Post-Construction Avian Monitoring Study
for the
Shiloh I Wind Power Project
Solano County, California

Year One Final Report

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EXECUTIVE SUMMARY

The Shiloh I Wind Power Project Area is situated on roughly 6,800 acres of agricultural land in the Montezuma Hills, near Rio Vista in Solano County, California. The project consists of 100 wind turbines rated at 1.5 MW each for a total capacity of up to 150 MW. All one hundred turbines went on-line in March 2006.

This report details the first year results of a three-year post-construction study of the Shiloh I wind power projects. This is the third fatality study of the newer turbine technology installed in the Collinsville Montezuma Hills Wind Resource Area (CMHWRA). These turbines are arrayed on similar landscape and habitat as that in which approximately 510 turbines of the older technology are deployed along with more than 200 turbines of the newer technology.

During the first year of this study, carcass surveys were conducted once per week at every other wind turbine tower between April 10, 2006 and April 5, 2007, for a total of 52 near-complete rounds at fifty wind turbine towers.

A total of 173 avian incidents were recorded by searchers during standardized wind turbine tower surveys, representing 35 species plus 13 unidentified passerines. Of the 35 species, 5 were raptor species including American Kestrel, Red-tailed Hawk, Northern Harrier, Golden Eagle, and Barn Owl. There were a total of 30 raptor incidents, 121 songbird incidents involving 22 species (plus unidentified species) and 22 incidents involving a mix of 8 other avian species found during this one year study. Remains of fifty-two bats were found at wind turbine towers by searchers during standardized surveys, representing 4 different species including Hoary Bat, Mexican Free-tailed Bat, Western Red Bat, and Silver-haired Bat.

None of the avian or bat incidents found are listed as federally or state threatened or endangered, however six were California Species of Special Concern, including a Golden Eagle, 2 Northern Harriers, a Tri-colored Blackbird, Yellow Warbler and a Yellow-breasted Chat. Two Burrowing Owl incidents were also found during standardized surveys, but were considered caused by "Other" means, and not deemed wind turbine tower (or met tower) related.

Based on estimated month of death (or injury), the greatest number of incidents occurred during the month of January, with twenty percent of all incidents for the year found in that month alone. The majority (80%) of these were passerines. Sixty-nine percent of raptor incidents occurred during the fall migration and pre-breeding seasons, between October and January. The greatest number of bat incidents occurred during the fall migration period, with 90% of all bat carcasses found between August and October 2006.

Raptor incidents were distributed widely throughout the project area with disproportionately greater numbers of American Kestrels in the northern region (n=14) of the project area (defined as north of Birds Landing Road) than in the south (n=1). Based on the number of wind turbine towers searched in each of these areas, the expected number of incidents would reflect a 3.1:1 ratio, north to south, if incidents were distributed randomly. Incidents of all other species of raptors were more numerous south of Birds Landing Road than north, however the number of

incidents is too small at the end of this one year study to draw any conclusions. There are six (6) turbines at which more than one raptor incident was recorded.

These two regions (north and south) differ in both topography and crop types. In comparison to the north, the southern area consists of steeper hills of higher elevations, which open up to a broad plain running south to the Sacramento River and Suisun Marsh. The south appears to have less variety of crops. Both of these factors may affect bird and bat use of these areas.

The distribution of passerine incidents differed significantly from their expected distribution, with 8 times more incidents found north of Birds Landing Road than south. Incidents of all other avian species were too few to make conclusions.

There were a greater number of bat incidents north of Birds Landing Road than south, with the Mexican Free-tailed Bat accounting for this difference in distribution, with 12 times the number of incidents of this species north of BLR than south. This differed significantly from the expected distribution of incidents based on the tower ratio of 3.1:1.

Distances from wind turbine towers were recorded for all 221 fatalities recorded during standardized surveys. Avian carcasses of all size groups tended to be located somewhat evenly over a larger distance range than bat carcasses, which tended to be located closer to towers. A greater percentage of bat carcasses (73%) were found within 60 meters of the towers as compared to small (40%), medium (42%) and large (43%) birds.

The vegetative cover of the wind farm consists entirely of agricultural land. It can roughly be sorted into two types of cover, pasture and crop land. Vegetation height was classified as short (<6”), medium (6”-12”), or tall (>12”). In the first year of the survey, short vegetation accounted for 55.6% of the surveyed towers, medium for 25.2%, and high for 19.23%.

The percentage of incidents is higher in pasture and till, and lower in croplands: fallow; hay; safflower; and, wheat. Pasture and till are either short vegetative cover or bare soil, so carcass visibility by the surveyor could be an explanation for this difference in incident distribution. A comparison of species group to cover height indicates that there seems to be a visibility factor involved, with over one half of the incidents occurring in short vegetation, about one third in medium vegetation, and only one sixth in high vegetation.

Comparing the species grouped by size to cover height further supports the idea that visibility might be an underlying factor influencing why carcasses were found more heavily in short and medium height vegetation than in tall (high) vegetation. The smallest percentage of incidents was found in tall vegetation, with the most noticeable difference being in the small bird and bat groups.

Comparison of unadjusted fatality rates between species groups at these two project areas shows greater differences between passerine incidents (7.2 times more passerine incidents at Shiloh I). However, raw data showed only 1.3 times more bat incidents and 1.2 times more raptor incidents per tower per year at Shiloh I than at High Winds.

Differences in search protocol may be partly responsible for the greater observances of incidents per turbines searched and the per MW capacity of each turbine. There were fewer turbine searches (50 turbines) at Shiloh I compared to an average of 86.3 at the High Winds site in the first year of that study. However, the 50 turbines at the Shiloh I project site were searched more frequently, every seven days, compared with the 14 day search interval between turbine searches at the High Winds project site. Further, the search radius at each tower in the High Winds project was 75m from the base of the tower, compared to 105m at the Shiloh I project. Thus, the area searched per tower (34,636 m^2) at Shiloh was nearly 2 times the amount searched per tower at High Winds (17,671 m^2).

The numbers of fatalities recorded at the site in this report are unadjusted. It is recognized that the number of carcasses found under the towers is lower than the total number of birds and bats likely to have been killed. There are at least two factors that need to be accounted for. The first is the possibility that the searchers will miss carcasses. A second possibility is that the carcasses are removed prior to the time the searchers arrive on location after the collision event occurred. A scavenger removal and searcher efficiency study was commenced at Shiloh I, with one searcher efficiency and carcass removal test conducted in 2006. Further testing was not conducted in the first year due to an insufficient number of birds to perform statistically valid tests. There are two sources upon which we rely for conducting these tests, birds found in the course of searching and birds acquired from a federal agency. In the first year there were not enough birds collected on site and birds were not available from the agency source to continue. One test in year one was deemed insufficient to establish statistically valid indicators.

In order to extrapolate raw incident data to an estimate of total mortality, a statistically adequate number of tests must be completed. Three to four tests will be conducted on a seasonal basis during the next twelve months. Test design in year two of this study will reflect differences in carcass detection rates at different vegetative heights as evidenced from the first year's data, in order to more accurately reflect true searcher efficiency. In addition, at the end of September, 2007 (the halfway point of the three year study cycle), we will switch and search the other half of the turbines (50) maintaining the same seven day interval cycle. Over the course of the 36 month study all turbines will have been searched for the same duration and at the same interval between searches of each turbine.

1.0 INTRODUCTION

The Shiloh I Wind Power Project Area (hereafter, the "Project"), operated by Shiloh Wind Partners, LLC, encompasses approximately 6,800 acres of agricultural land in the Montezuma Hills, near Rio Vista in Solano County, California. The project is within the Collinsville Montezuma Hills Wind Resource Area (CMHWRA) and is west of the 90 turbine High Winds, LLC project which became operational in 2003. The wind turbines installed in that project are the Vestas V80 model capable of generating 1.8 megawatts. The Shiloh I project utilizes 100 General Electric 1.5 MW wind turbines, for a total capacity of up to 150 MW. The hub height of each wind turbine is 65 meters (213 feet) and the rotor diameter is 77 meters (253 feet), for a total height of approximately 103.5 meters (339.5 feet) above ground level (AGL) when the rotors are in the 12 o'clock position. At the 6 o'clock position the tip of the rotors are approximately 26 meters AGL. The Shiloh project is also adjacent to a 510 turbine wind farm originally constructed by Kenetech Windpower in the early 1990s and is currently operated by enXco. The turbines in this project are the Kenetech Model KCS-56, each one capable of generating 100 kilowatts. The Shiloh project is north and west of this project area. One hundred turbines went on-line in March, 2006.

The Collinsville-Montezuma Hills Wind Resource Area (WRA) consists of approximately 40,300 acres of area. The current development area of the existing wind plants including Shiloh I consists of approximately 17,300 acres. The WRA in which the turbines are arrayed is situated about 3 miles west of Rio Vista in Solano County, California. The landscape consists of rolling hills with elevations ranging between near sea level adjacent to the Sacramento River to about 250 - 300 feet (61-91 m) in elevation above sea level. Turbines are placed on the highest ground and do not run through low-lying valleys. The northern boundary of the WRA for the present is California State Highway 12. The southern boundary is the Sacramento River Deep Water Ship Channel. The Sacramento River Deep Water Ship Channel is about 1.5 miles to the South of the southernmost location where turbines are located and most turbines are more than 4.5 miles from this waterway. Moving from south to north the terrain becomes more uniform with less elevation differential between the ridges and the valleys. On the west is the Suisun Marsh. The Suisun Marsh is a minimum of 1.25 miles from where the nearest turbine is located, with most turbines being located more than 1.5 miles from these wetlands. The terrain is generally uniform along the east-west axis.

The project is dissected by Shiloh Road, Birds Landing Road, Montezuma Hills Road and Talbert lane. These roads are bounded by narrow weedy (mostly grasses) strips and a few homesteads complete with houses, yards, barns, driveways, and other structures necessary for farming. The land is privately owned and is largely agricultural. Where turbines and project roads are located the land use is rotating agricultural crops and grazed pastures. Crops include wheat, barley, hay, safflower and fallow fields. A multi-year rotation is the norm with wheat, fallow, and grazing alternating being the regime used most often. There are some isolated wetlands (mostly cattail marsh) and one small reservoir within the project boundaries, but these are not within the project footprint.

Treed areas within the project are limited to the areas close to homes and in a few valleys. No trees were removed to construct the project. Many of the trees are non-native eucalyptus, olive,

and other species, although some native oaks and junipers are present near homes. There is a large olive grove to the east of the project area. These treed habitats provide havens and nesting substrate for birds that do not use farmland and other birds that forage in tilled fields.

2.0 METHODS

2.1 Carcass Surveys

2.1.1 Clean Sweep Surveys: Prior to the start of the carcass surveys, a "clean sweep" was conducted at all newly installed and operational wind turbine towers to remove all carcasses and remains of carcasses from the survey area. Clean sweeps were conducted using the same protocol as used in the standardized carcass surveys (see below), except that virtually all (99 of 100) of the installed towers were searched during the clean sweeps while only every other tower (n=50) was searched during standardized surveys. The thoroughness of the sweep was adopted to increase the likelihood that all carcasses found during the subsequent surveys would be associated with incidents that occurred during the course of the systematic surveys, and remove the possibility that scavengers or wind could relocate remains between towers. The clean sweep for 99 of all 100 towers was executed March 28 through April 8, 2006. The one tower not surveyed (A16) during the clean sweeps was not part of the set of towers surveyed during subsequent standardized surveys, and was unable to be surveyed during clean sweeps due to road construction and the presence of heavy equipment surrounding the tower. Standardized surveys of every other tower started two days following the clean sweeps, on April 10, 2006.

2.1.2 Standardized Surveys: During the first year of this on-going three-year project, carcass surveys were conducted once per week at the same fifty (every other tower of the 100) wind turbine towers between April 10, 2006 and April 5, 2007, for a total of approximately 52 total rounds. In order to avoid having the towers continually surveyed during the same time of day, each round started 3 towers beyond where the previous survey was started.

The survey consists of searchers walking in concentric circles around the tower's base at distances of 15, 30, 40, 50, 60, 70, 80, 90 and100 meters, and also around the base of each tower (Figure 1). While walking around each ring, the searcher using the unaided eye, alternately scans an area that extends for 5m in either side of his track (7-1/2 m on one side of the 15 and 30-meter circles), yielding a total of 105 meters scanned. The surveyors use range finders to initially establish and periodically check the distance of each circular route from the tower. Data recorded at the beginning of the surveys includes meteorological data (cloud cover, temperature, and wind velocity) and ground cover information (crop type and height). In addition, the start and finish times are recorded for each tower searched (see Appendix A).

When a carcass or injured bird or bat is found, the searchers perform a thorough investigation and documentation of the incident using the protocols listed in the Wildlife Response and Reporting System (WRRS). An incident report number is assigned and an incident report form filled out for each find (Appendix B). A GPS is used to determine geographic coordinates, and a range finder and compass are used to determine distance and bearing from the tower. The carcass is photographed in the position in which it is found (in situ) using a digital camera. After identifying the animal by species (including age and sex when possible), an examination is

performed to determine the nature and extent of any injuries, and whether any scavenging or insect infestation has occurred. The time since death is estimated and recorded. In case of dismemberment, the surveyors search the vicinity to locate all body parts. Loose feathers are only considered fatalities if enough feathers are found to represent a dead bird. All loose feathers are collected in order to avoid identifying the feathers as an additional kill during the next survey of the tower. The carcass is then placed in a plastic bag labeled with date, species, tower number, and incident report number, and taken to a freezer to be stored in accordance with the FWS permit requirements. When carcasses are found at times and locations outside of one of the standardized surveys conducted as part of this study, such as during avian surveys or while driving between sites, the carcass is processed as above but it is classified as an "incidental" find.

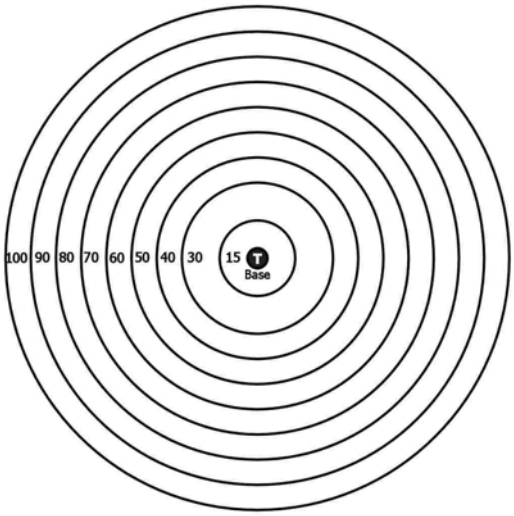

Figure 1. Search pattern for wind turbine tower carcass survey (distance in meters)

When an injured animal is found, the searchers record the same data collected for a carcass (noting however, that it is an injury and not a fatality). The searchers then capture and restrain the animal in a manner to avoid either further injury to the animal or injury to the survey crew. Once the animal is secured it is transported to a wildlife rehabilitator or veterinarian. The hospital accession number and the final disposition of the animal are recorded on the report form.

Only in those cases where the injury to the animal can be linked to a specific tower is a tower number recorded as the location in the report. When no corroborating information that the injury is linked to a tower is available, the animal is simply recorded as having been found "ON SITE". For instance, if a bird is found injured with a broken wing but is still mobile, it would not be associated with a specific wind turbine tower because it could have moved and the cause of incident cannot be assigned.

If the carcass or injured animal found is listed as a threatened or endangered species, the Avian Respondent, listed in the WRRS, is notified immediately by phone, and collection of the dead animal is delayed until specific direction for proceeding is received from the U.S. Fish and Wildlife Service. All Golden Eagle fatalities are reported to the U.S. Fish and Wildlife Service.

3.0 RESULTS

3.1 Carcass Surveys

3.1.1 Clean Sweeps. A total of 99 clean sweep surveys were conducted March 28 through April 8, 2006, totaling 1 round of surveys (ie. an individual survey) at every tower except one (A16) of the project area's 100 wind turbine towers. Carcasses found included: 1 European Starling, 3 Red-tailed Hawks, 1 Western Meadowlark, and 1 Hoary Bat (see Appendix C for data on these incidents).

3.1.2 Standardized Surveys. A total of 52 near-complete rounds (n = 51.42) of standardized searches were conducted between April 10, 2006 and April 5, 2007 (Table 1) on 258 days (70% of the days of the year), for a total of nearly 2571 complete individual turbine searches. For various reasons, some towers could not be completely surveyed every week. The reasons towers were not surveyed or were only partially surveyed included: presence of impenetrable tall and thorny safflower groundcover, application of biosolids/manure or pesticides/herbicides, presence of heavy equipment present near tower, or temporary loss of permission from landowner to be on the land. Biosolids refer to sewage treatment plant solid waste used as a fertilizer. The details of the rounds and dates towers were surveyed is shown in Table 1. The average number of wind turbine towers surveyed during the first year of this project was 49.44. The average number of days between successive searches for each tower was 7.0 days (Standard Deviation = 1.57).

Table 1. Summary of rounds of fatality searches during year 1 of Shiloh I carcass surveys: clean sweeps and standardized surveys

Year	Round No.	Dates Surveyed
Clean Sweep of 99 Wind Turbine Towers		
2006	Complete Round	March 28, 29, 30, 31 & April 1, 2, 5, 6, 7, 8
Carcass Surveys of 50 Wind Turbine Towers		
2006	Round 1	April 10, 11, 12, 13, 14
	Round 2	April 17, 18, 19, 20, 21
	Round 3	April 24, 25, 26, 27, 28, 29
	Round 4	May 1, 2, 3, 4, 5
	Round 5	May 8, 9, 10, 11, 12, 13
	Round 6	May 15, 16, 17, 18, 19
	Round 7	May 21, 22, 23, 24, 25 *(T#C3R, C8R, C23 not surveyed*)*
	Round 8	May 30, 31 & June 1, 2, 3
	Round 9	June 5, 6, 7, 8
	Round 10	June 10, 11, 12, 13, 14, 15 *(T#A9, A23, A24 partially surveyed **)*
	Round 11	June 17, 18, 19, 21, 22, 23, 24 *(T#A9, A23, A24 partially surveyed **)*
	Round 12	June 26, 27, 28, 29, 30 *(T#A9, A23, A24 partially surveyed **)*
	Round 13	July 3, 5, 6, 7 *(T#A9, A23, A24 partially surveyed **)*
	Round 14	July 10, 11, 12, 13, 14 *(T#A9, A23, A24 partially surveyed **)*
	Round 15	July 17, 18, 19, 20, 21 *(T#A9, A23, A24 partially surveyed **)*

Year	Round No.	Dates Surveyed
2006	Round 16	July 24, 25, 26, 27, 28 *(T#A9, A23, A24 partially surveyed **)*
	Round 17	July 31 & August 1, 2, 3, 4 *(T#A9, A23, A24 partially surveyed **)*
	Round 18	August 7, 8, 9, 10, 11 *(T#A9, A23, A24 partially surveyed **)*
	Round 19	August 14, 15, 16, 17, 18 *(T#A9, A23, A24 partially surveyed **)*
	Round 20	August 21, 22, 23, 24, 25 *(T#A23 partially surveyed **)*
	Round 21	August 28, 29, 30, 31 & September 1
	Round 22	September 5, 6, 7, 8, 9
	Round 23	September 11, 12, 13, 14, 15 *(T#B16R partially surveyed***)*
	Round 24	September 18, 19, 20, 21, 22 *(T#B10 not surveyed*)*
	Round 25	September 25, 26, 27, 28, 29 *(T#A23 not surveyed*)*
	Round 26	October 1, 2, 3, 4, 5, 6, 7
	Round 27	October 9, 10, 11, 12, 13
	Round 28	October 16, 17, 18, 19, 20, 21
	Round 29	October 23, 24, 25, 26, 27
	Round 30	October 30, 31 & November 1, 2, 3, 4
	Round 31	November 6, 7, 8, 9
	Round 32	November 13, 14, 15, 16, 17
	Round 33	November 19, 20, 21, 22
	Round 34	November 27, 28, 29, 30 & December 1, 2
	Round 35	December 4, 5, 6, 7
	Round 36	December 11, 13, 14, 15
	Round 37	December 18, 19, 20, 22
	Round 38	December 26, 27, 28, 29, 30
2007	Round 39	January 2, 3, 4, 5
	Round 40	January 6, 8, 9, 10, 11
	Round 41	January 15, 16, 17, 18 *(T#C3R not surveyed*)*
	Round 42	January 22, 23, 24, 25, 26, 27 *(T#B20 not surveyed*)*
	Round 43	January 29, 30, 31 & February 1, 2
	Round 44	February 5, 6, 7, 8
	Round 45	February 12, 13, 14, 15, 16
	Round 46	February 18, 19, 20, 21, 22, 23, 24
	Round 47	February 27, 28 & March 1, 2
	Round 48	March 5, 6, 8, 9, 10
	Round 49	March 12, 13, 14, 15
	Round 50	March 19, 20, 21, 22
	Round 51	March 26, 27, 28, 29
	Round 52	April 2, 3, 4, 5

Survey Summary

Standardized Surveys	Total # Field Days	258
	Total (Average) # of Rounds	51.42
	Average # of Towers Surveyed	49.44
	Total # of Individual Surveys	2570.95
	Total # Searcher-Hours in Field	2741.5
	Average # Searcher-Hours per Survey	1.07
	Average # Searcher-Minutes per Survey	64.0
Clean Sweep Surveys	Total # Field Days	10

Survey Summary

Total (Average) # of Rounds	1
Average # of Towers Surveyed	99
Total # of Individual Surveys	99
Total # Searcher-Hours in Field	132.05
Average # Searcher-Hours per Survey	1.33
Average # Searcher-Minutes per Survey	80

* The reasons surveys at specified towers were not conducted include: application of biosolids/manure or pesticides/herbicides, heavy equipment present near tower, or temporary loss of permission from landowner to be on the land.

** Partial surveys of wind turbine towers A9, A23, and A24 were due to tall, thorny safflower ground cover preventing all survey area to be searched. The proportions of the area surveyed for each of these towers are as follows: A9 ~ 50% (Rounds 10-19), A23 ~ 15% (Rounds 10-20), and A24 ~ 30% (Rounds 10-19).

*** Partial survey of wind turbine tower B16R was due to the spreading of manure/biosolids, allowing only 30% of the survey area to be searched for Round 23.

During the first year of this study, a grand total of 241 incidents were recorded (Table 2). Of the wind turbine related incidents, 225 incidents were found during standardized surveys, and an additional 10 were found in between surveys, or "incidentally", and all of these latter incidents were classified as "incidental" finds (Appendix D and E). In addition to these wind turbine incidents, a total of 6 incidents were collected which were deemed caused by something other than wind turbines based on their locations and/or conditions. "Other" possible causes include: predators, barbed wire fence, or harvesting equipment. Three of these "Other" cause related incidents were found during standardized surveys, and 3 were incidental (see Appendix F).

Table 2. Number of Wind Turbine and Other* Cause - related incidents per species at the Shiloh I Project Area, April 10, 2006 - April 5, 2007, found during standardized surveys and incidentally

	Wind Turbine (235)		Other* (6)		Grand
Species	Standardized	Incidental	Standardized	Incidental	**Total**
Bird Species (total = 173)					
American Coot	2				2
American Goldfinch	1				1
American Kestrel	15				15
American Pipit	4				4
Barn Owl	4			2	6
Black Headed Grosbeak	1				1
Black-throated Gray Warbler	1				1
Brewer's Blackbird	6				6
Burrowing Owl**			2		2
Chukar	1				1
Dark-eyed Junco, slate	1				1
European Starling	2				2
Golden Eagle**	1				1
Golden-Crowned Kinglet	1				1
Golden-Crowned Sparrow	1				1
Hammond's Flycatcher	1				1
Horned Lark	5				5

Species	Wind Turbine (235) Standardized	Wind Turbine (235) Incidental	Other* (6) Standardized	Other* (6) Incidental	Grand Total
House Sparrow	1				1
Mallard	4				4
Mourning Dove	8				8
Northern Flicker	1				1
Northern Harrier**	2				2
Northern Mockingbird	1				1
Red-tailed Hawk	8	4			12
Red-winged Blackbird	27	1			28
Ring-necked Pheasant	1				1
Rock Pigeon	4	1			5
Savannah Sparrow	3				3
Tree Swallow	3	1			4
Tri-colored Blackbird**	1				1
Virginia Rail	1				1
Western Meadowlark	42				42
Western Wood Pewee		1			1
White-crowned Sparrow	2				2
Wilson's Warbler	2				2
Yellow Warbler**	1				1
Yellow-breasted Chat**	1				1
Unidentified Sparrow spp.	3				3
Unidentified Swallow spp.	1				1
Unknown passerine spp.	9		1	1	11
Subtotal Avian Species	**173**	**8**	**3**	**3**	**187**
Bat Species (total = 54)					
Hoary Bat	24	1			25
Mexican Free-tailed Bat	26	1			27
Silver-Haired Bat	1				1
Western Red Bat	1				1
Subtotal Bat Species	**52**	**2**			**54**
Grand Total	**225**	**10**	**3**	**3**	**241**

* Indicates incidents in which cause of death or injury did not appear to be wind turbine tower related (i.e. causes appeared to be related to possible predator, barbed wire fencing, harvesting equipment, etc.)
** Denotes California Species of Special Concern (CSC)

A total of 173 wind turbine related avian incidents were recorded by searchers during standardized surveys, representing 35 species and 13 unidentified birds (3 of these were sparrows, 1 a swallow, and 9 were not identified to species but classified as passerines; Tables 2 and 3). Of the 35 species, 5 were raptor species including American Kestrel (15), Red-tailed Hawk (8), Northern Harrier (2), Golden Eagle (1), and Barn Owl (4). There were a total of 30 turbine related raptor carcasses found during this 12 month period. The largest number of carcasses found were songbirds, this group comprised 121 incidents identified to 22 different species plus unidentified species. Fifty-two (52) bat carcasses were found by searchers, representing 4 different species including Hoary Bat (24), Mexican Free-tailed Bat (26), Silver-haired Bat (1), and Western Red Bat (1). There were a total of 4 waterfowl incidents, all of them Mallards. Water bird species found included 2 American Coot and 1 Virginia Rail. Other avian

species included a mixed group of dove, a pheasant, a Chukar, and a flicker (Tables 2 and 3), comprising 5 species involved in 15 incidents.

For purpose of our analyses, "raptors" included all eagles, hawks, kites, falcons, harriers, and owls (predatory birds). Non-protected non-native species including Rock Dove and European Starling were included in analyses, fatality maps and data tables.

Table 3. Number of incidents per species grouping (raptors, passerines, waterfowl, water birds, other birds, bats) for year 1, found during standardized surveys at wind turbine towers

Species Group	# of Incidents
Bird Species	
Raptor (including owls)	30
Passerine (including unidentified bird spp.)	121
Waterfowl (ducks)	4
Water Bird (coots, rails)	3
All Other Bird spp. (doves, flickers, pheasants, etc.)	15
Bat Species	52
Total	**225**

All but four of the incidents found the first year of this study during standardized surveys were fatalities. Four injured birds were found, including an American Pipit, Western Meadowlark, Savannah Sparrow, and Golden Eagle, all of which were semi-mobile and therefore were considered "ON SITE" and not associated with a specific wind turbine tower. Their injuries were, however, consistent with collision with a wind turbine. All four injured birds were taken to Lindsay Wildlife Hospital.

1. April 12, 2006. A juvenile American Pipit was found with a broken right wing 46 meters north of Tower C1.

2. June 23, 2006. A juvenile Western Meadowlark was found 99 meters WSW of Tower C17. It appeared to be trying to fly, with its left wing was severed at the elbow.

3. February 28, 2007. An adult Savannah Sparrow was found unable to fly, 90 meters south of Tower A9.

4. March 10, 2007. An adult male Golden Eagle was found 200 meters WSW of Tower F3. It's primaries on left wing were gone, it had fractured metacarpals and could not fly (but was still mobile), was therefore non-releasable. The bird was euthanized and is listed elsewhere in this document as a fatality and included in the fatality data.

None of the carcasses or injured birds found is listed as federally or state threatened or endangered. Six fatalities were California Species of Special Concern, including a Golden Eagle, 2 Northern Harriers, a Tri-colored Blackbird, Yellow Warbler and a Yellow-breasted

Chat. Two Burrowing Owl incidents were also found during standardized searches, but were considered caused by "Other" means, and not deemed wind turbine tower related.

The number of wind turbine related incidents found per total installed megawatt capacity per year was calculated to provide a comparable metric between different wind power projects. The individual wind turbine MW of 1.5 was multiplied by the average number of wind turbine towers searched during the first year of this study (n=49.44, less than 50 because of partial and missed surveys) to yield a total installed megawatt capacity of 74.16 MW. Another unit for comparison purposes, the number of incidents per turbine tower per year, was also calculated (Table 4).

Table 4. Unadjusted number of incidents per species during year 1 surveys per total Installed megawatt capacity* per year, and per turbine per year, at the Shiloh I Project Area, April 2006 – April 2007, found during standardized surveys

Species	YEAR ONE (Ave. 49.44 Turbines)	# Incidents per Mw/Year	# Incidents per Turbine/Year
Bird Species (total = 173)			
American Coot	2	0.0270	0.0405
American Goldfinch	1	0.0135	0.0202
American Kestrel	15	0.2023	0.3034
American Pipit	4	0.0539	0.0809
Barn Owl	4	0.0539	0.0809
Black Headed Grosbeak	1	0.0135	0.0202
Black-throated Gray Warbler	1	0.0135	0.0202
Brewer's Blackbird	6	0.0809	0.1214
Chukar	1	0.0135	0.0202
Dark-eyed Junco, slate	1	0.0135	0.0202
European Starling	2	0.0270	0.0405
Golden Eagle**	1	0.0135	0.0202
Golden-Crowned Kinglet	1	0.0135	0.0202
Golden-Crowned Sparrow	1	0.0135	0.0202
Hammond's Flycatcher	1	0.0135	0.0202
Horned Lark	5	0.0674	0.1011
House Sparrow	1	0.0135	0.0202
Mallard	4	0.0539	0.0809
Mourning Dove	8	0.1079	0.1618
Northern Flicker	1	0.0135	0.0202
Northern Harrier**	2	0.0270	0.0405
Northern Mockingbird	1	0.0135	0.0202
Red-tailed Hawk	8	0.1079	0.1618
Red-winged Blackbird	27	0.3641	0.5461
Ring-necked Pheasant	1	0.0135	0.0202
Rock Pigeon	4	0.0539	0.0809
Savannah Sparrow	3	0.0405	0.0607
Tree Swallow	3	0.0405	0.0607
Tri-colored Blackbird**	1	0.0135	0.0202
Virginia Rail	1	0.0135	0.0202
Western Meadowlark	42	0.5663	0.8495

Species	YEAR ONE (Ave. 49.44 Turbines)	# Incidents per Mw/Year	# Incidents per Turbine/Year
White-crowned Sparrow	2	0.0270	0.0405
Wilson's Warbler	2	0.0270	0.0405
Yellow Warbler**	1	0.0135	0.0202
Yellow-breasted Chat**	1	0.0135	0.0202
Unidentified Sparrow spp.	3	0.0405	0.0607
Unidentified Swallow spp.	1	0.0135	0.0202
Unknown passerine spp.	9	0.1214	0.1820
Subtotal Avian Species	**173**	**2.3328**	**3.4992**
Bat Species (total = 52)			
Hoary Bat	24	0.3236	0.4854
Mexican Free-tailed Bat	26	0.3506	0.5259
Silver-Haired Bat	1	0.0135	0.0202
Western Red Bat	1	0.0135	0.0202
Subtotal Bat Species	**52**	**0.7012**	**1.0518**
Grand Total	**225**	**3.0340**	**4.5510**

* A total installed megawatt capacity of 74.16 MW was calculated by multiplying individual turbine MW of 1.5 by the average number of wind turbine towers surveyed per round throughout the one year survey of 49.44.
** Denotes California Species of Special Concern (CSC).

The number of wind turbine associated incidents found during standardized surveys was calculated per month for each species grouping. The estimated month of death or injury was determined by subtracting the estimated number of days since death or injury from the report date. The estimated month of death or injury could not be calculated for 7 of the 225 incidents because the number of days since death could not be accurately determined from the condition of those carcasses. Those carcasses were either scavenged at a faster rate than the other carcasses, or were too deteriorated to date, suggesting that they went unobserved during one or more round of searches. These (7) carcasses with unknown estimated months of death were excluded from our estimated month of death (or injury) analyses of the (218) other carcasses. See Appendices D and E for those incidents with unknown number of days since death or injury.

The greatest number of incidents occurred during the month of January, with a total of 44 (20% of the total) incidents in that month alone, 35 (80%) of them passerine species (Table 5). A large number of bat incidents occurred during the fall migration months, with 47 carcasses recorded between August and October, representing 90% of all bat incidents found during the entire year. Sixty-nine percent of raptor incidents occurred between October and January, during the fall migration and pre-breeding seasons. The three Mallard incidents occurred in April 2006, the three "water birds" incidents occurred in August (1 Virginia Rail) and March 2007 (2 American Coots), while the number of incidents of "other birds", a mixed group of species, did not vary greatly between months as a group.

Table 5. Number of wind turbine related incidents per species grouping per month*

	2006										2007			
Species Group	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Total**
Avian														
Raptor				1	4			8	1	5	6		4	29
Passerine	1	3	3	5	7	6	4	14	10	9	35	10	9	116
Waterfowl		3												3
Water Bird						1							2	3
Other Bird			2		1	3	1	2	1	1	3		1	15
Bat		1		2		15	23	9					2	52
Total	1	7	5	8	12	25	28	33	12	15	44	10	18	218

*Estimated month of death or injury, calculated by subtracting estimated number of days since death or injury from the report date. These numbers include incidents with known estimated month of death or injury, which were associated with wind turbine towers and found during standardized surveys only.

Forty-eight percent (n=14) of the raptor incidents found during the year (American Kestrels and Red-tailed Hawks) were recorded during migration between October and December (Table 6), and another 21% were recorded in January. Four of the six raptor incidents in January were Barn Owls while the other 2 were American Kestrels, indicating a decrease in numbers of kestrel and buteo turbine strikes by January (Table 6). Two Northern Harrier fatalities were recorded, one in June (during nesting season) and one in March 2007, both of which were adult males. During March of 2007 during the breeding season for most raptor species, an injured adult male Golden Eagle was found, along with an American Kestrel and Red-tailed Hawk.

Table 6. Number of wind turbine related incidents per raptor species per month*

	2006										2007			
Raptor Species	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Total**
Golden Eagle													1	1
Red-tailed Hawk					1			2		3			1	7
American Kestrel					3			6	1	2	2		1	15
Northern Harrier				1									1	2
Barn Owl											4			4
Total				1	4			8	1	5	6		4	29

*Estimated month of death or injury, calculated by subtracting estimated number of days since death or injury from the report date. These numbers include incidents with known estimated month of death or injury, which were associated with wind turbine towers and found during standardized surveys only.

The majority of raptor incidents which could be identified to age were adults (Table 7), however approximately 53% of American Kestrels were not identified to age because of missing feathers or body parts. Of those that were identifiable, 5 were adults and 2 were first year birds. Of 8 Red-tailed Hawk incidents, 5 were adults, 2 were first year birds, and 1 was of unknown age.

Table 7. Age classes of raptor wind turbine tower related incidents

Species	Adult	First Year	Unknown	Total
Golden Eagle	1			1
Red-tailed Hawk	5	2	1	8
American Kestrel	5	2	8	15
Northern Harrier	2			2
Barn Owl	2		2	4
Total	15	4	11	30

3.1.3 Spatial Distribution of Incidents

To determine if there are a statistically greater number of incidents occurring in one area than another, we divided the wind project area into two areas for spatial distribution analyses. These two areas are defined as follows: 1) North of Birds Landing Road, which encompasses 38 wind turbine towers (rows A, B, C, D, and E), hereafter referred to as "the north"; and 2) South of Birds Landing Road, with 12 wind turbine towers (rows F, G, and H), referred to as "the south". In comparison to the north, the southern area consists of steeper hills of higher elevations, which open up to a broad plain running south to the Sacramento River and Suisun Marsh. Based on observation from the first year of this study, there also appears to be less variety of crops in the south, with the land used for growing mostly hay, and to a lesser degree wheat and oats.

If the incidents are randomly spread throughout the area, with no difference between the north and the south, the number of incidents would be proportionate to the number of wind turbines in each of these areas. There are 38 wind turbines north of Bird Landing Road, and 12 in the south, however nine of the towers in the north were partially surveyed or had missed surveys on certain dates during the 52 rounds of surveys (see Table 1), therefore in the north, only 37.44 towers were searched (98.5% of 38 towers). Therefore the number of incidents would be expected to reflect a 3.1:1 ratio (37.44 to 12 ratio) in these two regions if there is no difference between the north and south regions.

3.1.3.1 Raptors

Raptor incidents were distributed widely throughout the project area (Figure 2), with greater numbers north of Birds Landing Road than south. Distribution of actual incidents (using only standardized survey incident data) appear to show disproportionately greater numbers of American Kestrel incidents north of Bird Landing Road than south (14:1) than expected in a random distribution (Table 8) . However, the difference in proportion was not significant according to a chi-squared analysis, as the actual number of incidents was fairly low ($\chi = 2.47$, $0.10<p<0.15$). There are several (6) wind turbine towers with 2 or more raptor incidents in the north (towers A4 and B14 had 3 American Kestrel incidents each).

Incident numbers were too low to discern any evident pattern of fatality between north and south sites.

Table 8. Comparison of raptor incident distribution to wind turbine tower distribution*

	Number			Ratio	
	North	South	Total	North	South
Number of Turbines	38	12	50	3.1	1
Incidents					
American Kestrel	14	1	15	14	1
Red-tailed Hawk	5	3	8	1.7	1
Golden Eagle	0	1	1	0	1
Northern Harrier	1	1	2	1	1
Barn Owl	2	2	4	1	1
Total Raptor Species	**22**	**8**	**30**	**2.75**	**1**

*Project area divided into two regions, North and South of Birds Landing Road. Note: Includes data from standardized surveys only.

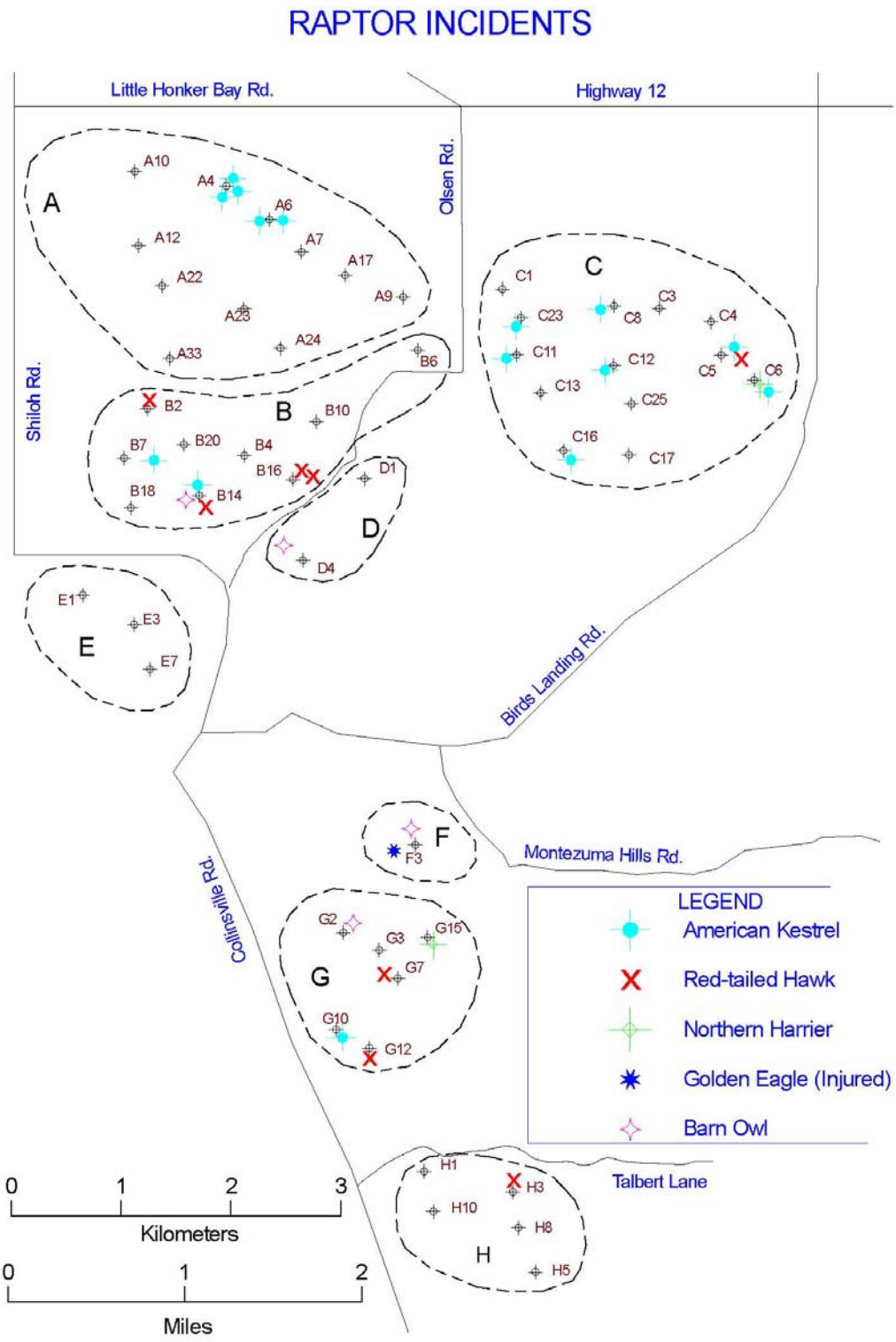

Figure 2. Locations of raptor incidents (found during standardized surveys) in the Shiloh I Project Site, April 2006 through April 2007

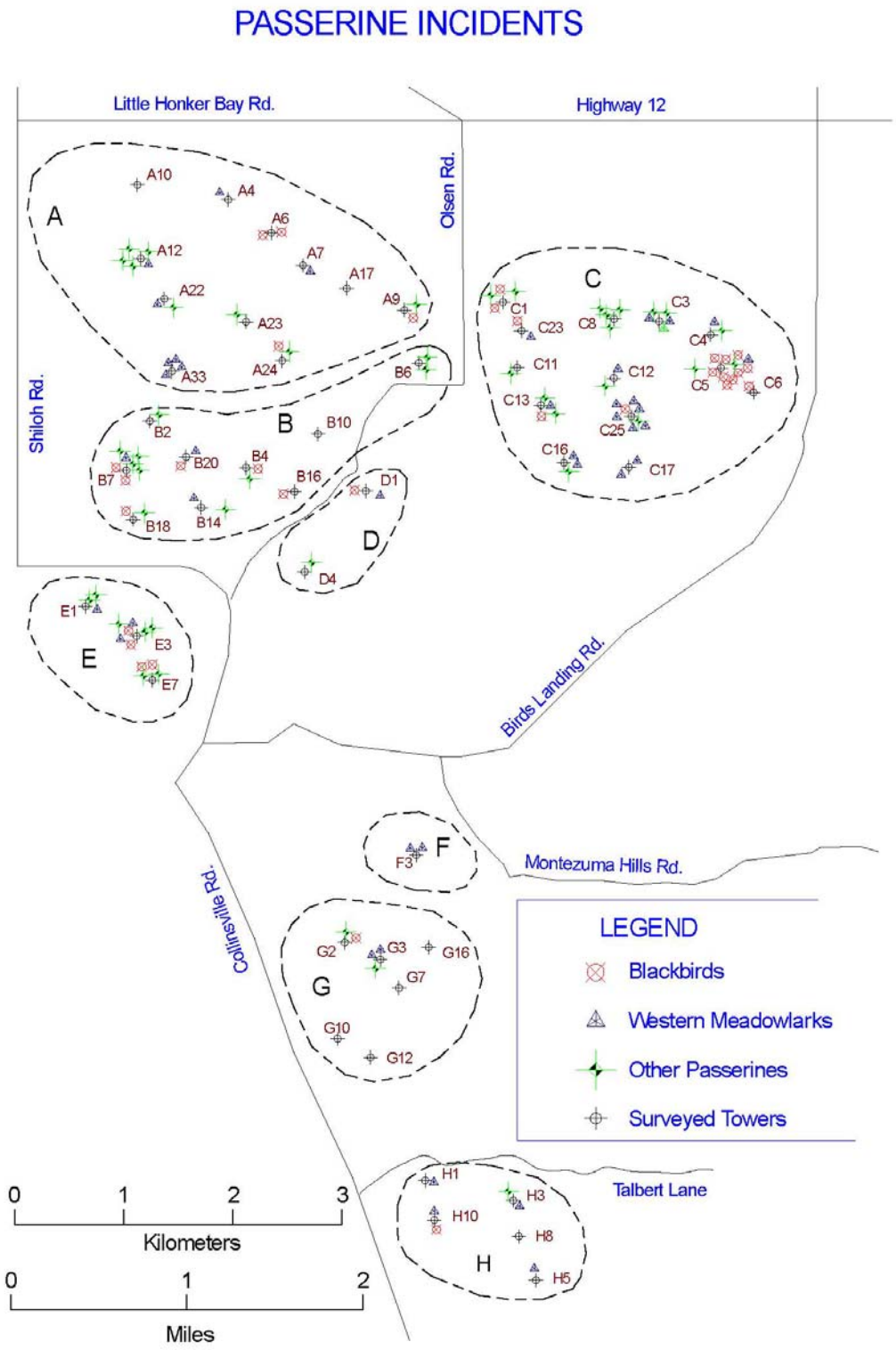

Figure 3. Locations of passerine avian incidents found during standardized surveys in the Shiloh I Project Site, April 2006 through April 2007

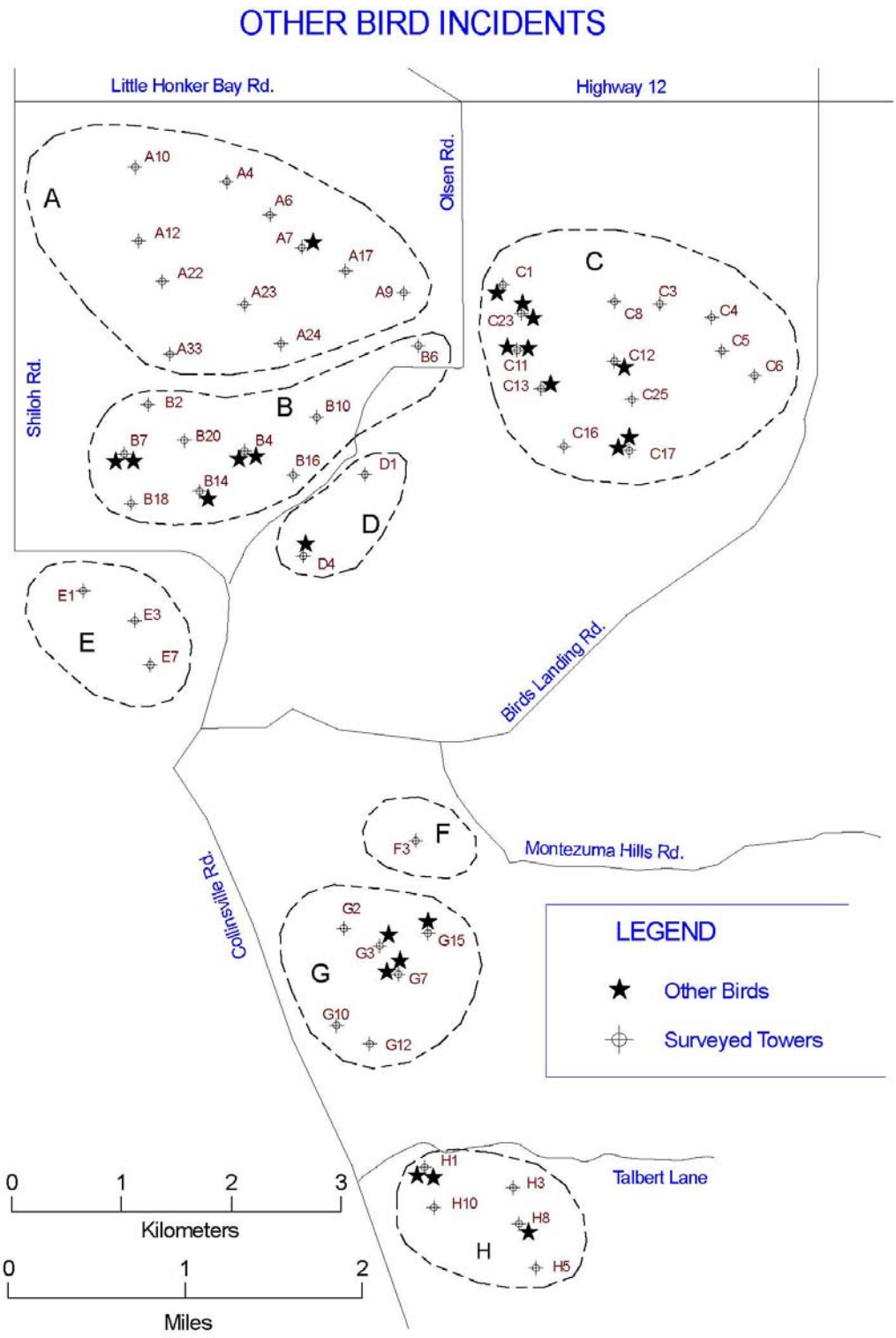

Figure 4. Locations of other (non-raptor, non-passerine) avian species incidents found during standardized surveys in the Shiloh I Project Site, April 2006 through April 2007

3.1.3.2 Non-Raptors

Incidents of non-raptor species appeared to be concentrated in the northern region of the project area (Figures 3 and 4). Passerine species accounted for the majority of incidents in the north, with nearly 8 times greater songbird fatalities in the north than the south (Table 9). The difference in proportion of passerine incidents between northern and southern sites was significantly greater than that expected from the numbers of towers in each area ($\chi = 10.25$, $0.001<p<0.0025$)

The numbers of incidents of all other avian species groups, or "Other Birds" (waterfowl, water birds, and "other" birds) were too small to make conclusions at this time.

Table 9. Comparison of all non-raptor avian incident distribution (by species group) to wind turbine tower distribution*

	Number			Ratio	
	North	South	Total	North	South
Number of Turbines	37.44	12	49.44	3.1	1
Incidents					
Passeriformes (songbirds)	107	14	121	7.6	1
Waterfowl	2	2	4	1	1
Water Birds (rails, coots)	2	1	3	2	1
Other (dove, pheasant, flicker, etc.)	11	4	15	2.8	1
Total Non-Raptor Avian Species	**122**	**21**	**143**	**5.8**	**1**

*Project area divided into two regions, North and South of Birds Landing Road. Note: Includes data from standardized surveys only.

3.1.3.3 Bats

Bat incidents were 5.5 times more numerous in the north than the south of Birds Landing Road. Looking at species individually, the Mexican Free-tailed Bat incidents were concentrated in the north (12:1), and showed moderate evidence of a significant difference in fatality distribution ($\chi = 3.79$, $0.05<p<0.10$), whereas the numbers of incidents of the other bat species with a large number of incidents, the Hoary Bat, were distributed as would be expected ($\chi = 0.01$, $p > 0.10$) based on wind turbine numbers in the north and south (Table 10).. Eleven towers had 2 or more bat fatalities, ten of these towers were on the north side (A12 alone had 7 bat fatalities, 5 of them Mexican Free-tailed), whereas there were 20 towers with no fatalities, suggesting other influences such as topographic features, presence of roosting trees or structures, or possibly light sources which could have influenced the presence or absence of bats in those areas. Figure 5 provides a map of the locations of bat incidents (found during standardized surveys) in the Shiloh I Project Site, April 2006 through April 2007.

Table 10. Comparison of bat incident distribution to wind turbine tower distribution

	Number			Ratio	
	North	South	Total	North	South
Number of Turbines	38	12	50	3.1	1
Incidents					
Hoary Bat	18	6	24	3	1
Mexican Free-tailed Bat	24	2	26	12	1
Silver-haired Bat	1	0	1	1	0
Western Red Bat	1	0	1	1	0
Total Bat Species	**44**	**8**	**52**	**5.5**	**1**

*Project area divided into two regions, North and South of Birds Landing Road. Note: Includes data from standardized surveys only.

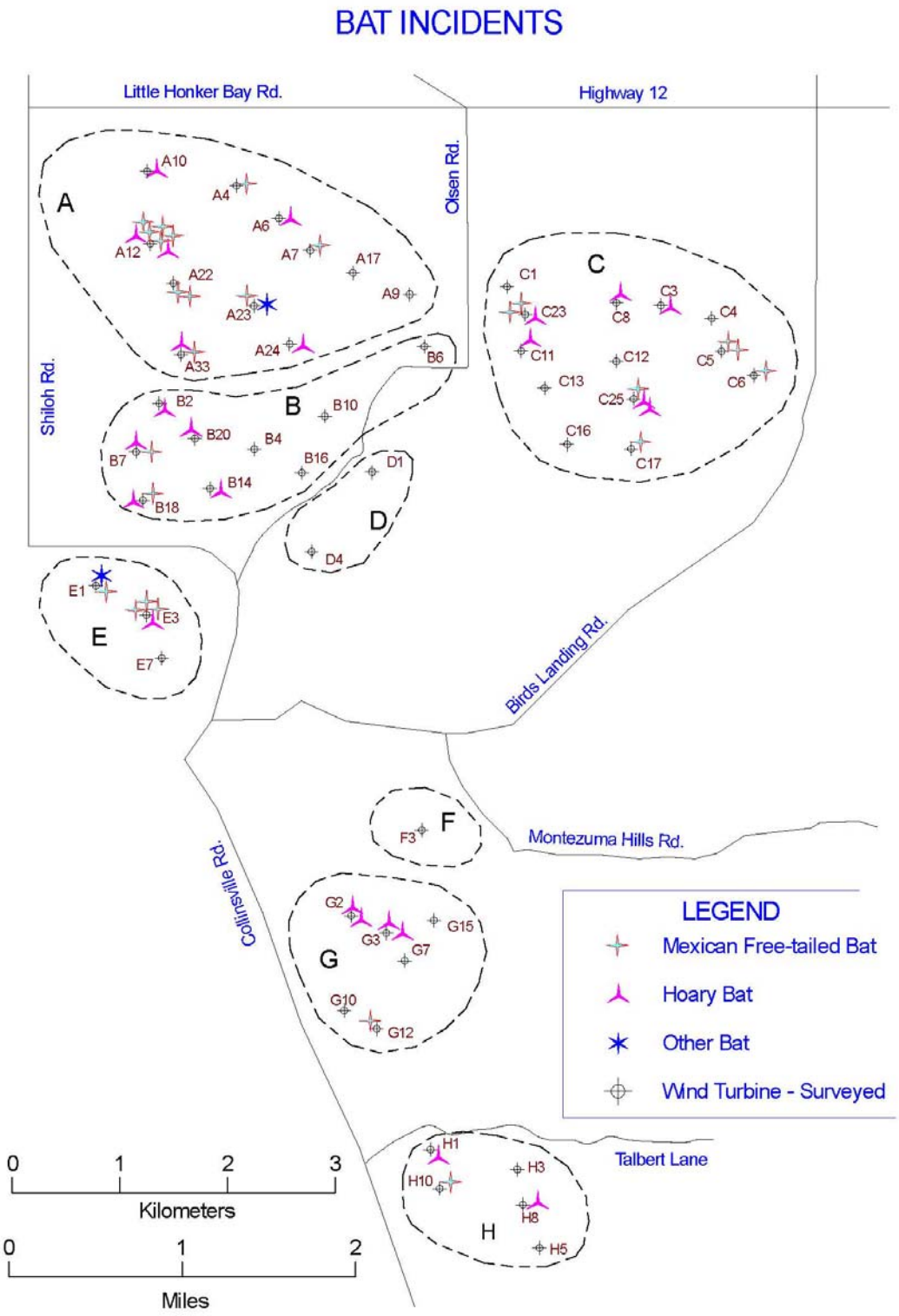

Figure 5. Locations of bat incidents found during standardized surveys in the Shiloh I Project Site, April 2006 through April 2007

3.1.4 Carcass Locations

Species were lumped into size groupings (Table 11) to determine if surveying a 105 meter radius area is an effective method for finding the majority of carcasses. The number of incidents of species (found during standardized surveys only) falling into each size grouping were then tabulated based on distance (range) from the wind turbine tower (Table 12).

Table 11. Species size groupings used in analyses

Category	Description
Small Bird	$\leq$ 8" length (most smaller passerines)
Medium Bird	8" < X $\leq$ 14" length (kestrels, flickers, starlings, blackbirds, doves, rails)
Large Bird	> 14" length (most raptors, coots, ducks, pheasants)
Bats	All small size

Of the 225 incidents found during standardized surveys, 221 could be assigned distances from a wind turbine. Four were not able to be assigned a distance because they were injured birds with some degree of mobility. Forty-seven percent were located within 60 meters of a wind turbine, 56% were within 70 meters, 69% within 80 meters, 75% within 90 meters, and 92% were within 100 meters (Table 11). Small carcasses that were found beyond the 100 meters radius included an American Pipit, Horned Lark and Wilson's Warbler, and were found at 102 meters, which is within the 105 meter scanned region. Of the 10 medium sized birds seen beyond 100 meters, 8 were found within 103m, one at 106m (Red-winged Blackbird), and one at 120m (Western Meadowlark, feathers only, was found in grazed pasture). The 5 large carcasses found beyond 100m, all raptor species, were all beyond the 105m search range, with one as far away as 200m (Barn Owl). Raptor carcasses are often easier to find because they are large and thus obvious, though changes in the vegetation such as harvesting, can remove visual obstacles which previously obscured the view, such as tall standing wheat or barley, making previously undetected carcasses visible. An example of a previously undetected carcass includes one Red-tailed Hawk incident, found at 119 meters on tilled soil, which was estimated to have been killed greater than 30 days prior to the report date, meaning its estimated date of death is unknown.

Avian carcasses of all size groups tended to be located somewhat evenly over a larger distance range than bat carcasses, which tended to be located closer to the towers. A greater percentage of bat carcasses (73%) were found within 60 m as compared to small (30%), medium (42%) and large (43%) birds.

Scavengers may move carcasses, affecting carcass distance analyses. Our previous analysis of the location of birds found at projects using the newest turbine technology (Erickson, et al., 2001, Erickson, et al, 2003), and the Orloff and Flannery (1992) experience searching under older turbine technology supported the judgment that 90% of the carcasses would be located within a circle having a 65 meter radius therefore we expected a 75 meter radius to be sufficient for finding nearly 100% of all carcasses. Based on the results of a one year carcass study at the neighboring High Winds Project Site, 74% of the carcasses were found within a 75 meter search radius.

Table 12. Number of incidents per size grouping versus distance from wind turbine tower

	Distance Range (meters)														
Species Size Group	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-200	Total
Small Bird	5	1		1	2		1	6	3	8	3				30
Medium Bird	9	6	2	8	6	15	15	14	3	21	9	1			109
Large Bird	3	1	2	1	1	1	1	1	2	3	1	1	2	1	21
Unknown Bird Species*						1	1	2	1	4					9
Bat	3		4	7	15	9	3	6	4	1					52
Total	20	8	8	17	24	26	21	29	13	37	13	2	2	1	221

* All unknown bird species were small or medium sized passerines

3.1.5 Vegetative Cover

The vegetative cover of the wind farm consists entirely of agricultural land. It can roughly be sorted into two types of cover, pasture and crop land

Pasture is land which is permanently used for the grazing of sheep, horses, and cattle. The vegetation consists of mixed grasses along with a lesser amount of Mustard family plants, various thistles, among others, and is generally kept short by the grazing. While the horse pastures are continuously grazed, those areas used exclusively for sheep are only periodically grazed, with the sheep being moved from field to field as the grass becomes too short. Eleven of the surveyed tower locations are designated as pasture land.

Crop land is land that goes through cycles of cultivation, crop production, fallow and grazing, and back to crop. The crops consist mostly of grass crops – wheat, barley, oats, and hay – with safflower being the other crop. When a grass crop is to be planted, the soil will generally be cultivated in late May or June, while the soil is still moist. The soil will remain in the tilled state throughout the summer with periodic re-tilling to break up the clumps further. In the fall the soil is fertilized, usually with liquid ammonia, although "Biosolids" (sewage treatment plant solid waste) was used on some fields in the past year. In November or December, just prior to the start of the winter rains, the fields are seeded. Harvesting of the crops usually occurs in July, but is determined by when the seed reaches the right moisture level. By the time the wheat, barley or oats are harvested the soil is usually too dry and hard to disc, so the field will be fallow the following winter, unless safflower is to be planted. Hay is usually mowed around the end of May, and allowed to dry in the field before baling and gathering. Like the other grass crops, by the time the hay is gathered, it is too late to disc in time to plant the following winter, so the field will be fallow.

Safflower is planted later in the season, around March. Since the soil is still quite moist, a less aggressive technique of cultivating is used to loosen up the soil. Harvesting of safflower occurred in August last year.

In the first year of this survey, fallow fields represented the ground cover around 29.34% of the surveyed towers, hay 12.54%, oat 1%, pasture 20.37%, safflower 3.99%, tilled soil 13.39%, and wheat 19.37%.

Although several towers had more than one kind of cover due to fence lines running through the survey area, for the purposes of this analysis each tower was considered to have a single type of vegetation cover, that which occupied more than 50% of the survey area and surrounded the base of the tower. Vegetation height was classified as short (<6"), medium (6"-12"), or tall (>12"). At less than 6", vegetation does not obscure the surveyor's vision, while a height of more than 12" could potentially obscure the view sufficiently that the surveyor could miss some carcasses, including larger birds. Between 6" and 12" there is some possibility of missing small birds and bats, but not the larger birds.

In the first year of the survey, short vegetation accounted for 55.6% of the surveyed towers, medium for 25.2%, and high for 19.23%. Comparing the percentage of incidents found on each vegetation cover type, it is clear that the percentages are not equal. For all of our vegetation-

incident comparisons, we analyzed standardized data of wind-turbine related fatalities only, as injured birds were all semi-mobile and could have moved between areas of different vegetation types.

The percentage of incidents is higher in pasture and till, and lower in fallow, wheat, hay, safflower, and oats than would be expected based on the percentage of ground cover. Although there are fewer fatalities found on fallow ground than would be expected by the extensive percentage of ground cover consisting of this type, the second highest numbers of fatalities were located in this vegetation type. Pasture, fallow and till are either short vegetative cover or bare soil, so carcass visibility by the surveyor could be an explanation for this difference in incident distribution (Table 13).

Table 13. Percentages of cover, and incidents by vegetative cover type

CROP	% COVER	# FATALITIES	% FATALITIES
Pasture	20.40%	70	29.90%
Fallow	29.30%	62	26.50%
Till	13.40%	41	17.50%
Wheat	19.40%	28	12.00%
Hay	12.50%	25	10.70%
Safflower	4.00%	6	2.60%
Oats	1.00%	2	0.90%
Totals	**100.00%**	**234**	**100.00%**

Comparing vegetative cover to species group shows that bats have a higher than expected mortality in pasture and fallow land, and a lower than expected number in till (Table 14). One possible explanation for this is the increased density of insects associated with grazed pastures and the lack of insects over tilled soil. Another factor could be that the coloration of the tilled soil is closer to the coloration of the bat carcasses. Spotting the carcasses is more difficult due to the fact that there is little or no contrast between the carcass and the exposed soil upon which it is laying. The other birds have a greater number of incidents in hay and wheat, while there are a greater number of passerines in safflower and till. Raptor incidents are about what would be expected, except there are a slightly greater number in wheat and slightly fewer in hay.

Table 14. Comparison of species group to vegetative cover type

Species group	Fallow	Hay	Oats	Pasture	Safflower	Till	Wheat	Total	% by Group
Bat	14	6	0	21	2	3	6	52	22.2%
Other bird	6	4	0	4	0	2	7	23	9.8%
Passerine	34	12	2	37	4	31	9	129	55.1%
Raptor	8	3	0	8	0	5	6	30	12.8%
Totals	62	25	2	70	6	41	28	234	100.0%
% of	26.5%	10.7%	0.9%	29.9%	2.6%	17.5%	12.0%	100.0%	

Species group	Fallow	Hay	Oats	Pasture	Safflower	Till	Wheat	Total	% by Group
fatalities									
Percentage									
Bat	22.6%	24.0%	0.0%	30.0%	33.3%	7.3%	21.4%	22.2%	
Other bird	9.7%	16.0%	0.0%	5.7%	0.0%	4.9%	25.0%	9.8%	
Passerine	54.8%	48.0%	100.0%	52.9%	66.7%	75.6%	32.1%	55.1%	
Raptor	12.9%	12.0%	0.0%	11.4%	0.0%	12.2%	21.4%	12.8%	

A comparison of species group to cover height indicates that there seems to be a visibility factor involved, with over one half of the incidents occurring in short vegetation, about one third in medium vegetation, and only one sixth in high vegetation (Table 15). The exception is the Other Bird category, with equal numbers being found in both high and medium vegetation.

Table 15. Comparison of species group to vegetative cover height

Sp. Group	High	Medium	Short	Total	% High	% Medium	% Short
Bat	2	20	30	52	3.85%	38.46%	57.69%
Other bird	6	6	11	23	26.09%	26.09%	47.83%
Passerine	11	43	75	129	8.53%	33.33%	58.14%
Raptor	2	14	14	30	6.67%	46.67%	46.67%
Totals	21	83	130	234			
Percentages							
Bat	9.52%	24.10%	23.08%	22.22%			
Other bird	28.57%	7.23%	8.46%	9.83%			
Passerine	52.38%	51.81%	57.69%	55.13%			
Raptor	9.52%	16.87%	10.77%	12.82%			

Comparing the species size groups to cover height further supports the idea that visibility might be an underlying factor influencing why carcasses were found more heavily in short and medium height vegetation than in tall (high) vegetation. The smallest percentage of incidents were found in tall vegetation, with the most noticeable difference being in the small bird and bat groups (Table 16). The Small/Medium (Unknown Species) group was the exception, with a larger percentage in the medium vegetation than the short vegetation. However, if this Small/Medium group is lumped with the Small Bird group (which is probably a valid grouping since larger birds are easier to identify) then the combined percentages are: High – 4.65%, Medium – 23.26% and Short - 72.09%. This all seems to suggest that the crop height plays an important part in the visibility of the fatalities, that there may be fatalities which are simply not visible to the surveyors.

Table 16. Comparison of incident species size group to vegetative cover height

Size Group	High	Medium	Short	Totals	% High	% Medium	% Short
Bat	2	20	30	52	3.85%	38.46%	57.69%
Large Bird	6	7	8	21	28.57%	33.33%	38.10%
Medium Bird	11	46	61	118	9.32%	38.98%	51.69%
Small Bird	1	4	28	33	3.03%	12.12%	84.85%
Sm/Med (Unk Sp.)	1	6	3	10	10.00%	60.00%	30.00%
Totals	21	83	130	234			
Percent	8.97%	35.47%	55.56%	100.00%			

The incident species were categorized by their principle diet into 5 categories: carnivore, insectivore, omnivore, seed eaters, and vegetation eaters.[1] There was no attempt to categorize those incidents listed as unknown species, except where some taxa was suggested (E.G. "Unknown Sparrow). Both the carnivores and insectivores have a higher fatality rate than represented by the percentage of species, and the seed eaters have a lower fatality rate than the percentage of species would indicate (Table 17). The omnivore and vegetation feeders are in such low numbers that a statistical evaluation would not be significant.

Table 17. Number of species and incidents by feeding niche

Feeding Niche	Number of Species	Percent of total Species	Number of Incidents	Percent of Incidents
Carnivore	5	12.2	32	14.3
Insectivore	25	61.0	161	71.9
Omnivore	1	2.7	1	0.4
Seeds	9	22.0	28	12.5
Vegetation	1	2.7	2	0.9

We then compared the number of incidents of species within each feeding niche to the cover type. A higher percentage of incidents were found in pasture and fallow, and to a lesser extent in till, wheat and hay, while a low percentage was found in oats and safflower (Table 18).

[1] Source: Ehrlich, Paul R., David S. Dobkin & Darryl Wheye, 1988, *The Birder's Handbook: A Field Guide to the Natural History of North American Birds*, Simon & Schuster.

Table 18. Comparison of feeding niche to vegetative cover type

Cover	Carnivore	Insectivore	Omnivore	Seeds	Vegetation	Total	% of incidents
Pasture	8	51	0	7	0	66	29.5
Fallow	8	42	1	4	2	57	25.4
Till	6	30	0	4	0	40	17.9
Wheat	6	14	0	8	0	28	12.5
Hay	4	18	0	3	0	25	11.2
Safflower	0	5	0	1	0	6	2.7
Oats	0	1	0	1	0	2	0.9
Totals	**32**	**161**	**1**	**28**	**2**	**224**	

We also compared the percentage of incidents within each feeding niche to vegetative cover type. Although carnivores seem to have a higher percentage of incidents in fallow and pasture, and till and wheat to a lesser degree, their numbers are not far from what would be expected based on vegetative cover distribution. Although their incident numbers are higher in fallow and pasture – 50% - fallow and pasture account for 49.7% of the cover (Table 19).

Table 19. Percentage of incidents within each feeding niche versus vegetative cover type

Cover		Birds					Bats
Type	Percent	Carnivore	Insectivore	Omnivore	Seeds	Vegetation	Insectivore
Fallow	29.30%	25%	25.70%	100%	14.30%	100%	25.90%
Hay	12.50%	12.50%	11%	0%	10.70%	0%	11.50%
Oats	1.00%	0%	0.90%	0%	3.60%	0%	0%
Pasture	20.40%	25%	27.50%	0%	25.00%	0%	40.40%
Safflower	4.00%	0%	2.80%	0%	3.60%	0%	3.80%
Till	13.40%	18.80%	24.80%	0%	14.30%	0%	5.80%
Wheat	19.40%	18.80%	7.30%	0%	28.60%	0%	11.50%

The seed-eaters have a higher mortality in wheat and pasture, with 53.6% of the incidents found in only 40.8% of the cover. The wheat may be attractive due to the large seeds, and the pasture due to the variety of seeds. Seed-eaters also were found in high numbers in fallow and tilled fields. Fallow fields would also offer a variety of seeds, and the process of tilling the soil would also expose buried un-germinated seeds.

Insectivorous birds have a higher mortality in fallow, pasture, and till. Together, incidents found on these cover types account for 78.0% of insectivorous species incidents, while these three vegetative cover types account for only 62.7% of the total cover. Fallow fields and pasture are often grazed, which often attracts insects as a food source. However even un-grazed fields may have a higher number of insects present due to their botanical diversity as well as less disturbance by farm equipment. The high number of incidents in tilled fields is less clear. Bats have very high mortality in fallow and pasture, with 67.3% of bat incidents found on 49.7% of the cover.

In conclusion, ground cover seems to have a two-fold affect. The height of the plants seems to have an affect on the surveyors' ability to find the carcasses, and there seems to be some correlation between feeding niches, cover, and mortality rate.

3.2 Prey Observations

Potential prey species, such as rodents, rabbits, other larger mammals, reptiles and amphibians, were recorded incidentally when seen. Species recorded included Black-tailed Jackrabbit and California Ground Squirrel (Table 20).

Table 20. Incidental prey observations at Shiloh I, April 2006 – April 2007*

Date	Tower	Prey Observation
7/12/2006	C1	1 Black-tailed Jackrabbit at base of tower
7/12/2006	C23	1 Black-tailed Jackrabbit at base of tower
2/1/2007	Met A	1 Black-tailed Jackrabbit
3/2/2007	D4	California Ground Squirrels
3/15/2007	C6R	California Ground Squirrels in gully West
4/3/2007	B6	1 California Ground Squirrel

* These observations were not recorded systematically.

4.0 DISCUSSION

This report details the first year results of a three-year post-construction study of the Shiloh I wind power project. This is the third fatality study of the newer turbine technology installed in the Collinsville Montezuma Hills Wind Resource Area (CMHWRA). These turbines are arrayed on generally the same type of landscape, land use patterns and habitat over which approximately 600 turbines (Kenetech 56-100 kw) of the older technology are deployed along with more than 200 turbines of the newer technology. The older turbine technology in the CMHWRA is the same as that currently used in much of the Altamont Pass Wind Resource Area and has been studied repeatedly (Howell and DiDonato 1991; Orloff and Flannery 1992, 1996; Howell 1997; Kerlinger 1997; Thelander and Rugge (2000); Smallwood and Thelander 2004). Many of the newer turbines in the Shiloh I and the High Winds projects are installed immediately adjacent to the older turbines and each other. The Shiloh I project will provide an expanded opportunity to examine and compare the effects of the change in turbine technology on the wildlife and habitat of the CMHWRA.

When this three year cycle of post-construction studies is completed we will have seven years of comparative documentation of the impacts of wind plant development in the CMHWRA in the nine year period (2000-2009). Both pre-construction and post-construction surveys will have been completed over that period of time using data collection protocols that are compatible enough to enable us to utilize the entire body of data to better understand the impact of wind

plant development on a large scale. The first study in this series was commenced on August 17, 2000 (High Winds).

Due to the similarity of terrain and land use practices throughout the CMHWRA we would expect to find a strong overlap of species composition and abundance among the wind project developed areas of the WRA. If this is so, we would also expect to find comparable post-construction risk to avian species since the new technology deployed in these areas is comparable in turbine configuration (tower hub height, blade length and FAA lighting requirements), operating characteristics and turbine layout (spacing). In addition, because the same team of individuals has been conducting the pre- and post-construction surveys using the same protocols it is reasonable to expect that the data collected should be comparable. If there are biases or idiosyncrasies for better or worse they too remain constant.

Table 21 compares specific attributes of these two adjacent developments within the CMHWRA.

Table 21. Comparison of High Winds and Shiloh I Attributes or Metrics

Attribute or Metric	**High Winds**	**Shiloh I**
Number of Turbines	86.3 Turbines Searched in year one of study	49.4 of 100 towers searched
Nameplate Capacity of Turbines	1.8 MW	1.5 M
Total Height of Rotor (AGL)	100 m	103.5 m
Duration of Study (months)	12	12
Study Dates	August 2003 – July 2004 (year one of two years)	April 2006 –April 2007 (year one of three years)
Search Interval (in days)	14 days	7 days
Number of Birds Found	96 (year one only)	173
Number of Raptors Found	41	30
Number of Songbirds Found	29	121
Number of Bats Found	70	52
Number of Birds Killed Per Turbine	1.11	3.5
Number of Birds Killed Per Megawatt	.62	2.3
Number of Bats Killed Per Turbine	.81	1.05
Number of Bats Killed Per Megawatt	.45	.70

We turn to a comparison of the fatalities recorded between the two project sites.

4.1 Recorded Avian Fatalities

4.1.1 Shiloh I

A total of 173 wind turbine related avian incidents were recorded by searchers during standardized surveys, representing 35 species and 13 unidentified birds (3 of these were sparrows, 1 a swallow, and 9 were not identified to species but classified as passerines; Tables 2 and 3). Of the 35 species, 5 were raptor species including American Kestrel (15), Red-tailed Hawk (8), Northern Harrier (2), Golden Eagle (1), and Barn Owl (4). There were a total of 30 turbine related raptor carcasses found during this 12 month period. The largest number of carcasses found were songbirds, this group comprised 121 (70.0%) incidents identified to 22 different species plus unidentified species. Fifty-two (52) bat carcasses were found by searchers, representing 4 different species including Hoary Bat (24), Mexican Free-tailed Bat (26), Silver-haired Bat (1), and Western Red Bat (1). There were a total of 4 waterfowl incidents, all of them Mallards. Water bird fatalities included 2 American Coots and 1 Virginia Rail. Other avian species included a mixed group of doves, a pheasant, a chukar, and a flicker (Tables 2 and 3), comprising 5 species involved in 15 incidents.

[Note: For convenient reference, Table 4 is re-inserted at this point.]

Table 4. Unadjusted number of incidents per species during year 1 surveys per total installed megawatt capacity* per year, and per turbine per year, at the Shiloh I Project Area, April 2006 – April 2007, found during standardized surveys

Species	YEAR ONE (Ave. 49.44 Turbines)	# Incidents per Mw/Year	# Incidents per Turbine/Year
Bird Species (total = 173)			
American Coot	2	0.0270	0.0405
American Goldfinch	1	0.0135	0.0202
American Kestrel	15	0.2023	0.3034
American Pipit	4	0.0539	0.0809
Barn Owl	4	0.0539	0.0809
Black Headed Grosbeak	1	0.0135	0.0202
Black-throated Gray Warbler	1	0.0135	0.0202
Brewer's Blackbird	6	0.0809	0.1214
Chukar	1	0.0135	0.0202
Dark-eyed Junco, slate	1	0.0135	0.0202
European Starling	2	0.0270	0.0405
Golden Eagle**	1	0.0135	0.0202
Golden-Crowned Kinglet	1	0.0135	0.0202
Golden-Crowned Sparrow	1	0.0135	0.0202
Hammond's Flycatcher	1	0.0135	0.0202
Horned Lark	5	0.0674	0.1011
House Sparrow	1	0.0135	0.0202
Mallard	4	0.0539	0.0809
Mourning Dove	8	0.1079	0.1618
Northern Flicker	1	0.0135	0.0202
Northern Harrier**	2	0.0270	0.0405

Species	YEAR ONE (Ave. 49.44 Turbines)	# Incidents per Mw/Year	# Incidents per Turbine/Year
Northern Mockingbird	1	0.0135	0.0202
Red-tailed Hawk	8	0.1079	0.1618
Red-winged Blackbird	27	0.3641	0.5461
Ring-necked Pheasant	1	0.0135	0.0202
Rock Pigeon	4	0.0539	0.0809
Savannah Sparrow	3	0.0405	0.0607
Tree Swallow	3	0.0405	0.0607
Tri-colored Blackbird**	1	0.0135	0.0202
Virginia Rail	1	0.0135	0.0202
Western Meadowlark	42	0.5663	0.8495
White-crowned Sparrow	2	0.0270	0.0405
Wilson's Warbler	2	0.0270	0.0405
Yellow Warbler**	1	0.0135	0.0202
Yellow-breasted Chat**	1	0.0135	0.0202
Unidentified Sparrow spp.	3	0.0405	0.0607
Unidentified Swallow spp.	1	0.0135	0.0202
Unknown passerine spp.	9	0.1214	0.1820
Subtotal Avian Species	**173**	**2.3328**	**3.4992**
Bat Species (total = 52)			
Hoary Bat	24	0.3236	0.4854
Mexican Free-tailed Bat	26	0.3506	0.5259
Silver-Haired Bat	1	0.0135	0.0202
Western Red Bat	1	0.0135	0.0202
Subtotal Bat Species	**52**	**0.7012**	**1.0518**
Grand Total	**225**	**3.0340**	**4.5510**

* A total installed megawatt capacity of 74.16 MW was calculated by multiplying individual turbine MW of 1.5 by the average number of wind turbine towers surveyed per round throughout the one year survey of 49.44.
****** Denotes California Species of Special Concern (CSC).

4.1.2 High Winds

A total of 96 avian incidents were recorded by searchers during the first year of standardized surveys, representing 29 species (Table 22). Of the 29 species, 5 were raptor species including American Kestrel, Red-tailed Hawk, Ferruginous Hawk, White-tailed Kite, Golden Eagle. There were a total of 41 raptor incidents found during the first year study. There were 29 incidents of songbirds identified to 14 different species.

Table 22. Unadjusted number of incidents per species per year and per total installed megawatt capacity at the Montezuma Hills WRA High Winds Company, August 2003 – July 2005, found during standardized surveys (incidental finds are noted separately)[2]

Species Name	YEAR ONE (Ave. 86.3 Turbines)	YEAR TWO (Ave. 89.6 Turbines)	Total	# Incidents per Mw/Year	# Incidents per Turbine/Year	Incidental**
Birds (163)						
American Kestrel	29	16	45	0.1422	0.25591	7
Red-tailed Hawk *	10	8	18	0.0569	0.10237	2
White-tailed Kite	2	1	3	0.0095	0.01706	
Ferruginous Hawk ***	1		1	0.0032	0.00569	
Rough-legged Hawk		1	1	0.0032	0.00569	
Golden Eagle ***	1		1	0.0032	0.00569	1
Turkey Vulture	1	1	2	0.0063	0.01137	2
Double-crested Cormorant	1		1	0.0032	0.00569	
Ring-necked Pheasant	2		2	0.0063	0.01137	1
Canada Goose*						1
Snow Goose*						1
Mallard						1
Common Moorhen	1		1	0.0032	0.00569	
American Coot	1	1	2	0.0063	0.01137	1
Virginia Rail	1	2	3	0.0095	0.01706	
Sora	1	2	3	0.0095	0.01706	
Mourning Dove	2		2	0.0063	0.01137	
Rock Dove		2	2	0.0063	0.01137	
Barn Owl *		2	2	0.0063	0.01137	2
White-throated Swift	2		2	0.0063	0.01137	
Northern Flicker	1	1	2	0.0063	0.01137	
Western Wood-Pewee	1		1	0.0032	0.00569	
Empidonax species	1		1	0.0032	0.00569	
Warbling Vireo	1	1	2	0.0063	0.01137	
Horned Lark	10	7	17	0.0537	0.09668	
Tree Swallow		1	1	0.0032	0.00569	
Ruby-crowned Kinglet	2		2	0.0063	0.01137	
European Starling	4	2	6	0.0190	0.03412	
American Pipit		2	2	0.0063	0.01137	
Orange-crowned Warbler	1		1	0.0032	0.00569	
Yellow Warbler ***	1	1	2	0.0063	0.01137	
Townsend's Warbler	2	1	3	0.0095	0.01706	
Wilson's Warbler		1	1	0.0032	0.00569	
Common Yellowthroat ***	1		1	0.0032	0.00569	1
Unidentified Warbler	2	1	3	0.0095	0.01706	
Lincoln's Sparrow	1		1	0.0032	0.00569	
Western Meadowlark	2	1	3	0.0095	0.01706	
Red-winged Blackbird	2	12	14	0.0442	0.07962	
Brewer's Blackbird	2		2	0.0063	0.01137	
Unidentified Blackbird	1		1	0.0032	0.00569	

[2] P. Kerlinger, et al. 2006. *Post-Construction Avian and Bat Fatality Monitoring Study for the High Winds Wind Power Project, Solano County, California: Two Year Report* (FPL Energy), Table 2 from pp. 24-25.

Species Name	YEAR ONE (Ave. 86.3 Turbines)	YEAR TWO (Ave. 89.6 Turbines)	Total	# Incidents per Mw/Year	# Incidents per Turbine/Year	Incidental**
Unidentified Bird	6		6	0.0190	0.03412	
Total Birds	96	67	163	0.5167	0.9301	20
Bats (116)						
Hoary Bat	45	17	62	0.1959	0.35259	1
Mexican Free-tailed Bat	22	26	48	0.1517	0.27298	1
Western Red Bat	3	1	4	0.0126	0.02275	
Silver-haired Bat		2	2	0.0063	0.01137	
Total Bats	70	46	116	0.3679	0.6623	2
Grand Total	166	113	279	0.8815	1.58667	22

The average number of wind turbines searched per year is given under the date ranges. A total installed megawatt capacity of 158.3 MW was calculated by multiplying individual turbine MW of 1.8 by the average number of wind turbine towers surveyed throughout the two year survey of 87.92

*One or more of the individuals of this species was found on "SITE" and was not associated with a wind turbine tower

**Number of individuals found incidentally and not during standardized surveys. NOT included in the Total for that species

***Denotes California Species of Special Concern (CSC)

Only birds and bats from the first year of the High Winds data were used for comparison. The average number of turbines searched in that first year at High Winds was 86.3. Comparison of fatality rates between the first year data recorded from each of these two project areas, (data from Tables 4 and 22 above) has been simplified below in Table 23 and 24. Table 23 reports the number of raptor incidents per turbine per year for each site.

Table 23. Number of raptor incidents species per turbine per year at Shiloh I (April 2006 - April 2007) and at High Winds (August 2003 - July 2004), found during standardized surveys

	Shiloh I		High Winds	
Species Name	# Incidents	# Incidents per tower/year	# Incidents	# Incidents per tower/year
American Kestrel	15	0.30	29	0.34
Red-tailed Hawk	8	0.16	10	0.12
Golden Eagle	1	0.02	1	0.01
Northern Harrier	2	0.04		
White-tailed Kite			2	0.02
Ferruginous Hawk			1	0.01
Barn Owl	4	0.08		
Total Raptor Incidents/Turbine/Year		**0.60**		**0.50**

Comparison of fatality rates between species groups at these two project areas (Table 24) shows greater fatality rates for passerine (7.2 times more passerine incidents) at the Shiloh site. However, raw data showed only 1.3 times more bat incidents and 1.2 times more raptor incidents per tower per year at Shiloh than at High Winds

Table 24. Number of unadjusted incidents per species group per turbine per year at Shiloh I (April 2006 - April 2007) and at High Winds (August 2003 - July 2004), found during standardized surveys

Species Group	Shiloh I	High Winds
Avian		
Raptor (including owls)	0.60	0.50
Passerine (incl. unidentified bird spp.)	2.44	0.34
Waterfowl (ducks)	0.08	*
Water Bird (coots, rails, cormorants)	0.06	0.06
All Other Bird (doves, flickers, pheasants, vultures)	0.30	0.12
Bat	1.05	0.81
Total Incidents/Turbine/Year	**4.53**	**1.83**

* Only found incidentally, including one Canada Goose, one Snow Goose, and one Mallard.

Differences in search protocol may be partly responsible for the greater observances of incidents per turbines searched and the per MW capacity of each turbine. There were fewer turbines searched (50 turbines) at Shiloh I compared to an average of 86.3 at the High Winds site in the first year of that study. However, the 50 turbines at the Shiloh I project site were searched more frequently, every seven days, compared with the 14 day search interval between turbine searches at the High Winds project site. Further, the search radius at each tower in the High Winds project was 75m from the base of the tower, compared to 105m at the Shiloh I project. Thus, the area searched per tower (34,636m^2) at Shiloh was nearly 2 times the amount searched per tower at High Winds (17,671m^2).

If search efficiency and amount of scavenging activity at these two WRAs were assumed to be the same, much of the differences in raw data of bats found at each site could be attributed to these differences in search protocol. However, the larger differences in observed passerine fatalities imply that scavenge and search efficiency rates can only explain part of the difference, and that the final estimate of mortality at Shiloh would be expected to show a greater number of total passerines killed per tower per year in the extrapolated data. A more valid comparison of data from the two WRAs should await extensive search efficiency and scavenge rate testing.

4.2 Second Year Adjustments

With the availability of a sufficient supply of indigenous birds with which to conduct searcher efficiency and scavenger removal tests we will be conducting three to four such tests during the next twelve months.

In addition, at the end of September, 2007 (the halfway point of the three year study cycle), we will switch and search the other half of the turbines (50) maintaining the same seven day interval cycle. Over the course of the study all turbines will have been searched for the same duration and the same interval between searches of each turbine.

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APPENDIX A. SHILOH I WIND POWER PROJECT AVIAN CARCASS SURVEYS Data Sheet

Page ____ of ____

Date_____ Observers _____
Notes:_____

Loc	Time		Fatalities		Ground Cover/Crop Type (give % cover, ave. height, whether standing or cut crop)						Weather			
Turb#	Start	Finish	#	Brief Notes	Gravel	Tilled	Wheat	Barley	Saff.	Fallow	Temp F	Wind Speed	Dir	% Cloud

APPENDIX B. SHILOH I WILDLIFE INCIDENT REPORT DATA SHEET.

SHILOH I
Wildlife Incident Report

SECTION NO. 1 - DISCOVERY DATA

Report Date: _____ Recovery Date: _____ ID#: _____

Reporting Crew: _____ Injury / Fatality Complete / Dismembered / Feathers / Bones

SECTION NO. 2 - LOCATION OF FIND

Parts: Bearing and Distance from tower/pole: Structure: _____

List parts by size:	Distance	Degrees
Part 1: _____	_____	_____
Part 2: _____	_____	_____
Part 3: _____	_____	_____

Location Remarks: _____
_____

SECTION NO. 3 - WILDLIFE IDENTIFICATION

Species: Field marks used:
_____ _____
Age: _____ Sex: _____ Band: No ___ Yes ___ Unknown ___ (Leg(s) missing)

SECTION NO. 4 - OBSERVATIONAL DATA

Describe the physical condition of the find at the time of discovery:
_____
_____
_____

Describe Scavenging Activity: _____
Estimated Time Since Death or Injury (days): <1, <4, <7, <14, <30, >30, UNK Photos: _____

Carcass Condition:
____ 1 - Fresh
____ 2 - Decomposing (early stage)
____ 3 - Decomposing (late stage)
____ 4 - Desiccated
____ 5 - N/A

Infestation Activity: ____ Yes ____ No
____ Fly Larvae (maggots)_____
____ Adult Flies _____
____ Beetles_____
____ Ants_____
____ Other_____

Eyes: __N/A __Round, Fluid Filled __Partially Dehydrated __Flat __Sunken __Amorphous/Empty

Other Field Notes: _____
_____

APPENDIX C. LIST OF 6 INCIDENTS FOUND DURING CLEAN SWEEP SURVEYS AT SHILOH I, MARCH 28 - APRIL 8, 2006.

Report Date	Estimated Month of Death	Species Name	Fatality /Injury	Species Group	Tower	Distance (m)	Degrees (GN)**	Days Since Death
3/28/2006	MAR	European Starling	Fatality	Passerine	A9	19	282	1
3/30/2006	MAR	Red-tailed Hawk	Fatality	Raptor	B11*	61	274	1
3/30/2006	MAR	Red-tailed Hawk	Fatality	Raptor	B11*	40	48	14
3/31/2006	MAR	Red-tailed Hawk	Fatality	Raptor	B2	55	56	14
4/2/2006	MAR	Western Meadowlark	Fatality	Passerine	C2R*	77	320	14
4/8/2006	APR	Hoary Bat	Fatality	Bat	G11*	31	0	1

* Tower was surveyed only during clean sweeps, and not during standardized surveys.

** Degrees Geographic North represents degrees from tower to carcass.

APPENDIX D. LIST OF 225 INCIDENTS FOUND DURING STANDARDIZED SURVEYS AT WIND TURBINE TOWERS AT SHILOH I, APRIL 2006- APRIL 2007.

ID#	Report Date	Estimated Month Death	Species Name	Fatality /Injury	Species Group	Tower	Dist (m)	Deg (GN)*	Days Since Death
SH-030-06	7/19/2006	JUL	American Kestrel	Fatality	Raptor	B7	19	134	7
SH-035-06	7/27/2006	JUL	American Kestrel	Fatality	Raptor	C12R	79	212	7
SH-039-06	8/7/2006	JUL	American Kestrel	Fatality	Raptor	A6	58	54	14
SH-043-07	1/31/2007	JAN	American Kestrel	Fatality	Raptor	A4	70	34	7
SH-050-07	2/6/2007	JAN	American Kestrel	Fatality	Raptor	A6	29	268	7
SH-078-07	3/27/2007	MAR 07	American Kestrel	Fatality	Raptor	B14	75	324	7
SH-100-06	10/3/2006	OCT	American Kestrel	Fatality	Raptor	A4	40	137	4
SH-110-06	10/9/2006	OCT	American Kestrel	Fatality	Raptor	C5	58	34	7
SH-112B-06	10/10/2006	OCT	American Kestrel	Fatality	Raptor	G10	39	128	4
SH-118-06	10/13/2006	OCT	American Kestrel	Fatality	Raptor	C16	102	120	7
SH-120-06	10/16/2006	OCT	American Kestrel	Fatality	Raptor	C6	33	84	4
SH-128-06	10/20/2006	OCT	American Kestrel	Fatality	Raptor	C23	18	182	7
SH-142-06	11/16/2006	NOV	American Kestrel	Fatality	Raptor	C8	53	241	1
SH-158-06	12/13/2006	DEC	American Kestrel	Fatality	Raptor	C11	10	244	7
SH-166-06	12/22/2006	DEC	American Kestrel	Fatality	Raptor	A4	51	77	1
SH-010-07	1/9/2007	JAN	Barn Owl	Fatality	Raptor	D4	200	276	4
SH-016-07	1/16/2007	JAN	Barn Owl	Fatality	Raptor	F3	122	334	4
SH-021-07	1/24/2007	JAN	Barn Owl	Fatality	Raptor	G2	87	14	7
SH-027-07	1/27/2007	JAN	Barn Owl	Fatality	Raptor	B14	121	51	7
SH-064-07	3/10/2007	MAR 07	Golden Eagle	Injury	Raptor	F3	200	254	1
SH-020-06	6/18/2006	JUN	Northern Harrier	Fatality	Raptor	G15	29	110	7
SH-061-07	3/9/2007	MAR 07	Northern Harrier	Fatality	Raptor	C6	7	24	1
SH-024-06	7/6/2006	JUL	Red-tailed Hawk	Fatality	Raptor	B2	4	46	4
SH-075-07	3/21/2007	MAR 07	Red-tailed Hawk	Fatality	Raptor	C5	86	91	4
SH-102-06	10/5/2006	OCT	Red-tailed Hawk	Fatality	Raptor	B16	75	28	4
SH-125-06	10/20/2006	OCT	Red-tailed Hawk	Fatality	Raptor	B14	96	130	7
SH-144-2-06	11/20/2006	UNK	Red-tailed Hawk	Fatality	Raptor	B16	119	62	>30
SH-156-06	12/7/2006	DEC	Red-tailed Hawk	Fatality	Raptor	G12	55	153	4
SH-164-06	12/20/2006	DEC	Red-tailed Hawk	Fatality	Raptor	G7	107	262	1
SH-165-06	12/20/2006	DEC	Red-tailed Hawk	Fatality	Raptor	H3	42	334	4
SH-035-07	1/29/2007	JAN	American Goldfinch	Fatality	Passerine	C5	36	198	1
SH-002-06	4/12/2006	APR 06	American Pipit	Injury	Passerine	C1	46	350	4
SH-014-07	1/16/2007	JAN	American Pipit	Fatality	Passerine	E1	80	16	7
SH-015-07	1/16/2007	JAN	American Pipit	Fatality	Passerine	E3	102	267	7
SH-051-07	2/7/2007	FEB	American Pipit	Fatality	Passerine	B7	96	12	7
SH-057-06	8/30/2006	AUG	Black Headed Grosbeak	Fatality	Passerine	C13	80	6	4
SH-101-06	10/4/2006	OCT	Black-throated Gray Warbler	Fatality	Passerine	A24	96	34	4
SH-045-07	2/2/2007	JAN	Brewer's Blackbird	Fatality	Passerine	C23	93	299	7
SH-080-07	4/3/2007	MAR 07	Brewer's Blackbird	Fatality	Passerine	C13	93	126	7
SH-144-1-06	11/20/2006	NOV	Brewer's Blackbird	Fatality	Passerine	B6	62	31	7
SH-146-06	11/21/2006	NOV	Brewer's Blackbird	Fatality	Passerine	C25	10	340	4
SH-154-06	12/6/2006	NOV	Brewer's Blackbird	Fatality	Passerine	E3	91	216	7
SH-167-06	12/26/2006	DEC	Brewer's Blackbird	Fatality	Passerine	B16	59	219	7
SH-121-06	10/18/2006	OCT	Dark-eyed Junco, slate	Fatality	Passerine	H3	80	328	1

ID#	Report Date	Estimated Month Death	Species Name	Fatality /Injury	Species Group	Tower	Dist (m)	Deg (GN)*	Days Since Death
SH-053-07	2/15/2007	FEB	European Starling	Fatality	Passerine	C1	9	301	7
SH-153-06	12/5/2006	DEC	European Starling	Fatality	Passerine	C25	2	85	4
SH-116-06	10/12/2006	OCT	Golden-Crowned Kinglet	Fatality	Passerine	B14	80	81	4
SH-132-06	10/25/2006	OCT	Golden-Crowned Sparrow	Fatality	Passerine	A12	100	271	4
SH-137-06	10/27/2006	OCT	Hammond's Flycatcher	Fatality	Passerine	C5	19	173	1
SH-001-06	4/10/2006	MAR 06	Horned Lark	Fatality	Passerine	A12	102	248	14
SH-029-07	1/29/2007	JAN	Horned Lark	Fatality	Passerine	C8	95	10	7
SH-136-06	10/27/2006	OCT	Horned Lark	Fatality	Passerine	C8	72	262	4
SH-152-06	12/4/2006	NOV	Horned Lark	Fatality	Passerine	A22	100	296	7
SH-157-06	12/13/2006	DEC	Horned Lark	Fatality	Passerine	B7	71	48	7
SH-016-06	6/5/2006	JUN	House Sparrow	Fatality	Passerine	C4	5	118	1
SH-017-06	6/11/2006	JUN	Northern Mockingbird	Fatality	Passerine	E7	73	300	7
SH-006-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	91	180	7
SH-007-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	95	182	7
SH-008-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	102	181	7
SH-009-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	102	181	7
SH-010-06	5/15/2006	MAY	Red-winged Blackbird	Fatality	Passerine	B20	51	177	14
SH-011-06	5/17/2006	APR 06	Red-winged Blackbird	Fatality	Passerine	H10	61	136	30
SH-012A-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	E3	14	294	7
SH-014-06	5/24/2006	MAY	Red-winged Blackbird	Fatality	Passerine	A9	43	74	1
SH-019-06	6/17/2006	JUN	Red-winged Blackbird	Fatality	Passerine	D1	92	254	7
SH-019-07	1/23/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	80	248	7
SH-028-06	7/17/2006	JUL	Red-winged Blackbird	Fatality	Passerine	A6	0	38	7
SH-029-06	7/19/2006	JUL	Red-winged Blackbird	Fatality	Passerine	B7	96	154	7
SH-032-07	1/29/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	45	7	7
SH-033-06	7/26/2006	JUL	Red-winged Blackbird	Fatality	Passerine	B7	74	286	4
SH-033-07	1/29/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	55	10	7
SH-034-06	7/26/2006	JUL	Red-winged Blackbird	Fatality	Passerine	B4	0	38	4
SH-034-07	1/29/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	38	255	7
SH-036-07	1/29/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	56	113	7
SH-037-06	7/28/2006	JUL	Red-winged Blackbird	Fatality	Passerine	E7	99	340	30
SH-040-06	8/7/2006	UNK	Red-winged Blackbird	Fatality	Passerine	A6	22	220	UNK
SH-040-07	1/30/2007	JAN	Red-winged Blackbird	Fatality	Passerine	E7	106	294	7
SH-059-07	3/1/2007	FEB	Red-winged Blackbird	Fatality	Passerine	C1	52	346	7
SH-065-07	3/10/2007	MAR 07	Red-winged Blackbird	Fatality	Passerine	G2	93	237	4
SH-067-07	3/13/2007	MAR 07	Red-winged Blackbird	Fatality	Passerine	A23	2	284	4
SH-073-07	3/20/2007	MAR 07	Red-winged Blackbird	Fatality	Passerine	C1	3	240	4
SH-090-06	9/28/2006	UNK	Red-winged Blackbird	Fatality	Passerine	A24	66	12	UNK
SH-139-06	11/3/2006	OCT	Red-winged Blackbird	Fatality	Passerine	B18	63	310	7
SH-056-07	2/28/2007	FEB	Savannah Sparrow	Injury	Passerine	A9	90	176	1
SH-079-06	9/15/2006	SEP	Savannah Sparrow	Fatality	Passerine	B4	62	144	7
SH-159-06	12/14/2006	DEC	Savannah Sparrow	Fatality	Passerine	E3	1	68	4
SH-036-06	7/27/2006	JUL	Tree Swallow	Fatality	Passerine	C3	43	20	4
SH-046-07	2/5/2007	JAN	Tree Swallow	Fatality	Passerine	E3	99	48	7
SH-066-06	9/6/2006	AUG	Tree Swallow	Fatality	Passerine	C8	10	275	7
SH-037-07	1/29/2007	JAN	Tri-colored Blackbird	Fatality	Passerine	C6	100	284	7
SH-020-07	1/23/2007	JAN	Unidentified Sparrow spp.	Fatality	Passerine	C8	87	174	7
SH-135-06	10/26/2006	OCT	Unidentified Sparrow spp.	Fatality	Passerine	C13	86	112	7

ID#	Report Date	Estimated Month Death	Species Name	Fatality /Injury	Species Group	Tower	Dist (m)	Deg (GN)*	Days Since Death
SH-140-06	11/9/2006	NOV	Unidentified Sparrow spp.	Fatality	Passerine	C16	3	174	7
SH-098-06	10/2/2006	SEP	Unidentified Swallow spp.	Fatality	Passerine	D4	49	34	7
SH-001-07	1/4/2007	DEC	Unknown bird spp.	Fatality	Passerine	E1	91	14	7
SH-002-07	1/4/2007	DEC	Unknown bird spp.	Fatality	Passerine	G3	73	173	7
SH-030-07	1/29/2007	JAN	Unknown bird spp.	Fatality	Passerine	C3	90	291	7
SH-044-07	2/1/2007	JAN	Unknown bird spp.	Fatality	Passerine	A12	93	227	7
SH-115-06	10/12/2006	OCT	Unknown bird spp.	Fatality	Passerine	B2	71	42	7
SH-122-06	10/19/2006	UNK	Unknown bird spp.	Fatality	Passerine	A12	68	30	UNK
SH-127-06	10/20/2006	OCT	Unknown bird spp.	Fatality	Passerine	B7	92	1	7
SH-143-06	11/16/2006	NOV	Unknown bird spp.	Fatality	Passerine	E7	57	334	7
SH-155-06	12/6/2006	NOV	Unknown bird spp.	Fatality	Passerine	G2	91	356	7
SH-003-07	1/8/2007	JAN	Western Meadowlark	Fatality	Passerine	B14	103	290	7
SH-006-06	4/12/2006	APR 06	Western Meadowlark	Fatality	Passerine	C12R	63	354	4
SH-011-07	1/9/2007	JAN	Western Meadowlark	Fatality	Passerine	E3	91	262	7
SH-013-07	1/15/2007	JAN	Western Meadowlark	Fatality	Passerine	C16	102	80	7
SH-017-07	1/17/2007	JAN	Western Meadowlark	Fatality	Passerine	H5	91	324	7
SH-018-06	6/15/2006	JUN	Western Meadowlark	Fatality	Passerine	C25	67	316	4
SH-018-07	1/23/2007	JAN	Western Meadowlark	Fatality	Passerine	C4	91	30	7
SH-022-06	6/23/2006	JUN	Western Meadowlark	Injury	Passerine	C17	99	246	1
SH-023-07	1/25/2007	JAN	Western Meadowlark	Fatality	Passerine	H1	80	102	7
SH-024-07	1/26/2007	JAN	Western Meadowlark	Fatality	Passerine	A4	86	272	7
SH-028-07	1/29/2007	JAN	Western Meadowlark	Fatality	Passerine	C25	69	310	7
SH-031-07	1/29/2007	JAN	Western Meadowlark	Fatality	Passerine	C3	59	254	7
SH-032-06	7/19/2006	JUL	Western Meadowlark	Fatality	Passerine	C13	47	68	7
SH-038-07	1/29/2007	JAN	Western Meadowlark	Fatality	Passerine	D1	91	76	7
SH-039-07	1/30/2007	JAN	Western Meadowlark	Fatality	Passerine	E3	82	248	7
SH-041-07	1/31/2007	JAN	Western Meadowlark	Fatality	Passerine	G3	80	322	7
SH-042-07	1/31/2007	JAN	Western Meadowlark	Fatality	Passerine	H10	80	2	7
SH-046-06	8/21/2006	AUG	Western Meadowlark	Fatality	Passerine	A33	100	2	7
SH-047-07	2/5/2007	JAN	Western Meadowlark	Fatality	Passerine	F3	71	292	7
SH-049-06	8/24/2006	UNK	Western Meadowlark	Fatality	Passerine	C5	80	49	UNK
SH-050-06	8/24/2006	AUG	Western Meadowlark	Fatality	Passerine	E1	61	76	7
SH-052-07	2/15/2007	FEB	Western Meadowlark	Fatality	Passerine	B20	103	26	7
SH-054-07	2/19/2007	FEB	Western Meadowlark	Fatality	Passerine	A7	13	90	4
SH-055-07	2/19/2007	FEB	Western Meadowlark	Fatality	Passerine	A33	93	23	7
SH-057-07	2/28/2007	FEB	Western Meadowlark	Fatality	Passerine	A22	80	342	7
SH-058-07	2/28/2007	FEB	Western Meadowlark	Fatality	Passerine	A33	62	209	7
SH-060-07	3/2/2007	FEB	Western Meadowlark	Fatality	Passerine	C25	100	268	7
SH-066-07	3/12/2007	MAR 07	Western Meadowlark	Fatality	Passerine	H3	32	85	7
SH-068-06	9/6/2006	AUG	Western Meadowlark	Fatality	Passerine	C3	60	58	7
SH-068-07	3/14/2007	MAR 07	Western Meadowlark	Fatality	Passerine	C17	79	207	7
SH-069-07	3/14/2007	MAR 07	Western Meadowlark	Fatality	Passerine	C25	17	7	7
SH-074-07	3/21/2007	MAR 07	Western Meadowlark	Fatality	Passerine	C3	36	79	7
SH-079-07	3/27/2007	MAR 07	Western Meadowlark	Fatality	Passerine	C25	102	114	7
SH-130-06	10/23/2006	OCT	Western Meadowlark	Fatality	Passerine	F3	61	0	7
SH-131-06	10/23/2006	UNK	Western Meadowlark	Fatality	Passerine	G3	42	300	unk
SH-133-06	10/26/2006	OCT	Western Meadowlark	Fatality	Passerine	C23	101	95	7
SH-148-06	11/29/2006	NOV	Western Meadowlark	Fatality	Passerine	B7	93	8	7

ID#	Report Date	Estimated Month Death	Species Name	Fatality /Injury	Species Group	Tower	Dist (m)	Deg (GN)*	Days Since Death
SH-149-06	11/30/2006	NOV	Western Meadowlark	Fatality	Passerine	C17	98	24	4
SH-151-06	12/4/2006	NOV	Western Meadowlark	Fatality	Passerine	A12	66	106	7
SH-161-06	12/19/2006	DEC	Western Meadowlark	Fatality	Passerine	C16	56	34	7
SH-163-06	12/19/2006	DEC	Western Meadowlark	Fatality	Passerine	C25	120	106	7
SH-168-06	12/30/2006	DEC	Western Meadowlark	Fatality	Passerine	A33	71	16	7
SH-103-06	10/6/2006	OCT	White-crowned Sparrow	Fatality	Passerine	C1	87	16	4
SH-105-06	10/7/2006	OCT	White-crowned Sparrow	Fatality	Passerine	C11	5	181	4
SH-012-06	5/21/2006	MAY	Wilson's Warbler	Fatality	Passerine	B18	93	40	4
SH-059-06	8/30/2006	AUG	Wilson's Warbler	Fatality	Passerine	C12R	102	197	1
SH-082-06	9/21/2006	SEP	Yellow Warbler	Fatality	Passerine	A9	100	64	7
SH-070-06	9/11/2006	SEP	Yellow-breasted Chat	Fatality	Passerine	B7	83	24	7
SH-081-07	4/5/2007	MAR 07	Chukar	Fatality	Other Bird	H8	91	100	7
SH-005-07	1/9/2007	JAN	Mourning Dove	Fatality	Other Bird	C12R	64	94	7
SH-012B-07	1/15/2007	JAN	Mourning Dove	Fatality	Other Bird	C1	42	187	7
SH-031-06	7/19/2006	JUL	Mourning Dove	Fatality	Other Bird	C13	35	35	7
SH-043-06	8/15/2006	AUG	Mourning Dove	Fatality	Other Bird	B14	0	60	7
SH-054-06	8/28/2006	AUG	Mourning Dove	Fatality	Other Bird	B4	41	157	7
SH-058-06	8/30/2006	AUG	Mourning Dove	Fatality	Other Bird	C17	33	288	1
SH-134-06	10/26/2006	OCT	Mourning Dove	Fatality	Other Bird	C23	54	358	7
SH-145-06	11/20/2006	NOV	Mourning Dove	Fatality	Other Bird	B4	15	128	4
SH-126-06	10/20/2006	OCT	Northern Flicker	Fatality	Other Bird	B7	71	104	7
SH-022-07	1/24/2007	JAN	Ring-necked Pheasant	Fatality	Other Bird	G15	99	320	7
SH-013-06	5/22/2006	MAY	Rock Pigeon	Fatality	Other Bird	D4	70	9	7
SH-015-06	6/1/2006	MAY	Rock Pigeon	Fatality	Other Bird	G7	57	310	4
SH-095-06	9/29/2006	SEP	Rock Pigeon	Fatality	Other Bird	B7	60	184	7
SH-160-06	12/15/2006	DEC	Rock Pigeon	Fatality	Bird	G3	91	12	7
SH-004-06	4/12/2006	APR 06	Mallard	Fatality	Waterfowl	C11	22	106	4
SH-005-06	4/12/2006	APR 06	Mallard	Fatality	Waterfowl	C11	7	235	4
SH-008-06	4/27/2006	APR 06	Mallard	Fatality	Waterfowl	H1	13	148	4
SH-075-06	9/14/2006	UNK	Mallard	Fatality	Waterfowl	H1	31	89	unk
SH-070-07	3/15/2007	MAR 07	American Coot	Fatality	Water Bird	G7	97	244	4
SH-071-07	3/19/2007	MAR 07	American Coot	Fatality	Water Bird	A7	65	19	1
SH-041-06	8/8/2006	AUG	Virginia Rail	Fatality	Bird	C23	68	74	4
SH-044-06	8/17/2006	AUG	Hoary Bat	Fatality	Bat	G2	41	357	4
SH-047-06	8/23/2006	AUG	Hoary Bat	Fatality	Bat	C3	33	52	4
SH-051-06	8/24/2006	AUG	Hoary Bat	Fatality	Bat	E3	28	80	7
SH-052-06	8/25/2006	AUG	Hoary Bat	Fatality	Bat	A24	80	66	4
SH-053-06	8/25/2006	AUG	Hoary Bat	Fatality	Bat	H8	79	52	4
SH-055-06	8/29/2006	AUG	Hoary Bat	Fatality	Bat	B14	98	60	7
SH-056-06	8/29/2006	AUG	Hoary Bat	Fatality	Bat	B7	59	7	4

ID#	Report Date	Estimated Month Death	Species Name	Fatality /Injury	Species Group	Tower	Dist (m)	Deg (GN)*	Days Since Death
SH-061-06	8/31/2006	AUG	Hoary Bat	Fatality	Bat	G3	81	44	4
SH-062-06	9/1/2006	AUG	Hoary Bat	Fatality	Bat	A10	48	76	7
SH-063-06	9/1/2006	AUG	Hoary Bat	Fatality	Bat	A6	57	53	7
SH-067-06	9/6/2006	AUG	Hoary Bat	Fatality	Bat	C8	79	11	7
SH-069-06	9/8/2006	SEP	Hoary Bat	Fatality	Bat	H1	70	102	4
SH-071-06	9/11/2006	SEP	Hoary Bat	Fatality	Bat	C11	90	22	1
SH-072-06	9/12/2006	SEP	Hoary Bat	Fatality	Bat	C25	70	69	1
SH-073-06	9/12/2006	SEP	Hoary Bat	Fatality	Bat	C25	80	37	14
SH-076-06	9/14/2006	SEP	Hoary Bat	Fatality	Bat	A12	77	76	1
SH-077-06	9/15/2006	SEP	Hoary Bat	Fatality	Bat	A12	52	312	1
SH-078-06	9/15/2006	SEP	Hoary Bat	Fatality	Bat	A33	46	20	1
SH-087-06	9/27/2006	SEP	Hoary Bat	Fatality	Bat	G3	47	50	7
SH-097-06	9/29/2006	SEP	Hoary Bat	Fatality	Bat	B18	40	254	14
SH-099-06	10/2/2006	SEP	Hoary Bat	Fatality	Bat	G2	59	71	14
SH-117-06	10/13/2006	OCT	Hoary Bat	Fatality	Bat	C23	84	68	7
Sh-123-06	10/20/2006	OCT	Hoary Bat	Fatality	Bat	B2	38	108	4
SH-124-06	10/20/2006	OCT	Hoary Bat	Fatality	Bat	B20	36	304	4
SH-003-06	4/12/2006	APR 06	Mexican Free-tailed Bat	Fatality	Bat	C23	5	355	4
SH-023-06	6/29/2006	JUN	Mexican Free-tailed Bat	Fatality	Bat	B18	58	54	7
SH-042-06	8/10/2006	AUG	Mexican Free-tailed Bat	Fatality	Bat	E3	49	24	7
SH-060-06	8/31/2006	AUG	Mexican Free-tailed Bat	Fatality	Bat	E3	49	26	14
SH-064-06	9/1/2006	AUG	Mexican Free-tailed Bat	Fatality	Bat	A23	8	344	7
SH-065-06	9/1/2006	AUG	Mexican Free-tailed Bat	Fatality	Bat	A22	51	54	7
SH-072-07	3/19/2007	MAR 07	Mexican Free-tailed Bat	Fatality	Bat	A7	33	26	4
SH-074-06	9/13/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	E1	40	81	7
SH-076-07	3/21/2007	MAR 07	Mexican Free-tailed Bat	Fatality	Bat	E3	6	261	4
SH-080-06	9/18/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	C25	54	64	4
SH-083-06	9/21/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	A12	73	348	1
SH-084-06	9/21/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	A12	50	2	1
SH-085-06	9/21/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	A12	49	16	1
SH-086-06	9/21/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	A12	41	10	4
SH-088-06	9/27/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	G12	26	2	7
SH-089-06	9/27/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	H10	42	48	1
SH-091-06	9/28/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	A12	53	8	4
SH-092-06	9/28/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	A22	43	60	7
SH-093-06	9/28/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	A33	56	46	4
SH-096-06	9/29/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	B7	47	78	14
SH-104-06	10/6/2006	OCT	Mexican Free-tailed Bat	Fatality	Bat	C23	36	306	1
SH-108-06	10/9/2006	OCT	Mexican Free-tailed Bat	Fatality	Bat	C5	88	10	1
SH-109-06	10/9/2006	OCT	Mexican Free-tailed Bat	Fatality	Bat	C5	69	54	1
SH-111-06	10/9/2006	SEP	Mexican Free-tailed Bat	Fatality	Bat	C6	29	60	14
SH-119-06	10/13/2006	OCT	Mexican Free-tailed Bat	Fatality	Bat	C17	41	56	4
SH-138-06	11/1/2006	OCT	Mexican Free-tailed Bat	Fatality	Bat	A4	48	51	7
SH-112A-06	10/9/2006	OCT	Silver-Haired Bat	Fatality	Bat	E1	44	66	4
SH-021-06	6/21/2006	JUN	Western Red Bat	Fatality	Bat	A23	23	29	1

* Degrees Geographic North represents degrees from tower to carcass.

APPENDIX E. LIST OF 10 INCIDENTS FOUND INCIDENTALLY (NOT DURING STANDARDIZED SURVEYS) AT WIND TURBINE TOWERS AT SHILOH I, APRIL 2006-APRIL 2007.

ID#	Report Date	Estimated Month Death	Species Name	Fatality /Injury	Species Group	Tower	Dist (m)	Deg (GN)*	Days Since Death
SH-038-06	8/2/2006	UNK	Red-tailed Hawk	Fatality	Raptor	C21	86	68	>30
SH-062-07	3/9/2007	FEB	Red-tailed Hawk	Fatality	Raptor	C18	68	348	14
SH-063-07	3/9/2007	UNK	Red-tailed Hawk	Fatality	Raptor	C18	50	302	>30
SH-162-06	12/19/2006	DEC	Red-tailed Hawk	Fatality	Raptor	C19	31	72	1
SH-007-06	4/20/2006	APR 06	Red-winged Blackbird	Fatality	Passerine	D4	112	238	1
SH-048-06	8/23/2006	AUG	Tree Swallow	Fatality	Passerine	C24	45	358	1
SH-009-06	5/2/2006	APR 06	Western Wood Pewee	Fatality	Passerine	C7R	35	99	4
SH-026-07	1/26/2007	UNK	Rock Pigeon	Fatality	Other Bird	B16	224	32	UNK
SH-045-06	8/21/2006	AUG	Hoary Bat	Fatality	Bat	A13	74	344	4
SH-141-06	11/10/2006	NOV	Mexican Free-tailed Bat	Fatality	Bat	C19	20	66	4

* Degrees Geographic North represents degrees from tower to carcass.

APPENDIX F. LIST OF 6 "OTHER" CAUSE-RELATED* INCIDENTS FOUND DURING STANDARDIZED SURVEYS AND INCIDENTALLY AT WIND TURBINE TOWERS AT SHILOH I, APRIL 2006- APRIL 2007.

ID#	Report Date	Estimated Month Death	Species Name	Fatality /Injury	Species Group	Tower	Dist (m)	Deg (GN)*	Days Since Death	Survey Type
SH-048-07	2/5/2007	JAN	Barn Owl	Fatality	Raptor	G2	180	250	7	Incidental
SH-049-07	2/6/2007	JAN	Barn Owl	Fatality	Raptor	G16	196	52	7	Incidental
SH-004-07	1/8/2007	JAN	Burrowing Owl	Fatality	Raptor	C16	90	32	7	Standardized
SH-025-07	1/26/2007	JAN	Burrowing Owl	Fatality	Raptor	A4	86	288	7	Standardized
SH-107-06	10/9/2006	UNK	Unknown bird spp.	Fatality	Passerine	C3	59	254	UNK	Standardized
SH-129-06	10/20/2006	SEP	Unknown bird spp.	Fatality	Passerine	C16	110	110	30	Incidental

* "Other" Cause-related incidents were deemed not caused by wind turbines or meteorological towers, but rather by a predator, barbed wire fence, or harvesting equipment.
** Degrees Geographic North represents degrees from met tower to carcass.

APPENDIX G. PERMIT CONDITIONS REGARDING MITIGATION OF PROJECT IMPACTS.

SOLANO COUNTY PLANNING COMMISSION

CONDITIONS OF APPROVAL
SHILOH I WIND PLANT PROJECT
Use Permit U-03-06

1. The project shall be established and operated in substantial conformance with the plans and descriptions submitted with Use Permit Application Number U-03-06, as subsequently revised, and as described and analyzed in the Final Environmental Impact Report certified by Solano County, subject to the terms and conditions imposed on the use permit.

2. This permit shall be valid for a period of thirty (30) years, ending April 12, 2035, subject to the modification and revocation provisions of condition numbers 3 and 4. Prior to expiration of this permit, the permittee may apply for an extension to the term of this permit. An application for extension must be submitted, in writing, at least six months prior to expiration. An extension of the term of this permit shall be a discretionary action, and the County may impose additional conditions or restrictions upon the project when granting a permit extension.

3. Any substantial change in the permitted operation, facilities, or structures, as determined by the Director of Resource Management, shall require a revision of the use permit. A revision of the permit shall be a discretionary action, and the County may impose additional conditions or restrictions upon the project when granting a permit revision.

4. Non-compliance with any condition(s) of the use permit shall be cause for revocation of the use permit, in accordance with County procedures, and for payment of bonds to the County.

5. Site inspections of the construction and operation of the project may be conducted by the County Department of Resource Management at any time, at the discretion of said Department, in order to assess compliance with project plans and all conditions of the use permit.

6. The County of Solano, its officers and employees shall not be responsible for injuries to property or person arising from the issuance or exercise of this permit or by the negligence or wrongful act of the permittee. The permittee shall defend, indemnify, and hold harmless the County of Solano, its officers, employees, and agents, from any claim, liability, loss, or legal action arising from any such injuries, and shall reimburse the County for all legal costs and attorney fees related to any claim or litigation based on such injuries.

7. The permittee shall defend, indemnify, and hold harmless the County of Solano, its officers, employees, and agents, from any claims, actions, or proceedings seeking to attack, set aside, void, or annul, in whole or in part, the County's approval of the Use Permit. The County agrees that it shall cooperate in the defense of any such challenge at Permittee's cost.

8. If the permittee challenges the approval by the Planning Commission and/or Board of Supervisors of any condition of approval in an action filed in a court of law, which action is brought within the time period provided for by law, the approval of this project by the Planning Commission and/or Board of Supervisors shall be suspended pending dismissal or final resolution of such action.

9. If any condition of approval of this project is invalidated by a court of law, the entire project shall be reviewed by the Planning Commission and/or Board of Supervisors and substitute conditions may be imposed at the Planning Commission and/or Board of Supervisors.

10. The site shall be maintained in a neat and orderly manner and kept free of accumulated junk and debris.

11. The use shall be operated in such a manner as to not constitute a nuisance or be detrimental to health, safety, comfort, or general welfare of the people of the County, or be detrimental to adjacent properties or improvements or to the general welfare of the County.

12. The Permittee shall be responsible for taking reasonable measures as may be required by the County to prevent light, glare, traffic congestion, visual distraction or other impacts which constitute a nuisance to the adjacent properties, persons or property in the surrounding area.

13. The permit shall be considered exercised, pursuant to Section 28-53 (j)(2) of the Solano County Code, upon issuance of Solano County building permits.

14. Prior to issuance of a building permit, all requirements of the Solano County Environmental Health Services Division shall be met including:

    a) A Hazardous Materials Business Plan shall be submitted if required by Solano County Environmental Management, Hazardous Materials Section.

    b) Based on the number of people served and on the number of service connections a permit may be required by the State of California Division of Drinking Water for the water system.

15. Prior to issuance of a building permit, all requirements of the Solano County Public Works - Engineering Division shall be met including:

a) The permittee shall enter into an agreement as required by the Public Works - Engineering Division and provide security for the maintenance and repair of the public roads used for access and hauling of equipment and materials for the construction of the project.

b) The permittee shall apply for, obtain and comply with the requirements of required encroachment permits and transportation permits from the Transportation Department. The encroachment permits shall be for any construction within the public right of way. The transportation permits will be for hauling any loads that exceed legal limits.

16. All requirements of the Solano County Department of Resource Management's Building Division shall be met including:

a) The permittee shall obtain building permits from the Solano County Building and Safety Division prior to construction, erection, enlargement, altering, repairing, moving, improving, removing, converting, demolishing any building or structure, fence or retaining wall regulated by the Solano County Building Laws. Submit four (4) sets of plans to the Building and Safety Division for plan review and obtain permits prior to beginning any improvements.

b) Except as exempted in Chapter 31 of the Solano County Code, no person shall commence or perform any grading, filling, excavation, or clearing of vegetation for any purpose without having first obtained a grading permit from the Department of Environmental Management.

17. Prior to issuance of building permits, the permittee shall submit a bond or other guarantee, in an amount determined by the Director of Resource Management, to cover the cost to dismantle and remove from the site any wind turbine generators which are abandoned (cease to operate for a period of one year) or are required to be removed. Said bond shall be updated periodically by an amount determined by the Director of Resource Management to reflect current economic conditions and construction cost index. Said bonds shall remain in force and shall not be released or cancelled unless and until the same is authorized in writing by the Director of Resource Management upon closure and clean-up of the project.

18. FAA Notification - Permittee shall provide evidence of notification to the FAA, pursuant to FAA CFR Part 77, Paragraph 77.13(a)(1) and the results of the analysis, for the meteorological towers and any new or altered turbine location not previously cleared (Determination of No Hazard to Air Navigation) by the FAA.

19. Where a turbine setback of less than three times (3x) the total turbine height is provided to the nearest property line, the Permittee shall furnish to the Department of Resource Management evidence that an agreement has been

reached with the owner of the neighboring property where the setback reduction would occur, prior to installation of the affecting turbine.

20. Following commencement of operation of the project and on each annual anniversary of said commencement, the permittee shall submit to the Director of Resource Management a brief status report containing at least the following information: Description and changes to rated capacity of all equipment installed, relevant meteorological data collected, and actual electric power generated to date broken down into appropriate time categories.

21. The permittee shall notify the County Department of Resource Management of any tower collapse, blade throw, fire, or injury to worker, within 24 hours of any such occurrence.

22. An environmental consultant shall be contracted by the County, at the Permittee's expense, to oversee compliance of the Project's Mitigation Monitoring and Reporting Program.

23. Mitigation Measure AES-6: Lighting. Prior to commencing operation, the Permittee shall light turbines for aviation warning in accordance with FAA requirements only. The turbines shall not be lighted for any other reasons.

24. Mitigation Measure AES-7: Decommissioning Turbines. At such time as the Project is decommissioned, the Permittee shall comply with the following:

    a) Remove all facilities to a depth of 3 feet below grade and dispose unsalvageable material at authorized sites;

    b) Restore the soft surface to original condition as is reasonably possible;

    c) Implement reclamation that is based on site-specific requirements and techniques commonly employed at the time the area is to be reclaimed, and which shall include regarding and revegetation of all disturbed areas; and,

    d) Reclaim or leave in place all decommissioned roads, based on landowner preference.

25. Mitigation Measure AIR-1: Emissions Controls. During Project construction, the Permittee shall reduce emissions from construction equipment exhaust by implementing the following mitigation measures to the extent feasible and practicable:

    a) Minimizing idling time (e.g., 5-minute maximum);

    b) Maintaining properly tuned equipment; and

c) Limiting the hours of operation of heavy-duty equipment and/or the amount of equipment in use (BAAQMD 1999).

26. Mitigation Measure AIR-2: Dust Control Plan. Permittee shall comply with the following:

a) During Project construction, emissions of airborne dust shall be controlled using industry-accepted dust control measures, as shown in tables 7.3-3 through 7.3-5 of the DEIR.

b) Prior to commencement of construction activities, the Permittee shall prepare and submit to the County for approval, a Construction Fugitive Dust Control Plan to describe how to minimize fugitive dust generated by construction activities in accordance with tables 7.3-3 through 7.3-5 of the DEIR and Bay Area Air Quality Management District and Yolo-Solano Air Quality Management District requirements. The Plan shall include the following:

i) A description of each active operation that may result in the generation of fugitive dust;

ii) Identification of all sources of fugitive dust (e.g., earthmoving, storage piles, and vehicular traffic); and

iii) A description of the control measures to be applied to each of the sources of dust emissions identified above. The description shall be sufficiently detailed to demonstrate that the applicable best available control measure(s) as specified in the table 7.3-3 of the DEIR, labeled Fugitive Dust Control Measures for Bay Area Quality Management District, will be utilized and/or installed during all periods of active operations.

c) In the event that there are special technical circumstances (e.g., non-economic), including safety, which prevent the use of at least one of the required mitigation measures for any of the sources identified, a justification statement shall be provided to explain the reason(s) why the required control measures cannot be implemented.

d) Disturbed areas that would not be covered with surface structures, such as buildings and pavement, following construction activities shall be stabilized. This may include installation of suitable vegetation to minimize future on-site soil loss and off-site sedimentation.

27. Mitigation Measure BIO-1: Restoration of Project Area. The Permittee shall implement the following measures, to the extent feasible:

a) Confine construction to necessary work areas. Prior to commencement of construction activities, fence or flag both the construction area and exclusion

areas, such as wetlands and sensitive plants, to minimize the construction footprint and prevent intrusions into the surrounding areas.

b) During site preparation and development, minimize disturbance to habitats and vegetation. Clearing of vegetation, grading, and other soil disturbance shall be restricted to those areas required for construction.

c) During construction activities, clearing and grading of large areas shall be avoided. For example, staging areas shall be located to the extent feasible in areas with little or no vegetation, such as in or adjacent to the gravel parking lot at the existing O&M building, rather than in agricultural fields or grasslands. The staging area shall also be setback at least 250 feet from vernal pools, 100 feet from wetlands and streams, and 500 feet from ponds.

d) During construction activities, maintain a 500-foot setback from groves of mature trees, which may provide habitat for raptors protected by the CDFG. After construction, and prior to Project operation, the Permittee shall reseed or restore the construction areas to pre-construction conditions. Areas cleared of vegetation shall be seeded with grasses or other vegetation as follows:

i) Revegetation shall be implemented in accordance with Solano County guidelines and the input of local farmers/farm residents.

ii) Disturbed or graded areas shall be planted with fast-growing and deep-rooted grasses or ground cover, preferably native to the area.

iii) If required, previously vegetated areas and inactive portions of the construction site shall be seeded and watered until vegetation is grown.

iv) Any trees removed shall be replaced with the same or compatible species.

v) Revegetated areas shall be monitored annually for complete and successful ground cover, and revegetated (if required) to conform to the requirements of the County Grading Ordinance. Revegetation shall be continued, if determined by Solano County, for the life of the Project.

28. Mitigation Measure BIO-2a: Avoid Wetlands and Streams. The Permittee shall locate the turbines, aboveground substation, and switchyard outside and away from wetlands, drainages, streams, and other sensitive natural features.

a) Project components shall be constructed using the following recommended setbacks:

i) 100-foot setback from wetlands and streams based on guidance from the Corps and CDFG;

ii) 567-foot setback from vernal pools that provide habitat for special-status plants and wildlife protected by the USFWS; and

iii) 567-foot setback from ponds that may provide habitat for water birds protected by the CDFG.

b) A qualified wetland biologist shall identify and flag the boundaries of the wetlands prior to construction as "exclusion areas," so that construction crews may follow the recommended setbacks.

c) Support facilities such as underground cables shall be sited away from the sensitive natural resources to the extent feasible. In most instances, new overhead lines shall only be used to specifically avoid impacts to sensitive natural resources.

d) No foundations, utility poles, or other permanent facilities shall be located within waters of the U.S.

e) Ground disturbance during construction shall be sited at least 100 feet from the boundaries of wetlands to the extent feasible to minimize secondary effects to the identified wetlands.

f) All fueling and storage areas shall be located at least 100 feet from intermittent streams and wetlands to prevent spills of fuel or other hazardous materials from affecting wetlands and streams.

g) During construction, a "Qualified Wetland Biologist" (a person with at least an undergraduate degree in biology, ecology, or a related field, with a minimum of three years' professional field experience within the region or working under the direct supervision of a professional wetland biologist with at least six years of field experience in the region) shall hold tailgate environmental training sessions with construction personnel to inform them of the adjacent Suisun Marsh and wetlands and intermittent streams in the Project Area. The training sessions shall include information about the location of biological sensitive areas, resource avoidance, permit conditions, and possible fines for violations of State or Federal environmental laws.

29. Mitigation Measure BIO-2b: Horizontal Directional Drilling.

a) To minimize the potential effects from the use of horizontal directional drilling, the permittee shall comply with the following mitigation measures:

i) HDD drilling shall occur only during the season when the seasonal streams and wetlands in the project area do not have surface water present (i.e., typically June through October).

ii) On-site briefings shall be conducted for HDD workers so that they understand the location of sensitive resources and to ensure that all field personnel understand their responsibility for timely reporting of frac-outs.

iii) Barriers (e.g., straw bales, sedimentation fences, etc.) shall be erected between the bore site and nearby sensitive resources prior to drilling, as appropriate, to prevent any material from reaching sensitive resource areas.

iv) The necessary response equipment and/or supplied (e.g., vacuum truck, straw bales, sediment fencing, etc.) shall be kept on-site by the contractor during HDD operations so that it is readily available in the event of a frac-out.

b) To prevent or minimize potential effects in the event of a frac-out is detected, Permittee shall implement the following measures to reduce or minimize effects on sensitive resources:

i) All work shall stop until the frac-out has been contained and cleaned up.

ii) The frac-out area shall be isolated with straw bales, sand bags, or silt fencing to surround and contain the drilling mud.

30. Mitigation Measure BIO-4: Exclusion Flagging and Training.

a) Prior to commencing construction, a Qualified Botanist (a person with at least an undergraduate degree in botany, plant ecology, or a related field, with a minimum of three years' professional field experience within the region or working under the direct supervision of a professional botanist with at least six years of field experience in the region) shall identify and flag the boundaries of the Carquinez goldenbush and Gairdner's yampah populations, to prevent any indirect or inadvertent impacts to these special-status plants.

b) All construction activities shall be located outside the flagged areas, including clearing and grading, construction traffic, or any activities associated with the proposed power collection system routes.

c) If the final power collection system route crosses the location of these sensitive plants, horizontal boring techniques shall be used, after prior approval from the Solano County Department of Resource Management, in consultation with USFWS, and CDFG.

d) All fueling and storage areas shall be located at least 100 feet from the flagged areas, to prevent spills of fuel or other hazardous materials from affecting the special-status plants.

e) During construction, a Qualified Botanist shall hold tailgate environmental training sessions with construction personnel to inform them of the special-status plants in the Project Area. These training sessions shall include information about the locations of these plants, resource avoidance, permit conditions, and possible fines for violations of State or Federal environmental laws.

31. Mitigation Measure BIO-5: Habitat Avoidance - California tiger salamander. Permitte shall comply with the following mitigation measures:

a) Ground-disturbance activities with 0.5 mile of potential wet California tiger salamander habitat shall occur during the dry season (i.e., June 1st. through October 15th) only.

b) A worker-training program covering the California tiger salamander will be conducted before groundbreaking. The program shall provide workers with information on their responsibilities with regard to the species, and overview of the appearance of the species, and a description of the measures being taken to reduce the potential effects to the species during project construction.

c) A qualified biologist shall conduct a preconstruction survey to assess the potential for California tiger salamander appearance relative to the quality and status of wetland and upland habitats in the vicinity of project features and shall identify any key areas that would require avoidance. Qualified surveyors/monitors shall be onsite during construction to provide clearance for all work activities in potential California tiger salamander habitat, including potential movement corridors and hibernation sites.

d) If a California tiger salamander is encountered during construction work, activities shall cease until the salamander is removed and relocated by a U.S. Fish and Wildlife Service-approved biologist. In the event of injury or mortality to a California tiger salamander, the U.S. Fish and Wildlife Service shall be notified immediately.

e) Signs that can be easily read from at least 20 feet away shall be placed to indicate potential California tiger salamander habitat that must be avoided by construction personnel. Prior to construction, a biologist shall determine the location and number of signs necessary.

f) To prevent inadvertent entrapment of California tiger salamanders during the Project, deep trenches that are within 2,000 feet of the vernal pools or stock ponds shall be completely covered using plywood or other appropriate materials at the close of each working day. Before the trench is filled, it shall be thoroughly inspected for trapped animals. If at any time a trapped California tiger salamander is discovered, the U.S. Fish and Wildlife Service-approved biologist shall carefully remove the animal by hand and place it at the entrance of a suitable rodent burrow within walking distance from the excavation site, but outside the area where the animal could be injured or killed by project activities.

The rescued California tiger salamander shall be monitored until it enters the burrow. The U.S. Fish and Wildlife Service, California Department of Fish and Game, and Solano County Department of Resource Management shall be notified by telephone and letter within one (1) working day if a California tiger salamander is found in the project area.

g) To eliminate the attraction to predators of the California tiger salamander, all food-related trash items such as wrappers, cans, bottles, and food scraps that are within 2,000 feet of the vernal pools or stock ponds shall be disposed of in closed containers and removed from the project site at the end of each working day.

h) Best management practices (required as part of the SWPPP) shall be implemented to prevent sediment from entering suitable California tiger salamander habitat at the project site, but not limited to, silt fencing, sterile hay bales, and temporary sediment disposal.

32. Mitigation Measure BIO-5: Habitat Avoidance - Western Burrowing Owl. The following guidelines adapted from the CDFG Staff Report on Burrowing Owl Mitigation (CDFG 1995) shall be implemented by the Permittee:

a) Preconstruction burrowing owl surveys shall be conducted in all areas that may provide suitable nesting habitat according to CDFG (1995) guidelines. No more than 30 days before construction, a survey for burrows and burrowing owls shall be conducted by a qualified wildlife biologist within 500 feet of the construction corridor in areas suitable for burrowing owls. The survey shall conform to the protocol described by the California Burrowing Owl Consortium (1993), which includes up to four surveys on different dates if there are suitable burrows present.

b) The Permittee shall avoid disturbing active burrowing owl nests and implement standard CDFG mitigation guidelines during the non-breeding season.

i) If occupied owl burrows are found during preconstruction surveys, a determination shall be made by a qualified biologist in consultation with CDFG as to whether access road construction or other proposed construction activities would impact occupied burrows or disrupt reproductive behavior.

ii) If it is determined that construction activities would not adversely affect occupied burrows or disrupt breeding behavior, construction may proceed without any restriction or mitigation measures for burrowing owls.

iii) If it is determined that construction could adversely affect occupied burrows during the August 31 through February 1 non-breeding season, the subject owls may be passively relocated from the occupied burrow(s) using one-way doors. There shall be at least two unoccupied burrows

suitable for burrowing within 300 feet of the occupied burrow before one-way doors are installed. The unoccupied burrows shall be located at least 160 feet from construction activities and can be natural burrows or artificial burrows constructed according to current design specifications. Artificial burrows shall be in place at least one-week before one-way doors are installed on occupied burrows. One-way doors must be in place for a minimum of 48 hours before burrows are excavated.

33. Mitigation Measure BIO-6: Avoidance of Nests.

a) A no-disturbance buffer zone shall be established around active nests during the breeding season. If construction activities (including removal of trees or shrubs) are scheduled to occur during the breeding season (February 1 through August 31), a qualified wildlife biologist shall conduct preconstruction surveys of all potential nesting habitat within 500 feet of construction activities. Surveys shall be conducted prior to construction activities, but no more than 30 days prior to construction activities.

b) If active nests are found, a 500-foot no disturbance buffer shall be created around active raptor nests during the breeding season or until it is determined that young have fledged. A 250-foot buffer zone shall be created around nests of other special-status birds.

c) If the nest(s) are found in an area where ground disturbance is to occur, the Permittee shall avoid the area, if feasible, by delaying ground disturbance in the area until the birds have fledged, or shall reroute the project component to avoid the area.

d) If surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, no further mitigation shall be required. Trees and shrubs that have been determined to be unoccupied by special-status birds or that are located more than 500 feet from active nests may be removed.

e) If construction is scheduled to occur during the non-nesting season, then no surveys shall be required.

34. Mitigation Measure BIO-7: Setback from the Suisun Marsh Management Area. The Permittee shall maintain a 1,000-foot setback from the boundary with the Suisun Marsh Secondary Management Area, to avoid any potential impacts to the migration or flight patterns of waterfowl or other birds using the Suisun Marsh.

35. Mitigation Measure BIO-8: Underground Lines and Design Specifications. Prior to Project operation, the Permittee shall implement the following design elements for the limited 50-foot high overhead collection lines:

a) All jumper wires shall be insulated (5-kV minimum rating and preferably 10-kV to 15-kV).

b) All exposed terminals (e.g., pot heads, lightning arresters, and transformer bushings) shall be covered by wildlife boots or other insulating materials.

c) Non-conductive materials (e.g., fiberglass, wood) shall be used instead of the straight, aluminum-type combination arms on riser poles.

d) Energized wires shall be placed a safe distance apart: 60 inches for crossarm configuration, 55 inches for armless configuration.

e) No cut-outs or riser poles shall be used.

f) Jumper leads shall be oriented in a vertical configuration to discourage bird perching.

g) Bonding of pole top devices mounted on non-conductive arms shall be done with insulated wire.

h) A minimum conductor wire size of 4/0 shall be used to increase the visibility of the wire.

i) Excepting angle poles of overhead lines, none of the installed facilities shall require the use of guy wires. All turbines and meteorological and microwave towers shall be free standing.

j) Bird diverters shall be installed on the overhead lines.

36. Mitigation Measure BIO-9: Turbine Locations. Turbine locations shall comply with the following standards:

a) Turbines shall be sited at least 500 feet from groves of mature trees, which could provide nesting habitat to raptors and other birds.

b) Facilities shall be set back at least 100 feet from wetlands and streams and 567 feet from vernal pools and ponds.

c) Turbines shall be setback at least 1,000- from Shiloh and Collinsville roads.

d) Facilities shall be set back at least 1,000 feet from the boundary of the Suisun Marsh Secondary Management Area.

e) All transmission lines and facilities shall be located to avoid crossing ridge tops to the extent feasible.

37. Mitigation Measure BIO-9: Bird Mortality Monitoring. The Permittee shall conduct annual monitoring of bird mortality in the Project Area, as follows:

a) Qualified ornithologists shall conduct annual bird mortality monitoring throughout the Project Area.

b) The species, number, location and distance from turbine, availability of raptor prey species, and cause of bird and bat mortalities shall be noted. All results shall be provided to the Wildlife Response and Reporting System ("WRRS") database.

c) The monitoring shall follow standardized guidelines outlined by the National Wind Coordinating Committee (Anderson et al. 1999) for a minimum of three years following the first delivery of power.

d) The Permittee shall contribute to the efforts of the Solano County Technical Advisory Committee (TAC) to develop mitigation measures to lessen potential impacts to raptors as a result of wind turbine generator operation.

e) The Permittee shall analyze the banding information obtained from the CDFG to assess the origin and population of red-tailed hawks, American kestrels, and other raptors.

38. Mitigation Measure BIO-9: On-site Mitigation. The Permittee shall provide on-site mitigation for bird and bat strikes, as outlined below:

a) Turbine locations shall avoid features of the landscape known to attract raptors such as cliff/rim edges.

b) The locations for Turbine Nos. A19 and B6 shall maintain a 500-foot buffer zone around the historical golden eagle nest identified in that area.

c) Prior to Project construction, a Raptor Mitigation Plan ("RMP") shall be developed. The Plan shall contain specific provisions for actions to minimize or offset impacts to golden eagles and other raptors, and shall include the following:

i) Move rock piles away from wind turbines.

ii) Construct tower pads to prevent under-burrowing by small mammals.

iii) Install bird flight diverters at the ends of strings and at the edges of clusters of turbines if determined necessary after three years of fatality data have been collected and based on recommendation of Solano County Technical Advisory Committee (TAC).

iv) Design turbines so the lowest reach of rotor planes is no lower than 26 meters off the ground.

39. Mitigation Measure BIO-9: Off-site Mitigation. The Permittee shall provide off-site mitigation for bird and bat strikes, as outlined below:

a) Within two years following the first delivery of power, the Permittee shall purchase and record an off-site conservation easement, at least 120 acres in size, for open space suitable as habitat for raptors such as the Golden Eagle and Red Tail Hawk. The County, in consultation with USFWS and the CDFG, shall approve the location of the easement, which approval shall not be unreasonably withheld. If the Permittee timely requests approval of the location of the easement and approval is not granted within the two year period, the Permittee shall purchase and record the conservation easement within a reasonable time after the County gives its approval. The conservation easement shall meet the following requirements:

i) The conservation easement shall be located within the regional area providing similar habitat as the Project area, but shall be outside the WRA.

ii) The easement site shall be dominated by natural vegetation, agricultural lands, or a combination of both. The primary purpose of this easement will be to provide conservation lands for a variety of bird species that could be potentially impacted by the Project.

iii) Conservation lands shall provide breeding opportunities in an effort to offset avian mortality associated with operation of the project. The main species anticipated to be impacted by the project are raptor species such as Golden Eagle, Red-tailed hawk, and American Kestrel, although the easement could also provide habitat for other species such as ground-nesting songbirds. Types of enhancement measures on the easement will be weighted according to the relative abundance of birds impacted by the project and the species specific needs of those species. A number of management measures and enhancements shall be provided (if such features are not already present) to provide suitable foraging and nesting habitat on the easement.

iv) The conservation easement shall be recorded, shall run with the land in perpetuity, and shall list and prohibit activities inconsistent with the purpose of supporting avian breeding opportunities.

b) The Permittee shall establish a non-wasting funding mechanism to fund the maintenance, management and monitoring of the conserved area. Estimated costs shall be established using a PAR-type analysis. The analysis and funding mechanism shall require approval by the County, in consultation with the

resource agencies, prior to recordation of the conservation easement. Management activities or restrictions in the conservation easement shall include:

i) Providing suitable foraging habitat by maintaining or enhancing natural areas, particularly grasslands and seasonal wetlands; or by maintaining compatible agricultural crops and practices. Suitable crop types for foraging raptors include those with low-lying vegetation such as alfalfa and other hays, and various row and grain crops. Unsuitable crop types that would be restricted in the easement shall include those that do not provide sufficient accessibility or have low prey densities, such as orchards and vineyards;

ii) Maintaining or enhancing nesting opportunities by protecting trees or planting trees that are suitable for raptor nesting, including native valley oaks and cottonwood trees.

c) Within 3 years following the first delivery of power, the Permittee, in conjunction with a Qualified Wildlife Biologist, shall undertake breeding habitat enhancement measures on the conserved property, which shall include the following:

i) Prior to recording the conservation easement, the Permittee shall submit to the County an open space management plan for the conserved area, which shall be prepared by a qualified Wildlife Biologist. Approval of the Plan by the County, in consultation with the resource agencies, shall be required prior to recordation of the easement.

ii) Types of enhancement measures on the easement will be weighted according to the relative abundance of birds impacted by the project and the species specific needs of those species, but shall include the placement of nesting substrate for Golden Eagles, Red-tailed Hawks and American Kestrels (nesting boxes, trees, perches, and/or other natural features).

iii) A number of management measures and enhancements shall be provided (if such features are not already present) to provide suitable foraging and nesting habitat on the easement.

iv) Prior to recording the conservation easement, the Permittee shall designate, for the County's approval, a public agency or non-profit entity, or a designative representative to manage the conserved area.

d) Prior to the issuance of the first building permit, the Permittee shall establish an irrevocable letter of credit in favor of the County of Solano from a reputable bank in the amount of $500,000 to ensure compliance with the conservation easement provisions described above. The Director of Resource

Management shall determine when the letter of credit may be cancelled due to the Permittee's compliance with the conservation easement provisions.

e) The Permittee shall be responsible for all mitigation costs including habitat enhancements, preparation and implementation of the open space management plan, and long-term management of the conservation area.

40. Mitigation Measure BIO-9: Post-construction Monitoring. The Permittee shall conduct post-construction avian and bat mortality monitoring, as follows:

a) Once the Project begins operation, the Permittee shall monitor the site to determine avian and bat mortality rates and the causes of mortality on the site itself for a period of three years. The monitoring shall be conducted by an independent biologist, and reports shall contain sufficient information (e.g. the location of dead birds relative to turbine location; the availability of raptor prey species) to allow evaluation of turbine design characteristics and location effects that contribute to mortality. This monitoring shall follow standardized guidelines outlined by the National Wind Coordinating Committee (Anderson et al. 1999).The Permittee shall prepare and provide reports from the monitoring to the County, USF&WS and CDFG, and shall also participate in the Solano County Technical Advisory Committee (TAC) for the term of the monitoring effort, and shall share the results of this research with the TAC.

b) After three years of post-construction monitoring data has been obtained, the County will review the permit and, in consultation with the California Department of Fish and Game and the USFWS, determine if any specific turbines should be relocated due to disproportionately high levels [e.g. more than at other turbines] of avian mortalities and no other mitigation measures are deemed appropriate. The County will determine whether turbines shall be relocated, based on consideration of the following factors:

i) Number of Annual Mortalities Per Turbine. Large comparative differences in the number of mortalities per turbine might indicate the need for relocation. In the absence of such large differences, however, this factor probably cannot be considered alone due to limited statistical basis upon which to estimate the number of avian mortalities at each turbine.

ii) Disproportionate Representation of a Particular Species. A large number of mortalities of a particular species must also be factored into the relocation decision due to enhanced concern for potential effects on that species population and further support for theories that something in that species' behavior, foraging strategy or flight mechanics make collision avoidance with that particular turbine configuration problematic.

iii) Comparison to other Windfarms in the Area. In light of the total body of knowledge accumulated about bird strikes on windfarms, an additional relocation factor is the number of mortalities at particular

turbines or group of turbines which is substantially out of line in comparison with the experience of other windfarms in the Solano County Wind Resource Area.

41. Mitigation Measure BIO-9: Reimbursement. Once the Project operation begins, and for the three years thereafter, the Permittee shall provide reimbursement to the County for a senior staff planner for two weeks annually. This planner shall monitor the implementation of the mitigation measures and others included in this DEIR.

42. Mitigation Measure CUL-2: Cultural Resources.

a) The permittee shall notify the Solano County Resource Management Department immediately if any cultural resources are disturbed during excavation.

b) Prior to the issuance of any grading permits, the Permittee shall include specific wording in the construction and engineering specifications for Project stating that if evidence of cultural resources is identified during excavation all work shall stop in an area within 100 feet of the find until a qualified archaeologist can assess the significance of the find. Evidence of cultural resources includes chipped or ground stone, historic debris, building foundations, or human bone.

c) If necessary, the archaeologist shall develop appropriate treatment measures for the resource in consultation with Solano County, SHPO, and other appropriate agencies.

43. Mitigation Measure GEO-1: Seismic Resistant Design. Project facilities shall be designed to withstand substantial fault movement without rupture. The Permittee shall also complete final geotechnical studies, as outlined below.

44. Mitigation Measure GEO-2: Geotechnical Study.

a) Prior to commencing construction activities, the Permittee shall conduct a geotechnical study to evaluate soil conditions and geologic hazards in the Project Area. The geotechnical study must be signed by a California-registered geologist and approved by Solano County, and shall identify the following:

i) Location of fault traces and potential for surface rupture;

ii) Potential for seismically induced ground shaking, liquefaction, landslides, differential settlement, and mudflows;

iii) Stability of existing cut-and-fill slopes;

iv) Collapsible or expansive soils;

v) Foundation material type;

vi) Potential for wind erosion, water erosion, sedimentation, and flooding; and

vii) Location and description of unprotected drainage that could be impacted by the proposed development.

b) The Project shall, based on the results of this study, be designed to:

i) Follow safety and building codes, and other design requirements, as indicated by the site-specific geotechnical review, including the UBC;

ii) Use existing roads to the greatest extent feasible to minimize increased erosion;

iii) Design fill slopes for an adequate factor of safety, considering material type and compaction, identified during the site-specific geotechnical study;

iv) Cut slopes with a slope ratio compatible with the known geologic conditions, or be stabilized by a buttressed fill;

v) Avoid locating roads and structures near landslide and mudflow areas. Where avoidance of landslide areas is not feasible, relatively flat cut-and-fill slopes would be constructed (2 horizontal: 1 vertical, or 26 percent, or flatter). Roads would be constructed with slope buttressing consisting of excavation of the unstable materials, installation of subdrains, and reconstruction of the slopes to the designed grades using the excavated materials in properly compacted fills. Stabilization of soil, where required for tower foundations, will use the same methods;

vi) Utilize setback requirements from surrounding uses, including roads or utilities and/or diversion walls to mitigate impacts from mudflow-prone areas; and

vii) Avoid locating turbine locations, transmission lines, and associated structures astride faults, lineaments, or unstable areas.

viii) Where service lines or utilities cross the potentially active faults, they shall be designed to withstand vertical and horizontal displacement.

ix) In some cases, depending on the findings of the site-specific geotechnical study and where feasible, removal and replacement of shrink-swell soils with a non-expansive or non-collapsible soil material shall be done.

45. Mitigation Measure GEO-3: Increased Erosion and Expansive Soils. Prior to commencing construction activities, the Permittee shall develop a Project Stormwater Pollution Prevention Plan (SWPPP) in compliance with the State Water Resources Control Board Construction Storm Water Permit. Permittee shall also monitor all disturbed areas each spring for eroding or slump areas.

46. Mitigation Measure HAZ-1: Proper Use and Storage of Materials.

a) Prior to commencing construction activities, the Permittee shall prepare a Hazardous Materials Business Plan/ Spill Prevention, Control, and Countermeasure (SPCC) plan to avoid spills and minimize impacts in the event of a spill. The Plan shall include a discussion of hazardous materials management, including delineation of hazardous material and hazardous waste storage areas, access and egress routes, and notification procedures. The Plan shall be provided to all contractors working on the Project, and one copy shall be available on site at all times.

b) The Permittee shall store all paint, solvents, and any other hazardous materials in the manner specified by the manufacturer and in accordance with Federal regulations and nationally and internationally recognized codes and standards. Small spray cans of carburetor fluid and other hazardous materials shall be stored in an enclosed area in the Operation and Maintenance (O&M) building. A material safety data sheet shall be stored with each material, as well. In addition, all employees must be properly trained in the use and handling of these materials.

c) Prior to commencing construction activities, the Permittee shall prepare a Storm Water Pollution Prevention Plan (SWPPP). In addition to covering erosion control measures, the SWPPP shall include best management practices for construction material and equipment fluid spill prevention and control. Best management practices shall include the following:

i) No debris, soil, silt, bark, rubbish, cement or cement washing, oil or petroleum products, or any other construction materials are allowed to be placed where they may be washed by rainfall into wetlands or streams;

ii) Vehicles and equipment shall be well maintained and periodically inspected for leaks.

iii) No refueling or fuel storage shall occur within 100 feet of sensitive areas, including intermittent streams, wetlands, biological and cultural areas, or within 150 feet of wells.

iv) A drain pan, drop cloth, absorbent pads, or other secondary containment shall be placed beneath nozzle to catch spills/leaks while fueling.

v) Spill containment/cleanup equipment shall be kept on hand and maintained at all times during construction.

vi) Portable toilets shall be located in a convenient and level area; at least 100 feet from sensitive areas.

d) In the event of a hazardous material spill, the Solano County Department of Resource Management shall have jurisdiction over response and cleanup operations.

47. Mitigation Measure HAZ-2: Plan for Encountering Hazardous Materials. The Permittee shall prepare a written plan prior to commencing construction, specifying the proper handling, reporting, and disposal procedures for hazardous contaminants. If hazardous contaminants are unexpectedly encountered during construction, construction crews shall stop work and notify the Department of Resource Management. A licensed waste disposal contractor shall be used to remove the hazardous materials, once identified, from the site, according to Federal, State, and local requirements.

48. Mitigation Measure WQ-1: Avoid Wetlands and Streams. The Permittee shall locate the turbines, aboveground substation, and switchyard outside and away from wetlands, drainages, streams, and other sensitive natural features.

a) Project components shall be constructed using the following recommended setbacks:

i) 100-foot setback from wetlands and streams based on guidance from the U.S. Army Corps of Engineers and CDFG;

ii) 567-foot setback from vernal pools that provide habitat for special-status plants and wildlife protected by the USFWS; and

iii) 567-foot setback from ponds that may provide habitat for water birds and the tiger salamander protected by the CDFG.

iv) Support facilities such as underground cables shall also be sited away from these sensitive natural resources to the extent feasible. In most instances, new overhead lines shall only be used to specifically avoid impacts to sensitive natural resources. No foundations, utility poles, or other permanent facilities shall be located within waters of the U.S.

b) To minimize the potential effects from the use of horizontal directional drilling, the Permittee shall incorporate the following measures:

i) HDD drilling shall occur during the season when the seasonal streams and wetlands in the project area do not have surface water present (i.e., typically June through October).

ii) On-site briefings shall be conducted for HDD workers so that they understand the location of sensitive resources and to ensure that all field personnel understand their responsibility for timely reporting of frac-outs.

iii) Barriers (e.g., straw bales, sedimentation fences, etc.) will be erected between the bore site and nearby sensitive resources prior to drilling, as appropriate, to prevent any material from reaching sensitive resource areas.

iv) The necessary response equipment and/or supplied (e.g., vacuum truck, straw bales, sediment fencing, etc.) will be kept on-site by the contractor during HDD operations so that it is readily available in the event of a frac-out.

c) In the event a frac-out from Horizontal Directional Drilling is detected, the following measures shall be implemented to reduce or minimize effects on sensitive resources:

i) All work shall stop until the frac-out has been contained and cleaned up;

ii) The frac-out area shall be isolated with straw bales, sand bags, or silt fencing to surround and contain the drilling mud.

49. Mitigation Measure WQ-2: Stormwater Pollution Prevention Plan.

a) To minimize erosion potential and subsequent wash-down to low-lying wetland and stream areas, Permittee shall implement the following:

i) Prior to commencing construction activities, a Project SWPPP shall be developed in compliance with the SWRCB's Construction Storm Water Permit.

ii) Overhead transmission lines shall be located away from streams and wetlands to avoid runoff to these areas.

iii) Alignment and location of the proposed service roads shall follow the existing land contours and ridgelines. A minimum amount of earth shall be moved to allow for the required 35-foot access roads. Tower pads shall be similarly constructed.

iv) Graded areas and stockpiled soil shall be stabilized to prevent wind or water erosion.

v) Cut slopes shall have a slope ratio compatible with the known geologic conditions or be stabilized by a buttressed fill.

vi) Surface flows shall be collected and diverted away from cut and fill slopes into ditches discharging to natural drainages.

vii) Rock channel protection shall be employed at points where water concentrates in drainage channels.

viii) Drainage culverts shall be sized and located to minimize erosion and maximize storm runoff away from the Project site. Culverts placed in drainage ways along County roads shall be designed for 100-year storms.

ix) During construction, vegetation removal and grading shall be limited to the minimal area necessary and restricted to areas required for construction only.

x) Erosion control structures shall be placed between disturbed soil and drainage structures or areas prior to the start of the rainy season.

xi) The grading, construction, and drainage of roads shall be carried out to maintain any downstream water quality.

b) To further minimize the erosion potential, the Project Area shall be seeded with grasses and other vegetation as follows:

i) Revegetation of a cut and fill area shall be implemented in accordance with Solano County guidelines and the input of local farmers/farm residents.

ii) Disturbed or graded areas shall be planted with fast-growing and deep-rooted grasses or groundcover, preferably native to the area.

iii) If required, previously vegetated areas and inactive portions of the construction site shall be seeded and watered until vegetation is grown.

iv) Revegetated areas, if any, shall be monitored annually for complete and successful ground cover, and revegetated (if required) to conform to the requirements of the County Grading Ordinance. Revegetation shall be continued, if determined by Solano County, for the life of the Project.

50. Mitigation Measure LU-3: Guarantee Bond or Corporate Surety. Prior to issuance of building permits, the Permittee shall set aside decommissioning funds in the form of a bond or corporate surety as a specific Project budget item. The bond or corporate surety shall be executed on behalf of the Project in favor of the County with an independent administrator of such funds to cover all decommissioning costs. The bond shall be maintained for the life of the Project and through any transfer of ownership.

51. Mitigation Measure NOI-1: Construction Noise.

a) MM NOI-1a: Care of Equipment- Equipment engines shall be covered and the Permittee shall ensure that mufflers are in good working condition.

b) MM NOI-1b: Restricted Work Hours- Work hours shall be restricted for all noise generating construction activities from 7:00 a.m. to 7:00 p.m. Monday through Friday, and from 8:00 a.m. to 6:00 p.m. on Saturdays and Sundays.

c) MM NOI-1c: Equipment Location- The Permittee shall locate stationary equipment, such as compressors and welding machines, away from noise receptors to the extent practicable.

d) MM NOI-1d: Pneumatic Tools- Pneumatic tools to be used within 1,500 feet of a residence shall have an exhaust muffler on the compressed air exhaust. This shall be included in the specifications for project construction.

e) MM NOI-1e: Noise Complaint Plan- Prior to issuance of any building permits for the Project, the Permittee shall submit a plan to the Solano County Resource Management Department that details how the Permittee will respond to noise complaints, keep the County apprised of the complaints, and document the resolution of those complaints. The plan must be approved by the County before the Project building permit is issued.

52. Mitigation Measure NOI-2: Operational Noise. Wind Turbine Operations could exceed the Solano County Zoning Ordinance-permitted noise levels.

a) MM NOI-2a: The Project shall be configured such that the operation of the selected wind turbines shall not exceed a CNEL of 50 dBA (or the equivalent 44 dBA) at nearby residences. This level shall be achieved by implementing one or more of the following:

i) Use all available sites more than 2,000 feet from residences and configure the turbines for sites within 2,000 feet of residences such that they would have the least practical effect on residents.

ii) Provide to the County, prior to obtaining a building permit, additional attenuation analyses, based on terrain effects, nighttime wind speed, or other considerations, demonstrating that the proposed configuration will not coincide with the 50 dBA CNEL area of influence at the nearby residences. A residence can be considered outside the CNEL influence area if, for all predicted wind speeds, either 1) the ambient noise exceeds the turbine noise, or 2) the turbine noise is less than the 50 dBA CNEL.

iii) If the Permittee receives a waiver from a landowner allowing construction of one or more turbines that would place his or her residence

within the 50 dBA CNEL, the Permittee may use noise-insulating features such as double-paned windows and door seals to reduce noise impacts, particularly at night, to levels that would be achieved by relocating turbine sites. To be most effective, noise-insulating features should be constructed in connection with mechanical ventilation that would allow windows and doors to be closed for acoustical isolation.

iv) Provide to the County, prior to obtaining a building permit, a plan for committing to operational limitations or adjustments (such as partial "feathering" of the turbine blades) during nighttime hours or other provisions that would be implemented based upon noise complaints from nearby residents. Such limitations would provide a basis for reducing the CNEL penalty imposed for nighttime noise. The plan would not be implemented unless field measurements verify that noise from nearby turbines substantially influences noise levels at the residence and exceeds the 50 dBA CNEL criterion and the County has reviewed and approved these measures.

v) Relocation of proposed turbines pursuant to table 14.5-3 of the EIR, as may be determined necessary by the County, should the preceding mitigation prove not to be fully effective.

vi) Prior to the installation of the turbines, the Permittee shall provide a written study to the County Resource Management Department demonstrating how the Project, using a combination of the above measures, would achieve compliance with the 50 dBA CNEL (or 44 dBA equivalent) standard.

b) MM NOI-2b. Upon receipt of a reasonable complaint alleging that noise from the operation of the Project turbines is causing noise levels at the exterior of a residence to exceed the 50 dBA CNEL:

i) The Solano County Building Official or the County Sheriff shall report the matter to the Permittee and to the Solano County Department of Resource Management ("DRM").

ii) The Solano County DRM shall commission, at Permittee's expense, a qualified acoustical firm to conduct a site-specific study to verify whether noise levels routinely exceed the 50 dBA CNEL criterion at the residence and whether these levels can be attributed to the operation of specific Project turbines. All findings shall be consolidated into a single report. The acoustical firm shall be authorized to require that the Permittee cease operation of the specified turbines at such times as may be necessary for a period not to exceed 10 days to verify that the noise levels at the residence would be noticeably reduced (3 dBA decrease in sound levels) by modifications to, or restrictions on, the operation of the specified Shiloh I turbines. Upon Verification of the complaint, the

qualified firm shall identify the circumstances and measures that could be undertaken to ensure conformance with the 50 dBA CNEL (or 44 dBA equivalent) standard.

iii) For 30 days after the receipt of the verification of the complaint and mitigation recommendations, the Permittee shall attempt in good faith to negotiate a resolution of this matter with the party making the allegation and shall report any such resolution to the DRM in a timely manner.

iv) If a resolution of the complaint is not achieved within 30 days, the DRM shall require the Permittee to implement one or more of the recommendations specified in the acoustical report to achieve conformance with the applicable standards, which may include turbine relocation.

53. Mitigation Measure PSU-1: Public Services. Permittee shall comply with the following:

a) Prior to commencing construction activities for the Project, the Permittee shall develop a Grass Fire Control Plan for use during construction and operation. The Plan shall include notification procedures and emergency fire precautions.

b) Permittee shall insure that the construction contractor develops a County Approved Health and Safety Plan.

c) Permittee shall notify the Solano Emergency Medical Services Cooperative and the affiliated Rio Vista Fire Department in advance of commencing construction activities for the Project.

54. Mitigation Measure PSU-3: Microwave Transmissions. Permittee shall comply with the following:

a) Permittee shall notify all microwave station owners within 2 miles of the Project Area to receive their clearance or, if necessary, negotiate alternative turbine locations or types of equipment, and shall provide such notification and the results to the Solano County Resource Management Department prior to issuance of building permits.

b) Wind turbine towers shall be sited outside the WCFZs identified for two pathways crossing the Project Area, and shall be sited an additional 40-meters from the WCFZs.

c) If any off-axis receiver interference occurs after installation of turbines, high-performance antennas shall be installed by Permittee at nearby microwave sites.

55. Mitigation Measure PSU-4: Television or Radio Interference. Permittee shall comply with the following:

a) Prior to issuance of building permits for the Project, Permittee shall notify all television and radio station owners within 2 miles of the Project Area of the Project.

b) All wind turbine towers shall be sited at least 1,000 feet (304.8 meters) from television/radio receivers or transmitters.

56. Mitigation Measure REC-2: Recreational Facilities. Setback from the Suisun Marsh Management Area. Turbines shall be set back a minimum of 1,000 feet from the boundary of the Suisun Marsh Secondary Management Area, as referenced in mitigation measure BIO-7.

57. Mitigation Measure SA-1: Grass Fire Control Plan.

a) Prior to commencing construction activities for the Project, the Permittee shall develop and implement a Grass Fire Control Plan ("Plan") for use during construction and operation and shall include notification procedures and emergency fire precautions.

b) During project construction, the Permittee shall comply with the following:

i) All internal combustion engines, stationary and mobile, shall be equipped with spark arresters.

ii) Spark arresters shall be in good working order.

iii) Light trucks and cars with factory-installed (type) mufflers, in good conditions, may be used on roads where the roadway is cleared of vegetation.

iv) Smoking sings and fire rules shall be posted on the project bulletin board at the contractor's field office and areas visible to employees during the fire season.

v) Equipment parking areas and small stationary engine sites shall be cleared of all extraneous flammable materials.

c) During project operation, the Permittee shall comply with the following:

i) Warning signs for high-voltage equipment

ii) Annual clearing of brush and other dried vegetation around pad-mount transformers, riser poles, and the Operation & Maintenance (O&M) building.

iii) Installation of fire extinguishers at the O&M building.

iv) Employee training in the use of extinguishers and communication with the Montezuma Hills Fire District.

v) Periodic inspections by the Montezuma Hills Fire District.

d) The Plan shall be submitted to the County for approval. Permittee shall not commence construction activities until the County has approved the Plan.

e) Permittee shall provide copies of the Plan, along with maps of the Project Area and roads, to the Montezuma Hills Fire District.

f) Permittee shall provide the Fire District access to its water storage tanks, if needed by the Fire District.

58. Mitigation Measure SA-2: Turbine Setbacks and Property Owner Waivers. Permittee shall comply with the following:

a) Prior to commencing Project operation, Permittee shall provide the County with manufacturer's specifications for the wind turbines, specifying that all turbines are equipped with a braking system, blade pitch control, and/or other mechanism for rotor control, and shall have both manual and automatic overspeed controls.

b) Where a turbine setback from a public road is less than three times (3x) the total turbine height, prior to turbine installation, Permittee shall provide the County Public Works Department certification that the base elevation of the turbine does not exceed 80 feet from the nearest public road, unless further study is provided to, and approved by, the County.

c) Prior to turbine installation, the Permittee shall provide to the County a waiver from adjacent property owners where a reduced turbine setback is proposed.

59. Mitigation Measure SA-3a: Equipment Shut-off Mechanisms.

a) All Project turbines and utility lines shall be equipped with automatic and manual-disconnect mechanisms.

b) Three circuit breakers that can be both manually and automatically operated shall be provided between each turbine and the connection to the electrical grid.

c) The electrical systems and substations shall be designed by California-registered electrical engineers, and shall meet national electrical safety codes

and other national standards, including NEMA, ANSI, and Cal-OSHA standards. Grounding shall also be designed to the standards of the Institute of Electrical and Electronics Engineers.

d) The above mechanisms shall be installed and tested prior to interconnection.

e) Prior to commencing construction activities, the Permittee shall develop a project-specific Health and Safety Plan for implementation during construction and operation. The Health and Safety Plan shall include emergency contacts, location of nearest hospital, and proper emergency protocol.

60. Mitigation Measure SA-3b: Limited Site Access. The Permittee shall restrict access to the wind turbines and other Project facilities during Project operation by implementing the following measures:

a) The Project area shall be completely fenced;

b) All turbine towers shall be locked;

c) All turbines shall have at least 15 feet (4.6 m) between the ground and both the tips of the turbine blades and the access routes (e.g., ladders) unless enclosed by a 6-foot (1.8 m) high fence;

d) The substation and switchyard shall be fenced and locked;

e) The O&M building shall be kept locked;

f) Each down-tower electrical/communication cabinet shall be locked and have a sign with high-voltage warning;

g) Road access to Project sites shall be through locked gates;

h) Field maintenance crewmembers shall be on-site during the day, and a security service shall patrol the area at night.

i) Only properly trained personnel shall be provided entry to the site, to reduce the likelihood of accidents.

j) Signs shall be posted at entrance gates noting the existence of high-voltage and underground cable on the site and warning people of the hazards of electrocution.

k) Permittee shall also post signs at entrance gates noting the existence of high voltage and underground cable on the site and warning people of the hazards of electrocution.

61. Mitigation Measure TRA-1a: Traffic Control Plan.

a) The permittee shall develop and implement a traffic control plan based on the final engineering design, and prepared by a registered professional engineer. The Plan shall be submitted at least 45 days prior to construction to the Solano County Public Works Division (for affected County roads) and to CalTrans (for affected state Highways). The plan shall describe the location, schedule, and safety procedures for lane and road closures, as well as the hours, routes, and safety and management requirements. The plan shall contain the following measures:

i) Traffic safety measures, such as warning signs on approaches to areas with construction activity (i.e., “Construction Traffic Ahead” or equivalent);

ii) Scheduling of construction traffic to avoid peak traffic hours (also see Mitigation Measure TRA-1b);

iii) Ensure access for emergency vehicles at all times;

iv) Provide temporary access to businesses and/or residences during construction;

v) Open lanes as soon as possible to restore normal traffic patterns;

vi) During the design phase the Permittee shall coordinate with other utilities service providers to ensure conflicts with other utilities are minimized;

vii) New roads shall be designed and constructed to accommodate Project traffic and minimize the potential for accidents, in accordance with all applicable CalTrans and Solano County specifications, including appropriate slopes, sufficient turning radii, and appropriate roadway depth; and

viii) After construction, restore the routes to original conditions.

b) Prior to commencing construction activities, the Permittee shall provide to County Public Works – Engineering, a Transportation Plan that addresses the following issues:

i) Transport of all equipment to the site; (2) transport of all equipment during equipment removal;

ii) Transport of all building materials;

iii) Circulation, itemizing how many of each vehicle type will use which roads;

iv) Responsibilities;

v) Security bonding;

vi) Vehicular traffic types and amounts necessary for the project;

vii) Extra-legal loads;

viii) Signage;

ix) Road maintenance; and

x) Encroachment permits.

c) All of the Permittee's activities shall conform to the approved Transportation Plan.

d) As required by Solano County Public Works Division, grading and encroachment permits must also be obtained prior to construction.

62. Mitigation Measure TRA-1b: Notification, Scheduling and Carpooling. Prior to commencing construction activities, the Permittee shall implement notification, schedule shifts, carpooling, and other best management practices to minimize increases in traffic. Specific measures to minimize the impact of short-term increase in traffic from the construction workforce and truck deliveries shall include the following:

a) Coordinate with local jurisdictions to notify residents of alternate traffic routes;

b) Schedule shifts and material deliveries to avoid peak traffic congestion hours;

c) Promote carpooling among construction workforce;

d) Stage worker personal vehicles and some trucks at the O&M building staging area;

e) Deliver construction equipment, such as that used for grading, excavation, material delivery, and turbine assembly, directly to the construction location rather than the O&M building staging area to minimize trips on local public roads.

63. Mitigation Measure TRA-2: Temporary Disruption to Traffic Flow during Construction.

a) Temporary lane closures of public roads must be approved in advance by the County Public Works, and shall be allowed only during workdays.

b) No overnight lane closures shall be allowed.

64. Mitigation Measure TRA-3: Repairs to Roads.

a) Any damage to roads that occurs as a result of the Project shall be repaired to the original conditions.

b) Prior to commencing construction activities, the Permittee shall enter into a secured agreement with Solano County to ensure that any County roads that have been damaged by the project are promptly repaired and, if necessary, reconstructed. The agreement shall include posting of security bond to cover costs for road maintenance during construction.

c) Permittee shall obtain all appropriate hauling permits prior to construction.

65. Mitigation Measure TRA-6: Turbines Siting.

a) Permittee shall site all turbines within the outer horizontal plane on hills less than 222.5 feet (above sea level) for the 65-meter towers and 172.5 feet (above sea level) for the 80-meter towers.

b) Permittee shall submit FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the FAA, requesting that the FAA issue a Determination of No Hazard to Air Navigation for all turbines and meteorological towers.