

Reply to ‘Staff Response to CalWEA August 9, 2005 Letter, Attachment 1: “Significant Calculation Errors Found in the August 2004 PIER Report”, Carol Pilz Weisskopf, PhD.’¹

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Many of the critical public comments in the California Energy Commission (CEC) docket 04-IEP-1G involve matters of study design, selection of appropriate correction factors, statistical treatment of data and the level of certitude placed in various mortality reduction hypotheses in the Smallwood and Thelander August 2004 PIER report.² These are areas subject to difference of opinion and professional judgment, and are open to debate. However, the matter of carcass selection in the calculation of mortality is not debatable – it is a matter of math and of fact, of performing the calculation exactly as described, and the calculation is either correct or incorrect.

Our review of golden eagle, red-tailed hawk and great horned owl mortality calculations relied on two files received from CEC staff on 07 July 2005: ‘CEC data_fatalities.sav’ dated 03/23/05 and ‘CEC data_search dates.xls’ also dated 03/23/05. The pertinent sections of the fatalities file are included in Attachment 2 and those from the search dates in Attachment 3.

The first part of the staff response claims ‘Weisskopf switched the number of golden eagle carcasses given an Estimated Time since Death of greater than 90 days (15 in Smallwood and Thelander, 6 by Weisskopf’s analysis) with the number categorized as not having ETDs (6 in Smallwood and Thelander, 15 in Weisskopf analysis).’³

First, the Smallwood and Thelander (2004) report gives neither the number of Set 2 carcasses with an ETD greater than 90 days nor the number with no ETDs. These must be determined from the data files. Second, in Attachment 2 (an accurate presentation of the data given to us by CEC staff) the carcasses given an ETD greater than 90 days are shown. It is no great trick to count to 6, since one does not even have to take off one’s shoes to do it. Third, *neither* of these groups of carcasses was to have been used in calculation of the golden eagle mortality factor, since only those with an assigned ETD *less* than 90 days were to have been used; so the actual carcass number in either category is irrelevant to the calculation. Finally, if CEC staff looked at the data to determine how many carcasses were in each category, either the transposition error is theirs or the data file they gave to us is in error. The sole point of agreement between staff and us is that *only* 10 golden eagle carcasses were supposed to have been used to calculate the Set 2 turbine’s mortality factor.

In reference to the actual mortality factor we calculated, CEC staff response to that is ‘It was only a coincidence that Weisskopf’s calculation using the wrong group of golden eagle carcasses nearly equaled the unadjusted estimate of Smallwood and Thelander (2004); however we cannot determine from her comment how she did this.’⁴ The staff then goes on to give a one-sentence description of the calculation of the unadjusted mortality factor and a one-page description and justification for the correction factors applied to

¹ August 31, 2005 memorandum to CEC commissioners Geesman and Boyd with the subject ‘Response to public comments on the staff report titled *Assessment of Avian Mortality from Collisions and Electrocutions* (CEC-700-2005-015) (Avian White Paper) written in support of the 2005 Environmental Performance Report and the 2005 Integrated Energy Policy Report’, unpaginated section, 157 – 159 of the memorandum.

² Smallwood K.S. and C.G. Thelander, ‘Developing Methods to Reduce Bird Mortality in the Altamont Pass Wind Resource Area’, PIER Final Project Report 500-04-052, August 2004

³ CEC staff memorandum, *op cit.* p. 157.

⁴ *Ibid*, p. 157.

the unadjusted mortality factor. Although we have great concern about the appropriateness of the correction factors, the error we posit is in the calculation of the unadjusted mortality factor itself.

From the data in the files given to us by CEC staff, mortality factors were calculated for the golden eagle, red-tailed hawk, great horned owl, burrowing owl and ferruginous hawk carcasses in the Set 2 turbines (Attachment 1) according to the calculation procedure described in the 2004 PIER report.⁵

In Attachment 1, data in columns A, B, C and H are taken from the CEC fatality file, and columns D, I and J taken from the CEC search dates file for the turbine string associated with the carcass. Column E is our count of the number of individual towers in the string, column F is our assignment of the per-turbine MW, and column G is the number of towers (E) times the per-turbine MW value (F). Column K is the interval between the two searches in that string (I and J), and column L is the study duration (the search interval (K) + 90 days). Column M is the deaths/MW/year for the individual eagle carcass in that string, calculated by dividing 1 carcass by the string MW sum (G) and by the study duration (L). Column N is the sum of the individual string factors (M), and in column O the string factor sum (N) is divided by the number of turbine strings in Set 2 (280 strings) to give the unadjusted mortality factor (in deaths per MW per year) for the Set 2 turbines. Column P gives the unadjusted mortality factor as shown in Table 3-9 of the 2004 PIER report.⁶

For the golden eagles, the **first pair** of numbers in columns N and O yields the unadjusted mortality factor produced if *only* the 10 carcasses with an ETD less than 90 days are used. This factor is 34.8% of the factor given in the 2004 PIER report. The **second pair** yields the mortality factor if the 10 carcasses with an ETD less than 90 days *and* the 15 carcasses with no ETD are used. The second pair gives a mortality factor that is 1.4% higher than that shown in the report. The same holds true for red-tailed hawk carcasses – our calculated unadjusted mortality factor only closely matches that reported when *all* carcasses with no assigned ETD are used along with those with an ETD less than 90 days.

The burrowing owl and ferruginous hawk calculations shown in Attachment 1 were performed as a check on our calculation procedure, as none of those carcasses had an unassigned ETD. The factor we calculated for burrowing owls was 0.5% higher and for ferruginous hawks 1.7% lower than the factors reported. As an additional check, calculations were also performed (but not shown here) for one cowbird, one mallard, one raven and two bluebird carcasses from the Set 2 turbines, with our calculated factors matching those reported \pm 2%. The differences in our calculated factors compared to those reported are probably due to rounding or some other minor factor, but serve to demonstrate the calculation was duplicated appropriately.

The only uncertainties in our calculation of the golden eagle unadjusted mortality factor was the individual turbine's MW rating and the study duration used by the authors for the golden eagle carcass found incidentally on 13-May-03 (Attachment 1) since it was found two months after searches of that string ceased. To produce a calculated golden eagle unadjusted mortality factor that matches that given in the 2004 PIER report using only the 10 carcasses with an assigned ETD less than 90 days, all the turbines need to average 0.035 MW and there are none in the Altamont that small. The authors did not address adjustment of study durations for incidental finds, so the original search dates appear in Attachment 1. However, the increase in that string's study duration to include the date the carcass was found produces a better match with the mortality factor in the 2004 PIER report, with ours higher by only 0.9% when the 10 eagle carcasses with an ETD less than 90 days *and* the 15 with no assigned ETD are all included.

There have been many estimates of Altamont golden eagle mortality (Howell and DiDonato 1991, Kerlinger and Curry 2003, Orloff and Flannery 1992 and 1996, Smallwood and Thelander in press)⁷. In addition, the

⁵ Smallwood and Thelander (2004), *op cit.* p. 49.

⁶ *Ibid*, p 70.

⁷ Howell J.A and J.E. DiDonato, 'Assessment of avian use and mortality related to wind turbine operations, Altamont Pass, Alameda and Contra Costa Counties, California, September 1998 – August 1989', report to US Windpower, 1991;

2004 PIER report golden eagle mortality factors from the Set 1 turbines can be extrapolated to the entire APWRA, omitting the Set 2 turbine factor disputed here. *All* of these mortality estimates, including Smallwood and Thelander (in press) lie between 28 and 43 golden eagle deaths per year, substantially different than the 2004 PIER report's 76 – 116 eagle deaths per year.⁸

In the PIER report, the authors address differences in mortality estimates between that report and their NREL report (in press). They state 'Our new mortality estimates are much larger than those reported in Smallwood and Thelander (in review), but our report to the National Renewable Energy Lab did not include data collected over most of the APWRA where we had not yet been granted access, and it did not include data from the wind turbines because we had not yet completed a full year of fatality searches on these turbines and decided to exclude them from our estimates of mortality. In fact, we had noticed that the mortality estimates representing the SeaWest-owned turbines were much larger than observed elsewhere, but we guessed that these larger estimates might be due to time spans consisting of less than a year because the denominator in the mortality estimate would be a fraction and would therefore artificially inflate the mortality estimate, as described in Chapter 3. However, continued searches at these wind turbines proved that the greater mortality previously observed (and excluded from our report) was not the result of insufficient time spanning the searches. Mortality at the SeaWest-owned portion of the APWRA substantially exceeds mortality observed over most of the rest of the APWRA'.⁹

In the NREL report, annual golden eagle mortality Altamont-wide is 28 and 34 deaths/year for the search efficiency-corrected total and the searcher efficiency plus scavenging-corrected total, respectively. The SeaWest-owned turbines discussed, above, are in the Set 1 turbines. When the PIER report Set 1 turbines alone are used to calculate annual golden eagle mortality Altamont-wide, the total is *also* 28 and 34 deaths/year for the searcher efficiency-corrected total and the searcher efficiency and scavenging-corrected total, respectively. The SeaWest-owned turbines do not account for the substantial difference in golden eagle mortality estimates between the Smallwood and Thelander NREL report and the Smallwood and Thelander PIER report.

There is no evidence that CEC staff attempted to perform the same calculation exercise we demonstrate here – an effort to determine the source of the unexpected magnitude in the annual golden eagle mortality – despite the improbability of the numbers and our effort to point out the source of the discrepancy.

That our calculated golden eagle and red-tailed hawk mortality factors match by 'coincidence' only when we include carcasses without ETDs in the data files *given to us by CEC staff* beggars the imagination. If this is the level of critical thought CEC staff has given to an issue as crucial as this mistake in calculation, we have little reason to expect competent assessment of any other public criticism in the remainder of the staff response.

Kerlinger P. and R. Curry, 'The relationship of golden eagle (*Aquila chrysaetos*) and red-tailed hawk (*Buteo jamaicensis*) collision fatalities in the Altamont Pass wind resource area of California to ground squirrel management practices: 1989 – 2002', report to Altamont Infrastructure Company, 2003; Orloff S. and A. Flannery, 'Wind turbine effects on avian activity, habitat use, and mortality in Altamont Pass and Solano County wind resource areas', CEC report, 1992; Orloff S. and A. Flannery, 'A continued examination of avian mortality in the Altamont Pass wind resource area', CEC report 1996; Smallwood K.S. and C.G. Thelander, 'Bird mortality in the Altamont Pass wind resource area', NREL report NREL/SR-500-36973, in press.

⁸Smallwood and Thelander, *op cit.*, p. 73.

⁹ *Ibid*, p.76.

Attachment1

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
ETD	String ID	Tower ID	Towers in string	# Towers	MW per turbine	String MW	Carcass Date	Study Start	Study End	Duration (years)	Duration + 90 d	d/MW/year for the string	d/MW/year sum for set 2	d/MW/year calculated factor	d/MW/year reported factor
Golden eagle															
5	361	4542	4536-4557	22	0.1	2.2	13-May-03	18-Nov-02	10-Mar-03	0.307	0.553	0.8213	13.569	0.0485	0.1391
7	335	41	36-63, 1561	29	0.1	2.9	4-Mar-03	12-Nov-02	5-Mar-03	0.310	0.556	0.6200	39.495	0.1411	0.1391
14	319	2910	2909-2915, 2954-2957	11	0.1	1.1	5-Mar-03	29-Oct-02	4-Feb-03	0.268	0.515	1.7650			
18	408	697	686-697, 1379-1380	14	0.1	1.4	17-Mar-03	16-Oct-02	29-Jan-03	0.288	0.534	1.3370			
21	340	104	97-110	14	0.1	1.4	3-Mar-03	14-Nov-02	4-Mar-03	0.301	0.548	1.3036			
24	312	2965	2871-2908, 2958-2972	53	0.1	5.3	27-Oct-02	28-Oct-02	4-Feb-03	0.271	0.518	0.3644			
33	363	964	954-964	11	0.1	1.1	14-Oct-02	15-Oct-02	28-Jan-03	0.288	0.534	1.7016			
45	328	4323	4314, 4322-4324	4	0.1	0.4	10-Mar-03	19-Nov-02	11-Mar-03	0.307	0.553	4.5173			
60	331	4418	4330-4349, 4410-4424	35	0.1	3.5	19-Nov-02	20-Nov-02	11-Mar-03	0.304	0.551	0.5188			
75	335	43	36-63, 1561	29	0.1	2.9	4-Mar-03	12-Nov-02	5-Mar-03	0.310	0.556	0.6200			
90	244	H04	H01-H04	4	0.065	0.26	26-Feb-03	11-Nov-02	27-Feb-03	0.296	0.542				
90	329	4325	4325-4329	5	0.1	0.5	18-Nov-02	19-Nov-02	11-Mar-03	0.307	0.553				
120	335	40	36-63, 1561	29	0.1	2.9	11-Nov-02	12-Nov-02	5-Mar-03	0.310	0.556				
135	341	4035	4034-4095	62	0.1	6.2	29-Oct-02	30-Oct-02	6-Feb-03	0.271	0.518				
180	335	39	36-63, 1561	29	0.1	2.9	11-Nov-02	12-Nov-02	5-Mar-03	0.310	0.556				
315	396	1395	1390-1395	6	0.1	0.6	1-Jan-03	2-Jan-03	1-Apr-03	0.244	0.490				
	213	S3003	S3001-S3010	10	0.33	3.3	20-Jan-03	21-Jan-03	10-Apr-03	0.216	0.463	0.6545			
	213	S3009	S3001-S3010	10	0.33	3.3	20-Jan-03	21-Jan-03	10-Apr-03	0.216	0.463	0.6545			
	251	6046	6046-6060	15	0.1	1.5	1-Dec-02	2-Dec-02	17-Mar-03	0.288	0.534	1.2479			
	271	4677	4677-4700	24	0.1	2.4	11-Mar-03	21-Nov-02	12-Mar-03	0.304	0.551	0.7566			
	279	2355	2347-2365	19	0.1	1.9	21-Jan-03	21-Oct-02	22-Jan-03	0.255	0.501	1.0498			
	289	2101	2094-2121	28	0.1	2.8	29-Jan-03	23-Oct-02	30-Jan-03	0.271	0.518	0.6897			
	306	2719	2690-2719	30	0.1	3	12-Nov-02	13-Nov-02	2-Mar-03	0.299	0.545	0.6114			
	307	2610	2565-2612	48	0.1	4.8	2-Feb-03	23-Oct-02	3-Feb-03	0.282	0.529	0.3940			
	333	5	1 to 32	32	0.1	3.2	5-Feb-03	29-Oct-02	6-Feb-03	0.274	0.521	0.6003			
	343	4102	4096-4102	7	0.1	0.7	10-Feb-03	30-Oct-02	11-Feb-03	0.285	0.532	2.6878			
	348	4384	4378-4390	13	0.1	1.3	18-Nov-02	18-Nov-02	10-Mar-03	0.307	0.553	1.3899			
	416	1508	1505-1508	4	0.1	0.4	5-Jan-03	6-Jan-03	26-Mar-03	0.216	0.463	5.3994			
	428	238	237-242	6	0.15	0.9	16-Feb-03	31-Oct-02	17-Feb-03	0.299	0.545	2.0380			
	462	58	58-59	2	0.15	0.3	6-Jan-03	7-Jan-03	7-Apr-03	0.247	0.493	6.7593			
	468	172	68-74, 168-174	14	0.15	2.1	7-Jan-03	13-Jan-03	8-Apr-03	0.233	0.479	0.9932			
Ferruginous hawk															
7	222	D13		7	0.065	0.455	5-Nov-02	6-Nov-02	25-Feb-03	0.304	0.551	3.9910	9.578	0.0342	0.0348
24	223	M5		5	0.065	0.325	5-Nov-02	6-Nov-02	25-Feb-03	0.304	0.551	5.5874			
Burrowing owl															
30	242	G02	G01-G02	2	0.065	0.13	26-Feb-03	11-Nov-02	27-Feb-03	0.296	0.542	14.1803	28.126	0.1005	0.1000
24	372	1331	1331-1334	4	0.1	0.4	14-Oct-02	15-Oct-02	28-Jan-03	0.288	0.534	4.6795			
75	240	F04	F03-F05	3	0.065	0.195	2-Mar-03	11-Nov-02	3-Mar-03	0.307	0.553	9.2663			

BRCNUMB	DATE	ETD	AOUS	GROUP	AGE	ID	TOWNAMES	TOWER	STRING2	DISTANCE	BEARING	FINDING
1247	14-Oct-02	24	BUOW	raptor	unknown	3296		1331	372	18	208	wings
1438	26-Feb-03	30	BUOW	raptor	unknown	1802	G02		242	39	180	old remains
1440	2-Mar-03	75	BUOW	raptor	unknown	1794	F04		240	37	262	wings
1484	23-Mar-03	90	BUOW	raptor	unknown	1938		4649	263	1		old remains
1278	5-Nov-02	7	FEHA	raptor	sub-adult	1664	D13		222	4	161	complete
1279	5-Nov-02	24	FEHA	raptor	unknown	1672	M5		223	34	22	feathers
1501	13-May-03	5	GOEA	raptor	sub-adult	3153		4542	361	21.9	12	wings
1444	4-Mar-03	7	GOEA	raptor	sub-adult	2761		41	335	22	194	complete
1450	5-Mar-03	14	GOEA	raptor	unknown	2595		2910	319	19	108	complete
1474	17-Mar-03	18	GOEA	raptor	sub-adult	3647		697	408	12	258	complete
1443	3-Mar-03	21	GOEA	raptor	unknown	2850		104	340	1		old remains
1258	27-Oct-02	24	GOEA	raptor	adult	2546		2965	312	44	216	complete
1244	14-Oct-02	33	GOEA	raptor	unknown	3192		964	363	16	228	prtl carcass
1459	10-Mar-03	45	GOEA	raptor	sub-adult	2670		4323	328	50	222	complete
1303	19-Nov-02	60	GOEA	raptor	unknown	2711		4418	331	15	196	prtl carcass
1445	4-Mar-03	75	GOEA	raptor	unknown	2763		43	335	27	82	old remains
1439	26-Feb-03	90	GOEA	raptor	adult	1806	H04		244	37	196	complete
1301	18-Nov-02	90	GOEA	raptor	unknown	2672		4325	329	28	206	wings
1282	11-Nov-02	120	GOEA	raptor	unknown	2760		40	335	41	197	complete
1266	29-Oct-02	135	GOEA	raptor	unknown	2858		4035	341	50	168	complete
1283	11-Nov-02	180	GOEA	raptor	unknown	2579		39	335	42	192	prtl carcass
1347	1-Jan-03	315	GOEA	raptor	unknown	3517		1395	396	40	286	prtl carcass
1380	20-Jan-03		GOEA	raptor	unknown	1604	S3003		213	26	170	prtl carcass
1382	20-Jan-03		GOEA	raptor	unknown	1607	S3009		213	49	188	prtl carcass
1316	1-Dec-02		GOEA	raptor	unknown	1857		6046	251	31	132	prtl carcass
1465	11-Mar-03		GOEA	raptor	unknown	1992		4677	271	0		old remains
1387	21-Jan-03		GOEA	raptor	unknown	2075		2355	279	50	192	wings
1400	29-Jan-03		GOEA	raptor	unknown	2218		2101	289	75	219	old remains
1288	12-Nov-02		GOEA	raptor	unknown	2399		2719	306	24	250	feathers
1401	2-Feb-03		GOEA	raptor	unknown	2445		2610	307	16	158	old remains
1409	5-Feb-03		GOEA	raptor	unknown	2730		5	333	3	268	prtl carcass
1426	10-Feb-03		GOEA	raptor	unknown	2957		4102	343	30	306	old remains
1300	18-Nov-02		GOEA	raptor	unknown	3042		4384	348	10	344	prtl carcass
1350	5-Jan-03		GOEA	raptor	unknown	3701		1508	416	20	184	prtl carcass
1431	16-Feb-03		GOEA	raptor	unknown	3762		238	428	49	46	old remains
1352	6-Jan-03		GOEA	raptor	unknown	3950		58	462	27	173	old remains
1356	7-Jan-03		GOEA	raptor	unknown	4013		172	468	35	98	old remains

BRCNUMB	DATE	ETD	AOUS	CAUSE	REPORT	SEX\$	INJURY	COMMENTS
1247	14-Oct-02	24	BUOW	collision	1	Unknown		Unknown injuries. Carcass missing.
1438	26-Feb-03	30	BUOW	collision	1	Unknown	sevrd wing	Broken piece of ulna and radius attached to remaining Rt win
1440	2-Mar-03	75	BUOW	collision	1	Unknown		Unknown injuries. Carcass missing.
1484	23-Mar-03	90	BUOW	collision	1	Unknown		Unknown injuries. Only one leg found.
1278	5-Nov-02	7	FEHA	collision	1	Unknown	torso in half	Blade cut through spine below ribcage, cutting raptor into 2
1279	5-Nov-02	24	FEHA	collision	1	Unknown		Unknown injuries. Carcass missing.
1501	13-May-03	5	GOEA	collision	incidental	Unknown	sevrd wing	
1444	4-Mar-03	7	GOEA	collision	1	Unknown	torso cut/twist	Wound in upper torso from mid back to right side of abdomen.
1450	5-Mar-03	14	GOEA	collision	incidental	Unknown	dismembered	Severed right leg and tail. Right Wing broken. Left leg like
1474	17-Mar-03	18	GOEA	collision	1	Unknown	sevrd wing	Left wing severed at top of humerus bone. Tail chopped off b
1443	3-Mar-03	21	GOEA	collision	1	Unknown		Unknown injuries. Only bones and tissues from one leg found.
1258	27-Oct-02	24	GOEA	collision	1	Unknown	torso cut/twist	Partial Right Wing severed.
1244	14-Oct-02	33	GOEA	collision	1	Unknown	torso in half	Head and upper torso found 9/16/02 by Tara near turbine #960
1459	10-Mar-03	45	GOEA	collision	1	Unknown	none apparent	Unknown injuries. Bird dragged by scavenger 83m. Head tucke
1303	19-Nov-02	60	GOEA	collision	1	Unknown	torso in half	Only lower torso and tail present. Spine and ribcage expose
1445	4-Mar-03	75	GOEA	collision	1	Unknown		Unknown injuries. Part of carcass missing.
1439	26-Feb-03	90	GOEA	unknown	1	Unknown	none apparent	Lying on Belly. 'No obvious injuries. Rubber on end of trans
1301	18-Nov-02	90	GOEA	collision	1	Unknown	sevrd wing	Unknown injuries. Only Partial Right Wing. Break at humerus
1282	11-Nov-02	120	GOEA	collision	1	Unknown	sevrd wing	Possible severed wing but carcass old.
1266	29-Oct-02	135	GOEA	collision	1	Unknown		Unknown injuries. Too old.
1283	11-Nov-02	180	GOEA	collision	1	Unknown	torso in half	Possible torso separation into two parts found but carcass o
1347	1-Jan-03	315	GOEA	collision	1	Unknown		Unknown injuries. Too old. Head and bones of one wing missin
1380	20-Jan-03		GOEA	collision	1	Unknown		Unknown injuries. Too old.
1382	20-Jan-03		GOEA	collision	1	Unknown		Unknown injuries. Too old.
1316	1-Dec-02		GOEA	collision	1	Unknown		Unknown injuries. Too old.
1465	11-Mar-03		GOEA	collision	1	Unknown		Unknown injuries. Only found broken Ulna bone.
1387	21-Jan-03		GOEA	collision	1	Unknown		Unknown injuries. Most of carcass missing. Old.
1400	29-Jan-03		GOEA	unknown	1	Unknown		Unknown injuries. Too old.
1288	12-Nov-02		GOEA	collision	1	Unknown		Unknown injuries. Most of carcass missing. Old.
1401	2-Feb-03		GOEA	collision	1	Unknown		Unknown injuries. Most of carcass missing.
1409	5-Feb-03		GOEA	collision	1	Unknown		Unknown injuries. Carcass missing.
1426	10-Feb-03		GOEA	collision	1	Unknown		Unknown injuries. Too old.
1300	18-Nov-02		GOEA	collision	1	Unknown		Unknown injuries. Carcass too old.
1350	5-Jan-03		GOEA	collision	1	Unknown		Unknown injuries. Too old. Head and bones of one wing missin
1431	16-Feb-03		GOEA	collision	1	Unknown		Unknown injuries. Only partial pelvis and spine found.
1352	6-Jan-03		GOEA	collision	1	Unknown		Unknown injuries. Only found broken bones of one wing.
1356	7-Jan-03		GOEA	collision	1	Unknown		Unknown Injuries. Only leg bones found.

BRCNUMB	DATE	ETD	AOU\$	COMMENT\$	REPEAT	SCAVENGE	INSECTS
1247	14-Oct-02	24	BUOW			extensive	
1438	26-Feb-03	30	BUOW	Left wingfound 6m away from Right Wing.		extensive	
1440	2-Mar-03	75	BUOW			extensive	
1484	23-Mar-03	90	BUOW			extensive	
1278	5-Nov-02	7	FEHA	Flies presenton lower half. Light morph.		arth. only	some
1279	5-Nov-02	24	FEHA	Light morph. Fox skull and spine bones nearby but seem of		extensive	
1501	13-May-03	5	GOEA				
1444	4-Mar-03	7	GOEA	Bird laying on its side with right wing meeting left.Newly		arth. only	some
1450	5-Mar-03	14	GOEA	Think tail and right leg moved by scavenger to 2nd localne.		extensive	some
1474	17-Mar-03	18	GOEA	Beetles & lots of maggots active on back& inside. 23 flags p		arth. only	abundant
1443	3-Mar-03	21	GOEA			extensive	
1258	27-Oct-02	24	GOEA	Radio transmitter and Avise Bird Band (629-41132) present.		arth. only	some
1244	14-Oct-02	33	GOEA	Feathers shafts broken, some chewed on. 10/15 feathers blown		extensive	
1459	10-Mar-03	45	GOEA	1st feathers found at 50m from turbine.Trail of feathers l		extensive	
1303	19-Nov-02	60	GOEA	Eurotrophication - flesh covered in white slime. Clean humer		extensive	
1445	4-Mar-03	75	GOEA	Keel of sternum chewed off.		extensive	
1439	26-Feb-03	90	GOEA	Radio Transmitter & Avise Bird Band 629-35736,Flies preseent.		arth. only	some
1301	18-Nov-02	90	GOEA			extensive	
1282	11-Nov-02	120	GOEA	Radio transmitter and Band (629-41129). Squirrel and bones b		extensive	
1266	29-Oct-02	135	GOEA	Looks as if it "melted" into the grass. 50 estimate. Slope		some	
1283	11-Nov-02	180	GOEA			some	
1347	1-Jan-03	315	GOEA	2-3 inches of grass grown above bones. Feather shafts are		some	
1380	20-Jan-03		GOEA	Bones found on surface and below few inches of dirt and gras		some	
1382	20-Jan-03		GOEA	Most bones found at or near the surface. Some bones scorched		some	
1316	1-Dec-02		GOEA	Bones partially buried and some broken.		some	
1465	11-Mar-03		GOEA			extensive	
1387	21-Jan-03		GOEA			extensive	
1400	29-Jan-03		GOEA	Bones found on surface or below grass and 2-3 inches of dirt		some	
1288	12-Nov-02		GOEA	Weathered bones and feather found partially submerged in dir		some	
1401	2-Feb-03		GOEA	Ulna had burn marks from fire in area. (Oct-02 Burn zone had		extensive	
1409	5-Feb-03		GOEA	Broken talon found on surface.		extensive	
1426	10-Feb-03		GOEA	Some small mammal bones found with GOEA bones. 20 degree slo		some	
1300	18-Nov-02		GOEA	Most bones buried and broken.		some	none
1350	5-Jan-03		GOEA	Small mammal bones found in same area - last meal? Most bone		some	
1431	16-Feb-03		GOEA			extensive	
1352	6-Jan-03		GOEA			extensive	
1356	7-Jan-03		GOEA			extensive	

String2	Turbine #	Fall 2002	Winter 2003	Spring 2003
213	S3001-S3010		1/21/2003	4/10/2003
222	D7-D13	11/6/2002	2/25/2003	
223	M1-M5 (M3 - M13)	11/6/2002	2/25/2003	
224	A3001-A3004	11/4/2002	2/25/2003	
240	F03-F05	11/11/2002		3/3/2003
242	G01-G02	11/11/2002	2/27/2003	
244	H01-H04	11/11/2002	2/27/2003	
251	6046-6060		12/2/2002	3/17/2003
271	4677-4700	11/21/2002		3/12/2003
279	2347-2365	10/21/2002	1/22/2003	
289	2094-2121	10/23/2002	1/30/2003	
306	2690-2719	11/13/2002		3/3/2003
307	2565-2612	10/23/2002	2/3/2003	
312	2871-2908, 2958-2972	10/28/2002	2/4/2003	
319	2909-2915, 2954-2957	10/29/2002	2/4/2003	
328	4314, 4322-4324	11/19/2002		3/11/2003
329	4325-4329	11/19/2002		3/11/2003
331	4330-4349, 4410-4424	11/20/2002		3/11/2003
333	1 to 32	10/29/2002	2/6/2003	
335	36-63, 1561	11/12/2002		3/5/2003
340	97-110	11/14/2002		3/4/2003
341	4034-4095	10/30/2002	2/6/2003	
343	4096-4102	10/30/2002	2/11/2003	
348	4378-4390	11/18/2002		3/10/2003
361	4536-4557	11/18/2002		3/10/2003
363	954-964	10/15/2002	1/28/2003	
372	1331-1334	10/15/2002	1/28/2003	
396	1390-1395		1/2/2003	4/1/2003
408	686-697, 1379-1380	10/16/2002	1/29/2003	
416	1505-1508		1/6/2003	3/26/2003
428	237-242	10/31/2002		2/17/2003
462	58-59		1/7/2003	4/7/2003
468	68-74, 168-174		1/13/2003	4/8/2003