

PERMIT COMPLIANCE FILINGS

Permittee: AWA Goodhue, LLC
Permit Type: LWECS Site Permit
Project Location: Goodhue County
Commission Docket Number: IP-6701/WS-08-1233
Permit Section: Section 13.1.1
Type of Submission: Eagle Point Count Report: Fall Migration 2011
Date of Submission: January 17, 2012
Date of Document: January 17, 2012

Pursuant to Section 13.1.1 of the AWA Goodhue, LLC LWECS Site Permit, please find enclosed the eagle point count survey report for the 2011 fall migration period.

Eagle Point Count Report
Fall Migration 2011
AWA Goodhue Wind Project
Goodhue County, Minnesota

Prepared for:

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Project Number: 20081147.00

January 17, 2012

1.0 REPORTING REQUIREMENT

Section 13.1.1 of the Site Permit, which was issued on August 23, 2011 requires the following:

“The Permittee shall develop a plan for monitoring Bald and Golden Eagle nest¹ sites near turbine locations and shall develop protocol to identify proposed point count locations, suggested count duration and number of survey visits. Point counts of 20-30 minutes shall be conducted to document eagle movements in these areas. Multiple point count visits shall be conducted to cover the remainder of the 2011 nesting season (eaglets are expected to fledge by mid-July). Additional point counts shall be conducted in the fall of 2011 and the winter of 2011-2012. Details of the plan shall be included in the Avian and Bat Protection Plan. Ongoing monitoring for eagles shall be conducted in accordance with the Avian and Bat Protection Plan and U.S. Fish and Wildlife Service requirements. The Permittee shall submit the results of the summer, fall, and winter surveys, and any subsequent surveys, to the Commission within one month of completion of the surveys.”

Section 7.2 of the ABPP for the AWA Goodhue wind project expands upon this reporting requirement and calls for collision risk modeling updates at the end of each survey season. This report presents the results of the 2011 fall migration eagle surveys conducted between October 3 and December 15, 2011 by Westwood Professional Services, Inc. on behalf of AWA Goodhue LLC and also provides collision risk modeling based on these survey results.

2.0 FALL 2011 MIGRATION PERIOD SURVEY METHODS

In conducting these surveys, AWA Goodhue employed the survey methods recommended by the USFWS in its September 16, 2011 letter to AWA Goodhue. In accordance with the letter, the purpose of the surveys was to:

1. Document fall bald and golden eagle migration events;
2. Document winter (including pre-water freeze) use of Operational Project Area by bald and golden eagles; and
3. Document undiscovered nests from the 2011 breeding season.

As part of these surveys, the USFWS recommended AWA Goodhue identify: (1) times that bald and golden eagles may be migrating through; (2) populations of migrating and wintering bald and golden eagles in the area; (3) food resources eagles may be using (pre-water freeze); and (4) eagle roosting and foraging areas.

¹ Golden eagles do not nest in Minnesota (Mark Martell, Minnesota Audubon, Pers. Comm.)

To accomplish these purposes, six observation point locations (designated Sites 1, 1A, 2, 3, 4, and 5) were selected to encompass turbine clusters closest to known eagle nests and provide broad coverage of the operational project area. Eagle observations were documented within 800 meter radius circular survey plots centered on the six observation points. Twenty of 48 proposed turbine locations (41.7 percent) are located within the 800 meter radius plots. Observations occurring within 100 meters of a proposed turbine location were also documented to facilitate collision risk modeling. Exhibit 1 depicts observation point locations, 800 meter survey plots around observation points and 100 meter radius survey plots around each turbine location.

3.0 FALL 2011 MIGRATION SURVEY DATES AND OBSERVATION HOURS

A total of 126 observation hours were spent conducting 2011 fall migration point counts. All six observation points were surveyed for one hour on the following 21 dates in 2011:

October 3, 12, 13, 19, 20, 27 and 28

November 3, 4, 7, 11, 15, 16, 21, 22 and 30

December 1, 6, 8, 13 and 15

In addition, helicopter surveys for important eagle use areas (IEUAs) were performed on November 28 and December 16, 2011. No new IEUAs were found during these surveys.

4.0 FALL 2011 POINT COUNT SURVEY RESULTS

4.1 Documentation of Fall Bald and Golden Eagle Migration Events

Tables 1 and 2 summarize all fall migration point count data using 800 and 100-meter radius survey plots. Eagles were observed within the six 800-meter radius plots 224 times for a total of 799 “exposure minutes” and were observed within 100 meters of a proposed turbine location 65 times for a total of 78 exposure minutes. These figures include all eagle flight data, including eagle movements known to be affected by artificial feeding. For the observation point-centered 800-meter radius survey plots, an exposure minute is the time spent within the volume of a cylinder with a height of 175 meters and a radius of 800 meters (i.e. 351,858,377 cubic meters). For the turbine-centered 100-meter radius survey plots, an exposure minute is the time spent within the volume of a cylinder with a height of 175 meters and a radius of 100 meters (i.e. 5,497,787 cubic meters).

Tables 3 and 4 summarize the fall migration point count data using 800 and 100-meter radius survey plots with data known to be affected by artificial feeding removed. With feeding-affected data removed, eagles were observed within the six 800-meter radius plots 117 times for a total of 356 exposure minutes and were observed within 100 meters of a proposed turbine location 24 times for a total of 30 exposure minutes.

As indicated by the figures provided above, artificial food sources were found to have increased eagle exposure minutes by at least 2.25 and 2.6 times for 800 and 100-meter radius survey plots, respectively. These are conservative estimates, as we only considered data to be affected by these sources when associated with primary documentation showing

the presence of artificial food sources. It is possible that additional eagle activity was associated with artificial food sources but went undetected.

During the course of these surveys, two migrating golden eagles were observed, one soaring and a second attracted to bald eagles feeding on a raccoon carcass. Collision risks associated with these golden eagle observations are included in the Collision Risk Modeling section below.

4.2 Eagle Use within Operational Project Area

Much of the eagle use observed during the 2011 fall migration period was associated with the Belle Creek Valley, which lies west of the Operational Project Area. Within the Operational Project Area, migratory eagle flights were primarily observed at observation point counts in the western portion of the project area (Sites 1, 1a, and 2) and not at point counts more distant from the Belle Creek Valley (Sites 3, 4, and 5).

Eagles observed in flight at Sites 1, 1a, and 2 showed strong migratory behavior in soaring, thermaling, and southbound flights. Migratory flights typically involved more than one eagle. Where eagles were not flying, they were typically perched or loafing about the agricultural fields where artificial food was present. Eagles were only observed fishing the reservoir at Site 2 once during the fall migration, whereas during the breeding season they were routinely observed fishing.

Eagles observed at Sites 3, 4 and 5 were mostly either flying over in thermals or engaged in low, local point-to-point flights, rather than higher migratory flights. Each of these three survey plots had at least 12 of 21 survey days where no eagles were observed.

In addition to the migratory flights observed at point counts near the Belle Creek Valley, bald eagles were also routinely observed foraging or loafing in agricultural fields. Harvested agricultural fields normally offer very little in the way of food resources for eagles. Since bald and golden eagles are scavenging carnivores, crop residue and other vegetable matter do not represent food sources for them. When eagles are observed on the ground in a harvested crop field, it indicates the presence of a food source consisting of some type of meat.

Over the course of the 2011 fall migration survey period, it became very evident that the regular and widespread availability of artificially placed food sources (particularly at Site 1), attracted migrating eagles that probably would have otherwise passed over the area. Eagles were repeatedly observed dropping out of high soaring flight on thermals directly to livestock carcasses and relocated road kills. Additionally, due to the almost constant availability of food at Site 1, eagles were frequently observed in this area perched in nearby trees or circling low and looking for food, even when food wasn't present or readily visible. When artificially placed food was available, eagles were consistently observed on the ground foraging.

Unlike our observations of foraging eagles during the 2011 breeding season, during the fall migration, eagles were only seen foraging for fish at the western Belle Creek Watershed District Reservoir or actively hunting over specific habitat features one time. Eagles were observed hunting the Reservoir at Site 2 once on October 12; eagles were not observed hunting the Reservoir again once artificial feeding began. Similarly, eagles were not observed at the Site 1 until artificial feeding began, which was first documented on October 20. Eagles were routinely observed at Site 1 utilizing artificially placed food. Active hunting involves low flight circling over natural habitat and periodic hovering and stooping when prey is sighted. With the exception of one survey site on one day, all observed foraging activity during the fall 2011 observation period was focused on carrion consisting of pigs, cattle, raccoons, and deer. Eagles were observed hunting the reservoir at Site 2 once. With a few exceptions where carrion appeared related to deer hunting, virtually all of the carrion observed appeared to have been artificially placed in a manner intended to attract eagles.

The September 16, 2011 USFWS letter indicated that documenting foraging and roosting areas away from large rivers was important, as activities such as protected microclimates, open water maintained by springs, effluent and underground irrigation, as well as “reliable food sources such as road kill, cattle/hog die off/improper disposal, unburied garbage, or areas with “promiscuous ice fishing” may change throughout the year. For reasons discussed more fully in the ABPP and in Appendix A to this report, AWA Goodhue questions the “reliability” of many of the artificial food sources observed during the fall migration survey. While it is difficult to conclusively determine the intent behind placement of improperly disposed livestock and relocated road kill, the frequency and proximity of these documented sites suggests that the activity may represent a concerted effort to influence the results of the fall migration survey by luring eagles to the reported survey sites throughout the survey period.

It is important to note that AWA Goodhue has collected and analyzed all eagle use activity, regardless of the source of the activity. However, AWA Goodhue believes it is relevant to the Project’s and agencies’ understanding of eagle use in this area to consider these artificial food sources, since it is unclear whether the food sources are, in fact, reliable sources that will support ongoing eagle use in these areas. Moreover, should these feeding activities continue into the operational phase of the Project, the food based management plan proposed in the ABPP could have a significant impact on whether eagles continue to use these locations for foraging.

4.3 Documentation of Undiscovered Nests

No additional bald eagle nests were discovered during the fall migration survey. Nests represented on Figure 3 of the ABPP remain the only documented eagle nest locations AWA Goodhue is aware of. One additional nest was reported by a citizen during the fall of 2011. However, based on the limited accompanying description, it appears to be over five miles from the nearest proposed turbine and more than 2 miles outside the survey area recommended by the USFWS. The location of this reported nest is in the process of being verified. AWA Goodhue will continue to monitor reported nest locations in future surveys

to determine if additional undiscovered nests have been built during the 2011 breeding season or the 2011-2012 fall and winter seasons.

5.0 COLLISION RISK MODELING

As called for in Section 7.2 of the ABPP, AWA Goodhue is providing eagle collision risk modeling based on point count surveys conducted during 2011 breeding and fall migration seasons. The collision risk modeling presented in this filing will also be used in the Bald and Golden Eagle Protection Act (BGEPA) Incidental Take Permit (ITP) application being pursued with the U. S. Fish and Wildlife Service. Consistent with direction from the U. S. Fish and Wildlife Service, we have conducted collision risk modeling using all eagle flight data.

For comparison purposes, we have included modeling removing eagle flights directly attributed to artificial feeding activities. The purpose of the comparison is to facilitate the agencies' understanding of how future collision risks might be reduced if AWA Goodhue's proposed food management plan is implemented in accordance with the ABPP. AWA Goodhue believes this is a useful exercise, since much more limited eagle feeding activities were observed during the 2011 breeding season when artificial feeding activities were at a much lower level.

In predicting future eagle collisions, we applied the collision risk model (CRM) published by Band et al. (2007)¹ (hereafter referred to as "the Band CRM"). Tables 5 and 6 present Band CRM results for all 2011 fall migration season data using 800 and 100-meter radius sample plots, respectively. Tables 7 and 8 present Band CRM results for 2011 fall migration season data excluding the artificial feeding-affected data and using 800 and 100-meter radius sample plots, respectively. Tables 9 and 10, respectively, present Band Stage 2 collision percentages for gliding and wing-flapping eagles passing through the rotor of a GE 1.6 MW turbine. Table 11 summarizes the CRM results presented in Tables 5 through 10. In collision risk modeling for the AWA Goodhue project, we have used the more conservative Stage 2 figure for an eagle flapping its wings.

Tables 5 and 6 were constructed to represent "worst case" collision predictions, as they extrapolate data from the fall migration season to the entire year. Fall migration likely represents the period of the year with the most concentrated eagle movement within or near the project area. The spring migration period may see comparable eagle movements but likely over a shorter time period. This conclusion will be refined after the spring migration survey results are collected and analyzed. Based on 2011 breeding season data, eagle movement within the project area during the breeding season is substantially less than during fall migration (see Section 7.2 and Appendix G of the ABPP). Winter activity levels are also expected to be lower than levels during the fall migration.

¹ First published as SNH (Scottish Natural Heritage). 2000. Windfarms and Birds: Calculating a theoretical collision risk assuming no avoiding action. Guidance Note Series. 10 pp.

The amount of allowable take that AWA Goodhue will initially request in its BGEPA ITP application will be determined through coordination with the USFWS. We anticipate that the requested allowable take figure will likely be based on CRM output that factors in the differences in collision risk by season. For purposes of the predicted collision rates presented here, we have assumed that: (1) collision rates predicted for the fall migration can also be applied to the spring migration period; (2) collision rates for the breeding season can also be applied to the winter period; and (3) breeding and fall migration collision rates will be combined during the portion of the spring migration period that overlaps the beginning of the breeding period. These periods have been assumed to be as follows:

Migration periods – 6.25 months of the year (2.25 and 4 months for spring and fall, respectively)
Spring migration and portion of breeding period that overlaps – 2.25 months
Portion of breeding period with no migration period overlap – 4 months
Winter period – 1.75 months

We acknowledge that the periods described above are approximate and would vary from year-to-year. The basis for these estimated seasonal periods is described below. Based on Green and Jansen (1975), the bald eagle breeding season in southeastern Minnesota and southwestern Wisconsin starts around mid-February and essentially coincides with the beginning of the spring migration period. Eggs are typically laid by the first week of March. The breeding season ends in late July or early August with the fledging of eaglets. The fall migration begins in late August and ends in late December. The winter period is short, beginning in late December and ending with the spring migration in mid-February. All of the foregoing date ranges are fluid and vary from year-to-year, depending on climatic conditions and food availability. For purposes of collision risk modeling, we have assumed that predicted collision rates for the fall migration period can be applied to both the spring and fall migration periods and that these periods encompass 6.25 months of the year (2.25 and 4 months for spring and fall, respectively). We have assumed that lower breeding season collision rates would apply to the winter period and the portion of the breeding season that falls outside the spring migration period. These periods have been assumed to encompass 5.75 months of the year (1.75 and 4 months, respectively). To be conservative, we have assumed that both the breeding season and fall migration collision rates apply to the portion of the spring migration period that overlaps the beginning of the breeding season.

The USFWS has recommended that all point count data be used in collision risk modeling, and AWA Goodhue plans to pursue an incidental take permit on the basis of all observed eagle data, regardless of the source of the eagle use. If the most conservative version of the Band CRM output is applied (i.e. 800 meter radius sample plots, data affected by baiting included) and the predicted collision rates are apportioned by season as described above, the predicted annual collision rate equals 0.651 collisions per year, or 1 collision every 1.54 years. If turbine-focused 100-meter survey plots (which are believed to more accurately reflect the relationship between eagle movements and turbine locations) are used, the predicted annual collision rate equals 0.304 collisions per year, or 1 collision every 3.29 years. The seasonal apportionment calculations for these collision rates are provided in Appendix B.

We anticipate that the allowable annual take that will be initially requested from the USFWS in the ITP application will be between 0.304 and 0.651 eagles per year. Again, these figures are preliminary and will likely be revised once spring migration point count data has been collected and further coordination with USFWS has occurred. Also, once food based management is in place, the actual collision rate should be much lower than these predicted rates.

Table C3 in Appendix C of the USFWS' Final Environmental Assessment (FEA) on the Proposal to Permit Take under the Bald and Golden Eagle Protection Act ("ITP FEA") (USFWS 2009) provides a permissible annual take threshold for USFWS Region 3. The allowable annual take is 5 percent of annual production or 1 eagle per 15 active breeding pairs. In Region 3, this equates to an annual allowable take of 224.39 individual bald eagles and 28.05 bald eagle territories per year. As of 2007, the USFWS determined that Minnesota had 1,312 of the 3,475 breeding pairs of bald eagles in Region 3 (37.76 percent). If this percentage is applied to the allowable take established for the region, the proportion of the allowable annual take attributable to Minnesota would be about 87.73 individual eagles and 10.59 bald eagle territories per year. The conservative collision rate prediction range of 0.304 to 0.651 collisions per year represents 0.35 to 0.74 percent of Minnesota's pro rata share of the allowable annual take of bald eagles for USFWS Region 3 (i.e. 87.73 eagles).

In the ITP FEA (USFWS 2009), the USFWS states that:

"the Service will initially place a cap on permitted take...at 0% of estimated annual productivity for golden eagles. If, in the future, data and modeling suggest golden eagle populations can support take, we would begin to authorize take at no greater than 1% of annual productivity, unless information available at that time demonstrates that higher levels of take can be supported..."

Only two golden eagles were observed during the fall migration survey, one soaring over an 800 meter radius survey plot and the other was attracted to an artificially placed raccoon carcass. Two eagle exposure minutes were ascribed to each golden eagle and one minute for each was at rotor swept height. If the Band CRM with an 800 meter radius plot size is applied to four golden eagle exposure minutes with an assumption that 50 percent of the flight time being in the RSZ (which is conservative), the predicted collision rate is 0.006 golden eagles per year or one golden eagle being struck every 167 years (Table 12). Accordingly, the probability of a golden eagle collision during the life of the AWA Goodhue project appears to be almost negligible.

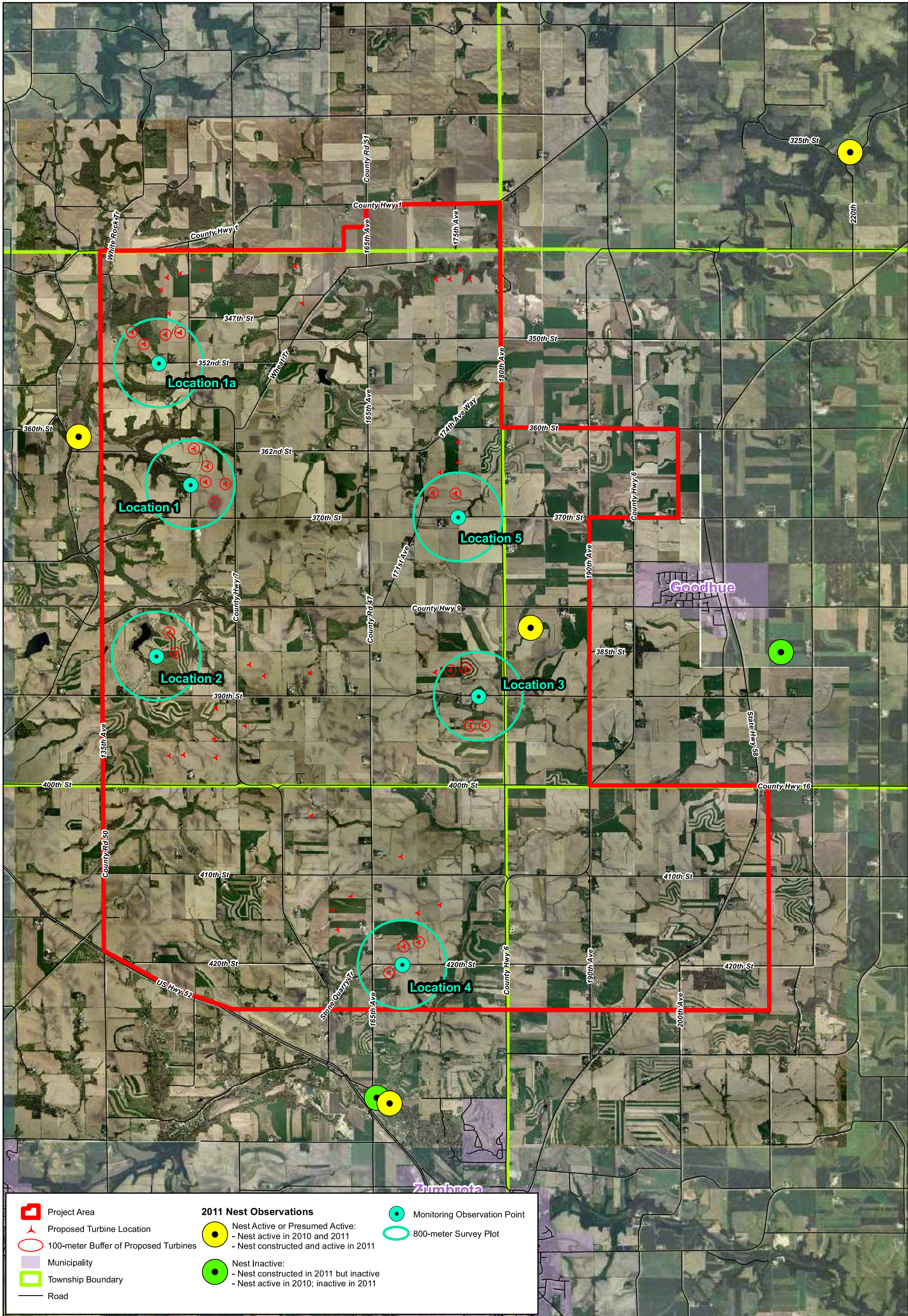
CONCLUSIONS

1. A total of 126 hours of point count monitoring was conducted in one-hour blocks at 6 observation points on 21 dates between October 3 and December 15, 2011.
2. Eagles were observed within six 800-meter radius plots 224 times for a total of 799 "exposure minutes" and were observed within 100 meters of a proposed turbine location 65 times for a total of 78 exposure minutes.
3. With artificial feeding-affected data removed, eagles were observed within the six 800-meter radius plots 117 times for a total of 356 exposure minutes and were observed within 100 meters of a proposed turbine location 24 times for a total of 30 exposure minutes.

4. Artificial food sources were found to have increased eagle exposure minutes by at least 2.25 and 2.6 times for 800 and 100-meter radius survey plots, respectively.
5. Since submission of the ABPP to the MPUC, no additional bald eagle nests have been found within the Operational Project Area plus a two-mile buffer around it.
6. Seasonally-weighted Band CRM collision risk modeling applied to all data from 800 meter radius survey plots (including data affected by artificial feeding) yields a predicted annual collision rate of 0.651 collisions per year, or 1 collision every 1.54 years.
7. Seasonally-weighted Band CRM collision risk modeling applied to all data from turbine-focused 100-meter survey plots (which are believed to more accurately reflect the relationship between eagle movements and turbine locations) yields a predicted annual collision rate of 0.304 collisions per year, or 1 collision every 3.29 years.
8. The conservative collision rate prediction range of 0.304 to 0.651 collisions per year represents 0.35 to 0.74 percent of Minnesota's pro rata share of the allowable annual take of bald eagles for USFWS Region 3 (i.e. 87.73 eagles).
9. Band CRM results for golden eagles observed during the 2011 fall migration season yielded a predicted collision rate of 0.006 golden eagles per year or one golden eagle being struck every 167 years.

LITERATURE CITED

- Band, W., M. Madders & D.P. Whitfield. 2007. Developing field and analytical methods to assess avian collision risk at wind farms. In: De Lucas, M., Janss G.F.E. & Ferrer, M., eds. *Birds and Wind Farms - Risk Assessment and Mitigation*. Servicios Informativos Ambientales/Quercus, Madrid. Pp. 259-275.
- Green, J.C. & R.B. Jansen. 1975. *Minnesota birds – where, when and how many?* University of Minnesota Press. 217 pp.
- USFWS. 2009. Final Environmental Assessment (FEA) on the Proposal to Permit Take under the Bald and Golden Eagle Protection Act. 210 pp.
http://alaska.fws.gov/eaglepermit/pdf/environmental_assessment.pdf.



Data Source(s): USDA AFPO NAIP (2009), MnDNR PLSS (1980), MnDOT Basemap (2010), Westwood (2011).

AWA Goodhue Wind Project - Summary of Raw Eagle Flight Data -- 2011 Fall Migration Period

Table 1: 800m survey plots - raw data

	Below	Within	Above	Perched	Total flight exposure minutes	No. Eagles
Site 1a	32	58	33	0	123	37
Site 1	162	224	59	49	445	114
Site 2	52	48	27	12	127	40
Site 3	23	12	14	6	49	16
Site 4	0	5	10	2	15	6
Site 5	21	11	8	6	40	11
TOTAL	290	358	151	75	799	224

Percentage flights w/in RSZ = 358/799 = 0.448

Table 2: 800m survey plots (minus artificial feeding)

	Below	Within	Above	Perched	Total flight exposure minutes	No. Eagles
Site 1a*	31	55	30	0	116	35
Site 1 *	14	7	2	3	23	12
Site 2	52	48	27	12	127	40
Site 3	23	12	14	6	49	16
Site 4	0	5	10	2	15	6
Site 5*	7	11	8	2	26	8
TOTAL	127	138	91	25	356	117

* denotes documented baiting that affected data

Percentage flights w/in RSZ = 138/356 = 0.388

Table 3: 100m survey plots - raw data**

	Below	Within	Above	Perched	Total flight exposure minutes	No. Eagles
Site 1a	0	2	1	0	3	3
Site 1	24	19	5	0	48	41
Site 2	4	0	7	0	11	9
Site 3	4	3	4	0	11	7
Site 4	0	0	1	0	1	1
Site 5	2	2	0	0	4	4
TOTAL	34	26	18	0	78	65

Percentage flights w/in RSZ = 26/78 = 0.333

Table 4: 100m survey plots (minus artificial feeding)**

	Below	Within	Above	Perched	Total flight exposure minutes	No. Eagles
Site 1a	0	2	1	0	3	3
Site 1 *	0	0	0	0	0	0
Site 2	4	0	7	0	11	9
Site 3	4	3	4	0	11	7
Site 4	0	0	1	0	1	1
Site 5	2	2	0	0	4	4
TOTAL	10	7	13	0	30	24

* denotes documented baiting that affected data

Percentage flights w/in RSZ = 7/30 = 0.233

** 100 meter radius plots are centered on 18 turbines located within 800 meter radius plots

TABLE 5

	PREDICTED NUMBER OF EAGLE-TURBINE COLLISIONS: AWA Goodhue Wind Farm -- 2011 Fall Migration Data Only -- 800 m Radius Plot around Observation Point			
Step	BAND ET AL (2007) MODEL STAGE 1	Units		Comments
1	Point Count Plot radius	m	800	800 meter survey plot around each observation point
2	Area of Point Count Plot	m ²	2010619.298	
3	Number of Plots		6	
4	Total Plot Area	m ²	12063715.79	
5	Plot Height	m	175	
6	Risk Volume (V _w) (Total Observation Plot Volume)	m ³	2111150263	
7	Number of turbines		48	
8	Rotor radius	m	41.25	
9	Rotor depth	m	2	
10	Bird length	m	0.94	
11	Critical Volume (V _r) (Total Rotor Swept Volume for 48 turbines)	m ³	754373.3651	
12	Proportion of Risk Volume Occupied by Critical Volume		0.000357328	Total rotor swept volume/total survey plot volume
13	Plot Observation Time	minutes	7,560	6 plots monitored for 60 minutes on 21 days
14	Observation Time Birds Spent in Flight w/in Risk Volume (V _w)	minutes	799	
15	Proportion of flights at RSH		0.448	From flight durations observed during fall migration 2011 point counts
16	Observation Time Birds Spent at RSH w/in Risk Volume (V _w)	seconds	21477.12	
17	Observation Time Birds Spent at RSH w/in Critical Volume	seconds	7.67437902	Portion of observation time birds would be w/in rotor swept volume
18	Daylight hours in a year in Project Area	hours	4468	Per U. S. Naval Observatory
19	Percentage of Hours Turbines Operational		0.85	Conservative estimate
20	Potential total bird occupancy	minutes per year	227868	Minutes per year birds could be interacting with moving turbine rotors
21	Proportion of Total Bird Occupancy represented by Obs Time		0.033177103	
22	Bird occupancy at RSH of Critical Volume (V _r) per Year	bird-seconds/yr	231.31553	Seconds per year that birds would be within total rotor swept volume
23	Flight speed	meters/second	15.00000	15 m/sec = 33.6 mph (estimated average flight speed per Whitfield (2009))
24	Time taken for transit through rotors	seconds	0.19600	
25	Number of transits through rotors/year	transits/year	1180.18127	
26	BAND Collision % of transits (From Stage 2 results)	collisions/transit	0.09100	From Stage 2 spreadsheet for GE 1.6 WTG - Bird flapping, not gliding
27	Collisions per annum w/o avoidance/displacement factor	collisions/year	107.39650	
28	Avoidance factor (for golden eagles from Whitfield 2009)		0.01000	
29	Predicted collisions per annum	collisions/year	1.07396	
30	Years between predicted collisions	years/collision	0.93113	

TABLE 6

PREDICTED NUMBER OF EAGLE-TURBINE COLLISIONS: AWA Goodhue Wind Farm -- 2011 Fall Migration FEEDING OMITTED -- 800 m Radius Plot around Observation Point			
BAND ET AL (2007) MODEL STAGE 1	Units		Comments
Point Count Plot radius	m	800	800 meter survey plot around each observation point
Area of Point Count Plot	m ²	2010619.298	
Number of Plots		6	
Total Plot Area	m ²	12063715.79	
Plot Height	m	175	
Risk Volume (V _w) (Total Observation Plot Volume)	m ³	2111150263	
Number of turbines		48	
Rotor radius	m	41.25	
Rotor depth	m	2	
Bird length	m	0.94	
Critical Volume (V _r) (Total Rotor Swept Volume for 48 turbines)	m ³	754373.3651	
Proportion of Risk Volume Occupied by Critical Volume		0.000357328	Total rotor swept volume/total survey plot volume
Plot Observation Time (#plots x observation minutes per plot)	minutes	6,960	6 plots monitored for 60 minutes on 21 days MINUS 600 MINS BAITED
Observation Time Birds Spent in Flight w/in Risk Volume (V _w)	minutes	356	
Proportion of flights at RSH		0.38764	From flight durations observed during fall migration 2011 point counts
Observation Time Birds Spent at RSH w/in Risk Volume (V _w)	seconds	8279.9904	
Observation Time Birds Spent at RSH w/in Critical Volume	seconds	2.958673445	Portion of observation time birds would be w/in rotor swept volume
Daylight hours in a year in Project Area	hours	4468	Per U. S. Naval Observatory
Percentage of Hours Turbines Operational		0.85	Conservative estimate
Potential total bird occupancy	minutes per year	227868	Minutes per year birds could be interacting with moving turbine rotors
Proportion of Total Bird Occupancy represented by Obs Time		0.030543999	
Bird occupancy at RSH of Critical Volume (V _r) per Year	bird-seconds/yr	96.86595	Seconds per year that birds would be within total rotor swept volume
Flight speed	meters/second	15.00000	15 m/sec = 33.6 mph (estimated average flight speed per Whitfield (2009))
Time taken for transit through rotors	seconds	0.19600	
Number of transits through rotors/year	transits/year	494.21402	
BAND Collision % of transits (From Stage 2 results)	collisions/transit	0.09100	From Stage 2 spreadsheet for GE 1.6 WTG - Bird flapping, not gliding
Collisions per annum w/o avoidance/displacement factor	collisions/year	44.97348	
Avoidance factor (for golden eagles from Whitfield 2009)		0.01000	
Predicted collisions per annum	collisions/year	0.44973	
Years between predicted collisions	years/collision	2.22353	

TABLE 7

	PREDICTED NUMBER OF EAGLE-TURBINE COLLISIONS: AWA Goodhue Wind Farm -- 2011 Fall Migration Data Only -- 100 m Radius Plot around Observation Point			
Step	BAND ET AL (2007) MODEL STAGE 1	Units		Comments
1	Point Count Plot radius	m	100	100 meter survey plot around each turbine w/in 800 meter radius survey plots
2	Area of Point Count Plot	m ²	31415.92654	
3	Number of Plots		20	
4	Total Plot Area	m ²	628318.5307	
5	Plot Height	m	175	
6	Risk Volume (V _w) (Total Observation Plot Volume)	m ³	109955742.9	
7	Number of turbines		48	
8	Rotor radius	m	41.25	
9	Rotor depth	m	2	
10	Bird length	m	0.94	
11	Critical Volume (V _r) (Total Rotor Swept Volume for 48 turbines)	m ³	754373.3651	
12	Proportion of Risk Volume Occupied by Critical Volume		0.0068607	Total rotor swept volume/total survey plot volume
13	Plot Observation Time (# plots x observation minutes per plot)	minutes	22,680	18 plots monitored for 60 minutes each on 21 days
14	Observation Time Birds Spent in Flight w/in Risk Volume (V _w)	minutes	78	
15	Proportion of flights at RSH		0.3333	From flight durations observed during fall migration 2011 point counts
16	Observation Time Birds Spent at RSH w/in Risk Volume (V _w)	seconds	1559.844	
17	Observation Time Birds Spent at RSH w/in Critical Volume	seconds	10.70162173	Portion of observation time birds would be w/in rotor swept volume
18	Daylight hours in a year in Project Area	hours	4468	Per U. S. Naval Observatory
19	Percentage of Hours Turbines Operational		0.85	Conservative estimate
20	Potential total bird occupancy	minutes per year	227868	Minutes per year birds could be interacting with moving turbine rotors
21	Proportion of Total Bird Occupancy represented by Obs Time		0.099531308	
22	Bird occupancy at RSH of Critical Volume (V _r) per Year	bird-seconds/yr	107.52016	Seconds per year that birds would be within total rotor swept volume
23	Flight speed	meters/second	15.00000	15 m/sec = 33.6 mph (estimated average flight speed per Whitfield (2009))
24	Time taken for transit through rotors	seconds	0.19600	
25	Number of transits through rotors/year	transits/year	548.57223	
26	BAND Collision % of transits (From Stage 2 results)	collisions/transit	0.09100	From Stage 2 spreadsheet for GE 1.6 WTG - Bird flapping, not gliding
27	Collisions per annum w/o avoidance/displacement factor	collisions/year	49.92007	
28	Avoidance factor (for golden eagles from Whitfield 2009)		0.01000	
29	Predicted collisions per annum	collisions/year	0.49920	
30	Years between predicted collisions	years/collision	2.00320	

TABLE 8

	PREDICTED NUMBER OF EAGLE-TURBINE COLLISIONS: AWA Goodhue Wind Farm -- 2011 Fall Migration FEEDING OMITTED -- 100 m Radius Plot around Observation Point			
Step	BAND ET AL (2007) MODEL STAGE 1	Units		Comments
1	Point Count Plot radius	m	100	100 meter survey plot around each turbine w/in 800 meter radius survey plots
2	Area of Point Count Plot	m ²	31415.92654	
3	Number of Plots		20	
4	Total Plot Area	m ²	628318.5307	
5	Plot Height	m	175	
6	Risk Volume (V _w) (Total Observation Plot Volume)	m ³	109955742.9	
7	Number of turbines		48	
8	Rotor radius	m	41.25	
9	Rotor depth	m	2	
10	Bird length	m	0.94	
11	Critical Volume (V _r) (Total Rotor Swept Volume for 48 turbines)	m ³	754373.3651	
12	Proportion of Risk Volume Occupied by Critical Volume		0.0068607	Total rotor swept volume/total survey plot volume
13	Plot Observation Time (# plots x observation minutes per plot)	minutes	20,100	18 plots monitored for 60 minutes each on 21 days minus 43 baited hours or 2580 baited minutes (see adjustments for baiting events table)
14	Observation Time Birds Spent in Flight w/in Risk Volume (V _w)	minutes	30	
15	Proportion of flights at RSH		0.2333	From flight durations observed during fall migration 2011 point counts
16	Observation Time Birds Spent at RSH w/in Risk Volume (V _w)	seconds	419.94	
17	Observation Time Birds Spent at RSH w/in Critical Volume	seconds	2.881082358	Portion of observation time birds would be w/in rotor swept volume
18	Daylight hours in a year in Project Area	hours	4468	Per U. S. Naval Observatory
19	Percentage of Hours Turbines Operational		0.85	Conservative estimate
20	Potential total bird occupancy	minutes per year	227868	Minutes per year birds could be interacting with moving turbine rotors
21	Proportion of Total Bird Occupancy represented by Obs Time		0.088208963	
22	Bird occupancy at RSH of Critical Volume (V _r) per Year	bird-seconds/yr	32.66201	Seconds per year that birds would be within total rotor swept volume
23	Flight speed	meters/second	15.00000	15 m/sec = 33.6 mph (estimated average flight speed per Whitfield (2009))
24	Time taken for transit through rotors	seconds	0.19600	
25	Number of transits through rotors/year	transits/year	166.64293	
26	BAND Collision % of transits (From Stage 2 results)	collisions/transit	0.09100	From Stage 2 spreadsheet for GE 1.6 WTG - Bird flapping, not gliding
27	Collisions per annum w/o avoidance/displacement factor	collisions/year	15.16451	
28	Avoidance factor (for golden eagles from Whitfield 2009)		0.01000	
29	Predicted collisions per annum	collisions/year	0.15165	
30	Years between predicted collisions	years/collision	6.59435	

TABLE 9

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA

Only enter input parameters in blue

W Band 12/14/2011

K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upwind:						Downwind:		
MaxChord	2.8 m	r/R	c/C	α	collide		contribution	collide		contribution
Pitch (degrees)	15	radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r
BirdLength	0.94 m	0.025	0.575	13.89	53.83	1.00	0.00125	52.99	1.00	0.00125
Wingspan	2.29 m	0.075	0.575	4.63	18.22	0.61	0.00455	17.39	0.58	0.00435
F: Flapping (0) or gliding (+1)	0	0.125	0.702	2.78	12.14	0.40	0.00506	11.12	0.37	0.00463
		0.175	0.860	1.98	9.78	0.33	0.00571	8.54	0.28	0.00498
Bird speed	15 m/sec	0.225	0.994	1.54	8.41	0.28	0.00630	6.96	0.23	0.00522
RotorDiam	82.5 m	0.275	0.947	1.26	6.81	0.23	0.00624	5.44	0.18	0.00499
RotationPeriod	6.00 sec	0.325	0.899	1.07	5.70	0.19	0.00617	4.39	0.15	0.00476
		0.375	0.851	0.93	4.87	0.16	0.00609	3.64	0.12	0.00454
		0.425	0.804	0.82	4.23	0.14	0.00599	3.06	0.10	0.00434
		0.475	0.756	0.73	3.72	0.12	0.00588	2.62	0.09	0.00415
Bird aspect ratio: β	0.41	0.525	0.708	0.66	3.29	0.11	0.00577	2.27	0.08	0.00397
		0.575	0.660	0.60	2.94	0.10	0.00564	1.98	0.07	0.00380
		0.625	0.613	0.56	2.64	0.09	0.00549	1.75	0.06	0.00364
		0.675	0.565	0.51	2.37	0.08	0.00534	1.55	0.05	0.00350
		0.725	0.517	0.48	2.14	0.07	0.00518	1.39	0.05	0.00336
		0.775	0.470	0.45	1.94	0.06	0.00500	1.25	0.04	0.00324
		0.825	0.422	0.42	1.75	0.06	0.00481	1.14	0.04	0.00313
		0.875	0.374	0.40	1.61	0.05	0.00470	1.07	0.04	0.00312
		0.925	0.327	0.38	1.51	0.05	0.00465	1.03	0.03	0.00319
		0.975	0.279	0.36	1.41	0.05	0.00458	1.01	0.03	0.00327
Overall p(collision) =					Upwind		10.4%	Downwind		7.7%
					Average			9.1%		

NOTES

Max chord 2.8m from estimate

Pitch 15 deg from estimate

Bird length female maximum 0.94 m - from natureserve.org

Wingspan female maximum 2.29 m from natureserve.org

Bird speed 15 m/s (34mph) - per Whitfield (2009) for golden eagles

Rotor diameter 82.5m for GE 1.6 xle WTG

Rotational period 6 sec for GE 1.6 WTG operating at 8m/s (10 RPM; 700kW; average output for site)

TABLE 10

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA

Only enter input parameters in blue

W Band 12/14/2011

K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upwind:						Downwind:		
MaxChord	2.8 m	r/R	c/C	α	collide		contribution	collide		contribution
Pitch (degrees)	15	radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r
BirdLength	0.94 m	0.025	0.575	13.89	42.27	1.00	0.00125	41.43	1.00	0.00125
Wingspan	2.29 m	0.075	0.575	4.63	14.37	0.48	0.00359	13.53	0.45	0.00338
F: Flapping (0) or gliding (+1)	1	0.125	0.702	2.78	9.83	0.33	0.00410	8.81	0.29	0.00367
		0.175	0.860	1.98	8.13	0.27	0.00474	6.89	0.23	0.00402
Bird speed	15 m/sec	0.225	0.994	1.54	7.12	0.24	0.00534	5.68	0.19	0.00426
RotorDiam	82.5 m	0.275	0.947	1.26	5.76	0.19	0.00528	4.39	0.15	0.00402
RotationPeriod	6.00 sec	0.325	0.899	1.07	4.81	0.16	0.00521	3.50	0.12	0.00380
		0.375	0.851	0.93	4.10	0.14	0.00512	2.86	0.10	0.00358
		0.425	0.804	0.82	3.55	0.12	0.00503	2.38	0.08	0.00338
		0.475	0.756	0.73	3.11	0.10	0.00492	2.01	0.07	0.00319
Bird aspect ratio: β	0.41	0.525	0.708	0.66	2.74	0.09	0.00480	1.72	0.06	0.00301
		0.575	0.660	0.60	2.44	0.08	0.00467	1.48	0.05	0.00284
		0.625	0.613	0.56	2.17	0.07	0.00453	1.29	0.04	0.00268
		0.675	0.565	0.51	1.95	0.06	0.00438	1.13	0.04	0.00254
		0.725	0.517	0.48	1.74	0.06	0.00421	0.99	0.03	0.00240
		0.775	0.470	0.45	1.56	0.05	0.00404	0.88	0.03	0.00228
		0.825	0.422	0.42	1.40	0.05	0.00385	0.79	0.03	0.00217
		0.875	0.374	0.40	1.61	0.05	0.00470	1.07	0.04	0.00312
		0.925	0.327	0.38	1.51	0.05	0.00465	1.03	0.03	0.00319
		0.975	0.279	0.36	1.41	0.05	0.00458	1.01	0.03	0.00327
Overall p(collision) =					Upwind		8.9%	Downwind		6.2%
					Average			7.6%		

NOTES

Max chord 2.8m from estimate

Pitch 15 deg from estimate

Bird length female maximum 0.94 m - from natureserve.org

Wingspan female maximum 2.29 m from natureserve.org

Bird speed 15 m/s (34mph) - per Whitfield (2009) for golden eagles

Rotor diameter 82.5m for GE 1.6 xle WTG

Rotational period 6 sec for GE 1.6 WTG operating at 8m/s (10 RPM; 700kW; average output for site)

**TABLE 11. SUMMARY OF EAGLE COLLISION RISK MODELING PREDICTIONS
AWA GOODHUE WIND PROJECT**

2011 Fall migration Season Data (October 3-December 15, 2011)	Predicted Collisions/Year	Predicted Years between Collisions
Band CRM 800 m radius plots ALL DATA	1.07	0.93
Band CRM 800 m radius plots ARTIFICIAL FEEDING EXCLUDED	0.4973	2.22
Band CRM 100 m radius plots ALL DATA	0.4992	2.00
Band CRM 100 m radius plots ARTIFICIAL FEEDING EXCLUDED	0.1517	6.59

2011 Breeding Season Data (June 17 – August 10, 2011)	Predicted Collisions/Year	Predicted Years between Collisions
Band CRM 800 m radius plots ALL DATA	0.1369	7.31
Band CRM 100 m radius plots ALL DATA	0.02327	43.00

2011 Fall migration Season Data for Golden Eagles Only	Predicted Collisions/Year	Predicted Years between Collisions
Band CRM 800 m radius plots ALL DATA	0.006	156

TABLE 12

	PREDICTED NUMBER OF EAGLE-TURBINE COLLISIONS: AWA Goodhue Wind Farm -- 2011 Fall Migration GOEA Data Only -- 800 m Radius Plot around Observation Point			
Step		Units		Comments
1	Point Count Plot radius	m	800	800 meter survey plot around each observation point
2	Area of Point Count Plot	m ²	2010619.298	
3	Number of Plots		6	
4	Total Plot Area	m ²	12063715.79	
5	Plot Height	m	175	
6	Risk Volume (V _w) (Total Observation Plot Volume)	m ³	2111150263	
7	Number of turbines		48	
8	Rotor radius	m	41.25	
9	Rotor depth	m	2	
10	Bird length	m	0.94	
11	Critical Volume (V _r) (Total Rotor Swept Volume for 48 turbines)	m ³	754373.3651	
12	Proportion of Risk Volume Occupied by Critical Volume		0.000357328	Total rotor swept volume/total survey plot volume
13	Plot Observation Time	minutes	7,560	6 plots monitored for 60 minutes on 21 days
14	Observation Time Birds Spent in Flight w/in Risk Volume (V _w)	minutes	4	
15	Proportion of flights at RSH		0.5	From flight durations observed during fall migration 2011 point counts
16	Observation Time Birds Spent at RSH w/in Risk Volume (V _w)	seconds	120	
17	Observation Time Birds Spent at RSH w/in Critical Volume	seconds	0.042879375	Portion of observation time birds would be w/in rotor swept volume
18	Daylight hours in a year in Project Area	hours	4468	Per U. S. Naval Observatory
19	Percentage of Hours Turbines Operational		0.85	Conservative estimate
20	Potential total bird occupancy	minutes per year	227868	Minutes per year birds could be interacting with moving turbine rotors
21	Proportion of Total Bird Occupancy represented by Obs Time		0.033177103	
22	Bird occupancy at RSH of Critical Volume (V _r) per Year	bird-seconds/yr	1.29244	Seconds per year that birds would be within total rotor swept volume
23	Flight speed	meters/second	15.00000	15 m/sec = 33.6 mph (estimated average flight speed per Whitfield (2009))
24	Time taken for transit through rotors	seconds	0.19600	
25	Number of transits through rotors/year	transits/year	6.59408	
26	BAND Collision % of transits (From Stage 2 results)	collisions/transit	0.09100	From Stage 2 spreadsheet for GE 1.6 WTG - Bird flapping, not gliding
27	Collisions per annum w/o avoidance/displacement factor	collisions/year	0.60006	
28	Avoidance factor (for golden eagles from Whitfield 2009)		0.01000	
29	Predicted collisions per annum	collisions/year	0.00600	
30	Years between predicted collisions	years/collision	166.64976	

APPENDIX A

DOCUMENTATION OF ARTIFICIAL FEEDING FALL 2011 MIGRATION SEASON AWA GOODHUE WIND PROJECT

As recommended by the USFWS and MDNR, we have used all fall 2011 eagle point count survey data in our collision risk modeling for the AWA Goodhue project. However, we believe it is important for the Minnesota Public Utilities Commission (MPUC), Department of Commerce Energy Facility Permitting (DOC-EFP), U. S. Fish and Wildlife Service (USFWS) and Minnesota Department of Natural Resources (MDNR) to understand the basis for the conclusion stated in the ABPP that our fall 2011 eagle survey data has been compromised by baiting (i.e. significantly influenced by artificial feeding activities).

We believe there are important policy reasons not to ignore the activity documented in this appendix. First, if artificial feeding activity is successfully used to inflate survey results and alter permitting decisions, this tactic will likely be adopted on other wind projects that have opposition. Second, this activity is damaging to the eagle resource. While in the short-term it provides a supplemental food source, over the long term it could encourage eagles to modify their migration patterns and nest in locations that lack adequate natural food sources. For this reason, the 2007 USFWS Bald Eagle Management Guidelines recommend against artificial feeding of eagles. Finally, if continued into the operational phase of a wind project, this activity could increase the potential for an eagle-turbine collision.

Not all surface-disposal of livestock and/or wildlife carcasses observed during the fall 2011 surveys were characterized as specifically designed to bait eagles into the survey area. Several instances clearly represented the disposal of the remains of butchered deer from the deer season. Also, one instance of improper livestock carcass disposal, while clearly an artificial feeding activity, did not appear to be in anyway related to the AWA Goodhue project surveys. In that instance, a calf carcass dump was found in May 2011, directly under the newly established eagle nest just west of Goodhue. The landowner was contacted, and he confirmed that he was feeding the eagles. However, the landowner is a participant in another wind project and there was no indication that the deposition was associated with wildlife surveys associated with the AWA Goodhue project. Nonetheless, this carcass dump was reported to BAH when fresh calf carcasses were observed during the helicopter survey on November 28, 2011.

Exhibit A-1 depicts the locations of documented artificial feeding activity in the AWA Goodhue project area. **Table A-1** summarizes the dates, locations, and characteristics of these incidents. **Exhibit A-2** provides representative photographs of documented artificial food sources. The instances listed in rows 2 through 9 and 11 through 23 of Table A-1 are considered evidence of intentional feeding activities for the following reasons:

1. Carl Denkinger of the Board of Animal Health indicated that piglets and pig fetuses in the large numbers observed could only be from a large farrowing operation. He indicated that there were only three such operations in the general area and that all were well outside the AWA Goodhue project area. This indicates that these carcasses were brought

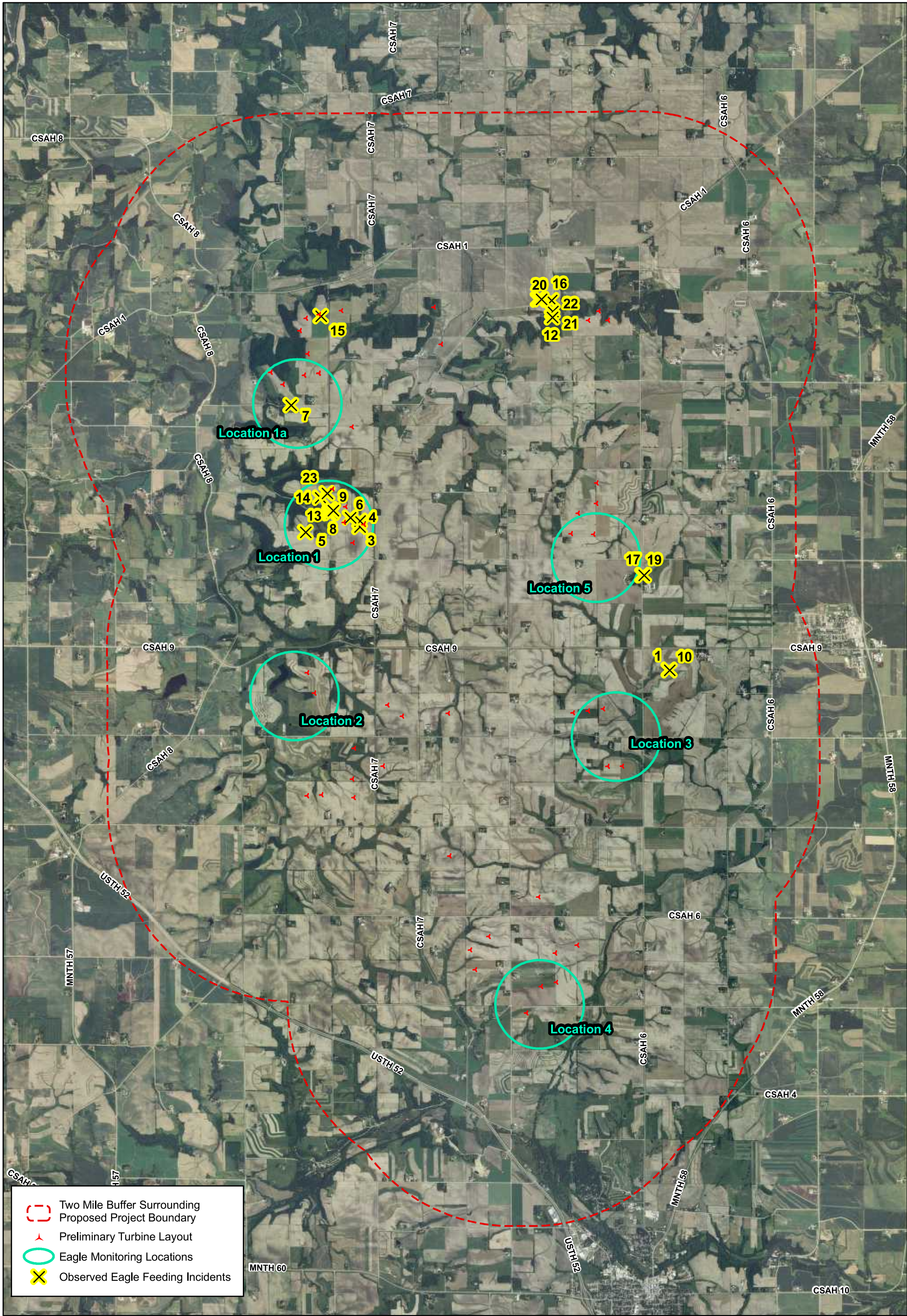
in from outside the AWA Goodhue project area for a purpose other than simple carcass disposal.

2. Multiple disposal incidents were documented in immediate proximity to each other, often on property owned or controlled by the same landowner.
3. Nearly all carcass disposal incidents were directly related to proposed turbine cluster locations or known eagle survey observation points. Given the frequency and visibility of our survey work, survey observation points are very well known among local residents.
4. The vast majority of carcass disposal incidents occurred on land owned or controlled by a small number of property owners.

Relocated road killed wildlife carcasses (raccoons or deer) were only considered evidence of baiting if the carcasses exhibited no evidence of being hunting-related (i.e. no evidence of gunshot wounds, butchering, or tagging and; (a) were found in immediate proximity to locations where pig carcasses had been found or (b) were part of a series of separate instances of wildlife carcass disposal observed in the same location or immediate proximity.

Carl Denkinger from the Board of Animal Health indicated in his December 16, 2011 letter to Larry Hartman of DOC-EFP (**Attachment A**) confirmed that, in his opinion, “[t]his particular case appeared to be dumping for some purpose other than disposal.” He went on to indicate that one of the key landowners he approached indicated that carcasses placed on the ground were associated with the baiting of coyotes to facilitate shooting them. However, this is not a plausible explanation for the widespread pattern of carcass disposal observed, particularly since most disposal locations were far from any cover a hunter could use for concealment. Moreover, in over 126 hours of eagle survey field time on 21 different days during the fall and early winter of 2011, not a single coyote hunter was ever observed by our surveyors. Simply put, intentional baiting by project opponents is the only rational explanation for the amount, character and distribution of the animal carcasses and parts observed during our fall 2011 eagle surveys. Accordingly, we stand by this interpretation of the carcass disposal activities we observed.

TABLE A-1: Documented Eagle Feeding Activity - Fall 2011 - AWA Goodhue Wind Project						
Loc	AnimalType	Observation Date	Comment			
1	Calf Carcass Dump	05-27-2011	NW of Site 3: Fresh carcasses under new 2011 nest; photo documented; landowner confirmed he was feeding eagles			
2	Piglet and pig fetus parts	10-20-2011	Site 1: photo documented			
3	Raccoon carcass	10-27-2011	Site 1: near location of previously documented piglet parts; photo documented			
4	Raccoon carcass (Day 2)	10-28-2011	Site 1: same raccoon carcass observed next day; photo documented			
5	Animal parts in recently plowed field	11-03-2011	Site 1: 42 eagles observed in 1hr and about 800 gulls west of 145th and several eagles east of 145th; fields recently plowed and appears spread with animal parts			
6	2 Pig fetuses	11-04-2011	Site 1: Two pig fetuses found east of 145th ; photo documented			
7	Pig Parts	11-11-2011	Site 1a: Eagles feeding on pig parts observed with optics			
8	14 Piglets and pig fetuses	11-17-2011	Site 1: Found by Board of Animal Health (BAH) (see letter dated 12-16-2011)			
9	Relocated road kill deer	11-28-2011	Site 1: Observed during helicopter survey; photo documented; Same location as previously documented piglet parts			
10	Calf Carcass Dump	11-28-2011	NW of Site 3: Fresh calf carcasses in same location as observed in May; video documented; reported to BAH same day			
11	Relocated road kill deer (Day 2)	11-29-2011	Site 1: Driving transect survey; Confirmed presence of deer seen from helicopter; photo documented; relocated road kill			
12	12 Piglets and pig fetuses	11-30-2011	NW of Turbine Cluster 17-20: 12 piglets and pig fetuses photo documented; landowner approached surveyor; location matches photo in Red Wing Post-Bulletin dated 11-18-2011			
13	Relocated road kill deer (Day 3)	11-30-2011	Site 1: driving transect survey; 3rd day this deer observed			
14	Deer Parts	12-01-2011	Site 1: just NW of piglet and road kill deer location			
15	Eagle observed taking off with apparent pig parts	12-01-2011	North of Site 1a: Photos of 3 eagles on ground; observed pig parts in talons with optics			
16	Piglets and pig fetuses (continued)	12-02-2011	NW of Turbine Cluster 17-20: BAH inspected site & found piglets removed but hair and blood evidence present (see letter dated 12-16-2011)			
17	Dead Calf	12-14-2011	Site 5: adult bald eagle on carcass; very habituated to humans, as eagle didn't leave with human presence; BAH visted landowner same day			
18	Relocated road kill deer	12-15-2011	Site 1: Relocated road killed deer; different deer than 11-28 through 11-30-2011			
19	Dead calf (Day 2)	12-15-2011	Site 5: carcass still present morning of 12-15-2011; landowner removed carcass when surveyor was seen			
20	Raccoon carcass	12-16-2011	NW of Turbine Cluster 17-20: helicopter survey; 2 adults on carcass; photo/video documented; same location as 12 piglets on 11-30-2011			
21	Undetermined animal parts	12-16-2011	NW of Turbine Cluster 17-20: helicopter survey; 8-12 eagles on ground, in trees; photo/video documented; just south of raccoon carcass			
22	2 dead cows	12-16-2011	NW of Turbine Cluster 17-20: helicopter survey; 2 dead cattle in ravine - eagles around and feeding; photo/video documented; just south of raccoon carcass			
23	Relocated road kill deer	12-16-2011	Site 1: relocated road kill deer - appears to be same deer as 12-15 but moved farther into property on same field road; photo/video documented			



Data Source(s): USGS (2011), MNGeo (2011), Westwood (2012).



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AWA Goodhue, LLC Wind Farm

Goodhue County, Minnesota

Observed Eagle Feeding Incidents

EXHIBIT A-1

EXHIBIT A-2
REPRESENTATIVE PHOTOS OF
EAGLE FEEDING ACTIVITY



Eagle Nest Built Above Calf Carcass
Dump: Incidents 1 and 10 in Table A-1
May 27 and November 28, 2011



Close-up of Calf Carcass Dump



Pig Fetus Parts Spread in Field
October 20, 2011 (Incident 2 in Table A-1.



Eagles Feeding on Pig Fetus Parts Spread
in Field October 20, 2011



Road Killed Raccoon Deposited In Field
October 27, 2011 (Same location as pig
parts observed on 10-20-2011): Incident 3
and 4 on Table A-2.



Head of Road Killed Raccoon Deposited
In Field October 27, 2011



Eagles Squabbling Over Road Killed
Raccoon Deposited in Field
October 27, 2011



Pig Fetuses Deposited in Field
November 4, 2011: Incident 6 in Table A-1



Close Up of Pig Fetuses Deposited In
Field November 4, 2011



Eagles Feeding in Location Where Pig
Fetuses Later Found in Field
November 3, 2011



Photo from The Republican Eagle in Red Wing, Minnesota published November 18, 2011 with caption: “A handful of juvenile and adult bald eagles, along with a pair of crows, have breakfast in a field that is located inside the project footprint of a wind farm being developed by AWA Goodhue Wind.”



Photo taken in the field November 30, 2011 by Westwood biologists in same location. Improperly deposited pig carcasses explain why eagles were present in a picked crop field. Incident 12 in Table A-1.



Close-ups of pig carcasses: November 30, 2011





Relocated Road Killed Deer
Deposited in Field (Same Location as
Piglets on 11-04-2011)
Incident 9 in Table A-1
November 29, 2011



Deer Parts Deposited in Field
(Northwest of 11-29-2011 Deer)
Incident 11 in Table A-1
December 1, 2011



Calf Carcass
Incident 17 in Table A-1
December 14, 2011



Adult Bald Eagle Feeding on Calf Carcass
Incident 17 in Table A-1
December 14, 2011



Landowner Removing Calf Carcass when
Surveyor was Observed (one day after
visit from BAH)
Incident 19 in Table A-1
December 15, 2011



Relocated Road Killed Deer
Incident 18 in Table A-1
December 14, 2011



Raccoon Carcass with Eagles Viewed from Helicopter:
Same Location as 12 piglets on 11-03-2011
Incident 20 in Table A-1
December 16, 2011

ATTACHMENT A
DECEMBER 16, 2011 LETTER FROM
MINNESOTA BOARD OF ANIMAL HEALTH



Minnesota

Board of Animal Health

Safeguarding Animal Health

www.bah.state.mn.us

December 16, 2011

4964 Nerstrand Blvd.

Faribault MN 55021

Dear Mr. Hartman,

This letter is in regard to past and ongoing investigations I have been conducting into the illegal disposal of livestock carcasses in the Belle Creek Twp. Area of Goodhue County. In the past month I have received numerous complaints from Westwood Professional Services, Eden Prairie MN relating to observed carcasses of what appeared to be calves and pigs in the area mentioned. I conducted an investigation on 11/17/11 and found baby pig carcasses at the location given by personnel at Westwood. From past experience in investigating this type of complaint, I believe the violation I witnessed on the date of my investigation was not simply a producer dumping carcasses to avoid rendering costs or the trouble of properly disposal. This particular case appeared to be a dumping for some purpose other than disposal. It has been alleged by the complainant that this violation was an effort to lure bald eagles into the area.

I also investigated a similar complaint on 12/2/11 concerning illegal dumping of pig carcasses in the same relative area as the first complaint. I was unable to locate any carcasses but I did find a spot where it was evident from hair and blood remains that carcasses had been on the site. I contacted the land owner and he stated that coyote hunters had used the site to bait coyotes. I informed him that using livestock carcasses to bait varmints is illegal and that he is liable for cleanup of carcasses on his property. He assured me he would put a stop to it in the future.

In addition to the above complaints, I have checked on at least two failures to properly dispose of cattle and found that cattle carcasses were either dumped and removed or in one case had not been properly handled before being observed.

In closing let me state that the Board of Animal Health takes proper carcass disposal very seriously and views dumping of carcasses for any purpose to be a paramount violation of biosecurity. I will continue to investigate any and all reports of violations and take immediate action according to board compliance policy against any party proven guilty of dumping livestock carcasses.

Sincerely yours,

Carl Denkinger

Board of Animal Health

APPENDIX B

This appendix provides the calculations for seasonal weighting of collision risk modeling results for the AWA Goodhue Wind project. Using the most conservative version of the Band CRM output (i.e. 800 meter radius sample plots, data affected by artificial feeding included), the predicted annual collision rate would be as follows:

- Winter = $1.75 \text{ months}/12 \text{ months/yr} \times 0.13685 \text{ collisions/yr} = 0.020 \text{ collisions}$
- Spring migration/breeding season overlap = $2.25 \text{ months}/12 \text{ months} \times (0.13685 + 1.07396) = 0.227 \text{ collisions}$
- Breeding season = $4 \text{ months}/12 \text{ months} \times 0.13685 \text{ collisions/yr} = 0.046 \text{ collisions}$
- Fall migration = $4 \text{ months}/12 \text{ months/yr} \times 1.07396 \text{ collisions/yr} = 0.358 \text{ collisions}$
- Total predicted collisions = 0.651 collisions per year or 1 collision every 1.54 years

If turbine-focused 100-meter survey plots (which are believed to more accurately reflect the relationship between eagle movements and turbine locations) are used and data affected by artificial feeding is still included, the predicted annual collision rate would be as follows:

- Winter = $1.75 \text{ months}/12 \text{ months/yr} \times 0.02327 \text{ collisions/yr} = 0.003 \text{ collisions}$
- Spring migration/breeding season overlap = $2.25 \text{ months}/12 \text{ months} \times (0.02327 + 0.55467) = 0.108 \text{ collisions}$
- Breeding season = $4 \text{ months}/12 \text{ months} \times 0.02327 \text{ collisions/yr} = 0.008 \text{ collisions}$
- Fall migration = $4 \text{ months}/12 \text{ months/yr} \times 0.55467 \text{ collisions/yr} = 0.185 \text{ collisions}$
- Total predicted collisions = 0.304 collisions per year or 1 collision every 3.29 years