.
- Time of year

  - The mortality monitoring results to-date have been somewhat variable on time of year (concentrated in the breeding season in some years and in the fall migration season in other years).
  - The addition of behavioral studies may help to refine when raptor activity is highest in the studies area, or when potentially high-risk behaviors are most frequent.

- Time of day
  - The monitoring completed to-date does not provide any insight into what time of day raptors may be a highest risk of mortality.
  - The additional behavior studies may help to determine what times of day raptor activity if highest or when high-risk behaviors are most frequent.

- Weather Conditions
  - It is difficult to correlate mortality monitoring results with weather conditions, as it is unknown exactly when a collision took place or the weather at the time.
  - However, through the additional behavioral monitoring, weather conditions can be recorded in real-time, when high-risk behaviors are identified.

PROPOSED WORK PLAN (REVISED)

The proposed Enhanced Raptor Monitoring Plan, which has been revised to address MECP and MNRF comments, is provided below. A reporting section has also been added to discuss how data will be analyzed to inform an operational mitigation strategy.

1. Mortality Monitoring
   - Weekly mortality monitoring
     - monitoring at all 18 turbines
     - weekly monitoring for raptors from the beginning of May to the end of November
     - Approx. 10 minute searches at each turbine (as the target are large-bodied, highly visible birds)
   - Correction factor trials:
     - searcher efficiency will be assumed to be 1.0 for large-bodied raptors, consistent with previous years of monitoring.
     - scavenger trials will be assumed to be 1.0 for large-bodied raptors, consistent with previous years of monitoring.
     - as previously requested by MNRF on this Project, raptor carcass, if available, will be set out to confirm if any removal of raptor carcasses is occurring.
     - percent area searched
2. Breeding territorial monitoring:
   - Initial April survey to identify and map location of active raptor nests within 1km of turbines.
   - Five additional surveys:
     - Identification of territory size around nests.

- Observation interactions between territorial raptors.
- Assume 2 hours of observations at each nest during each survey event.

3. Fall migration monitoring
    - 10 surveys from late August through early November.
    - Mapping migration flight paths in proximity to active territories and landscape features.
    - Observations of interactions between territorial raptors and migrant raptors.

4. Reporting
    - An annual report will be prepared summarizing the results, with a comparison to previous year's results at the Project.
    - The results will be compared to publicly available data from other sources (i.e. Hawk Watch) to assess trends in migration activity.
    - The results of behavioral studies (breeding and fall migration monitoring) will be compared to mortality data, to assess potential correlation between observed high-risk behavior and observed mortality.
    - Where possible, a determination of resident vs. migration will be made for observed raptor mortality.
    - Trends in observed high-risk behavior will be assessed against time of year, time of day and weather conditions.
    - The annual reports will provide conclusions on if and what trends in raptor mortality risk were identified, with recommendations for an operational mitigation strategy and/or additional study requirements.

Thank you for your attention to this letter and the ongoing consultation with Suncor and Stantec on this file. Should MECP or MNRF have additional comments or questions regarding the study design rational or the revised work plan above, please do not hesitate to contact the undersigned.

Regards,

Stantec Consulting Ltd.

Andrew Taylor
Senior Ecologist
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andrew.taylor@stantec.com

Attachment: Andrew Taylor CV

c. Mark Kozak, Suncor Energy Inc.

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Andrew Taylor B.Sc.

Senior Ecologist

Andrew is a knowledgeable terrestrial ecologist and project manager. He has successfully managed a wide range of projects, including natural heritage assessments (NHA), environmental impact statements, constraint analyses, environmental implementation reports and natural heritage components of Environmental Assessments. These projects involve the implementation of natural heritage policies of the Renewable Energy Approval, Ontario Provincial Policy Statement, Greenbelt Plan and municipal policy documents. He is familiar with various Acts and their application to projects, including the Migratory Birds Convention Act, Endangered Species Act, Species at Risk Act and others.

Andrew is knowledgeable about the biology and life history of Ontario birds and bats. He also has strong technical skills at identification of vascular plants, breeding amphibians (calling frogs and toads), breeding salamanders (adult and egg studies), reptiles, butterflies and dragonflies.

Andrew has been involved in field studies, providing technical advice and/or reporting on over 30 wind energy projects in Ontario. Through these projects he has extensive experience conducting surveys for the diversity, abundance and behavior of breeding, migrating, staging and wintering birds. Andrew has experience analyzing the results of field surveys to assess potential impacts of local and migratory populations of birds. He has conducted pre-construction bat surveys on a number of projects in Ontario; including identification of candidate roost and hibernacula features and has experience surveying for bats using acoustic detectors to determine presence and species. Andrew has extensive experience with post-construction monitoring at wind energy projects, having coordinated studies at ten facilities in Ontario. These studies have assessed the direct impact of mortality on bird and bat populations and the indirect impacts of avoidance on birds.

He has extensive experience with policies, field studies and permitting requirements pertaining to species at risk. He is skilled at assessing wildlife habitat, applying Ecological Land Classification (ELC) and delineating wetland boundaries. Andrew is experienced at analyzing natural heritage features for the presence of Significant Woodlands or Significant Wildlife Habitat using applicable provincial guidance documents.

Andrew has provided terrestrial ecology expertise in a wide range of sectors, including urban lands, energy (including renewable energy), recreational development, infrastructure and aggregate extraction. He has appeared as an expert witness in front of Boards and Tribunals including the Environmental Review Tribunal.

EDUCATION

B.Sc. (Hons), University of Guelph / Environmental Toxicology, Guelph, Ontario, 2001

CERTIFICATIONS & TRAINING

Certificate #032, Ontario Ministry of Natural Resources / Butternut Health Assessor, Hamilton, Ontario, 2009

Certificate, Ontario Ministry of Natural Resources / Ecological Land Classification System for Southern Ontario, Turkey Point, Ontario, 2006

PROJECT EXPERIENCE

Renewable Energy

Renewable Energy Approval (REA) Natural Heritage Assessments (NHA) and Environmental Impact Studies (EIS), Multiple Projects, Various Sites, Ontario (Terrestrial Ecologist)

NHAs and EISs were prepared in accordance with O. Reg. 359/09 under the Environmental Protection Act with guidance obtained from the Draft Natural Heritage Assessment Guide for Renewable Energy Projects (MNR, 2010). NHAs included records review and site investigation, including but not limited to vascular plant surveys, Ecological Land Classification and wildlife surveys for avian species, amphibians, reptiles, mammals and invertebrates.

Data obtained were used to identify and evaluate significant natural heritage features including wetlands, woodlands, valleylands and significant wildlife habitat. Outside the REA process, field surveys and habitat assessments were completed for species protected under the provincial Endangered Species Act. Andrew coordinated and conducted field studies, habitat assessments for species at risk, authored technical reports and engaged in public consultation for the following:
• Grand Renewable Energy Park (Haldimand County, 69 turbines & solar, total 253.1 MW)
• Port Dover and Nanticoke Wind Project (Norfolk and Haldimand Counties, 58 turbines)
• Ostrander Wind Energy Park (Prince Edward County, 9 turbines)
• Mica Bay (Algoma District, 12 turbines)
• Amherst Island (Lennox and Addington County, 37 turbines)
• Fairview Wind Farm (Simcoe County, 4 turbines)
• Whittington Wind Farm (Dufferin County, 3 turbines)
• Springwood Wind Farm (Wellington County, 4 turbines)
• Brooke-Alvinston Wind Farm (Lambton County, 4 turbines)
• Bow Lake (Algoma District, 36 turbines)
• Niagara Region Wind Farm (Niagara Region, 80 turbines)
• Adelaide Wind Power Project (Middlesex County; 28 turbines)
• Cedar Point Wind Power Project (Lambton County, 72 turbines)
• Grand Valley 3 (Dufferin County, 15 turbines)

Environmental Screening Report / Environmental Review Report, Multiple Projects, Various Sites, Ontario (Terrestrial Ecologist)
Environmental Screening Reports/Environmental Review Reports were prepared for various wind energy projects in compliance with the Ministry of the Environment's Guide to Environmental Assessment Requirements for Electricity Projects and the Canadian Environmental Assessment Act (CEAA). Andrew's involvement included pre-construction study design, coordinating and conducting monitoring for avian and other wildlife species, including targeted surveys for species at risk. Avian studies included breeding grassland and forest birds, wintering raptors and migratory surveys for waterfowl, raptors, passerines and shorebirds. Andrew conducted and coordinated acoustic bat surveys including data collection, species identification, data analysis and reporting, and co-authoring technical reports as part of the following projects in Ontario:
• Wolfe Island Wind Project (Wolfe Island, 86 turbines)
• Port Alma Wind Power Project (Municipality of Chatham-Kent, 44 turbines)
• Plateau Wind Project (Municipality of Grey Highlands & Melancthon Township, 18 turbines)
• Gosfield Comber Wind Energy Project (Essex County, 149 turbines)
• Kingsbridge II Wind Project (Huron County, 69 turbines)
• Chatham Wind Power Project (Municipality of Chatham-Kent, 44 turbines)
• Melancthon Wind Plant, Phases I & II (Melancthon and Amaranth Townships, 177 turbines)

Post-construction Monitoring Programs, Multiple Projects, Various Sites, Ontario (Terrestrial Ecologist)
Post-construction monitoring of renewable energy projects is performed to assess the direct impacts to birds and bats and indirect impacts to breeding, migrating and wintering wildlife. The purpose of post-construction monitoring programs is to verify predictions of the pre-construction assessment and, if necessary, implement appropriate measures to mitigate adverse effects. Andrew has coordinated and conducted monitoring field studies including assessment of disturbance to grassland, forest and wetland breeding birds, staging waterfowl and shorebirds, tundra swans and wintering raptors and co-authored or authored the post-construction monitoring reports for the following projects in Ontario:
• Wolfe Island Wind Project (Wolfe Island, 86 turbines)
• Melancthon Wind Plant, Phase I & II (Melancthon & Amaranth Townships, 177 turbines)
• Kingsbridge I Wind Plant (Huron County, 22 turbines)
• Port Alma Wind Power Project (Municipality of Chatham-Kent, 44 turbines)
• Gosfield Comber Wind Energy Project (Essex County, 149 turbines)
• Grand Valley Wind Farm (Dufferin County, 9 turbines)
• Enbridge Underwood and Cruickshank Wind Farms (Bruce County, 115 turbines)
• Gesner Wind Energy Project (Municipality of Chatham-Kent, 5 turbines)
• Port Dover and Nanticoke Wind Project (Counties of Norfolk and Haldimand, 58 turbines)

Oil & Gas

Energy East Pipeline, Various Sites, Ontario (Terrestrial Ecologist)
Senior ecologist and advisory role on impact assessment of wildlife habitat and species at risk for project spanning across Ontario through four ecoregions. Consultation with Ontario Ministry of Natural Resources regarding species at risk including, but not limited to, Woodland Caribou.

** denotes projects completed with other firms*

Andrew Taylor B.Sc.

Senior Ecologist

Genesis Pipeline Extension Project, Sarnia, Ontario (Terrestrial Ecologist)
Senior ecologist and advisory role on impact assessment of wildlife habitat and species at risk.

Hamilton to Milton Natural Gas Pipeline, Halton, Ontario (Terrestrial Ecologist)
Terrestrial surveys included vegetation community assessments and floral inventory, with emphasis on species at risk.

Parkway West Compressor Station, Halton, Ontario (Terrestrial Ecologist)
Senior ecologist and advisory role on impact assessment of wildlife habitat and species at risk.

Bickford to Dawn Pipeline Project, Chatham, Ontario (Terrestrial Ecologist)
Terrestrial surveys included vegetation community assessments, floral inventory and species at risk habitat assessments. Study design and development in conjunction with local Ontario Ministry of Natural Resources district for Eastern Foxsnake, including a SAR 17b permit application.

Brantford Take-off to Kirkwall Valve Site Pipeline Project, Hamilton, Ontario (Terrestrial Ecologist)
Senior ecologist and advisory role on impact assessment of wildlife habitat and species at risk.

Dow Moore, Corunna and Seckerton Pipeline Project, Lambton County, Ontario (Terrestrial Ecologist)
Species at risk habitat assessment and inventory. Study design and development in conjunction with local Ontario Ministry of Natural Resources district for several species protected under the Endangered Species Act.

Electrical Power Distribution

Bruce to Milton Transmission Reinforcement Project, Multiple Sites, Ontario (Terrestrial Ecologist)
Terrestrial surveys related for species at risk protected under the provincial Endangered Species Act (2007).

Coote's Paradise Transmission Reinforcement Project, Hamilton, Ontario (Terrestrial Ecologist)
Terrestrial surveys included vegetation community assessments, floral inventory, with emphasis on species at risk.

Clarington Transformer Station, Durham, Ontario (Terrestrial Ecologist)
Senior ecologist and advisory role on wildlife habitat and species at risk impact assessment.

Midtown Electricity Infrastructure Renewal Project, Toronto, Ontario (Terrestrial Ecologist)
Senior ecologist coordinating species at risk inventories and permitting requirements.

Huycke Island Electrical Distribution Submarine Cable Replacement, Trent Hills, Ontario (Terrestrial Ecologist)
Senior ecologist and advisory role on impact assessment of wildlife habitat and species at risk.

Bruce Creek x Sarnia Scott TS B3N Line Protection Project, Sarnia, Ontario (Terrestrial Ecologist)
Senior ecologist and technical advisory on species at risk and implementation of Species at Risk Act permit.

Stratford Distribution Station, Stratford, Ontario (Terrestrial Ecologist)
Coordination of tree management plan and species at risk assessment.

Transportation Planning

City of Toronto Fort York Pedestrian Footbridge, Toronto, Ontario (Terrestrial Ecologist)
Coordinated Natural Sciences component of project including assessment of potential impacts, with an emphasis on species at risk.

** denotes projects completed with other firms*

Andrew Taylor B.Sc.

Senior Ecologist

Natural Science Reports Related to MTO Highway Improvement Works, Various Sites, Ontario (Terrestrial Ecologist)
Produced numerous Natural Sciences reports related to highway improvement works. Where required, Fisheries Act authorization was obtained and Fish Habitat Compensation Plans were developed. Potential impacts to terrestrial vegetation, wetlands and wildlife were described for the following studies:
• Highway 3 (Essex County): Preliminary Design Study
• Highway 40 (Municipality of Chatham-Kent): Detail Design Study
• Highway 11 (Town of Bracebridge): Preliminary Design
• Highway 24 (Cambridge): Detailed Design
• Highway 8 (Perth County): Detailed Design
• Highway 401 (Kitchener): Post-construction Compliance Monitoring
• Highway 401 (Essex County, near Comber): Post-construction Compliance Monitoring
• Highway 26 (County of Grey): Post-construction Compliance Monitoring
• Highway 17 (Sudbury): Preliminary Design Study
• Highway 9 (Municipality of South Bruce): Post-construction Compliance Monitoring

Research

Rice Lake Plains Joint Initiative*, Northumberland County, Ontario (Ecologist)
Tallgrass prairie research program. Identification and detailed cataloging of remnant tallgrass prairie sites, landowner liaison and education, development of tallgrass prairie management plans, reporting of findings.

Alderville First Nations Black Oak Savannah*, Alderville, Ontario (Ecologist)
Tallgrass prairie and black oak savannah research program. Technical reporting. Vegetation monitoring, tallgrass prairie reconstruction, wildlife monitoring, Species at Risk reintroduction.

Aggregate Services

Proposed Bromberg Pit, Ayr, Ontario (Terrestrial Ecologist)
Natural environment field inventories with emphasis on Species at Risk (SAR).

Neubauer Pit, Town of Puslinch, Ontario (Terrestrial Ecologist)
Natural environment field inventories with emphasis on Species at Risk (SAR).

Dufferin Aggregates Acton Quarry Extension, Acton, Ontario (Terrestrial Ecologist)
The extension of the existing Acton Quarry is proposed to meet the need for additional close-to-market aggregate resources of high quality Amabel Dolostone. Andrew has conducted extensive ecological field surveys and habitat assessments for breeding birds, amphibians and mammals with specific emphasis on Species at Risk (SAR).

St. Marys Cement Flamborough Quarry License Environmental Impact Study and Level 2 Natural Environment Technical Report (Ecologist)
Identification and impact assessment of natural heritage features, compensation and management plan for Species at Risk (Butternut), water balance to maintain provincially significant wetland, salamander habitat and migration study, assessment of provincially significant woodland and significant wildlife habitat, environmental impacts of transportation.

Natural Sciences & Heritage Resources

Crates Marina, Keswick, Ontario (Project Manager / Ecologist)
Environmental policies, approvals and desgin. Identification of natural heritage features and sensitive species.

Kortright East Development, Guelph, Ontario (Project Manager / Ecologist)
Envrionmental Implementation Report. Vegetation buffers, wildlife corridor, tree conservation plan, planning and design of invasive species removal, design of compliance and performance monitoring program.

Southeast Sutton Development Area Plan, Sutton, Ontario (Project Manager / Ecologist)
Environmental policies, approval and design. Identification of natural heritage features and constraints for Development Area Plan. Plan of Subdivision forest buffers, mitigation of impacts to forest resources, sensitive vegetation and Species at Risk. Participation in Ontario Muncipal Board discussions.

** denotes projects completed with other firms*

Andrew Taylor B.Sc.

Senior Ecologist

Fourteen Mile Creek Development, Oakville, Ontario (Ecologist)
Natural Heritage Monitoring Program Director - directed monitoring program of vegetation communities, change in species composition, avian wildlife, aquatic Species at Risk, benthic invertebrate communities, hydrogeology, geomorphology and erosion.

Activa Waterloo East, Waterloo, Ontario (Ecologist)
Terrestrial and Aquatic Monitoring Program - monitoring of vegetation communties, changes in species composition and disturbance levels were undertaken, interpreted and reported. Directed monitoring of benthic invertebrate communities.

Sports, Recreation & Leisure
Sunnidale Park Master Plan, Barrie, Ontario (Ecologist)
Identification and delineation of ecological management units. Design of management plans for ecological units, wetland and forest habitat rehabilitation. Technical reporting.

** denotes projects completed with other firms*