Otter road casualties in Mid Wales: Recommendations for mitigation

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Summary

Background

1. Otter mortality on roads is thought to limit populations in some areas of the UK.

2. The UK Biodiversity Action Plan recommends that lead agencies "attempt to limit accidental killing or injury (for example by provision of road underpasses and fyke net guards), particularly on key catchments".

Otters found in Mid Wales

3. Three hundred and seventeen otter carcasses have been received or recorded from Mid Wales by the Cardiff University Otter Project and/or the Environment Agency. Of these, 283 were road traffic casualties.

4. There were forty nine multiple mortality sites in the Mid Wales Trunk Road Agency area.

Recommendations

5. High priority should be given to two sites, on the A40 south of Brecon, and the A486 north of Ffostrasol.

6. No sites in mid Wales reach the criteria set for medium priority.

7. Lower priority should be given to all other multiple mortality sites listed in Table 1, particularly the 10 sites listed in Section 4 for which 3 casualties are recorded.

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1. Introduction

1.1 The Eurasian otter *Lutra lutra*

The Eurasian otter population suffered a severe decline in the UK between the 1950s and 1970s. It is widely accepted that the cause of the decline was contamination with organochlorine pesticides and polychlorinated biphenyls (PCBs), combined with direct persecution and habitat loss. This led to extinction of the otter across much of central England, with remnant populations in Wales, Scotland and Southwest England.

The otter is now a Biodiversity Action Plan (BAP) 1995 priority species, classified as near threatened by the IUCN Red List and found in Appendix I of The Convention on International Trade in Endangered Species (CITES) 1997. Otters are also listed in Appendix II of the Bern Convention 1979 and Annex's 2 and 4 of the EC Habitats Directive 1992, protection transposed into domestic law through the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species regulations 2010 (replacing the Conservation (Natural Habitats, & c.) Regulations 1994).

Protection from hunting in England and Wales was introduced in 1978, and bans on organochlorine pesticides and PCBs were progressively introduced between 1962 and 1986. Since then, otter populations have recovered well (Crawford, 2010), but a high level of mortality on the roads is thought to limit recovery in some areas.

1.2 Deaths on roads and mitigation

Otter activity tends to be concentrated around aquatic (riparian or coastal) areas, but they will also travel considerable distances over land. Road traffic accidents (RTAs) cause a significant number of casualties (149 otter carcasses were sent to Cardiff University Otter Project (CUOP) in 2011, of which 80% were killed as the result of RTA). This almost certainly underestimates the total number killed, not least because dependent cubs are unlikely to survive following the death of their dam (mother).

Otters may cross roads for a number of reasons. They frequently travel on land, alongside streams or ditches, presumably because this is more energy efficient than swimming. Some 65% of otter mortalities occur within 100m of a watercourse, and of these ~34% occur at bridges and 44% at culverts (Grogan *et al*. 2001). Bridge / culvert design often leads to faster flows; otters may be reluctant or unable to swim through in strong currents (exacerbated by spate flows) or may simply prefer to continue travel on land. In some cases passage is blocked by a weir or by debris, culverts are too narrow to allow passage, or are inclined and too slippery for otters to gain purchase.

The UK Biodiversity Action Plan lists the proposed action: "Attempt to limit accidental killing or injury (for example by provision of road underpasses and fyke net guards), particularly on key catchments". Road underpasses may take the form of either ledges or dry culverts under bridges, in combination with appropriate fencing to guide otters towards mitigation / away from threats. Some examples of otter ledges and dry culverts are shown in Figures 1-3.

Figure 1. Otter ledge at Pont Dolau, Wales
(photograph provided by Geoff Liles)

Figure 2. Otter ledge over weir, Devon
(photograph provided by Cornwall Wildlife Trust)

Figure 3. Dry culvert at Neath Morfa Glas and spraint in dry culvert pipe
(photograph provided by Geoff Liles)

1.3 Monitoring otter mortalities

Otters reported dead in England or Wales are recorded in a monitoring project managed collaboratively by the Environment Agency and Cardiff University. Otters are typically reported by members of the public or by staff from a number of organisations (including the Environment Agency, Wildlife Trusts, Countryside Council for Wales, and others). Details of the date, finder, and location are recorded (location details typically including one or more of the following: named location, national grid reference, sketch or digital map and a site description).

Where possible, carcasses are collected, frozen, and sent to Cardiff University for post-mortem examination. Data are recorded on a range of factors including sex, age-class and reproductive status. These data are archived, linked to details of the location and date when the carcass was found. Location information can be used to guide mitigation, and the addition of information on breeding activity (juveniles, or pregnant / lactating females) can be used to help prioritise sites for action.

Both Cardiff University and the Environment Agency maintain separate databases listing all casualties reported / examined.

2. Methods

2.1 Collation of the dataset

Data from both Environment Agency and Cardiff University databases were collated (EA Wales database dated 15/12/2011, n = 711; CUOP database dated 15/12/2011, n = 1869 from England and Wales).

All records from England were excluded. Remaining records from both databases were cross-matched to identify and exclude duplicates. Records were assumed to be duplicates where location and at least one other identifying feature (e.g. date) matched. 475 records were held on both databases, 144 records were unique to the CUOP database and 236 records were unique to the EA database, resulting in a combined list of 855 casualties in Wales, of which 619 were collected for post mortem. All records lacking grid references, or with grid references less than 6 figure (n=70) were excluded from further analysis, leaving a dataset of 785 records.

2.2 Identification of multiple mortality sites

Examination of post mortem records (CUOP data) and finder notes (EA and CUOP data) were used to ascertain cause of death. Where information was lacking, an RTA was assumed if the otter was found on a road. 709 of the 785 otter mortalities reported from Wales were thought to have occurred as a result of road traffic accident (RTA). All non RTA's were excluded from further analysis.

Remaining records (n = 709) were mapped using ArcMap GIS (Figure 4). Maps indicating the boundary of South Wales Trunk Roads Agency (SWTRA) were used to interrogate the otter casualty map and identify casualties in the MWTRA area.

Nearest neighbour analysis was used in ArcMap to identify proximity of each casualty to all nearby casualties, within a limit of 2km. All cases where a casualty was found within 2km of another were examined in further detail, as follows:

(i) Original case notes from the finder were checked to ascertain the accuracy of location data (e.g. by examination of detailed sketch maps).

(ii) Date of finding and post mortem notes (where available) were examined to identify related mortalities, such as the death of mother and cub (either at the same time, or within a few days of one another). When assessing multiple mortality events, related deaths are counted here as a single event.

Post mortem notes are also used to highlight pregnant or lactating females and juveniles, so that if required, sites can be prioritised based on evidence of breeding activity.

All cases where four or more casualties were found in close proximity are mapped using ArcMap GIS, with Ordnance Survey data from Edina Digimap.

2.3 Rationale for prioritisation

High priority sites were defined as those where **5 or more casualties** had been reported since 2000, all within close proximity to one another (<2km), and on the same road.

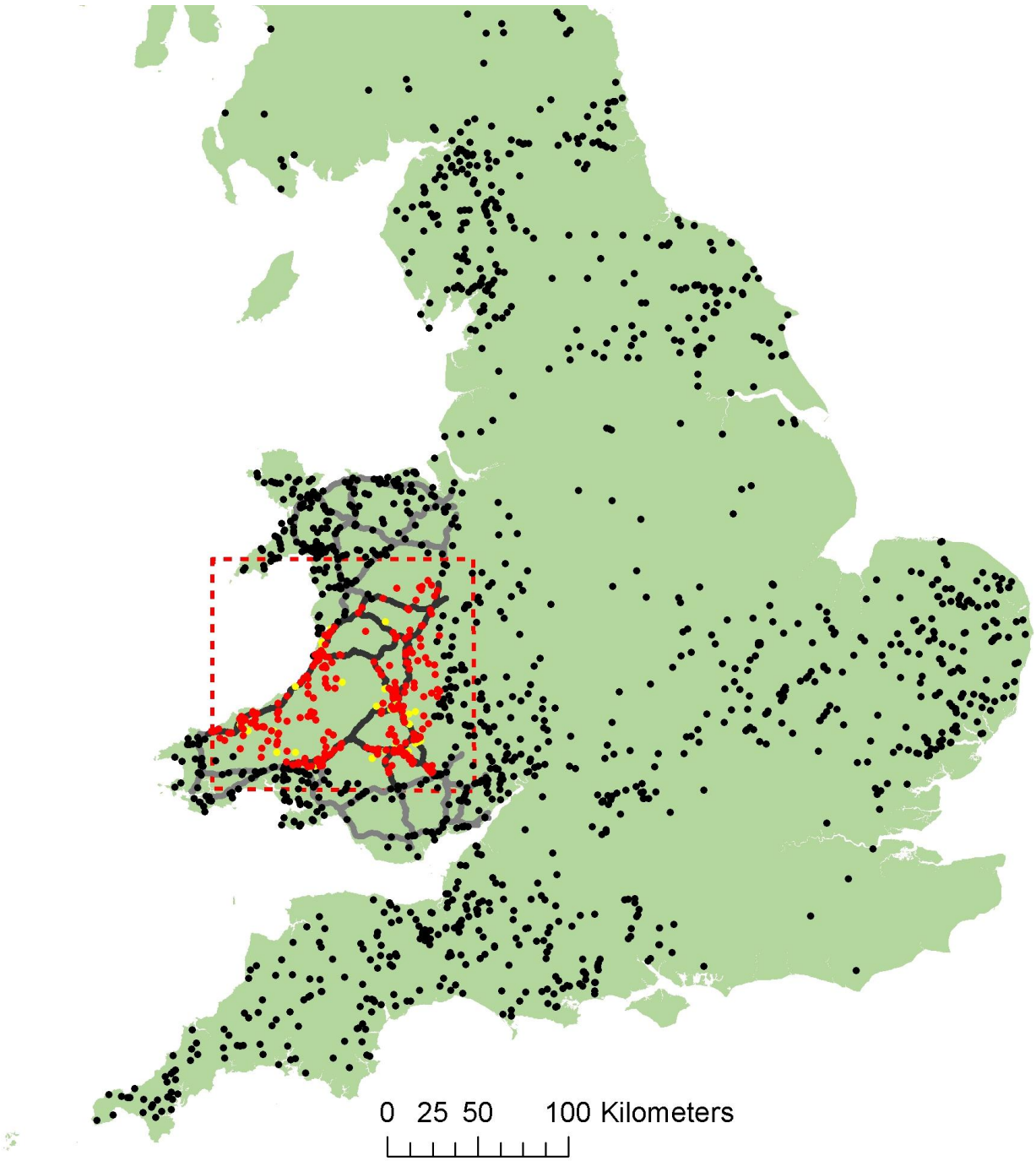
Medium priority sites were defined as those where **4 casualties** had been reported since 2000, all within close proximity to one another (<2km), and on the same road.

All other multiple mortality areas were regarded as lower priority, and included areas where mortalities were found on different roads within the same area, making targeted mitigation less likely to be effective, or where records of multiple mortalities were older (pre 2000).

2.4 Existing mitigation

Where available, information on existing mitigation has been added to details of Areas of Concern. Information was provided by Michelle Delafield, Mid Wales Trunk Road Agency. This information is not exhaustive, and mitigation may have been put in place at additional sites. Available information on existing mitigation at all sites (including sites additional to those in Areas of Concern) is summarised in Appendix B.

Figure 4. Distribution of otter casualties across England and Wales.
Otter casualties are shown in red (RTAs in Mid Wales), yellow (non RTAs in Mid Wales) and black (all other casualties). Trunk Roads Agency Roads are shown in black (Mid Wales) and pale grey (South Wales & North Wales). The dashed red line indicates the extent of Figure 5.



3. Results

3.1 Road traffic casualties

In the MWTRA area 283 road casualty otters have been recorded (Figure 5, listed in Appendix 1), of which 220 (77.7%) were sent to CUOP for post mortem examination.

Of those examined post mortem, 124 (56.6%) were male and 93 (43%) were female. Three were of unknown sex (not determined due to severe trauma). Breeding activity was evidenced by 5 juveniles, and of the 50 adult females recorded, 11 (22%) were lactating and 5 (10%) were pregnant. In total 32% of females within the study area showed current evidence of breeding.

3.2 Multiple mortality areas

Forty nine multiple mortality areas were identified. Nine of these areas have had four or more casualties since 2000 and are discussed in more detail (Figures 5 - 14; Table 1).

Figure 5. Otter casualties in Mid Wales.
Casualties in the MWTRA area are marked in red (RTAs) or yellow (non RTAs); all other casualties are shown in pale grey. Trunk roads are shown with thick lines in black (MWTRA) or grey (NWTRA and SWTRA), other primary routes are shown as thin grey lines. Rivers (blue) are also shown. Each area of concern is circled and numbered to correspond with the information in Table 2.

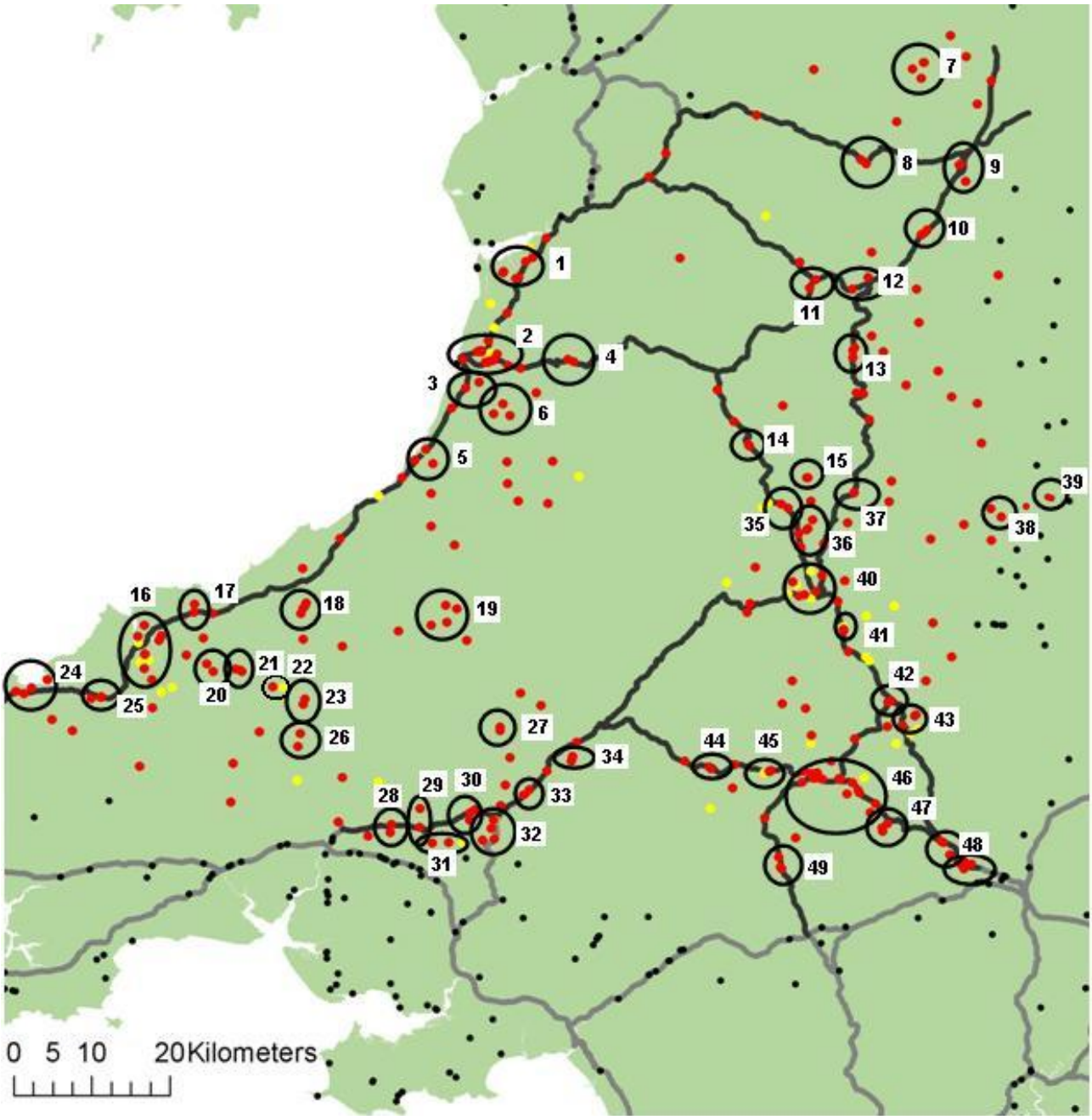


Table 1. **Multiple mortality sites.**
Sites are numbered here as marked on Figures 5-14. Sites with four or more casualties since 2000 are marked with an asterisk, and described in more detail below. Further information about each casualty is provided in the Appendix. Data origin states the source of the data (Environment Agency (EA), Cardiff University Otter Project (CUOP) or both). NR = Never reproduced.

Multiple mortality site	Reference number	Road	Data From	Date Found	Age	Sex	Reproductive status	Notes
1*	83	A487	Both	29-Sep-96	Adult	Male		6 individuals, 917 & 2067 possibly related.
	573	A487	CUOP	04-Apr-03	Adult	Male		
	917	B4353	Both	23-Feb-07	Sub-adult	Female	NR	
	1447	Minor road	CUOP	18-Jul-07	Sub-adult	Female	NR	
	1913	A487	EA	07-Nov-90	Adult	Male		
	2067	B4353	EA	22-Feb-07	Not recorded			
2*	77	A44	Both	21-Apr-96	Sub-adult	Male		13 individuals inc. 1 pregnant and 1 lactating female. No verification possible for date of 1979.
	129	A487	Both	05-Oct-97	Sub-adult	Male		
	145	A44	Both	01-Jan-98	Adult	Female	Lactating	
	207	A44	Both	18-Feb-99	Adult	Male		
	557	A487	Both	09-Feb-03	Adult	Female	Pregnant	
	601	A44	Both	08-Sep-03	Adult	Male		
	630	A44	Both	02-Feb-04	Adult	Male		
	665	A4159	CUOP	03-Mar-04	Adult	Male		
	666	A4159	CUOP	09-May-04	Adult	Male		
	1886	A40	EA	18-Mar-11	Not recorded	Female	Not recorded	
	1894	A487	EA	02-Mar-10	Not recorded			
	1974	A487	EA	14-Feb-91	Adult	Female	Not recorded	
	1979	A44	EA	05-Mar-71	Adult	Female	Not recorded	
3	10		Both	27-Oct-92	Adult	Female	Lactating	2 individuals inc. 1 lactating female.
	800	B4340	Both	17-Jan-06	Sub-adult	Male		
4	803	A44	Both	11-Jan-05	Sub-adult	Male		2 individuals.

	2044	A44	EA	05-Apr-05	Adult	Not recorded		
5	43	A487	Both	19-Mar-95	Sub-adult	Male		3 individuals.
	215	A487	Both	01-Jun-98	Sub-adult	Female	NR	
	1936	B4337	EA	10-Mar-92	Not recorded	Female	Not recorded	
6	413	B4340	Both	16-Jun-01	Sub-adult	Female		3 individuals.
	797	A485	Both	26-Jan-06	Sub-adult	Female	NR	
	868	B4575	CUOP	12-Mar-06	Adult	Female	Quiescent	
7	92	B4393	Both	01-Nov-96	Adult	Female	Quiescent	4 individuals.
	430		Both	25-May-01	Sub-adult	Male		
	538		CUOP	19-Oct-02	Adult	Male		
	762	A490	CUOP	05-Nov-05	Adult	Female	Quiescent	
8	444	A458	Both	29-Oct-01	Adult	Male		2 individuals.
	860	Watergate street	CUOP	22-Apr-06	Adult	Female	Quiescent	
9	1800		CUOP	20-Sep-11	Sub-adult	Male		2 individuals.
	2074	A458	EA	15-Sep-07	Not recorded			
10	72		Both	01-Mar-96	Adult	Female	Quiescent	4 individuals.
	85		Both	01-Sep-96	Adult	Male		
	334	A483	Both	20-Oct-00	Adult	Male		
	1950	A483	EA	01-May-86	Not recorded			
11	822	A489(T)	CUOP	29-Mar-06	Unknown			3 individuals. 822 & 1535 too damaged to fully assess at PM.
	1535	A470	CUOP	28-Mar-10	Unknown	Female	Unknown	
	1799	B4568	CUOP	24-Mar-11	Adult	Female	Pregnant	
12	582		CUOP	09-Jun-03	Adult	Male		2 individuals.
	1566	A489	Both	24-May-10	Adult	Female	Quiescent	
13	528		CUOP	14-Nov-02	Adult	Female	Pregnant	3 individuals inc. 1 pregnant female.
	2026	A483	EA	14-Oct-00	Adult	Not recorded		

	2027	A483	EA	23-Jul-01	Adult	Not recorded		
14	1836	A470	CUOP	19-Nov-11	Adult	Male		2 individuals (not a duplication).
	1837	A470	CUOP	19-Nov-11	Adult	Male		
15	434	A44	Both	14-Sep-01	Adult	Male		2 individuals.
	1184	A44	CUOP	30-Sep-08	Adult	Male		
16*	58	B4546	Both	01-Feb-96	Adult	Male		9 individuals. 460 not dated, but received by CUOP in 2002.
	256	A478	Both	01-Dec-99	Adult	Male		
	329	B4570	Both	29-Sep-00	Adult	Male		
	425	A478	Both	22-Aug-01	Sub-adult	Female	NR	
	460	A478	Both	No date given	Adult	Male		
	552	A478	CUOP	21-Jan-03	Adult	Male		
	1082	B4570	Both	20-Nov-06	Adult	Male		
	1636	A484	Both	03-Apr-10	Sub-adult	Female	NR	
	1911	B4548	EA	08-Apr-90	Juvenile	Female		
17	204		Both	01-Jan-99	Adult	Male		3 individuals.
	1349	Minor Road	Both	21-Jan-08	Adult	Female	Quiescent	
	1975	A487	EA	14-Jan-91	Not recorded	Male		
18*	511	A486	Both	27-Jun-02	Adult	Male		5 individuals.
	755	A486	CUOP	19-Sep-05	Sub-adult	Female	NR	
	796	A486	Both	27-Apr-05	Adult	Male		
	854	A486	CUOP	07-Sep-06	Adult	Female	Quiescent	
	2051	A486	EA	15-Oct-04	Adult	Not recorded		
19*	356	-	Both	29-Nov-00	Adult	Female	Lactating	5 individuals inc. 1 lactating female.
	365	-	Both	13-Dec-00	Adult	Male		
	872	A485	CUOP	27-Mar-06	Sub-adult	Male		
	1443	A475	Both	15-Nov-08	Sub-adult	Female	NR	
	1444	A482	Both	11-Nov-08	Adult	Female	Quiescent	

20	664		CUOP	06-Mar-04	Sub-adult	Female	NR	2 individuals.
	943	A484	Both	06-Mar-07	Adult	Male		
21	50		Both	01-Oct-95	Adult	Female	Quiescent	3 individuals.
	419	B4570	Both	12-Dec-00	Adult	Female	Quiescent	
	2155	B4333	EA	04-Nov-10	Adult	Not recorded		
22	155	A486	Both	01-Mar-98	Sub-adult	Female	NR	2 individuals.
	2123	A484	EA	05-Apr-09	Adult	Not recorded		
23	802	A487	CUOP	12-Jan-06	Adult	Male		5 individuals. 1928 and 1929 likely to be related; 2110 and 2115 may also be related.
	1928	A487	EA	03-Jan-89	Adult	Female	Not recorded	
	1929	A487	EA	03-Jan-89	Cub	Not recorded		
	2110	A487	EA	12-Aug-08	Adult	Female	Not recorded	
	2115	A487	EA	11-Aug-08	Not recorded			
24	118	A487	Both	01-May-97	Adult	Female	Quiescent	3 individuals.
	1982	A487	EA	01-Oct-93	Adult	Male		
	2024	N/A	EA	31-Oct-02	Adult	Not recorded		
25	34	A484	Both	25-Jul-93	Sub-adult	Female	NR	2 individuals.
	1577	A484	Both	04-Nov-09	Sub-adult	Female	NR	
26	39	-	Both	01-Apr-95	Adult	Male		2 individuals.
	93	-	Both	02-Dec-96	Adult	Male		
27	109	B4310	Both	25-Feb-97	Sub-adult	Male		2 individuals.
	2066	B4310	EA	01-Feb-07	Adult	Male		
28	366	A40(T)	Both	14-Dec-00	Juvenile	Male		2 individuals
	940	minor	Both	29-Mar-07	Adult	Male		
29	167		Both	20-Apr-98	Adult	Male		3 individuals
	941	A40	Both	20-Nov-06	Adult	Male		
	1907	A40	EA	01-Dec-89	Adult	Female	Not recorded	
30	1	-	Both	17-Feb-94	Sub-adult	Male		2 individuals.

	243		Both	10-Nov-99	Adult	Male		
31	170	A476	Both	01-Aug-98	Sub-adult	Female	NR	4 individuals
	292	-	Both	15-Feb-00	Adult	Male		
	1081	A483	Both	13-Feb-08	Sub-adult	Male		
	1288	Minor Road	CUOP	13-Feb-09	Sub-adult	Male		
32	442	A40	Both	02-Nov-01	Adult	Male		2 individuals
	853	A40(T)	Both	01-Sep-06	Adult	Male		
33	942	A4069	CUOP	24-Jan-07	Sub-adult	Male		3 individuals. 942 and 2065 were found 2 days apart and may be related incidents.
	1981	A4069	EA	01-Jun-96	Adult	Female	Not recorded	
	2065	A4069	EA	26-Jan-07	Not recorded	Male		
34	56	A470	Both	23-Dec-95	Adult	Male		2 individuals.
	713	A470	CUOP	20-Feb-05	Adult	Female	Quiescent	
35*	220	B4358	Both	04-May-99	Sub-adult	Male		7 individuals inc. 2 lactating females
	298	B4358	Both	26-Feb-00	Sub-adult	Female	NR	
	357	A470	Both	07-Dec-00	Adult	Female	Lactating	
	1008	B4358	Both	13-Nov-07	Adult	Male		
	1147	A470	CUOP	09-May-08	Adult	Female	Quiescent	
	1448	A470	CUOP	10-Dec-09	Adult	Male		
	1787	A470	CUOP	27-Aug-11	Adult	Female	Lactating	
36	1815		CUOP	03-Nov-11	Sub-adult	Male		2 individuals.
	1952	A483	EA	01-Aug-89	Adult	Male		
37	192		Both	01-Nov-98	Adult	Female	Quiescent	2 individuals.
	1139	B4367	Both	22-May-08	Sub-adult	Female	NR	
38	133	B4362	Both	11-Nov-97	Adult	Female	Unknown	2 individuals. 133 too damaged to fully assess at PM.
	1951	B4362	EA	01-Nov-86	Not recorded			

39*	441		Both	29-Oct-01	Adult	Unknown		6 individuals. 441 too damaged to assess fully at PM.
	625	A470	CUOP	27-Jan-04	Adult	Female	Quiescent	
	641		CUOP	03-Feb-04	Juvenile	Male		
	908		Both	04-Mar-07	Adult	Male		
	1948	A483	EA	01-May-85	Not recorded			
	1955	A483	EA	01-Feb-91	Not recorded			
40	660		CUOP	No date given	Adult	Male		3 individuals. 660 no date given, but received by CUOP in 2004.
	661	A470	CUOP	19-Apr-04	Unknown (damage)			
	1993	A470	EA	01-May-97	Cub	Not recorded		
41	16		Both	21-Jul-94	Adult	Female	Quiescent	2 individuals.
	1593	A470	Both	12-Sep-07	Adult	Male		
42	637	A4078	CUOP	16-Sep-03	Sub-adult	Male		4 individuals.
	694		Both	30-Nov-04	Sub-adult	Female	NR	
	910	A479	CUOP	05-Mar-07	Adult	Male		
	1992	A438	EA	01-Aug-98	Cub	Not recorded		
43	107	A40	Both	09-Feb-97	Juvenile	Male		2 individuals.
	304	A40	Both	29-Apr-00	Adult	Male		
44	71	-	Both	02-Mar-96	Adult	Male		3 individuals.
	188	-	Both	10-Sep-98	Sub-adult	Female	NR	
	203	A40	Both	07-Feb-99	Adult	Male		
45*	22	A40(T)	Both	24-Nov-94	Sub-adult	Male		15 individuals inc. 1 lactating female
	112	A40	Both	06-Mar-97	Adult	Female	Quiescent	
	354		Both	04-Nov-00	Adult	Female	Quiescent	

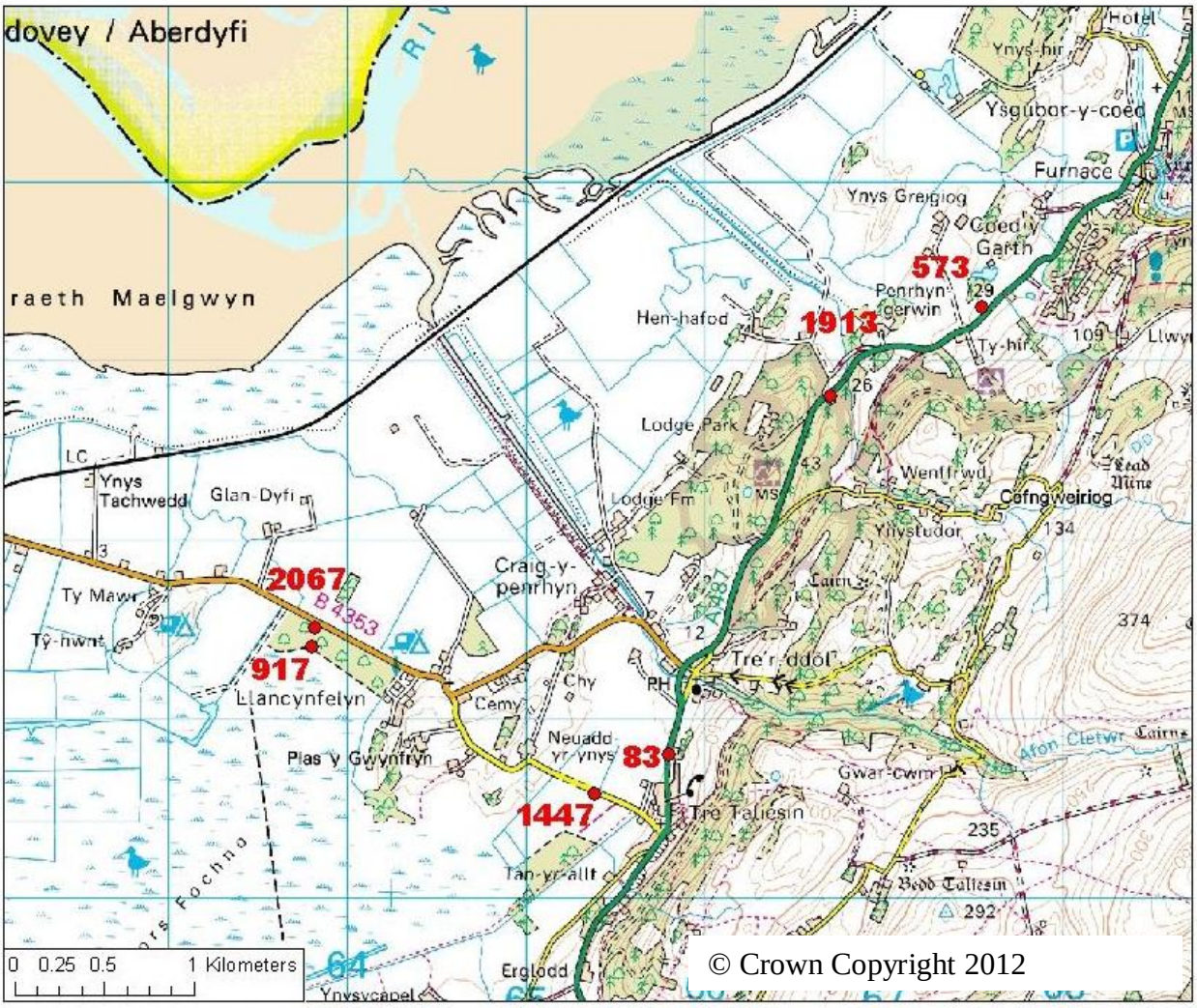
	680		CUOP	28-Jul-04	Sub-adult	Male		
	685		CUOP	21-Sep-04	Adult	Male		
	881	A40	CUOP	23-Dec-06	Sub-adult	Female	NR	
	882	A40	CUOP	10-Jan-07	Sub-adult	Female	NR	
	946	Minor	Both	12-Jun-07	Adult	Male		
	1009	A470	Both	13-Nov-07	Adult	Male		
	1357	A40	CUOP	08-Jun-09	Adult	Female	Lactating	
	1594	B4601	CUOP	26-Jan-10	Sub-adult	Female	NR	
	1739	A40	Both	29-Apr-09	Unknown	Female	Unknown	
	1930	A40	EA	20-Jan-94	Cub	Not recorded		
	1968	A40	EA	01-Dec-89	Not recorded			
	2021	A40	EA	28-Aug-04	Adult	Female	Not recorded	
46	31	A40	Both	16-Dec-97	Sub-adult	Female	NR	5 individuals inc. 1 lactating female.
	95	A40	Both	02-Dec-96	Adult	Male		
	988	unclassified	Both	27-Sep-07	Adult	Female	Quiescent	
	1328	B4558	Both	24-Feb-09	Adult	Male		
	1990	B4558	EA	24-Dec-95	Adult	Female	Lactating	
47	89		Both	29-Oct-96	Adult	Female	Lactating	2 individuals inc. 1 lactating female.
	1022	A40	CUOP	26-Nov-07	Adult	Female	Quiescent	
48*	310	A40	Both	04-Jun-00	Adult	Male		5 individuals
	635	A4077	CUOP	19-Jan-04	Adult	Male		
	667	A4077	CUOP	16-Jul-04	Adult	Female	Quiescent	
	1329	Minor road just off A4077	Both	08-Feb-08	Sub-adult	Male		
	1331	Nr A40	Both	06-Apr-09	Adult	Male		
49	806	A470	Both	18-Jul-05	Adult	Female	Quiescent	3 individuals.
	1079	A470	Both	22-Oct-07	Adult	Female	Quiescent	
	2126	A470	EA	07-Aug-09	Not recorded			

3.3 Sites with four or more RTA casualties since 2000

Nine areas have had clusters of four or more otter casualties since 2000. All available information relating to otters from these clusters has been reviewed, and details are provided below.

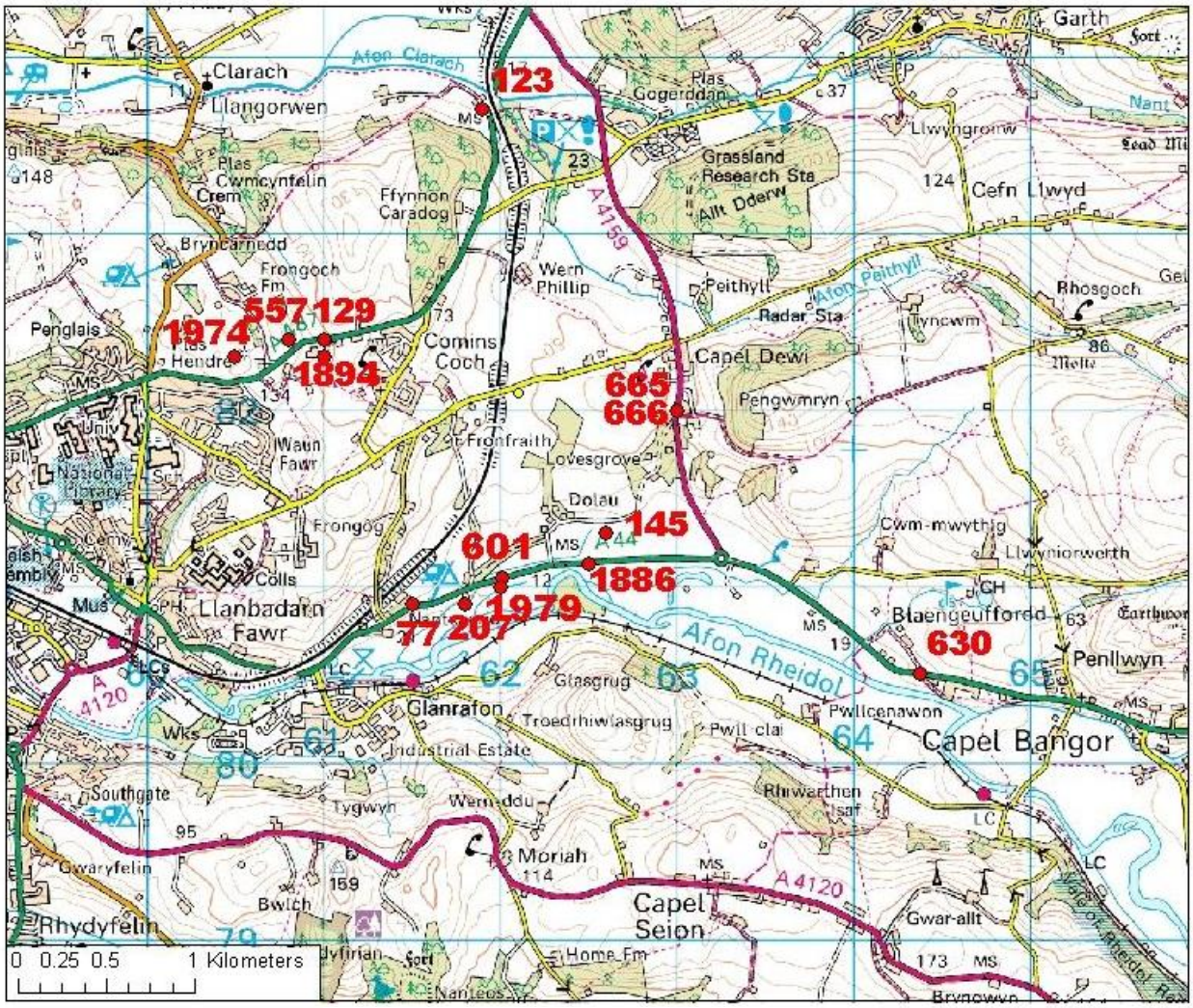
Area 1. Six mortalities have been reported in this area (Figure 6). Of these, four otters were received by CUOP (two not collected, 1913 and 2067). 83 and 1913 were received before 2000 (1996 and 1990 respectively); the remaining four were found between 2003 and 2007. Casualties, 917 and 2067 were found very close together and just one day apart, so are likely to be related; this could not be confirmed, and 2067 was not received for post mortem. Casualties are scattered on different roads, so targeted mitigation is unlikely to be effective.

Figure 6. **Area of concern 1.** Casualties are marked and numbered in red.



Area 2. Fourteen mortalities have been reported for this area (Figure 7). Of these, ten otters were received by CUOP (1886, 1894, 1974 and 1979 were not). Seven casualties were before 2000 and seven occurred between 2003 and 2011. Casualty 665 died six days before 666, at the same location; both animals were adult males so the incidences are unlikely to be related. In addition to several scattered incidents, there are two distinct clusters, on the A487 and A44, which may merit attention. However, although numerous in total, each road has had relatively few recent (post 2000) casualties.

Figure 7. Area of concern 2. Casualties are marked and numbered in red.



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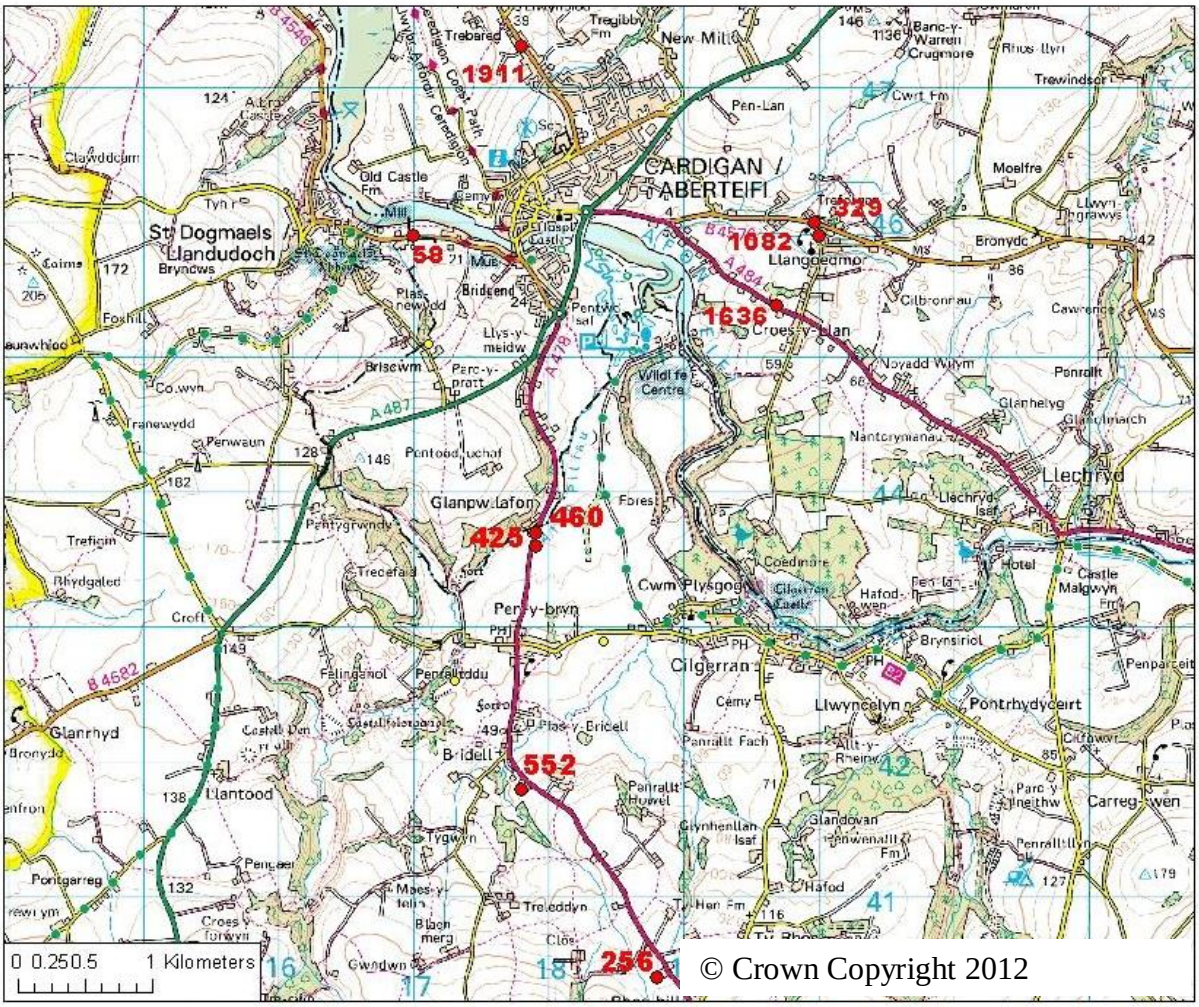
Information provided by MWTRA

An otter ledge was installed pre-2004 near at Pont Dolau (between Glanyrafon and Lovesgrove) to allow passage beneath a bridged river in order to safely cross the A44. This is near to where casualties 77, 145, 207, 601, 1886 and 1979 were recorded.

Area 16. Nine mortalities have been reported in this area (Figure 8). Of these, one (1911) was not received by CUOP for post mortem. Three (58, 256 and 1911) were found before 2000, 460 has no date recorded (but was received in 2002), and the remaining casualties were found between 2000 and 2010. As for Area 2, although numerous in total, each road has had few recent casualties. There have been three recent (post 2000) casualties on the A478; all other roads have had fewer than this.

Figure 8. Area of concern 16. Casualties are marked and numbered in red.

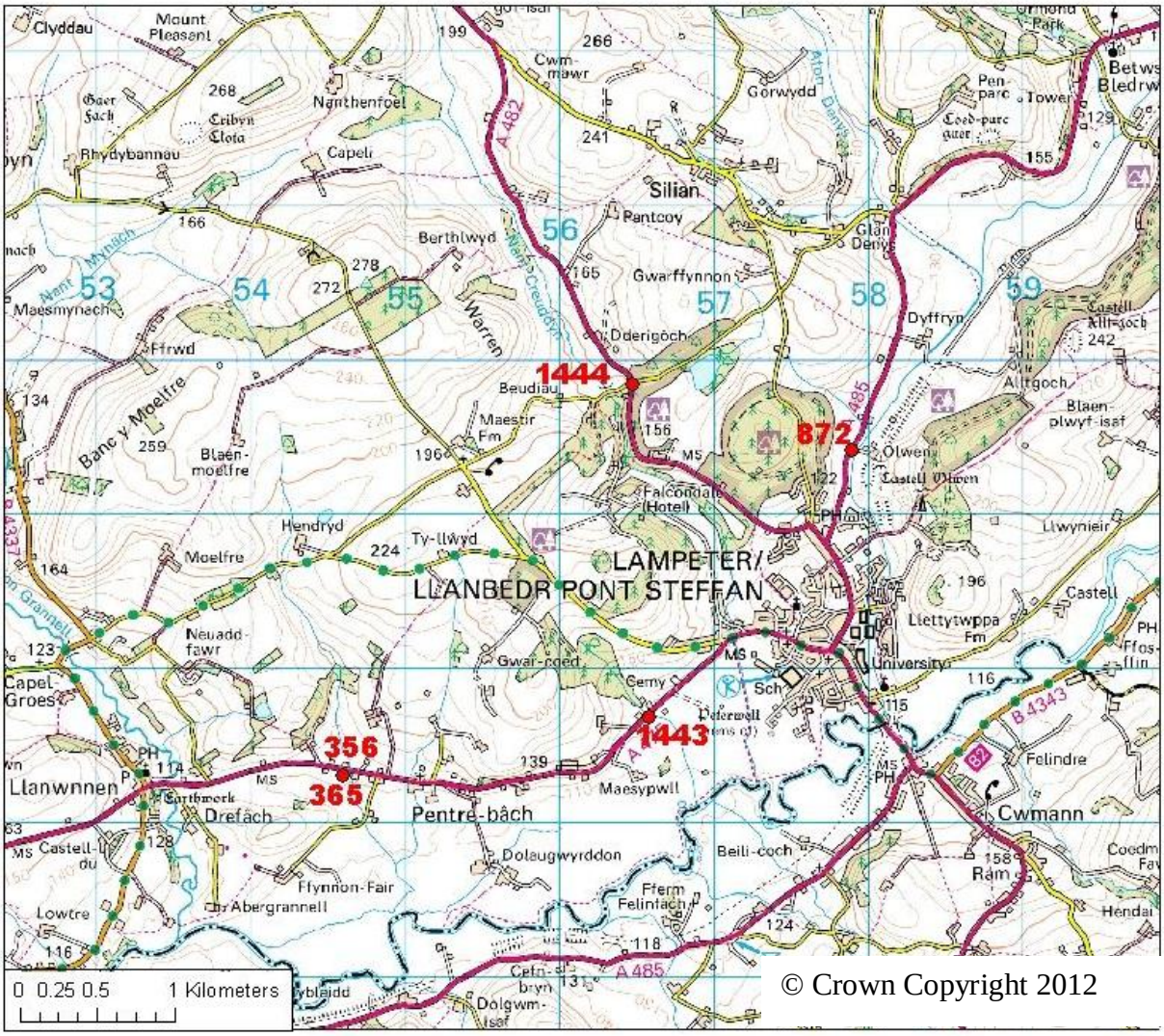


Area 18. Five mortalities have been reported from this area (Figure 9). Of these, one (2051) was not received by CUOP for post mortem. All casualties occurred in close proximity between 2002 and 2006, but there have been no reported casualties since.

Figure 9. Area of concern 18. Casualties are marked and numbered in red.

Area 19. Five mortalities have been reported from this area between 2000 and 2008 (Figure 10). All casualties were received by CUOP for post mortem. 365 (an adult male) and 356 (a lactating female) were found two weeks apart in the same location, but are not likely to be related. 1443 (a subadult female) was found four days after 1444 (an adult female) and may be related. Casualties are scattered on different roads, so targeted mitigation is unlikely to be effective.

Figure 10. Area of concern 19. Casualties are marked and numbered in red



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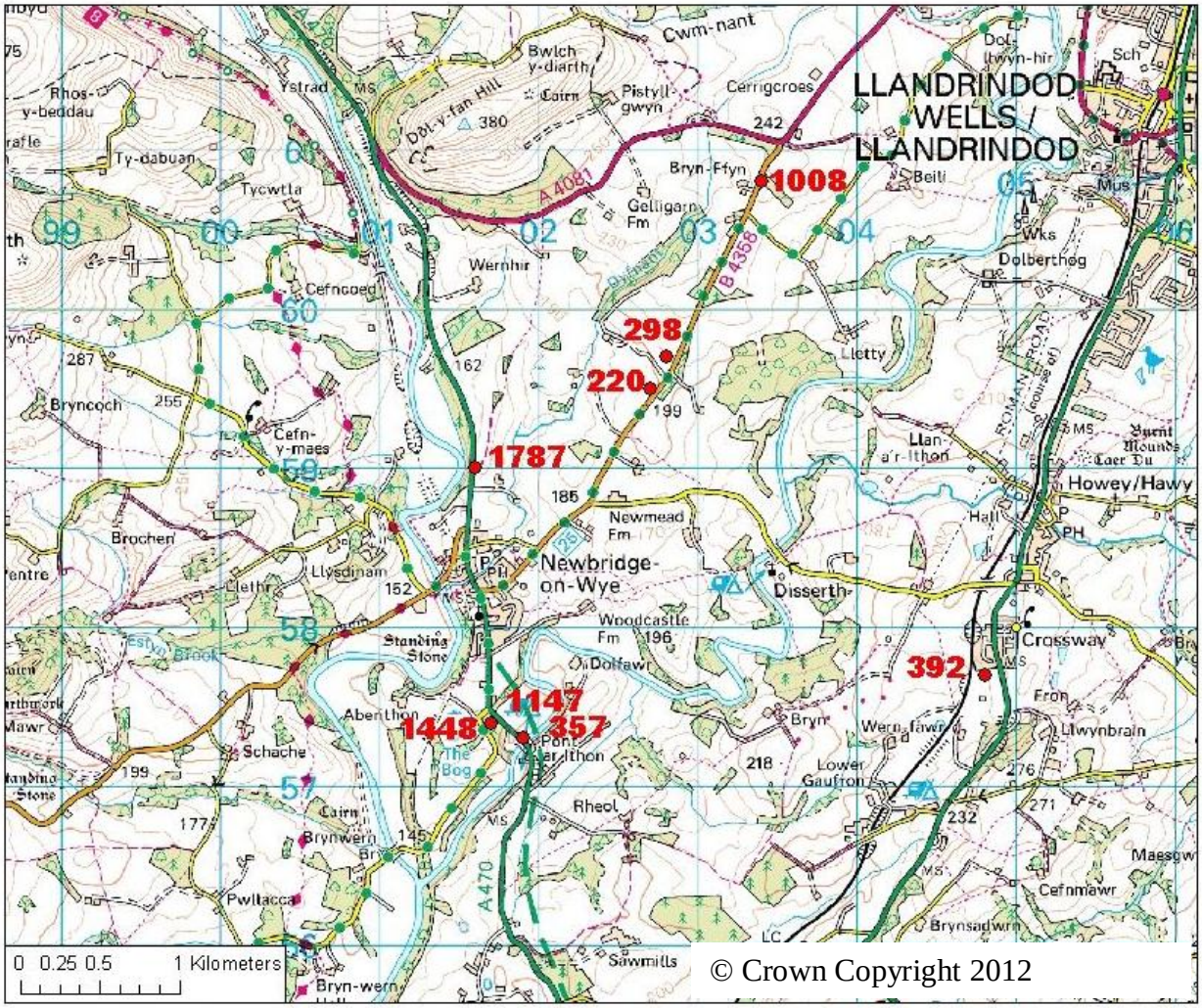
Area 35. Seven mortalities have been reported from this area (Figure 11). All casualties were received by CUOP for post mortem. One (220) was found before 2000. Both the A470 south of Newbridge on Wye, and the B4358 north of Newbridge on Wye, raise some cause for concern.

Figure 11. Area of concern 35. Casualties are marked and numbered in red.



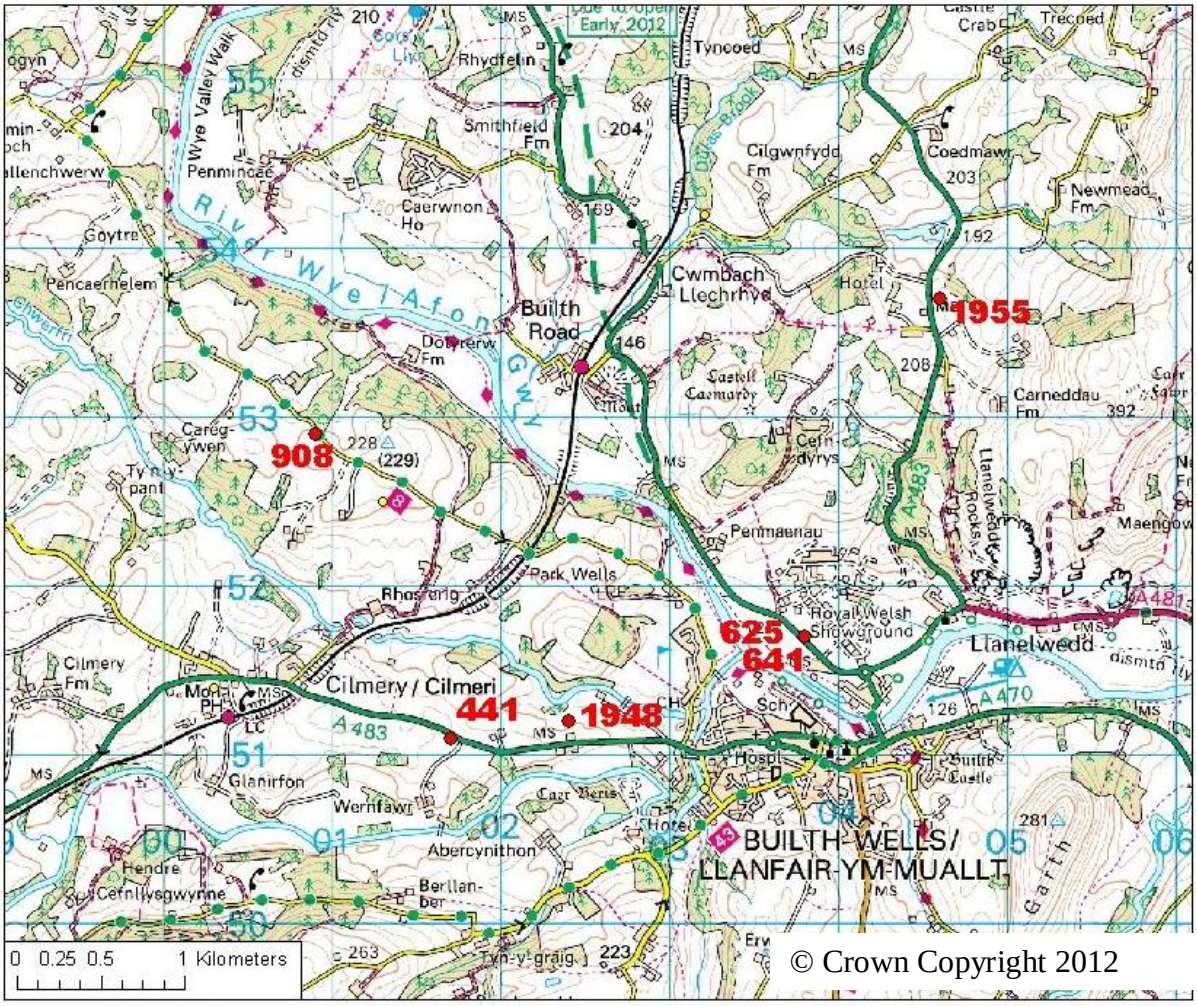
Information provided by MWTRA

Otter fencing was installed at Pont Ithon, Newbridge-on-Wye, in approximately 2008, prior to the construction of a new trunk road. This bridge is now on a de-trunked section of road. This location is where casualties 357, 1447 and 1448 were recorded

A large, multi-use mammal underpass/culvert has been provided as part of the new road design in 2012. This culvert is on the A470 approximately 2.56 km south of where the cluster of casualties 357, 1447 and 1448 were recorded.

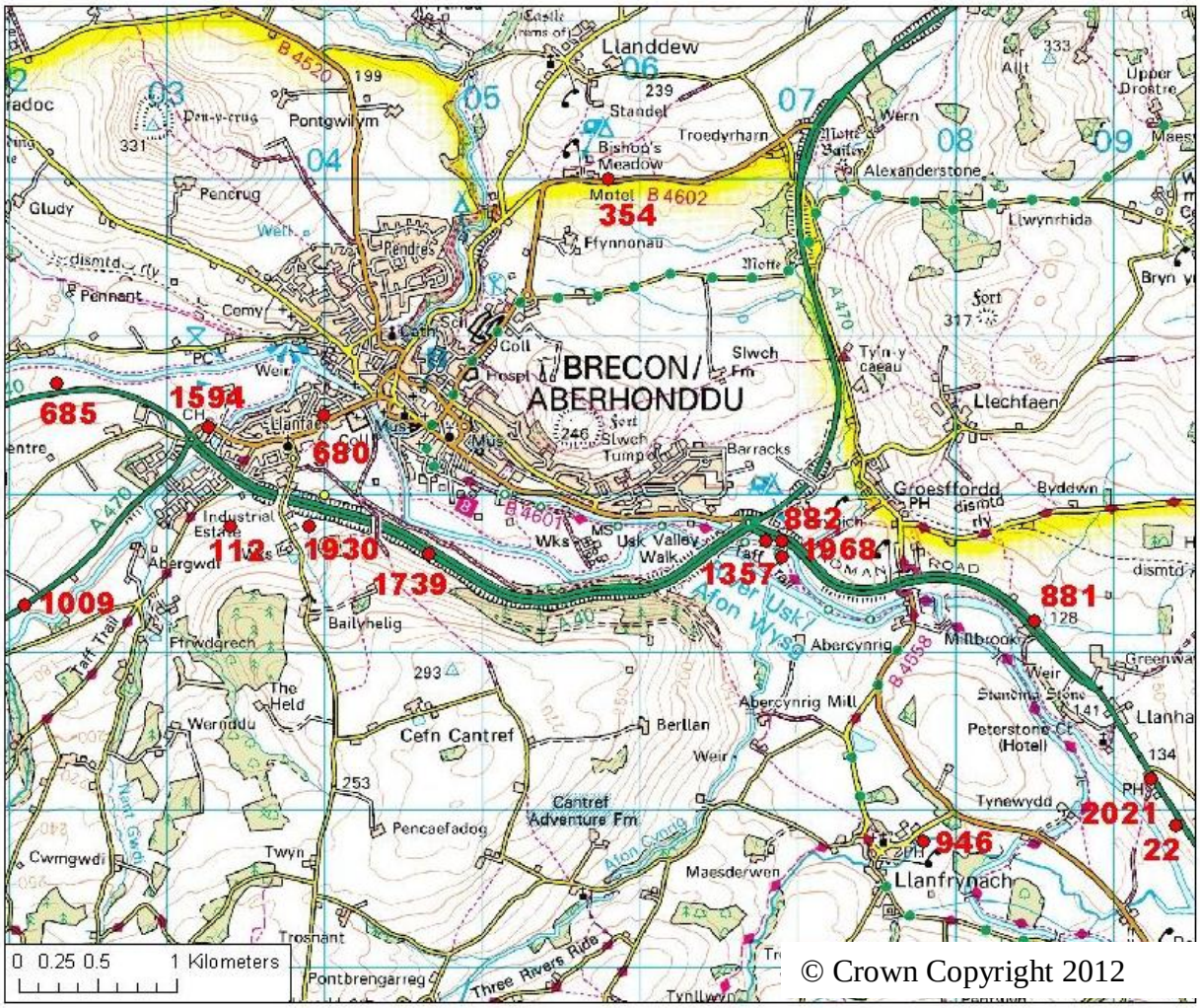
Area 39. Six mortalities have been reported in this area (Figure 12). Of these, two (1948 and 1955) were not received by CUOP for post mortem. 1948 and 1955 were found before 2000; remaining casualties were received between 2001 and 2007. Notes for 1948 suggest that it was found on the A483, the mapped location is slightly inaccurate. 625 (an adult female) may be related to 641 (a juvenile male) found in the same location a week later. Casualties are scattered on different roads, so targeted mitigation is unlikely to be effective.

Figure 12. **Area of concern 39**. Casualties are marked and numbered in red.



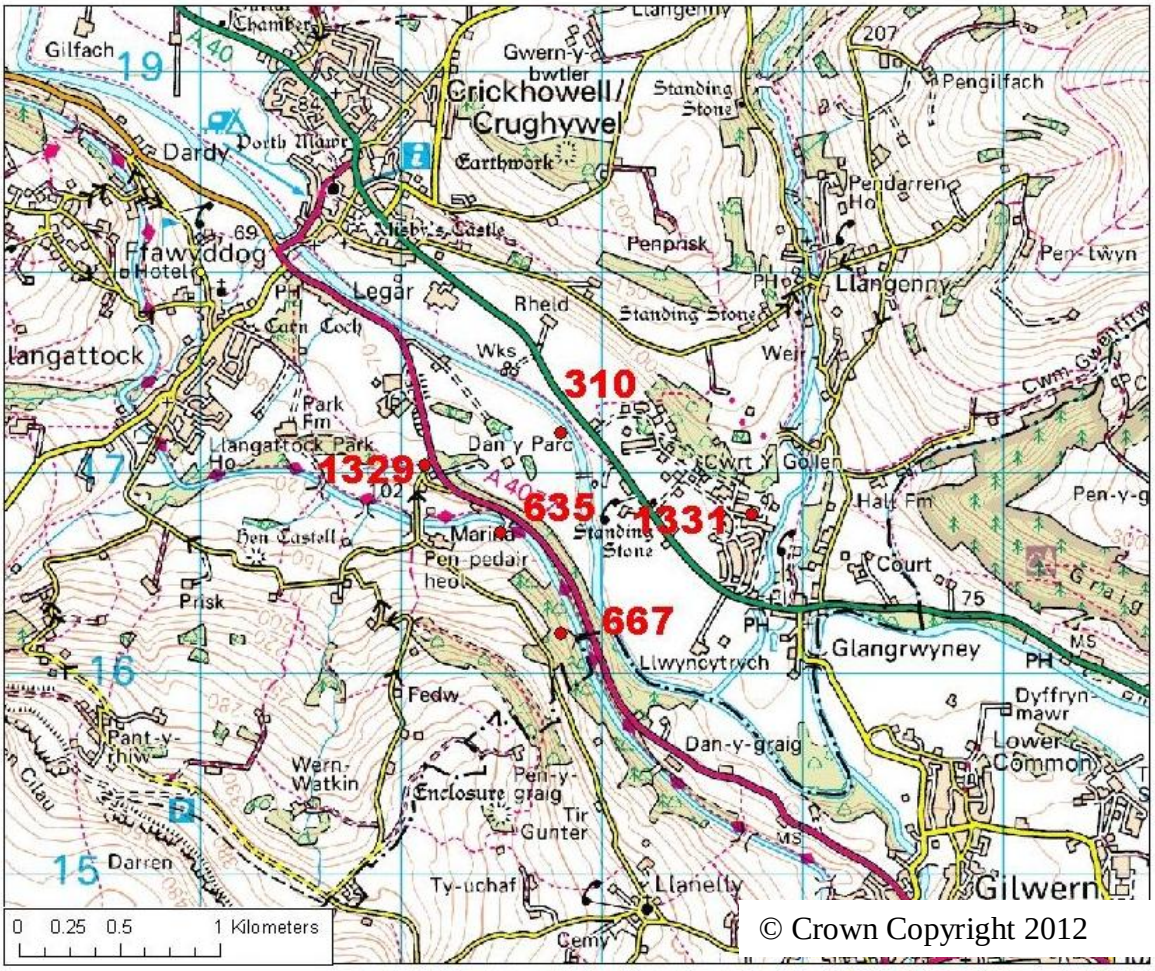
Area 45. Fifteen mortalities have been reported in this area (Figure 13). Of these, three (1930, 1968, 2021) were not received by CUOP for post mortem. Four (22, 112, 1930, 1968) casualties were found before 2000 and the remainder were found between 2004 and 2010. 10 casualties have been found on the A40, six of which since 2000, raising serious cause for concern in this area.

Figure 13. **Area of concern 45**. Casualties are marked and numbered in red.



Area 48. Five mortalities have been reported in this area (Figure 14). All casualties were received by CUOP for post mortem and were found between 2000 and 2009. Notes for 310 state it was found on the A40; no notes are provided to verify the location of 635 or 637 so the A4077 is assumed; 1331 was found away from the road (at the Cwrt-Y-Gollen Army Camp) but post mortem suggests it was an RTA, presumably on the A40). 1329 was found on the minor road just off the A4077.

Figure 14. **Area of concern 48**. Casualties are marked and numbered in red.



4. Recommendations

High priority should be given to:
Area 45: the A40 south of Brecon (10 casualties, 6 since 2000).
Area 18: the A486 north of Ffostrasol (5 casualties since 2000).

Medium priority should be given to:
No sites meet the given criteria

Lower priority should be given to:
All other multiple mortality areas listed in Table 1.

Those with 3 casualties are listed here for consideration:
Area 1: south of Machynlleth (6 casualties, of which 4 since 2000, but scattered between several roads).
Area 2: east of Aberystwyth (13 casualties, of which 7 since 2000). Recent (post 2000) casualties have been on the A44 (3), the A487 (2) and the A4159 (2). Although numerous in total, each road has had relatively few recent casualties.
Area 13: the A483 near Llanbadarn Fynydd (3 casualties since 2000, including a pregnant female).
Area 16: south of Cardigan (9 casualties, of which 6 since 2000). Recent (post 2000) casualties have been on the A478 (3), the B4570 (2) and the A484 (1). As for Area 2, although numerous in total, each road has had few recent casualties.
Area 19: the A475 south of Lampeter (3 casualties since 2000).
Area 35a: the A470 south of Newbridge on Wye (3 casualties since 2000).
Area 35b: the A4358 north of Newbridge on Wye (3 casualties, 2 since 2000).
Area 39: north of Builth Wells (6 casualties, 4 since 2000). Scattered on several different roads.
Area 48: the A4077 near Crickowell (3 casualties since 2000).
Area 49: the A470 near Cantref reservoir (3 casualties since 2000).

5. References

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Grogan AL, Philcox CK, MacDonald DW (2001) Nature Conservation and Roads: Advice in

Highways Agency (2001) Design Manual for Roads and Bridges. Nature conservation advice in relation to otters. Volume 10, Section 4. Available at: http://www.standardsforhighways.co.uk/dmrb/index.htm

UK Biodiversity Action Plan. Species Action Plan: Otter *Lutra lutra*. Available at: www.ukbap.org.uk/UKPlans.aspx?ID=42

6. Acknowledgements

Otter mortality records are collected with the aid of members of the public, and organisations including the Environment Agency, Countryside Council for Wales, UK Wildlife Trusts, the police and local authorities.

Appendix A. All otters found within Mid Wales Trunk Road Agency. (Data origin states the original source of the data, either the Environment Agency (EA), Cardiff University Otter Project (CUOP) or Both).

Multiple mortality site	Reference number	Data From	Date Found	Road	X	Y	County	Sex	Age	Reproductive status
30	1	Both	17-Feb-94	-	254700	219500	Dyfed	Male	Sub-adult	
	7	Both	07-Apr-94		296100	254700	Powys	Male	Adult	
	8	Both	21-Jul-94	A40	304000	228000	Powys	Female	Juvenile	Never reproduced
3	10	Both	27-Oct-92		259000	277600	Dyfed	Female	Adult	Lactating
	15	Both	24-Apr-94	A484	242700	222200	Dyfed	Female	Adult	Quiescent
41	16	Both	21-Jul-94		313500	237700	Powys	Female	Adult	Quiescent
	18	Both	21-Sep-94		311000	284300	Powys	Male	Sub-adult	
	20	Both	09-Oct-94		223200	243500	Dyfed	Male	Sub-adult	
45	22	Both	24-Nov-94	A40(T)	309400	225900	Powys	Male	Sub-adult	
	27	Both	25-Feb-95	B4385	327200	292100	Powys	Male	Adult	
46	31	Both	16-Dec-97	A40	313000	222000	Powys	Female	Sub-adult	
25	34	Both	25-Jul-93	A484	237800	233500	Dyfed	Female	Sub-adult	Never reproduced
	35	Both	10-Oct-95		206000	235300	Dyfed	Male	Sub-adult	
	37	Both	08-Nov-94	A40(T)	287000	230000	Powys	Female	Adult	Quiescent
26	39	Both	01-Apr-95	-	263400	233900	Dyfed	Male	Adult	
5	43	Both	19-Mar-95	A487	253900	269800	Dyfed	Male	Sub-adult	
21	50	Both	01-Oct-95		230300	241400	Dyfed	Female	Adult	Quiescent
34	56	Both	23-Dec-95	A470	299400	262800	Powys	Male	Adult	
16	58	Both	01-Feb-96	B4546	217000	245900	Dyfed	Male	Adult	
	60	Both	23-Dec-95	Minor	243200	227900	Dyfed	Female	Adult	Pregnant
44	71	Both	02-Mar-96	-	297900	228600	Powys	Male	Adult	
10	72	Both	01-Mar-96		318100	297800	Powys	Female	Adult	Quiescent
2	77	Both	21-Apr-96	A44	261500	280900	Dyfed	Male	Sub-adult	

1	83	Both	29-Sep-96	A487	265800	291800	Dyfed	Male	Adult	
	84	Both	07-Oct-96		307900	260400	Powys	Female	Sub-adult	Never reproduced
10	85	Both	01-Sep-96		317500	297300	Powys	Male	Adult	
47	89	Both	29-Oct-96		320200	219600	Powys	Female	Adult	Lactating
7	92	Both	01-Nov-96	B4393	317700	319200	Powys	Female	Adult	Quiescent
26	93	Both	02-Dec-96	-	263400	234300	Dyfed	Male	Adult	
46	95	Both	02-Dec-96	A40	311500	224500	Powys	Male	Adult	
	105	Both	16-Jan-96	A486	238200	245500	Dyfed	Male	Sub-adult	
43	107	Both	09-Feb-97	A40	290200	229200	Powys	Male	Juvenile	
27	109	Both	25-Feb-97	B4310	249500	221900	Dyfed	Male	Sub-adult	
	111	Both	01-Feb-97		326300	258200	Powys	Male	Adult	
45	112	Both	06-Mar-97	A40	303400	227800	Powys	Female	Adult	Quiescent
	113	Both	12-Mar-97		324500	275700	Powys	Female	Sub-adult	Never reproduced
	117	Both	12-May-97	A470	306600	250400	Powys	Male	Sub-adult	
24	118	Both	01-May-97	A487	201400	238900	Dyfed	Female	Adult	Quiescent
	123	Both	27-Jun-97	A487	261900	283700	Dyfed	Male	Adult	
2	129	Both	05-Oct-97	A487	261000	282400	Dyfed	Male	Sub-adult	
38	133	Both	11-Nov-97	B4362	333500	263700	Powys	Female	Adult	
	143	Both	01-Jan-98	A487	218900	236800	Dyfed	Male	Sub-adult	
2	145	Both	01-Jan-98	A44	262600	281300	Dyfed	Female	Adult	Lactating
	147	Both	31-Jan-98	B4302	264700	230400	Dyfed	Male	Adult	
22	155	Both	01-Mar-98	A486	238400	237900	Dyfed	Female	Sub-adult	Never reproduced
29	167	Both	20-Apr-98		259500	222400	Dyfed	Male	Adult	
31	170	Both	01-Aug-98	A476	262300	221400	Dyfed	Female	Sub-adult	Never reproduced
44	188	Both	10-Sep-98	-	297900	228700	Powys	Female	Sub-adult	Never reproduced
	189	Both	03-Oct-98	-	308000	244000	Powys	Female	Sub-adult	Never

										reproduced
37	192	Both	01-Nov-98		327600	261200	Powys	Female	Adult	Quiescent
	195	Both	02-Dec-98	-	246500	220400	Dyfed	Male	Adult	
44	203	Both	07-Feb-99	A40	298100	228800	Powys	Male	Adult	
17	204	Both	01-Jan-99		224200	249000	Dyfed	Male	Adult	
	206	Both	05-Feb-99	-	259100	245400	Dyfed	Male	Adult	
2	207	Both	18-Feb-99	A44	261800	280900	Dyfed	Male	Adult	
	208	Both	25-Feb-99	A44	303200	263200	Powys	Male	Adult	
	209	Both	04-Mar-99		238100	254600	Dyfed	Male	Adult	
	210	Both	12-Mar-99	A485	264300	268200	Dyfed	Male	Adult	
5	215	Both	01-Jun-98	A487	252500	268400	Dyfed	Female	Sub-adult	
35	220	Both	04-May-99	B4358	302700	259500	Powys	Male	Sub-adult	
30	243	Both	10-Nov-99		256800	219600	Dyfed	Male	Adult	
16	256	Both	01-Dec-99		218800	240400	Dyfed	Male	Adult	
	260	Both	22-Jan-00	A489	316700	290300	Powys	Male	Adult	
31	292	Both	15-Feb-00	-	263500	224300	Dyfed	Male	Adult	
	295	Both	01-Mar-00		299600	275400	Powys	Female	Adult	Quiescent
35	298	Both	26-Feb-00	B4358	302800	259700	Powys	Female	Sub-adult	Never reproduced
43	304	Both	29-Apr-00	A40	290400	229000	Powys	Male	Adult	
	305	Both	14-May-00	A487	264300	287200	Dyfed	Male	Sub-adult	
	308	Both	17-May-00	A438	308800	232800	Powys	Male	Sub-adult	
48	310	Both	04-Jun-00		322800	217200	Powys	Male	Adult	
	319	Both	25-May-00	B4343	269500	262900	Dyfed	Male	Adult	
16	329	Both	29-Sep-00		220000	245900	Dyfed	Male	Adult	
	330	Both	27-Sep-00	A487	299500	237300	Powys	Female	Sub-adult	Never reproduced
	332	Both	29-Sep-00		307500	253000	Powys	Female	Sub-adult	Never reproduced
10	334	Both	20-Oct-00	A483	317300	297200	Powys	Male	Adult	
45	354	Both	04-Nov-00		305800	230000	Powys	Female	Adult	Quiescent

	355	Both	26-Nov-00	A44	322800	260200	Powys	Male	Sub-adult	
19	356	Both	29-Nov-00	-	254600	247300	Dyfed	Female	Adult	Lactating
35	357	Both	07-Dec-00	A470	301900	257300	Powys	Female	Adult	Lactating
19	365	Both	13-Dec-00	-	254600	247300	Dyfed	Male	Adult	
28	366	Both	14-Dec-00	A40(T)	253100	221500	Dyfed	Male	Juvenile	
	392	Both	20-Feb-01	A483	304800	257700	Powys	Female	Adult	Lactating
6	413	Both	16-Jun-01	B4340	263800	275600	Dyfed	Female	Sub-adult	
21	419	Both	12-Dec-00	B4570	229600	241700	Dyfed	Female	Adult	Quiescent
16	425	Both	22-Aug-01		217900	243600	Dyfed	Female	Sub-adult	
7	430	Both	25-May-01		317300	317200	Powys	Male	Sub-adult	
15	434	Both	14-Sep-01	A44	302700	266200	Powys	Male	Adult	
39	441	Both	29-Oct-01		301700	251100	Powys		Adult	
32	442	Both	02-Nov-01	A40	266400	225600	Dyfed	Male	Adult	
8	444	Both	29-Oct-01	A458	309600	306800	Powys	Male	Adult	
	451	Both	05-Dec-01		313250	263090	Powys	Male	Adult	
	458	Both	31-Dec-01		205400	240400	Dyfed	Male	Adult	
16	460	Both	No date given	A478	217900	243700	Dyfed	Male	Adult	
	463	Both	11-Jan-01		229200	229700	Dyfed	Female	Adult	Lactating
18	511	Both	27-Jun-02	A486	238400	249800	Dyfed	Male	Adult	
	522	CUOP	23-Aug-02	A470	293300	273400	Powys	Male	Adult	
13	528	CUOP	14-Nov-02		308600	281500	Powys	Female	Adult	Pregnant
7	538	CUOP	19-Oct-02		317600	319200	Powys	Male	Adult	
16	552	CUOP	21-Jan-03		217800	241800	Dyfed	Male	Adult	
2	557	Both	09-Feb-03		260800	282400	Dyfed	Female	Adult	Pregnant
	569	CUOP	11-Mar-03		325000	270600	Powys	Male	Sub-adult	
1	573	CUOP	04-Apr-03	A487	267550	294300	Dyfed	Male	Adult	
12	582	CUOP	09-Jun-03		310500	291800	Powys	Male	Adult	
	597	CUOP	06-Jul-03	A487	257170	275080	Dyfed	Female	Adult	Quiescent
2	601	Both	08-Sep-03	A44	262010	281050	Dyfed	Male	Adult	

	611	CUOP	04-Nov-03	A4120	268000	277000	Dyfed	Male	Adult	
	619	Both	19-Oct-03	A482	266000	238620	Dyfed	Female	Adult	Lactating
39	625	CUOP	27-Jan-04	A470	303800	251700	Powys	Female	Adult	Quiescent
2	630	Both	02-Feb-04	A44	264380	280510	Dyfed	Male	Adult	
48	635	CUOP	19-Jan-04		322500	216700	Powys	Male	Adult	
42	637	CUOP	16-Sep-03	A4078	316500	235700	Powys	Male	Sub-adult	
39	641	CUOP	03-Feb-04		303800	251700	Powys	Male	Juvenile	
40	660	CUOP	No date given		307400	246800	Powys	Male	Adult	
40	661	CUOP	19-Apr-04	A470	307400	246800	Powys			
20	664	CUOP	06-Mar-04		226638	241392	Dyfed	Female	Sub-adult	
2	665	CUOP	03-Mar-04		263000	282000	Dyfed	Male	Adult	
2	666	CUOP	09-May-04	A4159	263000	282000	Dyfed	Male	Adult	
48	667	CUOP	16-Jul-04		322800	216200	Powys	Female	Adult	Quiescent
	673	Both	15-May-04	A470	291200	277400	Powys	Female	Sub-adult	
45	680	CUOP	28-Jul-04		304000	228500	Powys	Male	Sub-adult	
45	685	CUOP	21-Sep-04		302300	228700	Powys	Male	Adult	
42	694	Both	30-Nov-04		316632	235915	Powys	Female	Sub-adult	
	705	CUOP	10-Jan-05	B4337	254600	260000	Dyfed	Male	Adult	
34	713	CUOP	20-Feb-05	A470	300300	262300	Powys	Female	Adult	Quiescent
	723	Both	18-Mar-05		303600	318300	Powys	Female	Adult	Quiescent
18	755	CUOP	19-Sep-05	A486	237900	248800	Dyfed	Female	Sub-adult	Never reproduced
	757	Both	10-Oct-05	A487(T)	269300	296800	Dyfed	Female	Sub-adult	Never reproduced
7	762	CUOP	05-Nov-05	A490	316200	318400	Powys	Female	Adult	Quiescent
	774	CUOP	20-Nov-05	A4215	293200	226500	Powys	Male	Sub-adult	
	777	Both	19-Dec-05	B4520	303300	233300	Dyfed	Male	Adult	
	782	Both	16-Jan-06	B4520	300800	240200	Powys	Male	Adult	
18	796	Both	27-Apr-05	A road	238520	250170	Dyfed	Male	Adult	
6	797	Both	26-Jan-06	A485	262600	274300	Dyfed	Female	Sub-adult	Never

										reproduced
3	800	Both	17-Jan-06	B4340	260700	278400	Dyfed	Male	Sub-adult	
23	802	CUOP	12-Jan-06	A487	212220	238120	Dyfed	Male	Adult	
4	803	Both	11-Jan-05	A44	272800	281000	Dyfed	Male	Sub-adult	
49	806	Both	18-Jul-05	A470	299330	216400	Powys	Female	Adult	Quiescent
	812	CUOP	10-Mar-06		297300	222700	Powys	Female	Sub-adult	Never reproduced
	818	CUOP	05-Jan-06	B4392	324500	313900	Powys	Male	Sub-adult	
11	822	CUOP	29-Mar-06	A489(T)	303800	291500	Powys			
	834	CUOP	25-May-06		295400	250100	Powys	Female	Adult	
32	853	Both	01-Sep-06	A40(T)	267150	226320	Dyfed	Male	Adult	
18	854	CUOP	07-Sep-06	A486	238190	249510	Dyfed	Female	Adult	Quiescent
	859	CUOP	17-May-06	minor	311000	295000	Powys	Male	Sub-adult	
8	860	CUOP	22-Apr-06	Watergate street	310300	306300	Powys	Female	Adult	Quiescent
	866	Both	16-Feb-06	A487	242900	258410	Dyfed	Male	Adult	
6	868	CUOP	12-Mar-06	B4575	264700	274100	Dyfed	Female	Adult	Quiescent
19	872	CUOP	27-Mar-06	A485	257890	249410	Dyfed	Male	Sub-adult	
	876	CUOP	15-Dec-06	A483	310700	273600	Powys	Male	Sub-adult	
45	881	CUOP	23-Dec-06	A40	308500	227200	Powys	Female	Sub-adult	Never reproduced
45	882	CUOP	10-Jan-07	A40	306800	227700	Powys	Female	Sub-adult	
39	908	Both	04-Mar-07		300900	252900	Powys	Male	Adult	
42	910	CUOP	05-Mar-07	A479	314966	234540	Powys	Male	Adult	
1	917	Both	23-Feb-07	B4353	263800	292400	Dyfed	Female	Sub-adult	Never reproduced
	938	CUOP	18-Jan-07	B4302	264100	226900	Dyfed	Female	Sub-adult	Never reproduced
28	940	Both	29-Mar-07	minor	253140	223930	Dyfed	Male	Adult	
29	941	Both	20-Nov-06	A40	260150	223750	Dyfed	Male	Adult	
33	942	CUOP	24-Jan-07	A4069	272680	230510	Dyfed	Male	Sub-adult	

20	943	Both	06-Mar-07	A484	225800	242400	Dyfed	Male	Adult	
45	946	Both	12-Jun-07	Minor	307800	225800	Powys	Male	Adult	
	961	Both	05-Feb-07	A4059	301220	220180	Powys	Male	Sub-adult	
	984	CUOP	22-Apr-07		317000	286000	Powys	Female	Sub-adult	Never reproduced
	985	CUOP	12-Oct-07	A495	314200	311700	Powys	Male	Adult	
	987	CUOP	17-May-06	Minor Road	311000	295000	Powys	Male	Adult	
46	988	Both	27-Sep-07	unclassified	310800	223390	Powys	Female	Adult	Quiescent
35	1008	Both	13-Nov-07	B4358	303400	260800	Powys	Male	Adult	
45	1009	Both	13-Nov-07	A470	302100	227300	Powys	Male	Adult	
47	1022	CUOP	26-Nov-07	A40	319900	219700	Powys	Female	Adult	Quiescent
49	1079	Both	22-Oct-07	A470	299420	216210	Powys	Female	Adult	Quiescent
31	1081	Both	13-Feb-08	A483	262620	220050	Dyfed	Male	Sub-adult	
16	1082	Both	20-Nov-06	B4570	219970	246000	Dyfed	Male	Adult	
	1083	Both	13-Jan-07	Minor road	232600	233700	Dyfed	Male	Adult	
	1094	Both	07-Mar-08	Minor road	318800	247600	Powys	Male	Juvenile	
	1100	CUOP	26-Mar-08	B4520	302500	236700	Powys	Female	Sub-adult	Never reproduced
	1113	Both	03-Dec-07	A470	284600	307600	Powys	Male	Adult	
37	1139	Both	22-May-08	B4367	326200	262200	Powys	Female	Sub-adult	Never reproduced
35	1147	CUOP	09-May-08	A470	301700	257400	Powys	Female	Adult	Quiescent
15	1184	CUOP	30-Sep-08	A44	302800	266200	Powys	Male	Adult	
	1206	CUOP	27-Feb-08		323000	304000	Powys	Female	Sub-adult	Never reproduced
	1208	CUOP	09-Sep-08	Minor road	321100	322700	Powys	Male	Sub-adult	
	1218	CUOP	22-Oct-08		313500	265700	Powys	Male	Sub-adult	
	1256	Both	31-Oct-08	A470	282500	304600	Powys	Male	Adult	
31	1288	CUOP	13-Feb-09	Minor Road	262600	222400	Dyfed	Male	Sub-adult	
46	1328	Both	24-Feb-09	B4558	312350	221450	Powys	Male	Adult	
48	1329	Both	08-Feb-08	Minor road	322120	217040	Powys	Male	Sub-adult	

48	1331	Both	06-Apr-09	n/a	323750	216790	Powys	Male	Adult	
	1344	CUOP	20-Oct-08	B4393	323100	320000	Powys	Female	Sub-adult	Never reproduced
17	1349	Both	21-Jan-08	Minor Road	224260	250020	Dyfed	Female	Adult	Quiescent
	1352	CUOP	03-May-09		321200	276500	Powys	Female	Sub-adult	Never reproduced
45	1357	CUOP	08-Jun-09	A40	306900	227600	Powys	Female	Adult	Lactating
	1438	CUOP	30-Nov-09	B4355	319500	279800	Powys	Male	Sub-adult	
	1441	Both	10-Mar-08	B4577	254550	264150	Dyfed	Female	Adult	Quiescent
	1442	Both	20-Nov-06	B4570	219970	246000	Dyfed	Male	Sub-adult	
19	1443	Both	15-Nov-08	A475	256580	247680	Dyfed	Female	Sub-adult	Never reproduced
19	1444	Both	11-Nov-08	A482	256470	249840	Dyfed	Female	Adult	Quiescent
	1445	Both	15-Feb-09	A485	264400	265400	Dyfed	Female	Adult	Quiescent
1	1447	CUOP	18-Jul-07	Minor road	265380	291580	Dyfed	Female	Sub-adult	Never reproduced
35	1448	CUOP	10-Dec-09	A470	301700	257400	Powys	Male	Adult	
	1496	CUOP	31-Jan-10	A40(T)	269400	228700	Dyfed	Female	Adult	Lactating
	1506	CUOP	20-Jan-10	Minor road	234290	239460	Dyfed	Female	Adult	Pregnant
	1518	CUOP	11-Mar-10	A483	309000	277000	Powys	Female	Adult	Quiescent
	1522	CUOP	15-Mar-10	Minor road	315400	278000	Powys	Male	Sub-adult	
11	1535	CUOP	28-Mar-10	A470	303070	290430	Powys	Female		
	1549	CUOP	04-May-10	A40	321000	218000	Powys	Female	Adult	Quiescent
	1556	CUOP	No date given	A483	295000	249000	Powys	Female	Sub-adult	Never reproduced
12	1566	Both	24-May-10	A489	308500	290300	Powys	Female	Adult	Quiescent
25	1577	Both	04-Nov-09	A484	237533	231849	Dyfed	Female	Sub-adult	Never reproduced
41	1593	Both	12-Sep-07	A470	313100	237500	Powys	Male	Adult	
45	1594	CUOP	26-Jan-10	B4601	303262	228430	Powys	Female	Sub-adult	Never reproduced

	1633	Both	25-Oct-09	B4299	228900	224700	Dyfed	Female	Sub-adult	Never reproduced
16	1636	Both	03-Apr-10	A484	219690	245380	Dyfed	Female	Sub-adult	Never reproduced
	1641	CUOP	16-Sep-10	B4329	208600	233900	Dyfed	Male	Sub-adult	
	1732	Both	29-Dec-10	A487	250800	266200	Dyfed	Female	Sub-adult	Never reproduced
45	1739	Both	29-Apr-09	A40	304660	227620	Powys	Female	Unknown	Unknown
35	1787	CUOP	27-Aug-11	A470	301600	259000	Powys	Female	Adult	Lactating
11	1799	CUOP	24-Mar-11	B4568	301780	293720	Powys	Female	Adult	Pregnant
9	1800	CUOP	20-Sep-11		322200	306100	Powys	Male	Sub-adult	
36	1815	CUOP	03-Nov-11	n/a	308700	264300	Powys	Male	Sub-adult	
14	1836	CUOP	19-Nov-11	A470	295165	270438	Powys	Male		
14	1837	CUOP	19-Nov-11	A470	295368	270224	Powys	Male	Adult	
	1870	EA	29-Dec-10	A487	250800	266200	Dyfed	Not recorded	Not recorded	Not recorded
	1881	EA	25-Oct-09	B4299	228900	224700	Dyfed	Not recorded	Not recorded	Not recorded
	1882	EA	29-Jun-10	A48	257590	257590	Dyfed	Not recorded	Not recorded	Not recorded
2	1886	EA	18-Mar-11	A40	262500	281130	Dyfed	Female	Not recorded	
	1889	EA	15-Jul-11	Unclassified urban	258610	281300	Dyfed	Not recorded	Adult	Not recorded
	1893	EA	06-Jun-08	A458	296200	312500	Powys	Not recorded	Not recorded	Not recorded
2	1894	EA	02-Mar-10	A487	312500	282300	Dyfed	Not recorded	Not recorded	
29	1907	EA	01-Dec-89	A40	259600	223400	Dyfed	Female	Adult	Quiescent
	1909	EA	04-Feb-90	A478	217200	229300	Dyfed	Male	Adult	
16	1911	EA	08-Apr-90	B4548	217800	247300	Dyfed	Female	Juvenile	
1	1913	EA	07-Nov-90	A487	266700	293800	Dyfed	Male	Adult	

	1918	EA	01-Dec-89	A483	326300	316900	Powys	Female	Adult	Quiescent
	1919	EA	19-Feb-89	A40	273200	232400	Dyfed	Female	Adult	
	1921	EA	01-Mar-93	B4570	225400	245700	Dyfed	Female	Adult	Lactating
23	1928	EA	03-Jan-89	A487	212300	238200	Dyfed	Female	Adult	Not recorded
23	1929	EA	03-Jan-89	A487	212300	238200	Dyfed	Not recorded	Cub	Not recorded
45	1930	EA	20-Jan-94	A40	303900	227800	Powys	Not recorded	Cub	
5	1936	EA	10-Mar-92	B4337	254800	268000	Dyfed	Female	Not recorded	Not recorded
39	1948	EA	01-May-85	A483	302400	251200	Powys	Not recorded	Not recorded	Not recorded
10	1950	EA	01-May-86	A483	317400	297200	Powys	Not recorded	Not recorded	Not recorded
38	1951	EA	01-Nov-86	B4362	333900	263600	Powys	Not recorded	Not recorded	Not recorded
36	1952	EA	01-Aug-89	A483	308700	264200	Powys	Male	Adult	
	1954	EA	01-Oct-90	A483	309900	276900	Powys	Not recorded	Not recorded	Not recorded
39	1955	EA	01-Feb-91	A483	304600	253700	Powys	Not recorded	Not recorded	Not recorded
	1959	EA	01-Nov-91	B4340	270100	268300	Dyfed	Not recorded	Not recorded	Not recorded
	1965	EA	01-Feb-90	A40	293500	229500	Powys	Not recorded	Not recorded	Not recorded
45	1968	EA	01-Dec-89	A40	306900	227700	Powys	Not recorded	Not recorded	Not recorded
2	1974	EA	14-Feb-91	A487	260500	282300	Dyfed	Female	Adult	Not recorded
17	1975	EA	14-Jan-91	A487	226600	248800	Dyfed	Male	Not recorded	
2	1979	EA	05-Mar-71	A44	262000	281000	Dyfed	Female	Adult	Not recorded
33	1981	EA	01-Jun-96	A4069	272700	230600	Dyfed	Female	Adult	Not recorded

24	1982	EA	01-Oct-93	A487	202400	238600	Dyfed	Male	Adult	
	1984	EA	No date given	A485	265700	263200	Dyfed	Not recorded	Not recorded	Not recorded
46	1990	EA	24-Dec-95	B4558	312400	221000	Powys	Female	Adult	Lactating
42	1992	EA	01-Aug-98	A438	313000	234400	Powys	Not recorded	Cub	
40	1993	EA	01-May-97	A470	307400	246600	Powys	Not recorded	Cub	
45	2021	EA	28-Aug-04	A40 off	309240	226200	Powys	Female	Adult	Not recorded
24	2024	EA	31-Oct-02	N/A	203370	239310	Dyfed	Not recorded	Adult	Not recorded
13	2026	EA	14-Oct-00	A483	308800	282800	Powys	Not recorded	Adult	
13	2027	EA	23-Jul-01	A483	308600	282400	Powys	Not recorded	Adult	Not recorded
	2038	EA	21-Nov-04	Minor	323309	219985	Powys	Not recorded	Adult	Not recorded
	2039	EA	12-Dec-04	A475	243200	244600	Dyfed	Not recorded	Not recorded	Not recorded
4	2044	EA	05-Apr-05	A44	272090	281290	Dyfed	Not recorded	Adult	Not recorded
18	2051	EA	15-Oct-04	A486	237900	248800	Dyfed	Not recorded	Adult	Not recorded
	2055	EA	31-May-06	A44	318500	258300	Powys	Not recorded	Not recorded	Not recorded
	2057	EA	03-Mar-06	A438	321210	243300	Powys	Not recorded	Adult	Not recorded
33	2065	EA	26-Jan-07	A4069	272500	229950	Dyfed	Male	Not recorded	
27	2066	EA	01-Feb-07	B4310	249360	220830	Dyfed	Male	Adult	
1	2067	EA	22-Feb-07	B4353	263820	292510	Dyfed	Not recorded	Not recorded	Not recorded
	2071	EA	29-Jun-07	A482	268600	237100	Dyfed	Male	Adult	

9	2074	EA	15-Sep-07	A458	322400	306290	Powys	Not recorded	Not recorded	Not recorded
	2077	EA	30-Mar-08	A438	317960	240230	Dyfed	Male	Not recorded	
	2079	EA	03-Apr-08	A476	261150	219880	Dyfed	Female	Adult	Not recorded
	2104	EA	30-Sep-06	Unclassified	286400	294200	Powys	Not recorded	Not recorded	Not recorded
23	2110	EA	12-Aug-08	A487	212370	238103	Dyfed	Female	Adult	Not recorded
	2112	EA	24-Oct-07	A44	266000	280200	Powys	Not recorded	Not recorded	Not recorded
23	2115	EA	11-Aug-08	A487	211000	238000	Dyfed	Not recorded	Not recorded	Not recorded
22	2123	EA	05-Apr-09	A484	238150	237210	Dyfed	Not recorded	Adult	Not recorded
	2124	EA	29-Apr-09	A40	304660	227620	Powys	Female	Adult	Quiescent
49	2126	EA	07-Aug-09	A470	299100	217670	Powys	Not recorded	Not recorded	Not recorded
	2128	EA	29-Aug-09	Minor road	250400	246600	Dyfed	Male	Not recorded	
	2135	EA	02-Mar-10	A487	261000	282300	Dyfed	Not recorded	Not recorded	Not recorded
21	2155	EA	04-Nov-10	B4333	230150	241540	Dyfed	Not recorded	Adult	Not recorded

Appendix B. All known existing mitigation

Site location	Route	Grid reference	Existing mitigation	Date implemented	Within area of concern?
Pont Waun Fach	A479	SO 18380 26240	Otter tunnel incorporated into design of new bridge, along with guide fencing.	Approx. 2006	No
Talgarth bypass	A479	SO 15390 32440	Large, multi-use mammal underpass / culvert provided as part of the new road design.	2007	No
Penpont, east of Sennybridge	A40	SN 97180 28500	Otter ledge and fencing installed under bridge.	2011	No
Bronllys Castle	A479	SO 14980 34540	Otter ledge and fencing installed under bridge.	2012	No
Newbridge-on-Wye to Cwmbach new road	A470	SO 02470 54920	Large, multi-use mammal underpass / culvert provided as part of the new road design.	2012	2.56 km south of area 35
Four Crosses bypass	A483	SJ 26790 18340	Otter ledge and fencing installed under culvert as part of new road design.	2011	No
Esgairdraenllwyn	A483	SO 08587 82427	Otter tunnel provided as part of new road design.	Approx. 2005	No
Near Cider Mill Inn, west of Crickhowell	A40	SO 19750 19900 to SO 20190 19650	Investigated possibility of providing mitigation but not considered to be feasible.	Information not provided	No
Pont Ithon, Newbridge-on-Wye	A470	SO 01913 57284	Otter fencing installed prior to construction of new trunk road. This bridge is now on a de-trunked section of road.	Approx. 2008	Yes, area 35
Pont Dolau (between Glanyrafon and Lovesgrove, near Aberystwyth)	A44	SN 61853 81001	Otter ledge installed.	Pre-2004	Yes, area 2