

REFERENCE DOCUMENTS for PROPOSED LARGER TURBINES AND MET MASTS AT UPPERCHURCH WINDFARM for EIAR 2021 and AA 2021

REFERENCE DOCUMENT 22 of 36

This document contains the following:

UWF Grid Connection (ABP ref. ABP-306204-19)

- **2019 UWF Grid Connection EIA Report - Volume C4: EIAR Appendices (Part 2 of 2)**

- Appendix 8.1 – Species Records held by NPWS & NBDC
- Appendix 8.2 – Aquatic Habitats & Species Fieldwork & Survey Results
- Appendix 8.3 – Terrestrial Habitats Survey Results & Impact Calculations
- Appendix 8.4 – Hen Harrier Fieldwork & Survey Results
- Appendix 8.5 – Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
- Appendix 8.6 – Milestone & Inchivara Wind Farm Hen Harrier Survey 2015 2017
- Appendix 8.7 – General Birds Fieldwork & Survey Results
- Appendix 8.8 – Bat & Non-Volant Mammals Data
- Appendix 8.9 – Amphibians, Reptiles & Marsh Fritillary Field Work & Survey Results
- Appendix 9.1 – No Appendix for Chapter 9
- Appendix 10.1 – Trial Pit Investigations
- Appendix 11.1 – Inventory & Classification of Watercourses at Crossing Locations
- Appendix 11.2 – Surface Water Sampling Results
- Appendix 11.3 – Flood Risk Assessment
- Appendix 12.1 – Air Quality Monitoring & Standards
- Appendix 12.2 – Background Noise Modelling & Operational Noise Measurement
- Appendix 12.3 – Explanation and Modelling of Electromagnetic Fields
- Appendix 13.1 – Chapter 13 has no appendices
- Appendix 14.1 – Chapter 14 has no appendices
- Appendix 15.1 – Traffic and Transportation Assessment Report
- Appendix 15.2 – Pavement Condition Survey
- Appendix 15.3 – Site Photographs of UWF Grid Connection Roads, Bridges & Culverts
- Appendix 15.4 – Stage 1 Road Safety Audit and Review
- Appendix 15.5 – Peat Probe Survey
- Appendix 15.6 – Inventory & Classification of Watercourses at Crossing Locations
- Appendix 16.1 – Detailed Description of Cultural Heritage Sites
- Appendix 16.2 – Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905
- Appendix 17.1 – Contextual Photographs and Theoretical Visibility within the Study Areas
- Appendix 18.1 – Chapter 18 has no appendices
- Appendix 19.1 – Chapter 19 has no appendices

UWF Grid Connection EIA Report (2019)

Volume C4: EIAR APPENDICES

Part 2 of 2

Appendices to Chapters 8 - 19

 **KILKENNY ARCHAEOLOGY**
Archaeological Consultants



Inis



Environmental Agricultural
Engineering Consultancy



ECOPOWER

October 2019



Table of Appendices

Appendix No.	Appendix Title
Part 1 of 2	
Appendix 1.1	<i>Chapter 1 has no appendices</i>
Appendix 2.1	Scoping of Other Projects or Activities for Cumulative Evaluations
Appendix 3.1	Consultation with An Bord Pleanála
Appendix 3.2	Consent of Roads Authority of Tipperary County Council to the Making of a Planning Application
Appendix 3.3	Letters sent by Inis Consultancy to Birdwatch Ireland; Bat Conservation Ireland; IFI; and NPWS
Appendix 3.4	EDL Consultees Schedule & Sample Letter
Appendix 3.5	Replies from Statutory Bodies to EDL Consultation
Appendix 3.6	Community Liaison & Consultation Strategy
Appendix 3.7	Public Information Day
Appendix 4.1	<i>Chapter 4 has no appendices</i>
Appendix 5.1	Outline Construction Methodologies and Best Practice Measures
Appendix 5.2	Inventory & Classification of Watercourses at Crossing Locations
Appendix 5.3	Description of Development (UWF Related Works)
Appendix 5.4	Description of Development (UWF Replacement Forestry)
Appendix 5.5	Compiled Description of Upperchurch Windfarm
Appendix 5.6	Description of UWF Other Activities
Appendix 5.7	A Guide to Risk Assessment in Major Emergency Management Jan 2010
Appendix 6.1	Central Statistics Office & GeoDirectory Data
Appendix 7.1	<i>Chapter 7 has no appendices</i>

Appendix No.	Appendix Title
Part 2 of 2	
Appendix 8.1	Species Records held by NPWS & NBDC
Appendix 8.2	Aquatic Habitats & Species Fieldwork & Survey Results
Appendix 8.3	Terrestrial Habitats Survey Results & Impact Calculations
Appendix 8.4	Hen Harrier Fieldwork & Survey Results
Appendix 8.5	Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
Appendix 8.6	Milestone & Inchivara Wind Farm Hen Harrier Survey 2015 2017
Appendix 8.7	General Birds Fieldwork & Survey Results
Appendix 8.8	Bat & Non-Volant Mammals Data
Appendix 8.9	Amphibians, Reptiles & Marsh Fritillary Field Work & Survey Results
Appendix 9.1	No Appendix for Chapter 9
Appendix 10.1	Trail Pit Investigations
Appendix 11.1	Classification of Watercourses at Crossing Locations
Appendix 11.2	Surface Water Sampling Results
Appendix 11.3	Flood Risk Assessment
Appendix 12.1	Air Quality Monitoring & Standards
Appendix 12.2	Background Noise Measuring & Operational Noise Modelling
Appendix 12.3	Explanation and Modelling of Electromagnetic Fields
Appendix 13.1	Chapter 13 has no appendices
Appendix 14.1	Chapter 14 has no appendices
Appendix 15.1	Traffic and Transportation Assessment Report
Appendix 15.2	Pavement Condition Survey
Appendix 15.3	Site Photographs of UWF Grid Connection Roads, Bridges & Culverts
Appendix 15.4	Stage 1 Road Safety Audit and Review
Appendix 15.5	Peat Probe Survey

Appendix 15.6	Classification of Watercourses at Crossing Locations
Appendix 16.1	Detailed Description of Cultural Heritage Sites
Appendix 16.2	Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905
Appendix 17.1	Contextual Photographs and Theoretical Visibility within the Study Areas
Chapter 18.1	Chapter 18 has no appendices
Appendix 19.1	Chapter 19 has no appendices



Appendix to Chapter 8: Biodiversity

Appendix 8.1: Species Records held by NPWS & NBDC

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

Table of Contents

A8-1	Appendix to Chapter 8: Biodiversity.....	Error! Bookmark not defined.
A8-1.1.1	Relevant 10km Grid Squares for UWF Grid Connection	3

List of Plates & Tables

Plate 1: Relevant 10km Grid Squares for UWF Grid Connection

Table 1: Records of legally protected and rare species, excluding sensitive species, held by the National Parks and Wildlife Service

Table 2: Records of legally protected mammal species held by the National Biodiversity Data Centre

Table 3: Records of legally protected bird species held by the National Biodiversity Data Centre

Table 4 Records of legally protected amphibian species held by the National Biodiversity Data Centre

Table 5 Records of legally protected butterfly species held by the National Biodiversity Data Centre

Table 6 Records of legally protected bryophyte species held by the National Biodiversity Data Centre

Table 7 Records of legally protected crustacean species held by the National Biodiversity Data Centre

Table 8 Records of non-native invasive species held by the National Biodiversity Data Centre

A8-1.1.1 Relevant 10km Grid Squares for UWF Grid Connection

A data request was sent to NPWS GIS division on 01/08/19 for a full inventory of all protected and rare species recorded within pertinent 10km squares overlapping the subject UWF Grid Connection project. This data is presented in Table 1.

The database of the National Biodiversity Data Centre was also consulted to assess the presence of rare plant and faunal species and records of protected species reported within the primary 10km squares. This data is presented in Tables 2 to 8.

Due to the conditions of the data request with regard to the presentation of sensitive data as defined (<https://www.npws.ie/sites/default/files/general/npws-sensitive-species.pdf>), not all records are presented. In addition, the spatial resolution of each record is presented at 10 km scale in line with the condition that “data are provided on the understanding that users will not use the information to the detriment of individual species or habitats, biodiversity or the environment in general.”

Plate 1, illustrates the 10km squares selected for review.

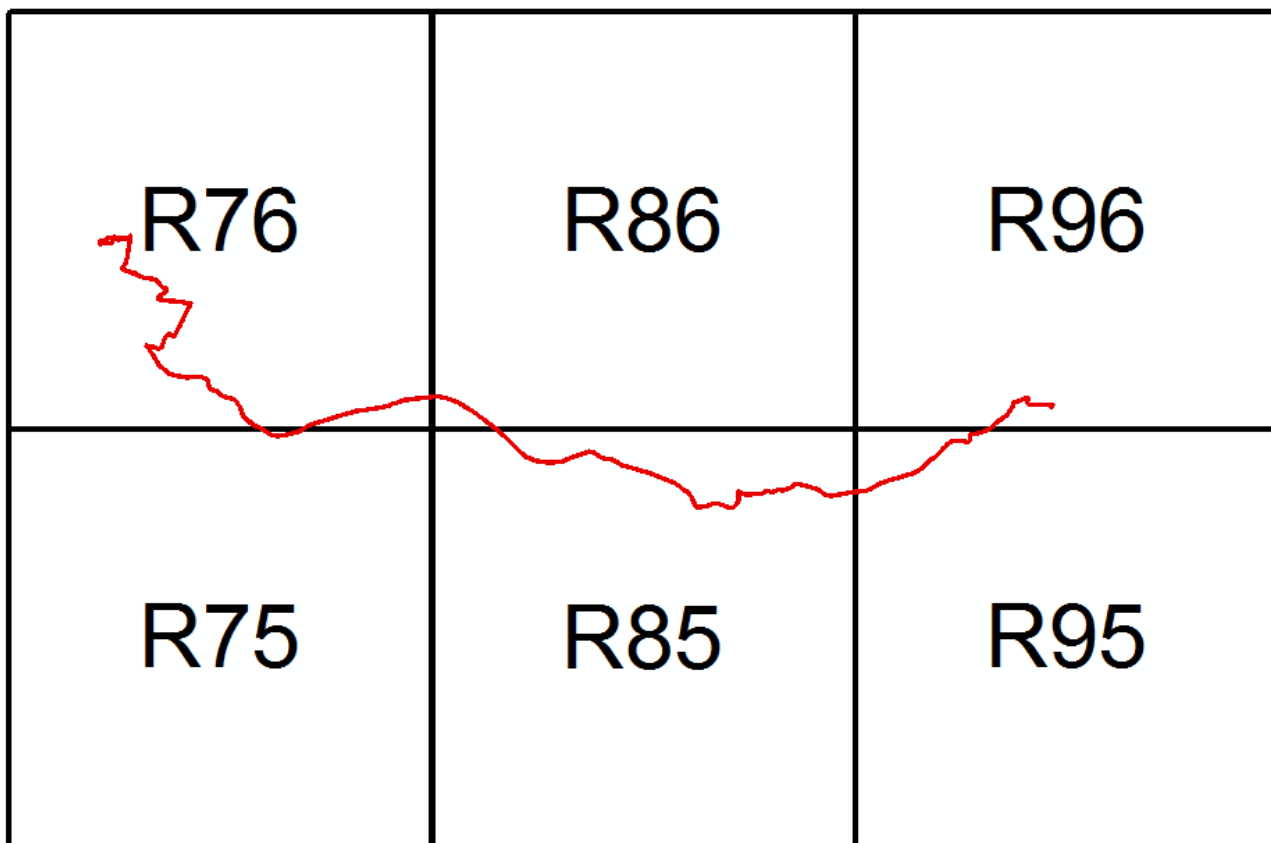


Plate 1: Relevant 10km grid squares for UWF Grid Connection

Other Elements of the Whole UWF Project: It should be noted that all of the Upperchurch Windfarm, all of UWF Related Works and all of UWF Replacement Forestry are located within the R95 and R96 grid squares. The UWF Other Activities are also predominately located within the grid squares associated with the UWF Grid Connection.

Table 1: Records of legally protected and rare species, excluding sensitive species, held by the National Parks and Wildlife Service (received 23/08/2019)

10 km Grid Square	Scientific Name	Common Name	Date of last record
R75	<i>Amblystegium fluviatile</i>	Brook-side Feather-moss	14/06/2005
R75	<i>Austropotamobius pallipes</i>	Freshwater Crayfish	25/09/1996
R75	<i>Cladonia ciliata</i>	Cladonia ciliata	04/11/2003
R75	<i>Cladonia portentosa</i>	Reindeer Moss	04/11/2003
R75	<i>Dama dama</i>	Fallow Deer	2004 - 2005
R75	<i>Erinaceus europaeus</i>	West European Hedgehog	1970
R75	<i>Eurodryas aurinia</i>	Marsh Fritillary	22/09/2010
R75	<i>Lepus timidus subsp. hibernicus</i>	Irish Hare	09/05/1990
R75	<i>Lisotriton vulgaris</i>	Smooth Newt	1974
R75	<i>Lutra lutra</i>	Otter	24/01/2005
R75	<i>Martes martes</i>	Pine Marten	2005 - 2006
R75	<i>Meles meles</i>	Badger	09/05/1990
R75	<i>Mustela erminea subsp. hibernica</i>	Irish Stoat	1970
R75	<i>Rana temporaria</i>	Common Frog	26/02/2011
R75	<i>Sorex minutus</i>	Eurasian Pygmy Shrew	1969
R75	<i>Trichomanes speciosum</i>	Killarney Fern	24/08/2016
R76	<i>Cephaloziella stellulifera</i>	Heath Threadingwort	06/05/2008
R76	<i>Dama dama</i>	Fallow Deer	2004 - 2005
R76	<i>Eurodryas aurinia</i>	Marsh Fritillary	19/09/2004
R76	<i>Lampetra fluviatilis</i>	River Lamprey	Unknown
R76	<i>Lepus timidus subsp. hibernicus</i>	Irish Hare	06/04/1990
R76	<i>Lutra lutra</i>	Otter	30/05/1980
R76	<i>Martes martes</i>	Pine Marten	2005 - 2006
R76	<i>Meles meles</i>	Badger	13/02/2007
R76	<i>Mustela erminea subsp. hibernica</i>	Irish Stoat	1969
R76	<i>Petromyzon marinus</i>	Sea Lamprey	Unknown
R76	<i>Rana temporaria</i>	Common Frog	19/02/2006

10 km Grid Square	Scientific Name	Common Name	Date of last record
R76	<i>Sorex minutus</i>	Eurasian Pygmy Shrew	July 1970
R85	<i>Amblystegium fluviatile</i>	Brook-side Feather-moss	28/06/2005
R85	<i>Dama dama</i>	Fallow Deer	2004 - 2005
R85	<i>Entosthodon fascicularis</i>	Hasselquist's Hyssop	28/06/2005
R85	<i>Lepus timidus</i> subsp. <i>hibernicus</i>	Irish Hare	15/02/1991
R85	<i>Lutra lutra</i>	Otter	02/09/2010
R85	<i>Martes martes</i>	Pine Marten	2005 - 2006
R85	<i>Meles meles</i>	Badger	15/02/1991
R85	<i>Mustela erminea</i> subsp. <i>hibernica</i>	Irish Stoat	01/06/2005
R85	<i>Philonotis caespitosa</i>	Tufted Apple-moss	28/06/2005
R85	<i>Rana temporaria</i>	Common Frog	03/05/2011
R85	<i>Sciurus vulgaris</i>	Red Squirrel	15/02/1991
R86	<i>Cladonia portentosa</i>	Reindeer Moss	26/08/2003
R86	<i>Dama dama</i>	Fallow Deer	2004 - 2005
R86	<i>Lepus timidus</i> subsp. <i>hibernicus</i>	Irish Hare	24/09/1990
R86	<i>Lutra lutra</i>	Otter	20/09/2010
R86	<i>Meles meles</i>	Badger	24/09/1990
R86	<i>Pseudorchis albida</i>	Small-White Orchid	11/06/2010
R86	<i>Rana temporaria</i>	Common Frog	23/02/2011
R86	<i>Sphagnum subnitens</i>	Lustrous Bog-moss	11/06/2005
R86	<i>Trichomanes speciosum</i>	Killarney Fern	1852
R95	<i>Austropotamobius pallipes</i>	Freshwater Crayfish	07/06/2006
R95	<i>Dama dama</i>	Fallow Deer	2004 - 2005
R95	<i>Lepus timidus</i> subsp. <i>hibernicus</i>	Irish Hare	28/02/1990
R95	<i>Lutra lutra</i>	Otter	20/10/2010
R95	<i>Meles meles</i>	Badger	28/02/1990
R96	<i>Austropotamobius pallipes</i>	Freshwater Crayfish	03/09/2008
R96	<i>Bromus racemosus</i>	Smooth Brome	1969
R96	<i>Cladonia portentosa</i>	Reindeer Moss	Unknown

10 km Grid Square	Scientific Name	Common Name	Date of last record
R96	Dama dama	Fallow Deer	2004 - 2005
R96	Lepus timidus subsp. hibernicus	Irish Hare	08/05/1990
R96	Lutra lutra	Otter	30/08/2010
R96	Meles meles	Badger	08/05/1990
R96	Pseudorchis albida	Small-white Orchid	1965
R96	Rana temporaria	Common Frog	13/04/2006
R96	Sorex minutus	Eurasian Pygmy Shrew	May 1969
R96	Trichomanes speciosum	Killarney Fern	16/04/2009

Table 2: Records of legally protected mammal species held by the National Biodiversity Data Centre (www.biodiversityireland.ie, 30/07/19)

10 km Grid Square	Scientific name	Common name	Record count	Date of last record	EU HD Annex II	EU HD Annex IV	EU HD Annex V	Wildlife Acts
R75	<i>Myotis daubentonii</i>	Daubenton's Bat	94	26/08/2014		X		X
R75	<i>Meles meles</i>	Eurasian Badger	52	31/12/2015				X
R75	<i>Sciurus vulgaris</i>	Eurasian Red Squirrel	18	12/09/2016				X
R75	<i>Lutra lutra</i>	European Otter	8	17/08/2008	X	X		X
R75	<i>Nyctalus leisleri</i>	Lesser Noctule	8	14/08/2014		X		X
R75	<i>Martes martes</i>	Pine Marten	11	02/08/2017			X	X
R75	<i>Pipistrellus pipistrellus sensu lato</i>	Pipistrelle	3	14/08/2014		X		X
R75	<i>Pipistrellus pygmaeus</i>	Soprano Pipistrelle	3	14/08/2014		X		X
R76	<i>Lutra lutra</i>	European Otter	5	30/05/1980	X	X		X
R76	<i>Martes martes</i>	Pine Marten	18	28/09/2017			X	X
R76	<i>Meles meles</i>	Eurasian Badger	72	17/02/2011				X
R76	<i>Myotis daubentonii</i>	Daubenton's Bat	26	23/08/2014		X		X
R76	<i>Nyctalus leisleri</i>	Lesser Noctule	1	09/10/2009		X		X
R76	<i>Pipistrellus pipistrellus sensu lato</i>	Pipistrelle	2	09/10/2009		X		X
R76	<i>Pipistrellus pygmaeus</i>	Soprano Pipistrelle	3	09/10/2009		X		X
R76	<i>Sciurus vulgaris</i>	Eurasian Red Squirrel	6	29/12/2015				X
R76	<i>Sorex minutus</i>	Eurasian Pygmy Shrew	1	31/07/1970				X
R85	<i>Myotis daubentonii</i>	Daubenton's Bat	5	20/08/2014		X		X
R85	<i>Meles meles</i>	Eurasian Badger	53	31/12/2012				X
R85	<i>Sciurus vulgaris</i>	Eurasian Red Squirrel	9	06/09/2017				X
R85	<i>Lutra lutra</i>	European Otter	10	02/09/2010	X	X		X
R85	<i>Martes martes</i>	Pine Marten	3	31/12/2011			X	X
R85	<i>Pipistrellus pygmaeus</i>	Soprano Pipistrelle	1	23/09/2008		X		X
R86	<i>Lutra lutra</i>	European Otter	8	20/09/2010	X	X		X
R86	<i>Myotis daubentonii</i>	Daubenton's Bat	23	28/08/2009		X		X
R86	<i>Myotis nattereri</i>	Natterer's Bat	1	28/10/2011		X		X

10 km Grid Square	Scientific name	Common name	Record count	Date of last record	EU HD Annex II	EU HD Annex IV	EU HD Annex V	Wildlife Acts
R86	<i>Nyctalus leisleri</i>	Lesser Noctule	1	28/06/2008		X		X
R86	<i>Pipistrellus pipistrellus sensu lato</i>	Pipistrelle	1	28/06/2008		X		X
R86	<i>Pipistrellus pygmaeus</i>	Soprano Pipistrelle	1	28/06/2008		X		X
R86	<i>Martes martes</i>	Pine Marten	5	21/05/2014			X	X
R86	<i>Cervus elaphus</i>	Red Deer	1	31/12/2008				X
R86	<i>Meles meles</i>	Eurasian Badger	51	19/03/2009				X
R86	<i>Sciurus vulgaris</i>	Eurasian Red Squirrel	2	12/04/2011				X
R95	<i>Lutra lutra</i>	European Otter	8	20/08/2012	X	X		X
R95	<i>Martes martes</i>	Pine Marten	2	17/07/2009			X	X
R95	<i>Meles meles</i>	Eurasian Badger	75	19/05/2009				X
R95	<i>Myotis daubentonii</i>	Daubenton's Bat	1	08/08/2009		X		X
R95	<i>Nyctalus leisleri</i>	Lesser Noctule	1	08/08/2009		X		X
R95	<i>Pipistrellus pipistrellus sensu lato</i>	Pipistrelle	1	08/08/2009		X		X
R95	<i>Pipistrellus pygmaeus</i>	Soprano Pipistrelle	2	08/08/2009		X		X
R95	<i>Sciurus vulgaris</i>	Eurasian Red Squirrel	2	03/04/2015				X
R96	<i>Lutra lutra</i>	European Otter	6	30/08/2010	X	X		X
R96	<i>Myotis daubentonii</i>	Daubenton's Bat	1	08/08/2009		X		X
R96	<i>Nyctalus leisleri</i>	Lesser Noctule	1	08/08/2009		X		X
R96	<i>Pipistrellus pipistrellus sensu lato</i>	Pipistrelle	2	08/08/2009		X		X
R96	<i>Pipistrellus pygmaeus</i>	Soprano Pipistrelle	2	08/08/2009		X		X
R96	<i>Plecotus auritus</i>	Brown Long-eared Bat	1	08/08/2009		X		X
R96	<i>Martes martes</i>	Pine Marten	4	28/05/2014			X	X
R96	<i>Erinaceus europaeus</i>	West European Hedgehog	1	12/08/2012				X
R96	<i>Meles meles</i>	Eurasian Badger	67	16/09/2008				X
R96	<i>Sciurus vulgaris</i>	Eurasian Red Squirrel	3	03/06/2015				X

Table 3: Records of legally protected bird species held by the National Biodiversity Data Centre (www.biodiversityireland.ie, 30/07/2019)

Grid square	Scientific name	Common name	Record count	Date of last record	EU BD Annex I	EU BD Annex II	EU BD Annex III	Wildlife Acts
R75	<i>Tyto alba</i>	Barn Owl	2	31/12/2011				X
R75	<i>Hirundo rustica</i>	Barn Swallow	13	31/12/2011				X
R75	<i>Larus ridibundus</i>	Black-headed Gull	2	29/02/1984				X
R75	<i>Fulica atra</i>	Common Coot	8	31/12/2011		X	X	X
R75	<i>Locustella naevia</i>	Common Grasshopper Warbler	5	31/12/2011				X
R75	<i>Falco tinnunculus</i>	Common Kestrel	15	05/10/2015				X
R75	<i>Alcedo atthis</i>	Common Kingfisher	3	31/07/1991	X			X
R75	<i>Carduelis cannabina</i>	Common Linnet	6	31/12/2011				X
R75	<i>Phasianus colchicus</i>	Common Pheasant	12	31/12/2011		X	X	X
R75	<i>Aythya farina</i>	Common Pochard	1	29/02/1984		X	X	X
R75	<i>Gallinago gallinago</i>	Common Snipe	5	31/12/2011		X	X	X
R75	<i>Sturnus vulgaris</i>	Common Starling	16	31/12/2011				X
R75	<i>Apus apus</i>	Common Swift	5	31/12/2011				X
R75	<i>Columba palumbus</i>	Common Woodpigeon	18	31/21/2011		X		X
R75	<i>Crex crex</i>	Corn Crane	1	31/07/1972	X			X
R75	<i>Numenius arquata</i>	Eurasian Curlew	4	31/21/2011		X		X
R75	<i>Anas crecca</i>	Eurasian Teal	3	31/12/2011		X	X	X
R75	<i>Scolopax rusticola</i>	Eurasian Woodcock	6	31/12/2011		X	X	X
R75	<i>Pluvialis apricaria</i>	European Golden Plover	2	31/12/2011	X	X	X	X
R75	<i>Caprimulgus europaeus</i>	European Nightjar	1	31/07/1972	X			X
R75	<i>Phalacrocorax carbo</i>	Great Cormorant	3	31/12/2011				X
R75	<i>Anser anser</i>	Greylag Goose	4	31/21/2011		X	X	X
R75	<i>Circus cyaneus</i>	Hen Harrier	7	31/12/2011	X			X
R75	<i>Larus argentatus</i>	Herring Gull	2	31/07/1991				X
R75	<i>Delichon urbicum</i>	House Martin	5	31/12/2011				X
R75	<i>Passer domesticus</i>	House Sparrow	13	31/12/2011				X
R75	<i>Egretta garzetta</i>	Little Egret	2	31/12/2011	X			X

APPENDIX 8.1: Species Records held by NPWS & NBDC
EJAR 2019, Chapter 8: Biodiversity

Grid square	Scientific name	Common name	Record count	Date of last record	EU BD Annex I	EU BD Annex II	EU BD Annex III	Wildlife Acts
R75	<i>Tachybaptus ruficollis</i>	Little Grebe	6	31/12/2011				X
R75	<i>Anas platyrhynchos</i>	Mallard	10	31/12/2011		X	X	X
R75	<i>Falco columbarius</i>	Merlin	5	31/12/2011	X			X
R75	<i>Cygnus olor</i>	Mute Swan	9	31/12/2011				X
R75	<i>Vanellus vanellus</i>	Northern Lapwing	4	31/12/2011		X		X
R75	<i>Oenanthe oenanthe</i>	Northern Wheatear	2	31/07/1991				X
R75	<i>Falco peregrinus</i>	Peregrine falcon	5	31/12/2011	X			X
R75	<i>Lagopus lagopus</i>	Red Grouse	4	31/12/2011		X	X	X
R75	<i>Riparia riparia</i>	Sand Martin	6	31/12/2011				X
R75	<i>Delichon urbicum</i>	House Martin	7	31/12/2011				X
R75	<i>Muscicapa striata</i>	Spotted Flycatcher	6	31/12/2011				X
R75	<i>Columba oenas</i>	Stock Pigeon	1	31/07/1972				X
R75	<i>Aythya fuligula</i>	Tufted Duck	2	31/07/1991		X	X	X
R75	<i>Rallus aquaticus</i>	Water Rail	1	31/07/1972				X
R75	<i>Emberiza citrinella</i>	Yellowhammer	1	31/07/1972				X
R76	<i>Alauda arvensis</i>	Skylark	11	19/04/2014				X
R76	<i>Alcedo atthis</i>	Kingfisher	7	31/12/2011	X			X
R76	<i>Anas platyrhynchos</i>	Mallard	16	31/12/2011		X	X	X
R76	<i>Anser anser</i>	Greylag Goose	6	31/12/2011		X	X	X
R76	<i>Apus apus</i>	Swift	1	31/07/1972				X
R76	<i>Linaria cannabina</i>	Linnet	8	31/12/2011				X
R76	<i>Circus cyaneus</i>	Hen Harrier	8	31/12/2011	X			X
R76	<i>Columba oenas</i>	Stock Dove	1	31/07/1972				X
R76	<i>Columba palumbus</i>	Woodpigeon	32	31/12/2011		X	X	X
R76	<i>Crex crex</i>	Corncrake	2	31/07/1991				X
R76	<i>Cygnus olor</i>	Mute Swan	2	31/12/2011				X
R76	<i>Delichon urbicum</i>	House Martin	7	31/12/2011				X
R76	<i>Emberiza citrinella</i>	Yellowhammer	1	31/07/1972				X

APPENDIX 8.1: Species Records held by NPWS & NBDC
EJAR 2019, Chapter 8: Biodiversity

Grid square	Scientific name	Common name	Record count	Date of last record	EU BD Annex I	EU BD Annex II	EU BD Annex III	Wildlife Acts
R76	<i>Falco columbarius</i>	Merlin	1	07/01/2014	X			X
R76	<i>Falco tinnunculus</i>	Kestrel	14	31/12/2011				X
R76	<i>Gallinago gallinago</i>	Snipe	9	31/12/2011		X	X	X
R76	<i>Hirundo rustica</i>	Swallow	17	31/12/2011				X
R76	<i>Lagopus lagopus</i>	Red Grouse	5	31/12/2011		X	X	X
R76	<i>Larus canus</i>	Common Gull	2	31/12/2011				X
R76	<i>Larus ridibundus</i>	Black-headed Gull	7	31/12/2011				X
R76	<i>Locustella naevia</i>	Grasshopper Warbler	6	31/12/2011				X
R76	<i>Muscicapa striata</i>	Spotted Flycatcher	11	31/12/2011				X
R76	<i>Numenius arquata</i>	Curlew	7	31/12/2011		X		X
R76	<i>Passer domesticus</i>	House Sparrow	20	31/12/2011				X
R76	<i>Phalacrocorax carbo</i>	Cormorant	3	31/12/2011				X
R76	<i>Phasianus colchicus</i>	Pheasant	16	31/12/2011		X	X	X
R76	<i>Pluvialis apricaria</i>	Golden Plover	2	31/12/2011	X		X	X
R76	<i>Riparia riparia</i>	Sand Martin	5	31/12/2011				X
R76	<i>Scolopax rusticola</i>	Woodcock	1	31/07/1972		X	X	X
R76	<i>Sturnus vulgaris</i>	Starling	24	31/12/2011				X
R76	<i>Tyto alba</i>	Barn Owl	2	31/12/2011				X
R76	<i>Vanellus vanellus</i>	Lapwing	3	31/12/2011		X		X
R85	<i>Tyto alba</i>	Barn Owl	1	31/07/1972				X
R85	<i>Hirundo rustica</i>	Barn Swallow	21	28/05/2016				X
R85	<i>Fulica atra</i>	Common Coot	3	31/12/2011		X	X	X
R85	<i>Locustella naevia</i>	Common Grasshopper Warbler	5	31/12/2011				X
R85	<i>Falco tinnunculus</i>	Common Kestrel	17	31/08/2016				X
R85	<i>Alcedo atthis</i>	Common Kingfisher	1	31/07/1972	X			X
R85	<i>Carduelis cannabina</i>	Common Linnet	8	31/12/2011				X
R85	<i>Phasianus colchicus</i>	Common Pheasant	20	31/12/2011		X	X	X
R85	<i>Actitis hypoleucos</i>	Common Sandpiper	1	31/07/1972				X

APPENDIX 8.1: Species Records held by NPWS & NBDC
EIA 2019, Chapter 8: Biodiversity

Grid square	Scientific name	Common name	Record count	Date of last record	EU BD Annex I	EU BD Annex II	EU BD Annex III	Wildlife Acts
R85	<i>Gallus gallus</i>	Common Snipe	9	31/12/2011		X	X	X
R85	<i>Sturnus vulgaris</i>	Common Starling	23	28/05/2016				X
R85	<i>Apus apus</i>	Common Swift	4	31/07/1991				X
R85	<i>Columba palumbus</i>	Common Wood Pigeon	30	29/12/2014		X	X	X
R85	<i>Crex crex</i>	Corn Crane	1	31/07/1972	X			X
R85	<i>Numenius arquata</i>	Eurasian Curlew	5	31/07/1991		X		X
R85	<i>Anas crecca</i>	Eurasian Teal	1	31/07/1972		X	X	X
R85	<i>Scolopax rusticola</i>	Eurasian Woodcock	3	31/12/2011		X	X	X
R85	<i>Pluvialis apricaria</i>	European Golden Plover	2	31/12/2011	X	X	X	X
R85	<i>Circus cyaneus</i>	Hen Harrier	4	31/12/2011	X			X
R85	<i>Delichon urbicum</i>	House Martin	9	28/05/2016				X
R85	<i>Passer domesticus</i>	House Sparrow	16	29/12/2014				X
R85	<i>Tachybaptus ruficollis</i>	Little Grebe	2	31/12/2011				X
R85	<i>Anas platyrhynchos</i>	Mallard	1	31/07/1972		X	X	X
R85	<i>Falco colombarius</i>	Merlin	1	31/07/1972	X			X
R85	<i>Vanellus vanellus</i>	Northern Lapwing	4	31/12/2011		X		X
R85	<i>Oenanthe oenanthe</i>	Northern Wheatear	1	31/07/1972				X
R85	<i>Lagopus lagopus</i>	Red Grouse	6	31/12/2011		X	X	X
R85	<i>Riparia riparia</i>	Sand Martin	12	08/05/2014				X
R85	<i>Alauda arvensis</i>	Skylark	9	31/12/2011				X
R85	<i>Muscicapa striata</i>	Spotted Flycatcher	6	31/07/1991				X
R85	<i>Columba oenas</i>	Stock Pigeon	1	31/07/1972				X
R85	<i>Emberiza citrinella</i>	Yellowhammer	1	31/07/1972				X
R86	<i>Falco peregrinus</i>	Peregrine	3	31/12/2011	X			X
R86	<i>Circus cyaneus</i>	Hen Harrier	5	31/12/2011	X			X
R86	<i>Falco columbarius</i>	Merlin	4	31/12/2011	X			X
R86	<i>Anas platyrhynchos</i>	Mallard	3	31/12/2011		X	X	X
R86	<i>Columba palumbus</i>	Woodpigeon	14	31/12/2011		X	X	X

APPENDIX 8.1: Species Records held by NPWS & NBDC
EIA 2019, Chapter 8: Biodiversity

Grid square	Scientific name	Common name	Record count	Date of last record	EU BD Annex I	EU BD Annex II	EU BD Annex III	Wildlife Acts
R86	<i>Phasianus colchicus</i>	Pheasant	11	31/12/2011		X	X	X
R86	<i>Lagopus lagopus</i>	Red Grouse	8	07/01/2016		X	X	X
R86	<i>Anas crecca</i>	Teal	1	31/07/1972		X	X	X
R86	<i>Lymnocyptes minimus</i>	Jack Snipe	2	31/12/2011				
R86	<i>Gallinago gallinago</i>	Snipe	11	17/10/2017		X	X	X
R86	<i>Scolopax rusticola</i>	Woodcock	3	31/07/1991		X	X	X
R86	<i>Numenius arquata</i>	Curlew	5	31/12/2011				
R86	<i>Alauda arvensis</i>	Skylark	11	31/12/2011				X
R86	<i>Linaria cannabina</i>	Linnet	9	31/12/2011				X
R86	<i>Delichon urbicum</i>	House Martin	6	31/07/1991				X
R86	<i>Falco tinnunculus</i>	Kestrel	11	31/12/2011				X
R86	<i>Hirundo rustica</i>	Swallow	9	31/12/2011				X
R86	<i>Locustella naevia</i>	Grasshopper Warbler	2	31/12/2011				X
R86	<i>Muscicapa striata</i>	Spotted Flycatcher	4	31/12/2011				X
R86	<i>Passer domesticus</i>	House Sparrow	14	31/12/2011				X
R86	<i>Riparia riparia</i>	Sand Martin	1	31/12/2011				X
R86	<i>Sturnus vulgaris</i>	Starling	14	31/12/2011				X
R86	<i>Emberiza citrinella</i>	Yellowhammer	4	31/07/1991				X
R95	<i>Alauda arvensis</i>	Skylark	6	31/12/2011				X
R95	<i>Alcedo atthis</i>	Kingfisher	1	31/07/1972	X			X
R95	<i>Anas platyrhynchos</i>	Mallard	7	31/12/2011		X	X	X
R95	<i>Apus apus</i>	Swift	7	31/07/1991				X
R95	<i>Linaria cannabina</i>	Linnet	11	31/12/2011				X
R95	<i>Circus cyaneus</i>	Hen Harrier	7	31/12/2011	X			X
R95	<i>Columba oenas</i>	Stock Dove	3	31/07/1991				X
R95	<i>Columba palumbus</i>	Woodpigeon	17	31/12/2011		X	X	X
R95	<i>Crex crex</i>	Corncrake	1	31/07/1972	X			X
R95	<i>Delichon urbicum</i>	House Martin	7	31/12/2011				X

APPENDIX 8.1: Species Records held by NPWS & NBDC
EJAR 2019, Chapter 8: Biodiversity

Grid square	Scientific name	Common name	Record count	Date of last record	EU BD Annex I	EU BD Annex II	EU BD Annex III	Wildlife Acts
R95	<i>Emberiza citrinella</i>	Yellowhammer	1	31/07/1972				X
R95	<i>Falco peregrinus</i>	Peregrine	1	28/07/2012				X
R95	<i>Falco tinnunculus</i>	Kestrel	8	31/12/2011				X
R95	<i>Gallinago gallinago</i>	Snipe	7	31/12/2011		X	X	X
R95	<i>Hirundo rustica</i>	Swallow	13	31/12/2011				X
R95	<i>Lagopus lagopus</i>	Red Grouse	1	31/07/1972		X	X	X
R95	<i>Larus argentatus</i>	Herring Gull	2	31/07/1991				X
R95	<i>Larus ridibundus</i>	Black-headed Gull	1	31/12/2011				X
R95	<i>Locustella naevia</i>	Grasshopper Warbler	1	31/07/1972				X
R95	<i>Muscicapa striata</i>	Spotted Flycatcher	5	31/12/2011				X
R95	<i>Numenius arquata</i>	Curllew	1	31/07/1972		X		X
R95	<i>Passer domesticus</i>	House Sparrow	7	31/12/2011				X
R95	<i>Phasianus colchicus</i>	Pheasant	13	31/12/2011		X	X	X
R95	<i>Riparia riparia</i>	Sand Martin	3	31/07/1991				X
R95	<i>Scolopax rusticola</i>	Woodcock	1	31/07/1972		X	X	X
R95	<i>Sturnus vulgaris</i>	Starling	11	31/12/2011				X
R95	<i>Vanellus vanellus</i>	Lapwing	2	31/07/1991		X		X
R96	<i>Alcedo atthis</i>	Kingfisher	2	31/07/1991	X			X
R96	<i>Circus cyaneus</i>	Hen Harrier	11	18/04/2015	X			X
R96	<i>Falco columbarius</i>	Merlin	2	31/07/1991	X			X
R96	<i>Crex crex</i>	Corncrake	1	31/07/1972	X			X
R96	<i>Columba livia</i>	Rock Dove	4	31/12/2011		X		X
R96	<i>Anas platyrhynchos</i>	Mallard	3	31/07/1991		X	X	X
R96	<i>Columba palumbus</i>	Woodpigeon	24	31/12/2011		X	X	X
R96	<i>Phasianus colchicus</i>	Pheasant	14	31/12/2011		X	X	X
R96	<i>Lagopus lagopus</i>	Red Grouse	4	31/07/1991		X	X	X
R96	<i>Fulica atra</i>	Coot	1	31/07/1972		X	X	X
R96	<i>Gallinago gallinago</i>	Snipe	10	18/10/2017		X	X	X

APPENDIX 8.1: Species Records held by NPWS & NBDC
 EIAR 2019, Chapter 8: Biodiversity

Grid square	Scientific name	Common name	Record count	Date of last record	EU BD Annex I	EU BD Annex II	EU BD Annex III	Wildlife Acts
R96	<i>Numenius arquata</i>	Curllew	7	31/12/2011		X		X
R96	<i>Vanellus vanellus</i>	Lapwing	2	31/07/1991		X		X
R96	<i>Alauda arvensis</i>	Skylark	13	31/12/2011				X
R96	<i>Linnæa cannabina</i>	Linnet	15	31/12/2011				X
R96	<i>Columba oenas</i>	Stock Dove	1	31/07/1972				X
R96	<i>Delichon urbicum</i>	House Martin	12	31/12/2011				X
R96	<i>Falco tinnunculus</i>	Kestrel	14	31/12/2011				X
R96	<i>Hirundo rustica</i>	Swallow	17	31/12/2011				X
R96	<i>Larus canus</i>	Common Gull	3	31/07/1991				X
R96	<i>Locustella naevia</i>	Grasshopper Warbler	3	31/12/2011				X
R96	<i>Muscicapa striata</i>	Spotted Flycatcher	5	31/12/2011				X
R96	<i>Oenanthe oenanthe</i>	Wheatear	2	31/07/1991				X
R96	<i>Passer domesticus</i>	House Sparrow	22	31/12/2011		X		X
R96	<i>Riparia riparia</i>	Sand Martin	3	31/12/2011				X
R96	<i>Sturnus vulgaris</i>	Starling	19	31/12/2011				X
R96	<i>Tachybaptus ruficollis</i>	Little Grebe	1	31/07/1972				X
R96	<i>Emberiza citrinella</i>	Yellowhammer	3	31/07/1991				X
R96	<i>Larus argentatus</i>	Herring Gull	2	31/12/2011				X
R96	<i>Larus ridibundus</i>	Black-headed Gull	8	31/12/2011				X

Table 4: Records of legally protected amphibian species held by the National Biodiversity Data Centre (www.biodiversityireland.ie, 30/07/2019)

Grid square	Scientific name	Common name	Record count	Date of last record	EU HD Annex V	Wildlife Acts
R75	<i>Rana temporaria</i>	Common Frog	9	15/03/2003	X	X
R75	<i>Lissotriton vulgaris</i>	Smooth Newt	1	31/12/1974		X
R76	<i>Rana temporaria</i>	Common Frog	9	19/02/2006	X	X
R85	<i>Rana temporaria</i>	Common Frog	2	07/02/2006	X	X
R86	<i>Rana temporaria</i>	Common Frog	2	21/02/2018	X	X
R96	<i>Rana temporaria</i>	Common Frog	12	01/05/2006	X	X

Table 5: Records of legally protected butterfly species held by the National Biodiversity Data Centre (www.biodiversityireland.ie, 30/07/19)

Grid square	Scientific name	Common name	Record count	Date of last record	ED HD Annex II
R75	<i>Euphydryas aurina</i>	Marsh Fritillary	10	06/06/2018	X
R76	<i>Euphydryas aurina</i>	Marsh Fritillary	6	31/12/1984	X
R85	<i>Euphydryas aurina</i>	Marsh Fritillary	6	31/12/2010	X
R86	<i>Euphydryas aurina</i>	Marsh Fritillary	1	31/12/2010	X
R95	<i>Euphydryas aurina</i>	Marsh Fritillary	7	31/12/2010	X

Table 6: Records of legally protected bryophyte species held by the National Biodiversity Data Centre (www.biodiversityireland.ie, 30/07/19)

Grid square	Scientific name	Common name	Record count	Date of last record	EU HD Annex IV
R75	<i>Leucobryum glaucum</i>	Large White-moss	2	14/06/2005	X
R85	<i>Leucobryum glaucum</i>	Large White-moss	1	06/02/2011	X
R86	<i>Leucobryum glaucum</i>	Large White-moss	1	21/08/1979	X

Table 7: Records of legally protected crustacean species held by the National Biodiversity Data Centre (www.biodiversityireland.ie, 30/07/19)

Grid square	Scientific name	Common name	Record count	Date of last record	EU HD Annex II	Wildlife Acts
R75	<i>Austropotamobius pallipes</i>	Freshwater White-clawed Crayfish	1	22/09/2015	X	X
R95	<i>Austropotamobius pallipes</i>	Freshwater White-clawed Crayfish	6	07/06/2006	X	X
R96	<i>Austropotamobius pallipes</i>	Freshwater White-clawed Crayfish	8	03/09/2008	X	X

Table 8: Records of non-native invasive species held by the National Biodiversity Data Centre (www.biodiversityireland.ie, 30/07/19)

Grid square	Species group	Scientific name	Common name	Record count	Date of last record	Medium Impact	High Impact	Wildlife Acts
R75	Flowering plant	<i>Acer pseudoplatanus</i>	Sycamore	5	23/09/2008	X		
R75	Flowering plant	<i>Heracleum mantegazzianum</i>	Giant Hogweed	2	07/02/2017		X	
R75	Terrestrial mammal	<i>Cervus nippon</i>	Sika Deer	1	24/10/2015		X	X
R75	Terrestrial mammal	<i>Dama dama</i>	Fallow Deer	2	31/12/2008		X	X
R75	Terrestrial mammal	<i>Mustela vison</i>	American Mink	1	18/08/2014		X	
R75	Terrestrial mammal	<i>Myodes glareolus</i>	Bank Vole	4	24/08/2012	X		
R75	Terrestrial mammal	<i>Oryctolagus cuniculus</i>	European Rabbit	1	09/05/1990	X		
R75	Terrestrial mammal	<i>Sciurus carolinensis</i>	Eastern Squirrel	3	31/12/2012		X	
R75	Flowering plant	<i>Fallopia japonica</i>	Japanese Knotweed	18	24/09/2018		X	
R75	Conifer	<i>Pseudotsuga menziesii</i>	Douglas Fir	1	16/05/2007	X		
R76	Flowering plant	<i>Acer pseudoplatanus</i>	Sycamore	1	21/10/2008	X		
R76	Flowering plant	<i>Gunnera tinctoria</i>	Giant-rhubarb	1	17/09/2008		X	
R76	Flowering plant	<i>Heracleum mantegazzianum</i>	Giant Hogweed	5	19/07/2016		X	
R76	Terrestrial mammal	<i>Cervus nippon</i>	Sika Deer	1	12/01/2009		X	X
R76	Terrestrial mammal	<i>Dama dama</i>	Fallow Deer	6	30/04/2009			X
R76	Terrestrial mammal	<i>Mustela vison</i>	American Mink	1	01/06/2015		X	
R76	Terrestrial mammal	<i>Myodes glareolus</i>	Bank Vole	2	17/11/2010	X		
R76	Terrestrial mammal	<i>Oryctolagus cuniculus</i>	European Rabbit	1	06/04/1990	X		
R76	Terrestrial mammal	<i>Sciurus carolinensis</i>	Eastern Squirrel	1	31/12/2001		X	

APPENDIX 8.1: Species Records held by NPWS & NBDC
EIA R 2019, Chapter 8: Biodiversity

Grid square	Species group	Scientific name	Common name	Record count	Date of last record	Medium Impact	High Impact	Wildlife Acts
R85	Flowering plant	<i>Acer pseudoplatanus</i>	Sycamore	4	11/01/2018	X		
R85	Flowering plant	<i>Fallopia japonica</i>	Japanese Knotweed	11	04/01/2019		X	
R85	Flowering plant	<i>Persicaria wallichii</i>	Himalayan Knotweed	1	19/07/2016	X		
R85	Terrestrial mammal	<i>Dama dama</i>	Fallow Deer	3	31/12/2008		X	X
R85	Terrestrial mammal	<i>Mustela vison</i>	American Mink	1	15/02/1991		X	
R85	Terrestrial mammal	<i>Sciurus carolinensis</i>	Eastern Squirrel	3	31/12/2011		X	
R85	Terrestrial mammal	<i>Oryctolagus cuniculus</i>	European Rabbit	3	23/05/2015	X		
R85	Terrestrial mammal	<i>Myodes glareolus</i>	Bank Vole	1	05/11/2010	X		
R86	Flowering plant	<i>Fallopia japonica</i>	Japanese Knotweed	3	17/10/2017		X	
R86	Flowering plant	<i>Heracleum mantegazzianum</i>	Giant Hogweed	1	18/09/2008		X	
R86	Flowering plant	<i>Impatiens glandulifera</i>	Indian Balsam	1	17/09/2008		X	
R86	Terrestrial mammal	<i>Sciurus carolinensis</i>	Eastern Squirrel	1	31/12/2001		X	
R86	Terrestrial mammal	<i>Dama dama</i>	Fallow Deer	11	28/11/2011		X	X
R86	Terrestrial mammal	<i>Oryctolagus cuniculus</i>	European Rabbit	1	24/09/1990	X		
R95	Conifer	<i>Pseudotsuga menziesii</i>	Douglas Fir	1	04/09/2007	X		
R95	Flowering plant	<i>Acer pseudoplatanus</i>	Sycamore	2	24/09/2007	X		
R95	Flowering plant	<i>Fallopia japonica</i>	Japanese Knotweed	2	22/04/2010		X	
R95	Flowering plant	<i>Heracleum mantegazzianum</i>	Giant Hogweed	1	04/09/2007		X	
R95	Flowering plant	<i>Leycesteria formosa</i>	Himalayan Honeysuckle	1	04/09/2007	X		
R95	Flowering plant	<i>Prunus laurocerasus</i>	Cherry Laurel	1	24/09/2007		X	

Grid square	Species group	Scientific name	Common name	Record count	Date of last record	Medium Impact	High Impact	Wildlife Acts
R95	Flowering plant	Quercus rubra	Red Oak	1	04/09/2007	X		
R95	Mollusc	Cornu aspersum	Common Garden Snail	1	19/07/1971	X		
R95	Terrestrial mammal	Crocidura russula	Greater White-toothed Shrew	3	24/08/2012	X		
R95	Terrestrial mammal	Dama dama	Fallow Deer	2	31/12/2008		X	X
R95	Terrestrial mammal	Myodes glareolus	Bank Vole	1	24/08/2012	X		
R95	Terrestrial mammal	Oryctolagus cuniculus	European Rabbit	1	28/02/1990	X		
R96	Flowering plant	Acer pseudoplatanus	Sycamore	4	22/09/2008	X		
R96	Mollusc	Cornu aspersum	Common Garden Snail	3	19/09/1977	X		
R96	Mollusc	Potamopyrgus antipodarum	Jenkins' Spire Snail	1	19/09/1977	X		
R96	Mollusc	Tandonia sowerbyi	Keeled Slug	1	19/09/1977	X		
R96	Terrestrial mammal	Cervus nippon	Sika Deer	1	11/09/2013		X	X
R96	Terrestrial mammal	Dama dama	Fallow Deer	2	25/10/2011		X	X
R96	Terrestrial mammal	Crocidura russula	Greater White-toothed Shrew	1	14/11/2010	X		
R96	Terrestrial mammal	Myodes glareolus	Bank Vole	1	14/11/2010	X		
R96	Terrestrial mammal	Oryctolagus cuniculus	European Rabbit	2	20/05/2017	X		

Appendix to Chapter 8: Biodiversity

Appendix 8.2: Aquatic Habitats & Species Fieldwork & Survey Results

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

Contents

A8-2.1 Fieldwork - Aquatic Habitats & Species1
A8-2.1.1 Watercourse Surveys for UWF Grid Connection 1
A8-2.1.2 Watercourse Classification 2
A8-2.2 Survey Results - Inventory & Classification of Watercourses at Crossing Locations3

A8-2.1 Fieldwork - Aquatic Habitats & Species

A8-2.1.1 Watercourse Surveys for UWF Grid Connection

Following a comprehensive desktop review to identify watercourses along the UWF Grid Connection, various field surveys took place.

A **watercourse characteristics survey** of crossing locations along the UWF Grid Connection route (by INIS Ecologists and members of the HES team) was carried out visually on the 17th, 22nd, 23rd and 28th of January 2019, and on the 30th of May, during which the following physical parameters and habitat quality indicators were recorded at each watercourse crossing point:

- *Grid coordinates of the crossing point;*
- *Watercourse feature i.e. drain, stream or river;*
- *Crossing type e.g. existing culvert, new crossing;*
- *Channel width and depth (m);*
- *Substrate type - listing substrate fractions in order of dominance i.e. large rocks, cobble, gravel, sand, mud, etc.*
- *Target notes on fisheries habitat and character including: features such as extent of riffle and glide/bank stability; salmonid suitability i.e. spawning / juvenile rearing habitat; and lamprey suitability.*

For additional information see Chapter 11: Water and relevant associated Appendices.

Surveys of watercourse crossing locations located on haulage routes associated with the UWF Grid Connection were carried out on the 7th and 8th June, 2017. (Haulage routes for this 2nd UWF Grid Connection application (2019) application were also considered as part of the Haulage routes for the 1st UWF Grid Connection application (2018)).

A8-2.1.2 Watercourse Classification

Watercourses have previously been characterised into 4 classes- Class 1 to Class 4:

Using a combination of the following Best Practice we evaluated each watercourse crossing for fisheries and assigned a fisheries importance rating of Class 1 (EPA Blue Line) or Class 2 (EPA Blue Line Equivalent watercourse) which were evaluated as having Optimal fisheries value, Class 3 for watercourses with Sub-Optimal fisheries value or Class 4 for watercourses with Poor fisheries value. We note that instances of marginal fisheries value (typically between Sub-Optimal and Poor) were subsumed into the Sub-Optimal category to allow for more robust evaluation of effects.




Best Practice literature utilised was as follows:




- Barbour, M.T. and Stribling, J.B. (1991) Use of Habitat Assessment in Evaluating the Biological Integrity of Stream Communities. In: Methods in Stream Ecology (Eds. Hauer, F.R. and Lamberti, G.A. Academic Press.
- Kelly & King (2001) A review of the ecology and distribution of three lamprey species, *Lampetra fluviatilis* (L.), *Lampetra planeri* (Bloch), and *Petromyzon marinus* (L.): A context for conservation and biodiversity considerations in Ireland. *Biology and the Environment*. 101B(3):165-185.
- Kennedy, GJA & Strange, CD (1986) The effects of intra- and inter-specific competition on the distribution of stocked juvenile Atlantic salmon, *Salmo salar* L., in relation to depth and gradient in an upland trout, *Salmo trutta* L., stream. *J. Fish. Biol.*, 29(2):199-214.
- Greenberg, L.A. and Dahl, J. 1998. Effect of habitat type on growth and diet of brown trout (*Salmo trutta* L.) in stream enclosures. *Fisheries Management & Ecology* 5: 331-348.
- Hatfield, T. & Bruce, J. (2000) Predicting Salmonid Habitat-Flow Relationships for Streams from Western North America. *North American Journal of Fisheries Management* 20:1005-1015, 2000
- O'Grady, M.F., Curtin, J (1993) The Enhancement of drained salmonid rivers in Ireland. A bioengineering perspective. *Hydroecol. Appl.*, 5(2):7-26.

Watercourse Characterisations and equivalent fisheries Evaluations (following Best Practice) are presented in Section A8-2.2 Survey Results – Aquatic Habitats & Species.

A8-2.2 Survey Results - Inventory & Classification of Watercourses at Crossing Locations

Photos of Watercourse Crossings at the Mountphilips Substation site	
	<p>Watercrossing Structure W1 (<i>Temporary Crossing</i>) Type: 1st Order Stream Fisheries: Class 2, Optimal Fisheries Location: Mountphilips Substation Site Existing Structure: No existing crossing structure Works at Crossing: Cable trenching under stream bed using dam & pump (flume) method. Temporary Bailey Bridge. Ecology Notes: c. 2 m wide, c. 10 cm deep, gravel (70), cobbles (5), boulders (5), sands/silts (20)</p>
	<p>Watercrossing Structure W2 Type: Drainage Ditch Fisheries: Sub-Optimal Fisheries Location: Mountphilips Substation Site Existing Structure: No existing crossing structure Works at Crossing: Installation of new permanent culvert. Cable trenching under new culvert. Ecology Notes: c. 0.5 m wide, c. 10 cm deep, silts/muds (100)</p>
	<p>Watercrossing Structure W3 Type: 1st Order Stream Fisheries: Class 2, Optimal Fisheries Location: Mountphilips Substation Site Existing Structure: No existing crossing structure Works at Crossing: Installation of new permanent culvert. Cable trenching under new culvert. Ecology Notes: c. 1 m wide, c. 10 cm deep, cobbles (20), gravels (40), sands/silts (40)</p>

Photos of UWF GRID CONNECTION Bridges / Culverts along Public Roads	
	<p>Watercrossing Structure W4 Type: Stream Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: L2166-0, Coole/Freagh Existing Structure: Concrete Block Box Culvert Works at the Crossing: Cable trenching under structure Ecology Notes: Downstream - Slow flowing, Coble (60), Gravel (40). Overgrown, vegetation shading. 1 metre wide and ~30cm deep.</p>
	<p>Watercrossing Structure W5 Type: River Fisheries: Class 1, Optimal Fisheries Location/Townland: L6013-0, Foildarrig/Freagh Existing Structure: Masonry Single Arch Bridge Works at the Crossing: Cable trenching over structure Ecology Notes: Upstream - riffle/glide sequence and pool. Bolder (30), cobble (30), sand/gravel (40). Culvert pipe also flowing into river. Downstream - Riffle and pool present. Sand gravel under bridge (60), boulders/cobble(40).</p>
	<p>Watercrossing Structure W6 Type: Stream Fisheries: Class 3, Sub-Optimal Fisheries Location/Townland: L6013-0, Oakhampton Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure Ecology Notes: Pipe culvert with stream through it. Bolder (50), mud/gravel (50).</p>

	<p>Watercrossing Structure W7</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: Rockvale Bridge, L2156-0, Oakhampton/Rockvale</p> <p>Existing Structure: Masonry Single Arch Bridge</p> <p>Works at the Crossing: Cable trenching over structure. Additional works to raise road level & parapet wall height</p> <p>Ecology Notes: Upstream - riffle and white water. Bedrock (70), cobble (20), sand (10). Deep water - could not judge depth. Downstream - white water, small riffle and some pooling. Deep water.</p>
	<p>Watercrossing Structure W8</p> <p>Type: Stream</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: L6009-0, Ahane/Castlewaller</p> <p>Existing Structure: Concrete Slab Bridge</p> <p>Works at the Crossing: Directional Drill under stream bed.</p> <p>Ecology Notes: Upstream - small riffle and glide. Pooling. Moderate flow. Cobble (70), gravel (30). Downstream - riffle and glide, pool at bridge. Cobble (60), gravel (40).</p>
	<p>Watercrossing Structure W9</p> <p>Type: Stream</p> <p>Fisheries: Class 1, Optimal Fisheries</p> <p>Location/Townland: L6009-0, Castlewaller/Carrowkeale</p> <p>Existing Structure: Concrete Slab Bridge</p> <p>Works at the Crossing: Directional Drill under stream bed.</p> <p>Ecology Notes: Upstream - riffle and glide and pool (with sand). Sand (30), cobble (50), gravel (20). Downstream - flat rock (40), boulders (30), cobble (30), riffle. Some pooling at edge, no visible build-up of sand. Fast flowing.</p>

REFERENCE DOCUMENTS

APPENDIX 8.2: Aquatic Habitats & Species Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity



Watercrossing Structure W10

Type: Stream, 1st Order

Fisheries: Class 3, Sub-optimal Fisheries

Location/Townland: R503, Kilnacappagh

Existing Structure: HDPE Plastic Circular Culvert

Works at the Crossing: Cable trenching over structure

Ecology Notes: deep, drained, flow



Watercrossing Structure W11

Type: Stream

Fisheries: Class 3, Sub-optimal Fisheries

Location/Townland: R503, Scrageen/Derrygreen

Existing Structure: Masonry Box Culvert

Works at the Crossing: Cable trenching over structure

Ecology Notes: c. 1 m wide, c. 20 cm deep



Watercrossing Structure W12

Type: Drain




Fisheries: Class 4, Poor Fisheries




Location/Townland: R503, Derrygreen

Existing Structure: Masonry Box Culvert & Circular Concrete Culvert

Works at the Crossing: Cable trenching under structure

Ecology Notes: c. 0.8m wide, c. 15 cm deep

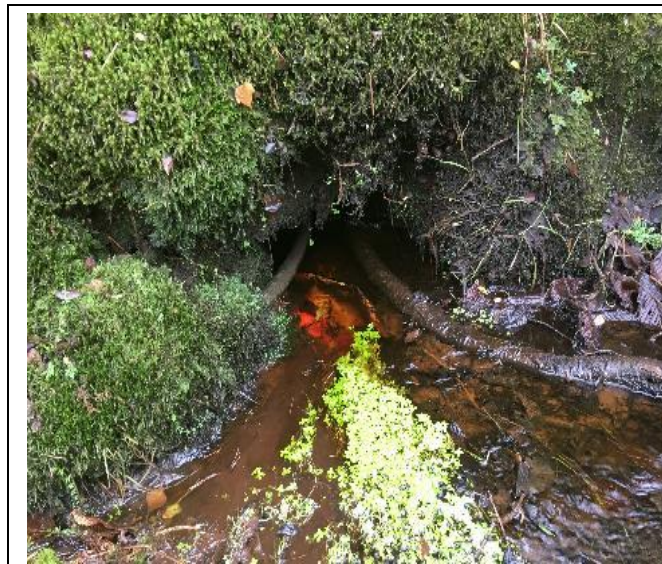
	<p>Watercrossing Structure W13 Type: Stream, 1st Order Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: No Fisheries Potential</p>
	<p>Watercrossing Structure W14 Type: Stream, 1st Order Fisheries: Class1, Optimal Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: steep gradient, cobble/gravel. 100% shade</p>
	<p>Watercrossing Structure W15 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: No Fisheries Potential</p>

	<p>Watercrossing Structure W16</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Knockancullenagh</p> <p>Existing Structure: Plastic Circular Culvert.</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>
	<p>Watercrossing Structure W17</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Knockancullenagh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Potential, steep</p>
	<p>Watercrossing Structure W18</p> <p>Type: Stream, 2nd Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Knockancullenagh/Fanit</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: steep, boulder cobble pool riffle. Downstream 100% shade, steep gradient</p>

REFERENCE DOCUMENTS

APPENDIX 8.2: Aquatic Habitats & Species Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity



Watercrossing Structure W19

Type: Drain

Fisheries: Class 4, Poor Fisheries

Location/Townland: R503, Fanit

Existing Structure: Masonry Box Culvert

Works at the Crossing: Cable trenching under structure. Culvert may need replacing.

Ecology Notes: No Fisheries Potential



Watercrossing Structure W20

Type: Drain

Fisheries: Class 4, Poor Fisheries

Location/Townland: R503, Fanit

Existing Structure: Masonry Box Culvert

Works at the Crossing: Cable trenching under structure. Culvert may need replacing.

Ecology Notes: No Fisheries Potential 100% shade downstream



Watercrossing Structure W21

Type: Stream, 1st Order




Fisheries: Class 3, Sub-optimal Fisheries




Location/Townland: R503, Fanit

Existing Structure: Masonry Single Arch Bridge

Works at the Crossing: Cable trenching over structure.

Ecology Notes: No Fisheries Potential 100% shade downstream

	<p>Watercrossing Structure W22 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Fanit/Lackamore</p> <p>Existing Structure: Masonry Single Arch Bridge</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: steep/cascade</p>
	<p>Watercrossing Structure W23 Type: Stream Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Lackamore</p> <p>Existing Structure: Masonry Arch Bridge Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential Upstream: 100% shade. Minor steep cascades Downstream: 100% shade</p>
	<p>Watercrossing Structure W24 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Lackamore</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>

	<p>Watercrossing Structure W25</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Plastic Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>
	<p>Watercrossing Structure W26</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>
	<p>Watercrossing Structure W27</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>

	<p>Watercrossing Structure W28</p> <p>Type: Stream</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore/Toorenbrien Upper</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value Upstream: steep/cascade Boulder/cobble</p>
	<p>Watercrossing Structure W29</p> <p>Type: Stream</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Toorenbrien Upper</p> <p>Existing Structure: Concrete Slab Bridge Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value 100% cover, steep gradient. Boulder cascade.</p>
	<p>Watercrossing Structure W30</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Toorenbrien Upper</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>



Watercrossing Structure W31

Type: Stream, 1st Order

Fisheries: Class 3, Sub-optimal Fisheries

Location/Townland: R503, Tooreenbrien Upper

Existing Structure: Concrete Circular Culvert
 Works at the Crossing: Crossing under new existing culvert

Ecology Notes: No Fisheries Value, Steep Gradient



Watercrossing Structure W32

Type: Minor Stream

Fisheries: Class 3, Sub-optimal Fisheries

Location/Townland: R503, Tooreenbrien Upper

Existing Structure: Masonry Box Culvert
 Works at the Crossing: Cable trenching under structure. Culvert may need replacing.

Ecology Notes: No Fisheries Value



Watercrossing Structure W33




Type: Stream




Fisheries: Class1, Optimal Fisheries




Location/Townland: R503, Tooreenbrien Upper/Tooreenbrien Lower


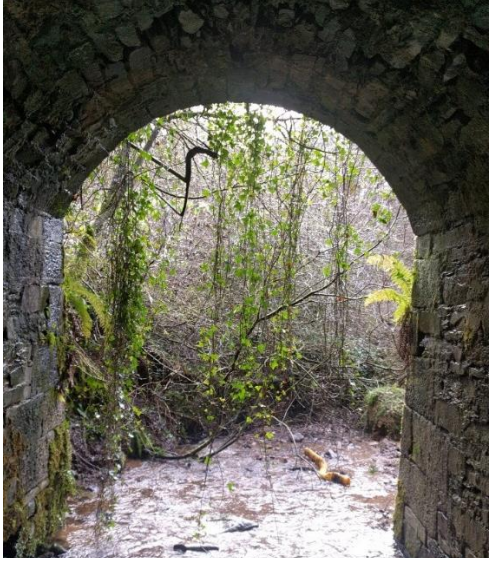

Existing Structure: Masonry Arch Bridge - Single
 Works at the Crossing: Cable trenching over structure.




Ecology Notes: cobble substrate, drained, channelised, riffle/glide




	<p>Watercrossing Structure W34</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Lower</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W35</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Lower</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W36</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: Tooreenbrien Bridge, R503, Tooreenbrien Lower/Reardnogy Beg</p> <p>Existing Structure: Masonry Arch Bridge - Double</p> <p>Works at the Crossing: Cable trenching over structure. Additional works to raise road level & parapet wall height</p> <p>Ecology Notes: c. 5 m wide, c. 100cm deep</p>




	<p>Watercrossing Structure W37</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy Beg</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Crossing over culvert</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W38</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy Beg/Reardnogy More</p> <p>Existing Structure: Plastic Circular Culvert</p> <p>Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: c. 0.7 m wide, c. 140cm deep</p>
	<p>Watercrossing Structure W39</p> <p>Type: Stream, 2nd Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy More</p> <p>Existing Structure: Plastic Circular Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: c. 0.6 m wide, c. 100cm deep</p>




	<p>Watercrossing Structure W40</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Rear Cross Village, Reardnogy More/ Shanballyedmond</p> <p>Existing Structure: Concrete Circular Culvert X 3</p> <p>Works at the Crossing: Cable trenching under structures.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W41</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy More/Baurnadomeeny</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Downstream:, cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W42</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Baurnadomeeny</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>




	<p>Watercrossing Structure W43</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Baurnadomeeny</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W44</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Baurnadomeeny</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W45</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Baurnadomeeny/Coonmore</p> <p>Existing Structure: Concrete Circular Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Riffle / glide, cobble substrate, channelised</p>




	<p>Watercrossing Structure W46</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W47</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W48</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Plastic Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>

	<p>Watercrossing Structure W49</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Coonmore/Foildarragh</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Cobble/gravel, channelised, riffle</p>
	<p>Watercrossing Structure W50</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, Very steep gradient, in gorge, 100% cover.</p>
	<p>Watercrossing Structure W51</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, Very steep gradient, in gorge, 100% cover.</p>

	<p>Watercrossing Structure W52</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value, steep, drained</p>
	<p>Watercrossing Structure W53</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: Anglesey Bridge, R503, Foildarragh/Kilcommon</p> <p>Existing Structure: Double Masonry Arch</p> <p>Works at the Crossing: Cable trenching over structure, additional works to raise road level & parapet wall height</p> <p>Ecology Notes: U/s: riffle, glide channelized, cobble gravel, sand</p>
	<p>Watercrossing Structure W54</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Plastic Circular Culvert</p> <p>Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>

	<p>Watercrossing Structure W55</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W56</p> <p>Type: Drain</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Concrete Circular Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, some flow</p>
	<p>Watercrossing Structure W57</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Kilcommon/Loughbrack</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>

	<p>Watercrossing Structure W58</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Concrete Circular Culvert</p> <p>Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W59</p> <p>Type:</p> <p>Upstream: Drain, Downstream: Stream, 1st Order</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Concrete Culvert & Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structures.</p> <p>Ecology Notes: No Fisheries Value. Downstream: flow, through forestry</p>
	<p>Watercrossing Structure W60</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>

	<p>Watercrossing Structure W61</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Knocknabansha/Knockmaroe</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W62</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: L2264-50, Knockmaroe</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W63</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: L2264-50, Knockmaroe/Knockcurraghbola Crownlands</p> <p>Existing Structure: Circular Concrete Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>



Watercrossing Structure W64

Type: Drain

Fisheries: Class 4, Poor Fisheries

Location/Townland: L2264-50, Knockmaroe

Existing Structure: Masonry Box Culvert
 Works at the Crossing: Cable trenching under structure. Culvert may need replacing.

Ecology Notes: No Fisheries Value



Watercrossing Structure W65

Type: Stream

Fisheries: Class 2, Optimal Fisheries

Location: L6188-0, Knockmaroe

Existing Structure: Concrete Circular Culvert
 Works at Crossing: Cable trenching under structure.

Ecology Notes: Steady flow to 20 cm deep with wetted width of c. 1 m. gravel bed.



Watercrossing Structure W66

Type: Drain

Fisheries: Class 4, Poor Fisheries

Location/Townland: L6188-0, Knockmaroe

Existing Structure: Concrete Circular Culvert
 Works at the Crossing: Cable trenching under structure.

Ecology Notes: No Fisheries Value

Photos of UWF GRID CONNECTION Bridges / Culverts along Private Paved Road	
	<p>Watercrossing Structure W67</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: Private Paved Road, Knockcurraghbola Commons</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: c. 0.5 m wide, 10 cm deep</p>
	<p>Watercrossing Structure W68</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: Private Paved Road, Knockcurraghbola Commons</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value, Slow flowing</p>

REFERENCE DOCUMENTS

APPENDIX 8.2: Aquatic Habitats & Species Fieldwork & Survey Results
EIAR 2019, Chapter 8: Biodiversity

Appendix to Chapter 8: Biodiversity

Appendix 8.3: Terrestrial Habitats Survey Results & Impact Calculations

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

Contents

A8-3.1	Fieldwork.....	1
A8-3.2	Survey Results – Terrestrial Habitats within the study area	1
A8-3.2.1	<i>Habitats Directive 92/43/EEC Annex I Habitat Assessments</i>	6
A8-3.2.2	<i>Rare/Protected Plant Species</i>	7
A8-3.2.3	<i>Habitat Survey Results – Other Elements (for cumulative evaluations)</i>	11
A8-3.3	Impact Calculations - Habitats.....	16

List of Tables:

- Table 1: Habitats (non-linear) surveyed within the survey corridor of the UWF Grid Connection
 - Table 2: Habitats (Linear) surveyed within the survey corridor of the UWF Grid Connection
 - Table 3: List of plant species recorded during habitat surveys
 - Table 4: Habitats (non-linear) surveyed within the UWF Related Works study area
 - Table 5: Habitats (linear) surveyed within the UWF Related Works study area
 - Table 6: Habitats (non-linear) surveyed within the UWF Replacement Forestry study area
 - Table 7: Habitats (linear) surveyed within the UWF Replacement Forestry study area
 - Table 8: Habitats (non-linear) surveyed within 50m of Haul Route Activities
 - Table 9: Habitats (linear) surveyed within 50m of Haul Route Activities
 - Table 10: Habitats recorded at each pole at the Overhead Line Activities
 - Table 11: Impact calculations for habitats greater than Local Importance (Higher Value) in the UWF Grid Connection study area
 - Table 12: Impact calculations for permanent hedgerow and tree removal required for UWF Grid Connection
 - Table 13: Impact calculations for habitats greater than Local Importance (Higher Value) in the UWF Related Works study area
 - Table 14: Impact calculations for hedgerow/tree removal associated with UWF Related Works
 - Table 15: Impact calculations for habitats greater than Local Importance (Higher Value) in the UWF Replacement Forestry study area
 - Table 16: Impact calculations for hedgerow/tree removal associated with UWF Replacement Forestry
 - Plate 1: Tables 13-22 and 13-23 from the Upperchurch Windfarm EIS
 - Table 17: Impact calculations for hedgerow and tree removal associated with Upperchurch Windfarm
 - Table 18: Impact calculations for habitats greater than Local Importance (Higher Value) in the UWF Other Activities study area
 - Table 19: Impact calculations for hedgerow and tree removal associated with UWF Other Activities
-

A8-3.1 Fieldwork

All habitat surveys undertaken for UWF Grid Connection followed best practice guidance (Smith *et al.*, 2011) and utilised the habitat classification presented in Fossitt (2000). All habitats within a 50-m buffer of work locations were surveyed and classified to level 3. All surveys were carried out in good weather. Habitat surveys of the UWF Grid Connection were undertaken in January 2019 and in May 2019. January is outside of the optimal survey season for flora, however, this survey was adequate for the biodiversity sensitivities occurring within the study area and also allowed for the identification of habitat classification to the appropriate resolution.

A8-3.2 Survey Results – Terrestrial Habitats within the study area

The study area comprised the UWF Grid Connection construction works areas along with a 50-m buffer from all UWF Grid Connection work locations. The area within the buffer is termed the ‘survey corridor’ hereafter. Nomenclature for vascular plants follows Parnell and Curtis (2012).

The habitats within the survey corridor of the UWF Grid Connection comprise a mosaic of agricultural grassland, commercial forestry plantations, peatlands, hedgerows, wet grassland, private roads and public roads.

Table 1: Habitats (non-linear) surveyed within the survey corridor of the UWF Grid Connection

Habitat Type	Area within Survey Corridor (ha)	Evaluation of Conservation Value
BL3	45.89	Local Importance (Lower Value)
ED1	0.12	Local Importance (Lower Value)
ED2	0.91	Local Importance (Lower Value)
ED3	0.45	Local Importance (Lower Value)
BL3/GA2	32.14	Local Importance (Lower Value)
GA1	110.38	Local Importance (Lower Value)
GA1/GS4	0.70	Local Importance (Lower Value)
BL3/GA2/BC4	2.27	Local Importance (Lower Value)
ED2/GA1	0.27	Local Importance (Lower Value)
GA1/WS1	0.72	Local Importance (Lower Value)
GA2	4.75	Local Importance (Lower Value)
GS4	40.13	Local Importance (Higher Value)
GS4/HH3	0.36	Local Importance (Higher Value)
FS1	0.45	Local Importance (Higher Value)
FS1/GS4	2.64	Local Importance (Higher Value)
PB4	0.15	Local Importance (Higher Value)
WD1	3.03	Local Importance (Higher Value)
WD2	5.92	Local Importance (Higher Value)
WD4	26.83	Local Importance (Lower Value)
WN5	1.95	Local Importance (Higher Value)
WS1	10.86	Local Importance (Higher Value)
WS5	5.05	Local Importance (Higher Value)
GA2/BL3	0.11	Local Importance (Lower Value)
GA2 WS3	0.08	Local Importance (Lower Value)
GS4/WD1	0.23	Local Importance (Higher Value)
HD1	0.04	Local Importance (Higher Value)
PB3	0.51	County Importance

Habitat Type	Area within Survey Corridor (ha)	Evaluation of Conservation Value
WD4/WS1	1.33	Local Importance (Lower Value)
WD5	0.92	Local Importance (Higher Value)
WN1	0.84	County Importance
WN6	0.17	Local Importance (Higher Value)
WS1/BL2	0.20	Local Importance (Higher Value)
WS1/WD2	0.16	Local Importance (Higher Value)
WS2	0.11	Local Importance (Higher Value)
WS1/GS4	3.13	Local Importance (Higher Value)

Table 2: Habitats (Linear) surveyed within the survey corridor of the UWF Grid Connection

Habitat Type	Length within Survey Corridor (m)	Evaluation
BL1	128.18	Local Importance (Lower Value)
BL2	5305.70	Local Importance (Lower Value)
FW2	373.25	International Importance
FW4	2220.60	Local Importance (Lower Value)
WL1	19109.05	Local Importance (Higher Value)
WL2	20137.77	Local Importance (Higher Value)
WS1	256.06	Local Importance (Higher Value)

Buildings and artificial surfaces (BL3)

This habitat type incorporates areas of built land in the Fossitt (2000) classification. It corresponds mostly to the R503 public road but also includes all buildings (domestic, agricultural, industrial and community) other than derelict stone buildings and ruins. Modern or intact buildings made of stone are included, as are derelict buildings made of bricks, cement blocks or mass concrete. It also includes areas of land that are covered with artificial surfaces of tarmac, cement, paving stones, etc. Within the context of the current development this classification includes built roads, buildings (including farm buildings) and paved access tracks. A mosaic of BL3 and Amenity grassland GA2 occurs widely along the UWF Grid Connection 110kV UGC route; this corresponds to dwellings and associated lawns and gardens.

Exposed sand gravel and till (ED1)

A very small area of this habitat was recorded corresponding to loose roadside sand and gravel.

Spoil and bare ground (ED2)

This habitat type was mainly recorded on unpaved forestry roads and farm tracks within the survey corridor. As the majority of the UWF Grid Connection will be laid in the existing public road, the portion of spoil and bare ground within the survey corridor is small.

Improved agricultural grassland (GA1)

Improved agricultural grassland is intensively managed or highly modified agricultural grassland that has been reseeded and/or regularly fertilised, and is now heavily grazed and or/used for silage making. The classification includes regularly reseeded monoculture grasslands and rye-grass leys that are planted as part of arable rotation. These differ significantly from areas of permanent grassland. Improved agricultural grassland is typically species poor. Sward quality varies depending on soil type, fertility, drainage and management.

Improved agricultural grasslands comprise the largest habitat area within the survey corridor. Improved agricultural grasslands occur at the Mountphilips Substation site and are located primarily in the eastern and western sections of the UWF Grid Connection 110kV UGC route with areas of this habitat located sporadically throughout the central sections where conifer plantations are more common. No arable rotation is present.

Amenity grassland (GA2)

This grassland type is improved or species poor and is managed for purposes other than grass production. It includes amenity, recreational or landscaped grasslands but excludes farmland. Most amenity grasslands have been reseeded and are regularly mown to maintain very short swards. Within the survey corridor, amenity grassland is typically associated with lawns and other managed grassland areas in gardens, parks, and grassy sports fields. This habitat occurs as a mosaic with Built land (BL3) within the study corridor, and is associated with dwellings along the R503.

Wet grassland (GS4)

This type of grassland can be found on flat or sloping ground in upland and lowland areas. It occurs on wet or waterlogged mineral or organic soils that are poorly-drained. On sloping ground, wet grassland is mainly confined to clay-rich gleys and loams, or organic soils that are wet but not waterlogged. This category includes areas of poorly drained farmland that have not recently been improved, and seasonally-flooded alluvial grasslands. Agricultural pasture not managed in recent years within the study area was classified as wet grassland.

This habitat occurs in poorly drained shallow soils primarily in the upland areas along the mid-section of the route of the 110kV UGC but also at a variety of locations along the route where poor drainage was present. A small area of wet grassland also occurs at the Mountphilips Substation site. Species recorded within the wet grassland habitat were soft rush (*Juncus effusus*) and small sedges (*Carex* spp.) in addition to grasses such as Yorkshire fog (*Holcus lanatus*), creeping bent (*Agrostis stolonifera*) and tufted hair-grass (*Deschampsia caespitosa*). Wet grassland also occurs as a mosaic with Reed and large sedge swamps (FS1) and Wet heath (HH3) at locations within the study area.

Lowland Blanket Bog (PB3)

An area of Lowland blanket bog (PB3) occurs within the survey corridor at Reardnogy Beg, this habitat corresponds to EU Habitats Directive 92/43/EEC Annex I habitat to 'Blanket bogs (7130)'; however, this area of bog, which occurs outside of the footprint of works, was found to be in poor condition due to evidence of peat harvesting and substantial colonization by invasive Rhododendron. Plant species recorded within this habitat type were Heather (*Calluna vulgaris*), Purple moor-grass (*Molinia caerulea*) and Bilberry (*Vaccinium myrtillus*).

Cutover Blanket Bog (PB4)

A small area (<1 ha) of this habitat is located adjacent to the route of the 110kV UGC at Knocknabansha. This habitat was recorded within the survey corridor and outside of the footprint of the proposed works. There is evidence of previous and ongoing turf cutting at this location along with ongoing drainage. The bog surface has been excavated c. 1 to 1.5 m below the adjoining peat banks leaving a flat area of peat that has been recolonised by abundant bog cotton. Green ribbed sedge is occasional. Deergrass, bog asphodel and purple moor grass are also frequently recorded with occasional ling heather and cross-leaved heath. No sphagnum was growing in this habitat and the dry surface is trafficked by excavators and tractors associated with peat extraction.

(Mixed) broadleaved woodland (WD1)

This category includes woodland areas with 75-100% cover of broadleaved trees, 0-25% cover of conifers. Trees may include native and non-native species. Plantations of broadleaved trees are included if the canopy height is greater than 5m or 4m in the case of wetland areas.

There are a number of small stands of (mixed) broadleaved woodland within the survey corridor along the route of the UWF Grid Connection 110kV UGC. These stands are located outside of the works area and adjacent to the public roads and domestic dwellings and on the edges of agricultural grassland fields. Species composition of these mixed broadleaved woodlands include birch (*Betula* spp.), ash (*Fraxinus excelsior*), willow (*Salix* spp.), rowan (*Sorbus aucuparia*) and sycamore (*Acer pseudoplatanus*).

Mixed broadleaved/conifer woodland (WD2)

This category includes woodland areas with mixed stands of broadleaved trees and conifers, where both types have a minimum cover of 25% and maximum of 75%. Trees may either be native or non-native species. This habitat type occurs at various locations along the entire length of the survey corridor. Deciduous species recorded were birch, ash, willow, rowan and sycamore and conifers were composed of a mix of larch (*Larix decidua*) and Sitka spruce (*Picea sitchensis*). This habitat which was recorded at numerous locations within the survey corridor does not occur with the works area.

Conifer plantation (WD4)

Conifer plantations are dense stands of planted conifers where the broadleaved component is less than 25% and the overriding interest is commercial timber production. Conifer plantations are characterized by even-aged stands of trees that are usually planted in regular rows, frequently within angular blocks. Species diversity is low and single species stands are common. The majority of planted conifers are non-native species such as Sitka spruce (*Picea sitchensis*), lodgepole pine (*Pinus contorta*), Norway spruce (*Picea abies*), and larches (*Larix* spp.).

Conifer plantation was frequently recorded within the survey corridor with the majority located throughout the central upland sections with some smaller plantations at various points throughout the corridor. Age classes of these plantations varied from first rotation to second rotation mature.

Riparian woodland (WN5)

This classification category includes wet woodlands of river margins and low islands that are subject to frequent flooding, or where water levels fluctuate as a result of tidal movement (lower reaches of rivers).

Riparian woodland comprises a small proportion of the survey corridor and was recorded at five locations. These areas of riparian woodland occur along watercourses within the survey corridor. This habitat is composed of mature willow species, hazel (*Corylus avellana*) and alder (*Alnus glutinosa*) with an understory of broadleaved herbs including nettle (*Urtica dioica*) and wood dock (*Rumex sanguineus*) together with a layer of ground ivy (*Glechoma hederacea*).

Scrub (WS1)

This broad category includes areas that are dominated by at least 50% cover of shrubs, stunted trees or brambles. The canopy height is generally less than 5m, or 4m in the case of wetland areas. Scrub frequently develops as a precursor to woodland and is often found in inaccessible locations, or on abandoned or marginal farmland. In the absence of grazing and mowing, scrub can expand to replace grassland or heath vegetation. Trees are included as components of scrub if their growth is stunted as a result to exposure, poor soils or waterlogging. If tall trees are present, these should have a scattered distribution and should not have a distinct canopy.

This habitat was recorded at numerous locations along the UWF Grid Connection survey corridor. The majority of these areas were dominated by willow scrub and well-established gorse (*Ulex europaeus*). Understorey botanical species diversity was typically poor. Small areas of scrub were also recorded forming a mosaic with Wet grassland (GS4), Conifer plantation (WD4), Improved agricultural grassland (GA1), Earth banks (BL2) and Mixed broadleaved/conifer woodland (WD2) within the study area.

Improved Agricultural Grassland (GA1)/Scrub (WS1) Mosaic

This habitat was recorded at locations where former grassland habitat had started to be colonised by bramble (*Rubus fruticosus agg.*) and willow scrub due to absence of grazing and/or mowing. It was recorded at one location outside of the works area in Kilcommon townland.

Stone walls and other stonework (BL1)

This habitat was recorded at two locations within the survey corridor for the UWF Grid Connection comprising of stone wall boundaries between dwellings and the public road.

Earth Banks (BL2)

Earth banks are a common type of field boundary in many parts of Ireland. Constructed from local materials such as peat, earth, gravel or stone, these narrow linear ridges are often bordered by drainage ditches.

There are a number of linear earth banks located primarily at the eastern end of the UWF Grid Connection and then sporadically throughout the remainder of the survey corridor. These banks are completely vegetated with common grass species and are typically species poor.

Eroding/Upland Rivers (FW1)

This habitat classifies natural watercourses in eroding conditions which are typically associated with the upland parts of river systems where gradients are steep and water flow is fast and turbulent. This habitat was mainly recorded as smaller streams in the upland areas of the UWF Grid Connection. However, larger watercourses such as the Bilboa, Newport and Clare Rivers were classified as upland/eroding watercourses within the survey corridor.

Drainage Ditches (FW4)

This habitat was frequently encountered within the survey corridor around the margins of agricultural grasslands and also within conifer forestry. Generally, these drains showed evidence of previous excavation but had subsequently revegetated. Water levels and flow rates within the drains were often low or absent.

Hedgerows (WL1)

Hedgerows are defined as linear strips of shrubs, often occasional trees that typically form field or property boundaries. Most hedgerows originate from planting and many occur on the raised banks of earth that are derived from the excavation of associated drainage ditches. Dimensions of hedgerows vary considerably, depending largely on management and composition and are taken as being mainly less than 5m high and 4m wide.

Many hedgerows within the survey corridor are well developed and maintained along field boundaries and roadside margins. Species composition varied due to factors such as age, management, geology, soils and exposure. Hedgerows within the study area commonly supported a high proportion of hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), gorse (*Ulex europaeus*), holly and bramble, in addition to other native trees such as ash, hazel (*Corylus avellana*) and willow. Climbing plants such as ivy (*Hedera hibernica*) and honeysuckle (*Lonicera periclymenum*) were also recorded at a number of hedgerows along the route.

Hedgerows (WL1)/ Treelines (WL2)

This habitat was recorded occasionally where hedgerow habitat and treeline habitat were present intermittently along a field boundary.

Treelines (WL2)

A treeline is a narrow row or single line of trees that is greater than 5m in height and typically occurs along field or property boundaries. This category includes tree-lined roads or avenues, narrow shelter belts with no more than a single line of trees and overgrown hedgerows that are dominated by trees.

The species composition of this habitat recorded within the study area was ash, beech (*Fagus sylvatica*), horse chestnut (*Aesculus hippocastanum*), sycamore and some conifers, including mature Sitka spruce.

WN6 Wet Willow Alder-Ash (WN6)

A small area of this non-riparian woodland habitat (<0.17ha) located north of Newport Town occurs outside of the work area but within the survey corridor. The tree species recorded in this area of habitat are Hazel (*Corylus avellana*), Ash (*Fraxinus excelsior*) and Willows (*Salix spp.*) Plants in the understory of the woodland included Herb Robert (*Geranium robertianum*), Rough meadow-grass (*Poa trivialis*), and Wood sanicle (*Sanicula europaea*). This area of habitat is evaluated as being of Local Importance (Higher Value) due to its limited extent and young age of trees.

Oak-Birch-Holly Woodland (WN1)

A small area of Oak-birch-holly woodland located outside the works area but within the survey corridor at Scraggeen was found to correspond to the EU Habitats Directive 92/43/EEC habitat, 'Old sessile oak woods with Ilex and Blechnum, in the British Isles (91A0)'. The dominant tree species recorded were Sessile oak (*Quercus petraea*), Birch (*Betula pubescens*), as well as Holly (*Ilex aquifolium*) and Hazel (*Corylus avellane*) in the shrub layer. The ground flora included Hard fern (*Blechnum spicant*), Bilberry (*Vaccinium myrtillus*) and Wood-rush (*Luzula sylvatica*). This area of woodland is evaluated as being of County Importance due to the presence of a limited area of woodland habitat listed in Annex I of the Habitats Directive.

A8-3.2.1 Habitats Directive 92/43/EEC Annex I Habitat Assessments

A small area of Oak-birch-holly woodland (WN1 - 0.84ha) occurs outside of the work area but within the survey corridor at Scraggeen. This area of woodland located outside of the works area was found to correspond to the EU Habitats Directive 92/43/EEC habitat, 'Old sessile oak woods with Ilex and Blechnum, in the British Isles (91A0)'. The presence of all four species deemed as indicative of this habitat type listed by Perrin *et al.* (2008) were present as well as a canopy dominated by Sessile Oak (*Quercus petraea*). **Therefore, this habitat meets the criteria presented in Perrin *et al* (2008) to be classified as the Annex I habitat, 'Old sessile oak woods with Ilex and Blechnum, in the British Isles (91A0)'.**

An area of Lowland blanket bog (PB3 – 0.51Ha) occurs outside of the work area but within the survey corridor at Reardnogy Beg, this habitat corresponds to EU Habitats Directive 92/43/EEC Annex I habitat to 'Blanket bogs (7130)'; however, this area of bog, which occurs outside of the footprint of works, was found to be in poor condition due to evidence of peat harvesting and substantial colonization by invasive Rhododendron. Due to the effects of peat harvesting, drainage and invasive species, this habitat does not correspond to the active peat-forming priority blanket bog Annex I habitat (7130). **This area does however correspond to the non-priority habitat Blanket bog (7130).**

A8-3.2.2 Rare/Protected Plant Species

Small White orchid (*Pseudorchis albida*)

Desktop reviews indicated that Small White orchid (*Pseudorchis albida*) has been recorded within the R86 and R96 10km squares¹. The BSBI database holds a record in tetrad (2 * 2 km square) R86P (BSBI database <http://bsbi.org/maps?taxonid=2cd4p9h.c3v>, accessed 27/09/2019). The NBDC database shows a record from June 2009 in the the Silvermines Mountains at Knockanroe in the monad (1 * 1 km square) R8469 (<https://maps.biodiversityireland.ie/Map/Terrestrial/Species/44170>, accessed 27/09/2019).

This species is listed in Schedule A of the Flora (Protection) Order, 2015 and is classed as Vulnerable in the Red Data List of Vascular Plants (Wyse Jackson *et al.*, 2016). **This species was not recorded during the habitat surveys for the project.** The desktop data indicates that the historic locations for this plant are c. 7 km north of the UWF Grid Connection. The habitats occurring within the UWF Grid Connection survey area are evaluated as not suitable for this species which generally requires well-drained hill pastures, mountain grasslands and hill pastures; the majority of habitats occurring within the survey corridor consist of poorly drained wet grassland and improved agricultural grassland, both of which are unsuitable habitats for this species.

Killarney Fern (*Trichomanes speciosum*)

The desktop review also showed that Killarney Fern (*Trichomanes speciosum*) has historically been recorded in the R75 hectad (10km square). This species is listed in Schedule A of the Flora (Protection) Order, 2015 and is classed as Least Concern in the Red Data List of Vascular Plants (Wyse Jackson *et al.*, 2016). No recent records exist for the species within 10km squares through which the UWF Grid Connection will pass. **This species was not recorded during the habitat survey.**

Bog Rosemary (*Andromeda polifolia*)

Bog Rosemary (*Andromeda polifolia*) was recorded incidentally at Bleanbeg Bog (during surveys for the previous 2018 grid connection application) in April 2017. This species is classed as Least Concern in the Red Data List of Vascular Plants (Wyse Jackson *et al.*, 2016). The species was previously unrecorded for the hectad R76 in either BSBI or NBDC databases. The plant was located c. 2.3km north of the current UWF Grid Connection 110kV UGC project.

A8-3.2.2.1 Plant Species List

A full Botanical list of species recorded during habitat surveys for UWF Grid Connection is herein presented. Species recorded during habitat surveys for Other Elements is also included.

Table 3: List of plant species recorded during habitat surveys

Common Name	Scientific Name
Alder	<i>Alnus glutinosa</i>
Annual meadow grass	<i>Poa annua</i>
Ash	<i>Fraxinus excelsior</i>
Beech	<i>Fagus sylvatica</i>
Bell heather	<i>Erica cinerea</i>
Bilberry	<i>Vaccinium myrtillus</i>

¹ The 10km grid squares are detailed in Appendix 8.1

REFERENCE DOCUMENTS

APPENDIX 8.3: Terrestrial Habitats Survey Results & Impact Calculations

EIAR 2019, Chapter 8: Biodiversity

Common Name	Scientific Name
Birch	<i>Betula spp.</i>
Blackthorn	<i>Prunus spinosa</i>
Bog asphodel	<i>Nartecium ossifragum</i>
Bog cotton	<i>Eriophorum angustifolium</i>
Bracken	<i>Pteridium aquilinum</i>
Bramble	<i>Rubus fruticosus agg.</i>
Broadleaf plantain	<i>Plantago major</i>
Broad-leaved dock	<i>Rumex obtusifolius</i>
Brooklime	<i>Veronica beccabunga</i>
Carination sedge	<i>Carex panicea</i>
Cat's ear	<i>Hypochaeris radicata</i>
Cock's foot grass	<i>Dactylis glomerata</i>
Common bent	<i>Agrostis capillaris</i>
Common chickweed	<i>Stellaria media</i>
Common hogweed	<i>Heracleum sphondylium</i>
Common mouse-ear	<i>Cerastium fontanum</i>
Common Reed	<i>Phragmites australis</i>
Common sorrel	<i>Rumex acetosa</i>
Cow parsley	<i>Anthriscus sylvestris</i>
Creeping bent	<i>Agrostis stolonifera</i>
Creeping buttercup	<i>Ranunculus repens</i>
Cross-leaved Heath	<i>Erica tetralix</i>
Daisy	<i>Bellis perennis</i>
Dandelion	<i>Taraxacum agg.</i>
Deergrass	<i>Trichophorum cespitosum</i>
Devil's bit scabious	<i>Succisa pratensis</i>
Downy birch	<i>Betula pubescens</i>
Eared willow	<i>Salix aurita</i>
Early purple orchid	<i>Orchis mascula</i>
Elder	<i>Sambucus nigra</i>
Escallonia	<i>Escallonia macrantha</i>
European larch	<i>Larix decidua</i>
False oat grass	<i>Arrhenatherum elatius</i>
Field horse tail	<i>Equisetum arvense</i>
Flea sedge	<i>Carex pulicaris</i>
Foxglove	<i>Digitalis purpurea</i>
Gorse	<i>Ulex europaeus</i>

REFERENCE DOCUMENTS

APPENDIX 8.3: Terrestrial Habitats Survey Results & Impact Calculations
 EIA 2019, Chapter 8: Biodiversity

Common Name	Scientific Name
Great woodrush	<i>Luzula sylvatica</i>
Greater bird's-foot-trefoil	<i>Lotus pedunculatus</i>
Green-ribbed sedge	<i>Carex binervis</i>
Grey willow	<i>Salix cinerea</i>
Ground Ivy	<i>Glechoma hederacea</i>
Hard fern	<i>Blechnum spicant</i>
Hard Rush	<i>Juncus inflexus</i>
Hart's-tongue Fern	<i>Phyllitis scolopendrium</i>
Hawthorn	<i>Crataegus monogyna</i>
Hazel	<i>Corylus avellana</i>
Heath bedstraw	<i>Galium saxatile</i>
Heath milkwort	<i>Polygala serpyllifolia</i>
Heath rush	<i>Juncus squarrosus</i>
Heath spotted orchid	<i>Dactylorhiza maculata</i>
Heath woodrush	<i>Luzula multiflora agg.</i>
Hemlock water dropwort	<i>Oenanthe crocata</i>
Holly	<i>Ilex aquifolium</i>
Honeysuckle	<i>Lonicera periclymenum</i>
Horse chestnut	<i>Aesculus hippocastanum</i>
Iris sp	<i>Iris sp.</i>
Ivy	<i>Hedera hibernica</i>
Lesser spearwort	<i>Ranunculus flammula</i>
Lesser stitchwort	<i>Stellaria graminea</i>
Ling heather	<i>Calluna vulgaris</i>
Lodgepole pine	<i>Pinus contorta</i>
Lousewort	<i>Pedicularis sylvatica</i>
Marsh bedstraw	<i>Galium palustre</i>
Marsh foxtail	<i>Alopecurus geniculatus</i>
Marsh ragwort	<i>Senecio aquaticus</i>
Marsh thistle	<i>Cirsium palustre</i>
Mat-grass	<i>Nardus stricta</i>
Meadow buttercup	<i>Ranunculus acris</i>
Meadow fox-tail	<i>Alopecurus pratensis</i>
Nettle	<i>Urtica dioica</i>
Norway spruce	<i>Picea abies</i>
Oval sedge	<i>Carex ovalis</i>
Pedunculate oak	<i>Quercus robur</i>

REFERENCE DOCUMENTS

APPENDIX 8.3: Terrestrial Habitats Survey Results & Impact Calculations
 EIA 2019, Chapter 8: Biodiversity

Common Name	Scientific Name
Perennial rye grass	<i>Lolium perenne</i>
Pineappleweed	<i>Matricaria discoidea</i>
Pondweed sp	<i>Potamogeton sp</i>
Purple Moor-grass	<i>Molinia caerulea</i>
Ragwort	<i>Senecio jacobaea</i>
Rowan	<i>Sorbus aucuparia</i>
Sharp flowered rush	<i>Juncus acutiflorus</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Sitka spruce	<i>Picea sitchensis</i>
Snowberry	<i>Symphoricarpos albus</i>
Soft rush	<i>Juncus effusus</i>
Sweet vernal grass	<i>Anthoxanthum odoratum</i>
Sycamore	<i>Acer pseudoplatanus</i>
Tormentil	<i>Potentilla erecta</i>
Tufted hair-grass	<i>Deschampsia caespitosa</i>
Velvet bent	<i>Agrostis canina</i>
Vetch spp.	<i>Vicia spp.</i>
Wavy hair grass	<i>Deschampsia flexuosa</i>
White clover	<i>Trifolium repens</i>
Wild angelica	<i>Angelica sylvestris</i>
Willow spp.	<i>Salix spp.</i>
Wood dock	<i>Rumex sanguineus</i>
Wych elm	<i>Ulmus glabra</i>
Yellow iris	<i>Iris pseudacorus</i>
Yorkshire fog	<i>Holcus lanatus</i>

A8-3.2.3 Habitat Survey Results – Other Elements (for cumulative evaluations)

The results of the habitat surveys for the Other Elements are included here for ease of reference. The results are used in the cumulative evaluations within the EIAR Main Report. Further details on these results are available in the Reference Documents which accompany the planning application – see Biodiversity Appendix 8.1 in the Revised EIAR for UWF Related Works (2019), Biodiversity Appendix 8.1 in the EIAR for UWF Replacement Forestry (2018), and Ecological Impact Assessments for Upperchurch Windfarm in the 2013 EIS and Response to Further Information.

UWF Related Works

The habitats within the survey corridor of the UWF Related Works comprise a mosaic of agricultural grassland, commercial forestry plantations, peatlands, heath, earth banks, wet grassland, acid grasslands, private roads and public roads.

Table 4: Habitats (non-linear) surveyed within the UWF Related Works study area

Habitat Type	Area within UWF Related Works Survey Corridor (ha)	Evaluation of Conservation Value
BL3	5.12	Local Importance (Lower Value)
ED2	1.74	Local Importance (Lower Value)
ED3	0.63	Local Importance (Lower Value)
GA1	113.38	Local Importance (Lower Value)
GA1/GS4	1.70	Local Importance (Higher Value)
GA1/WS1	0.42	Local Importance (Higher Value)
GA2	0.27	Local Importance (Lower Value)
GS2	0.14	Local Importance (Higher Value)
GS3	1.58	Local Importance (Higher Value)
GS4	11.95	Local Importance (Higher Value)
GS4/WS1	0.49	Local Importance (Higher Value)
HH1/GS4	0.11	Local Importance (Higher Value)
HH3	2.32	Local Importance (Higher Value)
GS3/HH3	2.81	Local Importance (Higher Value)
PB2	2.03	County Importance
PB2/GS4	0.13	Local Importance (Higher Value)
PB4	0.10	Local Importance (Higher Value)
WD1	0.15	Local Importance (Higher Value)
WD4	42.45	Local Importance (Lower Value)
WL2	0.09	Local Importance (Higher Value)
WS1	1.68	Local Importance (Higher Value)
WS2	0.78	Local Importance (Higher Value)
WS2/GS4	0.43	Local Importance (Higher Value)

Table 5: Habitats (linear) surveyed within the UWF Related Works study area.

Habitat Type	Length within UWF Related Works Survey Corridor (m)	Evaluation of Conservation Value
BL2	10429.54	Local importance (Lower value)
BL3	156.40	Local importance (Lower value)
FW1	693.78	County Importance; Local Importance (Higher Value)
FW2	433.92	Local Importance (Higher Value)

Habitat Type	Length within UWF Related Works Survey Corridor (m)	Evaluation of Conservation Value
FW4	2800.05	Local importance (Lower value)
GS2	159.93	Local importance (Lower value)
WL1	702.00	Local Importance (Higher Value)
WL1/WL2	187.63	Local Importance (Higher Value)
WL2	721.43	Local Importance (Higher Value)

Protected Habitats - UWF Related Works:

Wet heath (HH3) habitat identified during the habitat survey at Foilnaman (Turbine 21) was assessed for correspondence to the habitat 'Northern Atlantic wet heaths with *Erica tetralix* (4010) again using the methodology outlined by Perrin *et al.*, (2014). The habitat did not meet the required criteria to be classified as Annex I quality habitat, primarily due to the absence of *Erica tetralix* within 20 m of the relevé.

The dry-humid acid grassland (GS3)/wet heath (HH3) mosaic habitat identified during the habitat survey at Shevry (around Turbine 2 and the borrow pit) was assessed for correspondence to the Annex habitats 'Northern Atlantic wet heaths with *Erica tetralix* (4010)' and the priority habitat 'Species-rich *Nardus* grasslands (6230)'. This habitat did not meet the criteria presented in Perrin *et al.*, (2014) or O'Neill *et al.*, (2013) to be classified as Annex I quality habitat.

UWF Replacement Forestry

The habitats within the UWF Replacement Forestry lands comprise of improved and wet grassland with earth banks, drainage ditches and streams dividing the fields. An area of scrub and conifer plantation is concentrated on the steep sides of a small glen through which the stream flows. Additional habitats are described herein that occur within the Best Practice survey buffer however it is not proposed that these are planted with forestry. Results are included for completeness.

Table 6: Habitats (non-linear) surveyed within the UWF Replacement Forestry study area

Habitat Type	Area within UWF Replacement Forestry lands (ha)	Evaluation of Conservation Value
BL3	0.000001	Local Importance (Lower Value)
ED3	0.45	Local Importance (Lower Value)
GA1	8.92	Local Importance (Lower Value)
GS4	1.77	Local Importance (Lower Value)
WD1	0.18	Local Importance (Higher Value)
WD4	0.57	Local Importance (Lower Value)
WS1	0.59	Local Importance (Higher Value)

Table 7: Habitats (linear) surveyed within the UWF Replacement Forestry study area

Habitat Type	Length within UWF Replacement Forestry lands (m)	Evaluation of Conservation Value
BL2	748.86	Local importance (Lower value)
BL3	228.66	Local importance (Lower value)
FW1	489.44	National Importance; Local Importance (Higher Value)
FW4	314.32	Local importance (Lower value)
WL1	44.62	Local Importance (Higher Value)
WL2	89.50	Local Importance (Higher Value)

UWF Other Activities

The habitats along the Haul Route Activities locations mainly comprise of public road with associated margin vegetation often comprising grassy verges, ornamental planting, hedgerows and treelines and scrub.

Table 8: Habitats (non-linear) surveyed within 50m of Haul Route Activities

Habitat Type	Area within UWF Other Activities Survey Corridor (ha)	Evaluation of Conservation Value
BC4	0.2	Local Importance (Lower Value)
BL3	8.2	Local Importance (Lower Value)
ED2	0.2	Local Importance (Lower Value)
FW1	0.4	County Importance; Local Importance (Higher Value)
GA1	13.0	Local Importance (Lower Value)
GA2	1.7	Local Importance (Lower Value)
GS2	3.9	Local Importance (Lower Value)
GS4	1.1	Local Importance (Lower Value)
HH1	0.4	Local Importance (Lower Value)
WD1	5.1	Local Importance (Higher Value)
WD4	0.3	Local Importance (Lower Value)
WL2	0.2	Local Importance (Higher Value)
WS1	1.3	Local Importance (Higher Value)
WS2	0.3	Local Importance (Lower Value)

Table 9: Habitats (linear) surveyed within 50m of Haul Route Activities

Habitat Type	Length within UWF Other Activities Survey Corridor (m)	Evaluation of Conservation Value
BL1	207.57	Local importance (Lower value)
BL2	29.61	Local importance (Lower value)
ED2	57.22	Local importance (Lower value)
GS2	1617.89	Local importance (Lower value)
FW1	277.06	County Importance; Local Importance (Higher Value)
FW4	16.17	Local importance (Lower value)
HD1	111.88	Local importance (Lower value)
WL1	1761.73	Local Importance (Higher Value)
WL2	268.91	Local Importance (Higher Value)

Table 10: Habitats recorded at each pole at the Overhead Line Activities

*Angle Mast (AM), Intermediate Tower (INT), Intermediate Pole (IMP)

Structure number	Structure type*	Habitats at Pole location
1	AM	BL3
2	INT	GA1
3	AM	GA1
4	INT	GA1, HL1
5	AM	WS1
6	INT	GA1
7	INT	GA1
8	INT	GA1

REFERENCE DOCUMENTS

*APPENDIX 8.3: Terrestrial Habitats Survey Results & Impact Calculations
EIA 2019, Chapter 8: Biodiversity*

Structure number	Structure type*	Habitats at Pole location
9	INT	GA1
10	INT	GA1
11	AM	GA1, WL1
12	IMP	GA1
13	INT	GA1
14	INT	GA1
15	INT	GA1
16	INT	GA1
17	INT	GA1, WL1
18	INT	WS1
19	AM	GA2
20	IMP	GS4
21	AM	GS4
22	IMP	BL3, WS1
23	AM	BL3 (and standing water)
24	AM	GA1
25	IMP	GA1, WL1
26	INT	GA1
27	IMP	GA1
28	IMP	GA1
29	IMP	GA1
30	IMP	GA1
31	IMP	GA1
32	AM	GA1, WL1, FW4
33	IMP	GA1
34	IMP	GA1, WL1, FW4
35	IMP	GA1, WL1, FW4
36	IMP	GA1, WL1
37	IMP	GA1, WL1
38	IMP	GA1, WL1
39	IMP	GA1
40	AM	GA1, WS1
41	IMP	GA1
42	IMP	GA1, WL1, WS1
43	IMP	GA1, WS1
44	IMP	GA1, HL2
45	IMP	GA1
46	IMP	GS4
47	IMP	GS4
48	AM	WS1
49	AM	WS1
50	IMP	WS1
51	IMP	GA1
52	IMP	GA1

REFERENCE DOCUMENTS

APPENDIX 8.3: Terrestrial Habitats Survey Results & Impact Calculations
 EIA 2019, Chapter 8: Biodiversity

Structure number	Structure type*	Habitats at Pole location
53	IMP	WS1
54	IMP	WS4
55	IMP	WS4
56	IMP	WS4
57	IMP	GM1
58	AM	WS1
59	IMP	WS1
60	IMP	WS1
61	IMP	WS4
62	IMP	WN6
63	IMP	WN6
64	IMP	HD1/burnt
65	IMP	WS1
66	IMP	PB4
67	IMP	WS1, WL2
68	IMP	WS1
69	IMP	GA1, WL2
70	IMP	GA1
71	IMP	GA1
72	IMP	GA1, FW4
73	IMP	GA1, WS1
74	IMP	GA1, WS1
75	IMP	GA1
76	IMP	GA1
77	IMP	GA1
78	AM	WS4
79	IMP	GA1
80	IMP	GA1, HL2
81	IMP	GA1
82	IMP	WS1
83	IMP	WS1
84	IMP	WS1
85	IMP	GA1
86	IMP	GA1
87	IMP	GS4
88	IMP	WS1
89	IMP	GA1, FW4
90	AM	WS1, WL1

A8-3.3 Impact Calculations - Habitats

A8-3.3.1 Impact Calculations – UWF Grid Connection

The following tables detail the total areas present, with the UWF Grid Connection study area, of those habitats evaluated as of Local Importance (Higher Value) or above, as per the Best Practice guidance referenced in Chapter 8. The respective proportion of the overall study area covered by each habitat, in addition to the total area of permanent land use change (or habitat loss) and what proportion of the study area and the UWF Grid Connection footprint that represents is also presented. Habitats located within the Zone of Influence (ZOI), which is defined as those habitats occurring within the UWF Grid Connection footprint have been carried forward as key receptors for further evaluation. Calculations of habitat areas within the zone of influence of the Other Elements is also presented below.

Table 11: Impact calculations for habitats greater than Local Importance (Higher Value) in the UWF Grid Connection study area

Habitat Type	Evaluation	Total Area Present (ha)	Percentage of Overall Study Area (%)	Area of Habitat Permanently Lost (ha)	Proportion of Study Area Habitat Lost (%)	Area of Habitat within Works Footprint (ha)	Area of Habitat within ZOI (ha)	Carried Forward as Key Receptor
GS4	Local Importance (Higher Value)	40.13	13.09	0.81	45.7	1.88	1.88	Yes
GS4/HH3	Local Importance (Higher Value)	0.36	0.12	0.00	0.00	0.00	0.00	No
GS4/WS1	Local Importance (Higher Value)	1.48	0.48	0.00	0.00	0.00	0.00	No
PB3	County Importance	0.51	0.17	0.00	0.00	0.00	0.00	No
PB4	Local Importance (Higher Value)	0.15	0.05	0.00	0.00	0.00	0.00	No
FS1	Local Importance (Higher Value)	0.45	0.15	0.00	0.00	0.00	0.00	No
FS1/GS4	Local Importance (Higher Value)	2.64	0.86	0.00	0.00	0.00	0.00	No
WD1	Local Importance (Higher Value)	3.03	0.99	0.00	0.00	0.00	0.00	No
WD2	Local Importance (Higher Value)	5.92	1.93	0.00	0.00	0.00	0.00	No
WN5	Local Importance (Higher Value)	1.95	0.64	0.00	0.00	0.00	0.00	No
WS1	Local Importance (Higher Value)	10.86	3.54	0.00	0.00	0.00	0.00	No
WS5	Local Importance (Higher Value)	5.05	1.65	0.00	0.00	0.00	0.00	No
GS4/WD1	Local Importance (Higher Value)	0.23	0.07	0.00	0.00	0.00	0.00	No
GS4/WS1	Local Importance (Higher Value)	1.48	0.48	0.00	0.00	0.00	0.00	No
HD1	Local Importance (Higher Value)	0.04	0.01	0.00	0.00	0.00	0.00	No

REFERENCE DOCUMENTS

*APPENDIX 8.3: Terrestrial Habitats Survey Results & Impact Calculations
EIA 2019, Chapter 8: Biodiversity*

WD5	Local Importance (Higher Value)	0.92	0.30	0.00	0.00	0.00	0.00	No
WN1	County Importance	0.84	0.28	0.00	0.00	0.00	0.00	No
WN6	Local Importance (Higher Value)	0.17	0.05	0.00	0.00	0.00	0.00	No
WS1/W D2	Local Importance (Higher Value)	0.16	0.05	0.00	0.00	0.00	0.00	No
WS1/BL 2	Local Importance (Higher Value)	0.20	0.06	0.00	0.00	0.00	0.00	No
WS2	Local Importance (Higher Value)	0.11	0.04	0.00	0.00	0.00	0.00	No
	Total	76.68	24.01%	0.81	45.7	1.88ha	1.88ha	

Table 12: Impact calculations for permanent hedgerow and tree removal required for UWF Grid Connection

Project Element	UWF Grid Connection
Permanent Hedgerow Removal (m)	40
Permanent Mature Tree Removal	1
Permanent Immature Tree Removal	28

A8-3.3.2 Impact Calculations – Other Elements (for the cumulative evaluations)

Table 13: Impact calculations for habitats greater than Local Importance (Higher Value) in the UWF Related Works study area

Habitat Type	Evaluation	Total Area Present (ha)	Percentage of Overall Study Area (%)	Area of Habitat Permanently Lost (ha)	Proportion of Study Area Habitat Lost (%)
GA1/GS4	Local Importance (Higher Value)	1.70	0.9%	0.000	0.000
GA1/WS1	Local Importance (Higher Value)	0.42	0.2%	0.000	0.000
GS2	Local Importance (Higher Value)	0.14	0.07%	0.000	0.000
GS3	Local Importance (Higher Value)	1.58	0.8%	0.000	0.000
GS3/HH3	Local Importance (Higher Value)	2.81	1.5%	0.000	0.000
GS4	Local Importance (Higher Value)	11.95	6.3%	0.07	0.6%
GS4/WS1	Local Importance (Higher Value)	0.49	0.3%	0.000	0.000
HH1/GS4	Local Importance (Higher Value)	0.11	0.06%	0.000	0.000
HH3	Local Importance (Higher Value)	2.32	1.2%	0.000	0.000
PB2	County Importance	2.03	1.07%	0.01	0.5%
PB2/GS4	Local Importance (Higher Value)	0.13	0.07%	0.000	0.000
PB4	Local Importance (Higher Value)	0.10	0.05%	0.000	0.000
WD1	Local Importance (Higher Value)	0.15	0.08%	0.000	0.000
WL2	Local Importance (Higher Value)	0.09	0.05%	0.000	0.000
WS1	Local Importance (Higher Value)	1.68	0.9%	0.004	0.2%
WS2	Local Importance (Higher Value)	0.78	0.4%	0.000	0.000
WS2/GS4	Local Importance (Higher Value)	0.43	0.2%	0.000	0.000
	Total	26.91	14.15%	0.174	1.3%

Table 14: Impact calculations for hedgerow/tree removal associated with UWF Related Works

Project Element	UWF Related Works
Permanent Hedgerow Removal (m)	170
Permanent Mature Tree Removal	1
Permanent Immature Tree Removal	3

Table 15: Impact calculations for habitats greater than Local Importance (Higher Value) in the UWF Replacement Forestry study area

Habitat Type	Evaluation	Total Area Present (ha)	Percentage of Overall Study Area (%)	Area of Habitat Permanently Lost (ha)	Proportion of Study Area Habitat Lost (%)
GS4	Local Importance (Higher Value)	0.85	7.3	0.44	51%
WS1	Local Importance (Higher Value)	0.59	5.10%	0.01	1.7%
	Total	0.77	6.66	0.00	0.00

Table 16: Impact calculations for hedgerow/tree removal associated with UWF Replacement Forestry

Project Element	UWF Replacement Forestry
Permanent Hedgerow Removal (m)	0
Permanent Mature Tree Removal	0
Permanent Immature Tree Removal	0

Upperchurch Windfarm: Tables 13-22 and 13-23 from the EIS, see [Volume F8: Reference Documents](#), summarising the total habitat loss, are herein re-produced for completeness.

Plate 1: Tables 13-22 and 13-23 from the Upperchurch Windfarm EIS

TABLE 13-22: TABLE SUMMARISING HABITAT LOSS AS A RESULT OF THE PROPOSED DEVELOPMENT.					
Habitat	Selection as key ecological receptor	Total area of habitat (ha) within the study area.	Percentage of total habitat within the study area (%)	Area of habitat to be lost (ha).	Percentage of total habitat loss (%)
Improved Agricultural Grassland (GA1)	Yes	228.34	42.53	5.98	1.11
Wet Grassland (GS4)	Yes	19.94	3.71	0.5	0.09
Mosaic of Improved Grassland (GA1) & Wet Grassland (GS4)	Yes	11.44	2.13	0.3	0.06
Mosaic Wet Heath (HH3) & Upland Blanket Bog (PB3)	Yes	15.54	2.89	0.01	0.002
Acid Grassland (GS3)	Yes	20.34	4.68	0.57	0.11
Mosaic Upland Blanket Bog (PB3) & Acidic Grassland (GS3)	Yes	3.16	3.79	0.45	0.08
Upland Blanket Bog (PB2)	Yes	25.13	0.59	0	0
Coniferous Plantation (WD4)	No	202.2	37.66	1.18	0.22
Spoil and Bare Ground (ED2)	No	4.3	0.80	0.66	0.12
Buildings and Artificial Surfaces (BL3)	No	4.2	0.78	-	-
Neutral Grassland (GS1)	Yes	2.25	0.42	0	0.00
Total (ha) (excluding FW1, FW4, WL1 and WL2)		536.84 ha	100%	9.65Ha	1.79%

TABLE 13-23: SUMMARISING LINEAR LENGTH OF HABITAT LOST AS A RESULT OF THE PROPOSED DEVELOPMENT.					
Habitat	Selection as key ecological receptor	Total linear length of habitat (meters) within the study area.	Percentage of total habitat within the study area (%)	Area of habitat to be lost (m).	Percentage of total habitat loss (%)
Eroding/Upland River (FW1)	Yes	1486.88	-	0	-
Drainage Ditches (FW4)	Yes	1258.5	-	48.1	-
Hedgerow (WL1)	Yes	24968.69	-	980.77	-
Treelines (WL2)	Yes	668.73	-	-	-

Table 17: Impact calculations for hedgerow and tree removal associated with Upperchurch Windfarm

Project Element	Upperchurch Windfarm
Permanent Hedgerow Removal (m)	980
Permanent Mature Tree Removal	24
Permanent Immature Tree Removal	0

Table 18: Impact calculations for habitats greater than Local Importance (Higher Value) in the UWF Other Activities study area

Habitat Type	Evaluation	Total Area Present (ha)	Percentage of Overall Study Area (%)	Area of Habitat Permanently Lost (ha)	Proportion of Study Area Habitat Lost (%)
FW1	County Importance; Local Importance (Higher Value)	0.39	1.1	0.000	0.000
WD1	Local Importance (Higher Value)	5.15	14.2	0.000	0.000
WL2	Local Importance (Higher Value)	0.2	0.5	0.000	0.000
WS1	Local Importance (Higher Value)	1.3	3.6	0.000	0.000
Total		7.05	19.39	0.00	0.00

Table 19: Impact calculations for hedgerow and tree removal associated with UWF Other Activities

Project Element	UWF Other Activities
Permanent Hedgerow Removal (m)	0
Permanent Mature Tree Removal	0
Permanent Immature Tree Removal	0

Appendix to Chapter 8: Biodiversity

Appendix 8.4: Hen Harrier Fieldwork & Survey Results

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

Contents

8.4.1	Fieldwork - Hen Harrier	1
A8-4.1.1	2019 Breeding Season Vantage Points	2
A8-4.1.2	2016 and 2017 Breeding Season Vantage Points	3
A8-4.1.3	2016/2017 and 2017/2018 Winter Roost Vantage Points.....	3
A8-4.1.4	Upperchurch Wind Farm (UWF) Flight Activity Surveys 2019.....	4
A8-4.1.5	Details of Timing, Duration and Weather Conditions for UWF GC Vantage Point Surveys 2019	6
A8-4.1.6	Details of Timing, Duration and Weather Conditions for UWF Grid Connection Vantage Point Surveys 2016 - 2017	8
A8-4.1.7	Hen Harrier Habitat Suitability Mapping 2019	27
8.4.2	Survey Results Hen Harrier	29
A8.4.2.1	Nest Triangulation Vantage Point Surveys UWF Grid Connection - 2019.....	30
A8.4.2.2	Hen Harrier Surveys – Breeding Season 2016.....	36
A8.4.2.3	Hen Harrier Surveys – Non-Breeding Season 2016/2017.....	50
A8.4.2.4	Hen Harrier Surveys –Breeding Season 2017.....	67
A8.4.2.5	Hen Harrier Surveys –Non Breeding Season 2017/2018.....	92
A8.4.2.6	Hen Harrier Surveys –Breeding Season 2019.....	108

List of Tables:

Table 1: Vantage point locations utilised during UWF Grid Connection Hen Harrier nest triangulation surveys (2019)

Table 2: Fixed vantage point locations UWF Grid Connection (2016 and 2017)

Table 3: Fixed vantage points selected for UWF Grid Connection winter roost surveys (2016/2017, 2017/2018)

Table 4: Vantage points selected for 2019 UWF Hen Harrier VP Surveys

Table 5: Habitat codes recorded during VP watches

Table 6: Activity and behaviour codes recorded during watches

Table 7: Details of timing, duration and weather conditions for nest triangulation vantage point surveys undertaken undertaken April, June and July 2019

Table 8: Details of timing, duration and weather conditions for vantage point surveys undertaken during the breeding season in 2016

Table 9: Details of timing, duration and weather conditions for UWF Grid Connection vantage point surveys undertaken during the non-breeding season in 2016/2017

Table 10: Details of timing, duration and weather conditions for UWF Grid Connection vantage point surveys undertaken during the breeding season in 2017

Table 11: Details of timing, duration and weather conditions for UWF Grid Connection vantage point surveys undertaken during the non-breeding season in 2017/2018 (September 2017 to February 2018 inclusive)

Table 12: Details of timing, duration and weather conditions for vantage point flight activity surveys undertaken at Upperchurch Windfarm during the breeding season in 2019 (April and July)

Table 13: Habitat classification and suitability for Hen Harrier nesting and foraging

Table 14: Extent of suitable and unsuitable foraging habitats within 2km of identified Hen Harrier nests (conducted in May 2019)

Table 15: Distance of Hen Harrier roost sites recorded in the non-breeding season of 2016/17 to the nearest construction area boundaries

Table 16: Details of Hen Harrier sightings and the habitats over which the birds were observed from nest triangulation vantage point surveys undertaken undertaken April, June and July 2019

Table 17: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for nest triangulation vantage point surveys undertaken April, June and July 2019

Table 18: Details of UWF Grid Connection Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the breeding season in 2016

Table 19: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point surveys undertaken during the breeding season in 2016

Table 20: Details of UWF Grid Connection Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the non - breeding season in 2016/17

REFERENCE DOCUMENTS

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

Table 21: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point surveys undertaken during the non - breeding season in 2016/17

Table 22: Details of UWF Grid Connection Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the breeding season in 2017

Table 23: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point surveys undertaken during the breeding season in 2017

Table 24: Details of UWF Grid Connection Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the Non-breeding season 2017/2018

Table 25: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point surveys undertaken during the non-breeding season in September 2017 to February 2018 (inclusive)

Table 26: Details of Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the breeding season in April and July 2019 on Upperchurch Windfarm (UWF)

Table 27: Details of Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point flight activity surveys undertaken April and July 2019 on Upperchurch Windfarm (UWF)

8.4.1 Fieldwork - Hen Harrier

Following scoping and formal consultation with NPWS for the previous UWF Grid Connection planning application (2018) it was established that, based on likely sensitivities, and source-pathways linkages in respect of disturbance and displacement, the primary objective of Hen Harrier surveys should be to identify all Hen Harrier breeding sites (confirmed nest site or centre point of observed evidence of breeding behaviour identified during the breeding season) and winter roosting sites in suitable habitat within a 2km radius of proposed works (i.e. any likely source stimulus in terms of disturbance or displacement –with the distance of 2km being the radius stipulated by SNH guidance). This approach was formulated in consultations with NPWS and is supported in SNH guidance.

Further to the above, in 2019 (July 2nd and 3rd), in the field ground truthing was carried out in support of the evaluation of suitable habitat within 2km of identified nest sites in terms of its suitability for breeding and/or foraging Hen Harrier. See also Section A8.4.1.7 of this appendix.

As no breeding habitat is present at the Mountphilips Substation site location, then this was scoped out as a likely source of disturbance/displacement to nesting birds. The new substation was also scoped out as a likely source of collision mortality due to the absence of nesting habitat, the distance to nearest Hen Harrier habitat and absence of records of collision mortality with buildings/structures such as sub-stations.

Survey effort therefore in 2019 was concentrated on the UWF Grid Connection 110kV UGC route, in particular areas of high habitat suitability (as per SNH Guidance) within 2km, and which by default coincide with the SPA designation present.

Accordingly, the methodology selected was that published by SNH in respect of breeding raptor surveys (Hardey *et al.*, 2013), which describes the survey techniques to establish breeding occupancy by Hen Harrier. This method corresponds to that utilized to date in National Surveys for the species in the republic (e.g. Ruddock *et al.*, 2012, 2015) and also research into the species (Irwin *et al.*, 2015 and Wilson *et al.*, 2015).

Existing records of Hen Harrier usage of the area, dating back to 2003, were collated to establish suitable nesting or roosting habitat. Satellite imagery was additionally reviewed to identify areas of potentially suitable breeding habitat. NPWS Conservation Rangers and local bird experts with knowledge of existing and historical Hen Harrier nest record locations were consulted for further information.

For breeding season surveys to establish nesting attempts in 2016 and 2017, 12 vantage points were ground-truthed (for visibility) and fixed. These vantage points were used during the 2016 (March to June inclusive) and 2017 (March to August inclusive) breeding seasons. Additional effort in the months of July and August was added to surveys in 2017 as some nesting attempts occurred later than the previous year.

Further surveys in April, June and July 2019 utilised suitable vantage points as applicable to determine the occupancy status of those nesting territories within 2km of the revised UWF Grid Connection.

For winter roost surveys 7 of the preceding 12 vantage points were employed during the winter 2016/17 period. The rationale for decreasing the number of VPs from 12 in the breeding period to 7 during the winter period was based on the requirement to focus survey efforts on suitable roosting habitat within the study area – of which there is less. Additional Survey effort was carried out in September, October, and November 2017 and January 2018.

In terms of collision mortality there are no source impact pathways identified as the substation element of the UWF Grid Connection is not considered to pose a collision risk with remaining parts of the UWF Grid

Connection (110kV UGC, Ancillary works at Mountphilips Substation Site) at ground level or below. Although therefore not a formal flight activity survey to inform a collision risk model; as an approach to standardise effort, each Fixed Vantage Point (VP and UVP) received six hours of survey effort per month as per Best Practice (SNH, 2014).

Additionally in 2019, flight activity surveys of Upperchurch Wind Farm (UWF), utilising 10 no. vantage points (VP's) were carried out in April and July of 2019.

Results of Hen Harrier surveys are presented in Section A8-4.2 below.

A8-4.1.1 2019 Breeding Season Vantage Points

In order to identify potentially active Hen Harrier nesting territories and triangulate nesting locations within the vicinity of the UWF Grid Connection, breeding activity appraisals utilised nineteen different Vantage Points (VPs) focussed on suitable nesting habitat or near historically used territories, during April, June and July 2019. The location of these VPs is presented in the table below.

Table 1: Vantage point locations utilised during UWF Grid Connection Hen Harrier nest triangulation surveys (2019)

Nest Triangulation Vantage Point	ITM Grid Reference
Mauherslieve NTVP1	589725 662514
Curreeny NTVP2	590588 663561
Forkeala NTVP3	580311 661509
Gleno NTVP4	578863 660541
Fanit NTVP5	577158 659170
Cummer NTVP6	590681 658439
Toorenbrien NTVP7	578581 661444
Bleanbeg NTVP8	578854 663809
Goulmore NTVP9	588441 657850
Knockalough NTVP10	598854 659799
Cullaun (north) NTVP11	582869 659164
Reisk NTVP12	592191 663122
Cullaun (south) NTVP13	585063 656764
Glenstal NTVP14	577464 656872
Knockastanna NTVP15	583762 657254
Toorenbrien NTVP16	580917 659766
Bealaclave NTVP17	584700 661573
Gleno NTVP18	579184 660902
Toorlougher NTVP19	577832 660611

A8-4.1.2 2016 and 2017 Breeding Season Vantage Points

All 12 vantage points focused on suitable nesting habitat and historical nest locations within 2km of the previous 2018 UWF Grid Connection. These surveys remain relevant to the current application as some of the historical nest locations and territories which were the focus of the 2016 and 2017 surveys occur also within 2km of the new UWF Grid Connection- and are included for completeness. The grid references for VP locations (ITM) are presented in the below Table.

Table 2: Fixed vantage point locations UWF Grid Connection(2016 and 2017)

Vantage Point	ITM Grid Reference
1	590503 E 659845 N
2	590263 E 663064 N
3	588454 E 657845 N
4	585164 E 659385 N
5	584216 E 660366 N
6	584744 E 661484 N
7	583015 E 662754 N
8	580275 E 661364 N
9	580495 E 662744 N
10	579726 E 664434 N
11	576626 E 664763 N
12	575976 E 662474 N

A8-4.1.3 2016/2017 and 2017/2018 Winter Roost Vantage Points

Grid references of vantage points utilised during winter surveys are provided in the table below.

Table 3: Fixed vantage points selected for UWF Grid Connection winter roost surveys (2016/2017, 2017/2018)

Vantage Point	ITM Grid Reference
2	590263 E 663064 N
3	588454 E 657845 N
5	584216 E 660366 N
6	584744 E 661484 N
10	579726 E 664434 N
11	576626 E 664763 N
12	575976 E 662474 N

A8-4.1.4 Upperchurch Wind Farm (UWF) Flight Activity Surveys 2019

To identify possible Hen Harrier flight activity at Upperchurch Wind Farm (UWF), in line with SNH methods, ten Vantage Points (VP’s) were used for flight activity surveys in April and July 2019. The viewshed (i.e. area visible to the observer) covered by the 10 selected VP’s combined covered the consented turbine locations plus a 500m buffer, and included the 2013 WF EIS study area and the entirety of the area covered by Related Works.

Table 4: Vantage points selected for 2019 UWF Hen Harrier VP Surveys

Upperchurch Vantage Point	ITM Grid Reference
UVP 1	596303 E 660414 N
UVP 2	595759 E 660170 N
UVP 3	593478 E 658806 N
UVP 4	594104 E 659964 N
UVP 5	591679 E 660120 N
UVP 6	592650 E 662020 N
UVP 7	594219 E 662115 N
UVP 8	597320 E 663592 N
UVP 9	599149 E 661800 N
UVP 10	597281 E 658689 N

Data Recorded During Vantage Point Surveys

For each vantage point watch (both breeding and winter period) the following parameters were recorded:

- Vantage Point number;
- Date of watch;
- Watch period;
- Weather conditions including visibility, wind-force and direction and precipitation;
- Notes – any notes on other birds of prey or potentially disturbing activity etc.

When a Hen Harrier was observed, the following information was recorded:

- Sighting number during that watch;
- Time of sighting;
- Sex of Hen Harrier;
- Approximate height of flight (in meters);
- Habitat over which bird was flying – see Table 5 for habitat codes used;
- The activity of the bird – see Table 6 for activity codes used;
- The duration of the activity;
- Notes – any more information on behaviour of bird(s) (in particular breeding season territorial display, such as skydancing, food passes, nuptial flights etc), nesting location estimates, roosting location estimates.

Table 5: Habitat codes recorded during VP watches

Code	Habitats
G	Grazing
RG	Rough Grazing
HB	Heath or bog
DE	Deciduous woodland or scrub
GO	Gorse
CF	Clear fell
NF2	New forestry plantation trees 20-30cm high
NF3	New forestry plantation trees c 1m high
NF4	New forestry plantation trees > 2m high
2 nd F1/F2	Second rotation forestry plantation trees 20-30cm high
2 nd F3	Second rotation forestry plantation trees c 1m high
2 nd F4	Second rotation forestry plantation trees > 2m high
F	Post thicket forestry

Table 6: Activity and behaviour codes recorded during watches

Code	Behaviour or activity
S	Soaring
D	Displaying
H	Hunting
Fl	Flying
C	Circling
P	Perching

A8-4.1.5 Details of Timing, Duration and Weather Conditions for UWF GC Vantage Point Surveys 2019

Table 7: Details of timing, duration and weather conditions for nest triangulation vantage point surveys undertaken April, June and July 2019

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
NTVP1	12/04/19	GP	none	7	5	2	SE	10	12:00	15:00	7200
NTVP2	12/04/19	GP	none	7	5	2	SE	10	15:10	18:10	10800
NTVP3	16/04/19	GP	none	3	10	1	E	9	09:00	11:00	7200
NTVP4	16/04/19	GP	none	3	10	1	E	12	11:00	12:00	3600
NTVP5	16/04/19	GP	none	4	10	2	SE	15	14:00	17:00	10800
NTVP6	17/04/19	GP	none	8	5	1	E	9	08:20	11:20	10800
NTVP7	18/04/19	GP	none	4	5	2	E	16	09:15	12:15	10800
NTVP8	18/04/19	GP	none	4	5	3	E	18	13:30	16:30	10800
NTVP9	19/04/19	GP	none	4	5	2	SE	20	14:00	16:00	7200
NTVP10	20/04/19	GP	none	4	5	1	SE	16	09:10	11:10	7200
NTVP11	21/04/19	GP	none	1	5	1	SE	14	10:00	12:00	7200
NTVP12	21/04/19	GP	none	3	10	3	S	19	14:00	17:00	10800
NTVP13	22/04/19	GP	none	0	10	2	S	19	08:00	11:00	10800
NTVP14	23/04/19	GP	none	5	10	2	E	18	14:00	16:00	7200
NTVP17	23/04/19	GP	none	5	10	2	E	18	16:30	18:30	7200
NTVP18	29/06/19	GP	none	7	10	2	S	13	08:30	11:30	10800
NTVP17	29/06/19	GP	none	6	10	2	S	15	17:00	20:00	10800
NTVP1	02/07/19	GP	none	7	10	1	NW	13	08:00	11:00	10800
NTVP15	02/07/19	GP	none	8	10	13	NW	13	11:15	14:15	10800
NTVP16	04/07/19	GP	none	1	10	1	N	13	08:00	11:00	10800
NTVP14	04/07/19	GP	none	2	10	1	N	18	12:00	15:00	10800
NTVP8	05/07/19	GP	none	8	10	1	NW	16	08:20	11:20	10800
NTVP17	05/07/19	GP	none	8	10	1	NW	16	12:30	15:30	10800
NTVP3	08/07/19	GP	none	8	10	1	W	15	10:30	13:30	10800
NTVP11	08/07/19	GP	none	8	10	1	W	15	14:00	17:00	10800

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIA 2019, Chapter 8: Biodiversity EIA 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
NTVP18	09/07/19	GP	none	8	10	0		13	08:00	09:00	3600
NTVP19	09/07/19	GP	none	7	5	1	W	18	09:10	11:10	3600

A8-4.1.6 Details of Timing, Duration and Weather Conditions for UWF Grid Connection Vantage Point Surveys 2016 - 2017

Table 8: Details of timing, duration and weather conditions for vantage point surveys undertaken during the breeding season in 2016

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
1	11/03/2016	GP	None	8	10	1	SW	10	09:10	12:10	10800
1	15/03/2016	GP	None	2	10	2	E	10	13:40	16:40	10800
2	15/03/2016	GP	None	2	10	3	E	9	10:30	13:30	10800
2	21/03/2016	GP	None	8	5	1	NW	11	14:30	17:30	10800
3	11/03/2016	GP	None	8	10	2	SW	13	13:15	16:15	10800
3	13/03/2016	GP	None	8	10	1	SE	13	15:15	18:15	10800
4	12/03/2016	GP	None	6	10	2	S	10	08:15	11:15	10800
4	21/03/2016	GP	None	8	5	1	NW	9	11:30	14:30	10800
5	12/03/2016	GP	Light	8	10	2	S	11	11:30	14:30	10800
5	13/03/2016	GP	None	7	10	2	SE	15	12:00	15:00	10800
6	12/03/2016	GP	None	8	10	2	S	12	14:35	17:35	10800
6	21/03/2016	GP	Mist	8	2	1	NW	8	08:00	11:00	10800
7	13/03/2016	GP	None	8	10	2	SE	9	08:45	11:45	10800
7	14/03/2016	GP	None	2	10	2	E	14	14:40	17:40	10800
8	15/03/2016	RMD	None	7	5	1	SE	10	15:30	18:30	10800
8	16/03/2016	RMD	None	5	2	1	SE	7	09:30	12:30	10800
9	16/03/2016	RMD	None	8	2	1	SE	11	12:30	18:30	21600
10	14/03/2016	RMD	None	0	5	3	E	5	07:45	14:15	21600
11	15/03/2016	GP	None	1	5	1	SE	8	09:30	15:30	21600
12	14/03/2016	RMD	None	0	5	1	SE	10	11:00	17:00	21600
1	04/04/2016	GP	light	6	5	1	SW	12	09:45	12:45	10800
1	21/04/2016	GP	none	7	10	1	E	12	10:10	13:10	10800
2	07/04/2016	GP	none	3	10	1	NW	9	07:15	10:50	16800
2	09/04/2016	GP	light	4	10	1	SE	12	14:00	17:00	10800
3	08/04/2016	GP	light	6	5	3	SW	9	07:15	10:50	16800
3	04/04/2016	GP	light	7	5	1	SW	15	13:45	16:45	10800
4	05/04/2016	GP	light	6	10	1	W	11	11:30	17:30	21600
5	05/04/2016	GP	light	8	2	1	W	10	08:15	11:15	10800
5	17/04/2016	GP	none	6	10	2	SW	10	10:35	13:35	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
6	06/04/2016	GP	showers	8	5	4	SW	9	08:15	11:15	10800
6	07/04/2016	GP	light	6	5	3	W	13	14:20	17:20	10800
6	25/04/2016	GP	none	3	10	3	NW	14	16:40	19:40	10800
7	07/04/2016	GP	light	8	5	3	W	11	11:10	14:10	10800
7	25/04/2016	GP	light	8	10	3	N	12	09:15	12:15	10800
8	06/04/2016	RMD	showers	8	8	2	W	6	12:35	18:35	21600
9	06/04/2016	RMD	showers	8	8	2	W	7	09:30	12:30	10800
9	07/04/2016	RMD	showers	8	10	1	NW	7	09:30	12:30	10800
10	17/04/2016	RMD	none	5	10	2	SW	10	14:00	17:30	12600
10	25/04/2016	RMD	none	8	10	3	NW	12	13:30	16:30	10800
11	05/04/2016	GP	showers	7	10	1	SW	7	10:15	16:15	21600
12	04/04/2016	RMD	showers	7	3	1	S	9	11:30	17:30	21600
1	06/05/2016	GP	none	3	10	1	N	15	11:30	14:30	10800
1	10/05/2016	GP	mist	8	2	1	E	12	09:50	12:50	10800
2	06/05/2016	GP	none	4	10	1	N	10	08:15	11:15	10800
2	18/05/2016	GP	mist	6	10	1	N	12	10:00	13:00	10800
3	04/05/2016	GP	none	8	10	3	S	11	14:00	17:00	10800
3	06/05/2016	GP	none	1	10	1	N	17	14:45	17:45	10800
4	04/05/2016	GP	none	8	10	3	S	11	07:30	10:30	10800
4	19/05/2016	GP	none	4	10	3	W	15	12:40	15:40	10800
5	04/05/2016	GP	none	8	10	3	S	11	10:45	13:45	10800
5	12/05/2016	GP	mist	8	1	2	NE	12	08:30	11:30	10800
6	05/05/2016	GP	none	7	10	1	S	15	15:10	18:10	10800
6	13/05/2016	GP	none	1	10	2	NE	15	13:20	16:20	10800
7	05/05/2016	GP	none	7	10	2	S	11	12:00	15:00	10800
7	19/05/2016	GP	showers	7	10	3	W	10	08:30	12:30	10800
8	20/05/2016	RMD	showers	8	10	1	SE	12	10:15	16:15	10800
9	13/05/2016	RMD	none	0	16	1	NE	13	09:30	15:30	10800
9	13/05/2016	RMD	none	0	16	1	NE	13	09:30	15:30	10800
10	05/05/2016	RMD	none	1	10	3	S	10	07:25	10:30	10800
10	13/05/2016	RMD	none	0	10	2	NE	13	08:15	12:15	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
11	09/05/2016	GP	showers	8	16	1	NE	17	09:30	15:30	21600
12	11/05/2016	RMD	none	8	5	1	NE	13	09:30	15:30	21600
1	07/06/2016	GP	none	7	5	2	SW	17	14:30	16:30	10800
1	09/06/2016	GP	none	7	10	1	SW	16	08:40	11:40	10800
2	09/06/2016	GP	none	8	10	1	SW	17	15:00	18:00	10800
2	15/06/2016	GP	none	7	10	2	NW	14	07:50	10:50	10800
3	07/06/2016	GP	none	7	5	1	SW	17	10:10	13:10	10800
3	15/06/2016	GP	light	7	10	2	NW	15	11:00	14:00	10800
4	08/06/2016	GP	none	8	5	1	E	13	09:15	12:15	10800
4	13/06/2016	GP	light	7	5	3	W	15	15:00	18:00	10800
5	03/06/2016	GP	none	3	10	1	E	15	10:15	13:15	10800
5	13/06/2016	GP	light	1	10	1	W	14	08:40	11:40	10800
6	11/06/2016	GP	none	8	10	1	SW	15	10:00	13:00	10800
6	13/06/2016	GP	none	7	10	1	W	13	11:45	14:45	10800
7	03/06/2016	GP	none	5	10	1	E	19	13:30	16:30	10800
7	08/06/2016	GP	none	8	5	1	E	13	12:30	15:30	10800
8	10/06/2016	RMD	light	8	4	1	NE	15	09:20	15:20	21600
9	03/06/2016	RMD	none	2	16	1	SE	16	10:30	16:30	10800
10	11/06/2016	RMD	none	7	10	2	SE	18	13:45	16:45	10800
10	17/06/2016	RMD	none	8	10	2	NW	13	08:00	12:00	14400
11	09/06/2016	GP	none	7	16	1	SE	15	09:30	15:30	21600
12	08/06/2016	RMD	none	8	16	1	SE	17	09:30	15:30	21600

Table 9: Details of timing, duration and weather conditions for UWF Grid Connection vantage point surveys undertaken during the non-breeding season in 2016/2017

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
1	13/09/2016	GP	Misty	5/8	2	F2	NW	9	06:10	08:30	10800
6	13/07/2017	RMD	Light	8/8	5	F1	SW	16	10:00	16:00	21600
7	14/07/2017	RMD	None	7/8	5	F1	W	15	10:30	16:30	21600
8	12/07/2017	RMD	None	1/4	20	F1	E	16	10:00	16:00	21600
10	18/07/2017	KOC	None	7/8	>20	F2	W	19	12:00	15:00	10800
10	18/07/2017	KOC	None	3/4	15	F3	SE	19	15:30	18:30	10800
11	20/07/2017	KOC	Occasional showers	1/2	10	F3	S	15	15:10	18:10	10800
11	24/07/2017	KOC	None	3/4	10	F2	NW	21	17:30	20:30	10800
12	20/07/2017	KOC	Occasional showers	3/4	10	F3	SW	16	11:40	14:40	10800
12	24/07/2017	KOC	None	3/8	>20	F3	W	22	14:00	17:00	10800
2	07/08/2017	KOC	Dry	7/8	15	F3	W	16	12:15	15:15	10800
2	07/08/2017	KOC	Dry	5/8	12	F3	W	17	15:45	18:45	10800
3	08/08/2017	KOC	Occasional showers	3/4	10	F2	N	12	12:00	15:00	10800
3	08/08/2017	KOC	Occasional showers	5/8	15	F3	N	15	15:30	18:30	10800
1	19/09/2016	GP	None	08-Aug	2	F1	W	11	17:10	20:10	10800
1	15/10/2016	GP	Misty	3/4	2	F1	SE	4	07:30	10:30	10800
1	20/10/2016	GP	None	08-Aug	5	F1	E	8	07:10	10:10	10800
1	28/11/2016	SI	None	08-Aug	5	F1	E	6	07:19	10:19	10800
1	28/11/2016	SI	None	08-Aug	5	F1	E	8	13:58	16:58	10800
2	17/09/2016	GP	Misty	1/2	2	F1	SW	10	06:30	09:30	10800
2	17/09/2016	GP	None	08-Aug	2	F1	S	14	17:30	20:30	10800
2	16/10/2016	GP	Light	08-Aug	5	F2	S	10	16:15	19:15	10800
2	29/10/2016	GP	None	3/8	2	F1	SE	11	15:45	18:45	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
2	29/11/2016	SI	None	7/8	10	F1	SE	4	07:21	10:21	10800
2	29/11/2016	SI	None	7/8	10	F1	SE	4	14:00	17:10	10800
2	15/12/2016	SI	None	1/8	10	F1	NW	8	07:43	10:45	10800
2	15/12/2016	SI	None	1/8	10	F1	NW	8	14:30	17:30	10800
2	29/01/2017	MD	Light	08-Aug	6	F1	E	6	07:35	10:35	10800
2	29/01/2017	MD	Light	08-Aug	5	F1	SE	4	14:45	17:45	10800
2	10/02/2017	GP	None	08-Aug	2	F1	E	1	07:30	10:30	10800
2	23/02/2017	GP	None	1/4	5	F2	NW	8	15:30	18:30	10800
3	15/09/2016	GP	None	3/8	2	F1	S	14	17:20	20:20	10800
3	20/09/2016	GP	None	08-Aug	1	F1	SW	10	06:15	09:15	10800
3	18/10/2016	GP	Light	1/2	2	F1	NW	8	16:00	19:05	10800
3	25/10/2016	GP	None	3/8	1	F1	NE	4	07:30	10:30	10800
3	22/11/2016	GP	None	3/8	10	F1	NE	2	14:00	17:10	10800
3	30/11/2016	GP	None	0/8	5	F1	E	0	07:30	10:30	10800
3	27/01/2017	RMD	None	5/8	15	F1	SW	8	14:45	17:45	10800
3	31/01/2017	RMD	Light	08-Aug	4	F1	SW	4	07:40	10:40	10800
3	12/02/2017	GP	None	08-Aug	1	F2	NE	3	15:15	18:15	10800
3	15/02/2017	GP	Light	7/8	2	F2	SW	6	07:15	10:15	10800
4	14/09/2016	GP	None	1/2	2	F3	NW	10	06:30	09:30	10800
4	20/09/2016	GP	None	08-Aug	2	F1	W	12	17:00	20:00	10800
4	18/10/2016	GP	None	1/4	2	F1	SW	6	07:30	10:30	10800
4	22/10/2016	GP	None	5/8	5	F1	E	10	16:00	19:00	10800
4	23/11/2016	GP	None	1/4	5	F2	NE	5	14:10	17:10	10800
4	28/11/2016	GP	None	08-Aug	5	F1	E	6	07:30	10:30	10800
5	16/09/2016	GP	None	5/8	2	F1	W	11	06:30	09:30	10800
5	18/09/2016	GP	None	3/8	2	F1	W	14	17:15	20:15	10800
5	16/10/2016	GP	Light	08-Aug	1	F3	S	8	07:15	10:15	10800
5	21/10/2016	GP	None	7/8	5	F1	SE	10	16:15	19:00	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
5	21/11/2016	GP	None	08-Aug	5	F1	NE	0	07:30	10:30	10800
5	28/11/2016	GP	None	08-Aug	5	F1	E	5	14:10	17:10	10800
5	16/12/2016	RMD	None	0/8	15	F1	NW	8	14:00	17:00	10800
5	21/12/2016	RMD	Light	08-Aug	15	F1	SW	5	08:00	11:00	10800
5	18/01/2017	RMD	Single shower	08-Aug	15	F1	S	8	14:30	17:30	10800
5	19/01/2017	RMD	None	1/8	15	F1	SE	2	08:00	11:00	10800
5	10/02/2017	GP	None	08-Aug	5	F2	E	3	15:10	18:10	10800
5	13/02/2017	GP	Misty	08-Aug	1	F3	E	5	07:15	10:15	10800
6	16/09/2016	GP	None	1/2	2	F2	W	12	17:30	20:30	10800
6	19/09/2016	GP	None	08-Aug	2	F1	W	10	06:15	09:15	10800
6	19/10/2016	GP	None	08-Aug	2	F1	NW	7	07:30	10:30	10800
6	20/10/2016	GP	None	7/8	2	F1	E	10	16:00	19:00	10800
6	21/11/2016	GP	None	7/8	5	F3	NE	2	14:10	17:10	10800
6	24/11/2016	GP	None	0/8	5	F1	NE	0	07:30	10:30	10800
6	19/12/2016	RMD	None	1/4	20	F1	NW	8	14:00	17:00	10800
6	20/12/2016	RMD	None	1/2	15	F1	SE	0	08:00	11:00	10800
6	25/01/2017	RMD	Occasiona l showers	08-Aug	15	F3	SE	8	07:50	10:50	10800
6	31/01/2017	RMD	None	3/4	10	F1	SE	10	14:45	17:45	10800
6	11/02/2017	GP	None	1/8	5	F1	NE	0	07:30	10:30	10800
6	16/02/2017	GP	None	08-Aug	2	F1	SW	7	15:20	18:20	10800
7	22/09/2016	TG	None	1/2	15	F1	SE	5	06:45	09:45	10800
7	22/09/2016	TG	Light	08-Aug	1	F1	SE	12	17:11	20:11	10800
7	17/10/2016	GP	Light	5/8	5	F2	SW	11	16:10	19:10	10800
7	21/10/2016	GP	None	08-Aug	2	F1	SE	7	07:00	10:00	10800
7	30/11/2016	SI	None	3/4	10	F1	E	3	07:25	10:25	10800
7	30/11/2016	SI	None	3/4	10	F1	E	3	14:00	17:00	10800
8	27/09/2016	TG	None	08-Aug	1	F1	SW	11	06:55	09:55	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
8	27/09/2016	TG	None	3/4	3	F1	SW	11	16:54	19:54	10800
8	26/10/2016	RMD	Light	08-Aug	4	F1	SW	13	15:42	18:42	10800
8	27/10/2016	RMD	Misty	08-Aug	10	F1	SW	11	07:45	10:45	10800
8	22/11/2016	GP	None	1/4	5	F3	NW	4	07:30	10:30	10800
8	25/11/2016	GP	None	1/4	5	F1	E	5	14:10	17:10	10800
9	28/09/2016	TG	None	08-Aug	5	F1	S	12	06:57	09:57	10800
9	28/09/2016	TG	Heavy Showers	3/4	1	F1	S	14	16:52	19:52	10800
9	27/10/2016	RMD	None	08-Aug	15	F1	SE	16	15:40	18:40	10800
9	28/10/2016	RMD	Misty	08-Aug	4	F1	SW	12	07:50	10:50	10800
9	20/11/2016	GP	None	3/8	1	F1	NE	5	14:15	17:15	10800
9	23/11/2016	GP	None	0/8	5	F1	NE	5	07:30	14:30	10800
10	13/09/2016	GP	None	5/8	2	F1	NW	10	18:00	20:30	10800
10	18/09/2016	GP	Misty	08-Aug	1	F3	S	13	06:10	09:10	10800
10	15/10/2016	GP	None	7/8	5	F1	NW	10	16:00	19:00	10800
10	24/10/2016	GP	None	1/8	2	F1	NE	5	07:30	10:30	10800
10	30/11/2016	JD	None	0/8	15	F1	E	3	07:20	10:20	10800
10	30/11/2016	JD	None	0/8	15	F1	E	6	14:30	17:30	10800
10	21/12/2016	RMD	Light	5/8	15	F1	SW	6	14:00	17:00	10800
10	22/12/2016	RMD	None	3/8	5	F1	SW	5	08:00	11:00	10800
10	25/01/2017	RMD	None	7/8	15	F3	SE	9	14:45	17:45	10800
10	27/01/2017	RMD	Heavy Showers	08-Aug	5	F1	SE	6	07:50	10:50	10800
10	14/02/2017	GP	None	5/8	5	F2	SE	10	15:15	18:15	10800
10	24/02/2017	GP	Misty	7/8	<1	F2	SW	5	07:00	10:00	10800
11	21/09/2016	TG	Misty	08-Aug	5	F2	SE	11	06:42	09:42	10800
11	21/09/2016	TG	None	3/4	15	F1	SE	10	17:13	20:13	10800
11	24/10/2016	RMD	None	5/8	15	F1	NE	12	15:52	18:52	10800
11	25/10/2016	RMD	None	3/4	5	F1	SE	3	07:45	10:45	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
11	29/11/2016	JD	None	1/4	15	F1	E	6	07:20	10:20	10800
11	29/11/2016	JD	None	1/8	15	F3	SE	6	14:20	17:25	10800
11	19/12/2016	RMD	None	08-Aug	<1	F1	NW	8	08:00	11:00	10800
11	22/12/2016	RMD	Single shower	7/8	15	F1	SW	8	14:00	17:00	10800
11	17/01/2017	RMD	Misty	08-Aug	3	F1	SW	8	08:00	11:00	10800
11	17/01/2017	RMD	None	08-Aug	15	F1	SW	10	14:30	17:30	10800
11	08/02/2017	GP	None	7/8	5	F2	S	7	15:10	18:10	10800
11	16/02/2017	GP	Light	08-Aug	1	F1	SW	7	07:15	10:15	10800
12	20/09/2016	TG	None	08-Aug	10	F1	SE	11	06:40	09:40	10800
12	20/09/2016	TG	None	08-Aug	15	F1	SE	14	17:15	20:15	10800
12	25/10/2016	RMD	None	7/8	9	F1	N	11	15:50	18:50	10800
12	26/10/2016	RMD	None	08-Aug	15	F1	S	11	07:45	10:45	10800
12	28/11/2016	JD	None	08-Aug	10	F1	NE	6	07:15	10:19	10800
12	28/11/2016	JD	None	08-Aug	10	F1	NW	6	14:25	17:25	10800
12	16/12/2016	RMD	None	08-Aug	15	F1	NW	5	08:00	11:00	10800
12	20/12/2016	RMD	Constant	08-Aug	4	F1	SE	5	14:00	17:00	10800
12	18/01/2017	RMD	None	08-Aug	15	F1	SE	8	08:00	11:00	10800
12	19/01/2017	RMD	None	0/8	15	F1	SE	11	14:30	17:30	10800
12	09/02/2017	GP	None	08-Aug	2	F2	E	5	15:10	18:10	10800
12	22/02/2017	GP	Misty	08-Aug	<1	F1	SW	9	07:00	10:00	10800
Casual	23/12/2016	RMD	Heavy Showers	5/8	10	F3	SW	11	14:10	14:10	10800

Table 10: Details of timing, duration and weather conditions for UWF Grid Connection vantage point surveys undertaken during the breeding season in 2017

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
1	15/03/2017	GP	None	0/8	10	F2	SW	7	08:15	14:15	21600
1	10/04/2017	GP	None	08-Aug	5	F2	NW	8	08:45	11:45	10800
1	12/04/2017	GP	None	08-Aug	2	F2	NW	9	07:45	10:45	10800
1	05/05/2017	GP	None	3/8	10	F2	E	13	11:30	14:30	10800
1	08/05/2017	GP	None	0/8	10	F1	E	11	06:45	09:45	10800
1	16/06/2017	GP	Misty	08-Aug	2	F1	W	13	08:00	11:00	10800
1	17/06/2017	GP	None	1/4	10	F1	SW	22	13:30	16:30	10800
1	14/07/2017	GP	None	7/8	10	F2	W	12	07:50	13:30	21600
1	04/08/2017	RMD	Light	1/2	5	F1	W	15	10:50	16:50	21600
2	24/03/2017	GP	None	0/8	10	F1	NE	5	07:15	10:15	10800
2	27/03/2017	GP	None	1/8	5	F1	E	8	07:15	10:15	10800
2	06/04/2017	GP	None	08-Aug	5	F1	NW	8	07:00	10:00	10800
2	11/04/2017	GP	None	08-Aug	10	F2	NW	7	07:45	10:45	10800
2	05/05/2017	GP	None	3/8	10	F3	E	14	14:40	17:40	10800
2	20/05/2017	GP	None	7/8	10	F3	S	13	10:15	13:15	10800
2	18/06/2017	GP	None	0/8	10	F1	SW	15	08:30	12:30	14400
2	20/06/2017	GP	None	1/2	10	F1	NE	15	08:00	11:00	10800
2	17/07/2017	GP	None	1/8	10	F1	SE	14	07:10	10:10	10800
2	20/07/2017	GP	Occasional showers	3/4	5	F2	SW	11	08:30	11:30	10800
2	07/08/2017	KOC	Dry	7/8	15	F3	W	16	12:15	15:15	10800
3	12/03/2017	GP	None	1/2	10	F3	W	11	13:00	16:00	10800
3	14/03/2017	GP	None	1/2	10	F3	W	11	13:10	16:10	10800
3	05/04/2017	GP	None	08-Aug	10	F1	NW	10	08:15	11:15	10800
3	17/04/2017	GP	None	08-Aug	10	F1	NW	9	09:40	12:40	10800
3	08/05/2017	GP	None	3/8	5	F2	NE	18	13:30	16:30	10800
3	18/05/2017	GP	None	5/8	10	F1	SW	9	09:10	12:10	10800
3	16/06/2017	GP	None	08-Aug	5	F1	W	16	12:30	18:30	21600
3	14/07/2017	GP	None	1/2	10	F2	W	20	14:30	17:30	10800
3	16/07/2017	GP	None	1/2	10	F1	NW	14	09:00	12:00	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
3	08/08/2017	KOC	Occasional showers	3/4	10	F2	N	12	12:00	15:00	10800
4	24/03/2017	GP	None	0/8	10	F2	NE	9	10:30	16:30	21600
4	09/04/2017	GP	None	08-Aug	5	F1	NW	10	10:50	13:50	10800
4	19/04/2017	GP	None	7/8	5	F1	SW	14	14:00	16:30	10800
4	08/05/2017	GP	None	0/8	5	F1	E	17	09:50	12:50	10800
4	09/05/2017	GP	None	3/8	5	F1	E	9	11:30	14:30	10800
4	17/06/2017	GP	None	0/8	10	F2	SW	16	09:00	12:00	10800
4	19/06/2017	GP	None	3/8	10	F1	NE	17	08:00	11:00	10800
4	17/07/2017	GP	None	0/8	10	F1	SE	20	10:30	16:30	21600
4	15/08/2017	GP	Occasional showers	07-Aug	10	F2	SW	12	07:15	10:15	10800
4	17/08/2017	GP	Occasional showers	07-Aug	10	F2	S	14	07:30	10:30	10800
5	16/03/2017	RMD	None	1/4	20	F1	NW	9	15:50	16:50	3600
5	21/03/2017	RMD	Light	1/2	16	F1	SW	1	10:00	15:00	18000
5	10/04/2017	GP	None	7/8	10	F2	NW	10	12:00	15:00	10800
5	17/04/2017	GP	None	08-Aug	10	F1	NW	9	13:00	16:00	10800
5	09/05/2017	GP	None	0/8	10	F1	SE	8	08:00	11:00	10800
5	18/05/2017	GP	None	1/2	10	F2	SW	14	13:30	16:30	10800
5	19/06/2017	JD	None	1/4	10	F1	SE	20	10:15	16:45	21600
5	16/07/2017	GP	None	7/8	10	F1	NW	17	12:15	15:15	10800
5	24/07/2017	GP	None	1/4	10	F1	NW	15	08:30	11:30	10800
5	11/08/2017	GP	none	04-Aug	10	F2	NW	17	14:30	17:30	10800
5	15/08/2017	GP	Occasional showers	06-Aug	10	F2	SW	15	10:30	13:30	10800
6	21/03/2017	RMD	Light	08-Aug	16	F1	SW	5	15:15	17:15	7200
6	22/03/2017	RMD	None	08-Aug	15	F2	N	2	09:50	13:50	14400
6	12/04/2017	GP	Light	1/4	1	F2	NW	8	11:00	14:00	10800
6	19/04/2017	GP	None	7/8	5	F1	SW	13	10:45	13:45	10800
6	06/05/2017	GP	None	08-Aug	5	F3	E	10	14:30	17:30	10800
6	20/05/2017	GP	None	1/2	10	F3	S	13	13:45	16:45	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
6	26/06/2017	KOC	None	08-Aug	15	F2	SE	15	09:15	12:15	10800
6	26/06/2017	KOC	Misty	08-Aug	5	F2	SE	14	12:45	15:45	10800
6	09/08/2017	GP	none	02-Aug	10	F2	NW	18	14:45	17:45	10800
6	15/08/2017	GP	none	04-Aug	10	F2	SW	16	14:00	17:00	10800
7	23/03/2017	RMD	Misty	08-Aug	15	F1	N	5	09:40	15:40	21600
7	09/04/2017	GP	None	08-Aug	5	F1	NW	8	07:45	10:45	10800
7	10/04/2017	GP	None	1/2	10	F2	NW	12	15:10	18:10	10800
7	22/05/2017	KOC	None	7/8	15	F3	SW	15	18:45	20:15	4800
7	23/05/2017	KOC	None	08-Aug	10	F3	W	15	09:50	11:20	4800
7	24/05/2017	KOC	None	5/8	10	F2	SW	18	10:50	13:50	10800
7	26/06/2017	KOC	Misty	08-Aug	3	F3	SE	14	16:15	17:15	3600
7	28/06/2017	KOC	None	08-Aug	15	F2	NW	17	11:50	14:50	10800
7	28/06/2017	KOC	None	08-Aug	15	F2	NW	16	15:25	17:25	7200
7	11/08/2017	GP	none	07-Aug	5	F2	NW	15	08:00	14:00	21600
8	16/03/2017	RMD	Light	08-Aug	5	F2	SW	6	09:40	15:40	21600
8	05/04/2017	GP	None	08-Aug	10	F1	NW	10	13:30	16:30	10800
8	18/04/2017	GP	None	08-Aug	10	F1	NW	10	08:00	11:00	10800
8	19/05/2017	KOC	Light	7/8	15	F3	SW	12	10:40	13:40	10800
8	19/05/2017	KOC	Light	7/8	5	F3	SW	12	14:10	17:10	10800
8	25/06/2017	KOC	None	7/8	15	F3	W	16	14:05	17:05	10800
8	25/06/2017	KOC	None	08-Aug	10	F2	NW	15	17:35	20:35	10800
8	10/08/2017	GP	none	08-Aug	5	F2	SW	13	09:30	12:30	10800
8	17/08/2017	GP	Occasional showers	07-Aug	10	F2	S	15	11:00	14:30	10800
9	13/03/2017	RMD	None	7/8	8	F2	SW	9	09:30	15:30	21600
9	18/04/2017	GP	None	7/8	10	F1	S	12	11:00	17:00	21600
9	22/05/2017	KOC	None	3/4	20	F3	SW	15	11:10	14:10	10800
9	22/05/2017	KOC	None	3/4	20	F3	SW	17	14:40	17:40	10800
9	27/06/2017	KOC	None	7/8	15	F3	S	18	10:40	13:40	10800
9	27/06/2017	KOC	None	3/4	15	F3	S	18	14:10	17:10	10800
9	10/08/2017	GP	none	05-Aug	10	F2	SW	17	13:00	16:00	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
9	17/08/2017	GP	Occasional showers	06-Aug	10	F3	SW	18	15:00	18:00	10800
10	15/03/2017	RMD	None	08-Aug	16	F1	SE	11	14:00	17:00	10800
10	22/03/2017	RMD	Light	7/8	15	F1	N	5	14:15	17:15	10800
10	08/04/2017	GP	None	08-Aug	5	F3	S	16	10:20	16:20	21600
10	23/05/2017	KOC	None	08-Aug	10	F3	W	15	12:00	15:00	10800
10	23/05/2017	KOC	None	5/8	10	F4	W	15	15:30	18:30	10800
10	19/06/2017	GP	None	1/2	5	F1	NE	22	12:30	15:30	10800
10	21/06/2017	GP	None	7/8	5	F1	S	18	08:20	12:30	14400
10	09/08/2017	GP	none	06-Aug	10	F3	N	14	08:15	14:15	21600
11	14/03/2017	RMD	None	3/8	16	F1	W	13	14:00	16:00	7200
11	15/03/2017	RMD	None	1/4	16	F1	SE	11	09:35	13:35	14400
11	22/04/2017	GP	None	08-Aug	10	F1	NE	13	12:30	15:30	10800
11	27/04/2017	GP	None	5/8	10	F2	NW	11	13:00	16:00	10800
11	24/05/2017	GP	None	08-Aug	2	F1	S	16	11:00	14:00	10800
11	26/05/2017	GP	None	08-Aug	10	F2	SE	17	08:00	11:00	10800
11	20/06/2017	JD	None	0/8	10	F1	S	21	10:30	17:00	21600
11	10/08/2017	RMD	None	08-Aug	10	F1	W	14	11:00	14:00	10800
11	17/08/2017	RMD	None	3/4	5	F1	SW	17	10:00	13:00	10800
12	13/03/2017	RMD	None	08-Aug	10	F1	SW	14	15:50	16:50	3600
12	14/03/2017	RMD	Misty	08-Aug	2	F1	SW	12	09:40	13:40	14400
12	14/03/2017	RMD	None	5/8	16	F1	SE	11	16:10	17:10	3600
12	22/04/2017	GP	None	1/4	5	F1	NE	8	08:30	11:30	10800
12	27/04/2017	GP	None	08-Aug	10	F2	NW	9	09:50	12:50	10800
12	24/05/2017	GP	None	3/8	2	F1	S	20	14:30	17:30	10800
12	26/05/2017	GP	None	7/8	2	F2	SE	21	11:30	14:30	10800
12	21/06/2017	JD	None	08-Aug	10	F1	SW	23	10:30	17:00	21600
12	10/08/2017	RMD	None	08-Aug	10	F1	W	15	14:15	16:15	7200
12	17/08/2017	RMD	Occasional showers	3/4	5	F1	SW	17	13:15	17:15	14400

Table 11: Details of timing, duration and weather conditions for UWF Grid Connection vantage point surveys undertaken during the non-breeding season in 2017/2018 (September 2017 to February 2018 inclusive)

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
1	05/09/2017	GP	Light drizzle	08-Aug	2	F1	W	13	10:20	13:20	10800
1	06/09/2017	GP	dry	08-Aug	2	F2	SW	15	15:15	18:15	10800
1	12/10/2017	GP	dry	06-Aug	10	F1	SW	7	07:30	10:30	10800
1	17/10/2017	GP	dry	03-Aug	10	F1	SW	11	11:15	14:15	10800
1	08/11/2017	GP	Occasional showers	04-Aug	5	F1	SW	4	07:00	13:00	21600
1	01/12/2017	GP	dry	01-Aug	10	F1	NW	3	11:00	17:00	21600
1	03/01/2018	OOG	Misty	3/4	3	F4	W	5	09:40	15:40	21600
1	06/02/2018	OOG	None	7/8	10	F2	N	3	13:05	16:05	10800
1	07/02/2018	OOG	Light	08-Aug	5	F1	SW	4	13:30	16:30	10800
2	05/09/2017	GP	dry	3/4	10	F2	SW	16	14:00	17:00	10800
2	13/09/2017	GP	Occasional showers	7/8	10	F2	W	11	13:30	16:30	10800
2	12/10/2017	GP	dry	05-Aug	10	F3	SW	12	11:00	14:00	10800
2	22/10/2017	GP	dry	08-Aug	5	F2	SW	10	10:00	13:00	10800
2	09/11/2017	GP	dry	02-Aug	10	F1	NW	9	11:30	17:30	21600
2	21/12/2017	GP	Occasional showers	08-Aug	1	F1	SW	10	11:00	17:00	21600
2	05/01/2018	SD	None	5/8	3	F1	SW	2	09:00	15:00	21600
2	06/02/2018	SD	None	01-Apr	10	F1	SE	1	10:30	16:30	21600
3	06/09/2017	GP	dry	7/8	2	F2	W	14	12:00	15:00	10800
3	07/09/2017	GP	Light drizzle	08-Aug	5	F3	W	14	14:30	17:30	10800
3	14/10/2017	GP	dry	08-Aug	2	F3	SE	15	16:20	19:20	10800
3	18/10/2017	GP	dry	08-Aug	10	F2	E	9	10:00	13:00	10800
3	15/11/2017	GP	misty	08-Aug	2	F1	SE	7	07:15	13:15	21600
3	07/12/2017	GP	dry	04-Aug	5	F1	W	5	11:00	17:00	21600
3	03/01/2018	GP	Occasional showers	08-Aug	1	F4	W	6	11:00	17:00	21600

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAIAR 2019, Chapter 8: Biodiversity/EIAIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
3	01/02/2018	GP	Occasional showers	1/2	10	F3	NW	5	12:00	18:00	21600
4	06/09/2017	GP	dry	1/2	5	F2	W	12	08:30	11:30	10800
4	08/09/2017	GP	Occasional showers	7/8	5	F2	W	14	12:30	15:30	10800
4	13/10/2017	GP	dry	08-Aug	5	F2	SW	16	08:10	11:10	10800
4	20/10/2017	GP	dry	08-Aug	5	F1	SW	6	10:10	13:10	10800
4	22/11/2017	KOC	Light	08-Aug	2	F2	N	7	13:30	16:30	10800
4	23/11/2017	KOC	None	01-Aug	15	F3	W	5	10:00	13:00	10800
4	05/12/2017	GP	dry	08-Aug	10	F1	SW	8	11:00	17:00	21600
4	19/01/2018	OOG	snow showers	7/8	2	F2	W	4	10:05	16:05	21600
4	06/02/2018	OOG	None	1/8	10	F2	NW	1	09:50	12:50	10800
4	07/02/2018	OOG	Light	08-Aug	5	F1	SW	0	10:00	13:00	10800
5	08/09/2017	GP	Occasional showers	1/2	10	F2	W	13	09:10	12:10	10800
5	13/09/2017	GP	Occasional showers	1/2	10	F3	W	9	10:00	13:00	10800
5	13/10/2017	GP	dry	08-Aug	2	F2	SW	17	12:30	15:30	10800
5	23/10/2017	GP	Occasional showers	07-Aug	5	F1	S	13	13:00	16:00	10800
5	22/11/2017	KOC	Occasional showers	08-Aug	4	F1	NE	11	10:00	13:00	10800
5	23/11/2017	KOC	None	03-Apr	15	F2	W	6	13:30	16:30	10800
5	06/12/2017	OOG	Misty	08-Aug	2	F1	S	10	10:05	16:05	21600
5	02/01/2018	OOG	Misty	7/8	2	F1	W	9	10:15	16:15	21600
5	02/02/2018	OOG	None	1/4	10	F1	W	6	10:40	16:40	21600
6	11/09/2017	OOG	None	03-Apr	5	F2	W	13	11:20	17:20	21600
6	23/10/2017	GP	dry	08-Aug	2	F1	SW	14	16:15	19:15	10800
6	25/10/2017	GP	dry	08-Aug	5	F1	SW	13	16:15	19:15	10800
6	13/11/2017	GP	drizzle	08-Aug	5	F1	SW	7	11:15	17:15	21600
6	03/12/2017	GP	dry	07-Aug	10	F1	W	7	10:30	13:30	10800
6	09/12/2017	GP	dry	08-Aug	10	F1	SW	4	14:00	17:00	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
6	05/01/2018	GP	Occasional showers	3/4	5	F2	SW	5	11:00	17:00	21600
6	02/02/2018	GP	dry	1/2	10	F1	NW	3	07:30	13:30	21600
7	28/11/2017	OOG	None	05-Aug	5	F2	N	6	03:00	05:00	7200
7	29/11/2017	SD	None	01-Apr	4	F3	N	3	07:00	09:15	7200
8	29/11/2017	OOG	None	01-Apr	2	F1	N	1	07:15	09:15	7200
8	28/11/2017	SD	None	05-Aug	4	F3	N	4	15:00	17:00	7200
9	29/11/2017	OOG	None	03-Apr	2	F1	N	5	15:00	17:30	7200
9	30/11/2017	OOG	None	07-Aug	2	F1	NW	3	07:15	09:15	7200
11	05/12/2017	OOG	None	07-Aug	2	F1	S	10	15:20	17:20	7200
11	06/12/2017	OOG	Heavy Showers	08-Aug	2	F1	S	10	07:30	09:30	7200
12	30/11/2017	SD	None	01-Apr	3	F3	N	2	07:00	09:14	7200
12	29/11/2017	SD	None	01-Apr	3	F3	N	4	15:12	17:12	7200
7	11/09/2017	RMD	Occasional showers	08-Aug	20	F2	W	13	11:05	17:05	21600
7	14/10/2017	HW	dry	08-Aug	2	F3	SE	15	08:00	14:00	21600
7	28/11/2017	OOG	None	05-Aug	5	F2	N	6	03:00	05:00	7200
7	29/11/2017	SD	None	01-Apr	4	F3	N	3	07:00	09:15	7200
7	07/12/2017	SD	Dry	1/8	3	F1	NW	4	08:30	16:30	21600
7	04/01/2018	SD	Light	08-Aug	2	F3	SW	5	09:00	15:00	21600
7	05/02/2018	SD	None	01-Feb	10	F1	SE	2	10:30	16:30	21600
8	12/09/2017	RMD	Light	5/8	15	F2	S	11	10:10	16:10	21600
8	17/10/2017	HW	dry	03-Aug	10	F1	SW	11	08:00	14:00	21600
8	29/11/2017	OOG	None	01-Apr	2	F1	N	1	07:15	09:15	7200
8	28/11/2017	SD	None	05-Aug	4	F3	N	4	15:00	17:00	7200
8	06/12/2017	SD	Light	08-Aug	2	F4	SW	8	08:30	16:30	21600
8	15/01/2018	OOG	Heavy Showers	7/8	4	F2	W	8	10:05	16:05	21600
8	01/02/2018	SD	None	03-Apr	10	F1	NW	3	09:30	16:00	21600
9	05/09/2017	OOG	None	05-Aug	10	F1	SW	18	10:00	13:00	10800
9	06/09/2017	OOG	None	05-Aug	5	F2	SW	19	13:50	16:50	10800

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIA 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
9	18/10/2017	HW	dry	08-Aug	10	F2	E	9	09:00	15:00	21600
9	29/11/2017	OOG	None	03-Apr	2	F1	N	5	15:00	17:30	7200
9	30/11/2017	OOG	None	07-Aug	2	F1	NW	3	07:15	09:15	7200
9	08/12/2017	SD	Dry	1/8	4	F1	NW	1	08:30	16:30	21600
9	03/01/2018	SD	Light	08-Aug	1	F4	SW	6	09:00	15:00	21600
9	02/02/2018	SD	None	01-Aug	10	F1	NW	2	10:00	16:00	21600
10	04/09/2017	OOG	None	08-Aug	2	F2	S	16	13:30	15:30	7200
10	12/09/2017	OOG	None	05-Aug	5	F2	S	15	11:30	17:30	21600
10	20/10/2017	HW	dry	08-Aug	5	F1	SW	6	09:00	15:00	21600
10	07/11/2017	GP	dry	03-Aug	5	F2	W	5	07:00	13:00	21600
10	03/12/2017	GP	dry	06-Aug	10	F1	W	8	14:00	17:00	10800
10	09/12/2017	GP	dry	08-Aug	10	F1	SW	4	09:00	12:00	10800
10	06/01/2018	GP	dry	3/8	10	F2	NE	4	09:30	12:30	10800
10	22/01/2018	GP	dry	7/8	2	F1	SW	6	10:30	13:30	10800
10	04/02/2018	GP	dry	0	10	F1	NW	1	07:30	13:30	21600
11	05/09/2017	OOG	None	05-Aug	10	F2	SW	19	13:50	16:50	10800
11	06/09/2017	OOG	None	05-Aug	5	F1	W	17	09:50	12:50	10800
11	22/10/2017	HW	dry	08-Aug	5	F2	SW	10	09:00	15:00	21600
11	07/11/2017	GP	Occasional showers	05-Aug	2	F2	W	6	14:30	17:30	10800
11	16/11/2017	GP	dry	01-Aug	10	F1	NW	8	14:15	17:15	10800
11	05/12/2017	OOG	None	07-Aug	2	F1	S	10	15:20	17:20	7200
11	06/12/2017	OOG	Heavy Showers	08-Aug	2	F1	S	10	07:30	09:30	7200
11	06/01/2018	GP	dry	1/2	10	F2	NE	4	14:00	17:00	10800
11	06/01/2018	GP	dry	1/2	10	F2	NE	4	14:00	17:00	10800
11	22/01/2018	GP	dry	7/8	2	F1	SW	7	14:30	17:30	10800
11	04/02/2018	GP	dry	1/2	10	F2	NE	6	15:00	18:00	10800
11	06/02/2018	GP	dry	1/2	10	F2	NW	3	10:00	13:00	10800
12	07/09/2017	OOG	Light	08-Aug	2	F2	W	14	09:45	12:45	10800
12	07/09/2017	OOG	None	07-Aug	5	F2	W	15	13:15	16:15	10800

VP Name	Date	Observer	Rain	Cloud 0/8 = no cloud 8/8 = fully overcast	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (s)
12	30/11/2017	SD	None	01-Apr	3	F3	N	2	07:00	09:14	7200
12	29/11/2017	SD	None	01-Apr	3	F3	N	4	15:12	17:12	7200
12	05/12/2017	OOG	None	08-Aug	5	F1	S	8	09:05	15:05	21600
12	02/01/2018	SD	Light	08-Aug	2	F3	SW	8	10:00	16:00	21600
12	05/02/2018	OOG	None	3/4	10	F2	SE	4	10:10	16:10	21600
12	23/10/2017	HW	Occasional showers	07-Aug	5	F1	S	13	09:00	15:00	21600

Table 12: Details of timing, duration and weather conditions for vantage point flight activity surveys undertaken at Upperchurch Windfarm during the breeding season in 2019 (April and July)

VP Name	Date	Observer	Rain	Cloud (Okta)	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (°C)	Start Time	End Time	Duration of survey (s)
UVP1	12/04/2019	TK	Dry	03-Aug	3	2	SE	9	10:40	13:40	10800
UVP 1	12/04/2019	TK	Dry	03-Aug	3	2	SE	12	14:10	17:10	10800
UVP 1	31/07/2019	JP	Dry	07-Aug	15	F2	W	14	09:16	12:16	10800
UVP 1	31/07/2019	JP	Dry	08-Aug	15	F3	SW	17	12:46	15:46	10800
UVP 2	18/04/2019	TK	Dry	03-Aug	3	2	SE	14	10:40	13:40	10800
UVP 2	18/04/2019	TK	Dry	03-Aug	3	2	SE	18	14:10	17:10	10800
UVP 2	10/07/2019	JP	Dry	08-Aug	5	F2	S	17	09:16	12:16	10800
UVP 2	10/07/2019	JP	Dry	08-Aug	5	F3	SW	21	12:46	15:46	10800
UVP 3	08/04/2019	TK	Dry	05-Aug	3	1	E	13	10:50	13:50	10800
UVP 3	08/04/2019	TK	Dry	05-Aug	3	1	E	13	14:20	17:20	10800
UVP 3	24/07/2019	TK	None	05-Aug	3	F2	SE	17	09:10	12:10	10800
UVP 3	24/07/2019	TK	None	05-Aug	3	F2	SE	20	12:40	15:40	10800
UVP 4	19/04/2019	TK	Dry	02-Aug	3	2	SE	13	10:55	13:55	10800
UVP 4	19/04/2019	TK	Dry	02-Aug	3	2	SE	19	14:25	17:25	10800
UVP 4	31/07/2019	TK	Dry	05-Aug	3	F2	W	14	08:10	11:10	10800
UVP 4	31/07/2019	TK	Dry	05-Aug	3	F2	W	17	11:40	14:40	10800
UVP 5	20/04/2019	TK	Dry	02-Aug	3	1	W	12	10:50	13:50	10800
UVP 5	20/04/2019	TK	Dry	02-Aug	3	1	W	19	14:20	15:20	10800
UVP 5	29/07/2019	TK	None	07-Aug	3	F2	NW	18	11:00	14:00	10800
UVP 5	29/07/2019	TK	None	07-Aug	3	F2	NW	18	14:30	17:30	10800
UVP 6	27/04/2019	TK	Dry	05-Aug	3	3	W	8	11:05	14:05	10800
UVP 6	27/04/2019	TK	Dry	05-Aug	3	2	W	11	14:35	17:35	10800
UVP 6	19/07/2019	DOC	Heavy showers	07-Aug	15	3	SW	19	10:38	13:38	10800
UVP 6	19/07/2019	DOC	Heavy showers	07-Aug	15	3	SW	19	14:08	17:08	10800
UVP 7	25/04/2019	TK	Dry	07-Aug	2	2	SE	12	11:00	14:00	10800
UVP 7	25/04/2019	TK	Dry	07-Aug	2	2	SW	15	14:30	17:30	10800
UVP 7	17/07/2019	DOC	Heavy showers	08-Aug	15	4	SW	20	10:58	13:58	10800
UVP 7	17/07/2019	DOC	Heavy showers	08-Aug	15	4	SW	20	14:28	17:28	10800
UVP 8	17/04/2019	TK	None	08-Aug	2	2	SE	11	10:30	13:30	10800

VP Name	Date	Observer	Rain	Cloud (Oktas)	Visibility (km)	Wind Speed (Bft)	Wind Direction	Temp (°C)	Start Time	End Time	Duration of survey (s)
UVP 8	17/04/2019	TK	None	07-Aug	2	2	SE	14	14:00	17:00	10800
UVP 8	25/07/2019	TK	Single shower	08-Aug	3	F3	SE	18	08:55	11:55	10800
UVP 8	25/07/2019	TK	Single shower	08-Aug	3	F3	SE	21	12:30	15:30	10800
UVP 9	11/04/2019	TK	Dry	04-Aug	3	2	SE	12	10:45	13:45	10800
UVP 9	11/04/2019	TK	Dry	04-Aug	3	2	SE	12	14:15	17:15	10800
UVP 9	26/07/2019	TK	Single shower	07-Aug	3	F3	SW	17	09:05	12:05	10800
UVP 9	26/07/2019	TK	None	07-Aug	3	F3	SW	18	12:50	15:50	10800
UVP 9	26/07/2019	TK	None	07-Aug	3	F3	SW	18	12:50	15:50	10800
UVP 10	26/04/2019	TK	Single shower	08-Aug	2	3	W	9	09:15	12:15	10800
UVP 10	26/04/2019	TK	Occasional showers	08-Aug	2	3	W	11	12:45	15:45	10800
UVP 10	11/07/2019	JP	Dry	07-Aug	10	F3	W	18	12:39	15:39	10800
UVP 10	11/07/2019	JP	Misty	08-Aug	5	F3	W	16	09:09	12:09	10800

A8-4.1.7 Hen Harrier Habitat Suitability Mapping 2019

In order to determine the availability of nesting and foraging habitats for Hen Harriers, all habitats within 2km of each nest location recorded since 2016 were evaluated in terms of suitability for breeding and/or foraging Hen Harrier. This was followed by in the field ground truthing carried out on the 2nd and 3rd of July 2019.

Methods

Habitats were initially identified using shapefiles provided from existing habitat information arising from the Hen Harrier SPA Mapping Project undertaken by NPWS (Moran & Wilson-Parr, 2015). However, these only relate to habitats within the SPA, so an additional mapping exercise was undertaken to extend the coverage to include non-SPA habitat within 2km of each nest. In addition to mapping non-SPA habitat within 2km of nest sites, all habitats within 2km of the UWF Grid Connection were mapped and classified in respect of Hen Harrier suitability. Habitats were initially identified from aerial photos. Where the identification of habitats from aerial photos could not be confirmed, a ground-truthing exercise was undertaken to check the habitats actually present. As well as identifying unknown habitats, the ground-truthing exercise also sampled a variety of the identified habitats to ensure the habitat identification process was accurate and robust.

All habitat parcels, including both polygons for fields (or areas-based habitats) and lines for linear habitats (such as hedgerows and treelines) were digitised, allowing accurate measurement of area or length.

The identified habitats were classed as suitable or unsuitable for both nesting and foraging (see Table 12 below). Habitats identified as suitable for nesting by Hen Harriers were wet grassland, peatland habitats (including heath), scrub, dense bracken and both pre- and post-thicket forestry (as per Ruddock *et al.*, 2016). Habitats considered unsuitable for nesting included agricultural grasslands (including improved grasslands and rough grazing), clearfell, hedgerows and treelines (Ruddock *et al.*, 2016).

The habitat mapping results comprising the extent of suitable and unsuitable foraging habitats within 2km of identified Hen Harrier nests are presented in Table 13.

Table 13: Habitat classification and suitability for Hen Harrier nesting and foraging

NPWS Habitat ¹ (habitats present within the SPA)	NPWS Code ²	Habitats (as mapped outside of the SPA)	Code	Suitability for:	
				Foraging	Nesting
Improved agricultural grassland	GA1	Improved grassland	GA1	N	N
Amenity grassland/buildings and artificial surfaces	BL3/GA2	(Not included) ³		N	N
Marsh	GM1	(Not recorded) ⁴		Y	N
Dry humid-acid grassland	GS3	Heath	HH	Y	Y
Heath	HH			Y	Y
Mosaic grassland; Clustered Juncus 30-39%	MG_C3	Rough Grassland	RG	Y	N
Mosaic grassland; Clustered Juncus 40-49%	MG_C4			Y	N
Mosaic grassland; Dispersed Juncus 30-39%	MG_D3			Y	N
Mosaic grassland; Dispersed Juncus 40-49%	MG_D4			Y	N
Rough Grassland	RG			Y	N
Upland blanket bog	PB2	Bogs	PB	Y	Y
Cutover bog	PB4			Y	Y
Bracken	HD1	Bracken	HD1	Y	Y
Scrub	WS1	Scrub	WS1	Y	Y
Mixed broadleaved woodland	WD1	Mixed broadleaved woodland	WD1	N	N
Riparian woodland	WN5	Riparian woodland	WN5	N	N
Conifer plantation (unknown age)	FOR_UNK	(Not recorded)		Unknown	Unknown
Unproductive sparse conifer plantation	FOR_UNPRO	Pre-thicket conifer plantation	PRE	Y	Y
Conifer plantation (<3 yrs old)	FOR<3YR			Y	Y
Conifer plantation (4-8 yrs old)	FOR4_8			Y	Y
Conifer plantation (9-12 yrs old)	FOR9_12			Y	Y
Conifer plantation (13-14 yrs old)	FOR13_14	Post-thicket conifer plantation	POST	N	Y
Conifer plantation (>15 yrs old)	FOR>15yr			N	Y
Clear-fell conifer plantation	FOR_CL	Clear-fell	CF	Y	N

Results of the Surveys are presented below .

¹ Based on Moran & Wilson-Parr (2015)

² Derived from Fossit (2000) within Moran & Wilson-Parr (2015)

³ Recorded within the SPA but not included in the areas mapped outside of the SPA due to being unsuitable for Hen Harrier nesting and foraging

⁴ Not recorded in areas outside of the SPA during mapping and ground truthing exercises

8.4.2 Survey Results Hen Harrier

Table 14 Extent of suitable and unsuitable foraging habitats within 2km of identified Hen Harrier nests (conducted in May 2019)

Nest	Foraging			Nesting	
	Suitable Habitat (ha)	Unsuitable Habitat (ha)	Linear Habitats (m)	Suitable Habitat (ha)	Unsuitable Habitat (ha)
A	420	836	76,999	460	796
B	491	765	34,021	932	324
C	474	782	23,094	873	383
D	646	610	30,679	921	335
E	681	575	13,471	966	290
F	646	610	36,713	803	453
G1	566	690	40,971	701	555
G2	572	684	37,485	714	542
G3	555	701	36,297	701	555
H1	644	612	24,112	935	321
H2	636	620	22,961	872	384
I	442	814	13,050	1,091	165
J	475	781	25,908	922	334
G1 + G2 + G3	583	847	42,853	726	704
H1 + H2	696	777	28,288	1,015	458
All nests	3,580	4,763	255,011	3,580	4,763

Table 15: Distance of Hen Harrier roost sites recorded in the non-breeding season of 2016/17 to the nearest construction area boundaries

Roost Location	Habitat Type	Distance (m) from nearest construction area boundaries	Year
1	HB	3322	2016/2017
2	HB	2109	2016/2017
3	HB	3634	2016/2017

A8.4.2.1 Nest Triangulation Vantage Point Surveys UWF Grid Connection - 2019

Table 16: Details of Hen Harrier sightings and the habitats over which the birds were observed from nest triangulation vantage point surveys undertaken undertaken April, June and July 2019

G = Grazing; RG = Rough Grazing; HB = Heath or bog; DE = Deciduous woodland or scrub; GO = Gorse; CF = Clear fell; NF2 = New forestry plantation trees 20-30cm high; NF3 = New forestry plantation trees c 1m high; NF4= New forestry plantation trees > 2m high; 2nd F1/F2 = Second rotation forestry plantation trees 20-30cm high; 2nd F3 = Second rotation forestry plantation trees c 1m high; 2nd F4 = Second rotation forestry plantation trees > 2m high; F= Post thicket forestry

VP Name	Date	Species	Sex	Time of sighting	G	R	HB	D	G	C	NF	NF	NF	NF	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
NTVP1	12/04/19	Hen Harrier	Male/ Female	15:00			130												130
NTVP2	12/04/19	Nil Sightings																	
NTVP3	16/04/19	Hen Harrier	Male/ Female	10:12			120							20					140
NTVP4	16/04/19	Hen Harrier	Male/ Female	11:30			300							300					330
NTVP5	16/04/19	Nil Sightings																	
NTVP6	17/04/19	Nil Sightings																	
NTVP7	18/04/19	Hen Harrier	Male/ Female	09:15			40												40
NTVP8	18/04/19	Hen Harrier	Male	13:30			350												350
NTVP9	19/04/19	Hen Harrier	Male	14:28			60											60	60
NTVP10	20/04/19	Nil Sightings																	

VP Name	Date	Species	Sex	Time of sighting	G	R	HB	D	G	C	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
NTVP11	21/04/19	Hen Harrier	Male/ Female	11:05			45							15					60
NTVP12	21/04/19	Nil Sightings																	
NTVP13	22/04/19	Nil Sightings																	
NTVP14	23/04/19	Hen Harrier	Male/ Female	14:15														420	
NTVP17	23/04/19	Hen Harrier	Male/ Female	17:45			80												80
NTVP4	29/06/19	Hen Harrier	Male	09:30												20			20
NTVP18	29/06/19	Hen Harrier	Female	09:45			30							20					50
NTVP17	29/06/19	Hen Harrier	Female	17:45			60												
NTVP1	02/07/19	Hen Harrier	Male/ Female/ Juv	08:20			4370												4370
NTVP15	02/07/19	Hen Harrier	Male	11:00			240												240
NTVP16	04/07/19	Hen Harrier	Male/ Female	10:50			30												30
NTVP14	04/07/19	Nil Sightings																	
NTVP8	05/07/19	Hen Harrier	Male	10:25			70											100	220

VP Name	Date	Species	Sex	Time of sighting	G	R	HB	D	G	C	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
NTVP17	05/07/19	Nil Sightings																	
NTVP3	08/07/19	Nil Sightings																	
NTVP11	08/07/19	Nil Sightings																	
NTVP18	09/07/19	Hen Harrier	Male	08:30			x												
NTVP18	09/07/19	Hen Harrier	Female	08:45			x												
NTVP19	09/07/19	Nil Sightings																	

Table 17: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for nest triangulation vantage point surveys undertaken April, June and July 2019

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
NTVP1	12/04/19	Hen Harrier	Male/ Female		130						130	Male and female Hen Harrier courting around traditional nest site in failed forestry/heather
NTVP2	12/04/19	Nil Sightings										
NTVP3	16/04/19	Hen Harrier	Male/ Female		140						140	Male and female Hen Harrier courting around traditional nest site in failed forestry/heather
NTVP4	16/04/19	Hen Harrier	Male/ Female		300	30					330	Male and female Hen Harrier courting around traditional nest site in failed forestry/heather
NTVP5	16/04/19	Nil Sightings										
NTNTVP6	17/04/19	Nil Sightings										
NTVP7	18/04/19	Hen Harrier	Male/ Female		40						40	Male and female Hen Harrier courting around traditional nest site in failed forestry/heather bog.
NTVP8	18/04/19	Hen Harrier	Male		40		250	50	10		350	Male hunting/circling around traditional nest site in heather bog, no sightings of female.
NTVP9	19/04/19	Hen Harrier	Male	40				20			60	No Hen Harrier sightings at Goulmore, but male seen rising from Mauher Slieve and flying south east.
NTVP10	20/04/19	Nil Sightings										

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
NTVP11	21/04/19	Hen Harrier	Male/ Female	10	20		30				60	Male and female Hen Harrier courting around traditional nest site in heather bog.
NTVP12	21/04/19	Nil Sightings										
NTVP13	22/04/19	Nil Sightings										
NTVP14	23/04/19	Hen Harrier	Male/ Female	300		100		20			420	Male and female Hen Harrier courting around traditional nest site in failed forestry/heather, female skydancing.
NTVP17	23/04/19	Hen Harrier	Male/ Female		80						80	Male and female Hen Harrier courting around traditional nest site in failed forestry/heather
NTVP4	29/06/19	Hen Harrier	Male				20				20	Male hunting.
NTVP18	29/06/19	Hen Harrier	Female					50			50	Female with prey to nest.
NTVP17	29/06/19	Hen Harrier	Female				60					Female hunting around traditional territory but no evidence of breeding.
NTVP1	02/07/19	Hen Harrier	Male/ Female/ juvenile				4300	70			4370	Male , female and at least one juvenile, flying/hunting around area where seen courting in spring; traditional territory.
NTVP15	02/07/19	Hen Harrier	Male				240				240	Male hunting but no evidence of a nest.
NTVP16	04/07/19	Hen Harrier	Male/ Female							30	30	Male to Female foodpass.

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
NTVP14	04/07/19	Nil Sightings										
NTVP8	05/07/19	Hen Harrier	Male	100			50	60		10	220	Flew south 5km to Toorlougher, food pass to female.
NTVP17	05/07/19	Nil Sightings										
NTVP3	08/07/19	Nil Sightings										
NTVP11	08/07/19	Nil Sightings										
NTVP18	09/07/19	Hen Harrier	Male	120			120					
NTVP18	09/07/19	Hen Harrier	Female	210				210				Female flying around nest site.
NTVP19	09/07/19	Nil Sightings										

A8.4.2.2 Hen Harrier Surveys – Breeding Season 2016

Table 18: Details of UWF Grid Connection Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the breeding season in 2016

G = Grazing; RG = Rough Grazing; HB = Heath or bog; DE = Deciduous woodland or scrub; GO = Gorse; CF = Clear fell; NF2 = New forestry plantation trees 20-30cm high; NF3 = New forestry plantation trees c 1m high; NF4= New forestry plantation trees > 2m high; 2nd F1/F2 = Second rotation forestry plantation trees 20-30cm high; 2nd F3 = Second rotation forestry plantation trees c 1m high; 2nd F4 = Second rotation forestry plantation trees > 2m high; F= Post thicket forestry

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)		
1	11/03/16	Nil Sightings																			
1	15/03/16	Nil Sightings																			
2	15/03/16	Nil Sightings																			
2	21/03/16	Nil Sightings																			
3	11/03/16	Nil Sightings																			
3	13/03/16	Nil Sightings																			
4	12/03/16	Nil Sightings																			
4	21/03/16	Hen Harrier	M	13:40														F		30	
4	21/03/16	Hen Harrier	F	13:50																300	
5	12/03/16	Nil Sightings																			
5	13/03/16	Nil Sightings																			
6	12/03/16	Nil Sightings																			
6	21/03/16	Hen Harrier	M	11:39		RG															558
6	21/03/16	Hen Harrier	M	11:48														F		240	
6	21/03/16	Hen Harrier	M	11:48			HB														50

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
6	21/03/16	Hen Harrier	M	11:49			HB												20
6	21/03/16	Hen Harrier	F	11:49			HB												40
7	13/03/16	Nil Sightings																	
7	14/03/16	Nil Sightings																	
8	15/03/16	Hen Harrier	M	17:35		RG				CF									3
8	16/03/16	Hen Harrier	M	10:35		RG				CF									10
9	16/03/16	Hen Harrier	F	12:53				DE		CF									28
9	16/03/16	Hen Harrier	F	14:03		RG		DE											10
10	14/03/16	Hen Harrier	M	14:03			HB												30
11	15/03/16	Nil Sightings																	
12	14/03/16	Hen Harrier	M	12:07						CF									13
12	14/03/16	Hen Harrier	F	12:07						CF									13
1	04/04/16	Hen Harrier	M	11:05							NF1								8
1	04/04/16	Hen Harrier	M	11:05				DE											20
1	04/04/16	Hen Harrier	M	11:05							NF1								10
1	04/04/16	Hen Harrier	M	11:05														F	10
1	21/04/16	Nil Sightings																	
2	07/04/16	Hen Harrier	M	08:53			HB											F	420
2	07/04/16	Hen Harrier	M	09:00			HB												2100
2	07/04/16	Hen Harrier	M	09:35			HB											F	1140
2	07/04/16	Hen Harrier	M	09:55		RG	HB											F	360

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
2	07/04/16	Hen Harrier	F+M	10:01			HB											F	240
2	07/04/16	Hen Harrier	F	10:05		RG	HB											F	180
2	09/04/16	Hen Harrier	F	15:10			HB											F	10
2	09/04/16	Hen Harrier	F	15:45														F	180
2	09/04/16	Hen Harrier	F	17:10		RG												F	270
3	08/04/16	Hen Harrier	F	10:05		RG	HB											F	180
3	04/04/16	Hen Harrier	M+2 F's	14:50														F	270
4	05/04/16	Hen Harrier	F	12:13			HB												20
4	05/04/16	Hen Harrier	F	13:47			HB												20
5	05/04/16	Hen Harrier	F	10:27			HB												2100
5	05/04/16	Hen Harrier	M	09:00			HB												1140
5	05/04/16	Hen Harrier	M	09:35			HB											F	40
5	05/04/16	Hen Harrier	M	09:55		RG	HB											F	360
5	17/04/16	Nil Sightings																	
6	06/04/16	Hen Harrier	F	10:50			HB												90
6	07/04/16	Hen Harrier	F+M	16:26			HB					NF2							120
6	07/04/16	Hen Harrier	M+M	16:46			HB												40
6	07/04/16	Hen Harrier	M+M	16:48														F	300
6	25/04/16	Hen Harrier	1 st y M	17:00			HB											F	1200
6	25/04/16	Hen Harrier	F	17:00			HB											F	120

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
6	25/04/16	Hen Harrier	F+ad M	18:10			HB											F	1800
6	25/04/16	Hen Harrier	2ad M's	18:40														F	30
7	07/04/16	Nil Sightings																	
7	25/04/16	Nil Sightings																	
8	06/04/16	Nil Sightings																	
9	06/04/16	Nil Sightings																	
9	07/04/16	Nil Sightings																	
10	17/04/16	Hen Harrier	3xM's	15:35														F	1200
10	25/04/16	Hen Harrier	M+F	13:30			HB											F	1800
11	05/04/16	Nil Sightings																	
12	04/04/16	Hen Harrier	M	12:15				DE										F	60
12	04/04/16	Hen Harrier	F	13:15														F	35
12	04/04/16	Hen Harrier	M	14:10														F	57
12	04/04/16	Hen Harrier	M	14:35														F	3
12	04/04/16	Hen Harrier	M	16:20														F	20
1	06/05/16	Nil Sightings																	
1	10/05/16	Nil Sightings																	
2	06/05/16	Hen Harrier	F	09:05			HB											F	45
2	06/05/16	Hen Harrier	M	09:05			HB											F	60
2	18/05/16	Hen Harrier	M	12:45			HB											F	130

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)		
3	04/05/16	Nil Sightings																			
3	06/05/16	Nil Sightings																			
4	04/05/16	Nil Sightings																			
4	19/05/16	Nil Sightings																			
5	04/05/16	Hen Harrier	M	14:05			HB												15		
5	12/05/16	Hen Harrier	M	10:05		RG													13		
6	05/05/16	Hen Harrier	F	15:30														F	250		
6	13/05/16	Hen Harrier	M	13:25			HB											F	1020		
6	13/05/16	Hen Harrier	M	13:25			HB											F	1500		
7	05/05/16	Nil Sightings																			
7	19/05/16	Nil Sightings																			
8	20/05/16	Hen Harrier	M	13:40	G														6		
9	13/05/16	Hen Harrier	F	10:55		RG		DE											20		
9	13/05/16	Hen Harrier	F	15:03		RG		DE											187		
10	05/05/16	Hen Harrier	M	08:10														F	180		
10	05/05/16	Hen Harrier	F	09:05														F	70		
10	05/05/16	Hen Harrier	M	10:15			HB												20		
10	05/05/16	Hen Harrier	F	10:20														F	600		
10	13/05/16	Hen Harrier	M	09:36														F	660		
10	13/05/16	Hen Harrier	M	09:40														F	500		
11	09/05/16	Nil Sightings																			

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
12	11/05/16	Nil Sightings																		
1	07/06/16	Nil Sightings																		
1	09/06/16	Hen Harrier	M	11:15				DE											14	
2	09/06/16	Hen Harrier	M	17:15			HB											F	55	
2	09/06/16	Hen Harrier	F	17:15			HB											F	30	
2	15/06/16	Hen Harrier	M	08:40			HB												20	
2	15/06/16	Hen Harrier	F	08:40			HB												30	
2	15/06/16	Hen Harrier	M	10:15			HB												30	
2	15/06/16	Hen Harrier	F	10:15			HB												30	
3	07/06/16	Nil Sightings																		
3	15/06/16	Hen Harrier	M	13:25			HB												175	
4	08/06/16	Hen Harrier	M	11:05			HB												20	
4	13/06/16	Hen Harrier	M	16:10			HB												30	
5	03/06/16	Nil Sightings																		
5	13/06/16	Hen Harrier	M	11:20			HB												25	
6	11/06/16	Nil Sightings																		
6	13/06/16	Hen Harrier	M	14:30			HB											F	30	
6	13/06/16	Hen Harrier	F	14:30			HB											F	20	
7	03/06/16	Nil Sightings																		
7	08/06/16	Nil Sightings																		
8	10/06/16	Hen Harrier	M	11:18	G	RG													21	

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
9	03/06/16	Nil Sightings																		
10	11/06/16	Hen Harrier	M	14:30														F	15	
10	11/06/16	Hen Harrier	M	15:50			HB												45	
10	17/06/16	Hen Harrier	F	10:55														F	10	
11	09/06/16	Nil Sightings																		
12	08/06/16	Hen Harrier	M	10:05														F	4	
12	08/06/16	Hen Harrier	M	12:20														F	11	
12	08/06/16	Hen Harrier	M	13:55														F	476	

Table 19: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point surveys undertaken during the breeding season in 2016

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
1	11/03/16	Nil Sightings										
1	15/03/16	Nil Sightings										
2	15/03/16	Nil Sightings										
2	21/03/16	Nil Sightings										
3	11/03/16	Nil Sightings										
3	13/03/16	Nil Sightings										
4	12/03/16	Nil Sightings										
4	21/03/16	Hen Harrier	M			DI					30	1x male and 1x female HH over traditional nest site
4	21/03/16	Hen Harrier	F	S							300	
5	12/03/16	Nil Sightings										
5	13/03/16	Nil Sightings										
6	12/03/16	Nil Sightings										
6	21/03/16	Hen Harrier	M				H				558	1x male and 1 x female HH circling together.
6	21/03/16	Hen Harrier	M					FL			240	
6	21/03/16	Hen Harrier	M				H				50	
6	21/03/16	Hen Harrier	M		C						20	
6	21/03/16	Hen Harrier	F		C						40	
7	13/03/16	Nil Sightings										
7	14/03/16	Nil Sightings										

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
8	15/03/16	Hen Harrier	M					FI			3	1x male HH seen at 17:35 flying over RG and CF
8	16/03/16	Hen Harrier	M					FI			10	1x male HH seen at 10:35 flying over RG and gorse
9	16/03/16	Hen Harrier	F					FI			28	1x female HH seen at 12:53 flying over CF & DE,
9	16/03/16	Hen Harrier	F					FI			10	
10	14/03/16	Hen Harrier	M	S							30	2 Golden Plover
11	15/03/16	Nil Sightings										
12	14/03/16	Hen Harrier	M		C						13	1x male HH and 1x female HH seen at 12:07 circling each other high over CF
12	14/03/16	Hen Harrier	F		C						13	
1	04/04/16	Hen Harrier	M				H				8	
1	04/04/16	Hen Harrier	M				H				20	
1	04/04/16	Hen Harrier	M				H				10	
1	04/04/16	Hen Harrier	M				H				10	
1	21/04/16	Nil Sightings										
2	07/04/16	Hen Harrier	M		C						420	1x male and 1 x female HH over traditional nest site
2	07/04/16	Hen Harrier	M						P		2100	
2	07/04/16	Hen Harrier	M			DI					1140	
2	07/04/16	Hen Harrier	M			DI					360	
2	07/04/16	Hen Harrier	F+M		C						240	
2	07/04/16	Hen Harrier	F	S							180	

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
2	09/04/16	Hen Harrier	F	S							10	
2	09/04/16	Hen Harrier	F		C						180	
2	09/04/16	Hen Harrier	F	S							270	
3	08/04/16	Hen Harrier	F	S							180	
3	04/04/16	Hen Harrier	M+2F ^s	S							270	1x male and 1 x female HH over traditional nest site
4	05/04/16	Hen Harrier	F		C						20	
4	05/04/16	Hen Harrier	F				H				20	
5	05/04/16	Hen Harrier	F				H				2100	
5	05/04/16	Hen Harrier	M						P		1140	
5	05/04/16	Hen Harrier	M			DI					40	
5	05/04/16	Hen Harrier	M			DI					360	
5	17/04/16	Nil Sightings										
6	06/04/16	Hen Harrier	F				H				90	
6	07/04/16	Hen Harrier	F+M		C						120	1x male and 1 x female HH courting over suitable nesting habitat
6	07/04/16	Hen Harrier	M+M	S							40	
6	07/04/16	Hen Harrier	M+M	S							300	
6	25/04/16	Hen Harrier	1 st y M			DI					1200	1x male HH (Ringtail) skydancing
6	25/04/16	Hen Harrier	F		C						120	
6	25/04/16	Hen Harrier	F+ad M	S	C			FL			1800	

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
6	25/04/16	Hen Harrier	2ad M's	S				FL			30	
7	07/04/16	Nil Sightings										
7	25/04/16	Nil Sightings										
8	06/04/16	Nil Sightings										
9	06/04/16	Nil Sightings										
9	07/04/16	Nil Sightings										
10	17/04/16	Hen Harrier	3xM's	S				FL			1200	
10	25/04/16	Hen Harrier	M+F	S	C	DI		FL			1800	1x male and 1x female HH courting over suitable nesting habitat
11	05/04/16	Nil Sightings										
12	04/04/16	Hen Harrier	M	S							60	1x male HH soaring both in a S-N and N-S directions.
12	04/04/16	Hen Harrier	F					FL			35	1x female HH flying over forestry in an East-West direction landing into forestry.
12	04/04/16	Hen Harrier	M					FL	P		57	1x male HH flying in an E-W direction over forestry and then perches in forestry.
12	04/04/16	Hen Harrier	M					FL			3	1x male HH flying in an E-W direction over forestry
12	04/04/16	Hen Harrier	M					FL			20	1x male HH flying in an E-W direction over forestry
1	06/05/16	Nil Sightings										
1	10/05/16	Nil Sightings										
2	06/05/16	Hen Harrier	F					FL	P		45	
2	06/05/16	Hen Harrier	M					FL	P		60	

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
2	18/05/16	Hen Harrier	M	S			H	FL			130	
3	04/05/16	Nil Sightings										
3	06/05/16	Nil Sightings										
4	04/05/16	Nil Sightings										
4	19/05/16	Nil Sightings										
5	04/05/16	Hen Harrier	M				H				15	
5	12/05/16	Hen Harrier	M				H				13	
6	05/05/16	Hen Harrier	F	S							250	
6	13/05/16	Hen Harrier	M		C			FL			1020	1x adult male HH
6	13/05/16	Hen Harrier	M		C			FL			1500	1 st year male HH; ringtail
7	05/05/16	Nil Sightings										
7	19/05/16	Nil Sightings										
8	20/05/16	Hen Harrier	M					FL			6	
9	13/05/16	Hen Harrier	F	S							20	
9	13/05/16	Hen Harrier	F	S				FL			187	
10	05/05/16	Hen Harrier	M		C	DI					180	
10	05/05/16	Hen Harrier	F		C						70	
10	05/05/16	Hen Harrier	M				H				20	
10	05/05/16	Hen Harrier	F		C						600	
10	13/05/16	Hen Harrier	M	S		DI		FL			660	2 adult male HH together
10	13/05/16	Hen Harrier	M	S				FL			500	

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
11	09/05/16	Nil Sightings										
12	11/05/16	Nil Sightings										
1	07/06/16	Nil Sightings										
1	09/06/16	Hen Harrier	M				H				14	
2	09/06/16	Hen Harrier	M					FL			55	1x female and male HH together, no food pass seen
2	09/06/16	Hen Harrier	F					FL			30	
2	15/06/16	Hen Harrier	M					FL		FP	20	
2	15/06/16	Hen Harrier	F					FL		FP	30	
2	15/06/16	Hen Harrier	M					FL		FP	30	Food pass
2	15/06/16	Hen Harrier	F					FL		FP	30	Food pass
3	07/06/16	Nil Sightings										Food pass
3	15/06/16	Hen Harrier	M				H				175	Food pass
4	08/06/16	Hen Harrier	M				H				20	
4	13/06/16	Hen Harrier	M				H				30	
5	03/06/16	Nil Sightings										
5	13/06/16	Hen Harrier	M				H				25	Begging calls from female HH heard
6	11/06/16	Nil Sightings										
6	13/06/16	Hen Harrier	M					FL		FP	30	Food pass
6	13/06/16	Hen Harrier	F					FL		FP	20	Food pass
7	03/06/16	Nil Sightings										

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
7	08/06/16	Nil Sightings										
8	10/06/16	Hen Harrier	M				H				21	1x male HH flew low from N-S hunting over RG and grazing
9	03/06/16	Nil Sightings										
10	11/06/16	Hen Harrier	M					FL			15	1x male HH carrying prey into dead ground food pass not seen
10	11/06/16	Hen Harrier	M				H				45	
10	17/06/16	Hen Harrier	F					FL		FP	10	Begging calls from female HH heard
11	09/06/16	Nil Sightings										
12	08/06/16	Hen Harrier	M		C			FL			4	1x male HH, 3 sightings. Possible Food pass
12	08/06/16	Hen Harrier	M					FL			11	
12	08/06/16	Hen Harrier	M	S				FL			476	

A8.4.2.3 Hen Harrier Surveys – Non-Breeding Season 2016/2017

Table 20: Details of UWF Grid Connection Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the non - breeding season in 2016/17

G = Grazing; RG = Rough Grazing; HB = Heath or bog; DE = Deciduous woodland or scrub; GO = Gorse; CF = Clear fell; NF2 = New forestry plantation trees 20-30cm high; NF3 = New forestry plantation trees c 1m high; NF4= New forestry plantation trees > 2m high; 2nd F1/F2 = Second rotation forestry plantation trees 20-30cm high; 2nd F3 = Second rotation forestry plantation trees c 1m high; 2nd F4 = Second rotation forestry plantation trees > 2m high; F= Post thicket forestry

VP ID	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
1	13/09/16	Nil Sightings																		
10	13/09/16	Hen Harrier	Male	19:09			X													30
10	13/09/16	Hen Harrier	Male	19:15														X		10
4	14/09/16	Hen Harrier	Male	08:00			X													15
3	15/09/16	Hen Harrier	Juvenile	19:35		X														20
5	16/09/16	Nil Sightings																		
6	16/09/16	Hen Harrier	Juvenile	19:32			X													60
6	16/09/16	Hen Harrier	Male	19:38			X													30
2	17/09/16	Hen Harrier	Male	08:16			X													80
2	17/09/16	Nil Sightings																		
10	18/09/16	Hen Harrier	Immature Male	07:31			X													20
5	18/09/16	Nil Sightings																		
6	19/09/16	Hen Harrier	Juvenile	07:13			X													10
1	19/09/16	Nil Sightings																		
3	20/09/16	Hen Harrier	Juvenile	07:10		X	X													15

VP ID	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
4	20/09/16	Hen Harrier	Male	18:28			X												70
4	20/09/16	Hen Harrier	Juvenile	19:28		X													20
12	20/09/16	Nil Sightings																	
12	20/09/16	Nil Sightings																	
11	21/09/16	Nil Sightings																	
11	21/09/16	Nil Sightings																	
7	22/09/16	Nil Sightings																	
7	22/09/16	Nil Sightings																	
8	27/09/16	Nil Sightings																	
8	27/09/16	Nil Sightings																	
9	28/09/16	Nil Sightings																	
9	28/09/16	Hen Harrier	Male	17:25		X													60
1	15/10/16	Nil Sightings																	
10	15/10/16	Hen Harrier	Male	17:45			X												20
10	15/10/16	Hen Harrier	Male	17:45			X												2820
10	15/10/16	Hen Harrier	Male	18:32			X												10
5	16/10/16	Nil Sightings																	
2	16/10/16	Nil Sightings																	
7	17/10/16	Nil Sightings																	
4	18/10/16	Nil Sightings																	
3	18/10/16	Nil Sightings																	

VP ID	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
6	19/10/16	Nil Sightings																		
1	20/10/16	Nil Sightings																		
6	20/10/16	Hen Harrier	Male	18:44			X												30	
7	21/10/16	Nil Sightings																		
5	21/10/16	Nil Sightings																		
4	22/10/16	Nil Sightings																		
10	24/10/16	Hen Harrier	Female	08:15			X												25	
10	24/10/16	Hen Harrier	Male	08:17			X												40	
10	24/10/16	Hen Harrier	Male	08:30			X												30	
11	24/10/16	Hen Harrier	Male	16:29			X												10	
11	24/10/16	Hen Harrier	Male	18:32			X												13	
3	25/10/16	Nil Sightings																		
11	25/10/16	Nil Sightings																		
12	25/10/16	Nil Sightings																		
12	26/10/16	Nil Sightings																		
8	26/10/16	Nil Sightings																		
8	27/10/16	Hen Harrier	Male	09:50		X													13	
9	27/10/16	Nil Sightings																		
9	28/10/16	Nil Sightings																		
2	29/10/16	Nil Sightings																		
9	20/11/16	Nil Sightings																		

VP ID	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)		
5	21/11/16	Nil Sightings																			
6	21/11/16	Hen Harrier	Juvenile	16:18		X														40	
8	22/11/16	Nil Sightings																			
3	22/11/16	Nil Sightings																			
9	23/11/16	Nil Sightings																			
4	23/11/16	Hen Harrier	Juvenile	15:20			X													10	
6	24/11/16	Nil Sightings																			
8	25/11/16	Nil Sightings																			
4	28/11/16	Nil Sightings																			
5	28/11/16	Hen Harrier	Immature Male	15:09		X														360	
1	28/11/16	Nil Sightings																			
1	28/11/16	Nil Sightings																			
12	28/11/16	Nil Sightings																			
12	28/11/16	Nil Sightings																			
2	29/11/16	Nil Sightings																			
2	29/11/16	Hen Harrier	Female	16:51		X	X													20	
11	29/11/16	Nil Sightings																			
11	29/11/16	Hen Harrier	Female	16:24			X													12	
11	29/11/16	Hen Harrier	Male	16:47			X													947	
11	29/11/16	Hen Harrier	Male	16:52			X													11	

VP ID	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
3	30/11/16	Nil Sightings																		
7	30/11/16	Nil Sightings																		
7	30/11/16	Nil Sightings																		
10	30/11/16	Nil Sightings																		
10	30/11/16	Nil Sightings																		
2	15/12/16	Nil Sightings																		
2	15/12/16	Nil Sightings																		
12	16/12/16	Nil Sightings																		
5	16/12/16	Nil Sightings																		
11	19/12/16	Nil Sightings																		
6	19/12/16	Hen Harrier	Immature Female	16:08	X	X													20	
6	20/12/16	Hen Harrier	Male	09:02	X	X												X	36	
12	20/12/16	Nil Sightings																		
5	21/12/16	Nil Sightings																		
10	21/12/16	Nil Sightings																		
10	22/12/16	Nil Sightings																		
11	22/12/16	Hen Harrier	Male	16:00			X											X	642	
11	22/12/16	Hen Harrier	Male	16:15			X											X	212	
11	22/12/16	Hen Harrier	Female	16:21			X												7	
	23/12/16	Hen Harrier	Male	14:10																

VP ID	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
11	17/01/17	Hen Harrier	Male	08:55		X												X	18
11	17/01/17	Hen Harrier	Male	17:03			X												15
12	18/01/17	Nil Sightings																	
5	18/01/17	Nil Sightings																	
5	19/01/17	Nil Sightings																	
12	19/01/17	Nil Sightings																	
6	25/01/17	Nil Sightings																	
10	25/01/17	Nil Sightings																	
10	27/01/17	Nil Sightings																	
3	27/01/17	Nil Sightings																	
2	29/01/17	Nil Sightings																	
2	29/01/17	Nil Sightings																	
3	31/01/17	Nil Sightings																	
6	31/01/17	Nil Sightings																	
11	08/02/17	Hen Harrier	Male	17:25			X												14
11	08/02/17	Hen Harrier	Male	17:40			X												5
12	09/02/17	Nil Sightings																	
2	10/02/17	Hen Harrier	Male	10:10			X												15
5	10/02/17	Nil Sightings																	
6	11/02/17	Nil Sightings																	
3	12/02/17	Hen Harrier	Male	15:20			X												12

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP ID	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF 1	NF 2	NF 3	NF 4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
3	12/02/17	Hen Harrier	Male	15:35			X												10
3	12/02/17	Hen Harrier	Male	17:10			X												10
5	13/02/17	Nil Sightings																	
10	14/02/17	Hen Harrier	Male	16:00			X												6
10	14/02/17	Hen Harrier	Male	17:30			X												8
10	14/02/17	Hen Harrier	Ringtail	17:45														X	20
3	15/02/17	Nil Sightings																	
11	16/02/17	Hen Harrier	Ringtail	07:34			X												5
11	16/02/17	Hen Harrier	Male	07:34		X	X											X	30
6	16/02/17	Nil Sightings																	
12	22/02/17	Nil Sightings																	
2	23/02/17	Nil Sightings																	
10	24/02/17	Nil Sightings																	

Table 21: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point surveys undertaken during the non - breeding season in 2016/17

VP Name	Date	Species	Sex	Soaring	Circling	Dis-playing	Hunt ing	Fly-ing	Perc hing	Food Pass	Dura-tion (s)	Bird Notes
1	13/09/16	Nil Sightings										
6	13/07/2017	Nil Sightings										
7	14/07/2017	Nil Sightings										
8	12/07/2017	Hen Harrier	Male	13:57:00		X						
10	18/07/2017	Hen Harrier	Female	12:07:00			X				210	
10	18/07/2017	Hen Harrier	Female	12:30:00			X				90	
10	18/07/2017	Hen Harrier	Female	12:36:00			X				80	
10	18/07/2017	Hen Harrier	Female	13:04:00			X				210	
10	18/07/2017	Hen Harrier	Male	13:25:00			X				120	
10	18/07/2017	Hen Harrier	Male	13:49:00			X				480	
10	18/07/2017	Hen Harrier	Female	13:56:00			X				70	
10	18/07/2017	Hen Harrier	Female	13:58:00			X				50	
10	18/07/2017	Hen Harrier	Female	14:56:00			X				50	
10	18/07/2017	Hen Harrier	Male	16:18:00			X				240	
10	18/07/2017	Hen Harrier	Male	16:49:00			X				155	
10	18/07/2017	Hen Harrier	Female	16:52:00			X				130	
10	18/07/2017	Hen Harrier	Female	17:03:00			X				410	
10	18/07/2017	Hen Harrier	Male	17:19:00			X				90	
10	18/07/2017	Hen Harrier	Female	17:25:00			X				300	
10	18/07/2017	Hen Harrier	Male	17:48:00		80	180				260	

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
10	18/07/2017	Hen Harrier	Female	18:00:00			X				320	
10	18/07/2017	Hen Harrier	Female	18:17:00			X				130	
11	20/07/2017	Hen Harrier	Male	16:13:00			X				25	
11	20/07/2017	Hen Harrier	Male	16:54:00			120	10			140	
11	24/07/2017	Hen Harrier	Female	18:42:00			X				90	
11	24/07/2017	Hen Harrier	Female	19:06:00			X				40	
2	07/08/2017	Nil Sightings										
3	08/08/2017	Nil Sightings										
10	13/09/16	Hen Harrier	Male				X				30	1x male HH hunting over bog habitat
10	13/09/16	Hen Harrier	Male					X			10	1x male HH flying over forestry east towards Bealaclave.
4	14/09/16	Hen Harrier	Male				X				15	1x male HH hunting over bog habitat
3	15/09/16	Hen Harrier	Juvenile					X			20	1x HH (Ringtail – prob. juv. Male) flying, lost from view
5	16/09/16	Nil Sightings										
6	16/09/16	Hen Harrier	Juvenile					X			60	1x HH (Ringtail) circling around then flying north to north slope of Mauherslieve
6	16/09/16	Hen Harrier	Male					X			30	1x male HH flying similar flight to previous bird then circling north slope of Mauherslieve
2	17/09/16	Hen Harrier	Male				X				80	1x male HH hunting
2	17/09/16	Nil Sightings										18 Golden Plover

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
10	18/09/16	Hen Harrier	Immature Male				X				20	1x male HH hunting over bog habitat
5	18/09/16	Nil Sightings										
6	19/09/16	Hen Harrier	Juvenile					X			10	1x female HH seen briefly over roost area
1	19/09/16	Nil Sightings										
3	20/09/16	Hen Harrier	Juvenile					X			15	1x female HH seen briefly over roost area
4	20/09/16	Hen Harrier	Male		X						70	1x male HH circling over bog habitat
4	20/09/16	Hen Harrier	Juvenile					X			20	1x HH (Ringtail) flying direct line toward roost. South of Mauherslieve
12	20/09/16	Nil Sightings										
12	20/09/16	Nil Sightings										
11	21/09/16	Nil Sightings										
11	21/09/16	Nil Sightings										
7	22/09/16	Nil Sightings										
7	22/09/16	Nil Sightings										
8	27/09/16	Nil Sightings										
8	27/09/16	Nil Sightings										
9	28/09/16	Nil Sightings										
9	28/09/16	Hen Harrier	Male				X				60	1x male HH came from the N hunting over rough grassland and then headed in a southerly direction.
1	15/10/16	Nil Sightings										

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
10	15/10/16	Hen Harrier	Male				X				20	1x male HH hunting then perched on tussock for 45 mins then flying west into dead ground at 18:32hrs .
10	15/10/16	Hen Harrier	Male					X			2820	
10	15/10/16	Hen Harrier	Male					X			10	
5	16/10/16	Nil Sightings										
2	16/10/16	Nil Sightings										
7	17/10/16	Nil Sightings										
4	18/10/16	Nil Sightings										
3	18/10/16	Nil Sightings										
6	19/10/16	Nil Sightings										
1	20/10/16	Nil Sightings										
6	20/10/16	Hen Harrier	Male					X			30	1x male HH landing on ground twice eventually settling to roost at 18:44 hrs
7	21/10/16	Nil Sightings										
5	21/10/16	Nil Sightings										
4	22/10/16	Nil Sightings										
10	24/10/16	Hen Harrier	Female				X				25	1x HH (Ringtail - probably female) hunting 08:15 hrs coming from west.
10	24/10/16	Hen Harrier	Male				X				40	1x HH (Sub ad M) hunting coming from west.
10	24/10/16	Hen Harrier	Male				X				30	1x male HH hunting coming from west.
11	24/10/16	Hen Harrier	Male				X				10	1x male HH hunting over HB, flying in an E-W direction.

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
11	24/10/16	Hen Harrier	Male					X			13	1x male HH flying E-W over HB habitat and landing into heather 18:30.
3	25/10/16	Nil Sightings										
11	25/10/16	Nil Sightings										
12	25/10/16	Nil Sightings										
12	26/10/16	Nil Sightings										
8	26/10/16	Nil Sightings										
8	27/10/16	Hen Harrier	Male				X				13	1x male HH hunting over rough grass-land flying in an E-W and then flew N, disappeared from view.
9	27/10/16	Nil Sightings										
9	28/10/16	Nil Sightings										
2	29/10/16	Nil Sightings										8 Golden Plover flying around top of Mauherslieve 18:20h
9	20/11/16	Nil Sightings										
5	21/11/16	Nil Sightings										7 Golden Plover flying around
6	21/11/16	Hen Harrier	Juvenile					X			40	1x HH (Ringtail -prob. male), flying north
8	22/11/16	Nil Sightings										
3	22/11/16	Nil Sightings										
9	23/11/16	Nil Sightings										
4	23/11/16	Hen Harrier	Juvenile				X				10	9 Golden Plover flying around
6	24/11/16	Nil Sightings										
8	25/11/16	Nil Sightings										

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
4	28/11/16	Nil Sightings										20 Golden Plover on rough grassland.
5	28/11/16	Hen Harrier	Immature Male				X				360	1x HH (Sub ad Male) hunting on RG for 6 minutes, 2 strikes on prey and then perched on fieldbank for 2 minutes.
1	28/11/16	Nil Sightings										
1	28/11/16	Nil Sightings										
12	28/11/16	Nil Sightings										
12	28/11/16	Nil Sightings										
2	29/11/16	Nil Sightings										
2	29/11/16	Hen Harrier	Female					X			20	1x female HH flew east over VP
11	29/11/16	Nil Sightings										
11	29/11/16	Hen Harrier	Female					X			12	1x female HH flew in from south low over bog, circled briefly and quickly dropped into heather
11	29/11/16	Hen Harrier	Male					X			947	1x male HH flew in from the south over bog, flying for 16 seconds and perched on fence post at edge of forestry. Perched on the post for 8 min 20 secs before flying a short distance onto a tree in the bog. Perched here for a further 5 mins 20 secs. Flew from tree and over bog for 78 seconds before perching briefly on the ground (22 seconds). Took off from ground and flew up towards area where female roosted and dropped into heather and out of sight

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
11	29/11/16	Hen Harrier	Male					X			11	1x male HH flew in from the south, flying low over bog, circled briefly before landing into heather.
3	30/11/16	Nil Sightings										
7	30/11/16	Nil Sightings										
7	30/11/16	Nil Sightings										
10	30/11/16	Nil Sightings										
10	30/11/16	Nil Sightings										
2	15/12/16	Nil Sightings										
2	15/12/16	Nil Sightings										
12	16/12/16	Nil Sightings										
5	16/12/16	Nil Sightings										
11	19/12/16	Nil Sightings										
6	19/12/16	Hen Harrier	Immature Female					X			20	1x HH (Imm. Female) flying from south to north in front of VP6, flying low over grassland and rough grassland and disappeared behind hill to north of VP. Possibly heading to a roost. C. 20 Golden Plover feeding in improved grassland field to north of the VP6.
6	20/12/16	Hen Harrier	Male				X				36	1x male HH came from the north over rough grassland and forestry, lifted the field full of JD and RO and flew over VP6 and headed south behind VP6.
12	20/12/16	Nil Sightings										
5	21/12/16	Nil Sightings										

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
10	21/12/16	Nil Sightings										
10	22/12/16	Nil Sightings										8 x Golden Plover flying over HB in a S-N direction.
11	22/12/16	Hen Harrier	Male					X	X		642	1x male HH; first male flew from the forestry to east of bog habitat, perched on a fence post on the bog habitat for around 630 seconds and then went to roost after the second male went to roost in a clump of heather on the bog.
11	22/12/16	Hen Harrier	Male					X	X		212	1x male HH; second male joined the first male on the fence post coming from the forestry to the east of the vp. Perched there for approx. 200 seconds and was the first to head to roost on the bog.
11	22/12/16	Hen Harrier	Female					X			7	1x female HH came from the west over the bog habitat and went straight into a roost near to the 2x male HH.
	23/12/16	Hen Harrier	Male									1x male HH flew from Knockmaroe towards Knocknabasha and then headed west towards Knockduff. He was flying over improved grassland and headed towards mature forestry on Knockduff.
11	17/01/17	Hen Harrier	Male					X			18	1x male HH flying east over mature forestry and then looped back and headed west over rough grassland and over the mature forestry again and disappeared behind forestry and out of sight.
11	17/01/17	Hen Harrier	Male					X			15	1x male HH flew east over hill across heath and then looped back over the hill and headed west. Possibly heading

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
12	18/01/17	Nil Sightings										to roost but was disturbed by presence of three fallow deer.
5	18/01/17	Nil Sightings										
5	19/01/17	Nil Sightings										
12	19/01/17	Nil Sightings										
6	25/01/17	Nil Sightings										
10	25/01/17	Nil Sightings										
10	27/01/17	Nil Sightings										
3	27/01/17	Nil Sightings										
2	29/01/17	Nil Sightings										
2	29/01/17	Nil Sightings										
3	31/01/17	Nil Sightings										
6	31/01/17	Nil Sightings										
11	08/02/17	Hen Harrier	Male				X				14	1x male HH hunting around roost at dusk
11	08/02/17	Hen Harrier	Male				X				5	
12	09/02/17	Nil Sightings										
2	10/02/17	Hen Harrier	Male				X				15	
5	10/02/17	Nil Sightings										
6	11/02/17	Nil Sightings										
3	12/02/17	Hen Harrier	Male				X				12	
3	12/02/17	Hen Harrier	Male				X				10	

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
3	12/02/17	Hen Harrier	Male				X				10	
5	13/02/17	Nil Sightings										
10	14/02/17	Hen Harrier	Male				X				6	
10	14/02/17	Hen Harrier	Male				X				8	
10	14/02/17	Hen Harrier	Ringtail					X			20	1x male HH and 1x HH (Ringtail – prob. male) near roost at dusk
3	15/02/17	Nil Sightings										
11	16/02/17	Hen Harrier	Ringtail					X			5	1x HH (Ringtail) leaving roost
11	16/02/17	Hen Harrier	Male					X			30	1x male HH flying from roost toward Keeper Hill.
6	16/02/17	Nil Sightings										
12	22/02/17	Nil Sightings										
2	23/02/17	Nil Sightings										
10	24/02/17	Nil Sightings										

A8.4.2.4 Hen Harrier Surveys –Breeding Season 2017

Table 22: Details of UWF Grid Connection Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the breeding season in 2017

G = Grazing; RG = Rough Grazing; HB = Heath or bog; DE = Deciduous woodland or scrub; GO = Gorse; CF = Clear fell; NF2 = New forestry plantation trees 20-30cm high; NF3 = New forestry plantation trees c 1m high; NF4= New forestry plantation trees > 2m high; 2nd F1/F2 = Second rotation forestry plantation trees 20-30cm high; 2nd F3 = Second rotation forestry plantation trees c 1m high; 2nd F4 = Second rotation forestry plantation trees > 2m high; F= Post thicket forestry

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
3	12/03/17	Nil Sightings																		
9	13/03/17	Nil Sightings																		
12	13/03/17	Nil Sightings																		
12	14/03/17	Nil Sightings																		
11	14/03/17	Nil Sightings																		
12	14/03/17	Nil Sightings																		
3	14/03/17	Hen Harrier	Male	15:37			X												130	
3	14/03/17	Hen Harrier	Female	15:37			X												280	
11	15/03/17	Nil Sightings																		
10	15/03/17	Nil Sightings																		
1	15/03/17	Nil Sightings																		
8	16/03/17	Hen Harrier	Male	12:20		X												X	88	
8	16/03/17	Hen Harrier	Male	15:29		X													37	

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
5	16/03/17	Nil Sightings																		
5	21/03/17	Nil Sightings																		
6	21/03/17	Hen Harrier	Male	16:28		X													7	
6	21/03/17	Hen Harrier	Male	16:44	X	X												X	162	
6	22/03/17	Nil Sightings																		
10	22/03/17	Nil Sightings																		
7	23/03/17	Nil Sightings																		
2	24/03/17	Hen Harrier	Male	09:54			X					X							90	
4	24/03/17	Nil Sightings																		
2	27/03/17	Hen Harrier	Male	09:55								X							35	
2	27/03/17	Hen Harrier	Female	09:55								X							35	
3	05/04/17	Nil Sightings																		
8	05/04/17	Nil Sightings																		
2	06/04/17	Hen Harrier	Female	08:05			X											X	270	
2	06/04/17	Hen Harrier	Male	08:05			X											X	510	
10	08/04/17	Hen Harrier	Male	12:15			X											X	190	
10	08/04/17	Hen Harrier	Male	15:00			X											X	30	
7	09/04/17	Nil Sightings																		

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
4	09/04/17	Nil Sightings																		
1	10/04/17	Nil Sightings																		
5	10/04/17	Hen Harrier	Male	12:59			X												450	
5	10/04/17	Hen Harrier	Female	13:05			X												300	
5	10/04/17	Hen Harrier	Male	13:13			X												10	
5	10/04/17	Hen Harrier	Female	13:13			X												10	
5	10/04/17	Hen Harrier	Male	14:16			X												50	
5	10/04/17	Hen Harrier	Female	14:20			X												2400	
7	10/04/17	Hen Harrier	Male	15:30		X													10	
2	11/04/17	Hen Harrier	Male	08:00		X	X											X	761	
1	12/04/17	Nil Sightings																		
6	12/04/17	Hen Harrier	Male	11:47			X												30	
6	12/04/17	Hen Harrier	Male	13:05			X					X							1957	
6	12/04/17	Hen Harrier	Male	13:26								X							430	
3	17/04/17	Nil Sightings																		
5	17/04/17	Hen Harrier	Male	14:45			X												17	
8	18/04/17	Hen Harrier	Male	08:00			X											X	900	
8	18/04/17	Hen Harrier	Female	08:00			X											X	800	
9	18/04/17	Nil Sightings																		

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/ F2	2nd F3	2nd F4	F	Duration (s)
6	19/04/17	Hen Harrier	Female	11:13			x											x	720
6	19/04/17	Hen Harrier	Male	11:20			x											x	100
4	19/04/17	Nil Sightings																	
12	22/04/17	Hen Harrier	Male	08:48														X	70
12	22/04/17	Hen Harrier	Female	08:49														X	80
11	22/04/17	Hen Harrier	Female	13:00			X											x	80
11	22/04/17	Hen Harrier	Female	13:40			X												60
11	22/04/17	Hen Harrier	Female	13:40			X												60
11	22/04/17	Hen Harrier	Male	13:40			X											X	380
12	27/04/17	Hen Harrier	Male	12:05														X	270
12	27/04/17	Hen Harrier	Male	12:05														X	80
12	27/04/17	Hen Harrier	Female	12:05														X	340
11	27/04/17	Hen Harrier	Male	15:00				X											470
11	27/04/17	Hen Harrier	Male	15:15															135
1	05/05/17	Nil Sightings																	
2	05/05/17	Hen Harrier	Male	14:50			X											X	384
2	05/05/17	Hen Harrier	Female	14:50			X											X	50
2	05/05/17	Hen Harrier	Male	15:00			X												330
6	06/05/17	Hen Harrier	Male	15:45			X												504
6	06/05/17	Hen Harrier	Female	15:45			X												610

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
1	08/05/17	Nil Sightings																		
4	08/05/17	Hen Harrier	Male	10:12			X												108	
3	08/05/17	Hen Harrier	Female	15:50			X												30	
3	08/05/17	Hen Harrier	Male	16:20			X											X	135	
5	09/05/17	Hen Harrier	Male	09:46			X												70	
4	09/05/17	Nil Sightings																		
3	18/05/17	Nil Sightings																		
5	18/05/17	Nil Sightings																		
8	19/05/17	Hen Harrier	Male	11:09		X	X							X					314	
8	19/05/17	Nil Sightings																		
2	20/05/17	Hen Harrier	Male	12:53			X											X	80	
6	20/05/17	Hen Harrier	Male	16:17		X	X											X	60	
6	20/05/17	Hen Harrier	Female	16:17			X											X	10	
9	22/05/17	Hen Harrier	Male	11:36			X											X	169	
9	22/05/17	Hen Harrier	Male	12:03														X	8	
9	22/05/17	Hen Harrier	Male	12:39		X													151	
9	22/05/17	Hen Harrier	Male	14:04														X	53	
9	22/05/17	Hen Harrier	Male	15:05			X							X				X	130	
	22/05/17	Hen Harrier	Male	17:56		X													15	

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
7	22/05/17	Nil Sightings																		
7	23/05/17	Nil Sightings																		
10	23/05/17	Hen Harrier	Male	12:18			X												18	
10	23/05/17	Hen Harrier	Male	13:29			X											X	342	
10	23/05/17	Hen Harrier	Male	13:33			X											X	189	
10	23/05/17	Hen Harrier	Male	13:57			X							X					34	
10	23/05/17	Hen Harrier	Male	13:59			X												28	
10	23/05/17	Hen Harrier	Male	14:11			X												27	
10	23/05/17	Hen Harrier	Male	14:12			X							X					192	
10	23/05/17	Hen Harrier	Male	14:54			X							X					605	
	23/05/17	Hen Harrier	Male	15:12			X											X	180	
10	23/05/17	Hen Harrier	Male	15:37			X												540	
10	23/05/17	Hen Harrier	Male	16:14			X												131	
10	23/05/17	Hen Harrier	Male	16:25			X												680	
10	23/05/17	Hen Harrier	Male	17:00			X							X				X	2145	
10	23/05/17	Hen Harrier	Male	17:45			X							X				X	1080	
10	23/05/17	Hen Harrier	Male	18:24			X												582	
11	24/05/17	Hen Harrier	Male	11:05			X											X	35	
11	24/05/17	Hen Harrier	Male	12:20														X	60	
12	24/05/17	Hen Harrier	Male	15:55			X											X	80	
12	24/05/17	Hen Harrier	Male	15:55			X											X	120	

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/ F2	2nd F3	2nd F4	F	Duration (s)
12	24/05/17	Hen Harrier	Female	15:55			X											X	40
7	24/05/17	Hen Harrier	Male	12:28		X												X	420
7	24/05/17	Hen Harrier	Male	12:50		X								X				X	185
11	26/05/17	Nil Sightings																	
12	26/05/17	Nil Sightings																	
1	16/06/17	Nil Sightings																	
3	16/06/17	Hen Harrier	Male	14:57		X													150
4	17/06/17	Nil Sightings																	
1	17/06/17	Nil Sightings																	
2	18/06/17	Hen Harrier	Male	09:10			X											X	2449
2	18/06/17	Hen Harrier	Male	12:21		X													40
4	19/06/17	Hen Harrier	Male	08:30			X												90
4	19/06/17	Hen Harrier	Male	10:55			X												20
10	19/06/17	Hen Harrier	Male	14:38			X												60
10	19/06/17	Hen Harrier	Female	14:38			X											X	200
10	19/06/17	Hen Harrier	Male	15:10			X												30
5	19/06/17	Hen Harrier	Male	10:50			X												17
5	19/06/17	Hen Harrier	Male	10:51			X												46
5	19/06/17	Hen Harrier	Female	11:53			X												23

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/ F2	2nd F3	2nd F4	F	Duration (s)
5	19/06/17	Hen Harrier	Female	12:08			X											X	64
5	19/06/17	Hen Harrier	Male	12:55			X												76
5	19/06/17	Hen Harrier	Male	13:00			X												16
5	19/06/17	Hen Harrier	Male	13:02			X												7
5	19/06/17	Hen Harrier	Male	13:08			X												169
5	19/06/17	Hen Harrier	Male	14:16		X	X											x	55
5	19/06/17	Hen Harrier	Male	14:22			X											X	470
5	19/06/17	Hen Harrier	Female	14:25			X												171
5	19/06/17	Hen Harrier	Male	14:57														X	27
5	19/06/17	Hen Harrier	Female	15:51			X												37
5	19/06/17	Hen Harrier	Male	15:51		X	X												42
5	19/06/17	Hen Harrier	Female	15:59			X												23
5	19/06/17	Hen Harrier	Female	16:04			X												28
5	19/06/17	Hen Harrier	Male	16:10			X												31
5	19/06/17	Hen Harrier	Female	16:11			X												135
2	20/06/17	Hen Harrier	Male	10:47			X											X	130
11	20/06/17	Hen Harrier	Male	10:47			X											X	118
11	20/06/17	Hen Harrier	Male	12:39														X	13
11	20/06/17	Hen Harrier	Male	12:42			X											X	47
10	21/06/17	Hen Harrier	Male	08:50			X												75
10	21/06/17	Hen Harrier	Female	09:15			X												15

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
10	21/06/17	Hen Harrier	Male	09:44			X												20
12	21/06/17	Nil Sightings																	
8	25/06/17	Hen Harrier	Male	16:18	X	X		X											344
8	25/06/17	Nil Sightings																	
6	26/06/17	Hen Harrier	Male	11:55		X													25
6	26/06/17	Hen Harrier	Male	12:02		X													21
6	26/06/17	Nil Sightings																	
7	26/06/17	Nil Sightings																	
9	27/06/17	Nil Sightings																	
9	27/06/17	Nil Sightings																	
7	28/06/17	Nil Sightings																	
7	28/06/17	Nil Sightings																	
1	14/07/17	Nil Sightings																	
3	14/07/17	Nil Sightings																	
3	16/07/17	Nil Sightings																	
5	16/07/17	Hen Harrier	Male	13:00			X												100
2	17/07/17	Hen Harrier	Male	07:17			X												1764

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
2	17/07/17	Hen Harrier	Female	09:14			X												131
4	17/07/17	Hen Harrier	Female	15:18			X											X	5
2	20/07/17	Nil Sightings																	
5	24/07/17	Hen Harrier	Male	07:47			X												30
5	24/07/17	Hen Harrier	Female	09:43			X												70
5	24/07/17	Hen Harrier	Female	10:26			X												30
1	04/08/2017	Nil Sightings																	
11	10/08/2017	Nil Sightings																	
12	10/08/2017	Nil Sightings																	
10	09/08/2017	Hen Harrier	Female	09:55			X												60
10	09/08/2017	Hen Harrier	Juvenile Female	09:55			X												10
10	09/08/2017	Hen Harrier	Female	11:40			X												130
10	09/08/2017	Hen Harrier	Juvenile Female	11:40			X												20
10	09/08/2017	Hen Harrier	Female	13:15			X												60
10	09/08/2017	Hen Harrier	Juvenile Female	13:15			X												180

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
10	09/08/2017	Hen Harrier	Juvenile Female	14:10			X												250
6	09/08/2017	Nil Sightings																	
8	10/08/2017	Hen Harrier	Female	11:48														X	140
9	10/08/2017	Nil Sightings																	
7	11/08/2017	Nil Sightings																	
5	11/08/2017	Nil Sightings																	
4	15/08/2017	Nil Sightings																	
5	15/08/2017	Nil Sightings																	
6	15/08/2017	Nil Sightings																	
4	17/08/2017	Nil Sightings																	
8	17/08/17	Nil Sightings																	
9	17/08/17	Nil Sightings																	

Table 23: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point surveys undertaken during the breeding season in 2017

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
3	12/03/17	Nil Sightings											
9	13/03/17	Nil Sightings											
12	13/03/17	Nil Sightings											
12	14/03/17	Nil Sightings											
11	14/03/17	Nil Sightings											c. 200 Golden Plover
12	14/03/17	Nil Sightings											
3	14/03/17	Hen Harrier	Male	15:37					X			130	1x male HH and 1x female HH flying together.
3	14/03/17	Hen Harrier	Female	15:37					X			280	
11	15/03/17	Nil Sightings											
10	15/03/17	Nil Sightings											
1	15/03/17	Nil Sightings											
8	16/03/17	Hen Harrier	Male	12:20		X			X			88	1x male HH flying N-S over RG, circled over RG to south of VP and then flew over mature forestry and out of sight.
8	16/03/17	Hen Harrier	Male	15:29				X	X			37	1x male HH flying S-N over RG, and went behind farmhouse and out of sight.
5	16/03/17	Nil Sightings											
5	21/03/17	Nil Sightings											

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
6	21/03/17	Hen Harrier	Male	16:28					X			7	1x male HH hunting over RG north of VP. c.50 Golden Plover.
6	21/03/17	Hen Harrier	Male	16:44		X	X		X			162	1x male HH flew E-W over RG, circled back, displaying over grassland and forestry north of VP, flew and circled over and behind VP, across the road up onto the RG field south of vp and lost from sight behind hill.
6	22/03/17	Nil Sightings											
10	22/03/17	Nil Sightings											
7	23/03/17	Nil Sightings											
2	24/03/17	Hen Harrier	Male	09:54	X			X	X			90	1x male HH soaring over Mauher Slieve. 6 Golden Plover over Mauher Slieve.
4	24/03/17	Nil Sightings											
2	27/03/17	Hen Harrier	Male	09:55	X							35	1x male HH over traditional nest site
2	27/03/17	Hen Harrier	Female	09:55	X							35	1x male HH and 1x female HH flying together over traditional territory.
3	05/04/17	Nil Sightings											
8	05/04/17	Nil Sightings											
2	06/04/17	Hen Harrier	Female	08:05	X							270	
2	06/04/17	Hen Harrier	Male	08:05	X			X				510	
10	08/04/17	Hen Harrier	Male	12:15	X	X						190	1x male HH displaying high (c. 1km) over traditional territory.

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
10	08/04/17	Hen Harrier	Male	15:00					X			30	
7	09/04/17	Nil Sightings											
4	09/04/17	Nil Sightings											
1	10/04/17	Nil Sightings											
5	10/04/17	Hen Harrier	Male	12:59			X					450	1x male HH displaying over traditional territory. Food pass between male and female HH.
5	10/04/17	Hen Harrier	Female	13:05					X			300	
5	10/04/17	Hen Harrier	Male	13:13							X	10	
5	10/04/17	Hen Harrier	Female	13:13							X	10	
5	10/04/17	Hen Harrier	Male	14:16	X							50	
5	10/04/17	Hen Harrier	Female	14:20				X				2400	
7	10/04/17	Hen Harrier	Male	15:30					X			10	1x male HH hunting
2	11/04/17	Hen Harrier	Male	08:00			X		X	X		761	1x male HH flying from Knockfune then displaying and perched on ground at traditional territory Mauher Sleeve.
1	12/04/17	Nil Sightings											
6	12/04/17	Hen Harrier	Male	11:47					X			30	1x male HH over traditional nest site
6	12/04/17	Hen Harrier	Male	13:05					X	X		1957	
6	12/04/17	Hen Harrier	Male	13:26					X			430	2nd male HH flying, then both males fly away to north, one re-turning.

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Percing	Food Pass	Duration (s)	Bird Notes
3	17/04/17	Nil Sightings											
5	17/04/17	Hen Harrier	Male	14:45				X				17	
8	18/04/17	Hen Harrier	Male	08:00			X					900	1x male HH and 1x female HH displaying over traditional territory.
8	18/04/17	Hen Harrier	Female	08:00					X			800	
9	18/04/17	Nil Sightings											
6	19/04/17	Hen Harrier	Female	11:13		X						720	1x male HH and 1x female HH circling traditional territory.
6	19/04/17	Hen Harrier	Male	11:20		X						100	
4	19/04/17	Nil Sightings											
12	22/04/17	Hen Harrier	Male	08:48		X				X		70	1x male HH and 1x female HH circling traditional territory.
12	22/04/17	Hen Harrier	Female	08:49		X						80	
11	22/04/17	Hen Harrier	Female	13:00		X			X			80	1x female HH over traditional nest site.
11	22/04/17	Hen Harrier	Female	13:40	X							60	
11	22/04/17	Hen Harrier	Female	13:40	X							60	2x female HH and 1x male HH soaring between two traditional nest sites.
11	22/04/17	Hen Harrier	Male	13:40	X							380	
12	27/04/17	Hen Harrier	Male	12:05					270			270	2x male HH and 1x female HH over traditional territory
12	27/04/17	Hen Harrier	Male	12:05					80			80	
12	27/04/17	Hen Harrier	Female	12:05					340			340	

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
11	27/04/17	Hen Harrier	Male	15:00				X				470	1x male HH over traditional territory
11	27/04/17	Hen Harrier	Male	15:15			X					135	
1	05/05/17	Nil Sightings											
2	05/05/17	Hen Harrier	Male	14:50			X	X	X			384	1x male HH and 1x female HH over traditional territory
2	05/05/17	Hen Harrier	Female	14:50					X			50	
2	05/05/17	Hen Harrier	Male	15:00				X				330	
6	06/05/17	Hen Harrier	Male	15:45		X						504	1x male HH and 1x female HH over traditional territory
6	06/05/17	Hen Harrier	Female	15:45		X						610	
1	08/05/17	Nil Sightings											
4	08/05/17	Hen Harrier	Male	10:12	X							108	
3	08/05/17	Hen Harrier	Female	15:50	X							30	
3	08/05/17	Hen Harrier	Male	16:20			X		X			135	
5	09/05/17	Hen Harrier	Male	09:46	X							70	
4	09/05/17	Nil Sightings											
3	18/05/17	Nil Sightings											
5	18/05/17	Nil Sightings											
8	19/05/17	Hen Harrier	Male	11:09		X	X		X			314	1x male HH flying, circling and skydancing the last 15s over heath, rough grazing and young plantation (>2m).

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
8	19/05/17	Nil Sightings											
2	20/05/17	Hen Harrier	Male	12:53	X							80	1x male HH over traditional territory.
6	20/05/17	Hen Harrier	Male	16:17				X	X		X	60	Food pass at same site as 2016.
6	20/05/17	Hen Harrier	Female	16:17							X	10	
9	22/05/17	Hen Harrier	Male	11:36		x						169	1x male HH circling over heath and mature plantation
9	22/05/17	Hen Harrier	Male	12:03					X			8	1x male HH flying over mature plantation
9	22/05/17	Hen Harrier	Male	12:39					X			151	1x male HH flying over rough grazing
9	22/05/17	Hen Harrier	Male	14:04					X			53	1x male HH flying over mature plantation
9	22/05/17	Hen Harrier	Male	15:05		X						130	1x male HH circling over heath, mature plantation and young plantation (>2m).
CS	22/05/17	Hen Harrier	Male	17:56					X			15	1x male HH flying over rough grazing
7	22/05/17	Nil Sightings											
7	23/05/17	Nil Sightings											
10	23/05/17	Hen Harrier	Male	12:18					X			18	1x male HH flying over heath
10	23/05/17	Hen Harrier	Male	13:29		X			X			342	1x male HH flying, circling over heath and mature plantation, second male HH joins later
10	23/05/17	Hen Harrier	Male	13:33					X			189	1x male HH flying over mature plantation, joins another male HH
10	23/05/17	Hen Harrier	Male	13:57				X				34	1x male HH hunting in heath and over young plantation (>2m)

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
10	23/05/17	Hen Harrier	Male	13:59					X			28	1x male HH flying over heath
10	23/05/17	Hen Harrier	Male	14:11	X				X			27	1x male HH flying, soaring over heath
10	23/05/17	Hen Harrier	Male	14:12				X				192	1x male HH hunting in heath and over young plantation (>2m)
10	23/05/17	Hen Harrier	Male	14:54				X	X	X		605	1x male HH hunting, flying over heath and young plantation (>2m), keeps coming back to the same spot in heath
CS	23/05/17	Hen Harrier	Male	15:12				X	X			180	1x male HH flying hunting over heath and mature plantation
10	23/05/17	Hen Harrier	Male	15:37				x	X	X		540	1x male HH flying, hunting and perching in heath
10	23/05/17	Hen Harrier	Male	16:14					X			131	1x male HH flying over heath
10	23/05/17	Hen Harrier	Male	16:25					X	X		680	1x male HH flying over heath, perching and then flying away
10	23/05/17	Hen Harrier	Male	17:00				X	X	X		2145	1x male HH flying over heath and into young plantation (>2m), and then keeps coming back to perch in the same spot in heath. Doing the same circle many times
10	23/05/17	Hen Harrier	Male	17:45			X		X			1080	1x male HH flying, later skydancing for 4min over heath, young plantation (>2m) and mature plantation, later chasing away a HC.
10	23/05/17	Hen Harrier	Male	18:24					X	X		582	1x male HH perching for almost 10min then flying away
11	24/05/17	Hen Harrier	Male	11:05	X				X			35	1x male HH with prey flying south.
11	24/05/17	Hen Harrier	Male	12:20			X					60	

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
12	24/05/17	Hen Harrier	Male	15:55			X					80	2x male HH and 1x female HH over traditional territory
12	24/05/17	Hen Harrier	Male	15:55			X					120	
12	24/05/17	Hen Harrier	Female	15:55	X							40	
7	24/05/17	Hen Harrier	Male	12:28	X	X						420	1x male HH soaring and circling higher and higher, over rough grazing and mature plantation
7	24/05/17	Hen Harrier	Male	12:50		X	X		X			185	1x male HH flying, circling and skydancing over rough grazing, young plantation (>2m) and mature plantation
11	26/05/17	Nil Sightings											
12	26/05/17	Nil Sightings											
1	16/06/17	Nil Sightings											
3	16/06/17	Hen Harrier	Male	14:57				X				150	
4	17/06/17	Nil Sightings											
1	17/06/17	Nil Sightings											
2	18/06/17	Hen Harrier	Male	09:10				X		X		2449	1x male HH had a successful strike. No evidence of nesting after 4 hour survey. 1x male HH was hunting for 183 seconds, 1x male HH with prey for 441 seconds. The male then perched for 1711 seconds. Then started to hunt again for 114 seconds.
2	18/06/17	Hen Harrier	Male	12:21	X							40	1x male HH soaring and headed NE

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Percing	Food Pass	Duration (s)	Bird Notes
4	19/06/17	Hen Harrier	Male	08:30				X				90	
4	19/06/17	Hen Harrier	Male	10:55					X			20	1x male HH flying
10	19/06/17	Hen Harrier	Male	14:38		X						60	
10	19/06/17	Hen Harrier	Female	14:38					X		X	200	Probable food pass; 1x female HH flying from bog to edge of forestry perched on ground for 3 mins then returned to bog.
10	19/06/17	Hen Harrier	Male	15:10					X			30	1x male HH flying over same area as previously.
5	19/06/17	Hen Harrier	Male	10:50				X				17	1x male HH hunting low over heather bog/wet heath habitat, flew north behind ridge line and out of sight
5	19/06/17	Hen Harrier	Male	10:51		X						46	1x male HH circling and soaring over heather/bog/wet heath habitat, circled off to NE behind hill top and out of view.
5	19/06/17	Hen Harrier	Female	11:53								23	1x female HH soaring over heather bog and forestry, flew north out of sight
5	19/06/17	Hen Harrier	Female	12:08		X						64	1x female HH soaring and flying over heather bog, flew north out of sight.
5	19/06/17	Hen Harrier	Male	12:55								76	1x male HH soaring over heather bog and forestry
5	19/06/17	Hen Harrier	Male	13:00					X			16	1x male HH chasing Raven east over heather bog, dropped down behind hill and out of sight
5	19/06/17	Hen Harrier	Male	13:02					X			7	1 x HH male flying over heather bog

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
5	19/06/17	Hen Harrier	Male	13:08	X							169	1 x HH male soaring high over heather bog
5	19/06/17	Hen Harrier	Male	14:16				X				55	1 x HH male hunting over heather bog, RG, MF, along ridge of hill from east to west.
5	19/06/17	Hen Harrier	Male	14:22	X	X						470	1x male HH circling and soaring over heather bog, started low but quickly gained altitude beyond 100m. Dropped down to circle close to 1x female HH and gained altitude again and lost sight of him.
5	19/06/17	Hen Harrier	Female	14:25	X	X						171	1x female HH flew in from north and circled / soared up to ~50m, interacted with 1x female HH and dropped down
5	19/06/17	Hen Harrier	Male	14:57					X			27	1x male HH flying from west to east over forestry.
5	19/06/17	Hen Harrier	Female	15:51	X				X			37	1x female HH flying and then soaring over heather bog, soared only to ~50m, flew off to north
5	19/06/17	Hen Harrier	Male	15:51				X	X			42	1x male HH flying close over heather bog, flew off west hunting along forestry edge over rough grassland.
5	19/06/17	Hen Harrier	Female	15:59		X			X			23	1x female HH circling and then hunting over heather bog up on hill
5	19/06/17	Hen Harrier	Female	16:04	X	X			X			28	1x female HH circling and soaring over heather bog, gradually glided off north and out of sight

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
5	19/06/17	Hen Harrier	Male	16:10					X		X	31	1x male HH flew in from west carrying prey, directly towards heather bog on hill
5	19/06/17	Hen Harrier	Female	16:11					X	X	X	135	1x female HH flew from behind hill for food pass, landed on heather bog on south side of hill. Took off after 97 secs later and flew over hill to north and out of sight. Possibly ate food while on the ground - No sign of carrying prey on flight over hill.
2	20/06/17	Hen Harrier	Male	10:47				X				130	No evidence of nesting.
11	20/06/17	Hen Harrier	Male	10:47	X	X			X			118	1x male HH flew over heather bog at Bleanbeg, up and over mature forestry to north, circled and soared over forestry before dropping and flying east/northeast. Lost from sight behind crest of hill
11	20/06/17	Hen Harrier	Male	12:39				X	X			13	1x male HH seen briefly flying and hunting in forestry canopy and rides. Dipped out of sight behind trees
11	20/06/17	Hen Harrier	Male	12:42	X							47	1x male HH hunting along forestry edge on western boundary of bog, flew up over forestry and soared up over 100m. Descended and flew off to NE.
10	21/06/17	Hen Harrier	Male	08:50				X				75	
10	21/06/17	Hen Harrier	Female	09:15					X			15	1x female HH gathering nesting material. Male was carrying prey.

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
10	21/06/17	Hen Harrier	Male	09:44					X			20	
12	21/06/17	Nil Sightings											
8	25/06/17	Hen Harrier	Male	16:18	X				X			344	1x male HH flying, hunting and circling over rough grazing, grazing and scrub.
8	25/06/17	Nil Sightings											
6	26/06/17	Hen Harrier	Male	11:55					X			25	1x male HH flying over rough grazing.
6	26/06/17	Hen Harrier	Male	12:02	X							21	1x male HH soaring over rough grazing, moving down the hill.
6	26/06/17	Nil Sightings											
7	26/06/17	Nil Sightings											
9	27/06/17	Nil Sightings											
9	27/06/17	Nil Sightings											
7	28/06/17	Nil Sightings											
7	28/06/17	Nil Sightings											
1	14/07/17	Nil Sightings											
3	14/07/17	Nil Sightings											
3	16/07/17	Nil Sightings											
5	16/07/17	Hen Harrier	Male	13:00				X				100	1x male HH hunting
2	17/07/17	Hen Harrier	Male	07:17	X	X		X		X		1764	1x male HH hunting, perched on ground, circling, soaring.
2	17/07/17	Hen Harrier	Female	09:14	X			X				131	1x female HH around traditional territory no evidence of active nest.

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
4	17/07/17	Hen Harrier	Female	15:18					X			5	1x female HH flying toward other side of hill.
2	20/07/17	Nil Sightings											
5	24/07/17	Hen Harrier	Male	07:47				X				30	1x male HH hunting
5	24/07/17	Hen Harrier	Female	09:43	X			X				70	1x female HH hunting
5	24/07/17	Hen Harrier	Female	10:26				X	X			30	1x female HH interacting with Sparrowhawk.
1	04/08/17	Nil Sightings											
11	10/08/17	Nil Sightings											
12	10/08/17	Nil Sightings											
10	09/08/17	Hen Harrier	Female	09:55			X		X			60	Food pass female to juvenile.
10	09/08/17	Hen Harrier	Juvenile Female	09:55					X			10	Food pass female to juvenile.
10	09/08/17	Hen Harrier	Female	11:40			X	X	X			130	Food pass female to juvenile.
10	09/08/17	Hen Harrier	Juvenile Female	11:40					X			20	Food pass female to juvenile.
10	09/08/17	Hen Harrier	Female	13:15			X		X			60	Food pass female to juvenile.
10	09/08/17	Hen Harrier	Juvenile Female	13:15			X		X			180	Food pass female to juvenile.

VP Name	Date	Species	Sex	Time of sighting	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
10	09/08/17	Hen Harrier	Juvenile Female	14:10:00								250	Juvenile circling
6	09/08/17	Nil Sightings											
8	10/08/17	Hen Harrier	Female	11:48:00			X					140	1x female HH soaring then flying west.
9	10/08/17	Nil Sightings											
7	11/08/17	Nil Sightings											
5	11/08/17	Nil Sightings											
4	15/08/17	Nil Sightings											
5	15/08/17	Nil Sightings											
6	15/08/17	Nil Sightings											
4	17/08/17	Nil Sightings											
8	17/08/17	Nil Sightings											
9	17/08/17	Nil Sightings											

A8.4.2.5 Hen Harrier Surveys –Non Breeding Season 2017/2018

Table 24: Details of UWF Grid Connection Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the Non-breeding season 2017/2018

G = Grazing; RG = Rough Grazing; HB = Heath or bog; DE = Deciduous woodland or scrub; GO = Gorse; CF = Clear fell; NF2 = New forestry plantation trees 20-30cm high; NF3 = New forestry plantation trees c 1m high; NF4= New forestry plantation trees > 2m high; 2nd F1/F2 = Second rotation forestry plantation trees 20-30cm high; 2nd F3 = Second rotation forestry plantation trees c 1m high; 2nd F4 = Second rotation forestry plantation trees > 2m high; F= Post thicket forestry

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)		
1	05/09/17	Nil Sightings																			
2	05/09/17	Nil Sightings																			
4	06/09/17	Nil Sightings																			
3	06/09/17	Hen Harrier	Ring-tail	14:55:00			10													10	
1	06/09/17	Nil Sightings																			
3	07/09/17	Nil Sightings																			
5	08/09/17	Nil Sightings																			
4	08/09/17	Nil Sightings																			
5	13/09/17	Nil Sightings																			
2	13/09/17	Hen Harrier	Male	13:49:00			35													35	
7	11/09/17	Raven_RN		11:40:00	x													x		21	
7	11/09/17	Raven_RN		11:40:00	x													x		21	
7	11/09/17	Kestrel_K.		11:55:00	x													x		14	
7	11/09/17	Raven_RN		13:14:00	x			x										x		20	
8	12/09/17	Kestrel_K.		14:22:00	x		x		x											115	
10	04/09/17	Nil Sightings																			

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
9	05/09/17	Nil Sightings																		
11	05/09/17	Nil Sightings																		
11	06/09/17	Nil Sightings																		
9	06/09/17	Nil Sightings																		
12	07/09/17	Nil Sightings																		
12	07/09/17	Nil Sightings																		
6	11/09/17	Nil Sightings																		
10	12/09/17	Nil Sightings																		
1	12/10/17	Nil Sightings																		
2	12/10/17	Hen Harrier	Fe-male	13:20			50												50	
4	13/10/17	Nil Sightings																		
5	13/10/17	Hen Harrier	Ring-tail	12:30			120												10	
3	14/10/17	Nil Sightings																		
1	17/10/17	Nil Sightings																		
3	18/10/17	Nil Sightings																		
4	20/10/17	Nil Sightings																		
2	22/10/17	Nil Sightings																		
5	23/10/17	Nil Sightings																		
6	23/10/17	Hen Harrier	Male	18:28			7												7	
6	25/10/17	Hen Harrier	Male	18:34			4												4	
10	07/11/17	Hen Harrier	Male	09:18			348												348	

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)
11	07/11/17	Hen Harrier	Female	17:05			30												30
11	07/11/17	Hen Harrier	Male	17:08			30												30
1	08/11/17	Nil Sightings																	
2	09/11/17	Nil Sightings																	
6	13/11/17	Nil Sightings																	
3	15/11/17	Nil Sightings																	
11	16/11/17	Hen Harrier	Male	16:42			1080												1080
11	16/11/17	Hen Harrier	Male	16:56			60												60
5	22/11/17	Nil Sightings																	
4	22/11/17	Nil Sightings																	
4	23/11/17	Nil Sightings																	
5	23/11/17	Nil Sightings																	
7	28/11/17	Nil Sightings																	
7	29/11/17	Nil Sightings																	
8	28/11/17	Nil Sightings																	
8	29/11/17	Nil Sightings																	
9	29/11/17	Nil Sightings																	
9	30/11/17	Nil Sightings																	
3	29/11/17	Nil Sightings																	
8	28/11/17	Nil Sightings																	
12	30/11/17	Nil Sightings																	

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
12	29/11/17	Nil Sightings																		
7	29/11/17	Nil Sightings																		
8	06/12/17	Nil Sightings																		
7	07/12/17	Nil Sightings																		
9	08/12/17	Nil Sightings																		
12	05/12/17	Nil Sightings																		
11	05/12/17	Hen Harrier_HH	Male	16:05:00			6												6	
11	06/12/17	Nil Sightings																		
5	06/12/17	Nil Sightings																		
5	06/12/17	Nil Sightings																		
1	01/12/17	Nil Sightings																		
6	03/12/17	Nil Sightings																		
10	03/12/17	Hen Harrier	Male	16:10			80												80	
10	03/12/17	Hen Harrier	Male	16:11			50												50	
4	05/12/17	Nil Sightings																		
3	07/12/17	Hen Harrier	Male	15:57		20													20	
10	09/12/17	Hen Harrier	Male	11:14			130												130	
6	09/12/17	Nil Sightings																		
2	21/12/17	Nil Sightings																		
12	02/01/18	Nil Sightings																		
9	03/01/18	Nil Sightings																		

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
7	04/01/18	Nil Sightings																		
2	05/01/18	Nil Sightings																		
5	02/01/18	Nil Sightings																		
8	15/01/18	Nil Sightings																		
4	19/01/18	Nil Sightings																		
3	03/01/18	Nil Sightings																		
6	05/01/18	Nil Sightings																		
10	06/01/18	Nil Sightings																		
11	06/01/18	Hen Harrier	Male	16:27			2220												2220	
11	06/01/18	Hen Harrier	Male	16:27			2220												2220	
11	06/01/18	Hen Harrier	Male	16:27			2220												2220	
11	06/01/18	Hen Harrier	Male	16:30			2040												2040	
11	06/01/18	Hen Harrier	Female	16:35			1740												1740	
10	22/01/18	Hen Harrier	Male	12:10			20											20	40	
11	22/01/18	Hen Harrier	Male	16:58			1320												1320	
11	22/01/18	Hen Harrier	Male	17:00			1200												1200	
11	22/01/18	Hen Harrier	Male	17:12			600												600	
3	01/02/18	Hen Harrier	Male	12:05			25												25	
6	02/02/18	Hen Harrier	Male	10:50			30												30	

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/F2	2nd F3	2nd F4	F	Duration (s)	
10	04/02/18	Hen Harrier	Male	08:13			70													70
11	04/02/18	Hen Harrier	Male	17:34			720													720
11	04/02/18	Hen Harrier	Male	17:44			120													120
11	04/02/18	Hen Harrier	Male	17:44			120													120
11	06/02/18	Nil Sightings																		
5	02/02/18	Nil Sightings																		
12	05/02/18	Nil Sightings																		
4	06/02/18	Nil Sightings																		
1	06/02/18	Hen Harrier		15:02:00	33				10											43
1	07/02/18	Nil Sightings																		
8	01/02/18	Hen Harrier	m	11:13		x														8s
8	01/02/18	Hen Harrier	m	15:10		x														180s
8	01/02/18	Hen Harrier																		40mins
8	01/02/18	Hen Harrier	m	15:12		x														24s
8	01/02/18	Hen Harrier	m	15:50		x														3s
9	02/02/18	Nil Sightings																		
7	05/02/18	Nil Sightings																		
2	06/02/18	Nil Sightings																		

Table 25: Details of UWF Grid Connection Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point surveys undertaken during the non-breeding season in September 2017 to February 2018 (inclusive)

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Birds Notes
1	05/09/2017	Nil Sightings											
2	05/09/2017	Nil Sightings											
4	06/09/2017	Nil Sightings											
3	06/09/2017	Hen Harrier	Ring-tail	14:55:00				x				10	Ringtail seen briefly hunting up-per slopes of Mauher Sleeve.
1	06/09/2017	Nil Sightings											
3	07/09/2017	Nil Sightings											
5	08/09/2017	Nil Sightings											
4	08/09/2017	Nil Sightings											
5	13/09/2017	Nil Sightings											
2	13/09/2017	Hen Harrier	Male	13:49:00				x				35	Adult male Hen Harrier hunting off site
7	11/09/2017	Nil Sightings											
7	11/09/2017	Nil Sightings											
7	11/09/2017	Nil Sightings											

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Preaching	Food Pass	Duration (s)	Birds Notes
7	11/09/2017	Nil Sightings											
8	12/09/2017	Nil Sightings											
10	04/09/2017	Nil Sightings											
9	05/09/2017	Nil Sightings											
11	05/09/2017	Nil Sightings											
11	06/09/2017	Nil Sightings											
9	06/09/2017	Nil Sightings											
12	07/09/2017	Nil Sightings											
12	07/09/2017	Nil Sightings											
6	11/09/2017	Nil Sightings											
10	12/09/2017	Nil Sightings											
6	23/10/17	Nil Sightings											
7	25/10/17	Nil Sightings											
8	14/10/17	Nil Sightings											
9	17/10/17	Nil Sightings											
10	18/10/17	Nil Sightings											
11	20/10/17	Nil Sightings											

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Precising	Food Pass	Duration (s)	Birds Notes
1	12/10/17	Nil Sightings											
2	12/10/17	Hen Harrier	Female	13:20					x			50	
4	13/10/17	Nil Sightings											
5	13/10/17	Hen Harrier	Ring-tail	12:30					x			10	Ringtail hunting.
3	14/10/17	Nil Sightings											
1	17/10/17	Nil Sightings											
3	18/10/17	Nil Sightings											
4	20/10/17	Nil Sightings											
2	22/10/17	Nil Sightings											
5	23/10/17	Nil Sightings											
6	23/10/17	Hen Harrier	Male	18:28					x			7	Dusk watch at possible roost site, (single adult male Hen Harrier here 2016), male going to roost at 18:28hrs
6	25/10/17	Hen Harrier	Male	18:34					x			4	Dusk watch at possible roost site, (single adult male Hen Harrier here 2016), male going to roost at 18:34hrs
10	07/11/20	Hen Harrier	Male	09:18				x				348	ad male hunting Heather Bog, 4 snipe on site.
11	07/11/20	Hen Harrier	Female	17:05				x				30	Female going to roost.
11	07/11/20	Hen Harrier	Male	17:08				x				30	Male going to roost.
1	08/11/20	Nil Sightings											

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Precipitating	Food Pass	Duration (s)	Birds Notes
2	09/11/2017	Nil Sightings											
6	13/11/2017	Nil Sightings											
3	15/11/2017	Nil Sightings											
11	16/11/2017	Hen Harrier	Male	16:42				x		x		1080	Dusk watch at roost site, adult male perched on fence post for 20 mins before flying to nearby roost site in heather at 1707hrs.
11	16/11/2017	Hen Harrier	Male	16:56					x			60	2 nd adult male going to roost in heather at 16:56hrs
5	22/11/2017	Nil Sightings											
5	22/11/2017	Nil Sightings											
4	22/11/2017	Nil Sightings											
4	23/11/2017	Nil Sightings											
4	23/11/2017	Nil Sightings											
4	23/11/2017	Nil Sightings											
4	23/11/2017	Nil Sightings											
5	23/11/2017	Nil Sightings											
5	23/11/2017	Nil Sightings											

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Precising	Food Pass	Duration (s)	Birds Notes
5	23/11/2017	Nil Sightings											
5	23/11/2017	Nil Sightings											
5	23/11/2017	Nil Sightings											
7	28/11/17	Nil Sightings											
8	29/11/17	Nil Sightings											
9	29/11/17	Nil Sightings											
9	30/11/17	Nil Sightings											
8	28/11/17	Nil Sightings											
8	28/11/17	Nil Sightings											
12	30/11/2017	Nil Sightings											
12	29/11/2017	Nil Sightings											
7	29/11/17	Nil Sightings											
12	05/12/2017	Nil Sightings											
11	05/12/2017	Hen Harrier	Male	16:05					X			6	HH male flew E - W over bog/heath towards the conifer plantation at c. 10 - 15m.
11	06/12/2017	Nil Sightings										111	
5	06/12/2017	Nil Sightings										90	
5	06/12/2017	Nil Sightings										50	

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Precising	Food Pass	Duration (s)	Birds Notes
1	01/12/2017	Nil Sightings											
6	03/12/2017	Nil Sightings											
10	03/12/2017	Hen Harrier	Male	16:10				X				80	Ad male hunting Heather Bog heading toward roost site.
10	03/12/2017	Hen Harrier	Male	16:11				X				50	2 nd Ad male hunting Heather Bog heading toward roost site.
4	05/12/2017	Nil Sightings											
3	07/12/2017	Hen Harrier	Male	15:57				X				20	Ad male hunting Heather Bog.
10	09/12/2017	Hen Harrier	Male	11:14				X				130	Ad male hunting Heather Bog.
6	09/12/2017	Nil Sightings											
2	21/12/2017	Nil Sightings											
8	06/12/2017	Nil Sightings										20	
8	06/12/2017	Nil Sightings										20	
8	06/12/2017	Nil Sightings										10	
8	06/12/2017	Nil Sightings										5	
8	06/12/2017	Nil Sightings										300	
8	06/12/2017	Nil Sightings										20	

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Precipitating	Food Pass	Duration (s)	Birds Notes
7	07/12/2017	Nil Sightings										20	
7	07/12/2017	Nil Sightings										10	
7	07/12/2017	Nil Sightings											
9	08/12/2017	Nil Sightings											
9	08/12/2017	Nil Sightings										240	
9	08/12/2017	Nil Sightings										300	
9	08/12/2017	Nil Sightings										5	
12	02/01/2018	Nil Sightings											
9	03/01/2018	Nil Sightings											
7	04/01/2018	Nil Sightings											
2	05/01/2018	Nil Sightings											
5	02/01/2018	Nil Sightings											
1	03/01/2018	Nil Sightings											
1	03/01/2018	Nil Sightings											
8	15/01/2018	Nil Sightings											

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Birds Notes
4	19/01/2018	Nil Sightings											
4	19/01/2018	Nil Sightings											
3	03/01/18	Nil Sightings											
6	05/01/18	Nil Sightings											
10	06/01/18	Nil Sightings											
11	06/01/18	Hen Harrier	Male	16:27					X	X		2220	
11	06/01/18	Hen Harrier	Male	16:27					X	X		2220	3 males sitting on fence posts before going to roost.
11	06/01/18	Hen Harrier	Male	16:27					X	X		2220	Ad male and female flying around roost site at before going to roost.
11	06/01/18	Hen Harrier	Male	16:30					X			2040	
11	06/01/18	Hen Harrier	Female	16:35					X			1740	All going to roost at about 17:04hrs.
10	22/01/18	Hen Harrier	Male	12:10				X	X			40	Ad male hunting Heather Bog and flying over Forestry.
11	22/01/18	Hen Harrier	Male	16:58					X	X		1320	Ad male flying in to roost site perched on fence post before going to roost at 17:20hrs.
11	22/01/18	Hen Harrier	Male	17:00					X			1200	2 nd ad male flying in to roost site perched on fence post before going to roost at 17:20hrs.
11	22/01/18	Hen Harrier	Male	17:12					X			600	3 rd ad male flying around roost site at before going to roost 17:22hrs
3	01/02/18	Hen Harrier	Male	12:05				X				25	Ad male hunting Heather Bog around last year's nest site.
6	02/02/18	Hen Harrier	Male	10:50				X				30	Ad male hunting Heather Bog

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Birds Notes
10	04/02/18	Hen Harrier	Male	08:13				X				70	Ad male hunting Heather Bog
1	04/02/18	Hen Harrier	Male	17:34					X	X		720	Ad male perched on fence post before going to roost at 17:46hrs. 2 nd ad male going to roost 17:46hrs.
11	04/02/18	Hen Harrier	Male	17:44					X			120	3 rd ad male going to roost 17:46hrs; different location to last months roost site; all three birds flew over skyline out of site.
11	04/02/18	Hen Harrier	Male	17:44								120	
11	06/02/18	Nil Sightings											
5	02/02/18	Nil Sightings											
12	05/02/18	Nil Sightings											
4	06/02/18	Nil Sightings											
1	06/02/18	Nil Sightings											
1	06/02/18	Hen Harrier	-	15:02					X			43	HH female flew N - S over gorse and grassland being mobbed by hooded crows
1	06/02/18	Nil Sightings											
4	07/02/18	Nil Sightings											
1	07/02/18	Nil Sightings											
8	01/02/18	Hen Harrier	Male	11:13				X	X			8	Male Hen Harrier first seen hunting close to drainage channel, flew behind dip in the land and was not seen emerging. Later in afternoon, assumed same adult male HH is observed hunting along hedgelines

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sightings	Soaring	Circling	Displaying	Hunting	Flying	Precipitating	Food Pass	Duration (s)	Birds Notes
8	01/02/18	Nil Sightings											
8	01/02/18	Hen Harrier	Male	15:10				X	X			180	
8	01/02/18	Hen Harrier								X		2400	
8	01/02/18	Hen Harrier	Male	15:12					X			24	
8	01/02/18	Hen Harrier	Male	15:50					X			3	
9	02/02/18	Nil Sightings											
7	05/02/18	Nil Sightings											
2	06/02/18	Nil Sightings											
2	06/02/18	Nil Sightings											
2	06/02/18	Nil Sightings											
2	06/02/18	Nil Sightings											

A8.4.2.6 Hen Harrier Surveys –Breeding Season 2019

Table 26: Details of Hen Harrier sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the breeding season in April and July 2019 on Upperchurch Windfarm (UWF)

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/ F2	2nd F3	2nd F4	F	Dura- tion (s)		
UVP3	08/04/2019	Nil Sight-ings																			
UVP 9	11/04/2019	Nil Sight-ings																			
UVP 1	12/04/2019	Nil Sight-ings																			
UVP 8	17/04/2019	Nil Sight-ings																			
UVP 2	18/04/2019	Nil Sight-ings																			
UVP 4	19/04/2019	Nil Sight-ings																			
UVP 5	20/04/2019	Nil Sight-ings																			
UVP 7	25/04/2019	Nil Sight-ings																			
UVP 10	26/04/2019	Hen Harrier	Male	10:26		35														35	
UVP 6	27/04/2019	Hen Harrier	Male	12:33		156															156
UVP 2	10/07/2019	Nil Sight-ings																			
UVP 10	11/07/2019	Nil Sight-ings																			
UVP 7	17/09/2019	Nil Sight-ings																			

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	CF	NF1	NF2	NF3	NF4	2nd F1/ F2	2nd F3	2nd F4	F	Duration (s)	
UVP 6	19/07/2019	Nil Sightings																		
UVP 3	24/07/2019	Nil Sightings																		
UVP 8	25/07/2019	Nil Sightings																		
UVP 9	26/07/2019	Nil Sightings																		
UVP 5	29/07/2019	Nil Sightings																		
UVP 1	31/07/2019	Hen Harrier	Female	09:41	9														9	
UVP 4	31/07/2019	Nil Sightings																		

Table 27: Details of Hen Harrier behaviour which the birds were exhibiting during each observation and associated notes for vantage point flight activity surveys undertaken April and July 2019 on Upprchurch Windfarm (UWF)

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
UVP 2	18/04/2019	Nil Sightings										
UVP 3	08/04/2019	Nil Sightings										
UVP 9	11/04/2019	Nil Sightings										
UVP 1	12/04/2019	Nil Sightings										
UVP 8	17/04/2019	Nil Sightings										
UVP 2	18/04/2019	Nil Sightings										
UVP 4	19/04/2019	Nil Sightings										
UVP 5	20/04/2019	Nil Sightings										
UVP 7	25/04/2019	Nil Sightings										
UVP 10	26/04/2019	Hen Harrier	Male					35			35	
UVP 6	27/04/2019	Hen Harrier	Male				156				156	Male Hen Harrier hunting, quartering the ground on hillside of rough grassland/bog.
UVP 2	10/07/2019	Nil Sightings										
UVP 10	11/07/2019	Nil Sightings										

APPENDIX 8.4: Hen Harrier Fieldwork & Survey Results
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Soaring	Circling	Displaying	Hunting	Flying	Perching	Food Pass	Duration (s)	Bird Notes
UVP 7	17/09/2019	Nil Sightings										
UVP 6	19/07/2019	Nil Sightings										
UVP 3	24/07/2019	Nil Sightings										
UVP 8	25/07/2019	Nil Sightings										
UVP 9	26/07/2019	Nil Sightings										
UVP 5	29/07/2019	Nil Sightings										
UVP 1	31/07/2019	Hen Harrier	Female					9			9	
UVP 4	31/07/2019	Nil Sightings										

APPENDIX 8.4: *Hen Harrier Fieldwork & Survey Results*
EIAR 2019, Chapter 8: Biodiversity
EIAR 2019, Chapter 8: Biodiversity

Appendix to Chapter 8: Biodiversity

Appendix 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 – 2017

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

Contents

A8-5 Appendix to Chapter 8: Biodiversity..... 1

A8-5.1 Upperchurch Windfarm 2015 to 2017 Survey Background..... 1

A8-5.2 Upperchurch Windfarm 2015 to 2017 Survey Results 2

List of Tables:

- Table 1: Breeding Season (Summer) 2015 Hen Harrier Sighting Notes
- Table 2: Breeding Season (Summer) 2015 Hen Harrier Survey Results (Time Date and Weather Conditions)
- Table 3: Non-Breeding Season (Winter) 2015 Hen Harrier Sighting Notes
- Table 4: Non-Breeding Season (Winter) 2015 Hen Harrier Survey Results (Time Date and Weather Conditions)
- Table 5: Breeding Season (Summer) 2016 Hen Harrier Sighting Notes
- Table 6: Breeding Season (Summer) 2016 Hen Harrier Survey Results (Time Date and Weather Conditions)
- Table 7: Non-Breeding Season (Winter) 2016 Hen Harrier Sighting Notes
- Table 8: Non-Breeding Season (Winter) 2016 Hen Harrier Survey Results (Time Date and Weather Conditions)

A8-5.1 Upperchurch Windfarm 2015 to 2017 Survey Background

Ecopower Developments commissioned Joe Adamson (independent bird surveyor) to undertake Hen Harrier surveys between March 2015 to April 2017. Joe is a graduate of the Royal Society of Chemistry in Applied Chemistry and has a MSc. in Environmental Resource Management. He is a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM) since 2010. Joe Adamson is an Ecologist, working in the energy sector since 1997, mainly on natural gas pipelines and windfarms, in a range of disciplines, including ornithological surveys & ecological surveys. Joe has over 40 years of field observation experience of birds and has worked on over 75 windfarms throughout Ireland, conducting ornithological surveys.

A8-5.2 Upperchurch Windfarm 2015 to 2017 Survey Results

Table 1: Breeding Season (Summer) 2015 Hen Harrier Sighting Notes

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
2	26/03/2015	Nil Sightings						
3	26/03/2015	Nil Sightings						
1	27/03/2015	Nil Sightings						
2	27/03/2015	Nil Sightings						
2	27/03/2015	Hen Harrier	Male (Adult)	11:42	Wet Heath	120 sec	Foraging	First observed over heath. Started to circle, gaining height, flying in a N.W direction.
2	27/03/2015	Hen Harrier	Male (Adult)	11:42	Wet Heath	125 sec	Soaring	First observed over heath. Started to circle, gaining height, flying in a N.W direction.
2	27/03/2015	Hen Harrier	Male (Adult)	11:42	Sitka Spruce	20	Soaring	First observed over heath. Started to circle, gaining height, flying in a N.W direction.
2	27/03/2015	Hen Harrier	Female (Adult)	14:48	Conifer Plantation	15	Foraging	Foraging along path/track, very low
3	28/03/2015	Nil Sightings						
4	28/03/2015	Nil Sightings						
1	29/03/2015	Nil Sightings						
4	29/03/2015	Nil Sightings						
2	16/04/2015	Nil Sightings						
3	16/04/2015	Nil Sightings						
1	17/04/2015	Nil Sightings						
2	17/04/2015	Nil Sightings						
3	17/04/2015	Nil Sightings						
1	18/04/2015	Nil Sightings						

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
4	18/04/2015	Nil Sightings						
5	18/04/2015	Nil Sightings						
4	19/04/2015	Nil Sightings						
5	19/04/2015	Hen Harrier	Female (Adult)	11:33	Diciduous Forestry	7 sec	Foraging	Observes briefly flying over brow of hill at edge of diciduous forestry
3	27/05/2015	Nil Sightings						
4	27/05/2015	Nil Sightings						
1	28/05/2015	Nil Sightings						
5	28/05/2015	Nil Sightings						
2	29/05/2015	Nil Sightings						
3	29/05/2015	Nil Sightings						
4	30/05/2015	Nil Sightings						
5	30/05/2015	Nil Sightings						
1	31/05/2015	Nil Sightings						
2	31/05/2015	Nil Sightings						
1	17/06/2015	Nil Sightings						
2	17/06/2015	Nil Sightings						
2	18/06/2015	Nil Sightings						
3	18/06/2015	Nil Sightings						
1	19/06/2015	Nil Sightings						
3	19/06/2015	Nil Sightings						
4	20/06/2015	Nil Sightings						
5	20/06/2015	Nil Sightings						
4	21/06/2015	Nil Sightings						
5	21/06/2015	Nil Sightings						
2	20/07/2015	Nil Sightings						

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
5	20/07/2015	Nil Sightings						
1	21/07/2015	Nil Sightings						
2	21/07/2015	Nil Sightings						
3	21/07/2015	Nil Sightings						
4	22/07/2015	Nil Sightings						
5	22/07/2015	Nil Sightings						
1	23/07/2015	Nil Sightings						
4	23/07/2015	Nil Sightings						
3	24/07/2015	Nil Sightings						
2	23/08/2015	Nil Sightings						
3	23/08/2015	Nil Sightings						
1	24/08/2015	Nil Sightings						
2	24/08/2015	Nil Sightings						
1	25/08/2015	Nil Sightings						
3	25/08/2015	Nil Sightings						
4	26/08/2015	Nil Sightings						
5	26/08/2015	Nil Sightings						
4	27/08/2015	Nil Sightings						
5	27/08/2015	Nil Sightings						

Table 2: Breeding Season (Summer) 2015 Hen Harrier Survey Results (Time Date and Weather Conditions)

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
2	26/03/2015	JA	DRY	OVERCAST	EXCELLENT	F2-3	NW	8	1000	1300	3H
3	26/03/2015	JA	DRY	OVERCAST	EXCELLENT	F2-3	NW	10	1330	1630	3H
1	27/03/2015	JA	OCC. SHOWERS	OVERCAST	GOOD	F3	SE	8	1540	1840	3H
2	27/03/2015	JA	SQUALLS	OVERCAST	GOOD	F2-3	SE	8	0900	1200	3H
2	27/03/2015	JA	OCC. SHOWERS	OVERCAST	EXCELLENT	F3	SE	8	1230	1530	3H
3	28/03/2015	JA	HEAVY SQUALLS	OVERCAST	GOOD	F3-4	W	8	1320	1620	3H
4	28/03/2015	JA	HEAVY SQUALLS	OVERCAST	GOOD	F3-4	W	10	1000	1300	3H
1	29/03/2015	JA	OCC. SHOWERS	OVERCAST	GOOD	F2-3	SW	10	0900	1200	3H
4	29/03/2015	JA	OCC. SHOWERS	OVERCAST	GOOD	F2-3	SW	10	1230	1530	3H
2	16/04/2015	JA	NONE	SUNNY	EXCELLENT	F2-3	SE	12	1330	1630	3H
3	16/04/2015	JA	NONE	SUNNY	EXCELLENT	F2-3	SE	10 TO 12	1000	1300	3H
1	17/04/2015	JA	NONE	NONE	GOOD	F1	NE	14	1530	1830	3H
2	17/04/2015	JA	NONE	SOME	CLEAR	F1	NE	8	0900	1200	3H
3	17/04/2015	JA	NONE	SOME	EXCELLENT	F1	NE	12	1215	1515	3H
1	18/04/2015	JA	NONE	NONE	GOOD	F4	E	6	1215	1515	3H
4	18/04/2015	JA	NONE	NONE	EXCELLENT	F4	E	7	1530	1830	3H
5	18/04/2015	JA	NONE	LITTLE	EXCELLENT	F4	E	6	0900	1200	3H
4	19/04/2015	JA	NONE	NONE	EXCELLENT	F1-2	E	15	1330	1630	3H
5	19/04/2015	JA	NONE	NONE	EXCELLENT	F1-2	E	12	1000	1300	3H
3	27/05/2015	JA	HEAVY	NONE	GOOD	F4-5	SW	10	1300	1600	3H
4	27/05/2015	JA	HEAVY	NONE	OKAY	F4	SW	10	0930	1230	3H
1	28/05/2015	JA	FREQUENT SQUALLS	NONE	GOOD	F4-5	NW	8	0930	1230	3H
5	28/05/2015	JA	FREQUENT SQUALLS	NONE	GOOD	F4-5	NW	9	1245	1545	3H
2	29/05/2015	JA	HEAVY	NONE	GOOD	F4	NW	8 TO 10	0900	1200	3H
3	29/05/2015	JA	NONE	CLEAR	EXCELLENT	F4	NW	10	1215	1515	3H

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
4	30/05/2015	JA	NONE	SUNNY	GOOD	F2-3	SW	12	1245	1545	3H
5	30/05/2015	JA	NONE	CLOUDY AT TIMES	GOOD	F2-3	SW	12 TO 13	0930	1230	3H
1	31/05/2015	JA	NONE	SUNNY	GOOD	F3	SW	14	1250	1550	3H
2	31/05/2015	JA	NONE	SUNNY	GOOD	F2-3	SW	12 TO 13	0930	1230	3H
1	17/06/2015	JA	NONE	SUNNY	EXCELLENT	F3	SW	13	1000	1300	3H
2	17/06/2015	JA	NONE	CLEAR	EXCELLENT	F3	SW	14	1315	1515	2H
2	18/06/2015	JA	NONE	CLEAR	EXCELLENT	F2-3 VEERING F3-4	SW TO W	18 TO 19	1000	1200	2H
3	18/06/2015	JA	NONE	HAZY	GOOD	F3-4	W	19 TO 20	1300	1600	3H
1	19/06/2015	JA	NONE	OVERCAST	GOOD	F2-3	SW	18 TO 19	0930	1230	3H
3	19/06/2015	JA	NONE	SUNNY	GOOD	F2-3	SW	18	1245	1545	3H
4	20/06/2015	JA	NONE	SUNNY THEN CLOUDY	EXCELLENT	F2-3	SW	15	0930	1230	3H
5	20/06/2015	JA	NONE	SUNNY, SOME CLOUD	CLEAR	F3	SW	18	1300	1600	3H
4	21/06/2015	JA	NONE	SUNNY, SOME CLOUD	GOOD	F2-3	SW	15	1000	1300	3H
5	21/06/2015	JA	NONE	CLEAR	EXCELLENT	F2-3	SW	16	1300	1600	3H
2	20/07/2015	JA	OCC. SQUALLS	OVERCAST	GOOD	F3-4	SW	14	0930	1230	3H
5	20/07/2015	JA	OCC. SQUALLS	OVERCAST	GOOD	F3-4	SW	14	1300	1600	3H
1	21/07/2015	JA	OCC. SQUALLS	SOME CLOUD	EXCELLENT	F5	WSW	12	1215	1515	3H
2	21/07/2015	JA	OCC. SQUALLS	CLOUDY	EXCELLENT	F4-5	W	12	1515	1815	3H
3	21/07/2015	JA	OCC. SQUALLS	SOME CLOUD	GOOD	F4-5	WSW	10	0900	1200	3H
4	22/07/2015	JA	NONE	OVERCAST	GOOD	F3	NW	15	1230	1530	3H
5	22/07/2015	JA	NONE	CLOUDY	GOOD	F2-3	NW	15	0930	1230	3H
1	23/07/2015	JA	OCC. SHOWERS	OVERCAST	GOOD	F2-3	NW	14	1000	1300	3H
4	23/07/2015	JA	SHOWERY	OVERCAST	GOOD	F3-4	NW	14 TO 15	1330	1630	3H
3	24/07/2015	JA	NONE	CLOUDY AT TIMES	GOOD	F2	SW	14 TO 15	0930	1230	3H
2	23/08/2015	JA	CONTINUOUS SQUALLS	OVERCAST	GOOD	F2-3	SW	16	1000	1300	3H
3	23/08/2015	JA	SQUALLS	NONE	GOOD	F2-3	SW	16	1330	1630	3H
1	24/08/2015	JA	NONE	CLEAR	EXCELLENT	F4	NW	15	1330	1630	3H

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIA 2019, Chapter 8: Biodiversity/EIA 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
2	24/08/2015	JA	OCC. DRIZZLE	OVERCAST	GOOD	F3	NW	15	1000	1300	3H
1	25/08/2015	JA	HEAVY RAIN	DULL	POOR AT TIMES	AT F2-3	SW	12	0930	1230	3H
3	25/08/2015	JA	HEAVY RAIN	NONE	GOOD	F2	SW	12	1300	1600	3H
4	26/08/2015	JA	NONE	SUNNY, OCC. CLOUD	EXCELLENT	F4	SW	15	1245	1545	3H
5	26/08/2015	JA	NONE	SUNNY, SOME CLOUD	CLEAR	F3-4	SW	15	0930	1230	3H
4	27/08/2015	JA	NONE	SUNNY. CLOUDY AT TIMES	GOOD	F3-4	SW	15	1300	1600	3H
5	27/08/2015	JA	NONE	SUNNY	CLEAR	F3-4	SW		0930	1230	3H

Table 3: Non-Breeding Season (Winter) 2015 Hen Harrier Sighting Notes

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
1	17/09/2015	Nil Sightings						
2	15/09/2015	Nil Sightings						
3	15/09/2015	Nil Sightings						
2	16/09/2015	Nil Sightings						
3	16/09/2015	Nil Sightings						
5	17/09/2015	Nil Sightings						
1	18/09/2015	Nil Sightings						
4	18/09/2015	Nil Sightings						
4	19/09/2015	Nil Sightings						
5	19/09/2015	Nil Sightings						
4	20/10/2015	Nil Sightings						
2	21/10/2015	Nil Sightings						
3	21/10/2015	Nil Sightings						
4	22/10/2015	Nil Sightings						
1	29/10/2015	Nil Sightings						
5	29/10/2015	Nil Sightings						
1	30/10/2015	Nil Sightings						
2	30/10/2015	Nil Sightings						
3	31/10/2015	Nil Sightings						
5	31/10/2015	Nil Sightings						
1	11/11/2015	Nil Sightings						
2	12/11/2015	Nil Sightings						
4	13/11/2015	Nil Sightings						
5	13/11/2015	Nil Sightings						
1	25/11/2015	Nil Sightings						
3	25/11/2015	Nil Sightings						
2	26/11/2015	Nil Sightings						
3	26/11/2015	Nil Sightings						

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
4	27/11/2015	Nil Sightings						
5	27/11/2015	Nil Sightings						
2	11/12/2015	Nil Sightings						
3	11/12/2015	Nil Sightings						
5	12/12/2015	Nil Sightings						
4	13/12/2015	Nil Sightings						
5	13/12/2015	Nil Sightings						
1	22/12/2015	Nil Sightings						
2	22/12/2015	Nil Sightings						
3	22/12/2015	Nil Sightings						
4	23/12/2015	Nil Sightings						
2	14/01/2016	Nil Sightings						
3	14/01/2016	Nil Sightings						
2	15/01/2016	Nil Sightings						
4	15/01/2016	Nil Sightings						
1	16/01/2016	Nil Sightings						
5	16/01/2016	Nil Sightings						
1	17/01/2016	Nil Sightings						
3	17/01/2016	Nil Sightings						
1	26/01/2016	Nil Sightings						
3	26/01/2016	Nil Sightings						
2	27/01/2016	Nil Sightings						
4	27/01/2016	Nil Sightings						
5	27/01/2016	Nil Sightings						
1	11/02/2016	Nil Sightings						
3	11/02/2016	Nil Sightings						
4	12/02/2016	Nil Sightings						
5	12/02/2016	Nil Sightings						
2	16/02/2016	Nil Sightings						

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIA 2019, Chapter 8: Biodiversity/EIA 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
3	16/02/2016	Nil Sightings						
1	17/02/2016	Nil Sightings						
4	17/02/2016	Nil Sightings						
5	17/02/2016	Nil Sightings						
2	18/02/2016	Nil Sightings						

Table 4: Non-Breeding Season (Winter) 2015 Hen Harrier Survey Results (Time Date and Weather Conditions)

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg.C)	Start Time	End Time	Duration of survey (hrs)
1	17/09/2015	JA	NONE	SOME CLOUD	EXCELLENT	F2-2	SW	12	0930	1230	3H
2	15/09/2015	JA	NONE	CLOUDY	GOOD	< F1	NW	17 TO 18	1100	1400	3H
3	15/09/2015	JA	NONE	OVERCAST	GOOD	F1	NW	15	1405	1705	3H
2	16/09/2015	JA	NONE	LOW CLOUD AT TIMES	GOOD	F2-3	N	10	0930	1230	3H
3	16/09/2015	JA	NONE	BRIGHT, OCC. CLOUD	GOOD	F2-3	N	10	1235	1535	3H
5	17/09/2015	JA	NONE	SOME CLOUD	EXCELLENT	F2	SW	11 TO 12	1300	1600	3H
1	18/09/2015	JA	HEAVY RAIN	NONE	POOR AT TIMES	AT F3-4	SW	14	1000	1300	3H
4	18/09/2015	JA	HEAVY RAIN	NONE	POOR	F3-4	SW	12	1330	1630	3H
4	19/09/2015	JA	NONE	SUNNY, CLOUDY AT TIMES	GOOD	F3-4	SW	14	1330	1630	3H
5	19/09/2015	JA	NONE	SUNNY, SOME CLOUD	GOOD	F3-4	SW	15	1000	1300	3H
4	20/10/2015	JA	MISTY, CLEARING AT TIMES	NONE	GOOD	F3-4	SW	9 TO 10	1300	1600	3H
2	21/10/2015	JA	HEAVY MISTY RAIN	NONE	POOR	F3-4	SW	10	1000	1300	3H
3	21/10/2015	JA	HEAVY MISTY RAIN	NONE	POOR	F3-4	SW	10	1315	1615	3H
4	22/10/2015	JA	NONE	BRIGHT AT TIMES, OVERCAST	GOOD	F4	NW	9	1000	1300	3H
1	29/10/2015	JA	NONE	SUNNY	GOOD	F1 BECOMING F3-4	SW	9	0930	1230	3H
5	29/10/2015	JA	NONE	SUNNY	GOOD	F3-4	SW	8 TO 9	1245	1545	3H
1	30/10/2015	JA	NONE	SOME SUN	GOOD	F4	SW	8	0930	1230	3H
2	30/10/2015	JA	NONE	BRIGHT	GOOD	F4	SW	8	1240	1540	3H
3	31/10/2015	JA	NONE	OVERCAST, CLOUDY, CLEAR	GOOD	F3-4	SW	8	0930	1230	3H
5	31/10/2015	JA	NONE	OVERCAST, CLOUDY, CLEAR	GOOD	F3-4	SW	8	1240	1540	3H
1	11/11/2015	JA	SHOWERS	DULL	GOOD	F3-4 OCC. 4-5	SW	8	1310	1610	3H
2	12/11/2015	JA	SHOWERS	DULL, OVERCAST	GOOD	F5-6	SW	7 TO 8	1000	1200	2H
4	13/11/2015	JA	SHOWERS	DULL	GOOD	F4-5	SW	9	1310	1610	3H

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
5	13/11/2015	JA	NONE	DULL, OVERCAST	GOOD	F4-5	SW	8 TO 9	1000	1300	3H
1	25/11/2015	JA	FREQUENT SHOWERS	SUNNY	GOOD	F4-5	W	10	0930	1230	3H
3	25/11/2015	JA	FREQUENT SHOWERS	SUNNY	GOOD	F4-5	W	10	1245	1545	3H
2	26/11/2015	JA	DENSE MIST, OCC. DRIZZLE	NONE	POOR	F2	W	9 TO 10	1000	1300	3H
3	26/11/2015	JA	MIST, CLEARING AT TIMES	NONE	GOOD	F2	W	9 TO 10	1315	1515	2H
4	27/11/2015	JA	MISTY RAIN, CLEARING LATER	NONE	POOR	F2-3	W	9 TO 10	1245	1545	3H
5	27/11/2015	JA	MISTY RAIN, CLEARING AT TIMES	NONE	POOR AT TIMES	AT F2-3	W	8 TO 9	0930	1230	3H
2	11/12/2015	JA	NONE	BRIGHT, SUNNY	GOOD	F2-3	SE	7 TO 8	0930	1230	3H
3	11/12/2015	JA	NONE	BRIGHT, SUNNY	GOOD	F2-3	SE	7 TO 8	1240	1540	3H
5	12/12/2015	JA	PERSISTENT SQUALLS	NONE	GOOD	F2-3	SW	9 TO 10	1210	1510	3H
4	13/12/2015	JA	WET	CLOUDY, DULL	GOOD	F3-4	SW	9 TO 10	1240	1540	3H
5	13/12/2015	JA	WET	CLOUDY, DULL	GOOD	F3-4	SW	9 TO 10	0930	1230	3H
1	22/12/2015	JA	OCC. HEAVY DRIZZLE	OVERCAST	GOOD	F3-4	S-SW	7 TO 8	0900	1100	2H
2	22/12/2015	JA	OCC. DRIZZLE	OVERCAST, BRIGHT SPELLS	GOOD	F4-5	S-SW	6 TO 8	1100	1300	2H
3	22/12/2015	JA	DRY	BRIGHT, SOME CLOUD	GOOD		S-SW	6 TO 7	1300	1500	2H
4	23/12/2015	JA	NONE	BRIGHT, SUNNY	GOOD	F2-3	SW	6 TO 7	1310	1610	3H
2	14/01/2016	JA	FROST ON GROUND	BRIGHT, OVERCAST	GOOD	F3-4	WNW	4	1100	1300	2H
3	14/01/2016	JA	OCC. DRIZZLE	BRIGHT, SOME CLOUD	GOOD	F4	WNW	4	1305	1505	2H
2	15/01/2016	JA	NONE	SUNNY, CLEAR	GOOD	F3-4	SE	4 TO 5	1215	1415	2H
4	15/01/2016	JA	NONE	SUNNY, CLEAR	GOOD	F3	NW	4 TO 5	1405	1605	2H
1	16/01/2016	JA	NONE	FOGGY AT FIRST, CLEAR	GOOD	F1-2	SE	5	1000	1200	2H
5	16/01/2016	JA	NONE	BRIGHT	GOOD	F1-2	SE	5	1420	1620	2H
1	17/01/2016	JA	NONE	FOGGY, LIFTING AT TIMES	GOOD	F1-2	SE	5 TO 6	0930	1230	3H
3	17/01/2016	JA	NONE	FOGGY, LIFTING AT TIMES	GOOD	F1-2	SE	5	1240	1540	3H
1	26/01/2016	JA	CONTINUOUS RAIN	NONE	GOOD	F3-4	SW	7 TO 8	0930	1030	1H

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
3	26/01/2016	JA	PERSISTENT RAIN	NONE	GOOD	F3-4	SW		1040	1140	1H
2	27/01/2016	JA	OCC. SQUALLS	NONE	GOOD	F3-4	NW	8 TO 9	1140	1340	2H
4	27/01/2016	JA	DRY	CLEAR	GOOD	F3-4	NW	8 TO 9	1400	1600	2H
5	27/01/2016	JA	OCC. SQUALLS	NONE	GOOD	F3-4	NW	8 TO 9	0930	1130	2H
1	11/02/2016	JA	OCC. LIGHT SHOWERS	BRIGHT, SUNNY	GOOD	F1	SE	6 TO 7	0900	1200	3H
3	11/02/2016	JA		BRIGHT, SUNNY	GOOD	F1-2	SE	8 TO 9	1230	1530	3H
4	12/02/2016	JA	OCC. SHOWER	DULL, OVERCAST	GOOD	F2	SW	8 TO 9	0930	1230	3H
5	12/02/2016	JA	NONE	DULL, OVERCAST	GOOD	F3	SW	8 TO 9	1300	1600	3H
2	16/02/2016	JA	HEAVY PERSISTENT RAIN	NONE	POOR AT TIMES	AT GALE FORCE	SE	10	1000	1300	3H
3	16/02/2016	JA	HEAVY PERSISTENT RAIN	NONE	GOOD	GALE FORCE	SE	10	1315	1615	3H
1	17/02/2016	JA	HEAVY RAIN AT TIMES	NONE	POOR AT TIMES	AT F2-3	SW	7 TO 8	0900	1200	3H
4	17/02/2016	JA	NONE	SUNNY, CLEAR	GOOD	F2-3	SW	7 TO 8	1230	1630	4H
5	17/02/2016	JA	HEAVY SHOWER AT 1300	BRIGHT, SUNNY	GOOD	F1	SW	8 TO 9	1230	1530	3H
2	18/02/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F1-2	W	6 TO 7	0900	1200	3H

Table 5: Breeding Season (Summer) 2016 Hen Harrier Sighting Notes

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
1	26/03/2016	Nil Sightings						
1	26/03/2016	Nil Sightings						
1	27/03/2016	Nil Sightings						
4	27/03/2016	Nil Sightings						
4	28/03/2016	Nil Sightings						
3	30/03/2016	Nil Sightings						
5	30/03/2016	Nil Sightings						
2	31/03/2016	Nil Sightings						
4	06/04/2016	Nil Sightings						
2	08/04/2016	Nil Sightings						
3	27/04/2016	Nil Sightings						
5	27/04/2016	Nil Sightings						
1	28/04/2016	Nil Sightings						
3	28/04/2016	Nil Sightings						
5	28/04/2016	Nil Sightings						
1	29/04/2016	Nil Sightings						
2	29/04/2016	Nil Sightings						
4	29/04/2016	Nil Sightings						
2	11/05/2016	Nil Sightings						
3	11/05/2016	Nil Sightings						
1	12/05/2016	Nil Sightings						
4	13/05/2016	Nil Sightings						
2	14/05/2016	Nil Sightings						
3	14/05/2016	Nil Sightings						
4	27/05/2016	Nil Sightings						

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
5	27/05/2016	Nil Sightings						
1	28/05/2016	Nil Sightings						
5	29/05/2016	Nil Sightings						
1	07/06/2016	Nil Sightings						
3	07/06/2016	Nil Sightings						
2	08/06/2016	Nil Sightings						
1	09/06/2016	Hen Harrier	Male (Adult)	12:35	Semi-improved Agricultural Grassland	180sec	Foraging	Observed for a total of 180sec at various heights
5	09/06/2016	Nil Sightings						
2	10/06/2016	Nil Sightings						
3	10/06/2016	Nil Sightings						
4	15/06/2016	Nil Sightings						
4	17/06/2016	Nil Sightings						
5	17/06/2016	Nil Sightings						
1	19/07/2016	Nil Sightings						
3	19/07/2016	Nil Sightings						
1	20/07/2016	Nil Sightings						
3	20/07/2016	Nil Sightings						
2	21/07/2016	Nil Sightings						
4	21/07/2016	Nil Sightings						
2	22/07/2016	Nil Sightings						
5	22/07/2016	Nil Sightings						
4	23/07/2016	Nil Sightings						
5	23/07/2016	Nil Sightings						
3	08/08/2016	Nil Sightings						
4	08/08/2016	Nil Sightings						
2	09/08/2016	Nil Sightings						

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIA 2019, Chapter 8: Biodiversity/EIA 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
2	10/08/2016	Nil Sightings						
3	11/08/2016	Nil Sightings						
4	11/08/2016	Nil Sightings						
1	16/08/2016	Nil Sightings						
5	16/08/2016	Nil Sightings						
1	17/08/2016	Nil Sightings						
5	17/08/2016	Nil Sightings						

Table 6: Breeding Season (Summer) 2016 Hen Harrier Survey Results (Time Date and Weather Conditions)

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
1	26/03/2016	JA	FREQUENT SHOWERS	OVERCAST	GOOD	F3-4	SW	10	1200	1500	3H
1	26/03/2016	JA	FREQUENT SHOWERS	OVERCAST	GOOD	F3-4	SW	10	0845	1145	3H
1	27/03/2016	JA	FREQUENT HAIL SHOWERS	BRIGHT AT TIMES	GOOD	F5	SSW	10	0930	1230	3H
4	27/03/2016	JA	FREQUENT HAIL SHOWERS	BRIGHT	GOOD	F5-6	SSW	8 TO 9	1300	1600	3H
4	28/03/2016	JA	FREQUENT SHOWERS	BRIGHT, SUNNY	GOOD	F3-4	SW	10	0900	1200	3H
3	30/03/2016	JA	OCC. SHOWERS	SUNNY	GOOD	F3-4	SW		1240	1540	3H
5	30/03/2016	JA	FREQUENT HAIL SHOWERS	SUNNY	GOOD	F3-4	SW	8 TO 9	0930	1230	3H
2	31/03/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F2-3	SW	12	1240	1540	3H
4	06/04/2016	JA	FREQUENT HAIL	CLEAR AT TIMES	GOOD	F4-5 (GALE FORCE AT TIMES)	NW	6 TO 8	1545	1845	3H
2	08/04/2016	JA	NONE	OVERCAST	GOOD	F2-3	SW	9	1230	1530	3H
3	27/04/2016	JA	OCC. HEAVY HAIL SHOWER	SOME CLOUD	GOOD	F3-4	NW	8	0900	1200	3H
5	27/04/2016	JA	NONE	SOME CLOUD	GOOD	F3-4	NW	10	1300	1600	3H
1	28/04/2016	JA	CONTINUOUS SQUALLS	OVERCAST	POOR AT TIMES	F4-5	WSW	8 TO 9	1530	1830	3H
3	28/04/2016	JA	OCC. SQUALLS	NONE	GOOD	F5 OCC -5-6	WSW	7 TO 8	1215	1515	3H
5	28/04/2016	JA	OCC. SQUALLS, DRIZZLE	OVERCAST	GOOD	F4-5	SW	8 TO 9	0900	1200	3H
1	29/04/2016	JA	OCC. SHOWERS	OVERCAST	GOOD	F4-5	NW	6 TO 7	0900	1200	3H
2	29/04/2016	JA	OCC. SHOWERS	OVERCAST	GOOD	F3-4	NW		1530	1830	3H
4	29/04/2016	JA	OCC. SHOWERS	OVERCAST	GOOD	F3-4	NW	6 TO 7	1215	1515	3H
2	11/05/2016	JA	NONE	HAZY	GOOD	F1-2	N	12	1500	1800	3H
3	11/05/2016	JA	NONE	HAZY	GOOD	F1-2	N	12	1130	1430	3H
1	12/05/2016	JA	NONE	OVERCAST	FAIR	F2-3	NE	10	1000	1300	3H
4	13/05/2016	JA	NONE	CLOUDLESS, SUNNY	GOOD	F1-2	NE	10	0930	1230	3H
2	14/05/2016	JA	NONE	CLOUD	GOOD	F2-3	NE	10	1300	1600	3H
3	14/05/2016	JA	NONE	CLOUDY AT TIMES	GOOD	F1-2	NE	9 TO 10	0930	1230	3H
4	27/05/2016	JA	NONE	SUNNY	EXCELLENT	F2-3	NE	12	1000	1300	3H

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIAR 2019, Chapter 8: Biodiversity/EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
5	27/05/2016	JA	NONE	OVERCAST	GOOD	F2-3	NE	13	1330	1630	3H
1	28/05/2016	JA	NONE	CLOUDY WITH HAZE	GOOD	F1	NE	12	1000	1300	3H
5	29/05/2016	JA	NONE	SUNNY	GOOD	F3-4	NE	17	1300	1600	3H
1	07/06/2016	JA	NONE	CLEAR	GOOD	F1-2	SW	17 TO 18	1000	1300	3H
3	07/06/2016	JA	NONE	CLEAR, SUNNY	GOOD	F1-2	SW	20	1330	1630	3H
2	08/06/2016	JA	NONE	FOG THEN SUNSHINE	GOOD	F1-2	SW	12	1000	1300	3H
1	09/06/2016	JA	RAIN AT 1300	OVERCAST THEN BRIGHTER	GOOD	F1-2	SW	12	1000	1300	3H
5	09/06/2016	JA	SLIGHT DRIZZLE AT 1430	SUNNY, SOME CLOUD	GOOD	F2	S	15 TO 17	1315	1615	3H
2	10/06/2016	JA	RAIN, CLEARING AT TIMES	OVERCAST	GOOD	F2	SE	12	0900	1200	3H
3	10/06/2016	JA	RAIN, CLEARING AT TIMES	OVERCAST	GOOD	F2	SE	12	1215	1515	3H
4	15/06/2016	JA	OCC. SHOWERS	BRIGHT	GOOD	F3-4	NW	15	1200	1500	3H
4	17/06/2016	JA	NONE	OVERCAST	GOOD	F3-4	N	8 TO 10	1245	1545	3H
5	17/06/2016	JA	NONE	OVERCAST	GOOD	F3-4	N	10	0930	1230	3H
1	19/07/2016	JA	NONE	SUNNY, OCC. CLOUD	GOOD	F2-3	E	25 TO 26	1200	1500	3H
3	19/07/2016	JA	NONE	SUNNY, CLOUDY SPELLS	GOOD	F2-3	E	30	1530	1830	3H
1	20/07/2016	JA	NONE	SUNNY, SOME CLOUD	EXCELLENT	F2-3	SW	15	0900	1200	3H
3	20/07/2016	JA	OCC. LIGHT SHOWER	CLOUDY SPELLS	GOOD	F3-4	SW	15 TO 16	1220	1520	3H
2	21/07/2016	JA	NONE	HAZY	GOOD	F3-4	S	12	0930	1230	3H
4	21/07/2016	JA	NONE	OVERCAST	GOOD	F4	S	12 TO 15	1245	1545	3H
2	22/07/2016	JA	RAIN AT 1400	OVERCAST, CLOUDY	GOOD	F2-3	NW	15	1240	1540	3H
5	22/07/2016	JA	OCC. LIGHT DRIZZLE	CLOUDY AT TIMES	GOOD	F2-3	NW	10	0930	1230	3H
4	23/07/2016	JA	MISTY	OVERCAST	FAIR	F2	W	14	1245	1545	3H
5	23/07/2016	JA	DRIZZLE	OVERCAST, FOG AT TIMES	GOOD	F1-2	W	12	0930	1230	3H
3	08/08/2016	JA	OCC. SQUALLS	SUNNY	GOOD	F3-4	NW	17 TO 18	1530	1830	3H
4	08/08/2016	JA	OCC. SQUALLS	SUNNY	GOOD	F3-4	NW	17 TO 18	1200	1500	3H
2	09/08/2016	JA	NONE	OCC. CLOUD	GOOD	F4-5	NW	10 TO 12	1015	1315	3H

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIA 2019, Chapter 8: Biodiversity/EIA 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
2	10/08/2016	JA	OCC. LIGHT SQUALLS	OVERCAST	GOOD	F4-5	NW	10	0930	1230	3H
3	11/08/2016	JA	NONE	OVERCAST	GOOD	F2-3	SW	15	1300	1600	3H
4	11/08/2016	JA	OCC. LIGHT DRIZZLE	OVERCAST	GOOD	F2-3	W	14 TO 15	0930	1230	3H
1	16/08/2016	JA	NONE	SUNNY	GOOD	F1-2	SE	20 TO 22	1600	1900	3H
5	16/08/2016	JA	NONE	SUNNY	GOOD	F1-2	SE	17 TO 20	1230	1530	3H
1	17/08/2016	JA	OCC. DRIZZLE	OVERCAST, HAZY	GOOD	F1-2 OCC. 1-2	E	15 TO 17	1000	1300	3H
5	17/08/2016	JA	NONE	OVERCAST, HAZY	GOOD	F1-2 OCC. 3-4	E	17	1330	1630	3H

Table 7: Non-Breeding Season (Winter) 2016 Hen Harrier Sighting Notes

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
4	21/09/2016	Nil Sightings						
5	21/09/2016	Nil Sightings						
1	22/09/2016	Nil Sightings						
1	23/09/2016	Nil Sightings						
5	23/09/2016	Nil Sightings						
4	27/09/2016	Nil Sightings						
2	27/09/2016	Nil Sightings						
2	28/09/2016	Nil Sightings						
3	28/09/2016	Nil Sightings						
5	29/10/2016	Nil Sightings						
2	29/10/2016	Nil Sightings						
4	30/10/2016	Nil Sightings						
3	30/10/2016	Nil Sightings						
3	31/10/2016	Nil Sightings						
1	31/10/2016	Nil Sightings						
2	01/11/2016	Nil Sightings						

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
1	01/11/2016	Nil Sightings						
4	01/11/2016	Nil Sightings						
4	02/11/2016	Nil Sightings						
2	02/11/2016	Nil Sightings						
3	02/11/2016	Nil Sightings						
1	24/11/2016	Nil Sightings						
5	24/11/2016	Nil Sightings						
1	25/11/2016	Nil Sightings						
5	25/11/2016	Nil Sightings						
2	26/11/2016	Nil Sightings						
3	26/11/2016	Nil Sightings						
4	27/11/2016	Nil Sightings						
3	29/11/2016	Nil Sightings						
2	29/11/2016	Nil Sightings						
4	30/11/2016	Nil Sightings						
3	01/12/2016	Nil Sightings						
2	01/12/2016	Nil Sightings						

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
5	12/12/2016	Nil Sightings						
1	12/12/2016	Nil Sightings						
4	13/12/2016	Nil Sightings						
5	13/12/2016	Nil Sightings						
4	14/12/2016	Nil Sightings						
1	14/12/2016	Nil Sightings						
4	28/12/2016	Nil Sightings						
2	29/12/2016	Nil Sightings						
3	29/12/2016	Nil Sightings						
4	30/12/2016	Nil Sightings						
2	30/12/2016	Hen Harrier	Female (Adult)	12:49	Wet Grassland / Conifer Edge	190 sec	Foraging	Less than 5 meters above ground Hunting down through the valley
2	30/12/2016	Hen Harrier	Female (Adult)	12:49	Acid Grassland	50 sec	Foraging	Less than 5 meters above ground Hunting down through the valley
3	03/01/2017	Nil Sightings						
2	25/01/2017	Nil Sightings						
3	25/01/2017	Nil Sightings						
5	26/01/2017	Nil Sightings						

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
5	26/01/2017	Nil Sightings						
4	26/01/2017	Nil Sightings						
4	27/01/2017	Nil Sightings						
1	27/01/2017	Hen Harrier	Female (Adult)	10:45	Grassland and Conifer edge	360	Commuting & Hunting	Flew across valley then started to hunt over rough pasture circling field and edge of small conifer planting until lost from view. 6 mins total 2 mins hunting (less that 10 m above ground)
5	28/01/2017	Nil Sightings						
4	29/01/2017	Nil Sightings						
1	29/01/2017	Nil Sightings						
2	30/01/2017	Nil Sightings						
2	31/01/2017	Nil Sightings						
3	31/01/2017	Nil Sightings						
5	27/02/2017	Nil Sightings						
3	27/02/2017	Nil Sightings						
5	28/02/2017	Nil Sightings						

VP Name	Date	Species	Sex	Time of sighting	Habitat	Duration (s)	Activity	Bird Notes
4	28/02/2017	Nil Sightings						
1	01/03/2017	Nil Sightings						
3	02/03/2017	Nil Sightings						
1	03/03/2017	Nil Sightings						
2	03/03/2017	Nil Sightings						
2	04/03/2017	Nil Sightings						
1	19/03/2017	Nil Sightings						
3	19/03/2017	Nil Sightings						
2	20/03/2017	Nil Sightings						
1	20/03/2017	Nil Sightings						
2	21/03/2017	Nil Sightings						
5	30/03/2017	Nil Sightings						
4	30/03/2017	Nil Sightings						
4	31/03/2017	Nil Sightings						
5	01/04/2017	Nil Sightings						
3	02/04/2017	Nil Sightings						

Table 8: Non-Breeding Season (Winter) 2016 Hen Harrier Survey Results

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
4	21/09/2016	JA	HEAVY AT TIMES	OVERCAST	FAIR TO POOR	F2-3	S	10	1130	1430	3H
5	21/09/2016	JA	HEAVY AT TIMES	BRIGHT	GOOD	F2-3	S	12	1500	1800	3H
1	22/09/2016	JA	HEAVY SHOWERS AT TIMES	SOME CLOUD COVER	GOOD	F1-2 UP TO F3-4	SW	5 TO 6	1000	1300	3H
1	23/09/2016	JA	NONE	OVERCAST BUT BRIGHT	GOOD	F4 OCC. F5	SW	6 TO 7	0930	1230	3H
5	23/09/2016	JA	NONE	OVERCAST BUT BRIGHT	EXCELLENT	F4-5	SW	6 TO 8	1245	1545	3H
4	27/09/2016	JA	NONE	BRIGHT, SOME HAZE	GOOD	F5-6	SW	14 TO 15	1100	1400	3H
2	27/09/2016	JA	NONE	BRIGHT, SOME HAZE	GOOD	F5-6	SW	15	1430	1730	3H
2	28/09/2016	JA	NONE	OVERCAST, BRIGHT, CLOUD	GOOD	F3-4	SW	10 TO 12	1000	1300	3H
3	28/09/2016	JA	NONE	OVERCAST, OCC. BRIGHT SPELLS	GOOD	F4-5 OCC. F5-6	SW	15	1330	1630	3H
5	29/10/2016	JA	NONE	SUNNY, SOME CLOUD	GOOD	F1-2	SW	8 TO 10	1100	1300	2H
2	29/10/2016	JA	NONE	BRIGHT, OVERCAST AT TIMES	GOOD	F1-2	SW	10 TO 13	1330	1630	3H
4	30/10/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F1-2	S	12 TO 15	1330	1430	1H
3	30/10/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F1-2	SW	8 TO 9	0900	1100	2H
3	31/10/2016	JA	NONE	OVERCAST, FOG	POOR	<F1	S	10	1115	1315	2H
1	31/10/2016	JA	NONE	HAZY, SOME SUN	GOOD	<F1	S	8 TO 10	0900	1100	2H
2	01/11/2016	JA	NONE	BRIGHT, SOME CLOUD	GOOD	F4	NE	6 TO 7	1045	1245	2H
1	01/11/2016	JA	NONE	OVERCAST, SOME BRIGHT SPELLS	GOOD	F3-4	ENE	6 TO 7	0830	1030	2H
4	01/11/2016	JA	NONE	BRIGHT, SUNNY, SOME CLOUD	GOOD	F3-4	NE	7 TO 8	1250	1450	2H
4	02/11/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F1	NE	7	1215	1315	1H
2	02/11/2016	JA	NONE	BRIGHT, SUNNY, SOME CLOUD	GOOD	F1-2	NE	6 TO 7	0945	1045	1H

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIA 2019, Chapter 8: Biodiversity/EIA 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
3	02/11/2016	JA	NONE	BRIGHT, SUNNY, SOME CLOUD	GOOD	F1-2	NE	6 TO 7	0830	0930	1H
1	24/11/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F1-2	NE	4 TO 5	1000	1300	3H
5	24/11/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F1-2	NE	4 TO 5	1320	1620	3H
1	25/11/2016	JA	NONE	DENSE FOG AT FIRST	GOOD	F1-2	NE	2 TO 3	0930	1230	3H
5	25/11/2016	JA	NONE	FOGGY	GOOD AT TIMES	AT F1-2	NE	2 TO 3	1245	1545	3H
2	26/11/2016	JA	NONE	SLIGHT FOG AT FIRST	GOOD	F2	NE	2 TO 3	1350	1550	2H
3	26/11/2016	JA	NONE	DENSE FOG AT FIRST	GOOD	F2	NE	1 TO 2	0930	1130	2H
4	27/11/2016	JA	NONE	OVERCAST BUT BRIGHT	GOOD	F1	NE	4	0930	1230	3H
3	29/11/2016	JA	NONE	BRIGHT, SUNNY	GOOD	<F1	SW	2	1000	1300	3H
2	29/11/2016	JA	NONE	BRIGHT, SUNNY, SOME CLOUD	GOOD	<F1	SW	3	1215	1415	2H
4	30/11/2016	JA	NONE	BRIGHT, CLOUDLESS	GOOD	<F1	SE	2	0930	1230	3H
3	01/12/2016	JA	NONE	BRIGHT, CLOUDLESS	GOOD	<F1	SE	-2/-3	0930	1130	2H
2	01/12/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F1	SE	0	1345	1545	2H
5	12/12/2016	JA	NONE	BRIGHT, OVERCAST	EXCELLENT	F2	SW	7	1245	1545	3H
1	12/12/2016	JA	NONE	OVERCAST, DULL	GOOD	F3-4	SW	8	0930	1230	3H
4	13/12/2016	JA	MISTY	OVERCAST, DULL	GOOD	F2-3	SE	7	1215	1515	3H
5	13/12/2016	JA	NONE	BRIGHT, SUNNY	GOOD	F2-3	SE	6	0900	1200	3H
4	14/12/2016	JA	HEAVY SQUALLS	OVERCAST, DULL	POOR AT TIMES	AT F1-2	SE	13	1215	1515	3H
1	14/12/2016	JA	FREQUENT HEAVY SQUALLS	OVERCAST, DULL	POOR AT TIMES	AT F1-2	SE	12	0900	1200	3H
4	28/12/2016	JA	NONE	CLOUD 4/8, BRIGHT	GOOD	F1	SSW	8 TO 9	1010	1310	3H
2	29/12/2016	JA	NONE	CLOUD 8/8, OVERCAST	EXCELLENT	F1	S	8 TO 9	1215	1515	3H
3	29/12/2016	JA	NONE	OVERCAST	GOOD	<F1	SW	8	0900	1200	3H
4	30/12/2016	JA	NONE	OVERCAST, BRIGHT	GOOD	F1	SW	7 TO 10	0915	1215	3H
2	30/12/2016	JA	NONE	OVERCAST, CALM	GOOD	F1-2	SW	10 TO 11	1230	1530	3H

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIA 2019, Chapter 8: Biodiversity/EIA 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
3	03/01/2017	JA	NONE	CLOUD 2/8, BRIGHT	GOOD	F1	WNW	6 TO 8	1235	1535	3H
2	25/01/2017	JA	RAIN AT FIRST CLEARING LATER	BRIGHT	GOOD	F4	SW VEERING S	9	0930	1230	3H
3	25/01/2017	JA	RAIN AT 1500	OVERCAST BUT BRIGHT	GOOD	F5-6	SSW	9 TO 10	1230	1530	3H
5	26/01/2017	JA	NONE	OVERCAST, HAZY	GOOD	G6-7 OCC.	SE	5 TO 6	1215	1515	3H
5	26/01/2017	JA	NONE	DULL, OVERCAST	GOOD	F5 OCC. F5-6	SE	6	0900	1200	3H
4	26/01/2017	JA	FREQUENT HEAVY SQUALLS	BRIGHT	GOOD	F3-4	NW	3 TO 4	1000	1300	3H
4	27/01/2017	JA	NONE	BRIGHT BECOMING OVERCAST	GOOD	F1-2	SW	8	1245	1545	3H
1	27/01/2017	JA	HEAVY SHOWER AT FIRST CLEARING	NONE	GOOD	F1-2 THEN F3-4	SE TO SW	7	0930	1230	3H
5	28/01/2017	JA	NONE	BRIGHT, SUNNY	GOOD	F1-2	SW	6	0930	1230	3H
4	29/01/2017	JA	MISTY RAIN, OCC. SPELLS	CLEAR NONE	GOOD	F1-2	SE	9 TO 10	1000	1300	3H
1	29/01/2017	JA	MISTY RAIN, CLEARING LATER	NONE	GOOD	F1-2	SE	9 TO 10	1315	1615	3H
2	30/01/2017	JA	MISTY RAIN AT FIRST	NONE	GOOD	F3-4 OCC. F4-5	SE	10	1000	1300	3H
2	31/01/2017	JA	NONE	FOGGY AT FIRST, SUNNY	GOOD	F1-2	SE TO SW	10	1000	1300	3H
3	31/01/2017	JA	NONE	BRIGHT, CLOUDY AT TIMES	AT GOOD	F1-2	SW	8 TO 9	1310	1610	3H
5	27/02/2017	JA	OCC. SHOWERS	BRIGHT, OVERCAST	GOOD	F3-4	SW	3 TO 4	1230	1530	3H
3	27/02/2017	JA	OCC. SHOWERS	BRIGHT BECOMING OVERCAST	GOOD	F3-4	SW	3 TO 4	0900	1200	3H
5	28/02/2017	JA	HEAVY SQUALLS	CLEAR AT TIMES	GOOD	F5-6 OCC. FORCE	NW	2 TO 3	1230	1530	3H
4	28/02/2017	JA	FREQUENT HEAVY SQUALLS	DULL, OVERCAST	GOOD	F5-6	NW	2 TO 3	0900	1200	3H
1	01/03/2017	JA	NONE	BRIGHT THEN OVERCAST	DULL GOOD	F1-2	SW	3 TO 4	0900	1200	3H

APPENDIX 8.5: Hen Harrier Surveys at Upperchurch Windfarm 2015 - 2017
 EIA 2019, Chapter 8: Biodiversity/EIA 2019, Chapter 8: Biodiversity

VP Name	Date	Observer	Rain	Cloud	Visibility	Wind Speed (Bft)	Wind Direction	Temp (Deg C)	Start Time	End Time	Duration of survey (hrs)
3	02/03/2017	JA	MISTY RAIN AT TIMES	BRIGHT THEN OVERCAST	GOOD	F3-4	SE	4	0930	1230	3H
1	03/03/2017	JA	SHOWERY WITH SPELLS	CLEAR DULL, OVERCAST	GOOD	F3-4	SE	6 TO 7	1245	1545	3H
2	03/03/2017	JA	SHOWERY WITH SPELLS	CLEAR NONE	GOOD	F3-4	SE	6 TO 7	0930	1230	3H
2	04/03/2017	JA	DRIVING RAIN AT TIMES	CLEAR SPELLS	GOOD	F5-6	WNW	7 TO 8	1245	1545	3H
1	19/03/2017	JA	FREQUENT SHOWERS	BRIGHT SPELLS	GOOD	F5-6	S	12 TO 13	1030	1230	2H
3	19/03/2017	JA	SHOWERS	BRIGHT AT TIMES	GOOD	F5-6	S	13 TO 14	1345	1645	3H
2	20/03/2017	JA	SHOWERY, SOME HAIL	BRIGHT SPELLS	GOOD	F5	SW	8	1300	1600	3H
1	20/03/2017	JA	OCC. LIGHT SHOWER	BRIGHT, CLOUD AT TIMES	GOOD	F4-5 OCC 5-6	SW	9	0930	1230	3H
2	21/03/2017	JA	SLIGHT SNOW FLURRY	BRIGHTENING UP	GOOD	F4	SSW	2	0930	1230	3H
5	30/03/2017	JA	SHOWERY	DULL, OVERCAST	GOOD	F4-5	S	10	1430	1730	3H
4	30/03/2017	JA	FREQUENT RAIN	DULL, OVERCAST	GOOD	F4-5	S	10	1100	1400	3H
4	31/03/2017	JA	SHOWERY WITH SPELLS	OVERCAST AT TIMES	GOOD	F4-5	SW	10	0930	1230	3H
5	01/04/2017	JA	FREQUENT SQUALLS	BRIGHT	GOOD	F4-5	SW	8	0930	1230	3H
3	02/04/2017	JA	NONE	SOME CLOUD, SUNNY AFTER	GOOD	F2-3	SW	7 TO 8	0930	1230	3H

Appendix to Chapter 8: Biodiversity

Appendix 8.6: Milestone & Inchivara Wind Farm Hen Harrier Survey 2015 2017

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

REFERENCE DOCUMENTS

APPENDIX 8.6: Milestone & Inchivara Wind Farm Hen Harrier Survey 2015 2017

EIAR 2019, Chapter 8: Biodiversity

**MILESTONE & INCHIVARA
WIND FARM DEVELOPMENT**

**PRE-CONSTRUCTION HEN HARRIER SURVEY
2015**

DECEMBER 2015

Prepared for

ABO Wind Ltd.

by

**Biosphere Environmental Services
29 La Touche Park, Greystones, Co. Wicklow
Tel: 01-2875249 E-mail: maddenb@eircom.net**



Milestone & Inchivara Wind Farms: Hen Harrier Survey 2015

CONTENTS

1.0 Introduction	3
1.1 General description of sites	3
1.2 Slieve Felim to Silvermine Mountains SPA	3
2.0 Survey Methods	4
3.0 Results and Discussion	5
3.1 Results of 2015 Survey	5
3.2 Discussion	6
3.3 Other bird species recorded	6
4.0 Conclusion and Recommendation	6
5.0 References	7

APPENDICES

Appendix 1. Hen Harrier survey : Classification of habitat types & Categories for activity and behaviour of observed birds.

Appendix 2. Hen Harrier Survey 2015: details of Vantage Point watches, April and May

Milestone & Inchivara Wind Farms: Hen Harrier Survey 2015

1.0 INTRODUCTION

BioSphere Environmental Services (BES) was commissioned by ABO Wind Ireland Ltd. to carry out a Hen Harrier breeding survey in 2015 at the sites of the Milestone and Inchivara wind farm developments. The survey was focused on the area within a 500 m radius (approximately) of the construction works which will be carried out at these sites for wind farm development.

It is noted that BES had previously carried out bird surveys at the two sites in 2012, with a further survey at Inchivara in 2013.

1.1 General description of sites

Milestone

The majority of the Milestone site is improved grassland that is managed intensively for agriculture and is of little or no value for foraging hen harriers. Part of the grassland on the Knockcurraghbola Crowlands hill (north-west sector of site) has been reclaimed from heath relatively recently and has a wet character. However, this offers limited foraging potential for hen harriers as the sward is managed intensively through mowing and lacks a tussocky character.

Conifer plantation of two main ages occurs in the north-east sector of the site. Part of this is mature closed canopy forest (planted in 1993) and provides negligible foraging opportunities for harriers. The remainder was planted in 1998 and similarly offers low foraging potential. One small stand of young pre-thicket plantation (planted circa 2009), which provides potential foraging habitat for harriers, occurs in the central area of the site. A strip of immature deciduous woodland (WS2) in the central area of the site offers some foraging potential though is small in extent.

Further conifer plantations occur to the north and east of the site (all now beyond the canopy closure stage), with recent plantings on Shevry Hill.

Inchivara

The majority of the Inchivara site is improved grassland and is of little or no value for foraging hen harriers. The few areas of wet or rough grassland offer some potential for foraging. The plantation on site is now closed canopy and offers low potential for foraging.

The site is adjacent to areas of heath/bog, rough pasture and young plantation to the south and west (mostly within the SPA).

1.2 Slieve Felim to Silvermine Mountains SPA

The Milestone site is located approximately 1 kilometre east of the south-east boundary of the Slieve Felim to Silvermine Mountains SPA (code 04165), while the Inchivara site partially overlaps with the south-east boundary of the SPA.

The SPA is an extensive upland site, much of which is over 200 metres in altitude, rising to 694 m at Keeper Hill. Several important rivers rise within the site, including the Mulkear, Bilboa and Clare rivers.

The site consists of a variety of upland habitats, though approximately half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and

Milestone & Inchivara Wind Farms: Hen Harrier Survey 2015

post-thicket stands present. Substantial areas of clearfell are also present at any one time. Roughly one-quarter of the site is unplanted blanket bog and heath, with both wet and dry heath present. The remainder of the site is largely rough grassland that is used for hill farming.

This SPA is one of the strongholds for Hen Harriers in the country with a population of national importance. During the 2010 national survey, six confirmed pairs and one possible pair were recorded within the SPA (Ruddock et al. 2012). The mix of forestry and open areas provides optimum habitat conditions for this rare bird, which is listed in Annex I of the Birds Directive.

The SPA site is also a traditional breeding site for a pair of Peregrines. Merlin has been recorded within the site but further survey is required to determine its status. Both of these species are listed on Annex I of the EU Birds Directive. Red Grouse is found on some of the unplanted areas of bog and heath – this is a species that has declined in Ireland and is now Red-listed.

2.0 SURVEY METHODS

The survey is based on the methodology of Scottish Natural Heritage (2013). However, as the objective was merely to establish the presence of breeding birds on site (or strictly within 500 m of construction areas) there was no need for monthly surveys through the entire season (which is a requirement for collision risk modelling). Two rounds of surveying were carried out in the early part of the season, i.e. April to May. After early to mid June there is no real prospect of a breeding territory being established although a further short visit to the Milestone site was made in late June.

Surveys were carried out in the following periods:

28th to 29th April

13th to 14th May

23rd June

In previous surveys (as detailed in the relevant EIS reports), two vantage points had been used to provide complete coverage over the Milestone site and one for the Inchivara site. These were used again in 2015 and are described below:

Milestone

- **VP 1** (grid ref. 9583 6024) is located on the road at Shevry just east of the site. This gives commanding views over Knockcurraghbola Commons towards the peak of Knockmaroe, and also views of the north side of the 377 m hill to the south-west of Shevry.
- **VP 2** is located within the site on the mid-slope of Knockcurraghbola Crowlands (grid ref. 9444 5980). This gives views of the internal valley and adjoining slopes extending west of the R497 and to the western slope of Shevry Hill.

Milestone & Inchivara Wind Farms: Hen Harrier Survey 2015

Inchivara

- **VP 1** (grid ref. 9304 5754) is located on the mid-slope (350 m) of the hill to the south-southeast of the site. This gives a commanding view over the site, the rising ground to the north and east, and the lower land to the west (latter within SPA).

From the VPs, watches of approximately 6 hrs duration (broken into 3 hr sessions) were undertaken in each of the survey months (i.e. 12 hrs coverage from each VP). All surveys were carried out in suitable weather conditions. Observations were conducted between 07.30 and 18.00 hrs GMT. The following variables were recorded for sightings of hen harriers:

- Watch period
- Time of sighting
- Sex of bird
- Behaviour
- Habitat(s) below flight path
- Heights of flight (<10 m, 10-50 m, 50-100m, 100-150m, >150 m)

Where sightings of harriers were made, activity and behaviour of birds observed was identified and differentiated into various standard categories (see Appendix 1). Flight lines (if any) were plotted in the field on a 1:25,000 scale map, with direction of flight indicated.

The habitat or habitats over which the birds passed were classified using the standard categories recommended for hen harrier survey (see Appendix 1).

Other species of conservation importance

As well as Hen Harrier, any other bird species of conservation interest was recorded.

3.0 RESULTS AND DISCUSSION

3.1 Results of 2015 survey

Milestone

One Hen Harrier was recorded from VP1 over the strip of conifer plantation to the northeast of WTG4 (within site) and then the adjoining forest to the east of site boundary (Knockcurraghbola Commons) on 13th May 2015. This was an adult female which was foraging over and through the conifers (NF4) at a height of less than 10 m for approximately 90 seconds. Less than 1 hour later it was seen over conifers to northeast of site and then rose steadily in a northwest direction towards Knockmaroe (eventually high in sky, c.200 m, and lost sight off) (see sighting 1, Figure 1).

Inchivara

There were no sightings within the site during the vantage point watches.

However, a male bird was seen briefly (c.30 sec) flying low (presumably hunting) over rough ground approximately 1 km west of the Inchivara site on 29th April 2015. (see sighting 2, Figure 1).

Milestone & Inchivara Wind Farms: Hen Harrier Survey 2015

3.2 Discussion

From the 2015 survey, it can be concluded with full certainty that Hen Harriers did not attempt to nest within the Milestone or Inchivara sites (or within 500 m of the future construction work areas).

The female recorded foraging just outside the Milestone site was probably from one of the territories in the hinterland though the nearest regular territory to Milestone is at a distance of almost 3 km. As the female would be expected to be sitting on the nest in mid May and only making short feeding forays from the nest location, this may suggest that the nesting attempt failed early in the season.

The male recorded in late April to the west of Inchivara (within the SPA) is not unexpected and this bird could be associated with any of the traditional territories (no. 3) within a 5 km radius of Inchivara.

The 2015 results concur with the findings of the 2012 and 2013 surveys, when several birds were recorded foraging within and around the Milestone site and in the vicinity of the Inchivara site but with local nesting not suspected.

3.3 Other bird species recorded

There were no records from within the two wind farm sites of any other species of high conservation importance.

Kestrel (*Falco tinnunculus*), however, was recorded regularly (1-2 birds) within and around the Milestone site and on two occasions at Inchivara and probably breeds locally.

4.0 CONCLUSION AND RECOMMENDATION

The present survey provides conclusive proof that there were no nesting attempts by Hen Harriers within the Milestone and Inchivara wind farm sites in the 2015 season. This is in line with the previous surveys at these two sites and also reflects the absence of any historic records of nesting within or close to the sites.

While it is likely that the situation (i.e. no nesting within sites) will not change in the 2016 season, a similar survey focused on the early part of the breeding season would be required to confirm this. Should a survey in 2016 prove negative for nesting birds, it follows that there would be no restrictions on construction activities within the sites due to Hen Harriers during 2016.

The sightings of two hunting birds in the area during the April and May 2015 surveys indicates that nesting is still occurring at some of the traditional territories within the hinterland of the wind farm sites and foraging birds can be expected in the Milestone and Inchivara area.

Milestone & Inchivara Wind Farms: Hen Harrier Survey 2015

5.0 REFERENCES

Barton, C., Pollack, C., Norriss, D.W., Nagle, T.A., Oliver, G.A. & Newton, S. (2006) The second national survey of breeding Hen Harriers *Circus cyaneus* in Ireland 2005. *Irish Birds* 8: 1-20

Colhoun, K. & Cummins, S. (2013) Birds of conservation concern in Ireland 2014-2019. *Irish Birds* 9 (4): 523-544.

Ruddock, M, Dunlop, B.J., O'Toole, L., Mee, A., & Nagle, T. (2012) *Republic of Ireland National Hen Harrier Survey 2010*. Irish Wildlife Manual No. 59. NPWS, Dublin.

Scottish Natural Heritage (May 2013). Survey Methods for Use in Assessing the Impacts of Onshore Wind Farms on Bird Communities

Milestone & Inchivara Wind Farms: Hen Harrier Survey 2015

APPENDIX 1

Hen Harrier Survey

Classification of habitat types

NF 2	New forestry plantation, trees 20-30 cm high
NF 3	New forestry plantation, trees c 1m in height
NF 4	New forestry plantation, trees >2m in height, patchy thickets
2nd F 1 & 2	2nd rotation forestry plantation, trees 20-30 cm high
2nd F 3	New forestry plantation, trees c 1m in height
2nd F 4	New forestry plantation, trees >2m in height, patchy thickets
F	Post thicket plantation
G	Grazing
RG	Rough Grazing & rushy pasture
HB	Heath / Bog
DE	Deciduous woodland & scrub
GO	Gorse
CF	Clearfell
H	Hedgerow

Categories for activity and behaviour of observed birds

c - circling
d - displaying
fl - flying
fp - foodpass
g - on ground
gl - gliding
h - hunting
p - perching
s - soaring
wp - with prey
fp - foodpass

APPENDIX 2

Hen Harrier Survey 2015: details of Vantage Point watches, April and May

MILESTONE

3-hour Vantage Point Watches

VP ID	Observer	Date	Watch Period	Details	Notes	Weather
1	BM	28 April	09:30-12:30	-	No HH sighted Cuckoo calling ; Male Kestrel hunting on & off site – seen several times;	Vis: good; Prec.: dry; Wind: SW F2-3
2	BM	28 April	14:00 - 17:00	-	Kestrel - 1 NW of wind farm	Vis: good; Prec.: dry; Wind: SW F3
1	BM	29 April	08.15-11.15	-	No HH sighted 2 Cuckoos Pair Kestrels	Vis: good; Prec.: dry; Wind: SW F2
2	BM	29 April	12.30-15.30	-	No HH sighted	Vis: good; Prec.: dry; Wind: SW F3
1	BM	13 May	09.45-12:45	Female Hen Harrier flew over conifers to NE of WTG4 & conifers to east at 10.50 hrs. Height <10 m; Duration 90 sec. At 11.35 hrs, same bird flew up from conifers and rose n a NW direction towards Knockmaroe, to a height of c.200 m & out of sight		Vis: good; Prec.: dry; Wind: W F2
2	BM	13 May	14:30-17:30	-	No HH sighted 1 Kestrel hunting in site	Vis: good; Prec.: dry; Wind: W F2+
1	BM	14 May	08.30-11.30	-	No HH sighted Buzzard drifted over north end of site	Vis: good; Prec.: mostly dry (a few showers); Wind: SW F3
2	BM	14 May	13.00-16.00	-	No HH sighted 4 Ravens in area	Vis: good; Prec.: dry; Wind: SW F3

INCHIVARA

3-hour Vantage Point Watches

VP ID	Observer	Date	Watch Period	Details	Notes	Weather
1	GP	28 April	09:00-12:00	-	No HH sighted Cuckoo pair; Kestrel to west	Vis: good; Prec.: dry; Wind: SW F2-3
1	GP	29 April	08:00 - 11:00	Male HH close to forest c.1km west of wind farm – foraging mode, c.10 m high. Seen for 30 sec	No HH sighted;	Vis: good; Prec.: dry; Wind: SW F2
1	GP	13 May	08.15-11.15	-	No HH sighted Kestrel off site	Vis: good; Prec.: dry; Wind: W F2

Milestone & Inchivara Wind Farms: Hen Harrier Survey 2015

VP ID	Observer	Date	Watch Period	Details	Notes	Weather
1	GP	13 May	14.30- 17.30	-	No HH sighted	Vis: good; Prec.: dry; Wind: W F2-3

**MILESTONE
WIND FARM DEVELOPMENT
PRE-CONSTRUCTION HEN HARRIER SURVEY,
2017**

FINAL REPORT

MAY 2017

Prepared for

ABO Wind Ireland Ltd.

by

**Biosphere Environmental Services
29 La Touche Park, Greystones, Co. Wicklow
Tel: 01-2875249 E-mail: maddenb@eircom.net**



Milestone Wind Farm - Hen Harrier Survey 2017

CONTENTS

1.0 Introduction	3
1.1 General description of site	
1.2 Slieve Felim to Silvermine Mountains SPA	3
2.0 Survey Methods	4
3.0 Results and Discussion	6
4.0 Conclusion	6
5.0 References	7

APPENDICES

Appendix 1. Hen Harrier survey: Classification of habitat types & Categories for activity and behaviour of observed birds.

Appendix 2. Hen Harrier Survey 2017: details of Vantage Point watches, April and May

Milestone Wind Farm - Hen Harrier Survey 2017

1.0 INTRODUCTION

BioSphere Environmental Services (BES) was commissioned by ABO Wind Ireland Ltd. to carry out a Hen Harrier breeding survey in 2017 at the site of the Milestone and Inchivara wind farm development. The survey was focused on the area within a 500 m radius (approximately) of the construction works which will be carried out at the site for wind farm development.

It is noted that BES had previously carried out bird surveys at the site in 2015, 2013 and 2012.

1.1 General description of site

Milestone component

The majority of the Milestone site is improved grassland that is managed intensively for agriculture and is of little or no value for foraging hen harriers. Part of the grassland on the Knockcurraghbola Crowlands hill (north-west sector of site) has been reclaimed from heath relatively recently and has a wet character. However, this offers limited foraging potential for hen harriers as the sward is managed intensively through mowing and lacks a tussocky character.

Conifer plantation of two main ages occurs in the north-east sector of the site. Part of this is mature closed canopy forest (planted in 1993) and is not of significant value to harriers for nesting or foraging purposes. The remainder was planted in 1998 and similarly offers low potential for nesting or foraging. One small stand of young pre-thicket plantation (planted circa 2009), which provides potential foraging habitat for harriers, occurs in the central area of the site. A strip of immature deciduous woodland (WS2) in the central area of the site offers some foraging potential though is small in extent.

Further conifer plantations occur to the north and east of the site, including Shevry Hill, though all of these are now at or beyond the canopy closure stage.

Inchivara component

The Inchivara component of the site is improved grassland and is of little or no value for foraging hen harriers. Locally there are a few areas of wet or rough grassland which offer marginal potential for foraging. A nearby conifer plantation is now closed canopy and offers negligible potential for foraging. The site is adjacent to areas of heath/bog, rough pasture and some young plantation to the south and west – these habitats provide useful foraging habitats for Hen Harriers and are mostly within the SPA. _

1.2 Slieve Felim to Silvermine Mountains SPA

The Milestone site is located approximately 1 kilometre east of the south-east boundary of the Slieve Felim to Silvermines Mountains SPA (code 04165), while the turbine location at

Milestone Wind Farm - Hen Harrier Survey 2017

Inchivara is approximately 300 m from the SPA boundary.

The SPA is an extensive upland site, much of which is over 200 metres in altitude, rising to 694 m at Keeper Hill. Several important rivers rise within the site, including the Mulkear, Bilboa and Clare rivers.

The site consists of a variety of upland habitats, though approximately half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. Substantial areas of clearfell are also present at any one time. Roughly one-quarter of the site is unplanted blanket bog and heath, with both wet and dry heath present. The remainder of the site is largely rough grassland that is used for hill farming.

The SPA is an important stronghold for Hen Harriers (Barton *et al.* 2006, Ruddock *et al.* 2012, Ruddock *et al.* 2016). Survey in the 2005 national survey recorded 5 pairs (4 confirmed, 1 possible). Numbers had increased to six confirmed pairs and one possible pair in the 2010 national survey, though this may have been due to increased survey coverage (Ruddock *et al.* 2012). Further increase to 10 breeding pairs (4 confirmed, 6 possible) was recorded in the 2015 national survey (Ruddock *et al.* 2016).

The SPA site is also a traditional breeding site for a pair of Peregrines. Merlin has been recorded within the site but further survey is required to determine its status. Both of these species are listed on Annex I of the EU Birds Directive. Red Grouse is found on some of the unplanted areas of bog and heath – this is a species that has declined in Ireland and is now Red-listed.

2.0 SURVEY METHODS

The survey is based on the methodology used in the Irish Hen Harrier Survey 2015 (Ruddock *et al.* 2016) to detect breeding territories (see ‘Survey and recording guidelines for contributors’). Two rounds of site visits are required between late-March and mid-May to establish territorial occupancy. Should these visits indicate that there is a territory present, further visits are required between late-May and July. However, if no birds are detected by mid-May, it can be assumed that the establishment of a new territory after that is highly unlikely.

The surveys were carried out on the following dates:

12th and 19th April

18th and 19th May

In previous surveys (as detailed in the relevant EIS reports), two vantage points had been used to provide complete coverage over the Milestone site and one for the Inchivara site. These were used again in 2017 and are described below:

Milestone

- **VP 1** (grid ref. 9583 6024) is located on the road at Shevry just east of the site. This gives commanding views over Knockcurraghbola Commons towards the peak of

Milestone Wind Farm - Hen Harrier Survey 2017

Knockmaroe, and also views of the north side of the 377 m hill to the south-west of Shevry.

- **VP 2** is located within the site on the mid-slope of Knockcurraghbola Crowlands (grid ref. 9444 5980). This gives views of the internal valley and adjoining slopes extending west of the R497 and to the western slope of Shevry Hill.

Inchivara

- **VP 1** (grid ref. 9304 5754) is located on the mid-slope (350 m) of the hill to the south-southeast of the site. This gives a commanding view over the site, the rising ground to the north and east, and the lower land to the west (latter within SPA).

From the VPs, watches of approximately 6 hrs duration (broken into 3 hr sessions) were undertaken in each of the survey sessions (i.e. 12 hrs coverage from each VP). All surveys were carried out in suitable weather conditions (winds <F4). Observations were conducted between 07.00 and 19.00 hrs GMT. The following variables were recorded for sightings (if any) of hen harriers:

- Watch period
- Time of sighting
- Sex of bird
- Behaviour
- Habitat(s) below flight path
- Heights of flight (<10 m, 10-50 m, 50-100m, 100-150m, >150 m)

Where sightings of harriers were made, activity and behaviour of birds observed was identified and differentiated into various standard categories (see Appendix 1). Flight lines (if any) were plotted in the field on a 1:25,000 scale map, with direction of flight indicated. The habitat or habitats over which the birds passed were classified using the standard categories recommended for hen harrier survey (see Appendix 1).

Other species of conservation importance

As well as Hen Harrier, any other bird species of conservation interest was recorded.

Milestone Wind Farm - Hen Harrier Survey 2017

3.0 RESULTS AND DISCUSSION

Results of the 2017 survey

Information on the vantage point watches is presented in Appendix 2.

There were no sightings of Hen Harriers within the wind farm site during the vantage point surveys in April and May 2017.

On 19th May, a male bird was seen off-site, approximately 2 km northwest of the Inchivara component – this bird was passing west over forestry and bog on the southern slope of Knocknabansha (approx. location R 914593) and within the area of the SPA.

The results confirm that there was no attempt by a Hen Harrier pair to establish a breeding territory within the wind farm study area. The single sighting of a male bird to the northwest could have been from any one of several traditional territories to the north and west of Milestone (male harriers can travel up to 5 km from the nest site when foraging).

The absence of sightings is not surprising as habitats on site are of low value for Hen Harriers (both for nesting and foraging purposes). The plantation forestry that is present is now within the closed canopy stage which is not of significant value for Hen Harriers (see Plates 1 & 2). It is noted that the sightings of Hen Harriers in previous surveys were at a time when open canopy plantation existed which provided suitable foraging habitat.

Other bird species recorded

There were two records of Kestrel on site in April and one just north of site in May. The April records were both male birds and probably referred to the same individual (sex of May bird not determined). It is likely that Kestrel nests locally (but not on site).

There was one record of Sparrowhawk on site in April and this species is expected to breed locally.

Raven nested off-site in a small quarry to the east of Shevry Hill.

4.0 CONCLUSION

The 2017 survey did not record any sighting of Hen Harrier within or around the wind farm site (the only sighting during the study was of a single bird off-site at a distance of c.2 km from the development area). This conclusively demonstrates that Hen Harrier did not attempt to nest within the site or in the surrounding areas.

Taking into account that there are no records of harriers nesting in this area in the past, and considering the low potential the habitats on site presently have for supporting Hen Harriers, the absence of birds in the study area is not surprising.

Milestone Wind Farm - Hen Harrier Survey 2017

5.0 REFERENCES

Barton, C., Pollack, C., Norriss, D.W., Nagle, T.A., Oliver, G.A. & Newton, S. (2006) The second national survey of breeding Hen Harriers *Circus cyaneus* in Ireland 2005. *Irish Birds* 8: 1-20

Colhoun, K. & Cummins, S. (2013) Birds of conservation concern in Ireland 2014-2019. *Irish Birds* 9 (4): 523-544.

Ruddock, M, Dunlop, B.J., O'Toole, L., Mee, A., & Nagle, T. (2012) *Republic of Ireland National Hen Harrier Survey 2010*. Irish Wildlife Manual No. 59. NPWS, Dublin.

Ruddock, M., Mee, A., Lusby, J., Nagle, T., O'Neill, S. & O'Toole, L. (2016) *The 2015 National Survey of Breeding Hen Harriers in Ireland*. Irish Wildlife Manual No. 93. NPWS, Dublin.

Scottish Natural Heritage (May 2014). Survey Methods for Use in Assessing the Impacts of Onshore Wind Farms on Bird Communities

Milestone Wind Farm - Hen Harrier Survey 2017



Plate 1. View of Milestone Wind Farm from Vantage Point A, looking westwards across site towards Knockcurraghbola Hill. Note closed canopy conifer plantations.



Plate 2. View of Milestone Wind Farm from Vantage Point B, looking eastwards across site towards Shevry Hill (centre of photo). Note improved pasture grassland and closed canopy conifer plantations.

APPENDIX 1

Hen Harrier Survey

Classification of habitat types

NF 2	New forestry plantation, trees 20-30 cm high
NF 3	New forestry plantation, trees c 1m in height
NF 4	New forestry plantation, trees >2m in height, patchy thickets
2nd F 1 & 2	2nd rotation forestry plantation, trees 20-30 cm high
2nd F 3	New forestry plantation, trees c 1m in height
2nd F 4	New forestry plantation, trees >2m in height, patchy thickets
F	Post thicket plantation
G	Grazing
RG	Rough Grazing & rushy pasture
HB	Heath / Bog
DE	Deciduous woodland & scrub
GO	Gorse
CF	Clearfell
H	Hedgerow

Categories for activity and behaviour of observed birds

c - circling
d - displaying
fl - flying
fp - foodpass
g - on ground
gl - gliding
h - hunting
p - perching
s - soaring
wp - with prey
fp - foodpass

APPENDIX 2

Hen Harrier Survey 2017: details of Vantage Point watches, April and May

MILESTONE 3 hour Vantage Point Watches

VP ID	Date	Watch Period	Observation Details	Weather
1	12 April	08.30-11.30	No HHs Kestrel at Shevry (off-site); Ravens active in area	Dry Wind: SW F2 Visibility: good
2	12 April	12.15-15:15	No HHs	Showers Wind: SW F2-3 Visibility: mod-good
1	19 April	07.45-10.45	No HHs Male kestrel flew through site	Dry Wind: W F2 Visibility: good
2	19 April	12.00-15.00	No HHs Sparrowhawk hunting along edge of conifer plantation Swallows (20+)	Dry Wind: W F2 Visibility: good
2	18 May	10.30-13:30	No HHs Cuckoo calling; Kestrel hunting just north of site	Dry Wind: S F2 Visibility: good
1	18 May	14.30-17:70	No HHs	Dry Wind: S F2 Visibility: good
2	19 May	07.00-10.00	No HHs Ravens (2) overhead	Dry Wind: SW F2 Visibility: good
1	19 May	11.00-14.00	No HHs 2 cuckoos	Occ. showers Wind: SW F2 Visibility: good

INCHIVARA 3 hour Vantage Point Watches

VP ID	Date	Watch Period	Observation Details	Weather
1	12 April	16.00-19.00	No HHs	Dry Wind: SW F2 Visibility: good
1	19 April	15.45-18.45	No HHs	Dry Wind: W F2 Visibility: good
1	18 May	07.00-10:00	No HHs Cuckoo calling;	Dry Wind: S F2 Visibility: good
1	19 May	15.00-18.00	Hen Harrier – male c. 2km NW of site – hunting on slope of Knocknabansha	Dry Wind: SW F2 Visibility: good

Appendix to Chapter 8: Biodiversity

Appendix 8.7: General Birds Fieldwork & Survey Results

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

Contents

A8-7 Appendix to Chapter 8: Biodiversity..... 1

 A8-7.1 Fieldwork - General Birds 3

 A8-7.1.1 2019 Breeding Bird Surveys 3

 A8-7.1.2 Kingfisher Surveys..... 4

 A8-7.1.3 Barn Owls 4

 A8-7.2 Survey Results - General Bird Species 5

 A8-7.2.1 Results of Countryside Bird Surveys 2019..... 5

 A8-7.2.2 Results of 2019 Kingfisher Survey for UWF Grid Connection..... 10

 A8-7.2.3 Results of 2019 Barn Owl Survey for UWF Grid Connection 11

 A8-7.2.4 Results of Countryside Bird Surveys 2016 to 2018..... 12

 A8-7.2.5 Survey Results – Other Elements 26

 A8-7.2.6 General Bird Species Recorded and Corresponding Sensitivity Rating 27

List of Tables:

Table 1: Results of Countryside Bird Surveys undertaken along transects T1 to T40 along the UWF Grid Route Connection during 2019 breeding season

Table 2: Results of Kingfisher Survey for UWF Grid Connection carried out in June 2019

Table 3: Results of Barn Owl Survey for UWF Grid Connection carried out in July 2019

Table 4: Results of Countryside Bird Surveys undertaken along Mountphilips’ transect during the breeding season of 2016.

Table 5: Results of winter bird transect surveys undertaken along Mountphilips’ transect during the non-breeding season of 2016/17

Table 6: Countryside Bird Survey Results for Mountphilips’ transect during 2017 breeding season

Table 7: Results of winter bird transect surveys undertaken along Mountphilips’ transect during the non-breeding season of 2017/18 (November 2017 to December 2017).

Table 8: Results of winter bird transect surveys undertaken along Mountphilips transect during the non-breeding season of 2017/18 (January to February 2018).

Table 9: Hen Harrier Vantage Point Surveys –General Bird Sightlines Non Breeding Season 2017/2018

Table 10: Birds Recorded during Overhead Line Activities Surveys

Table 11: Bird Sensitivity Rating for bird species recorded across all bird surveys

A8-7.1 Fieldwork - General Birds

The receiving environment for Whole UWF Project includes typical upland habitats in the Irish context in addition to an improved agricultural landscape.

A8-7.1.1 2019 Breeding Bird Surveys

Breeding season bird transects were carried out for the subject development, UWF Grid Connection, with 40 transects along the entire length (c.30km) of the 110kV UGC carried out in April 2019. Survey work was carried out over seven days in April 2019 (12, 17, 18, 20, 25, 27 and 28). The methodology followed the standardised line transect methodology for surveying birds (BWI, 2012). All birds were recorded onto standardised recording sheets in four distance categories from the proposed UGC route (0-25m; 25-100m; 100+m and in flight).

Transect data were recorded using standard Countryside Bird Survey (CBS) methodology (Birdwatch Ireland, 2012). The conservation status of each species recorded during the field surveys was assessed using the Birds of Conservation Concern in Ireland (BoCCI) list (Colhoun & Cummins, 2013) in addition to relevant national or international legal designations.

A8-7.1.1.1 Information from 2016 and 2017 surveys for previous UWF Grid Connection application

A standardised bird transect survey was undertaken at the Mountphilips Substation site in the breeding season of 2016, 2017 and 2019. Standardised bird transect surveys were also undertaken along the entire length of the 110kV UGC. It is thought that the 2016 and 2017 data is still relevant as the habitats have not significantly changed over time.

A8-7.1.1.2 Survey information for Other Elements

Transect data and survey results for the Other Elements, UWF Related Works, UWF Replacement Forestry and UWF Other Activities was reviewed. Survey results for the Other Elements is included in the Biodiversity Appendices for UWF Related Works (Revised EiAR 2019) and for UWF Replacement Forestry (EiAR 2018). Available data on breeding birds within the EIS documentation for the Upperchurch Windfarm was also reviewed within the context of overlap with the locations of UWF Related Works, UWF Replacement Forestry and UWF Other Activities. The Upperchurch Windfarm EIS (2013) and RFI (2013) are included in the Reference Documents which accompany this planning application.

Due to the continuity and overlap of habitat types present throughout the respective elements, a sufficient representative sample of breeding birds is considered to have been achieved through both the results of the current study and previously conducted studies for the Upperchurch Windfarm.

A8-7.1.2 Kingfisher Surveys

Kingfisher are associated with aquatic habitats such as watercourses and canals. This species is listed on Annex I of the EU Birds Directive and Amber-listed in Ireland as a species of Conservation Concern (Colhoun & Cummins, 2013). With regard to the proposed UWF Grid Connection, in 2019, 26 no. suitable watercourses were surveyed 300m upstream and downstream of watercourse crossing locations. These surveyed watercourses include the Newport River (W7), Clare River (W26) and Bilboa River (W53) and 23 other watercourses (W5, W7, W8, W9, W18, W21, W22, W23, W26, W28, W29, W30, W33, W35, W39, W41, W42, W46, W47, W48, W49, W50, W51 and W52). These rivers were selected due to their potential to support suitable Kingfisher foraging and nesting habitats, and the potential for greater prey item availability. Watercourse crossings along the UWF Grid Connection route are generally unsuitable for nesting Kingfisher, which requires sandy or earth banks alongside the watercourse to establish their tunnel/burrow nests.

In addition, Kingfisher surveys extending to 500m upstream and downstream of W7 Newport River crossing point, following the methodology presented in National Roads Authority (2008), was undertaken on 26 June 2019 (in tandem with the Otter surveys).

Watercourse crossings were evaluated for any evidence of nest holes within 300m of crossing locations (in tandem with Otter surveys). In each case banks were inspected for evidence of Kingfisher, and general suitability of banks in proximity to crossing locations for nesting Kingfisher. Target notes were made on suitable nesting banks, and any observed nest holes.

A8-7.1.3 Barn Owls

In February 2019, buildings were noted for potential suitability for Breeding Barn Owls. In July 2019, buildings identified as having high suitability for Barn Owls were surveyed. This involved checking for signs of building occupation (such as pellets, feathers, etc.). All Barn Owl surveys were carried out in accordance with *Barn Owl Surveying Standards for National Road Projects*, (TII, 2017).

Four buildings were assessed as having high suitability for Barn Owl. These were all surveyed in August 2019 for occupancy. No signs of occupancy were detected for any of these buildings. One building was too dangerous to enter due to the state of repair. The owner stated that he had occasionally observed Barn Owls during the winter but did not believe that they were breeding at that location.

A8-7.2 Survey Results - General Bird Species

A8-7.2.1 Results of Countryside Bird Surveys 2019

Table 1: Results of Countryside Bird Surveys undertaken along transects T1 to T40 along the UWF Grid Route Connection during 2019 breeding season

Transect No.	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
Date	12/04	12/04	12/04	12/04	12/04	17/04	17/04	17/04	17/04	17/04	18/04	18/04	18/04	18/04	18/04	18/04	20/04	20/04	20/04	20/04
Species																				
Barn Swallow		2		3							2		2	6	3	2				1
Blackbird	4	5	4	5	2	3	6	6	4	2	2	4	10	11	9	5	6	8	8	4
Blackcap	1				6	1	1		2	3	1	3	1	1	2	2	3	4	3	
Blue Tit		2	1	1			1	1	1				1	4	3	2		1	4	2
Bullfinch	2	2	2			2		4						2				4		
Chaffinch	3	2	3	5	5	4	7	4	2	5	3	5	8	10	7	6	7	2	8	3
Chiffchaff	2	1	1	2	3	2	3	2	2	3	2	3		1			2	2	2	
Coal Tit				1					2											
Cuckoo				1			1		1			1							1	
Dunnock	2	2	3	2	2	4	3	2	2	2	1	2	3	1	1		3	2	2	
Goldcrest	3		1	1	1			2	2			1	1				1		1	
Goldfinch		2			2	2	2	4	2	2	2	2	4	9	2	4	2	8		
Grasshopper Warbler					1	1		1												
Great Tit	2	2	4		1	2	3	2	2	1		1	1	4	3	4	2	3	4	2
Greenfinch	1		2			2							2		2					
Hooded Crow	3	5	2	2	2	5	2	1	2		3	2	3	4	4	6	7	8	8	2
House Sparrow		6	4		3	11							12	8	14	10	4	8	12	14
Jackdaw	2	11		4		2	4	5			2		2	17	9	14	6	2	4	14
Jay					1					1		1							1	

Transsect No.	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
Date	12/04	12/04	12/04	12/04	12/04	17/04	17/04	17/04	17/04	17/04	18/04	18/04	18/04	18/04	18/04	18/04	20/04	20/04	20/04	20/04
Linnet	2		2				2		2											4
Magpie	1	1		1		1	2	1	1				1	3	3			2	3	3
Mallard				2																
Meadow Pipit						2	7	5	2		4	6	3	3	2			3	6	
Mistle Thrush	2	2		3			1	1	2				1							
Pheasant		1			1	1	1	1	1	1	2	1						1	2	
Pied Wagtail	4	4	2			4		2			2	3	4	8	3	8		2	3	7
Reed Bunting				2		4	2				2							1		
Robin	2	2	5	2	3	3	3	2	3	3	2	3	2	3	4	6		3	4	
Rook	33	6	5	6	0	6	16	11	2	2	6	7	14	33	8	23		24	22	12
Herring Gull											2									
Woodpigeon	1	1	1	3	3	1	6	2	1	3	4	3	2	4	4			3	2	1
Collared Dove																				6
Kestrel			1		1			1		1	1	1						1		
Raven	2	1		1		1		2	2						2			2		
Skylark	3	2	1	3	1	1	1	1				2	1					2	3	
Long-tailed Tit				4		3		2	2											4
Willow Warbler	3	3	4	3	2	3	4	1	3	2	3	2	2	4	5			6	3	
Sedge Warbler					1			1		1		1								
Whitethroat																		1		
Wren	5	4	5	3	5	3	4	3	3	5	3	5	3	6	6	5		5	4	3
Starling		12	4	3		2	1		1		6	6	8	5	5				7	10
Song Thrush	1	2	2	1	1	1	2	1	1	1	1	1	2	6	4	2		2	2	
Stonechat	2	2	2	2	2	4	2	2	2	2	2	2						2	2	
Dipper								1												

Transsect No.	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	
Date	12/04	12/04	12/04	12/04	12/04	17/04	17/04	17/04	17/04	17/04	18/04	18/04	18/04	18/04	18/04	18/04	20/04	20/04	20/04	20/04	
Grey Wagtail						1							1						1		5

Transsect No.	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40
Date	20/04	20/04	25/04	25/04	25/04	25/04	25/04	27/04	27/04	27/04	27/04	27/04	27/04	28/04	28/04	28/04	28/04	28/04	28/04	28/04
Species																				
Barn Swallow				2					2		2	2			2	3		2	2	
Blackbird	11	3	4	8	4	7	3	5	2	3	4	8	4	7	4	5	12	13	5	5
Blackcap	2	1	1	1	3	2	1	1	2	2	1	2	1				1	1	1	2
Blue Tit				3				3			1			1		3	3	4	2	1
Bullfinch							2			2	2							2		
Chaffinch	11	4	3	4	8	6	7	4	2	5	6	6	9	5			4	4	7	6
Chiffchaff	2	2	2	2	1	2	1	1	2	1	1		2	1			1	1	1	3
Coal Tit				2				4												
Cuckoo	1	1	1						1		1			1						
Duncock	1	1	2	2	2	1		1	1	1	1	2		3			3	2		1
Goldcrest				1	3	1		2	2	2	1	1								
Goldfinch	4	4	2			2	2				4	4	2	2				3	4	
Grasshopper Warbler		1		1						1										
Great Tit	3	1	2	1	2	1	2	2	1		2	3		3	1	2	3	4	2	
Greenfinch	2		1	1	1				1	1	1	1		2				3		2
Hooded Crow	4	2	3	6		4		6	6	7	7	3	8	4	5	7	7	6	2	7

Transsect No.	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40
Date	20/04	20/04	25/04	25/04	25/04	25/04	25/04	27/04	27/04	27/04	27/04	27/04	27/04	28/04	28/04	28/04	28/04	28/04	28/04	28/04
House Sparrow	10		5	2		4	10		5	8		4	12	11	15	18	4	20	6	8
Jackdaw	4	2	5			4	4		2	3	5		13	7	12	24	16	12	9	4
Jay				2	1	1		1	1			1								
Linnet		4																		
Magpie	3			1			3		2	1			1	1	2	2	4	3	1	1
Mallard												2		2						
Meadow Pipit	3	9	3	3		4	3	5	1	1	4	5		4				2	3	5
Mistle Thrush	2	2		2	1	2			2	2	1	1		1					1	1
Pheasant		1	1	1					1	1	1			1					1	
Pied Wagtail	5	2	2	2			4		4	2	2	3	2	4	8	6	5	4	6	2
Redpoll			4							4										
Reed Bunting		2	2						2	2	2									
Robin	4	2	3	3	4	3	4				3	5	3	4	1		5	5	4	4
Rook		6	10	7	16	9	25		8	12	24		18	21	17	17	23	13	14	19
Sparrowhawk								1												
Herring Gull											3			2						
Woodpigeon	2	1	2	2	1		1	1		1	1	2	3	2		1	4	2	2	4
Collared Dove																			4	
Kestrel									1											
Raven		2	2	1			1				1									
Skylark	2	3	2	1				2		1				1						
Sand Martin							4		2	3		2		2						6
House Martin	2											2	2			2				

Transsect No.	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40
Date	20/04	20/04	25/04	25/04	25/04	25/04	25/04	27/04	27/04	27/04	27/04	27/04	27/04	28/04	28/04	28/04	28/04	28/04	28/04	28/04
Long-tailed Tit			2						4		2									
Willow Warbler	5	3	2	3	2		3	5	2	1	2	2	4	7			2	4	4	5
Sedge Warbler						1														
Whitethroat			1																	
Wren	4	3	2	3	2	4	2	3	3	2	3	3	5	6		1	5	4	5	5
Starling			8			7			6		12	2	6		4	11	6	4	6	2
Song Thrush	5	1	1	1	2	2	1	1				2	2	2			2	2	2	2
Stonechat		2	2	2	2			2	2		2	2		2						
Grey Wagtail	1										1			1						
Siskin								2		2										

A8-7.2.2 Results of 2019 Kingfisher Survey for UWF Grid Connection

Kingfisher surveys following the methodology presented in National Roads Authority (2008) was undertaken in January and May 2019. These surveyed watercourses include the Newport River (W7), Clare River (W26) and Bilboa River (W53) and 23 other watercourses (W5, W7, W8, W9, W18, W21, W22, W23, W26, W28, W29, W30, W33, W35, W39, W41, W42, W46, W47, W48, W49, W50, W51 and W52).. Watercourse crossings were evaluated for any evidence of nest holes within 300m of crossing locations (in tandem with Otter surveys). In each case banks were inspected for evidence of Kingfisher, and general suitability of banks in proximity to crossing locations for nesting Kingfisher.

Watercourse crossings along the UWF Grid Connection route are generally unsuitable for nesting Kingfisher, which requires sandy or earth banks alongside the watercourse to establish their tunnel/burrow nests.

In addition, Kingfisher surveys extending to 500m upstream and downstream of W7 Newport River crossing point, following the methodology presented in National Roads Authority (2008), was undertaken on 26 June 2019 (in tandem with the Otter surveys).

A Kingfisher nest was recorded 430m upstream of Rockvale Bridge, Newport River crossing W7, of the proposed UWF Grid Connection.

Table 2: Results of Kingfisher Survey for UWF Grid Connection carried out in June 2019

Location	Date	Record	Coordinates ITM (x)	Coordinates ITM (y)
Newport River (430m Upstream of Rockvale Bridge – W7)	26/06/19	Earth bank with Kingfisher nesting potential – No nest hole present	574163	663498
Newport River (450m Upstream of Rockvale Bridge – W7)	26/06/19	Kingfisher sighted; first flying downstream then upstream	574182	663512
Newport River (540m Upstream of Rockvale Bridge – W7)	26/06/19	Nest hole in riverbank – evidence of Kingfisher use in the form of whitewash (droppings)	574255	663567

A8-7.2.3 Results of 2019 Barn Owl Survey for UWF Grid Connection

Four buildings within the UWF Grid Connection study area were assessed as having high suitability for Barn Owl. These were all surveyed in July 2019 for occupancy. No signs of occupancy were detected for any of these buildings. One building was too dangerous to enter due to the state of repair. The owner stated that he had occasionally observed Barn Owls during the winter but did not believe that they were breeding at that location.

Table 3: Results of Barn Owl Survey for UWF Grid Connection carried out in July 2019

House Number	Level of Barn Owl Suitability	Coordinates ITM (x)	Coordinates ITM (y)	Description	Survey Results
1	High	588330	658608	House missing all windows but has potential for Barn Owl. Parts of roof and chimney are missing. Multiple entry/exit points and nesting opportunities.	Searched – no evidence of Barn Owl.
2	High	588911	658779	Set of old farm buildings with barn, cottage and shed. Slate roof open enough for coverage.	Searched – no evidence of Barn Owl.
3	High	586591	658227	The slate roof is intact but the chimney is half missing.	No evidence – no entry points due to intact doors and windows
4	High	573624	661496	Old farmhouse and barns with part of the roof of extension missing. Large chimneys. Looks derelict	Owner has occasionally observed Barn Owls during the winter but did not believe that they were breeding.

A8-7.2.4 Results of Countryside Bird Surveys 2016 to 2018

Note on Species colour codes:

Red = Red-listed species in the Birds of Conservation Concern (Colhoun and Cummins, 2013) are those of highest conservation priority

Orange = Amber-listed species in the Birds of Conservation Concern (Colhoun and Cummins, 2013) are those of which are of lesser conservation priority

Green = Green-listed species in the Birds of Conservation Concern (Colhoun and Cummins, 2013) are those of which are of least conservation priority

White = Not assessed/omitted from the Birds of Conservation Concern (Colhoun and Cummins, 2013) list

Table 4: Results of Countryside Bird Surveys undertaken along Mountphilips’ transect during the breeding season of 2016.

Transect No.40 Visit	40 - Mountphilips	
	May-16	Jun-16
Species		
Barn Swallow	2	7
Blackbird	13	1
Blackcap	3	4
Blue Tit	1	3
Chaffinch	7	8
Chiffchaff	1	1
Coal Tit		1
Dunnock	4	4
Goldcrest		3
Goldfinch		1
Grasshopper Warbler	1	
Great Tit	1	
Greenfinch	4	
Hooded Crow		2
Jackdaw	3	
Jay		1
Linnet	4	1
Magpie		2
Mistle Thrush	1	
Moorhen		2
Pheasant	1	1
Pied Wagtail	1	
Reed Bunting		2
Robin	12	5
Rook	9	10
Siskin	1	
Song Thrush	4	
Stonechat		3

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

Transect No.40	40 - Mountphilips	
Visit	May-16	Jun-16
Willow Warbler	6	3
Wood Pigeon	2	3
Wren	22	14
Total Abundance	103	82
Species Diversity	22	23

Table 5: Results of winter bird transect surveys undertaken along Mountphilips' transect during the non-breeding season of 2016/17

Transect No.40	Transect No.40 - Mountphilips			
Visit	Nov-16	Dec-16	Jan-17	Feb-17
Species				
Wood Pigeon	1			
Meadow Pipit	15	13		
Pied Wagtail	1			1
Dunnock	1	4	1	
Robin	3	6	4	
Stonechat				
Song Thrush	1	5	2	2
Mistle Thrush				
Blackbird	4	3	1	1
Redwing		3	10	
Wren	2	2	1	
Great Tit			2	
Coal Tit	1	3	1	
Magpie				1
Jay		2		
Rook	2			5
Starling	11			
Chaffinch	1	1		
Treecreeper	1			
Bullfinch	1			
Reed Bunting	1			
Total Abundance	46	42	22	10
Species Diversity	15	9	8	5

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

Table 6: Countryside Bird Survey Results for Mountphilips' transect during 2017 breeding season

Species	Transect No.40 - Mountphilips	
	Apr-17	June-17
Blackbird	7	4
Blackcap	1	
Blue Tit	1	
Chaffinch	2	3
Chiffchaff	2	
Coal Tit	5	6
Fieldfare	4	
Goldcrest		1
Hooded Crow	2	1
Jay		1
Magpie		4
Mallard	2	
Meadow Pipit		2
Robin	4	
Rook	10	
Song Thrush	5	3
Stonechat		2
Willow Warbler	1	2
Wood Pigeon	4	4
Wren	13	9
Total Abundance	63	42
Species Diversity	15	13

Table 7: Results of winter bird transect surveys undertaken along Mountphilips' transect during the non-breeding season of 2017/18 (November 2017 to December 2017).

Transect No.40 Visit	Transect No. 40 - Mountphilips		
	Nov-17	Nov-17	Dec-17
Species			
Blackbird	1	8	1
Blue Tit	0	1	0
Bullfinch	0	2	0
Chaffinch	0	1	0
Coal Tit	0	1	0
Dunnock	0	0	0
Goldcrest	0	2	0
Great Tit	0	0	0
Grey Wagtail	0	0	0
Hooded Crow	1	3	0
House Sparrow	0	5	0
Jackdaw	0	1	2
Jay	0	1	0
Kestrel	0	0	0
Long-tailed Tit	0	0	0
Magpie	0	1	0
Meadow Pipit	20	1	0
Mistle Thrush	0	0	0
Pheasant	0	0	0
Pied Wagtail	0	0	0
Raven	2	0	0
Robin	2	9	0
Rook	15	2	4
Snipe	0	1	0
Song Thrush	0	0	0
Starling	40	50	0
Wood Pigeon	0	1	0
Fieldfare	0	0	0
Redwing	0	0	0
Wren	0	1	0
Goldfinch	0	0	1
Total Abundance	81	91	9
Species Diversity	7	18	4

Table 8: Results of winter bird transect surveys undertaken along Mountphilips transect during the non-breeding season of 2017/18 (January to February 2018).

Transect No.40	Transect No.40 - Mountphilips	
Visit	Jan-18	Feb-18
Species		
Blackbird	2	0
Blue Tit	0	1
Bullfinch	0	1
Chaffinch	0	2
Coal Tit	0	0
Dunnock	0	1
Goldcrest	0	0
Great Tit	1	0
Grey Wagtail	0	0
Hooded Crow	2	0
House Sparrow	0	3
Jackdaw	0	4
Jay	0	0
Kestrel	0	0
Long-tailed Tit	0	0
Magpie	0	0
Meadow Pipit	0	0
Mistle Thrush	0	0
Pheasant	0	0
Pied Wagtail	0	0
Raven	0	0
Robin	1	0
Rook	0	30
Snipe	0	0
Song Thrush	0	0
Starling	0	0
Wood Pigeon	0	0
Stonechat	0	0
Fieldfare	0	0
Wren	0	0
Total Abundance	6	42
Species Diversity	4	8

Table 9: Hen Harrier Vantage Point Surveys –General Bird Sightlines Non Breeding Season 2016/2017

Table 9: Details of UWF Grid Connection General Bird sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the Hen Harrier UWF Grid Connection Non-breeding season 2016/2017 Vantage Point Surveys. See Appendix 8.4 for Vantage Point locations.

G = Grazing; RG = Rough Grazing; HB = Heath or bog; DE = Deciduous woodland or scrub; GO = Gorse; NF3 = New forestry plantation trees c 1m high; NF4 = New forestry plantation trees > 2m high; 2nd F4 = Second rotation forestry plantation trees > 2m high;

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	NF3	NF4	2nd F4	F	Duration (s)
10	18/07/2017	Raven_RN		12:07:00			70							
10	18/07/2017	Raven_RN		12:09:00			30							
10	18/07/2017	Raven_RN		12:36:00			40							
11	20/07/2017	Kestrel_K.		15:25:00	30									
11	20/07/2017	Raven_RN		17:43:00		20	20							10
11	24/07/2017	Raven_RN		17:40:00			40							
11	24/07/2017	Raven_RN		17:47:00			60							40
11	24/07/2017	Kestrel_K.		18:13:00			80							
11	24/07/2017	Kestrel_K.		18:22:00			160							
11	24/07/2017	Kestrel_K.		18:24:00			100							
11	24/07/2017	Kestrel_K.		18:47:00		220								
11	24/07/2017	Kestrel_K.		19:51:00			70							
11	24/07/2017	Kestrel_K.		19:54:00			450							10

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	NF 3	NF 4	2nd F4	F	Duration (s)
11	24/07/2017	Kestrel_K.		20:21:00		70								
12	20/07/2017	Kestrel_K.		12:13:00									30	
12	20/07/2017	Kestrel_K.		12:37:00		80							60	
12	20/07/2017	Kestrel_K.		14:21:00		120							40	
12	24/07/2017	Sparrowhawk_SH		14:17:00		145		10						
12	24/07/2017	Sparrowhawk_SH		14:28:00		50		130						
12	24/07/2017	Raven_RN		13:58:00		50								80
12	24/07/2017	Kestrel_K.		15:26:00										130
12	24/07/2017	Kestrel_K.		15:55:00										160
12	24/07/2017	Kestrel_K.		16:14:00				50						130
12	24/07/2017	Kestrel_K.		16:32:00		210								530
2	07/08/2017	Kestrel_K.		15:55:00		210								
2	07/08/2017	Raven_RN		16:01:00	20	20								
2	07/08/2017	Raven_RN		16:29:00	20	70								
2	07/08/2017	Kestrel_K.		17:12:00		40								
2	07/08/2017	Kestrel_K.		17:54:00		100								

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	NF 3	NF 4	2nd F4	F	Duration (s)
3	08/08/2017	Raven_RN		16:40:00		10							10	20

Table 10: Hen Harrier Vantage Point Surveys –General Bird Sightlines Non Breeding Season 2017/2018

Table 10: Details of UWF Grid Connection General Bird sightings and the habitats over which the birds were observed from vantage point surveys undertaken during the Hen Harrier UWF Grid Connection Non-breeding season 2017/2018 Vantage Point Surveys. See Appendix 8.4 for Vantage Point locations.

G = Grazing; RG = Rough Grazing; HB = Heath or bog; DE = Deciduous woodland or scrub; GO = Gorse; NF3 = New forestry plantation trees c 1m high; NF4 = New forestry plantation trees > 2m high; 2nd F4 = Second rotation forestry plantation trees > 2m high;

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	NF3	NF4	2nd F4	F	Duration (s)
7	11/09/17	Raven_RN		11:40:00	x								x	21
7	11/09/17	Raven_RN		11:40:00	x								x	21
7	11/09/17	Kestrel_K.		11:55:00	x								x	14
7	11/09/17	Raven_RN		13:14:00	x			x					x	20
8	12/09/17	Kestrel_K.		14:22:00	x	x			x					115
5	22/11/17	Raven_RN		10:35:00		40								40
5	22/11/17	Kestrel_K.		11:07:00		120								120
4	23/11/17	Kestrel_K.		10:55:00		140								140
4	23/11/17	Raven_RN		12:11:00		110								110
4	23/11/17	Kestrel_K.		12:23:00	240									240
4	23/11/17	Kestrel_K.		12:31:00	170									170
5	23/11/17	Golden Plover_GP		13:50:00		110	20							130

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	NF 3	NF 4	2nd F4	F	Duration (s)
5	23/11/17	Golden Plover_GP		14:06:00		10	30							40
5	23/11/17	Golden Plover_GP		14:17:00		210								210
5	23/11/17	Kestrel_K.		14:46:00		320								320
5	23/11/17	Raven_RN		16:25:00		50								50
8	29/11/17	Snipe_SN		08:37:00		79								79
9	29/11/17	Kestrel_K.	Female	16:11:00		465						10		479
3	29/11/17	meadow Pipit_MP		11:57:00						X				15
8	28/11/17	Raven_RN		15:25:00									X	60
8	28/11/17	Raven_RN		16:42:00									X	10
8	28/11/17	Meadow Pipit_MP		16:06:00									X	5
12	30/11/17	Meadow Pipit_MP		08:03:00	X									20
12	30/11/17	Meadow Pipit_MP		08:52:00	X									5
12	30/11/17	Raven_RN		08:45:00	X									20
12	29/11/17	Kestrel_K.	Female	15:51:00	X									20

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	NF 3	NF 4	2nd F4	F	Duration (s)
12	29/11/17	Meadow Pipit_MP		16:17:00	X									
7	29/11/17	Raven_RN		07:10:00	X									5
7	29/11/17	Raven_RN		08:09:00	X									20
8	06/12/17	Raven_RN		10:44:00		X								20S
8	06/12/17	Raven_RN		10:46:00		X								20S
8	06/12/17	Kestrel_K.		10:55:00		X								10S
8	06/12/17	Kestrel_K.		10:55:00		X								5s
8	06/12/17	Raven_RN		12:31:00									X	300s
8	06/12/17	Raven_RN		10:46:00		x								20S
7	07/12/17	Kestrel_K.		11:01:00	X									20S
7	07/12/17	Raven_RN		13:32:00	X									10S
7	07/12/17	Kestrel_K.		14:00:00	X									
9	08/12/17	Raven_RN		11:55:00									X	
9	08/12/17	Kestrel_K.		12:25:00	X									240S
9	08/12/17	Kestrel_K.		12:28:00	X									300s
9	08/12/17	Kestrel_K.		12:31:00	X									5s

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	NF 3	NF 4	2nd F4	F	Duration (s)
11	06/12/17	Kestrel_K.		08:36:00	111									111
5	06/12/17	Raven_RN		10:58:00	90									90
5	06/12/17	Raven_RN		11:40:00	50									50
2	05/01/18	Kestrel_K.		12:40:00 pm	x									
5	02/01/18	Kestrel_K.	Female	11:52:00		57								57
1	03/01/18	Kestrel_K.	Female	10:36:00	8									8
1	03/01/18	Kestrel_K.	Female	14:12:00	18									18
8	15/01/18	Raven_RN		10:52:00		48					74			122
4	19/01/18	Raven_RN		14:06:00	16									16
4	19/01/18	Raven_RN		14:10:00	67									67
12	05/02/18	Kestrel_K.		15:33:00	12			19						21
1	06/02/18	Sparrowhawk_SH	Female	14:59:00					13					13

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

VP Name	Date	Species	Sex	Time of sighting	G	RG	HB	DE	GO	NF 3	NF 4	2nd F4	F	Duration (s)
			Male											
1	06/02/18	Raven_RN		15:09:00		26								26
4	07/02/18	Sparrowhawk_SH		12:39:00	40							2240		2280
8	01/02/18	Raven		14:10		x								10s
9	02/02/18	Raven		12:41		x (6s)							x (8s)	14s
7	05/02/18	Kestrel		11:00		x								5s
2	06/02/18	Kestrel	m	12:05		x								15s
2	06/02/18	Kestrel	m	14:33		x								24s
2	06/02/18	Kestrel	m	15:35		x								129s
2	06/02/18	Golden Plover		16:00	x									

A8-7.2.5 Survey Results – Other Elements

A8-7.2.5.1 Incidental Bird Recordings at Overhead Line Activities Study Area

All incidental sightings of birds were recorded within the overhead lines activities study area during a site walkover (January 2018). Table 11 lists the bird species and the total number of each species recorded. A total of 23 bird species consisting of 109 individual birds were recorded.

Table 11: Birds Recorded during Overhead Line Activities Surveys

Species	BOCCI status (Colhoun and Cummins, 2013)	Total Count
Blackbird	Green	7
Blue Tit	Green	3
Bullfinch	Green	5
Chaffinch	Green	22
Coal Tit	Green	2
Goldcrest	Amber	2
Great Tit	Green	6
House Sparrow	Amber	6
Jay	Green	2
Long-tailed Tit	Green	5
Pied Wagtail	Green	1
Robin	Amber	9
Rook	Green	2
Snipe	Amber	11
Song Thrush	N/A	2
Starling	Amber	5
Stonechat	Amber	1
Wood Pigeon	Green	3
Little Egret	Green	1
Magpie	Green	6
Goldfinch	Green	5
Redwing	Green	1
Wren	Green	2
Species Diversity		23
Total Abundance		109

A8-7.2.6 General Bird Species Recorded and Corresponding Sensitivity Rating

The table below, lists all species recorded across all surveys and all project elements. It should be noted that not all species will have been recorded as present at the location of works pertinent to the UWF Grid Connection development under consideration.

The corresponding sensitivity rating in line with the criteria outlined in Section 8.1.8 of the Biodiversity Chapter is also provided. Species included here includes those recorded from standardised survey effort and additionally anecdotal observations.

Note on Species colour codes:

Red = Red-listed species in the Birds of Conservation Concern (Colhoun and Cummins, 2013) are those of highest conservation priority

Orange = Amber-listed species in the Birds of Conservation Concern (Colhoun and Cummins, 2013) are those of which are of lesser conservation priority

Green = Green-listed species in the Birds of Conservation Concern (Colhoun and Cummins, 2013) are those of which are of least conservation priority

White = Not assessed/omitted from the Birds of Conservation Concern (Colhoun and Cummins, 2013) list

Table 12: Bird Sensitivity Rating for bird species recorded across all bird surveys

Species	BOCCI Status	EU Birds Directive	Sensitivity Rating
Barn Swallow	Amber	-	Low
Blackbird	Green	-	Negligible
Blackcap	Green	-	Negligible
Blue Tit	Green	-	Negligible
Bullfinch	Green	-	Negligible
Buzzard	Green	-	Negligible
Chaffinch	Green	-	Negligible
Chiffchaff	Green	-	Negligible
Coal Tit	Green	-	Negligible
Collared Dove	Green	-	Negligible
Common	Amber	-	Low
Crossbill	Green	-	Negligible
Cuckoo	Green	-	Negligible
Curlew	Red	-	High
Dunnock	Green	-	Negligible
Fieldfare	N/A	-	Negligible
Goldcrest	Amber	-	Low
Golden Plover	Red	Annex I	High
Goldfinch	Green	-	Negligible
Grasshopper Warbler	Green	-	Negligible
Great Tit	Green	-	Negligible
Greenfinch	Amber	-	Low
Grey Wagtail	Red	-	Low
Hen Harrier	Amber	Annex I	Very High
Hooded Crow	Green	-	Negligible

REFERENCE DOCUMENTS

APPENDIX 8.7: General Birds Fieldwork & Survey Results

EIAR 2019, Chapter 8: Biodiversity

Species	BOCCI Status	EU Birds Directive	Sensitivity Rating
House Martin	Green	-	Negligible
House Sparrow	Amber	-	Low
Jackdaw	Green	-	Negligible
Jay	Green	-	Negligible
Kestrel	Amber	-	Low
Lesser Redpoll	Green	-	Negligible
Linnet	Amber	-	Low
Long-tailed Tit	Green	-	Negligible
Magpie	Green	-	Negligible
Mallard	Green	-	Negligible
Meadow Pipit	Red	-	Medium
Mistle Thrush	Amber	-	Low
Moorhen	Green	-	Negligible
Peregrine Falcon	Green	Annex I	Low
Pheasant	N/A	-	Negligible
Pied Wagtail	Green	-	Negligible
Raven	Green	-	Negligible
Red Grouse	Red	-	Medium
Redwing	N/A	-	Negligible
Reed Bunting	Green	-	Negligible
Robin	Amber	-	Low
Rook	Green	-	Negligible
Sand Martin	Amber	-	Low
Sedge Warbler	Green	-	Negligible
Siskin	Green	-	Negligible
Snipe	Amber	-	Low
Skylark	Amber	-	Low
Song Thrush	Green	-	Negligible
Sparrowhawk	Amber	-	Low
Starling	Amber	-	Low
Stonechat	Amber	-	Low
Swift	Amber	-	Low
Tree Creeper	Green	-	Negligible
Wheatear	Amber	-	Low
Whitethroat	Green	-	Negligible
Willow Warbler	Green	-	Negligible
Wood Pigeon	Green	-	Negligible
Woodcock	Red	-	Low
Wren	Green	-	Negligible

Appendix to Chapter 8: Biodiversity

Appendix 8.8: Bat & Non-Volant Mammals Data

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

Contents

A8-8	Appendix to Chapter 8: Biodiversity.....	1
A8-8.1	Desktop Review - Bats	1
A8-8.1.1	<i>Landscape Suitability for Bats</i>	1
A8-8.1.2	<i>Records of Known Bat Roosts</i>	1
A8-8.2	Fieldwork - Bats & Non-Volant Mammals	2
A8-8.2.1	<i>Fieldwork - Bats</i>	2
A8-8.2.2	<i>Fieldwork - Non-Volant Mammals</i>	5
A8-8.3	Survey Results.....	7
A8-8.3.1	<i>Survey Results - Bats</i>	7
A8-8.3.2	<i>Survey Results - Non-Volant Mammals</i>	14

List of Plates & Tables

Plate 1: Bat Suitability Areas as per National Bat Suitability Landscape Mapping

Table 1: Characterisation of Bat Activity Indices

Table 2: Preliminary bat roost suitability of buildings within survey corridor

Table 3: Preliminary bat roost suitability of trees within survey corridor

Table 4: Preliminary bat roost suitability rating for bridges within survey corridor and details of endoscope and/or activity surveys

Table 5: Summary of bat activity levels at each sampling point using automated detectors.

Table 6: Observations/evidence of otter recorded during 2019 in the UWF Grid Connection Study Area

Table 7: Observations/evidence of badger recorded in the UWF Grid Connection Study Area

Table 8: Observations/evidence of all other non-volant mammals recorded in the UWF Grid Connection Study Area

Table 9: Observations/evidence of invasive non-volant mammals recorded during 2019 surveys for the UWF Grid Connection

Table 10: Summary of bat activity levels at each sampling point using automated detectors – UWF Related Works

Table 11: Observations/evidence of non-volant mammals recorded during surveys for Other Elements (UWF Related Works /Upperchurch Windfarm)

Table 12: Observations/evidence of non-volant mammals recorded during surveys for the UWF Other Activities – Overhead Line Activities

A8-8.1 Desktop Review - Bats

A8-8.1.1 Landscape Suitability for Bats

National landscape suitability maps for Irish bat species (Lundy *et al.*, 2010) were reviewed using the Map Viewer of the National Biodiversity Data Centre. The suitability index for the 'all bats combined' layer varies across the Whole UWF Project; areas of high suitability are found at the western end and in the centre of the UWF Grid Connection, while the eastern end of the UWF Grid Connection route and Upperchurch Windfarm are of moderate suitability. Overall, the landscape suitability follows a west to east pattern of decreasing suitability for all species, which roughly corresponds with the changes in altitude.

Landscape suitability in respect of Bats as available from the above cited source is illustrated in Plate 1.

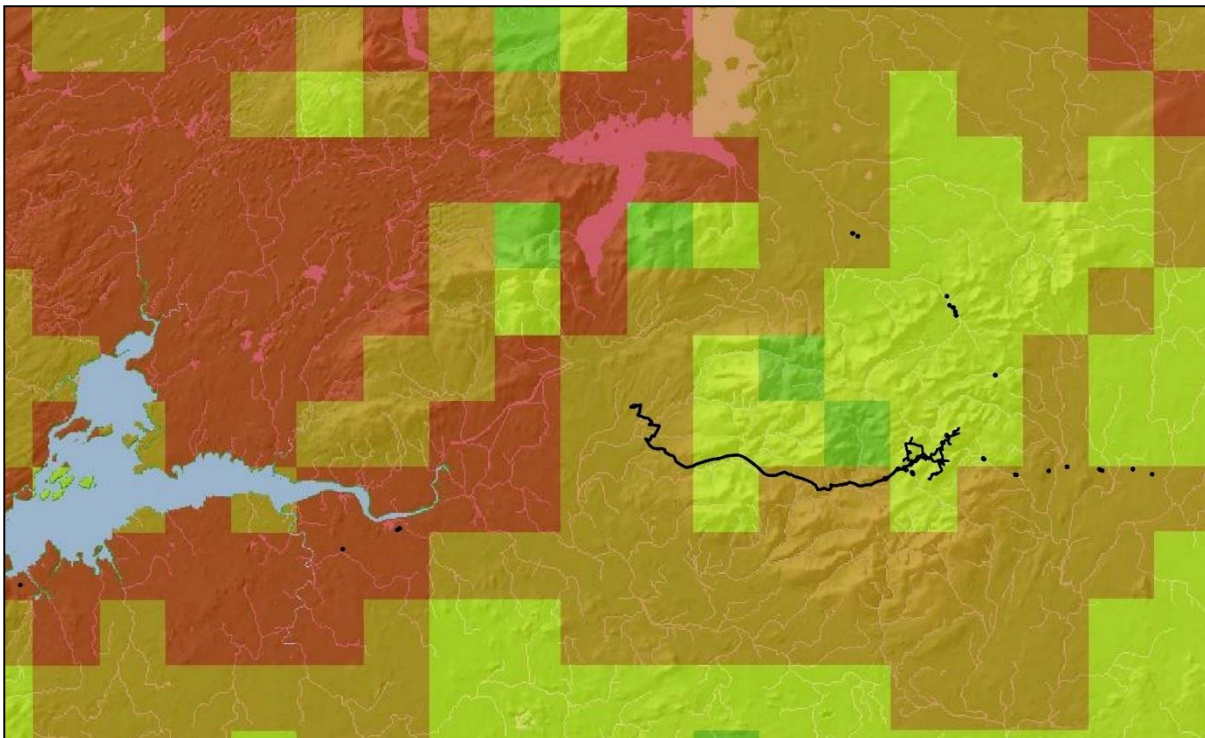


Plate 1: Bat Suitability Areas as per National Bat Suitability Landscape Mapping

(Areas shown in red have the highest habitat suitability index, and those in green, the lowest suitability index. However, squares highlighted as less favourable may still have local areas of abundance).

A8-8.1.2 Records of Known Bat Roosts

Records of known bat roosts within 10km of the UWF Grid Connection were obtained from the Bat Conservation Ireland database on the 5th September 2016. Eighteen roosts were identified, but all were located more than 5km from the UWF Grid Connection; most were from the banks of the River Shannon, and a small number were from the towns of Murroe (Glenstal Abbey), Ballyvoureen and Silvermines in County Tipperary. Consultations for this 2nd 2019 application were carried out with Bat Conservation Ireland in 2019, no feedback was received.

There were a number of activity records of Daubenton's bat, common pipistrelle, soprano pipistrelle and Leisler's bat within 10km of the UWF Grid Connection, with a few records of Natterer's bat and brown long-eared bat. The project is outside the geographical range of the lesser horseshoe bat, as the closest desktop records of this species were at Annacotty, Co. Limerick and Doonass, Co. Clare, approximately 8-10km to the west of the UWF Grid Connection.

A8-8.2 Fieldwork - Bats & Non-Volant Mammals**A8-8.2.1 Fieldwork - Bats**

The key sensitivities of bats are the destruction or disturbance of their roosting places, and the modification of their commuting routes and foraging habitats (NPWS 2013, Collins et al., 2016).

Survey aims

The aims of the bat surveys were to:

- Assess the bat roost suitability of bridges, buildings and mature trees that will be directly affected by the Whole UWF Project
- Identify potential indirect effects on bats, e.g. from disruption of commuting routes, or lighting

Designated sites

Bats are not listed as conservation interests for any designated sites within 5km of the UWF Grid Connection.

A8-8.2.1.1 Survey of potential bat roosts in 2019

Surveys of buildings: A Preliminary Ecological Appraisal was carried out for all buildings within 150m of the development works using the approach outlined in Section 4.3 of Bat Conservation Trusts Guidelines (Collins, 2016). These surveys were conducted during ecological survey on 17th, 22nd and 23rd January 2019. All buildings were assigned a suitability category of negligible, low, moderate or high suitability, based on their age, construction, and condition. Detailed surveys of buildings were not carried out, because direct impacts on bat roosts in buildings was subsequently scoped out of the assessment.

Surveys of Trees: Mature trees within 50m of the UWF Grid Connection construction works area were inspected from ground level. Ground-level roost assessments were carried out for all trees with moderate or low bat suitability within 50m of the development works.

Surveys of Existing Watercourse Crossing Structures: As the 110kV UGC will be installed over/under c. 65 watercourse crossing structures (i.e. bridges and culverts), all structures along the route were inspected. It is noted that the development will cross 3 other watercourses (giving a total of 68 watercourse crossings), but there are no existing structures (bridges or culverts) at these locations. Within the study area, 11 no. watercourse crossing structures had moderate suitability for roosting bats, 6 no. bridges had low suitability, and 48 had negligible suitability. The Bridges with moderate and low suitability were surveyed using a high-powered torch, endoscope (with regard to Section 5.3 of the Bat Conservation Trust guidelines 2016) and/or bat detector survey, to determine whether or not roosting bats were present. Preliminary ecological appraisals were conducted in January 2019, and endoscope surveys / bat detector surveys were conducted in May and June 2019. All surveys were carried out in suitable weather conditions

A8-8.2.1.2 Mountphilips Substation and Upperchurch Substation Bat Activity surveys

Bat activity surveys using automated detectors were carried out at four locations near the Mountphilips Substation site and two locations near the consented Upperchurch Windfarm substation in 2016, in the mid-summer period (June – August 2016) and in the autumn season (September / October 2016). There was no change in the habitat at these locations between 2016 and 2019, and bat populations are stable on a national scale, so the data from 2016 is still considered to be representative of current bat activity.

Surveys were undertaken using automated Anabat Express bat detectors (Titley Scientific); these are high-specification modern bat detectors that are fit for purpose. External microphones were mounted on canes at a height of approximately 1.5m in order to obtain 'clean' recordings that were not affected by surrounding vegetation.

One detector was placed in each location for two nights in the mid-summer period (June – August 2016) and two nights in the autumn season (September / October 2016). Night length ranged from 7.15 hours in late June to 12.45 hours in early October, giving a total survey effort of approx. 35-40 hours at each sampling point. We consider that this survey effort was sufficient to provide a good representation of bat activity during their most active periods, and that it was proportionate to the potential effects of the Whole UWF Project, as discussed in Section 2.2.5 of Collins (2016).

Surveys were carried out during suitable weather conditions, i.e. minimum temperatures above 10°C, average winds of less than 4m/s and little or no rainfall. There was wet weather or high winds on some of the survey nights in September 2016, so the survey was extended until two nights of suitable conditions were obtained.

Species identification and interpretation of data

Sonograms from Anabat Express detectors were obtained in the ‘zero-crossing’ format and viewed using AnalookW software (Corben 2014). Species were identified with reference to *British Bat Calls: A Guide to Species Identification* (Russ 2012) based primarily on frequency and call shape, but also with reference to call slope for *Myotis* spp. Social calls were classified as unidentified bats unless they closely matched the examples provided in Russ (2012).

It is acknowledged that *Myotis* spp. can have very similar calls, and that the classification of sonograms can be imprecise, so all *Myotis* records in this document should be considered as *conferre* records, i.e. *Myotis* cf *daubentonii*. There can also be overlaps in call frequency between *Pipistrellus* spp. - calls with a CF component at 50 kHz may be either soprano pipistrelle or common pipistrelle, while calls at 40 kHz may be either common pipistrelle or Nathusius’ pipistrelles – but in most cases, it is possible to determine the species based on call characteristics and/or other calls immediately before or after the recording. If a bat pass could not be confidently identified to species level it was recorded as an unidentified bat, or identified only to genus level (e.g. *Myotis* spp.).

Calculation and comparison of bat activity indices

In order to standardise bat activity between the mid-summer and autumn survey periods, results are displayed as a ‘Bat Activity Index’, which is the total number of bat passes divided by the number of hours per night (Hundt, 2012). This was calculated from sunset to sunrise, using publicly-available data from www.timeanddate.com.

At present there is not a standard system to categorise bat activity as low, moderate or high, because the results vary depending on the species involved and the location of the site. For the purposes of this report we use a bespoke system to discuss and compare levels of bat activity at the site, as outlined in the Table 1. This approach uses standardised terms (e.g. occasional, frequent) to categorise bat activity indices within certain ranges; the average time interval between passes is also provided to give a more-intuitive interpretation of the terms. Activity levels (from the Mountphilips Substation site sampling locations) were rated using a Bat Activity Index, as outlined in Table 1.

Table 1: Characterisation of Bat Activity Indices

Bat Activity Index	Average interval between calls	Terms of characterisation
<2	> 30 minutes	Negligible
2 - 12	5 – 30 minutes	Occasional
12 – 60	1 – 5 minutes	Frequent
>60	< 1 minute	Near-constant

A8-8.2.1.3 Species identification and interpretation of data

Sonograms from Anabat Express detectors were obtained in the 'zero-crossing' format and viewed using AnalookW software (Corben 2014). Species were identified with reference to *British Bat Calls: A Guide to Species Identification* (Russ 2012) based primarily on frequency and call shape, but also with reference to call slope for *Myotis* spp. Social calls were classified as unidentified bats unless they closely matched the examples provided in Russ (2012).

A8-8.2.1.4 Previous Surveys for Other Elements of the Whole UWF Project

A Preliminary Ecological Appraisal was carried out in 2016 for all buildings within 150m of the Other Elements of the Whole UWF Project. Ground-level roost assessments were carried out for all trees with moderate or low bat suitability within 50m of the Whole UWF Project, using binoculars. Bat activity surveys using automated Anabat Express bat detectors were carried out at two locations near the consented Upperchurch Windfarm substation. Follow-up surveys were carried out for features of high or moderate roost suitability. In most cases this included a preliminary roost appraisal and a presence / absence survey, as defined in Collins (2016).

Results of Bat Surveys are presented below in Section A8-8.3.1.

A8-8.2.2 Fieldwork - Non-Volant Mammals

Surveys for all legally protected non-volant mammal species were undertaken within a 50m buffer of the UWF Grid Connection, with the exception of otter as detailed below.

The surveys to inform the first planning application (partially relied on herein) was undertaken on 8th – 11th March, 2016. Additional surveys were undertaken on 29th August 2016, 29th September 2016, 5th/6th April 2017.

Updated surveys of the revised UWF Grid Connection project (subject development) were completed in 17th, 22nd, 23rd January and 30th May 2019.

A8-8.2.2.1 Otters

Otter surveys followed the NRA *Guidelines for Treatment of Otters During Construction of National Road Schemes* (NRA, 2008), which state that, although there are no seasonal constraints for otter surveys, any dense vegetation (especially in summer) can reduce success in the identification of otter holts or couches. A total of 26 watercourses were surveyed for Otter (in tandem with Kingfisher), 300m upstream and downstream, which include the Newport River (W7), Clare River (W36) and Bilboa River (53) and 23 other watercourses (W5, W8, W9, W18, W21, W22, W23, W26, W28, W29, W30, W33, W35, W39, W41, W42, W46, W47, W48, W49, W50, W51 and W52). Surveys were conducted in January 2019 in order to optimize detection of otters within the study area. Surveys of watercourses on the section of grid route around Newport where conducted in May, 2019, it is not thought that vegetation in May hampered the survey as vegetation remains low in spring compared to summer vegetation cover.

Guidance on the extent of the study area for otters was taken from the *British Highways Agency's Nature Conservation Advice in Relation to Otters HA8199* (Highways Agency, 1999) which dictates a linear search of 300m upstream and downstream of each watercourse crossing is undertaken.

A8-8.2.2.2 Badgers

According to the NRA *Guidelines for the Treatment of Badgers Prior to Construction of National Road Schemes* (NRA, 2005), survey of setts within 50m of the proposed works location is required. Badger surveys are significantly constrained by vegetative cover and season, and are best conducted from November to April (NRA, 2005). In accordance with NRA guidance, all areas were systematically searched for setts and all hedgerows and boundaries were checked comprehensively by Inis ecologists. Badger territorial activity is high from mid-January to March and surveys at this time are most efficient in identification of badger paths, latrines and feeding signs. Badger surveys were conducted in January 2019 along the majority of the route and in May 2019 for the section of 110kV UGC route around Newport, it is not thought that vegetation cover in May hampered the survey as vegetation remains low in spring compared to summer vegetation cover.

A8-8.2.2.3 Other Mammals

The following field signs of all mammals were recorded during non-volant mammal surveys within the study area:

- Well-used pathways;
- Prints/tracks;
- Scat/spraints/droppings;
- Signs of feeding (foraged pine cones, badger snuffle holes)
- Places of shelter and features or areas likely to be of particular value as foraging resources).

REFERENCE DOCUMENTS

APPENDIX 8. 8: Bat & Non-Volant Mammals Data

EIAR 2019, Chapter 8: Biodiversity

Photographs and detailed notes were also recorded for each feature and mapped using ArcGIS 10.4.

Results of the Non-Volent Mammals Survey are presented below in Section A8-8.3.2

A8-8.3 Survey Results

A8-8.3.1 Survey Results - Bats

A8-8.3.1.1 Bat Roost Survey Results: Suitability of Buildings

Preliminary inspections of buildings within the survey corridor are provided below. Detailed surveys of these buildings were not carried out, because direct effects to roosts within buildings were subsequently scoped out of the assessment, as the 110kV UGC will be installed entirely within road pavements – i.e. no works or damage to buildings will occur.

Table 2: Preliminary bat roost suitability of buildings within survey corridor

Code	ITM Grid Ref		Description	Rating
1	572911	664350	Two-storey house	Low
2	572917	664380	Bungalow	Low
3	572930	664448	Bungalow	Low
4	573083	663753	Barns	Low
5	573605	661571	Two-storey house	Moderate
6	573624	661496	Farmhouse and barns	High
7	57361	661577	Two houses	High
8	573652	663110	Bungalow	Moderate
9	573676	661944	Farmhouse and barns	Moderate
10	573883	662253	Farmhouse and barns	Moderate
11	575382	660716	Shed	Low
12	576215	659967	Barn	Moderate
13	576444	659881	Barn	Low
14	576591	659847	Shed	Low
15	576630	659914	Derelict house	Moderate
16	577049	660050	Derelict house	Moderate
17	577082	660061	Farm buildings	Low
18	577356	660116	Shed	Low
19	578290	660445	Bungalow	Moderate
20	578689	660533	Barn	Moderate
21	578838	660566	House	High
22	579850	660799	Derelict house	Moderate
23	580007	660797	House	High
24	580194	660822	Barn	Moderate
25	580281	660844	Shed	Moderate
26	580675	660750	Shed	High
27	580679	660778	Bungalow	High
28	580741	660725	Bungalow	Moderate
29	581593	660094	Bungalow	Moderate
30	582615	659316	Barn	Moderate
31	583575	659441	Barn	High
32	583601	659438	Shed	Low

REFERENCE DOCUMENTS

APPENDIX 8. 8: Bat & Non-Volant Mammals Data

EIAR 2019, Chapter 8: Biodiversity

Code	ITM Grid Ref		Description	Rating
33	583601	659438	Derelict house	Moderate
34	584464	659274	Derelict house	High
35	585213	659047	Derelict house	High
36	585581	658914	House	Moderate
37	585668	658875	House and shed	Moderate
38	586591	658227	House	High
39	587054	658265	Shed	Moderate
40	588254	658572	Bungalow	High
41	588330	658608	Derelict house	Moderate
42	588911	658779	Farm buildings	High
43	589887	658488	Shed	High
44	592577	659794	Metal-roofed barns	Negligible
45	592660	659789	Bungalow	Low
46	592747	659741	Bungalow	Low
47	592805	659732	Two-storey house	Low
48	592823	659756	Bungalow	Low
49	592855	659730	Bungalow	Low
50	592921	659806	Bungalow and barns	Low
51	592961	659742	Farmhouse and barns	Low
52	593267	659975	Bungalow	Low
53	593327	659998	Bungalow	Low
54	593332	660032	Bungalow	Low
55	593343	660032	Barn	Moderate
56	593371	660016	Metal-roofed barn	Low
57	593411	660036	Bungalow	Low
58	593446	660059	Two-storey house	Low
59	593654	660420	Metal-roofed barns	Negligible
60	593741	660362	Bungalow	Low
61	593756	660301	Two-storey house	Low
62	593815	660412	Two-storey house	Moderate
63	593873	660405	Ruins	Low
64	593892	660401	House	Moderate
65	593915	660483	Incomplete house	Low
66	593951	660527	Two-storey house	Low
67	593994	660673	House and shed	Moderate
68	593998	660679	Derelict house	Negligible
69	595050	660559	Derelict house, shed	High

A8-8.3.1.2 Bat Roost Survey Results: Suitability of Trees

Preliminary inspections of mature trees are provided below. Ground-level roost assessments were carried out for all trees with moderate or low bat suitability within 50m of the UWF Grid Connection. No live bats were seen or heard, and no field signs were observed (e.g. droppings, fur-oil staining, urine splashes), so none of these trees were confirmed to be supported roosting bats at the time of survey. All other broadleaf trees within 50m of the UWF Grid Connection were inspected, but none had any potential roost features that would be suitable for bats, so they were considered to have negligible roost suitability.

Table 3: Preliminary bat roost suitability of trees within survey corridor

Code	ITM Grid Ref		Number of trees	Rating
1	572213	664603	1	Low
2	572932	664502	9	Low
3	572218	664333	1	Moderate
4	572405	664616	1	Low
5	572936	664459	1	Moderate
6	572952	664534	1	Low
7	573728	661504	5	Low
8	574766	661249	1	low
9	576501	659885	2	Low
10	580014	660809	1	Low

A8-8.3.1.3 Bat Roost Survey Results: Suitability of Bridges/Watercourse Crossing Structures

Preliminary inspections of bridges / watercourse crossings are provided below. 11 no. bridges had moderate suitability for roosting bats, 7 no. bridges had low suitability, and 47 had negligible suitability. Bridges with moderate suitability were surveyed by endoscope or bat detector survey, and bat roosts were recorded in two structures: bridges W33 and W44. Both were of a single soprano pipistrelle bat, and thus were considered to be day roosts / satellite roosts, which would be of negligible ecological value. Endoscope surveys were carried out for bridges with low suitability for bats, but no roosting bats were found.

Table 4: Preliminary bat roost suitability rating for bridges within survey corridor and details of endoscope and/or activity surveys

Code	ITM Grid Ref		Description	Preliminary Rating	Endoscope/Activity Surveyed conducted
W4	572862	664009	Concrete Block Box Culvert	Negligible	
W5	573131	663713	Masonry Single Arch Bridge	Negligible	
W6	573587	663589	Concrete Circular Culvert	Low	
W7	573819	663380	Masonry Single Arch Bridge	Moderate	Yes
W8	574375	662952	Concrete Slab Bridge	Low	
W9	574192	662602	Concrete Slab Bridge	Low	Yes
W10	574524	661296	Plastic Circular Culvert	Negligible	

REFERENCE DOCUMENTS

APPENDIX 8. 8: Bat & Non-Volant Mammals Data

EIAR 2019, Chapter 8: Biodiversity

Code	ITM Grid Ref		Description	Preliminary Rating	Endoscope/Activity Surveyed conducted
W11	575519	660667	Masonry Box Culvert	Negligible	
W12	576075	660062	Masonry Box Culvert, circular culvert other side concrete circular culvert	Negligible	
W13	576440	659886	Masonry Box Culvert	Negligible	
W14	576616	659900	Masonry Box Culvert	Negligible	
W15	576900	659963	Masonry Box Culvert	Negligible	
W16	576988	659992	Plastic Circular Culvert	Negligible	
W17	577104	660067	Masonry Box Culvert	Negligible	
W18	577225	660134	Masonry Box Culvert	Moderate	Yes
W19	577338	660175	Masonry Box Culvert	Negligible	
W20	577758	660305	Masonry Box Culvert	Negligible	
W21	577911	660350	Masonry Single Arch Bridge	Low	Yes
W22	578130	660412	Masonry Arch Bridge	Low	Yes
W23	578284	660456	Masonry Arch Bridge	Moderate	Yes
W24	578470	660491	Concrete Circular Culvert	Negligible	
W25	578580	660507	Plastic Circular Culvert	Negligible	
W26	578696	660524	Concrete Circular Culvert	Negligible	
W27	578829	660544	Masonry Box Culvert	Negligible	
W28	579117	660608	Masonry Box Culvert	Moderate	Yes
W29	579430	660718	Concrete Slab Bridge	Low	Yes
W30	579691	660761	Masonry Box Culvert	Low	Yes
W31	580017	660796	Concrete Circular Culvert	Negligible	

REFERENCE DOCUMENTS

APPENDIX 8. 8: Bat & Non-Volant Mammals Data

EIAR 2019, Chapter 8: Biodiversity

Code	ITM Grid Ref		Description	Preliminary Rating	Endoscope/Activity Surveyed conducted
W32	580180	660813	Masonry Box Culvert	Negligible	
W33	580524	660771	Masonry Arch Bridge - Single	Moderate	Yes, roost found single soprano pipistrelle bat
W34	580871	660622	Masonry Box Culvert	Negligible	
W35	580924	660593	Double Masonry Arch	Negligible	
W36	581397	660263	Double Masonry Arch	Moderate	Yes
W37	581837	659906	Masonry Arch	Negligible	
W38	581937	659811	Plastic Circular Culvert	Negligible	
W39	582792	659264	Plastic Circular Culvert	Negligible	
W40	583808	659491	Circular Culvert	Negligible	
W41	584369	659330	Masonry Box Culvert	Moderate	Yes
W42	584924	659119	Masonry Box Culvert	Negligible	
W43	585276	659017	Masonry Arch	Moderate	Yes
W44	585502	658935	Masonry Arch	Moderate	Yes, roost found - single soprano pipistrelle bat
W45	586013	658701	Concrete Circular Culvert	Negligible	
W46	586250	658535	Masonry Box Culvert	Negligible	
W47	586604	658207	Masonry Box Culvert	Negligible	
W48	586892	658283	Plastic Circular Culvert	Negligible	
W49	587421	658558	Masonry Arch	Moderate	Yes
W50	587698	658493	Masonry Box Culvert	Negligible	
W51	587892	658501	Masonry Box Culvert	Negligible	
W52	588325	658580	Masonry Box Culvert	Negligible	
W53	588920	658727	Double Masonry Arch	Moderate	Yes
W54	589306	658623	Plastic Circular Culvert	Negligible	

REFERENCE DOCUMENTS

APPENDIX 8. 8: Bat & Non-Volant Mammals Data

EIAR 2019, Chapter 8: Biodiversity

Code	ITM Grid Ref		Description	Preliminary Rating	Endoscope/Activity Surveyed conducted
W55	589659	658463	Masonry Box Culvert	Negligible	
W56	589835	658492	Concrete Circular Culvert	Negligible	
W57	590060	658539	Masonry Box Culvert	Negligible	
W58	590574	658624	Concrete Circular Culvert	Negligible	
W59	590819	658754	1 X Concrete Culvert and 1 X Masonry Box Culvert	Negligible	
W60	591131	658859	Masonry Box Culvert	Negligible	
W61	592457	659714	Masonry Box Culvert	Negligible	
W62	593239	659980	Masonry Box Culvert	Negligible	
W63	593652	660259	Concrete Circular Culvert	Negligible	
W64	593939	660564	Masonry Box Culvert	Negligible	
W65	594023	660695	Concrete Circular Culvert	Negligible	
W66	594275	660792	Concrete Circular Culvert	Negligible	
W67	594611	660624	Concrete Circular Culvert	Negligible	
W68	594860	660610	Concrete Circular Culvert	Negligible	

A8-8.3.1.4 Bat Activity Survey Results

Bat activity surveys using automated detectors were carried out at four locations near the Mountphilips Substation site and two locations near the consented Upperchurch Windfarm substation (2016). Activity levels (from six sampling locations) were relatively high, with an average of one bat pass every 2 - 3 minutes throughout the survey period (a Bat Activity Index, BAI, of 23.4). The most frequently-recorded species were common pipistrelles, followed by soprano pipistrelles, *Myotis* spp. and Leisler’s bat, in order of abundance. Lesser-horseshoe bats were not recorded

Table 5: Summary of bat activity levels at each sampling point using automated detectors

Species codes are as follows: CP (common pipistrelle), SP (soprano pipistrelle), L (Leisler’s bat) and MY (Myotis spp.)

Sampling Location	Habitat	Month	Characterisation of activity (BAI)	Importance Evaluation
SD1	Mature treeline	Jun	Frequent CP, occasional SP	Local
		Sept	Frequent CP, occasional SP & MY	
SD2	Hedgerow	Aug	Frequent CP	Local
		Sept	Occasional CP	
SD3	Hedgerow	Jun	Negligible	Local
		Sept	Frequent SP, occasional CP	
SD4	Hedgerow	Jun	Frequent CP, occasional SP	Local
		Sept	Occasional CP	
SD27*	Edge of conifer plantation	Jun	Occasional CP	Negligible
		Sept	Negligible	

* It should be noted that sampling locations SD 1 to SD 4 are at Mounthilips. SD27 is at the Upperchurch Windfarm Substation, this also within the zone of influence of the UWF Related Works, and are discussed in relation to same within the relevant section of this report.

To assist with the interpretation and comparison of BAIs we classify the results as negligible, occasional, frequent and near-constant, using a bespoke system (as per Table 1). One of the sampling sites was considered to be of County Importance as a feeding areas / commuting route, four to be of Local Importance, and one of Negligible Importance.

A8-8.3.2 Survey Results - Non-Volant Mammals

Table 6: Observations/evidence of otter recorded during 2019 in the UWF Grid Connection Study Area

Species	Evidence	Watercourse Crossing	Notes
Otter	Otter Print	W33	Underneath W33 bridge structure
Otter	Otter Spraint	W33	45 metres downstream of watercourse crossing W33
Otter	Otter Slide	W36	135 metres upstream of watercourse Crossing W36
Otter	Otter Slide	W53	60 metres downstream of watercourse crossing W53

Table 7: Observations/evidence of badger recorded in the UWF Grid Connection Study Area.

Species	Evidence	Easting (ITM)	Northing (ITM)	Notes
Badger	Badger tracks/print	594777	660632	
Badger	Badger tracks/print	572468	664451	
Badger	Badger latrine/scat	572278	664412	Small latrine, along edge of hedgerow in field
Badger	Badger latrine/scat	572251	664437	Small latrine, along edge of hedgerow in field
Badger	Badger latrine/scat	572220	664438	Small latrine, along edge of hedgerow in field
Badger	Badger latrine/scat	572187	664435	Small latrine, along edge of hedgerow in field
Badger	Badger latrine/scat	572114	664432	Small latrine, along edge of hedgerow in field
Badger	Badger latrine/scat	572052	664432	Small latrine, along edge of hedgerow in field

Table 8: Observations/evidence of all other non-volant mammals recorded in the UWF Grid Connection Study Area

Species	Evidence	Easting (ITM)	Northing (ITM)	Notes
Deer sp.	Deer tracks/slot	594802	660625	
Deer sp.	Deer tracks/slot	572567	664537	Slots and droppings on track
Pine Marten	Pine Marten scat	594682	660714	
Fox	Fox tracks/print	572470	664456	Fox print in mud
Fox	Fox scat	572451	664462	Fox scat on top of GWT shrew in track within field
Squirrel sp.	Hazelnut feeding sign	572568	664538	Split hazelnut shell with distinctive notch on tip
Rat	Burrow	573659	663423	
Mammal	Mammal Path	579187	660627	
Mammal	Mammal Path	583443	659316	
Mammal	Mammal Path	576755	659944	
Mammal	Mammal Path	576740	659961	
Mammal	Mammal Path	575153	660845	
Mammal	Mammal Path	575428	660727	
Mammal	Mammal Path	575431	660705	
Mammal	Mammal Path	575469	660689	
Mammal	Mammal Path	575726	660275	
Mammal	Mammal Path	576165	660010	
Mammal	Mammal Path	576130	660029	
Mammal	Mammal Path	587439	658476	
Mammal	Mammal Path	573187	663696	
Mammal	Mammal Path	573605	663481	
Mammal	Mammal Path	573770	663379	
Mammal	Mammal Path	573659	663423	
Mammal	Mammal Path	573846	663359	
Mammal	Mammal Path	573829	663381	

Table 9: Observations/evidence of invasive non-volant mammals recorded during 2019 surveys for the UWF Grid Connection

Species	Evidence	Easting (ITM)	Northing (ITM)	Notes
Greater white toothed shrew	Corpse	572451	664462	GWT shrew under fox scat

A8-8.3.2.1 Survey Results – Other Elements

Observations/Evidence of mammals recorded during surveys for UWF Related Works/Upperchurch Windfarm/UWF Replacement Forestry

Table 10: Summary of bat activity levels at each sampling point using automated detectors – UWF Related Works

Species codes are as follows: CP (common pipistrelle), SP (soprano pipistrelle), L (Leisler’s bat) and MY (Myotis spp.)

Sampling Location	Habitat	Month	Characterisation of activity (BAI)	Importance Evaluation
SD26*	Farmyard	Jun	Near-constant CP	County
		Sept	Occasional CP	
SD27*	Edge of conifer plantation	Jun	Occasional CP	Negligible
		Sept	Negligible	

* SD27 is at the Upperchurch Windfarm Substation, along the UWF Grid Connection UGC route and is also within the zone of influence of the UWF Grid Connection, and are discussed in relation to same within the relevant section of this report.

Table 11: Observations/evidence of non-volant mammals recorded during surveys for Other Elements (UWF Related Works /Upperchurch Windfarm)

Other Element	Species	Evidence	Easting (ITM)	Northing (ITM)	Notes
Upperchurch Windfarm	Badger	Badger entrance	595771	660284	An old disused single entrance badger sett was recorded along a hedgerow approximately 250m south west of turbine T7. The entrance was overgrown and did not appear to have been used for a significant period of time.
Upperchurch Windfarm	Badger	Badger sett	595693	659683	A potential single entrance badger sett was recorded along a field boundary 150m west of turbine T4
Upperchurch Windfarm	Fox	Presence noted			
UWF Replacement Forestry	Badger	Badger print	594687	661526	
UWF Replacement Forestry	Fox	Presence noted			
UWF Replacement Forestry	Fallow Deer	Presence noted			
UWF Related Works	Fox	Fox Scat	594483	661518	Droppings on edge of farm track
UWF Related Works	Fox	Fox Scat	594689	661471	Droppings at mammal crossing point on earth bank.
UWF Related Works	Fox	Fox Scat	594584	661694	Dropping on mammal trail near crossing point of stream

UWF Other Activities: Incidental records of mammal signs and individuals were made during surveys with the overhead line activities study area, findings are detailed below

Table 12: Observations/evidence of non-volant mammals recorded during surveys for the UWF Other Activities – Overhead Line Activities

Species	Notes
Otter	An old Otter holt was recorded within the bank of a drainage ditch shared by water-course crossing 2 (W2). An otter pathway located 80 metres west of AM 3 was recorded leading from the Groody River over a grassland field and into an adjoining stream
Badger	No active Badger setts were recorded within close proximity to the poles. An old badger sett was recorded within the hedgerow 180 metres north east AM 78
Fox	The smell of fox was recorded along a hedgerow leading to water crossing 1 (W1)
Deer	A herd of 6 deer, Fallow, were observed in the conifer plantation adjacent to IMP 83
Rabbit	Rabbit burrows were recorded on occasion within some of the hedgerows. A rabbit was observed adjacent to Annacotty Business Park
Mammal Pathways	Mammal pathways were recorded frequently within hedgerows and through treelines. These could be used by a number of mammals including Badger and Fox



Plate 2: Deer slot in mud



Plate 3: Badger print in mud.



Plate 4: Otter spraint on boulder under bridge.



Plate 5: Greater white toothed shrew and fox droppings on track in field

REFERENCE DOCUMENTS

APPENDIX 8. 8: Bat & Non-Volant Mammals Data
EIAR 2019, Chapter 8: Biodiversity

Appendix to Chapter 8: Biodiversity

Appendix 8.9: Amphibians, Reptiles & Marsh Fritillary Field Work & Survey Results

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

Contents

A8-9 Appendix to Chapter 8: Biodiversity..... 1

A8-9.1 Field Work – Amphibians, Reptiles, Invertebrates..... 1

A8-9.1.1 *Amphibians and Reptiles*..... 1

A8-9.1.2 *Marsh Fritillary*..... 1

A8-9.2 Survey Results 2

A8-9.2.1 *Survey Results for Amphibians & Reptiles*..... 2

A8-9.2.2 *Survey Results - Invertebrates-Marsh Fritillary* 2

List of Tables:

Table 1: Incidental observations of amphibians and reptiles recorded during surveys for Other Elements of the Whole UWF Project (for cumulative evaluations)

Table 2: Observations of Marsh Fritillary recorded during surveys for the Other Elements of the Whole UWF Project (for cumulative evaluations)

A8-9.1 Field Work – Amphibians, Reptiles, Invertebrates**A8-9.1.1 Amphibians and Reptiles**

Amphibians and reptiles occurring within the study area of UWF Grid Connection were recorded during the course of all site walkovers for habitat, mammal and bird surveys.

Results of the Amphibians/Reptiles Surveys are presented below in Section A8-9.2.1

A8-9.1.2 Marsh Fritillary

Suitable habitats, determined by the presence of Devil's Bit Scabious (*Succisa pratensis*) as well as an evaluation of vegetation height and structure, aspect and scrub cover, were identified within the wider study area of the UWF Grid Connection corridor during the 1st 2018 UWF Grid Connection application habitat survey.

No habitats suitable for Marsh Fritillary were recorded within the 2nd UWF Grid Connection application (*current 2019 application*) study area.

A8-9.1.2.1 Marsh Fritillary surveys within study areas for Other Elements

In relation to the Other Elements of the Whole UWF Project, surveys in 2016 and 2017 for suitable habitat within the Upperchurch Windfarm/UWF Related Works site found suitable potential Marsh Fritillary habitat at Shevry, where the construction works area for both the Upperchurch Windfarm and the UWF Related Works overlap. Due to their potential to possibly contain larval webbing these sites were visited on 6th September 2017 to confirm the baseline environment. In the interest of clarity both the consented turbine footprint and described works area for turbine establishment and erection and internal cabling were surveyed. No other Marsh Fritillary habitat overlaps the any other part of the Whole UWF Project.

Results of the Marsh Fritillary Surveys are presented below in Section A9-9.2.2.

A8-9.2 Survey Results

A8-9.2.1 Survey Results for Amphibians & Reptiles

No observations or evidence of Amphibians or Reptiles were recorded during surveys within the UWF Grid Connection study area, although suitable habitat is present.

The observations in the table below relate to Other Elements of the Whole UWF Project only.

Table 1: Incidental observations of amphibians and reptiles recorded during surveys for Other Elements of the Whole UWF Project (for cumulative evaluations)

Species	Easting (ITM)	Northing (ITM)	Location	Date	Notes
Frog	593269	661083	Knockmaroe	13/07/2017	Adult in disturbed ground near mobile phone mast
Frog	593127	661667	Grousehall	13/07/2017	Adult in species rich wet grassland
Frog	594368	661161	Foilynman	19/05/2017	Adult in improved grassland next to plantation
Viviparous Lizard	595169	659348	Shevry	13/07/2017	In acid grassland

A8-9.2.2 Survey Results - Invertebrates-Marsh Fritillary

No Marsh Fritillary or suitable Marsh Fritillary habitat was recorded within the UWF Grid Connection study area.

The records below only relate to Other Elements – UWF Related Works and Upperchurch Windfarm.

Table 2: Observations of Marsh Fritillary recorded during surveys for the Other Elements of the Whole UWF Project (for cumulative evaluations)

Easting (ITM)	Northing (ITM)	Evidence	Year	Location
595775	659918	Larval Web	Sep-17	Shevry
595732	659852	Larval Web	Sep-17	Shevry
595751	659829	Larval Web	Sep-17	Shevry
595775	659815	Larval Web	Sep-17	Shevry



Plate 1: Wet grassland at Shevry which contained patches of Devil’s bit scabi-ous where Marsh Fritillary webs were recorded

Appendix to Chapter 9: Land

There are no appendices associated with this topic chapter.

REFERENCE DOCUMENTS

Appendix to Chapter 10: Soils

Appendix 10.1: Trial Pit Investigations

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

REFERENCE DOCUMENTS

REFERENCE DOCUMENTS

TRIAL PIT LOG

TRIAL PIT NUMBER: TH-01

PROJECT NUMBER: P1299-2

DATE STARTED: 21/01/2016

EASTING: 172290

SITE: Upperchurch Grid Connection

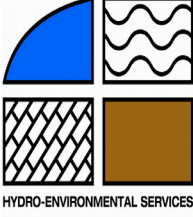
LOGGED BY: D. Broderick

NORTHING: 164486

CLIENT: Ecopower Developments Ltd.

CONTRACTOR: James Bradshaw

ELEVATION:



HYDRO-ENVIRONMENTAL SERVICES

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				0.00	0		Ground Surface
				-0.10			Topsoil
				-0.40			Firm, greyish brown to grey SILT - SILT/CLAY (with some orange mottling)
				-0.80			Firm to very firm, orange/brown slightly gravelly CLAY (with minor sand discontinuities)
				-2.00	1		Soft to firm, grey, gravelly sandy CLAY with some cobbles (wet, groundwater seepage below approx 1mbgl, layer unstable)
				-3.00	2		Firm, greyish brown, slightly gravelly, sandy CLAY with some cobbles and boulders
							Bedrock not met
					3		End of Hole @ 3mbgl.
							Total Depth of Trial Pit

REMARKS: Suspected old stone land drain with minor inflows intercepted at 0.7mbgl	PIT LENGTH: 3m PIT BREADTH: FINAL DEPTH: 3mbgl EXCAVATOR:
---	--

LEGEND V - Water strike D - Disturbed sample B - Bulk disturbed sample W - Water sample V - Vane test T - No. of threads R - Average length of ribbons Dil - Dilatancy recorded ND - No dilatancy recorded	PAGE 1 of 1
	SCALE As shown

REFERENCE DOCUMENTS

TRIAL PIT LOG

TRIAL PIT NUMBER: TH-02

PROJECT NUMBER: P1299-2

DATE STARTED: 21/01/2016

EASTING: 172280

SITE: Upperchurch Grid Connection

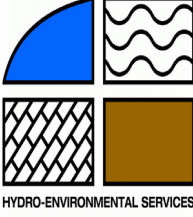
LOGGED BY: D. Broderick

NORTHING: 164455

CLIENT: Ecopower Developments Ltd.

CONTRACTOR: James Bradshaw

ELEVATION:



HYDRO-ENVIRONMENTAL SERVICES

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				0.00	0		Ground Surface
				-0.10			Topsoil
							Firm, grey SILT (with some orange mottling)
				-0.60			Firm to very firm, greyish brown, slightly gravelly, sandy CLAY with some cobbles
					1		Refusal at 2.7m due to dense ground and boulders
					2		
				-2.70			End of Hole @ 2.7mbgl.
					3		Total Depth of Trial Pit

REMARKS: Suspected old stone land drain with minor inflows intercepted at 0.8mbgl	PIT LENGTH: 2.7m PIT BREADTH: FINAL DEPTH: 2.7mbgl EXCAVATOR:
---	--

LEGEND ∇ - Water strike D - Disturbed sample B - Bulk disturbed sample W - Water sample V - Vane test T - No. of threads R - Average length of ribbons Dil - Dilatancy recorded ND - No dilatancy recorded	PAGE 1 of 1 SCALE As shown
--	---

REFERENCE DOCUMENTS

TRIAL PIT LOG

TRIAL PIT NUMBER: TH-'\$'

PROJECT NUMBER: P1299-2

DATE STARTED: 05/05/2017

EASTING: 172552

SITE: Upperchurch Grid Connection

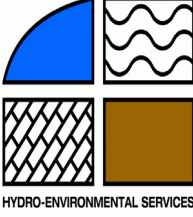
LOGGED BY: D. Broderick

NORTHING: 164494

CLIENT: Ecopower Developments Ltd.

CONTRACTOR: James Bradshaw

ELEVATION:



HYDRO-ENVIRONMENTAL SERVICES

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				0.00	0		Ground Surface
				-0.10			TOPSOIL
				-0.40			SILT/CLAY Brown, firm SILT/CLAY
				-0.65			CLAY Light grey, very firm to stiff CLAY
				-1.40	1		CLAY Greyish brown, very firm to stiff, slightly gravelly CLAY with sub-rounded to angular cobbles
							End of hole @ 1.4mbgl Total Depth of Trial Pit

<p>REMARKS:</p> <p>Lots of orange mottling in the clay (poor drainage) Dry hole</p>	<p>PIT LENGTH: 1.4m</p> <p>PIT BREADTH:</p> <p>FINAL DEPTH: 1.4mbgl</p> <p>EXCAVATOR:</p>
--	---

<p>LEGEND</p> <p>∇ - Water strike D - Disturbed sample B - Bulk disturbed sample W - Water sample V - Vane test T - No. of threads R - Average length of ribbons Dil - Dilatancy recorded ND - No dilatancy recorded</p>	<p>PAGE 1 of 1</p> <hr/> <p>SCALE As shown</p>
---	--

REFERENCE DOCUMENTS

TRIAL PIT LOG

TRIAL PIT NUMBER: TH-\$(

PROJECT NUMBER: P1299-2

DATE STARTED: 05/05/2017

EASTING: 172550

SITE: Upperchurch Grid Connection

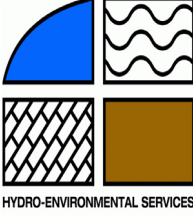
LOGGED BY: D. Broderick

NORTHING: 164519

CLIENT: Ecopower Developments Ltd.

CONTRACTOR: James Bradshaw

ELEVATION:



HYDRO-ENVIRONMENTAL SERVICES

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				0.00	0		Ground Surface
				-0.10			TOPSOIL
				-0.40			SILT Dark grey, firm slightly sandy SILT
				-1.40	1		CLAY Orange brown, very firm to stiff slightly gravelly CLAY
							End of hole @ 1.4mbgl Total Depth of Trial Pit

REMARKS: Lots of orange mottling in the clay (poor drainage) Dry hole	PIT LENGTH: 1.4m PIT BREADTH: FINAL DEPTH: 1.4mbgl EXCAVATOR:
--	--

LEGEND ▽ - Water strike D - Disturbed sample B - Bulk disturbed sample W - Water sample V - Vane test T - No. of threads R - Average length of ribbons Dil - Dilatancy recorded ND - No dilatancy recorded	PAGE 1 of 1 SCALE As shown
--	---

REFERENCE DOCUMENTS

TRIAL PIT LOG

TRIAL PIT NUMBER: TH-05

PROJECT NUMBER: P1299-2

DATE STARTED: 09/06/2016

EASTING: 172979

SITE: Upperchurch Grid Connection

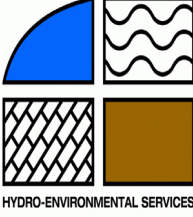
LOGGED BY: D. Broderick

NORTHING: 164498

CLIENT: Ecopower Developments Ltd.

CONTRACTOR: James Bradshaw

ELEVATION:



HYDRO-ENVIRONMENTAL SERVICES

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				0.00	0		Ground Surface TOPSOIL
				-0.15			SILT/CLAY Firm, orange/brown, slightly sandy SILT/CLAY with some rounded to sub-rounded limestone cobbles
					1		
				-1.60			Total Depth of Trial Pit
					2		

REMARKS:	PIT LENGTH: 1.6m PIT BREADTH: FINAL DEPTH: 1.6mbgl EXCAVATOR:
-----------------	--

LEGEND ∇ - Water strike D - Disturbed sample B - Bulk disturbed sample W - Water sample V - Vane test T - No. of threads R - Average length of ribbons Dil - Dilatancy recorded ND - No dilatancy recorded	PAGE 1 of 1
	SCALE As shown



REFERENCE DOCUMENTS
TRIAL PIT LOG

TRIAL PIT NUMBER: TH-06

PROJECT NUMBER: P1299-2	DATE STARTED: 12/04/2012	EASTING: 194754
SITE: Upperchurch Grid Connection	LOGGED BY: S. Doyle	NORTHING: 160387
CLIENT: Ecopower Developments Ltd.	CONTRACTOR: William McLoughlin	ELEVATION:

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				0.00	0		Ground Surface
				-0.30		[Cross-hatched pattern]	PEATY ORGANIC SOIL
				-1.50		[Dotted pattern]	CLAY Stiff stony grey clay
				-2.20		[Horizontal line pattern]	CLAY Stiff stoney yellow clay stratum
							End of hole @2.2mbgl Total Depth of Trial Pit

REMARKS: No ground water infiltration End of trial pit within clay stratum	PIT LENGTH: 1.6m PIT BREADTH: FINAL DEPTH: 2.2mbgl EXCAVATOR:
---	--

LEGEND ∇ - Water strike D - Disturbed sample B - Bulk disturbed sample W - Water sample V - Vane test T - No. of threads R - Average length of ribbons Dil - Dilatancy recorded ND - No dilatancy recorded	PAGE 1 of 1 SCALE As shown
--	---

Appendix to Chapter 11: Water

Appendix 11.1: Inventory & Classification of Watercourses at Crossing Locations

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.




REFERENCE DOCUMENTS

APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
EIAR 2019, Chapter 11: Water

REFERENCE DOCUMENTS




APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 11: Water

Photos of Watercourse Crossings at the Mountphilips Substation site	
	<p>Watercrossing Structure W1 (<i>Temporary Crossing</i>)</p> <p>Type: 1st Order Stream</p> <p style="background-color: #f08080;">Fisheries: Class 2, Optimal Fisheries</p> <p>Location: Mountphilips Substation Site</p> <p>Existing Structure: No existing crossing structure</p> <p>Works at Crossing: Cable trenching under stream bed using dam & pump (flume) method. Temporary Bailey Bridge.</p> <p>Ecology Notes: c. 2 m wide, c. 10 cm deep, gravel (70), cobbles (5), boulders (5), sands/silts (20)</p>
	<p>Watercrossing Structure W2</p> <p>Type: Drainage Ditch</p> <p style="background-color: #ffff00;">Fisheries: Sub-Optimal Fisheries</p> <p>Location: Mountphilips Substation Site</p> <p>Existing Structure: No existing crossing structure</p> <p>Works at Crossing: Installation of new permanent culvert. Cable trenching under new culvert.</p> <p>Ecology Notes: c. 0.5 m wide, c. 10 cm deep, silts/muds (100)</p>
	<p>Watercrossing Structure W3</p> <p>Type: 1st Order Stream</p> <p style="background-color: #f08080;">Fisheries: Class 2, Optimal Fisheries</p> <p>Location: Mountphilips Substation Site</p> <p>Existing Structure: No existing crossing structure</p> <p>Works at Crossing: Installation of new permanent culvert. Cable trenching under new culvert.</p> <p>Ecology Notes: c. 1 m wide, c. 10 cm deep, cobbles (20), gravels (40), sands/silts (40)</p>




Photos of UWF GRID CONNECTION Bridges / Culverts along Public Roads	
	<p>Watercrossing Structure W4 Type: Stream Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: L2166-0, Coole/Freagh Existing Structure: Concrete Block Box Culvert Works at the Crossing: Cable trenching under structure Ecology Notes: Downstream - Slow flowing, Coble (60), Gravel (40). Overgrown, vegetation shading. 1 metre wide and ~30cm deep.</p>
	<p>Watercrossing Structure W5 Type: River Fisheries: Class 1, Optimal Fisheries Location/Townland: L6013-0, Foildarrig/Freagh Existing Structure: Masonry Single Arch Bridge Works at the Crossing: Cable trenching over structure Ecology Notes: Upstream - riffle/glide sequence and pool. Bolder (30), cobble (30), sand/gravel (40). Culvert pipe also flowing into river. Downstream - Riffle and pool present. Sand gravel under bridge (60), boulders/cobble(40).</p>
	<p>Watercrossing Structure W6 Type: Stream Fisheries: Class 3, Sub-Optimal Fisheries Location/Townland: L6013-0, Oakhampton Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure Ecology Notes: Pipe culvert with stream through it. Bolder (50), mud/gravel (50).</p>

REFERENCE DOCUMENTS

APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 11: Water




	<p>Watercrossing Structure W7</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: Rockvale Bridge, L2156-0, Oakhampton/Rockvale</p> <p>Existing Structure: Masonry Single Arch Bridge Works at the Crossing: Cable trenching over structure. Additional works to raise road level & parapet wall height</p> <p>Ecology Notes: Upstream - riffle and white water. Bedrock (70), cobble (20), sand (10). Deep water - could not judge depth. Downstream - white water, small riffle and some pooling. Deep water.</p>
	<p>Watercrossing Structure W8</p> <p>Type: Stream</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: L6009-0, Ahane/Castlewaller</p> <p>Existing Structure: Concrete Slab Bridge Works at the Crossing: Directional Drill under stream bed.</p> <p>Ecology Notes: Upstream - small riffle and glide. Pooling. Moderate flow. Cobble (70), gravel (30). Downstream - riffle and glide, pool at bridge. Cobble (60), gravel (40).</p>
	<p>Watercrossing Structure W9</p> <p>Type: Stream</p> <p>Fisheries: Class 1, Optimal Fisheries</p> <p>Location/Townland: L6009-0, Castlewaller/Carrowkeale</p> <p>Existing Structure: Concrete Slab Bridge Works at the Crossing: Directional Drill under stream bed.</p> <p>Ecology Notes: Upstream - riffle and glide and pool (with sand). Sand (30), cobble (50), gravel (20). Downstream - flat rock (40), boulders (30), cobble (30), riffle. Some pooling at edge, no visible build-up of sand. Fast flowing.</p>

REFERENCE DOCUMENTS




	<p>Watercrossing Structure W10 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Kilnacappagh</p> <p>Existing Structure: HDPE Plastic Circular Culvert Works at the Crossing: Cable trenching over structure</p> <p>Ecology Notes: deep, drained, flow</p>
	<p>Watercrossing Structure W11 Type: Stream Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Scrageen/Derrygareen</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure</p> <p>Ecology Notes: c. 1 m wide, c. 20 cm deep</p>
	<p>Watercrossing Structure W12 Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Derrygareen</p> <p>Existing Structure: Masonry Box Culvert & Circular Concrete Culvert Works at the Crossing: Cable trenching under structure</p> <p>Ecology Notes: c. 0.8m wide, c. 15 cm deep</p>

REFERENCE DOCUMENTS




APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 11: Water

	<p>Watercrossing Structure W13 Type: Stream, 1st Order Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: No Fisheries Potential</p>
	<p>Watercrossing Structure W14 Type: Stream, 1st Order Fisheries: Class1, Optimal Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: steep gradient, cobble/gravel. 100% shade</p>
	<p>Watercrossing Structure W15 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: No Fisheries Potential</p>




REFERENCE DOCUMENTS

	<p>Watercrossing Structure W16 Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Knockancullenagh</p> <p>Existing Structure: Plastic Circular Culvert.</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>
	<p>Watercrossing Structure W17 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Knockancullenagh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Potential, steep</p>
	<p>Watercrossing Structure W18 Type: Stream, 2nd Order Fisheries: Class 1, Optimal Fisheries Location/Townland: R503, Knockancullenagh/Fanit</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: steep, boulder cobble pool riffle. Downstream 100% shade, steep gradient</p>

REFERENCE DOCUMENTS




	<p>Watercrossing Structure W19 Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Fanit</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Potential</p>
	<p>Watercrossing Structure W20 Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Fanit</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Potential 100% shade downstream</p>
	<p>Watercrossing Structure W21 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Fanit</p> <p>Existing Structure: Masonry Single Arch Bridge</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential 100% shade downstream</p>

REFERENCE DOCUMENTS

	<p>Watercrossing Structure W22 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Fanit/Lackamore</p> <p>Existing Structure: Masonry Single Arch Bridge</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: steep/cascade</p>
	<p>Watercrossing Structure W23 Type: Stream Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Lackamore</p> <p>Existing Structure: Masonry Arch Bridge Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential Upstream: 100% shade. Minor steep cascades Downstream: 100% shade</p>
	<p>Watercrossing Structure W24 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Lackamore</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>

REFERENCE DOCUMENTS




APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
EIA 2019, Chapter 11: Water

	<p>Watercrossing Structure W25</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Plastic Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>
	<p>Watercrossing Structure W26</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>
	<p>Watercrossing Structure W27</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>

REFERENCE DOCUMENTS




	<p>Watercrossing Structure W28</p> <p>Type: Stream</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore/Tooreenbrien Upper</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value Upstream: steep/cascade Boulder/cobble</p>
	<p>Watercrossing Structure W29</p> <p>Type: Stream</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper</p> <p>Existing Structure: Concrete Slab Bridge Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value 100% cover, steep gradient. Boulder cascade.</p>
	<p>Watercrossing Structure W30</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>

REFERENCE DOCUMENTS




	<p>Watercrossing Structure W31</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Crossing under new existing culvert</p> <p>Ecology Notes: No Fisheries Value, Steep Gradient</p>
	<p>Watercrossing Structure W32</p> <p>Type: Minor Stream</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W33</p> <p>Type: Stream</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper/Tooreenbrien Lower</p> <p>Existing Structure: Masonry Arch Bridge - Single Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: cobble substrate, drained, channelised, riffle/glide</p>

REFERENCE DOCUMENTS

APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 11: Water




	<p>Watercrossing Structure W34</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Toorenbrien Lower</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W35</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Toorenbrien Lower</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W36</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: Toorenbrien Bridge, R503, Toorenbrien Lower/Reardnogy Beg</p> <p>Existing Structure: Masonry Arch Bridge - Double</p> <p>Works at the Crossing: Cable trenching over structure. Additional works to raise road level & parapet wall height</p> <p>Ecology Notes: c. 5 m wide, c. 100cm deep</p>


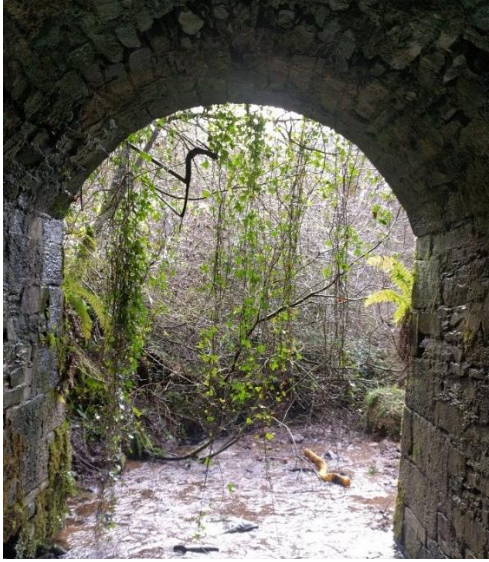

REFERENCE DOCUMENTS

	<p>Watercrossing Structure W37</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy Beg</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Crossing over culvert</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W38</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy Beg/Reardnogy More</p> <p>Existing Structure: Plastic Circular Culvert</p> <p>Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: c. 0.7 m wide, c. 140cm deep</p>
	<p>Watercrossing Structure W39</p> <p>Type: Stream, 2nd Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy More</p> <p>Existing Structure: Plastic Circular Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: c. 0.6 m wide, c. 100cm deep</p>

REFERENCE DOCUMENTS




APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 11: Water

	<p>Watercrossing Structure W40</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Rear Cross Village, Reardnogy More/ Shanballyedmond</p> <p>Existing Structure: Concrete Circular Culvert X 3</p> <p>Works at the Crossing: Cable trenching under structures.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W41</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy More/Baurnadomeeny</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Downstream:, cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W42</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Baurnadomeeny</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>

	<p>Watercrossing Structure W43</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Bournadomeeny</p> <p>Existing Structure: Masonry Arch Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W44</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Bournadomeeny</p> <p>Existing Structure: Masonry Arch Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W45</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Bournadomeeny/Coonmore</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Riffle / glide, cobble substrate, channelised</p>




REFERENCE DOCUMENTS

APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
EIA 2019, Chapter 11: Water




	<p>Watercrossing Structure W46</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W47</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W48</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Plastic Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>

REFERENCE DOCUMENTS




APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 11: Water




	<p>Watercrossing Structure W49</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Coonmore/Foildarragh</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Cobble/gravel, channelised, riffle</p>
	<p>Watercrossing Structure W50</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, Very steep gradient, in gorge, 100% cover.</p>
	<p>Watercrossing Structure W51</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, Very steep gradient, in gorge, 100% cover.</p>

REFERENCE DOCUMENTS




	<p>Watercrossing Structure W52</p> <p>Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value, steep, drained</p>
	<p>Watercrossing Structure W53</p> <p>Type: River Fisheries: Class1, Optimal Fisheries Location/Townland: Anglesey Bridge, R503, Foildarragh/Kilcommon</p> <p>Existing Structure: Double Masonry Arch Works at the Crossing: Cable trenching over structure, additional works to raise road level & parapet wall height Ecology Notes: U/s: riffle, glide channelized, cobble gravel, sand</p>
	<p>Watercrossing Structure W54</p> <p>Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Plastic Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>

REFERENCE DOCUMENTS

	<p>Watercrossing Structure W55</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W56</p> <p>Type: Drain</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Concrete Circular Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, some flow</p>
	<p>Watercrossing Structure W57</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Kilcommon/Loughbrack</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>

	<p>Watercrossing Structure W58</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W59</p> <p>Type: Upstream: Drain, Downstream: Stream, 1st Order</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Concrete Culvert & Masonry Box Culvert Works at the Crossing: Cable trenching under structures.</p> <p>Ecology Notes: No Fisheries Value. Downstream: flow, through forestry</p>
	<p>Watercrossing Structure W60</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>

REFERENCE DOCUMENTS

	<p>Watercrossing Structure W61</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Knocknabansha/Knockmaroe</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W62</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: L2264-50, Knockmaroe</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W63</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: L2264-50, Knockmaroe/Knockcurraghbola Crownlands</p> <p>Existing Structure: Circular Concrete Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>

REFERENCE DOCUMENTS

APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
EIA 2019, Chapter 11: Water



Watercrossing Structure W64

Type: Drain

Fisheries: Class 4, Poor Fisheries

Location/Townland: L2264-50, Knockmaroe

Existing Structure: Masonry Box Culvert
Works at the Crossing: Cable trenching under structure. Culvert may need replacing.

Ecology Notes: No Fisheries Value



Watercrossing Structure W65

Type: Stream

Fisheries: Class 2, Optimal Fisheries

Location: L6188-0, Knockmaroe

Existing Structure: Concrete Circular Culvert
Works at Crossing: Cable trenching under structure.

Ecology Notes: Steady flow to 20 cm deep with wetted width of c. 1 m. gravel bed.



Watercrossing Structure W66

Type: Drain

Fisheries: Class 4, Poor Fisheries


Location/Townland: L6188-0, Knockmaroe

Existing Structure: Concrete Circular Culvert
Works at the Crossing: Cable trenching under structure.

Ecology Notes: No Fisheries Value

REFERENCE DOCUMENTS

APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations
EIA 2019, Chapter 11: Water

Photos of UWF GRID CONNECTION Bridges / Culverts along Private Paved Road	
	<p>Watercrossing Structure W67</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: Private Paved Road, Knockcurraghbola Commons</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: c. 0.5 m wide, 10 cm deep</p>
	<p>Watercrossing Structure W68</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: Private Paved Road, Knockcurraghbola Commons</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value, Slow flowing</p>

REFERENCE DOCUMENTS

APPENDIX 11.1: Inventory & Classification of Watercourses at Crossing Locations

EIAR 2019, Chapter 11: Water

Appendix to Chapter 11: Water

Appendix 11.2: Surface Water Sampling Results

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

A11.2.1 Surface Water Sampling Results

Table 1: Surface Water Sampling Results – UWF Grid Connection

Sample ID	Water Crossing Number	Sampling Date	Ammoniacal Nitrogen (mg/L)	BOD (mg/L)	Chloride (mg/L)	Electrical Conductivity (uS/cm)	Nitrate (mg/L)	Nitrite (mg/L)	Ortho-Phosphate (mg/L)	pH (pH Units)	Suspended Solids (mg/L)	Total Phosphorous (mg/L)	Total Nitrogen (mg/L)
			≤0.065 (mean) or ≤0.140 (95%ile)	≤1.5 (mean) or ≤2.6 (95%ile)					≤0.035 (mean) or ≤0.075 (95%ile)	6 - 9			
U2GWS1	W1	22-01-2019	0.019	<1	16.8	238	2.4	<0.005	0.053	7.7	<2	0.06	2.62
U2GWS1	W1	13/02/2019	0.023	<1	19.8	230	2.2	<0.005	0.043	7.6	<2	0.08	2.36
W4B	W5	31-05-2019	0.058	<1	15.3	313	0.774	<0.005	0.019	8.1	3	<0.05	0.848
W5B	W6	31-05-2019	0.059	<1	22.1	483	4.94	0.031	<0.01	8.0	3	<0.05	4.50
W6B	W7	31-05-2019	0.007	1	10.8	125	0.204	<0.005	<0.01	7.9	4	<0.05	<0.5
W7B	W8	31-05-2019	0.018	<1	14.9	241	0.87	0.005	<0.01	7.8	<2	<0.05	0.901
W8B	W9	31-05-2019	0.005	1	13	86.5	<0.1	<0.005	<0.01	7.1	<2	<0.05	0.631
U2GWS3	W10	22-01-2019	0.005	<1	24.3	331	1.39	<0.005	0.022	7.8	334	0.26	1.12
U2GWS3	W10	13/02/2019	0.045	<1	22.6	157	1.27	0.005	0.019	7.2	<2	<0.05	1.12
U2GWS4	W11	22-01-2019	0.009	<1	16.5	167	0.691	<0.005	0.038	7.5	57	<0.05	0.541
U2GWS4	W11	13/02/2019	0.007	<1	17.2	157	0.699	<0.005	0.014	7.4	8	<0.05	0.604
U2GWS5	W18	22-01-2019	0.022	<1	16.7	71.6	<0.1	<0.005	0.015	5.0	10	<0.05	0.701
U2GWS5	W18	13/02/2019	0.01	1	16.4	63.9	<0.1	<0.005	<0.01	5.4	<2	<0.05	0.561
U2GWS6	W28	22-01-2019	0.01	<1	10.7	57.9	<0.1	<0.005	0.014	6.6	5	<0.05	<0.5
U2GWS6	W28	13/02/2019	0.013	<1	10.8	54.8	<0.1	<0.005	0.011	6.7	<2	<0.05	<0.5
U2GWS7	W33	22-01-2019	0.007	<1	13.1	79.0	0.321	<0.005	<0.01	6.8	2	<0.05	<0.5
U2GWS7	W33	13/02/2019	0.007	<1	13.5	76.6	0.452	<0.005	<0.01	6.9	3	<0.05	0.562

REFERENCE DOCUMENTS

U2GWS8	W36	17-01-2019	<0.005	<1	11.1	102	0.348	<0.005	<0.01	6.4	5	<0.05	0.593
U2GWS8	W36	13/02/2019	0.009	1	11.7	107	0.692	<0.005	<0.01	7.3	2	<0.05	0.654
U2GWS9	W38	17-01-2019	0.007	<1	9.14	86.4	0.203	<0.005	<0.01	6.4	4	<0.05	0.573
U2GWS9	W38	13/02/2019	0.017	1	15.8	126	0.758	<0.005	<0.01	7	2	<0.05	0.785
U2GWS10	W41	17-01-2019	0.006	<1	9.88	161	1.3	<0.005	<0.01	6.8	<2	<0.05	1.03
U2GWS10	W41	13/02/2019	0.009	<1	10	144	1.47	<0.005	<0.01	7.4	3	<0.05	1.26
U2GWS11	W43	17-01-2019	0.009	<1	10.8	144	1.19	<0.005	<0.01	6.5	7	<0.05	0.988
U2GWS11	W43	13/02/2019	0.012	<1	11	141	1.36	<0.005	0.011	7.7	<2	<0.05	1.21
U2GWS12	W45	17-01-2019	0.013	<1	12.5	116	0.532	<0.005	<0.01	6.5	15	<0.05	0.597
U2GWS12	W45	13/02/2019	0.01	<1	12.8	109	0.738	<0.005	<0.01	7.5	<2	<0.05	0.737
U2GWS13	W49	17-01-2019	0.006	<1	10.6	110	0.768	<0.005	<0.01	6.5	<2	<0.05	0.663
U2GWS13	W49	13/02/2019	0.059	1	11.2	108	0.83	<0.005	<0.01	7.5	<2	<0.05	0.690
U2GWS14	W53	17-01-2019	0.014	<1	10.7	125	0.683	<0.005	<0.01	6.6	11	<0.05	0.699
U2GWS14	W53	13/02/2019	0.007	<1	12.1	122	0.994	<0.005	<0.01	7.4	<2	<0.05	0.882
U2GWS15	W57	17-01-2019	0.203	<1	14.5	177	0.772	0.008	0.03	6.8	<2	0.06	1.23
U2GWS15	W57	13/02/2019	0.014	<1	12.1	188	1.05	<0.005	<0.01	7.4	<2	<0.05	0.917
U2GWS16	W59	17-01-2019	0.041	<1	13.2	180	0.902	<0.005	<0.01	6.7	3	<0.05	1.06
U2GWS16	W59	13/02/2019	0.008	<1	13.8	200	1.51	<0.005	<0.01	7.3	3	<0.05	1.34
U2GWS17	W61	22-01-2019	0.01	<1	15.6	290	2.65	<0.005	0.023	7.5	7	<0.05	2.32
U2GWS17	W61	13/02/2019	0.007	<1	19.6	265	3.59	<0.005	0.015	7.2	<2	<0.05	3.33
U2GWS18	W64	22-01-2019	0.007	<1	9.53	241	2.24	<0.005	0.012	7.2	94	0.08	1.83
U2GWS18	W64	13/02/2019	0.008	<1	10.7	230	2.3	<0.005	<0.01	7	<2	<0.05	1.98
U2GWS19	W65	22-01-2019	0.007	<1	9.87	222	1.7	<0.005	0.011	7.4	9	<0.05	1.40
U2GWS19	W65	13/02/2019	0.005	<1	11.5	214	1.87	<0.005	<0.01	7.5	<2	<0.05	1.67
U2GWS20	Downstream W1-W9	22-01-2019	<0.005	1	12.4	161	0.637	<0.005	0.014	7.7	4	<0.05	0.778
U2GWS20	Downstream W1-W9	13/02/2019	0.007	<1	13.9	180	1.06	<0.005	<0.01	7.8	<2	<0.05	0.968
U2GWS2	Downstream W5-W9	22-01-2019	0.006	<1	11.9	149	0.532	<0.005	0.019	7.8	<2	<0.05	1.00
U2GWS2	Downstream W5-W9	13/02/2019	<0.005	1	13.6	165	0.936	<0.005	<0.01	7.9	<2	<0.05	0.878
U2GWS21	Downstream W10-W39	22-01-2019	<0.005	1	12.9	126	0.509	<0.005	0.011	7.5	2	<0.05	0.632
U2GWS21	Downstream W10-W39	13/02/2019	0.011	1	13.7	129	0.806	<0.005	<0.01	7.6	<2	0.11	0.828
U2GWS22	Downstream W12-W39	22-01-2019	0.008	<1	12.3	108	0.36	<0.005	0.011	7.4	6	<0.05	<0.5

U2GWS22	Downstream W12-W39	13/02/2019	0.01	<1	12.9	108	0.525	<0.005	<0.01	7.5	<2	<0.05	0.564
U2GWS23	Downstream W27-W39	22-01-2019	0.01	<1	11.7	108	0.412	<0.005	0.012	7.2	3	<0.05	<0.5
U2GWS23	Downstream W27-W39	13/02/2019	0.007	<1	12.3	106	0.565	<0.005	<0.01	7.4	<2	<0.05	0.585
U2GWS24	Downstream W39	22-01-2019	0.012	<1	10.2	115	0.409	<0.005	0.01	7.2	2	<0.05	<0.5
U2GWS24	Downstream W39	13/02/2019	0.008	1	11.2	111	0.5	<0.005	<0.01	7.3	2	<0.05	0.52
U2GWS25	Downstream W40-W63	22-01-2019	0.01	<1	11.5	147	0.879	<0.005	0.011	7.6	11	<0.05	0.833
U2GWS25	Downstream W40-W63	13/02/2019	0.007	1	13.6	139	1.58	<0.005	<0.01	7.8	7	<0.05	1.44
U2GWS26	Downstream W54-W63	22-01-2019	0.01	<1	11.5	174	0.79	<0.005	0.014	7.8	<2	<0.05	0.900
U2GWS26	Downstream W54-W63	13/02/2019	0.008	1	12.6	170	0.949	<0.005	0.011	7.8	2	<0.05	0.953

A11.2.2 Surface Water Sampling Results –UWF Grid Connection Max, Min & Average

Table 2: Surface Water Sampling Results – – UWF Grid Connection Max, Min & Average

	Ammonical Nitrogen (mg/L)	BOD (mg/L)	Chloride (mg/L)	Electrical Conductivity (uS/cm)	Nitrate (mg/L)	Nitrite (mg/L)	Ortho-Phosphate (mg/L)	pH (pH Units)	Suspended Solids (mg/L)	Total Phosphorous (mg/L)	Total Nitrogen (mg/L)
MAXIMUM	0.203	1	24.3	483	4.94	0.031	0.053	8.1	334	0.26	4.5
MINIMUM	0.005	<1	9.14	54.8	<0.1	<0.005	<0.01	5	<2	<0.05	<0.5
AVERAGE	0.0175	<1	13.38	158.5	1.12	<0.005	0.019	7.2	19.8	<0.05	1.1

Appendix to Chapter 11: Water
Appendix 11.2 - Figure 1
 Surface Water Sampling Locations

Map Number:
 Overview Map

Legend:

Subject Development:

- UWF Grid Connection - 110kV UGC
- UWF Grid Connection - Mounthphils Substation

Survey Results:

EPA Sub-Catchment:

- Kileengarriff_SC_010
- Newport(Tipperary)_SC_010
- Bibboa_SC_010
- Suir_SC_030

Survey Results:

- ★ Surface Water Sampling Locations and Identification Numbers
- DSW6



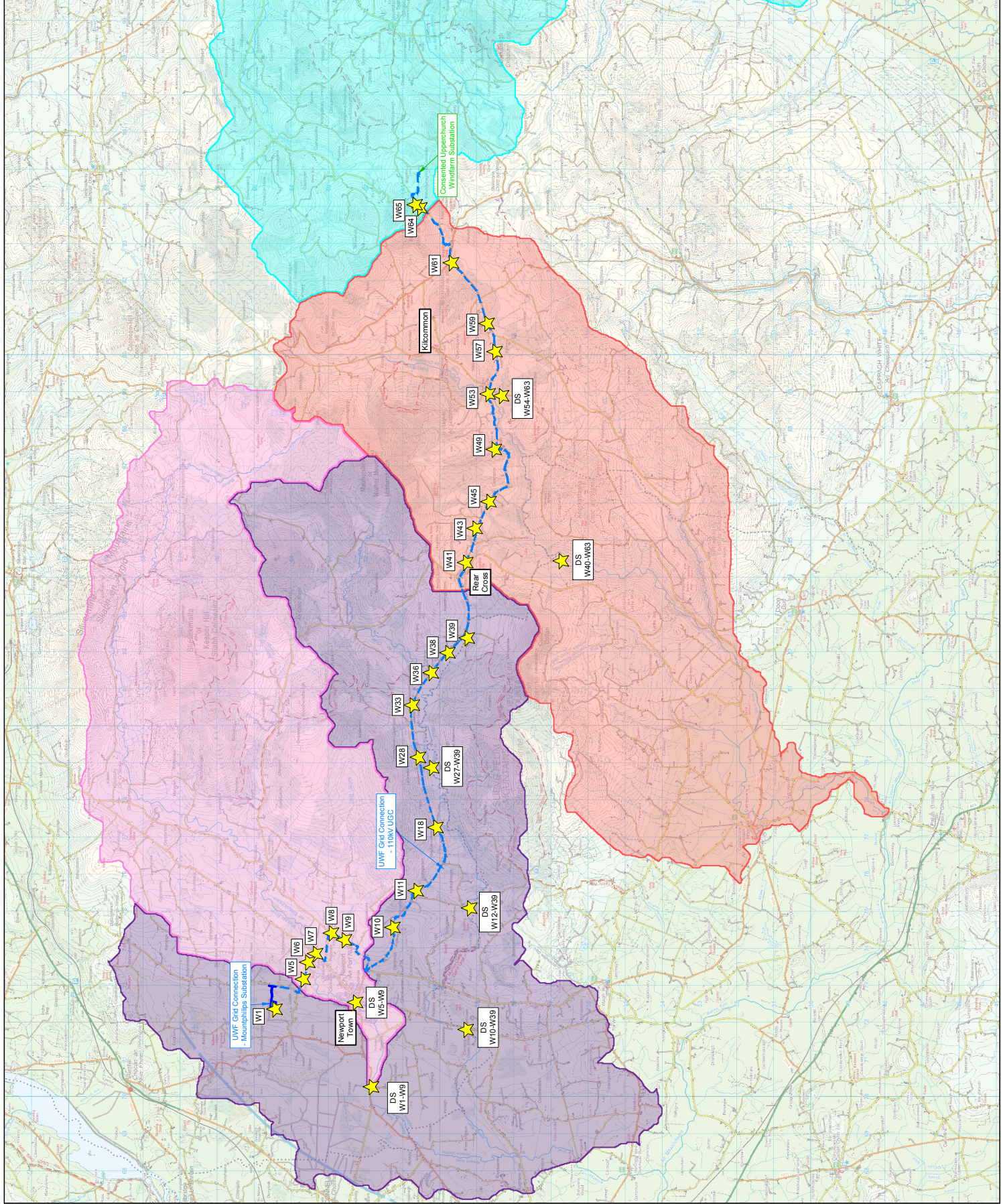
Project:

UWF Grid Connection (2019)

Drawn By: AB
 Checked By: PK
 Date: October 19
 Sheet Size: A4



Aoife Butler
 EcoPower Developments Ltd
 Sunland Business Park, Killybeggy
 TEL: +353 85 773010
 MOB: +353 83 880544



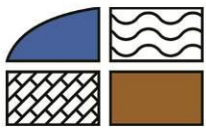
REFERENCE DOCUMENTS

Appendix to Chapter 11: Water

Appendix 11.3: Flood Risk Assessment

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

REFERENCE DOCUMENTS



APPENDIX 11.3

FLOOD RISK ASSESSMENT

UWF GRID CONNECTION, CO. TIPPERARY

FLOOD RISK ASSESSMENT FINAL REPORT

**PREPARED FOR:
ECOPOWER DEVELOPMENTS LTD**

**PREPARED BY:
HYDRO-ENVIRONMENTAL SERVICES**

DOCUMENT information


DOCUMENT TITLE:	UWF Grid Connection, Co. Tipperary FLOOD RISK ASSESSMENT
ISSUE DATE:	23RD JULY 2019
PROJECT NUMBER:	P1299-2
PROJECT REPORTING HISTORY:	NONE
CURRENT REVISION NO:	P1299-2_FINAL R0
AUTHOR(S):	MICHAEL GILL David Broderick
SIGNED:	 <hr/> Michael Gill B.A., B.A.I., M.Sc., MIEI Managing Director – Hydro-Environmental Services
<p>Disclaimer: This report has been prepared by HES with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. The flood risk assessment undertaken as part of this study is site-specific and the report findings cannot be applied to other sites outside of the survey area which is defined by the site boundary. This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.</p>	

TABLE OF CONTENTS

A11.3 1.	INTRODUCTION	1
A11.3 1.1	BACKGROUND	1
A11.3 1.2	KEY OBJECTIVES	1
A11.3 1.3	STATEMENT OF EXPERIENCE	3
A11.3 1.4	REPORT LAYOUT & METHODOLOGY	3
A11.3 2.	BACKGROUND INFORMATION	4
A11.3 2.1	INTRODUCTION	4
A11.3 2.2	PROPOSED DEVELOPMENT DETAILS	4
A11.3 2.3	PROJECT LOCATION AND TOPOGRAPHY	5
A11.3 3.	EXISTING ENVIRONMENT AND CATCHMENT CHARACTERISTICS	6
A11.3 3.1	INTRODUCTION	6
A11.3 3.2	BASELINE HYDROLOGY	6
A11.3 3.2.1	Regional and Local Hydrology	6
A11.3 3.2.2	Rainfall and Evaporation	7
A11.3 3.3	GEOLOGY	7
A11.3 4.	SITE SPECIFIC FLOOD RISK ASSESSMENT	8
A11.3 4.1	INTRODUCTION	8
A11.3 4.2	FLOOD ZONE MAPPING	8
A11.3 4.2.1	Soils Maps – Fluvial Maps	9
A11.3 4.2.2	Historical Mapping	9
A11.3 4.2.3	OPW National Flood Hazard Mapping	9
A11.3 4.2.4	Preliminary Flood Risk Assessment Maps – Fluvial and Pluvial Flooding	11
A11.3 4.2.5	CFRAM Maps – Fluvial and Coastal Flooding	11
A11.3 4.3	SUMMARY – FLOOD RISK IDENTIFICATION	11
A11.3 4.4	INITIAL FLOOD RISK ASSESSMENT	12
A11.3 4.4.1	Site Survey	12
A11.3 4.4.2	Hydrological Flood Conceptual Model	12
A11.3 4.4.3	Summary – Initial Flood Risk Assessment	13
A11.3 4.5	DEVELOPMENT INFRASTRUCTURE AND FLOOD RISK	14
A11.3 4.5.1	Introduction	14
A11.3 4.5.2	New Culverts and Replacement Works at Watercourse Crossing	14
As agreed during a telephone consultation carried out by the EIA Coordinator with OPW, Limerick office, (February 2018), a Section 50 application will be submitted to the OPW for new crossings and up-grades following the receipt of planning permission for the UWF Grid Connection. The Section 50 applications will be accompanied by a hydraulic assessment of the new crossing structures to ensure they are adequate from a flood prevention perspective.	14	
A11.3 4.5.3	Permanent Hardstanding Areas	14
A11.3 5.	PLANNING POLICY AND JUSTIFICATION TEST	15
A11.3 5.1	PLANNING POLICY AND THE NORTH TIPPERARY COUNTY DEVELOPMENT PLAN	15
A11.3 5.2	REQUIREMENT FOR A JUSTIFICATION TEST	15
A11.3 6.	CONCLUSIONS	18
A11.3 7.	REFERENCES	19
A11.3 8.	FIGURES	20

FIGURES ATTACHED

- Figure 1: Local Hydrology Map
- Figure 2: PFRA Flood Mapping 1
- Figure 3: PFRA Flood Mapping 2
- Figure 4: PFRA Flood Mapping 3
- Figure 5: PFRA Flood Mapping 4

A11.3 1. INTRODUCTION

A11.3 1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by the Promoter, Ecopower Developments Ltd, to undertake a Flood Risk Assessment (FRA) for the proposed Upperchurch Windfarm (UWF) Grid Connection, Co. Tipperary. A site location map is shown below as **Figure A**.

This FRA is carried out in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (DoEHLG, 2009).

The UWF Grid Connection comprises the following main elements:

- Mountphilips 110kV Substation near Newport, Co. Tipperary
- Mountphilips – Upperchurch 30.5km 110kV Underground Grid Connection (UGC)
- Ancillary Works at Mountphilips Substation Site

A11.3 1.2 KEY OBJECTIVES

The primary objective of this FRA is to identify areas potentially prone to fluvial and pluvial flooding along the UWF Grid Connection 110kV UGC route and at the Mountphilips Substation site which includes a new permanent access road to the proposed Mountphilips Substation with a focus being on residual risk to permanent infrastructure that will be present during the operational phase of the development.

Of particular importance will be access to the UWF Grid Connection Mountphilips Substation and the 110kV UGC Joint Bays (and their communication and link box chambers) for testing, inspection and maintenance purposes. Access to the Joint Bays will be from the public road, while access to the Mountphilips Substation will be via a new permanent access road.

The second objective of this FRA is to assess whether the UWF Grid Connection project has the potential to increase flood risk locally or downstream of the development.

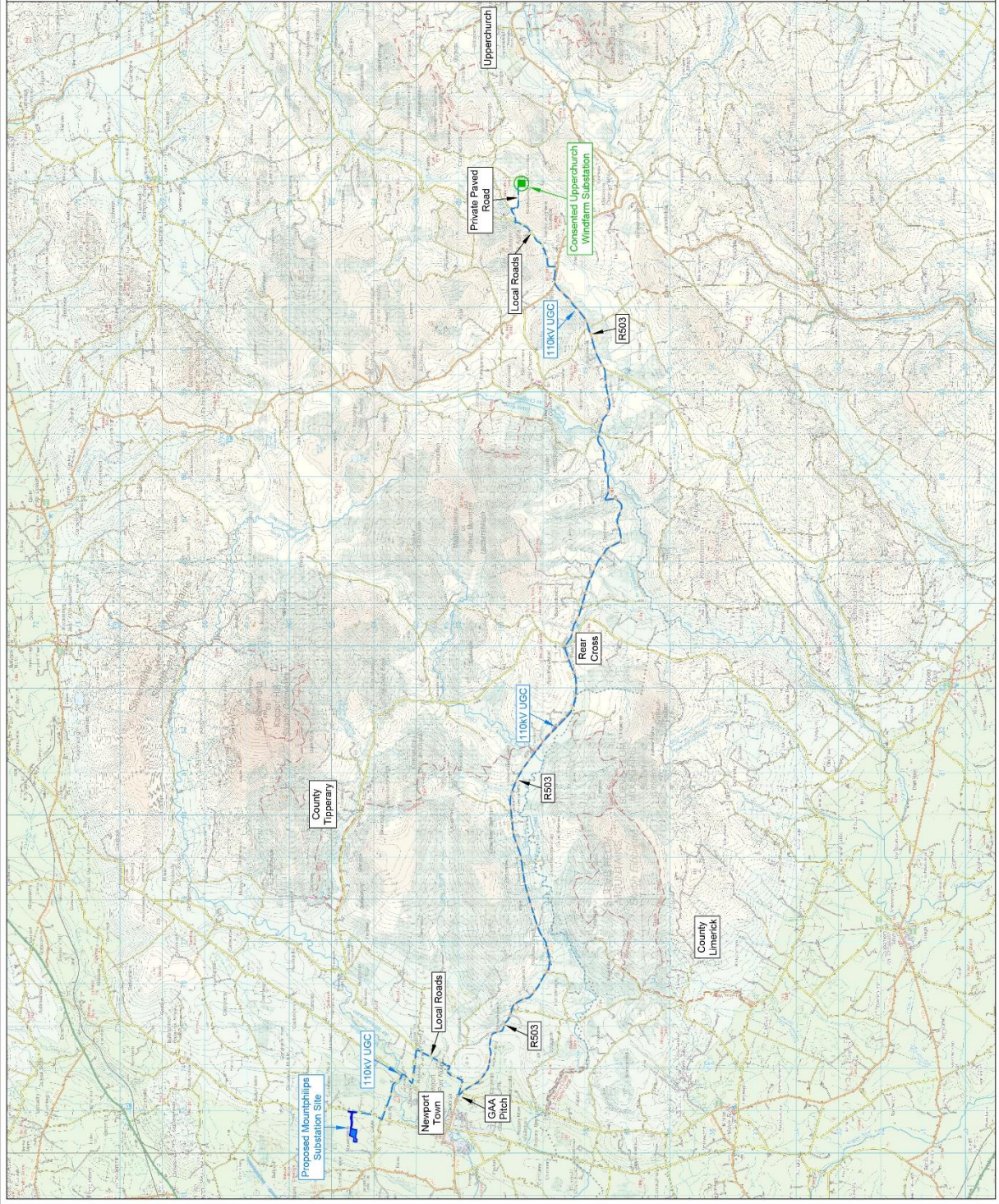


Figure A: Site Location Map

A11.3 1.3 STATEMENT OF EXPERIENCE

Hydro-Environmental Services (“HES”) are a specialist hydrological, hydrogeological and environmental practice, established in 2005, which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES is based in Dungarvan, County Waterford.

Our core area of expertise and experience is hydrology and hydrogeology, including flooding assessment and surface water modelling. We routinely work on surface water monitoring and modelling, and prepare flood risk assessment reports.

Michael Gill is an Environmental Engineer with 18 years environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological assessments for various developments across Ireland. Michael has significant experience in surface water drainage issues, SUDs design, and flood risk assessment.

David Broderick is a hydrogeologist with over 13 years environmental consultancy experience across Ireland. David has completed numerous Flood Risk Assessments for all types of developments, and he regularly uses HEC-RAS and FlowMaster modelling software.

A11.3 1.4 REPORT LAYOUT & METHODOLOGY

This FRA report has the following format:

- Section 2 describes setting and details of the proposed development;
- Section 3 outlines the hydrological and geological characteristics of the local surface water catchments in the vicinity of the proposed development;
- Section 4 deals with a site-specific flood risk assessment (FRA) undertaken for the proposed development which was carried out in accordance with the below-mentioned guidelines;
- Section 5 provides commentary in relation to the Justification Test; and,
- Section 6 presents the FRA report conclusions.

As stated above this FRA is carried out in accordance with ‘The Planning System and Flood Risk Management Guidelines for Planning Authorities’ (DoEHLG, 2009).

The assessment methodology involves researching and collating flood related information from the following data sources:

- Base maps – Ordnance Survey of Ireland;
- Flood Hazard Maps and flooding information for Ireland, www.floodmaps.ie;
- Office of Public Works (OPW);
- Geological Survey of Ireland (GSI) maps on superficial deposits;
- EPA hydrology maps;
- Preliminary Flood Risk Assessment (PFRA) Maps, and CFRAM maps and studies where available; and,
- Site walkover surveys

A11.3 2. BACKGROUND INFORMATION

A11.3 2.1 INTRODUCTION

This section provides a general overview of the proposed development along with a description of the local setting and topography.

A11.3 2.2 PROPOSED UWF GRID CONNECTION DEVELOPMENT DETAILS

The project comprises an 110kV substation at Mountphilips near Newport, the Mountphilips – Upperchurch 110kV Underground Grid Connection (30.5km), and Ancillary Works at the Mountphilips Substation site which include a new access road and new watercourse crossings.

The Mountphilips 110kV substation is proposed for a location 230m east of the existing Killonan - Nenagh 110kV line in agricultural grassland in Mountphilips townland, 2km north of Newport, Co. Tipperary which is approximately 23km west of the Upperchurch Windfarm (also in Co. Tipperary).

The 110kV UGC (30.5km) will connect the new substation at Mountphilips to the already consented substation at Upperchurch Windfarm (Consented UWF Substation) by underground cabling, mainly along public roads.

Starting at Mountphilips Substation, the route of the 110kV UGC follows the local road network around Newport town, joining the Limerick to Thurles road (R503) on the east side of Newport town, at the GAA club. From that point, the 110kV UGC will be installed in R503 as far as the turnoff for Borrisoleigh at Knockmaroe. From there, the 110kV UGC uses the local road network to the Consented UWF Substation, with the last section of the route along private paved road.

The route bypasses Newport; passes through the village of Rear Cross; passes through the Slieve Felim to Silvermines Mountain SPA; crosses the boundary of the Lower River Shannon SAC at 6 points; and will be installed under or over 65 existing watercourse crossing structures (65 of the 68 no. watercourse crossings along the 110kV UGC are existing culverts/bridges under paved roads).

In total, there will be 68 No. watercourse crossing required for the 110kV UGC. 3 no. watercourse crossings are at the Mountphilips Substation site, 1 no. new temporary, 2 no. new permanent. There will be 63 no. crossings along the public roads between the Mountphilips Substation site and the turn off for the Consented UWF Substation site. The remaining 2 no. crossings (existing culverts) are on the private paved road to the Consented UWF Substation site.

The watercourses intersected by the 110kV UGC along the public road network range from drains / small headwater streams to larger rivers such as the Newport River, Clare River and Bilboa River, and are crossed by various crossing structures, including 15 No. bridges and 48 No. are culverts (both box culverts and pipe culverts). At Mountphilips Substation, 3 watercourses will be crossed by 1 no. new temporary crossing and 2 no. new permanent crossings. Along the private paved road to the consented UWF Substation, the 110kV UGC crossings 2 No. existing culvert crossings.

Crossing existing bridges: There is sufficient cover (depth of road) at the 13 no. of the 15 no. bridges to install the 110kV UGC within the existing road surface and therefore no instream works are required. 2 of the 15 bridges (W8, W9) do not have sufficient cover to accommodate the installation of the 110kV UGC over the bridge in the road. At these two locations the 110kV UGC will cross underneath the watercourse using horizontal directional drilling techniques, whereby a hole is bored by a drilling rig under the water channel, and the ducting is pulled through. Using this technique means that there is no interference with the water channel or instream works.

Of the 13 no. bridges with sufficient cover, 3 no. require the road level to be raised slightly and associated parapet wall works (W7, W36 and W53). These works will all be carried out from the road surface over the bridge structures.

The 110kV UGC will be laid either under or over the 50 No. culverts. 13 no. of the 50 no. culverts (all comprising old masonry culverts) may need to be replaced during construction works for the cables trench.

A11.3 2.3 PROJECT LOCATION AND TOPOGRAPHY

The proposed Mountphilips 110kV Substation is located in the townland of Mountphilips which exists approximately 2km to the north of Newport Town in Co. Tipperary. The site is located on a relatively low-lying, north-south trending ridge with the slope of the site being to the west/southwest. The current land use is grassland. The elevation of the site is at approximately 70m OD.

The UWF Grid Connection 110kV UGC runs in an easterly direction from the Mountphilips Substation site and crosses through the southern hills of the Silvermine Mountains towards the consented Upperchurch Windfarm substation. The straight line distance between the proposed Mountphilips Substation and the Upperchurch Windfarm Substation is ~23km while the actual length of the 110kV UGC is ~30.5km. The topography along the public road is hilly with an overall elevation range of between 70 and 310m OD (Ordnance Datum). The 110kV UGC follows a mix of agricultural grassland (c.0.5km- under the new access road at the Mountphilips Substation site), public roads (c.29.3km) and private road (c.0.7m).

A11.3 3. EXISTING ENVIRONMENT AND CATCHMENT CHARACTERISTICS

A11.3 3.1 INTRODUCTION

This section gives an overview of the hydrological and geological characteristics in the area of the UWF Grid Connection.

A11.3 3.2 BASELINE HYDROLOGY

A11.3 3.2.1 Regional and Local Hydrology

The majority of the footprint of the UWF Grid Connection is located within the River Shannon surface water catchment, with the remainder located in the River Suir surface water catchment. Within the River Shannon catchment, the Mountphilips Substation site and c.29km of the 110kV UGC exist within the Lower Shannon & Mulkear hydrometric area (HA25D). The sub-catchments within the Lower Shannon & Mulkear hydrometric area include, (listed from west to east) the Killeengarriff_SC_010, Newport (Tipperary)_SC_010 and the Bilboa_SC_010. Within the River Suir catchment, the remaining c.1.5km of the 110kV UGC route is located within the Suir_SC_030 sub catchment. These sub catchments are further divided into river sub basins as tabulated in Table A.

There is a total of 68 no. watercourses within the construction works area boundary associated with the UWF Grid Connection, 3 no. of these are at the Mountphilips Substation site (2 no. of these watercourses are new crossings located along the new access road to Mountphilips Substation, 1 no. watercourse crossing between Mountphilips and the End Masts). 63 no. watercourse crossings are located along the route of the 110kV UGC on the public road network (road numbers: L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, R503, L2264-50 and L6188-0) and the remaining 2 no. are located along the private paved road close to the Consented UWF Substation on the eastern extremity of the 110kV UGC route.

Due to the primarily upland nature of the study area, the majority of the watercourses intercepted by the UWF Grid Connection are either drains or minor headwater (1st - 2nd order) streams. Three larger watercourse crossings of note will occur, these watercourses include the Newport River at Rockvale Bridge (W7) on the L2156-0 north of Newport town; the Clare River at Toorenbrien Bridge (W36) on the R503 near Lackamore; and the Bilboa River at Anglesey Bridge (W53) on the R503 near Kilcommon. These rivers will be crossed by installing the trench in the road over the bridges.

A summary of regional and local surface water bodies as defined by the EPA GIS Mapping that the UWF Grid Connection passes through and the number of watercourse crossings required in each surface water body are shown on Table A below. Mountphilips Substation is located in the Ballyard_010 catchment. The Ballyard_010 catchment drains into the Newport River (at a point below Newport town) c. 6km downstream of the Mountphilips Substation site. It is located in the Killeengarriff_SC_010 sub catchment. The occurrence of the 110kV UGC and number of watercourse crossings in each catchment are detailed in Table A below.

Table A: Summary of Regional Hydrology, Local Hydrology and Proposed Infrastructure along the UWF Grid Connection (110kV UGC)

Regional Catchment	EPA Sub-Catchments ¹	EPA - Local Surface Water Bodies ²	Length of 110kV UGC (km)	No. Water-course Crossings
Shannon	Killeengarriff_SC_010	Ballyard_010	1.3	4
	Newport (Tipperary)_SC_010	Newport_040	3.5	5
	Killeengarriff_SC_010	Annagh(Tipperary)_030	4	7
		Annagh(Tipperary)_020	8.4	23
	Bilboa_SC_010	Bilboa_010	6.4	18
		Inch (Bilboa)_010	5.4	6
Suir	Suir_SC_030	Clodiagh (Tipperary)_010	1.5	5

¹ Catchments are listed from west to east along the UWF Grid Connection route from the Mountphilips Substation to the Consented UWF Substation

²Catchment areas as now defined in <https://gis.epa.ie/EPAMaps/>

A11.3 3.2.2 Rainfall and Evaporation

The SAAR (Standard Average Annual Rainfall) recorded at Silvermine Mountains (Curreeny) (station no: 4819), which is located approximately 4.2km north of the 110kV UGC, is 1,713mm. The average potential evapotranspiration (PE) at Shannon Airport is taken to be 543mm and AE is calculated to be 516mm. Using the above figures the ER for the area is calculated to be 1,197mm.

A11.3 3.3 GEOLOGY

The superficial geology (*i.e.* overburden) along the UWF Grid Connection, comprises mainly mineral or organic topsoil over glacial tills. Alluvium and fluvio-glacial sand and gravels are present at the larger watercourse crossings (Bilboa River, Clare River and Newport River) which are intercepted by the 110kV route. Bedrock is close to the surface along much of the 110kV UGC route. Some pockets of blanket peat are mapped along the central section of the 110kV UGC on the regional road R503. Peat probes undertaken in Summer 2019 found that the road is predominantly constructed on competent ground.

The underlying bedrock along the UWF Grid Connection comprises sandstone, limestone and Silurian meta-sediments with the latter been most predominant.

A11.3 4. SITE SPECIFIC FLOOD RISK ASSESSMENT

A11.3 4.1 INTRODUCTION

The following assessment is carried out in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (DoEHLG, 2009). The basic objectives of these guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and,
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

A Stage 1 assessment of flood risk requires an understanding of where the water comes from (*i.e.* the source), how and where it flows (*i.e.* the pathways) and the people and assets affected by it (*i.e.* the receptors). It is necessary to identify whether there may be any flooding or surface water management issues related to the proposed site that may warrant further detailed investigation.

As per the guidance (DOEHLG, 2009), the stages of a flood risk assessment are:

- *Flood risk identification* – identify whether there are surface water flooding issues at a site; and,
- *Initial flood risk assessment* - confirm sources of flooding that may affect a proposed development.

Further to this, a Stage 2 assessment involves the confirmation of sources of flooding, appraising the adequacy of existing information and determining what surveys and modelling approach may be required for further assessment.

A11.3 4.2 FLOOD ZONE MAPPING

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types or levels of flood zones defined for the purposes of according to OPW guidelines:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and,
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.
- Flood Risk Identification

A11.3 4.2.1 Soils Maps – Fluvial Maps

A review of the soil types in the vicinity of the site was undertaken as soils can be a good indicator of past flooding in an area. Due to past flooding of rivers deposits of transported silts/clays referred to as alluvium build up within the flood plain and hence the presence of these soils is a good indicator of potentially flood prone areas.

Alluvial is typically mapped at the larger streams and rivers along the route of the UWF Grid Connection with the most extensive areas being mapped at the Newport River, Clare River and Bilboa River. It should be noted that the UWF Grid Connection crosses these watercourses via existing structures.

Soils maps, however, tend to be generalised and therefore are not definitive, and further analysis is required as outlined below.

A11.3 4.2.2 Historical Mapping

There is no text on local available historical 6" or 25" mapping for the route that identify areas that are "*prone to flooding*".

A11.3 4.2.3 OPW National Flood Hazard Mapping

The OPW National Flood Hazard maps have no records of recurring flood incidences within the UWF Grid Connection works area boundary or immediately downstream of it (**Figure B** below refers). The closest mapped recurring flood event is mapped at Derryleigh, 350m south of the UWF Grid Connection 110kV UGC route.

There are further afield recurring flood incidences mapped to the west of the Substation and west of the UWF Grid Connection Route in the town of Newport.



Figure B: OPW Flood Hazard Mapping (www.floods.ie)

A11.3 4.2.4 CFRAM Maps – Fluvial and Coastal Flooding

Where complete the Catchment Flood Risk Assessment and Management (CFRAM)¹ OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the Preliminary Flood Risk Assessment Maps (PFRA) maps.

Only very limited CFRAM mapping is available for the area of the UWF Grid Connection around Newport town and the mapped flood zones are largely downstream of the works area. Therefore the area of the development is examined using the PRFA mapping, as detailed below.

A11.3 4.2.5 Preliminary Flood Risk Assessment Maps – Fluvial and Pluvial Flooding

The OPW PFRA mapping can be viewed at www.myplan.ie

The PFRA mapping indicates that fluvial flooding along the 110kV UGC route is relatively localised to the larger stream and river crossing locations, namely; crossing locations W5, W7 (Newport River), W8, W9, W33, W36 (Clare River), W49 and W53 (Bilboa River) which are all mapped to be within the 100-year flood zone (Flood Zone A). All of these watercourse crossings within mapped 100-year flood zones are along the public road at existing bridges. These bridges will be crossed by installing a cable within the existing bridge structure, with the exception of W8 and W9, which will be directional drilled below the watercourse.

There are 38 no. joint bays (and their communication and link box chambers) located along the 110kV UGC and only 1 no. of the joint bay locations (J6) is located within a mapped fluvial flood zone. This joint bay location is assessed further below. The Mountphilips Substation site or its access road is also not located within a mapped fluvial flood zone.

There are no significant mapped pluvial flood zones along the UWF Grid Connection route. Due to the elevated and hilly nature of the topography in the area of the UWF Grid Connection development and the fact the majority of the route is along public roads (with road drainage) no significant pluvial flooding is anticipated. None of the proposed joint bays are located within a mapped pluvial flood zone.

A11.3 4.3 SUMMARY – FLOOD RISK IDENTIFICATION

Based on the information gained through the flood identification process, it appears that fluvial flood zones mapped along the UWF Grid Connection route are typically associated with the larger stream and river crossing locations. This is based largely on the PFRA mapped flood zones. However, the OPW Flood Hazard Mapping, which has no reports of actual flood incidents at any of these locations, is likely to be a more accurate reflection of the actual flood risk.

The route of the 110kV UGC passes through these flood zones via existing crossing structures (i.e. bridges/culverts), however no permanent over ground infrastructure (associated with UWF Grid Connection) are mapped within these flood zones (i.e. 100-year and Extreme Event flood zones). All works at these flood zones will either involve installing cables within the bridge structure or directional drilling at 2 no. watercourse crossings. Only 1 no. joint bay (J6) is located within a mapped fluvial flood zone. This is discussed further in **Section 4.4** below where a site-specific flood risk assessment was carried out to further assess the risk of potential flooding at the proposed development site.

¹ CFRAM is Catchment Flood Risk Assessment and Management. The national CFRAM programme commenced in Ireland in 2011, and is managed by the OPW. The CFRAM Programme is central to the medium to long-term strategy for the reduction and management of flood risk in Ireland.

A11.3 4.4 INITIAL FLOOD RISK ASSESSMENT

A11.3 4.4.1 Site Survey

A detailed survey of all watercourse crossings along the UWF Grid Connection was completed as part of this assessment. The walkover surveys were completed in the January, May and July 2019 and therefore streams and rivers were seen in medium to high flow conditions.

Due to the upland nature of the majority of the UWF Grid Connection areas, many of the watercourses in proximity of the works area are small headwater streams or drains. A summary of the watercourse types intercepted by the UWF Grid Connection are shown in **Table B** Error! Reference source not found..

63 no. of the 68 no. watercourse crossings are located within the public road network. The main watercourse crossings along the grid connection include the Newport River, Clare River and the Bilboa River. These rivers will be crossed by installing the 110kV cable within the existing bridge structure

There was no evidence of past significant flood events at any of the watercourse crossing location at the level of the public road surface. The J6 joint bay location was also assessed on the ground and there are no indications of past flooding events. The topography of the local area around J6 and the elevated nature of the road surface above the local land and watercourse would suggest that the risk of flooding is low

Table B: Watercourse Crossing Types along the UWF Grid Connection works areas

Class	Watercourse Description	Total No.
1	EPA mapped blue line, major river or stream (fisheries value)	13
2	Headwater Stream Equivalent to EPA blue line but not mapped (fisheries value)	3
3	Sub-optimal, heavily vegetated with low or no flow during dry periods (low fisheries value)	27
4	Drain (no fisheries value)	25
	Total	68

A11.3 4.4.2 Hydrological Flood Conceptual Model

Potential flooding in the vicinity of the proposed development can be described using the Source – Pathway – Receptor Model (“S-P-R”). The primary potential source of flooding in this area, and the one with most consequence for the proposed development, is fluvial.

The primary potential pathway would be overbank flooding of the various larger watercourses intersected by the UWF Grid Connection infrastructure during significant rainfall events. The potential receptors in the area are infrastructure and land as outlined below.

A11.3 4.4.3 Summary – Initial Flood Risk Assessment

Based on the information gained through the flood identification process and Initial Flood Risk Assessment process the sources of flood risk for the site are outlined and assessed in **Table C**.

Table C: S-P-R Assessment of Flood Sources for the site

Source	Pathway	Receptor	Comment
Tidal	Not applicable	Land and infrastructure.	The UWF Grid Connection route is at least 25km from the coast and there is no risk of coastal flooding.
Fluvial	Overbank flooding of the various watercourses in the area of the UWF Grid Connection	Land and infrastructure.	<p>There are 8 no. watercourse crossing locations mapped within a fluvial flood zone (Flood Zone A) along the 110kV route, including 1 no. joint bay (J6).</p> <p>All fluvial flood zones are at existing bridges. The UWF Grid Connection 110kV cables will be installed within or underneath the bridge structure.</p> <p>There is no permanent above ground level infrastructure located within a mapped fluvial flood zone (<i>i.e.</i> new permanent culverts).</p>
Pluvial	Ponding of rainwater / surface water	Land and infrastructure.	<p>There is no significant risk of pluvial flooding at the proposed development areas as the topography is elevated and sufficiently sloped to adequately convey waters during heavy rainfall events. The majority is also along public roads which have road drainage.</p> <p>There is no permanent infrastructure located within a mapped pluvial flood zone</p>
Surface water	Surface ponding/ Overflow	Land and infrastructure	Same as above (pluvial).
Groundwater	Rising groundwater levels	Land and infrastructure.	Based on local hydrogeological regime, elevated nature of the majority of the development and PFRA mapping, there is no apparent risk from groundwater flooding.

A11.3 4.5 DEVELOPMENT INFRASTRUCTURE AND FLOOD RISK

A11.3 4.5.1 Introduction

The proposed UWF Grid Connection development largely involves the installation of underground cables and joint bays for the 110kV UGC. These elements of the development have no potential to increase flood risk due to their subsurface nature. The public road and agricultural land will be reinstated back to its original condition and level after the works are completed.

Culvert replacement works are looked at below in terms of flood risk.

A11.3 4.5.2 New Culverts and Replacement Works at Watercourse Crossing

65 no. of the 68 no. watercourse crossings are existing bridges or culverts within the public roads and paved forestry road. Of the 65 no, 13 no. may require culvert replacement. There will also be 2 no. new permanent culverts along the new access track to Mountphilips Substation.

The following measures are proposed to ensure that there is no increased flood risk locally:

- All new permanent watercourse culverts at the Mountphilips Substation site and any replacement culverts along the public road for the 110kV UGC will be sized to cope with a minimum 100-year flood event.;
- At a minimum, all new pipe culverts will be 900mm in diameter regardless of the anticipated flood flow (i.e. minimum 900mm culvert will be used in Type 3/Type 4 watercourses regardless of flows);
- As agreed during a telephone consultation carried out by the EIA Coordinator with OPW, Limerick office, (February 2018), a Section 50 application will be submitted to the OPW for new crossings and up-grades following the receipt of planning permission for the UWF Grid Connection. The Section 50 applications will be accompanied by a hydraulic assessment of the new crossing structures to ensure they are adequate from a flood prevention perspective.
- Culvert design and construction will adhere to best practise and conform to the OPW (2013) guidance document "Construction, Replacement or Alteration of Bridges and Culverts

A11.3 4.5.3 Permanent Hardstanding Areas

The only permanent hardstand areas associated with the UWF Grid Connection is the Mountphilips Substation compound, access road (c.450m) and 2 No. end masts, all of which will occur within the Mountphilips Substation site in Coole and Mountphilips townlands. This permanent infrastructure is not expected to increase flood risk for the following reasons:

- The permanent hardstanding areas are negligible in comparison to the area of the local surface water body;
- It is proposed that the permanent access roads will have permanent road side drains in place which will include check dams for reduction of runoff rates; and,
- It is proposed that the Mountphilips Substation will have a permanent surface water drainage network in place which will allow for surface water attenuation.

A11.3 5. PLANNING POLICY AND JUSTIFICATION TEST

A11.3 5.1 PLANNING POLICY AND THE NORTH TIPPERARY COUNTY DEVELOPMENT PLAN

The following policies in **Table D** below are defined in North Tipperary County Development Plan (CDP) 2010-2016 in respect of flooding, and we have outlined in the column to the right how these policies are provided for within the proposed developments design.

Table D: North Tipperary CDP Policies and Project Responses

No.	Policy	Development Design Response
CEF8	<p>Management of Flood Risk</p> <p>It is the policy of the Council to apply a sequential approach to the assessment of developments in areas of flood risk. Developments on lands identified as being at risk of flooding shall be subject to a Flood Risk Assessment in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, (DEHLG 2009) and any amendment thereof*, and shall include a Justification Test and have regard to non-vulnerable uses.</p> <p>*Flood Risk Assessments will be required, as appropriate, in areas identified to be of risk of flooding.</p>	<p>This site-specific FRA is consistent with the DoEHLG/OPW guidelines and its accompanying technical appendix.</p>
TI9	<p>Storm Water Disposal</p> <p>It is the policy of the Council to require the implementation of Sustainable Drainage Systems (SuDS) as an integral part of the design of new developments to reduce the generation of storm water run-off, and to ensure that all storm water generated is disposed of on-site or is attenuated and treated prior to discharge to an approved storm water system.</p>	<p>All drainage proposals for permanent infrastructure will be consistent with SUDs principles and best practice SUDs drainage design.</p>

A11.3 5.2 REQUIREMENT FOR A JUSTIFICATION TEST

The matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test² is shown in **Table E** below.

Table E: Matrix of Vulnerability versus Flood Zone (Taken from Table 3.2 (DoEHLG, 2009))

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification test	Justification test	Appropriate
Less vulnerable development	Justification test	Appropriate	Appropriate
Water Compatible development	Appropriate	Appropriate	Appropriate

Bold/yellow background: Applies to this project.

² A 'Justification Test' is an assessment process designed to rigorously assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk, (DoEHLG, 2009).

It may be considered that the proposed development is a ‘Highly Vulnerable Development – utilities distribution’. While all of proposed above ground permanent infrastructure such as the Mountphilips Substation is located in Flood Zone C (Low Risk), there are sections of the 110kV UGC route mapped in Fluvial Flood Zone A and these are typically at the larger river crossings such the Newport River, Clare River and Bilboa River and some of the larger unnamed streams.

The permanent infrastructure (*i.e.* 110kV UGC cabling and 1 no. joint bay) within the mapped fluvial flood zones will be placed below ground level (within a trench) and/or beneath the watercourse and as such no impacts on the proposed developments are expected.

65 no. of the 68 no. watercourse crossings are existing culverts or bridges. Where culverts need replacing, this will be done as set out in **Section 11.3.4.5.2** above. The construction of the cable trench will be temporary and transient (not all occurring at once). Also, there will be no potential of increased flood risk as a result of the proposed UWF Grid Connection development for the reasons described in **Section 11.3.4.5** above.

Notwithstanding this and in the interest of being conservative, a justification test is presented in **Table F** below. The Justification Test is carried out in accordance with the “The Planning System and Flood Risk Management Guidelines” (PSFRM Guidelines). The format of the Justification Test has been adapted for this report from Box 5.1 of the PSFRM Guidelines, which outlines the criteria required to complete the “Justification Test”.

Table F: Format of Justification Test for Development Management

Box 5.1 Justification Test for Development Management (to be submitted by the applicant)
When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied: <ol style="list-style-type: none"> 1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines. 2. The proposal has been subject to an appropriate flood risk assessment that demonstrates: <ol style="list-style-type: none"> i. The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk; ii. The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible; iii. The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and iv. The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes. <p>The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.</p>

Referring to Point 1 and Points 2 (i) to (iv) inclusive:

1. The sections of the UWF Grid Connection 110kV UGC route (including Joint Bay J6) located in the mapped flood zones are along the public road. The 110kV UGC cables and J6 joint bay will be installed within the structure of the existing bridge and road.

2. The proposed developments has been the subject of a flood risk assessment (this report) and this assessment shows that the infrastructure design proposed for these watercourse crossings is appropriate in areas of the route mapped in Fluvial Flood Zone A.
 - i. The proposed developments is predicted to have **No Impact** on flood risk elsewhere in the locality.
 - a. The UWF Grid Connection largely involves the installation of underground cables and joint bays for the 110kV UGC which have no potential to increase flood risk;
 - b. The footprint of the permanent above ground infrastructure (i.e. Mountphilips Substation compound, new permanent access road and end masts – all at the Mountphilips Substation site) is minimal and therefore associated surface water runoff will not result in increased downstream flood risk; and,
 - c. Where existing culvert replacement is required, the hydraulic capacity of the culvert will be suitably designed for peak flood flows.
 - ii. The nature of the proposed developments means there will be no flood risk to people, property, the economy or the environment during extreme flood events.
 - a. The proposed developments have no potential to increase flood risk for the reasons outlined in (i) above; and
 - b. Where the proposed route of the 110kV UGC passes through mapped fluvial flood zones, there are no permanent over ground infrastructure, within these flood zones (i.e. 100-year and Extreme Event flood zones). Therefore, there is no risk to property or people during the operation of the development;
 - iii. There will be no residual risks to the area and to the proposed development during extreme flood events.
 - a. The proposed UWF Grid Connection will largely involve the installation of underground cables and joint bays for the 110kV UGC and therefore there will be no residual risk;
 - b. Where existing culverts are being replaced, the hydraulic capacity of the culvert will be suitably designed for peak flood flows.
 - iv. The proposed development is compatible with the wider planning objectives of the area.
 - a. The proposed development will serve the Upperchurch Windfarm which has been granted permission. The Upperchurch Windfarm is consistent with the County Development Plan on renewable energy.

A11.3 6. CONCLUSIONS

- A flood risk identification study was conducted to identify potential flood risks associated with the proposed UWF Grid Connection, Co. Tipperary. From this study:
 - No instances of historical flooding were identified in historic OS maps;
 - No instances of recurring flooding were identified on OPW maps along the proposed 110kV UGC route or at the Mountphilips Substation Site; and,
 - Sections of the UWF Grid Connection 110kV UGC route were identified with the PFRA Flood Zones as described.
- The available Preliminary Flood Risk Assessment (PFRA) mapping indicates that there are sections of the 110kV UGC route located in the fluvial Flood Zone A (100-year flood zone) and these are largely associated with the larger stream and river crossings;
- The 8 no. sections of the UWF Grid Connection 110kV UGC route (and joint bay J6) in the areas of the mapped fluvial flood zones involve placing cables and joint bay J6 within the existing bridge structure and road. i.e. no instream works are required;
- Construction at each crossing will be short duration (temporary) and transient (will not occur at all crossing locations at once) in nature;
- As outlined in Section A11.3.5 above, the proposed development is consistent with the relevant planning objectives and policies from the North Tipperary County Development Plan;
- No impact on the proposed development is expected as a result of potential flooding. Also, there will be no potential of increased local flood risk as a result of the proposed development as the majority of the UWF Grid Connection works are underground and the footprint of the over ground permanent infrastructure at the Mountphilips Substation site is minimal and outside of mapped flooding areas.
- Where existing culverts require replacement for the UWF Grid Connection along the 110kV UGC route, the hydraulic capacity of the culvert will be suitably designed for peak flood flows of the watercourse.

A11.3 7. REFERENCES

AGMET	1996	Agroclimatic Atlas of Ireland.
DOEHLG	2009	The Planning System and Flood Risk Management.
Met Eireann	1996	Monthly and Annual Averages of Rainfall for Ireland 1961-1990.

A11.3 8. FIGURES

Title:
Figure 1
Local Hydrology Map

Scale 1 : 125,000

Legend:

— UWF Grid Connection
— Construction Works Area

EPA Sub-Catchment:

- Kilteganrif_SC_010
- Newport(Tipperary)_SC_010
- Bilboa_SC_010
- Suir_SC_030

EPA Local Surface Water Bodies:

- Ballyard_010
- Newport_040
- Annagh (Tipperary)_030
- Annagh (Tipperary)_020
- Bilboa_010
- Inch (Bilboa)_010
- Clodaigh (Tipperary)_010

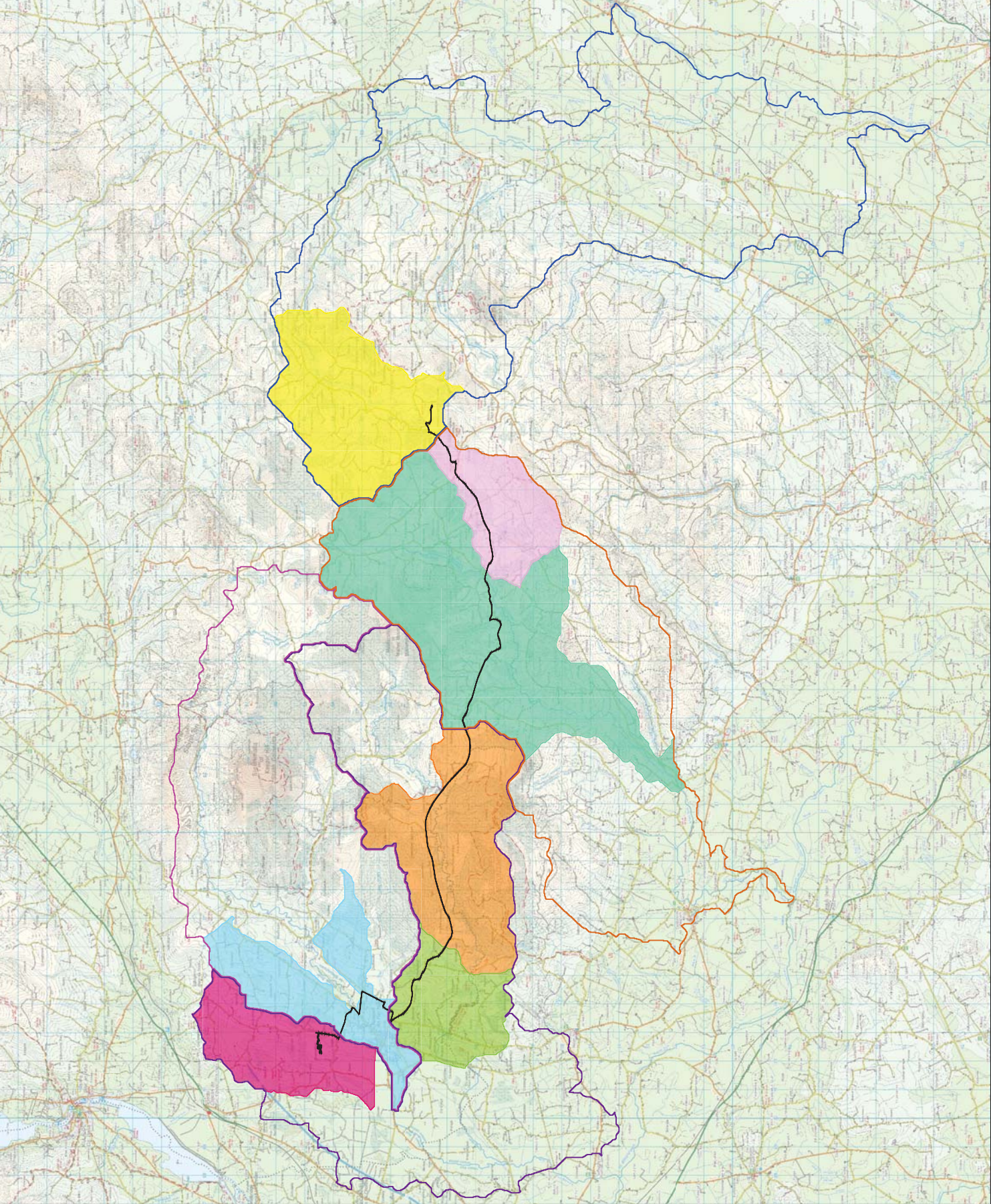


Project
UWF Grid Connection

Drawn by: AB
Checked by: JB
Date: 14-Aug-19
Sheet Size: A3

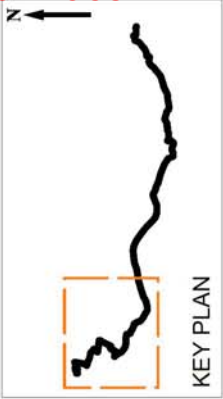


Ecology
Engineering
Planning
Development
Construction
Management
Services
Tel: +353 (0) 7599 69
Fax: +353 (0) 8655 94
www.ecopower.ie



- Legend**
- UWF Grid Connection
 - Construction Works Area Boundary
 - Permanent Access Road 110kV
 - Temporary Access Road 110kV
 - Joint Bay Locations
 - Watercourse
 - Fluvial - 1% AEP Event
 - Fluvial - Extreme Event
 - Fluvial - 1% AEP Event
 - Fluvial - Extreme Event

- Watercourse Crossing Class Type**
- Class 1_EPA BlueLine
 - Class 2_EPA BlueLine Equivalent
 - Class 3_Sub Optimal/Ephemeral
 - Class 4_Drainage Ditch

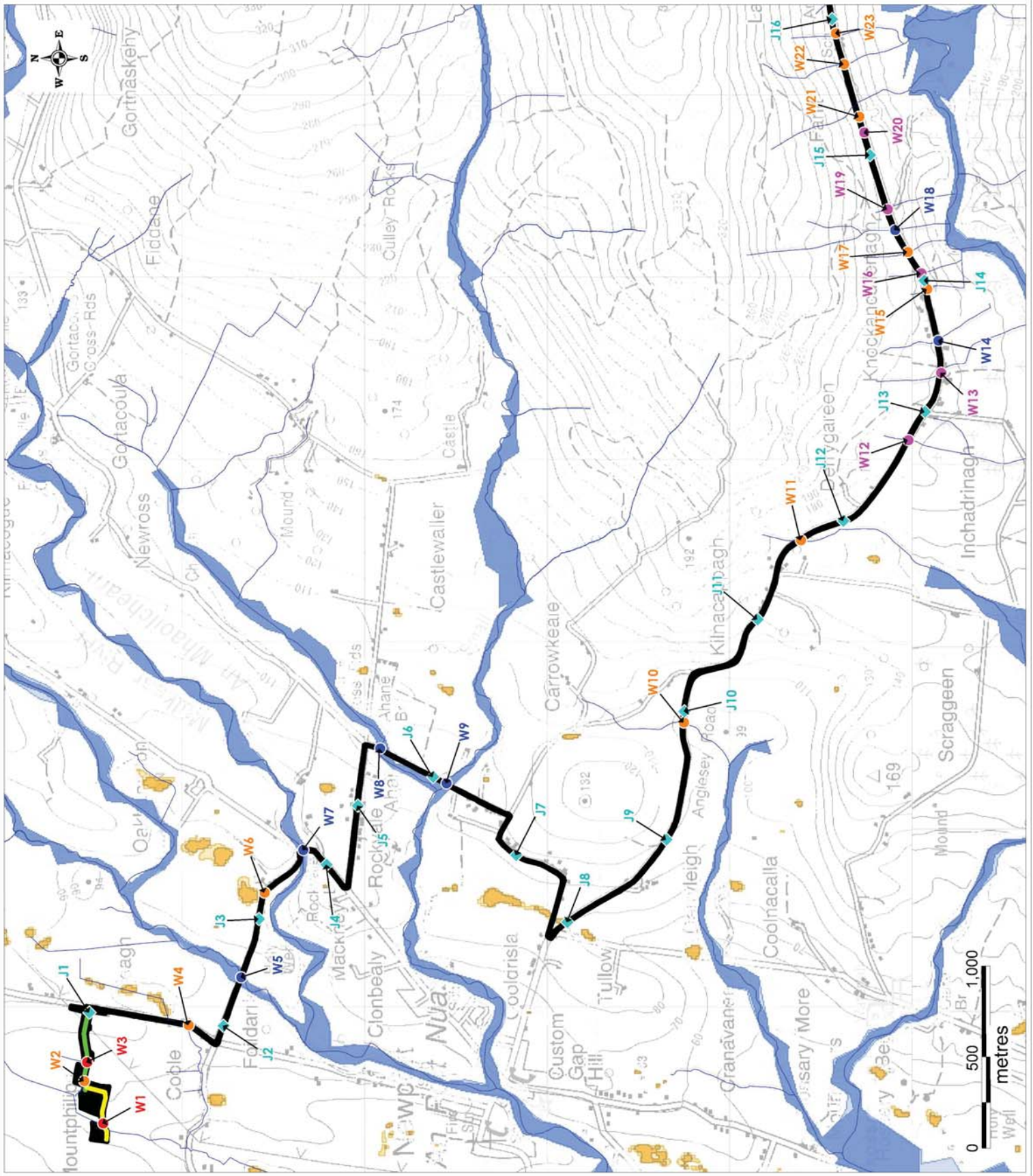


HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co. Waterford
Ireland

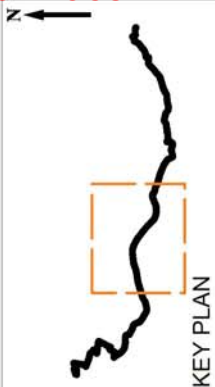
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.	
Job: Upperchurch WF Grid Connection	
Title: PFRA Flood Mapping 1	
Figure No: Figure 2	
Drawing No: P1299-4-0719-Fig-2-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:20,000	Drawn By: GD
Date: 22/07/2019	Checked By: MG



Legend

- UWF Grid Connection
- Construction Works Area Boundary
- Joint Bay Locations
- Watercourse
- Fluvial - 1% AEP Event
- Fluvial - Extreme Event
- Fluvial - 1% AEP Event
- Fluvial - Extreme Event
- Class 1_EPA_Blueline
- Class 2_EPA_Blueline Equivalent
- Class 3_Sub Optimal/Ephemeral
- Class 4_Drainage Ditch



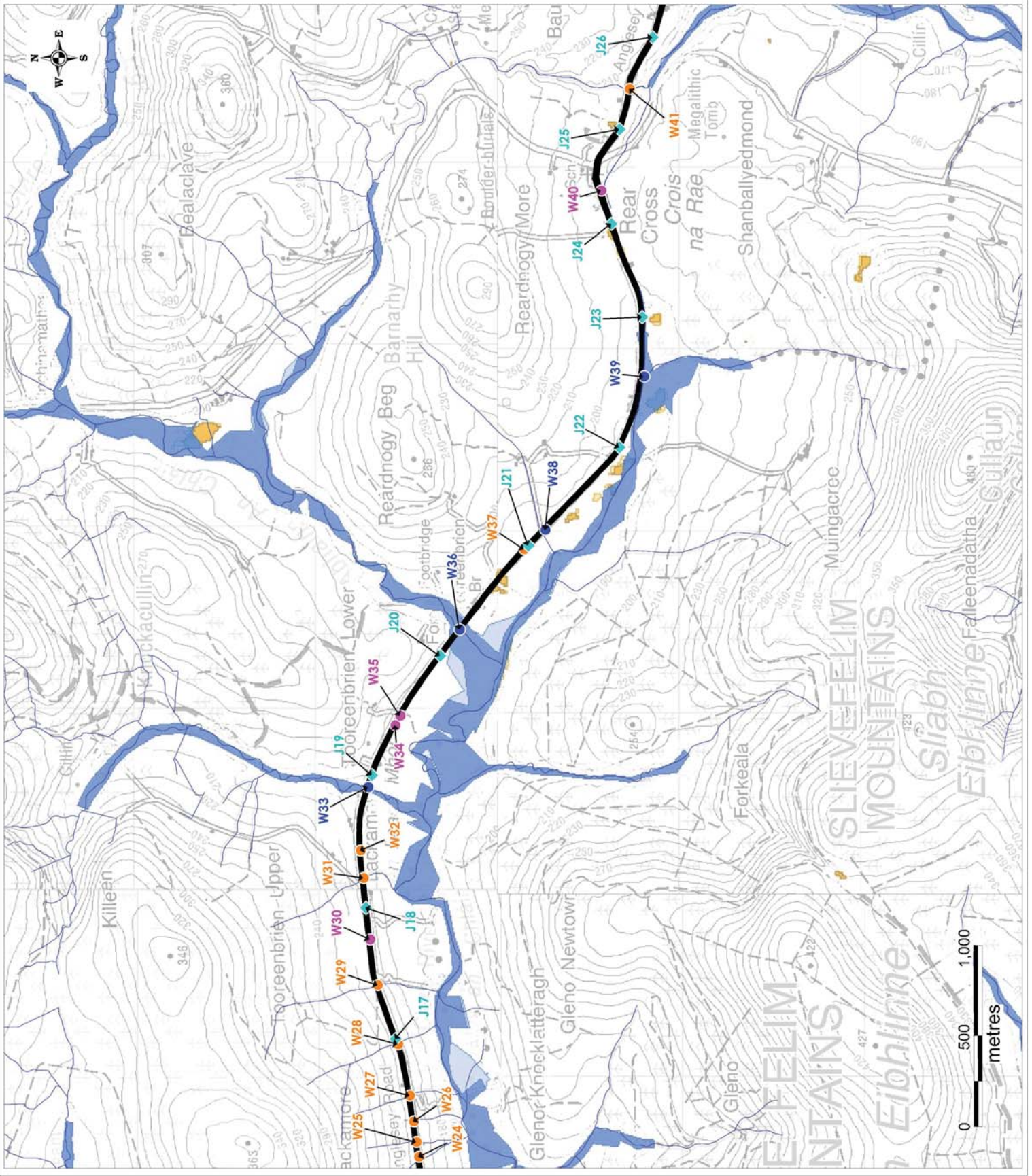
KEY PLAN

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co. Waterford
Ireland

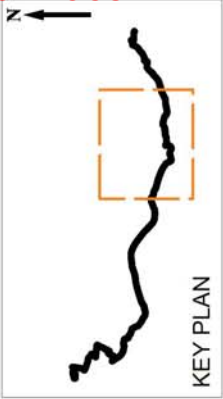
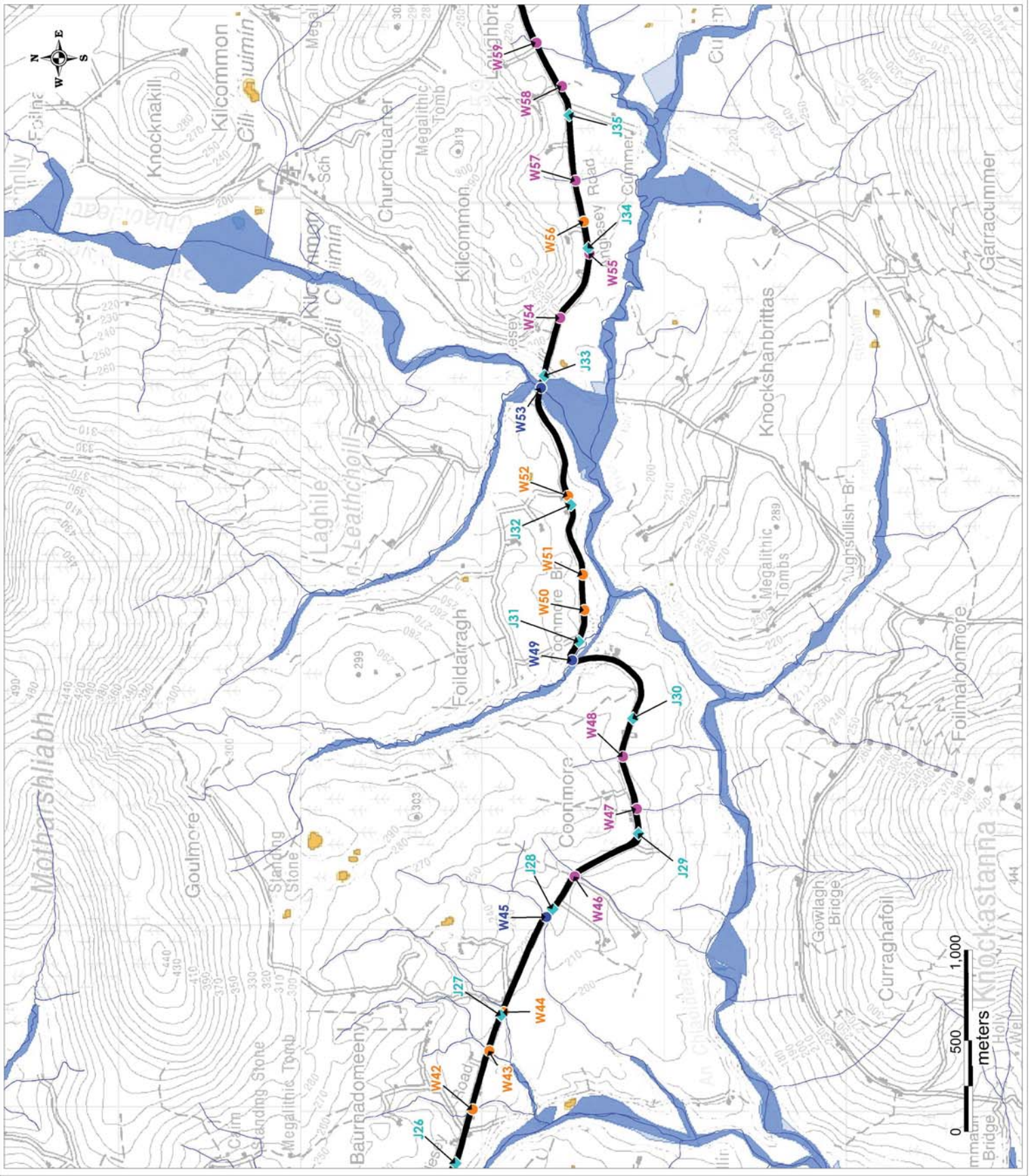
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.	
Job: Upperchurch WF Grid Connection	
Title: PFRA Flood Mapping 2	
Figure No: Figure 3	
Drawing No: P1299-4-0719-Fig-3-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:20,000	Drawn By: GD
Date: 22/07/2019	Checked By: MG



Legend

- UWF Grid Connection
- Construction Works Area Boundary
- Joint Bay Locations
- Watercourse
- Fluvial - 1% AEP Event
- Fluvial - Extreme Event
- Pluvial - 1% AEP Event
- Pluvial - Extreme Event
- Class 1_EPA BlueLine
- Class 2_EPA BlueLine Equivalent
- Class 3_Sub Optimal/Ephemeral
- Class 4_Drainage Ditch



HYDRO ENVIRONMENTAL SERVICES

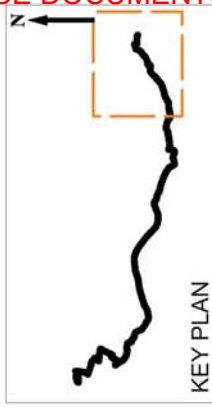
22 Lower Main St
 Dungarvan
 Co Waterford
 Ireland

tel: +353 (0)58 44122
 fax: +353 (0)58 44244
 email: info@hydroenvironmental.ie
 web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.	
Job: Upperchurch WF Grid Connection	
Title: PFRA Flood Mapping 3	
Figure No: Figure 4	
Drawing No: P1299-4-0719-Fig-4-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:20,000	Drawn By: GD
Date: 22/07/2019	Checked By: MG

Legend

- UWF Grid Connection
- Construction Works Area Boundary
- Join Bay Locations
- Watercourse
- Fluvial - 1% AEP Event
- Fluvial - Extreme Event
- Pluvial - 1% AEP Event
- Pluvial - Extreme Event
- Watercourse Crossing Class Type
 - Class 1_EPA Blueeline
 - Class 2_EPA Blueeline Equivalent
 - Class 3_Sub Optimal/Ephemeral
 - Class 4_Drainage Ditch

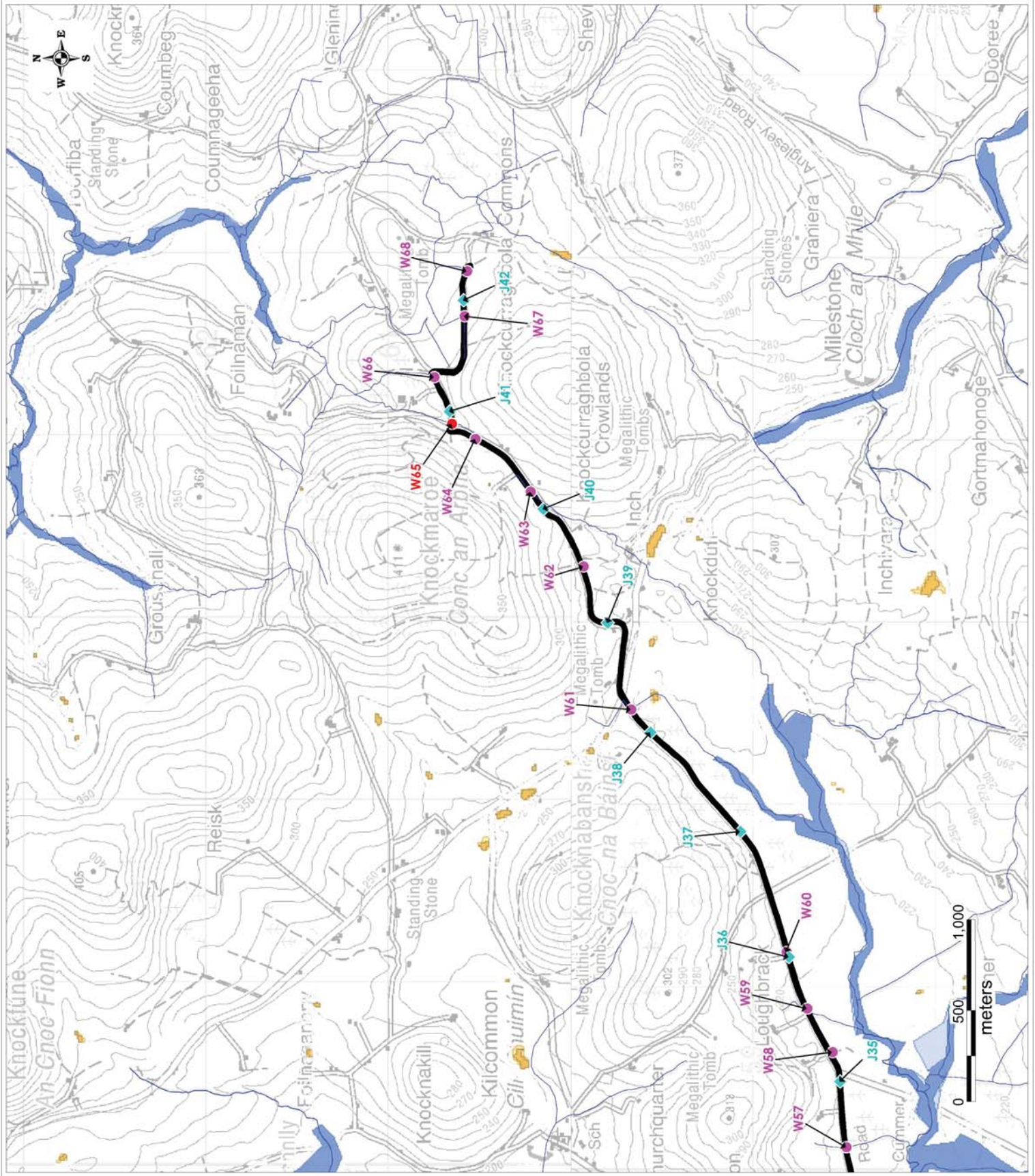


HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.	
Job: Upperchurch WF Grid Connection	
Title: PFRA Flood Mapping 4	
Figure No: Figure 5	
Drawing No: P1299-4-0719-Fig-5-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:20,000	Drawn By: GD
Date: 22/07/2019	Checked By: MG



REFERENCE DOCUMENTS

Appendix to Chapter 12: Air

Appendix 12.1: Air Quality Monitoring & Standards

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

TABLE OF CONTENTS

A12.1 Air Quality Monitoring & Standards.....3

A12.1.1 EPA Monitoring Programme Results3

A12.1.2 Air Quality Standards.....3

A12.1 AIR QUALITY MONITORING & STANDARDS**A12.1.1 EPA Monitoring Programme Results**

The EPA and Local Authorities have undertaken air quality monitoring programmes in recent years. They have divided the country into various Air Quality Zones¹. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The UWF Grid Connection and the Whole UWF Project is within Zone D. The most recent annual report on air quality “*Air Quality Monitoring Report 2017*”², details the range and scope of monitoring undertaken throughout Ireland.

Long-term PM₁₀ monitoring is carried out at two rural Zone D locations, Killkitt and Claremorris². The annual average concentration measured at these sites from 2012 - 2017 ranged from 8 - 13 µg/m³. The average result for both locations indicates an upper average annual mean concentration of no more than 11 µg/m³. The long term results for both locations show that levels of PM₁₀ are well below the annual mean limit value of 40 µg/m³. There was one exceedance (in Claremorris) of the 24-hour PM₁₀ concentration of 50 µg/m³ (35 exceedances are permitted per year). Based on the above information an estimate of the 2020 background PM₁₀ concentration for the region of the Whole UWF Project is 11 µg/m³.

The results of PM_{2.5} monitoring at a Zone D site in over the period 2012 - 2017 indicated an average PM_{2.5}/PM₁₀ ratio ranging from 0.50 – 0.62². Long-term average PM_{2.5} concentrations measured at these locations were significantly lower than the annual average limit value of 25 µg/m³. Based on this information, the conservative ratio of 0.65 was used to generate a rural background PM_{2.5} concentration in 2020 of 7.2 µg/m³.

Long-term NO₂ monitoring was carried out at the three rural Zone D locations in Ireland². The NO₂ annual average in 2017 across all three sites ranged from 3 - 7 µg/m³. The NO₂ annual average result for the period 2012 – 2017 ranged from 2 - 11 µg/m³. Hence long-term average concentrations measured at these locations were substantially lower than the annual average limit value of 40 µg/m³. Based on the above information, a conservative estimate of the background NO₂ concentration, for the region of the Whole UWF Project is 7 µg/m³.

In summary, existing baseline levels of PM₁₀, PM_{2.5} and NO₂ based on extensive long-term data from the EPA are well below ambient air quality limit values in the study area. There is no monitoring of baseline dust concentrations (PM greater than 10 microns) but these are also predicted to be low.

A12.1.2 Air Quality Standards

Air Quality Standards were established under EU Directive 2008/50/EC which sets limit values for certain air pollutants in order to protect against human health and ecological impacts. These limit values or “Air Quality Standards” are health or environmental-based levels for which additional factors, such as natural background levels, environmental conditions and socio-economic factors, may be considered.

The limit values are presented in Table 1 below.

¹ EPA (2017) Air Monitoring Data (<http://www.epa.ie/whatwedo/monitoring/air/>)

² EPA (2018) Air Quality Monitoring Report 2017 (& previous annual reports 2010 - 2016)

Table 1 Air Quality Standards Regulations 2011

Pollutant	Regulation ³	Limit Type	Value
Particulate Matter (as PM ₁₀)	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m ³ PM ₁₀
		Annual limit for protection of human health	40 µg/m ³ PM ₁₀
PM _{2.5}	2008/50/EC	Annual limit for protection of human health	25 µg/m ³ PM _{2.5}
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m ³ NO ₂
		Annual limit for protection of human health	40 µg/m ³ NO ₂
		Critical Load for protection of vegetation	30 µg/m ³ NO + NO ₂

³ Based on EU Directive 2008/50/EC

Appendix to Chapter 12: Air

Appendix 12.2: Background Noise Modelling & Operational Noise Measurement

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

TABLE OF CONTENTS

A12.2	Background Noise Modelling & operational Noise Measurement	3
A12.2.1	Quiet Area Screening at the Mountphilips Substation Site	3
A12.2.2	Low Background Noise Area Screening at the Mountphilips Substation Site	4
A12.2.3	Mountphilips 110kV Substation Noise Emissions.....	12

A12.2 BACKGROUND NOISE MODELLING & OPERATIONAL NOISE MEASUREMENT

A12.2.1 Quiet Area Screening at the Mountphilips Substation Site

As the Mountphilips Substation will be a permanent fixture with noise emissions a Quiet Area screening was carried out for the location of the substation. The criteria for a ‘Quiet Area’ classification, as per the EPA NG4 Guidance Note, are listed in the first column of Table 1, and the results of the screening are outlined in the second column.

Table 1 Quiet Area Screening – location criteria

‘Quiet Area’ screening criteria	Screening Results: Context in relation to the Mountphilips 110kV Substation
At least 3 km from urban areas with a population >1,000 people	Quiet Area Criteria not met: Newport with a population of approximately 1,800 is approximately 2 km south of the substation site
At least 10 km from any urban areas with a population >5,000 people	Quiet Area Criteria met Annacotty and Castletroy is approximately 11 to 12 km from the site.
At least 15 km from any urban areas with a population >10,000 people	Quiet Area Criteria met: Limerick city, with a population of 190,000 is approximately 16 km south west of the site
At least 3 km from any local industry	Quiet Area Criteria not met: Newport Memorials is approximately 1 km east of the site.
At least 10 km from any major industry centre	Quiet Area Criteria not met: Annacotty Business Park is 9.6 km south west of the site.
At least 5 km from any National Primary Route, and	Quiet Area Criteria not met: The R504 is approximately 500m west of the substation site.
At least 7.5 km from any Motorway or Dual Carriageway	Quiet Area Criteria not met: M7 motorway is approximately 2 km west of the site

Because not all of the criteria in the table above for classification as a Quiet Area are met, **the area is not classed as a ‘Quiet Area’.**

A12.2.2 Low Background Noise Area Screening at the Mountphilips Substation Site

As all of the criteria for Quiet Area classification are not met, then screening was carried out to see if the area met the criteria for a low background noise area, as per the EPA NG4 Guidance Note. This criteria is outlined in Table 2.

Table 2: Low Background Noise Area Screening

'Low Background Noise Area' screening criteria
Average Daytime Background Noise Level ≤ 40 dB LAF90, and;
Average Evening Background Noise Level ≤ 35 dB LAF90, and;
Average Night-time Background Noise Level ≤ 30 dB LAF90

Background Noise Measurement

To facilitate the screening exercise, existing background noise levels were measured during an environmental noise survey. As the Mountphilips Substation will operate throughout each 24 hour period, day, evening and night time noise surveys were carried out.

A site visit was undertaken on the 24th April 2017 and baseline environmental noise survey was undertaken between the 28th April and 2nd May 2017. This included weekend and weekday periods, both day and night. The survey was conducted adjacent to the nearest noise sensitive receptor which is a local residence approximately 385m east on the L2166-0 of the Mountphilips Substation location (See Plate 1).

The measurements were made using a Bruel & Kjaer type 2250 Light Logging integrating Sound Level Meter. This instrument is a Type 1 instrument in accordance with IEC 651 regulations. The Time Weighting used was Fast and the Frequency Weighting was A-weighted as per IEC 651. A frequency analysis was also undertaken. The calibration certificate and serial number for the sound level meters and calibrator used during the survey work are attached at the end of this Appendix 12.1.

Several parameters were measured in order to be able to interpret the noise levels correctly. These included the;

- L_{Aeq} Time-averaged A weighted noise level.
- L_{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level).
- L_{A10} Noise level exceeded for 10 % of measurement period.
- L_{Amax} Maximum A weighted noise level measured.

The noise monitoring location and set up can be seen in Plate 1 and Plate 2 below.

The results of the baseline survey are presented in full in Table 3.



Plate 1 Noise Monitoring Location and Set Up

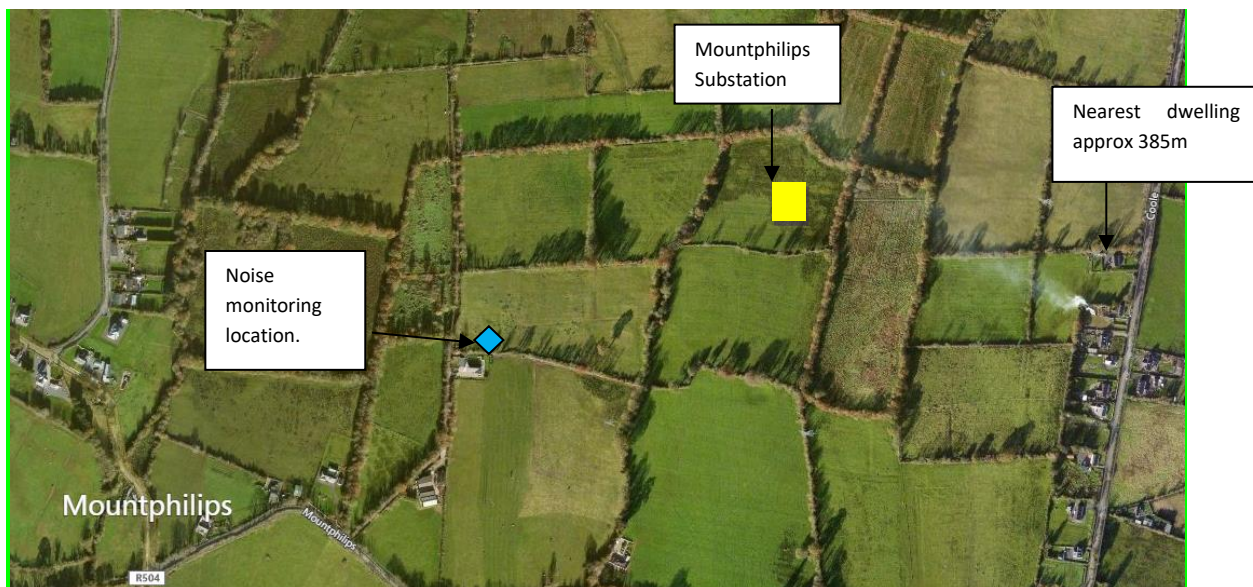


Plate 2 Baseline Noise Monitoring Location and Nearest Dwelling

The area is rural in nature and there are many mature hedgerows and trees in the vicinity of the nearest house (see Plate 2). There was blustery weather on Saturday and this is reflected in the higher background noise levels recorded in Table 3.

The noise monitoring location while not exactly at the nearest property is at a location adjacent and representative. The noise levels would be similar and this proxy location has the added advantage of not being impacted by cars in the driveway and occupier activity.

Table 3: Results of Baseline Noise Survey at Mountphilips

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
Friday 11 am to 7 pm				
28/04/2017 11:00	42	31	68	27
28/04/2017 11:30	44	33	67	28
28/04/2017 12:00	46	32	65	27
28/04/2017 12:30	47	33	64	29
28/04/2017 13:00	47	34	68	27
28/04/2017 13:30	38	32	56	28
28/04/2017 14:00	42	33	61	29
28/04/2017 14:30	47	33	63	28
28/04/2017 15:00	47	32	68	28
28/04/2017 15:30	39	31	56	28
28/04/2017 16:00	47	33	72	29
28/04/2017 16:30	43	33	67	30
28/04/2017 17:00	39	32	61	29
28/04/2017 17:30	46	33	66	28
28/04/2017 18:00	39	34	59	30
28/04/2017 18:30	47	34	67	30
28/04/2017 19:00	48	35	70	32
Average	44	33	65	29
Friday Evening 7 pm to 11 pm				
28/04/2017 19:30	45	35	63	31
28/04/2017 20:00	44	34	68	30
28/04/2017 20:30	51	34	71	31
28/04/2017 21:00	42	34	70	30
28/04/2017 21:30	42	33	76	30
28/04/2017 22:00	44	33	77	29
28/04/2017 22:30	35	31	55	27
28/04/2017 23:00	34	30	57	27
Average	42	33	67	29
Friday Night 11 pm to 7 am				
28/04/2017 23:30	36	32	58	30
29/04/2017	38	31	65	28
29/04/2017 00:30	36	31	46	28
29/04/2017 01:00	35	32	45	28
29/04/2017 01:30	39	31	50	27
29/04/2017 02:00	42	35	53	32
29/04/2017 02:30	41	36	54	32
29/04/2017 03:00	32	25	44	21
29/04/2017 03:30	32	24	49	21
29/04/2017 04:00	39	29	50	24
29/04/2017 04:30	35	27	44	24
29/04/2017 05:00	45	36	61	31
29/04/2017 05:30	58	36	81	29
29/04/2017 06:00	50	34	75	28
29/04/2017 06:30	43	36	62	31
Average	40	32	56	28
Saturday 7 am to 7 pm				
29/04/2017 07:00	44	38	59	33
29/04/2017 07:30	45	40	61	37
29/04/2017 08:00	46	37	66	33
29/04/2017 08:30	47	40	63	35

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
29/04/2017 09:00	45	39	71	35
29/04/2017 09:30	50	41	75	36
29/04/2017 10:00	52	45	66	37
29/04/2017 10:30	54	44	74	39
29/04/2017 11:00	58	49	82	42
29/04/2017 11:30	56	48	74	43
29/04/2017 12:00	59	49	81	41
29/04/2017 12:30	55	46	71	42
29/04/2017 13:00	57	48	70	43
29/04/2017 13:30	56	48	65	43
29/04/2017 14:00	57	49	77	44
29/04/2017 14:30	59	52	72	46
29/04/2017 15:00	59	47	86	42
29/04/2017 15:30	55	47	67	41
29/04/2017 16:00	51	44	69	40
29/04/2017 16:30	48	42	66	38
29/04/2017 17:00	50	41	75	36
29/04/2017 17:30	52	45	68	41
29/04/2017 18:00	52	44	67	40
29/04/2017 18:30	50	42	63	38
Average	52	44	70	39
Saturday evening 7 pm to 11 pm				
29/04/2017 19:00	49	42	66	37
29/04/2017 19:30	49	39	69	35
29/04/2017 20:00	46	35	61	31
29/04/2017 20:30	50	38	69	31
29/04/2017 21:00	52	47	64	43
29/04/2017 21:30	49	42	61	35
29/04/2017 22:00	52	45	70	41
29/04/2017 22:30	50	43	62	38
Average	50	41	65	37
Saturday night 11 pm to 7 am				
29/04/2017 23:00	46	39	60	34
29/04/2017 23:30	43	36	56	30
30/04/2017	46	38	62	31
30/04/2017 00:30	48	40	57	33
30/04/2017 01:00	46	38	60	32
30/04/2017 01:30	47	38	61	34
30/04/2017 02:00	50	41	64	37
30/04/2017 02:30	53	44	74	39
30/04/2017 03:00	50	43	62	40
30/04/2017 03:30	54	46	67	42
30/04/2017 04:00	53	46	64	40
30/04/2017 04:30	50	42	63	37
30/04/2017 05:00	50	44	63	40
30/04/2017 05:30	50	44	63	37
30/04/2017 06:00	47	41	63	37
30/04/2017 06:30	53	44	64	39
Average	49	41	63	36
Sunday 7 am to 7 pm				
30/04/2017 07:00	51	40	70	35
30/04/2017 07:30	54	47	68	40

Start Time	L _{Aeq}	L _A F90.0	L _A Fmax	L _A Fmin
30/04/2017 08:00	56	46	69	39
30/04/2017 08:30	56	49	67	44
30/04/2017 09:00	51	44	62	40
30/04/2017 09:30	53	44	67	39
30/04/2017 10:00	52	42	73	37
30/04/2017 10:30	50	38	74	33
30/04/2017 11:00	47	37	65	33
30/04/2017 11:30	44	38	60	34
30/04/2017 12:00	47	39	69	34
30/04/2017 12:30	48	39	70	30
30/04/2017 13:00	47	39	67	35
30/04/2017 13:30	49	39	67	33
30/04/2017 14:00	44	37	64	32
30/04/2017 14:30	46	37	71	33
30/04/2017 15:00	44	37	64	32
30/04/2017 15:30	48	41	71	35
30/04/2017 16:00	53	38	74	34
30/04/2017 16:30	50	42	70	38
30/04/2017 17:00	47	40	67	34
30/04/2017 17:30	43	36	61	33
30/04/2017 18:00	47	39	69	34
30/04/2017 18:30	47	36	66	32
30/04/2017 19:00	54	38	74	31
30/04/2017 19:30	49	36	71	31
30/04/2017 20:00	44	33	61	28
30/04/2017 20:30	43	31	65	27
30/04/2017 21:00	44	29	69	26
30/04/2017 21:30	48	25	68	22
30/04/2017 22:00	26	22	46	20
30/04/2017 22:30	38	22	72	20
Average	48	38	67	33
Sunday night 11 pm to 7 am				
30/04/2017 23:00	29	23	61	21
30/04/2017 23:30	25	23	38	21
01/05/2017	25	21	44	19
01/05/2017 00:30	28	24	36	21
01/05/2017 01:00	29	23	38	20
01/05/2017 01:30	29	24	38	21
01/05/2017 02:00	21	18	33	17
01/05/2017 02:30	24	20	39	18
01/05/2017 03:00	25	20	44	18
01/05/2017 03:30	23	19	37	18
01/05/2017 04:00	26	18	61	17
01/05/2017 04:30	26	19	39	18
01/05/2017 05:00	57	27	84	22
01/05/2017 05:30	46	37	72	31
01/05/2017 06:00	41	33	65	28
01/05/2017 06:30	45	34	66	29
Average	31	24	50	21
Bank Holiday Monday 7 am to 7 pm				
01/05/2017 07:00	45	36	64	32
01/05/2017 07:30	46	35	69	30
01/05/2017 08:00	42	35	66	30

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
01/05/2017 08:30	45	34	61	29
01/05/2017 09:00	51	33	78	28
01/05/2017 09:30	43	32	63	27
01/05/2017 10:00	43	33	60	28
01/05/2017 10:30	46	32	67	28
01/05/2017 11:00	40	33	59	30
01/05/2017 11:30	44	32	72	28
01/05/2017 12:00	53	33	87	30
01/05/2017 12:30	43	32	68	30
01/05/2017 13:00	40	33	63	30
01/05/2017 13:30	46	32	65	28
01/05/2017 14:00	45	33	68	30
01/05/2017 14:30	49	32	74	29
01/05/2017 15:00	42	33	64	29
01/05/2017 15:30	48	32	68	27
01/05/2017 16:00	40	29	62	26
01/05/2017 16:30	48	33	78	27
01/05/2017 17:00	43	33	64	28
01/05/2017 17:30	47	33	77	29
01/05/2017 18:00	38	33	61	29
01/05/2017 18:30	44	32	67	28
Average	45	33	68	29
Bank Holiday Monday evening 7 pm to 11 pm				
01/05/2017 19:00	50	31	74	26
01/05/2017 19:30	43	31	61	27
01/05/2017 20:00	42	33	69	29
01/05/2017 20:30	46	34	64	29
01/05/2017 21:00	41	34	66	29
01/05/2017 21:30	46	30	69	27
01/05/2017 22:00	41	27	72	25
01/05/2017 22:30	30	23	51	20
Average	42	30	66	27
Bank Holiday Monday night 11 pm to 7 am				
01/05/2017 23:00	23	20	40	19
01/05/2017 23:30	34	20	55	18
02/05/2017	24	21	40	19
02/05/2017 00:30	29	20	52	19
02/05/2017 01:00	40	22	67	20
02/05/2017 01:30	30	20	52	18
02/05/2017 02:00	23	20	42	19
02/05/2017 02:30	22	20	43	19
02/05/2017 03:00	25	21	51	18
02/05/2017 03:30	29	20	54	19
02/05/2017 04:00	34	20	56	18
02/05/2017 04:30	28	22	48	19
02/05/2017 05:00	54	34	83	29
02/05/2017 05:30	48	36	72	31
02/05/2017 06:00	46	35	68	30
02/05/2017 06:30	43	36	75	30
Average	33	24	56	22
Tuesday 7 am to 11 am				
02/05/2017 07:00	46	36	71	32

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
02/05/2017 07:30	49	37	75	33
02/05/2017 08:00	44	36	73	32
02/05/2017 08:30	45	35	77	31
02/05/2017 09:00	44	32	68	28
02/05/2017 09:30	45	32	71	28
02/05/2017 10:00	45	32	66	28
02/05/2017 10:30	46	32	65	28
02/05/2017 11:00	50	31	66	29
Average	46	34	70	30

The results were then evaluated against the criteria for an area of low background noise (see Table 1), whether or not the existing background noise measurements meet the criteria is provided in Table 4.

Table 4: Determination of Low Background Noise Area near Mountphilips substation locations

Time Period 28th April to 2nd May	Average Background Noise Level LA dB	Low Background Noise Criteria	Do the results meet the screening criteria for a Low Background Noise Area? Yes/No, and Comments
Friday	33	≤40	Yes, meets Low Background Noise Area Criteria
Friday Evening	33	≤35	Yes, meets Low Background Noise Area Criteria
Friday Night	32	≤30	No, does not meet Low Background Noise Area criteria. Windy Weather increasing noise levels.
Saturday	44	≤40	No, does not meet Low Background Noise Area criteria. Windy Weather increasing noise levels.
Saturday Evening	41	≤35	No, does not meet Low Background Noise Area criteria. Windy Weather increasing noise levels.
Saturday Night	41	≤30	No, does not meet Low Background Noise Area criteria.
Sunday	40	≤40	No, does not meet Low Background Noise Area criteria. Windy Weather increasing noise levels.
Sunday Evening	38	≤35	No, does not meet Low Background Noise Area criteria.
Sunday Night	24	≤30	Yes, meets Low Background Noise Area Criteria
Monday	33	≤40	Yes, meets Low Background Noise Area Criteria
Monday Evening	30	≤35	Yes, meets Low Background Noise Area Criteria
Monday Night	24	≤30	Yes, meets Low Background Noise Area Criteria
Tuesday	24	≤40	Yes, meets Low Background Noise Area Criteria

The results show, when averaged for each of the day, evening and night time periods that the noise monitoring location can be considered an area of low background noise, during calm weather at least.

As per the EPA NG4 Guidance Notes, where all three of the criteria for Low Background Noise Areas are met (See Table 2 and 3), then those locations are deemed to be in areas of low background noise, and the reduced noise limits, detailed in Table 5, are applicable to the operational Mountphilips Substation.

Table 5: Low Background Noise - Limit Criteria at Nearest Dwelling (EPA NG 4)

Scenario	Daytime Noise Limit, dB (LAr, T) (07:00 to 19:00hrs)	Evening Noise Limit, dB (LAr, T) (19:00 to 23:00hrs)	Night Noise Limit dB (LAr, T) (23:00 to 07:00hrs)
Area of Low Background Noise	45dB	40 dB	35dB

A12.2.3 Mountphilips 110kV Substation Noise Emissions


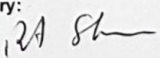
In order to determine the noise emissions from the operational Mountphilips Substation, a noise measurement was taken from a representative substation, in Kerry. The representative substation was considered a worst case scenario and was of similar size and scale to the proposed Mountphilips Substation.

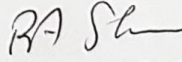
A noise level of 60 dB(A) was measured at a distance of 5m from the representative substation. Using the inverse square law rule, which means a 6 dB decrease in noise levels per doubling of distance from a point source, as per:

- 60 dB at 5 m distance
- 54 dB at – 10 m distance
- 48 dB at – 20 m distance
- 42 dB at – 40 m distance
- 36 dB at – 80 m distance
- 30 dB at – 160 m distance
- 24 dB at – 320 m distance
- 18 dB at – 640 m distance

Worse case noise emission levels from the operational substation, at the closest house (which is 385m distance) will be 22dB, and will be well below EPA noise limit criteria for areas of low background noise and most likely will also be below the existing background noise levels.

Sound Meter – Serial Number & Calibration Certificate

CERTIFICATE OF CALIBRATION					
Issued by: Telephone: +44 (0)1642 876 410	Laboratory address: Please note delivery address below	MTS Calibration Ltd. 17 Elvington Close Billingham TS23 3YS England			
Date of Issue: 05 July 2017	Certificate Number: 30463U	0607			
Sound Calibrator					
Client: Environmental Measurements Unit 12, Tallaght Business Centre Whitestown Business Park Co. Dublin 24, Ireland					
Brüel & Kjær		Model 4231	Serial Number 2665058		
A Reference Calibrator, calibrated by a National Standards Laboratory, was used to establish the sensitivity of the measurement chain. The same measurement chain is then used to determine the output level of the Object Calibrator by the difference between its output and that of the nominated Reference Calibrator. Four independent measurements of the third-octave band sound pressure levels produced by the Reference Calibrators and the Object Calibrator are averaged to minimise uncertainties of the calibration. The measurement chain consists of a calibrated, Reference Microphone, Reference Pre-amplifier and Reference Analyser.					
As well as providing a traceable measurement of the sound pressure level in the cavity of the Object Calibrator, the Calibrator's frequency and total harmonic distortion are also measured. Frequency is determined from the average of four independent measurements using a multimeter with a current UKAS-accredited calibration. The total harmonic distortion is measured from the average of three independent measurements by third octave analysis, subtracting the level of the fundamental frequency from the sum of the combined harmonics in the frequency band to 20kHz. The complete procedure is detailed in the MTS Calibration Ltd work procedure WPO1.					
The sound pressure level generated by the calibrator in its WS2 configuration was measured by reference to B&K Model 4133 Microphone and reference Sound Calibrator as shown in the Test Equipment section below.					
The measured values were:					
Output Level 1:	94.04	dB re 20µPa	+/- 0.16 dB (k= 2.00)		
Fundamental Frequency 1:	999.96	Hz	+/- 0.11 Hz (k= 2.00)		
Total Harmonic Distortion 1:	0.581	%	+/- 0.015 % (k= 2.00)		
Output Level 2:	114.11	dB re 20µPa	+/- 0.19 dB (k= 2.05)		
Fundamental Frequency 2:	999.97	Hz	+/- 0.11 Hz (k= 2.00)		
Total Harmonic Distortion 2:	0.393	%	+/- 0.015 % (k= 2.00)		
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k (individually calculated as above), providing a coverage probability of approximately 95%. The uncertainty evaluation has been calculated in accordance with the current version of UKAS publication M3003. The uncertainty quoted for the Distortion Measurement is the Distortion Percentage as measured, multiplied by our Uncertainty as calculated for the individual measurement or our BMC, whichever is the larger.					
Measurement Conditions:					
Temperature	24	°C	± 1 °C		
Atmospheric Pressure	1019	mBar	± 2 mBar		
Relative Humidity	45	%	± 5 %		
This measurement is valid only for the above device configured for calibration of a WS-2 microphone under the above environmental conditions. For deviation of prevailing conditions, the manufacturer's literature for the calibrator should be referred to.					
Test Equipment:					
Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Calibration Due
Reference Calibrator	Brüel & Kjær	4231	2343058	TE 133	Aug-19
Multimeter	Agilent	34401A	US36106159	TE 202	Sep-17
Signal Generator (set 2)	Agilent	33120A	MY40007806	TE 160	Sep-17
Real-Time Analyser (set 1)	Larson Davis	2900	0492	TE 108	Nov-17
Date of Receipt:	30 June 2017		Approved Signatory:		
Date of Measurement:	05 July 2017				
Page 1 of 1		Tony Sherris			
This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards and to units of measurement realised at a recognised national standards laboratories. This Certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.					
PLEASE SEND ALL DELIVERIES TO: MTS Calibration Ltd					
<small>Company Registration Number: 06588525 England and Wales</small>					
The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG, England					
<small>Telephone: 0044 1642 876410 E-Mail: dmarsh@slmcal.co.uk or tsherris@slmcal.co.uk http://www.slmcal.co.uk</small>					

CERTIFICATE OF CALIBRATION					
Issued by: MTS Calibration Ltd					
Telephone: +44 (0)1642 876 410		Laboratory address: 17 Elvington Close Billingham TS23 3YS England			
Please note delivery address below					
Date of Issue: 28 June 2017	Certificate Number: 30446				
Sound Level Meter Periodic Tests to BS EN 61672-3: 2006 Class 1					
Client:	Environmental Measurements on behalf of Malachy Walsh Unit 12, Tallaght Business Centre Whitestown Business Park Co.Dublin 24, Ireland				
Instrument Make:	Brüel & Kjær	Microphone Make:	Brüel & Kjær		
Instrument Model:	2250	Microphone Model:	4950		
Serial Number:	2654709	Serial Number:	1657422		
Preamplifier Make:	Brüel & Kjær	Calibrator Make:	Brüel & Kjær		
Preamplifier Model:	ZC0032	Calibrator Model:	4231		
Serial Number:	10489	Calibrator Serial Number:	2343058		
		Calibrator Adaptor:	UC0210		
		Calibrator Certification Ref:	S6718		
Other Accessories supplied:	none				
<p>MTS Calibration Ltd has obtained evidence which is generally available to the public that an independent testing organisation responsible for pattern approvals has demonstrated that this model of sound level meter has successfully completed the pattern evaluation tests of IEC 61672-2: 2003. This instrument, which was constructed to the requirements of BS EN 61672-1:2002 Class 1, has been tested using the procedures for periodic testing as specified in BS EN 61672-3: 2006.</p> <p>The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3: 2006 for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1: 2002, the sound level meter submitted for testing conforms to the Class 1 requirements of IEC 61672-1: 2002</p>					
In conducting these measurements, it was necessary to use manufacturer's data. This was taken from the instruction manual of the instrument.		BE 1712-16			
The instrument was within the above specification as received - no modifications were made					
Ambient Temperature at Calibration (deg C ± 1)	23.9	Calibration check frequency (Hz)	1000.0		
Ambient Pressure at Calibration (mPa ± 2)	1000.4	Reference Sound Pressure Level (dBA)	94.0		
Ambient Relative Humidity at Calibration (% ± 5)	50.05	Reference Level Range dB	Single Range		
Test Equipment:					
Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Cal. Due
Condenser Microphone	Larson Davis	2541	7300	TE 157	Oct-17
Acoustic Calibrator 1kHz	Brüel & Kjær	4231	2343058	TE 132	Aug-19
Acoustic Calibrator	Brüel & Kjær	4226	2141963	TE 206	Oct-17
Signal Generator (set 2)	Agilent	33120A	MY40007806	TE 160	Sep-17
Real-Time Frequency Analyser (set 3)	Larson Davis	2900	0510	TE 165	Oct-17
Authorised signatory:					
Date of Receipt:	26 June 2017	Page: 1		 Tony Sherris	
Date of Periodic Test:	28 June 2017	of: 12			
Date of Certificate:	28 June 2017				
MTS Calibration Ltd					
The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG					
Telephone: 01642 876410 Fax: 01642 876411 E-Mail: dmarsh@slmcal.co.uk or tsherris@slmcal.co.uk					

Appendix to Chapter 12: Air

Appendix 12.3 Explanation and Modelling of Electromagnetic Fields

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

12 TABLE OF CONTENTS

A12.1	Explanation and Modelling of Electromagnetic fields	3
A12.3.1	Explanation of Electric Fields and Magnetic Fields.....	3
A12.3.2	Typical Electric and Magnetic Fields in Residential and Working Environments	4
A12.3.3	Criteria for Modelling Theoretical Worst-Case Effects.....	6
A12.3.4	Worst Case EMF emissions from the UWF Grid Connection	8
A12.3.5	Worst Case EMF emissions from the Upperchurch Windfarm.....	9
A12.3.6	Worst Case EMF emissions from the UWF Related Works	10
A12.3.7	Worst Case EMF emissions from Other Projects.....	10

A12.1 EXPLANATION AND MODELLING OF ELECTROMAGNETIC FIELDS

A12.3.1 Explanation of Electric Fields and Magnetic Fields

Electrical objects and anything connected to them produce two types of fields - electric fields and magnetic fields. The term "field" is used to describe the way an object influences its surrounding area. A temperature field, for example, surrounds a warm object, such as a space heater. EMF's surround any object that is generating, transmitting or using electricity, including appliances, wiring, office equipment, generators, batteries and any other electrical devices. EMFs are invisible and they cannot be felt or heard.

Electric fields occur as a result of the electric potential (or voltage) on these objects, and magnetic fields occur as a result of electric current flowing through these objects. Just like a temperature field, electric and magnetic fields can be measured and their levels depend on, among other things:

- Characteristics of the source of the field (voltage, current, cable configuration and formation); and
- Distance from the source of the field.

The Electric Field is measured in volts per metre (V/m) or (kV/m). Magnetic Fields are measured in microtesla (μT). Electric Fields and Magnetic Fields are highest closest to the source and their level reduces quickly with distance from the source. This is similar to the way that the heat from a candle or campfire weakens as you move farther away. Although ordinary objects do not block magnetic fields, electric fields can be easily blocked by objects such as trees and buildings.

All sources of EMF below 300 GHz in the electromagnetic spectrum (such as the subject development) are considered Non-ionizing Radiation, which means the EMF does not carry enough energy to remove an electron from its atomic structure.

A-12.3.1.1 Electromagnetic Fields in the Natural Environment

Both electric and magnetic fields occur naturally in our environment and even in our own bodies as part of the normal functioning of our cardiac and nervous systems. There is a natural electric field at the earth's surface that is created by electric charges in the upper atmosphere, also known as the ionosphere. During fair weather, these electric field levels vary between 100 and 150 volts per meter (V/m) over flat surfaces. During stormy weather, on the other hand, storm clouds often contain large quantities of electric charge, and the electric field may reach intensities up to 20,000 V/m over flat surfaces and can be considerably higher above hillocks or near the tops of objects such as trees. The Earth's magnetic field, which is due mainly to currents circulating in the outer layer of the Earth's core, extends from the Earth's core out into space. Its magnitude at the Earth's surface varies between about 30 μT (microTesla) at the equator and about 60 μT at the poles.

Such naturally occurring electric and magnetic fields do not change direction and are, therefore, referred to as static or direct current (DC) fields. Naturally occurring electric and magnetic fields differ from the extremely low frequency electromagnetic Fields (ELF-EMF) produced by the power system, which fluctuate at a fixed frequency and are referred to as alternating current (AC) fields. For this reason, the existing levels of naturally occurring static EMF fields are not taken into account in the UWF Grid Connection EIA Report.

A-12.3.1.2 Electromagnetic Fields in the Built Environment

In the built environment, man-made sources of EMF include the power system and communication networks. In Ireland, the AC electric and magnetic fields produced by the power system vary at a frequency of 50-Hertz (Hz) (i.e. the fields alternate direction and intensity back and forth 50 times each second). Electric and magnetic fields are produced in all residential and working environments as a result of nearby electrical wiring, appliances, power lines and telecommunication masts, among other things. A comparison of electric and magnetic fields from 110kV electrical power system infrastructure with the typical electric and magnetic fields emitted by common household appliances is included in Section A-12.3.2. In summary this comparison demonstrates that in many cases, residential electrical appliances and tools can generate higher magnetic and electric fields in their close proximity (30cm) than at either the fence of an 110kV substation compound or directly above 110kV underground cables.

In a recent study of homes in the UK, most of homes had average magnetic field levels in the range 0.2 μ T to 0.4 μ T which were attributed to low voltage sources (i.e., wiring, appliances, and distribution circuits) (Mastanyi et al, 2007). Electric field measurements in residential environments, average exposures were found to be less than 10 V/m (Bracken et al, 1990)

A12.3.2 Typical Electric and Magnetic Fields in Residential and Working Environments

Field measurements, carried out by CEI, of the electric fields and magnetic fields near 110kV substations and underground cables are shown below in Table 1 and Table 2.

Table 1 Electric Fields measured from electrical power system infrastructure

Electrical power system	0 meter distance ¹ (V/m)	30 meters distance (V/m)	100 meters distance (V/m)	ICNIRP Limit
110kV Substation	40	20	Less than 1	5000 V/m
110kV Underground Cables ²	n/a	n/a	n/a	5000 V/m

Table 2 Magnetic Fields measured from electrical power system infrastructure

Electrical power system	0 meter distance (μ T)	30 meters distance (μ T)	100 meters distance (μ T)	ICNIRP Limit
110kV Substation	1	0.4	Less than 0.01	100 μ T
110kV Underground Cables ³	10 (See footnote 3)	Less than 0.1	Less than 0.05	100 μ T

Measurements of the typical electric and magnetic fields near domestic appliances are shown in Table 3 and Table 4 below.

Table 3 Typical Electric Fields Household Appliances

Electric appliance	Electric field strength (V/m) at 30cm	ICNIRP Limit
Stereo receiver	180	5000 V/m
Iron	120	5000 V/m
Refrigerator	120	5000 V/m
Mixer	100	5000 V/m
Toaster	80	5000 V/m
Hair dryer	80	5000 V/m
Colour TV	60	5000 V/m
Coffee machine	60	5000 V/m
Vacuum cleaner	50	5000 V/m
Electric oven	8	5000 V/m
Light bulb	5	5000 V/m

¹ A distance of 0 m corresponds to the central point above the underground cable, or at the substation fence.

² There is no electric field above ground level for underground cables, as the soil, earth materials and metallic sheath, which surrounds each cable, removes the potential for electric fields outside the cable.

³ Scaled to reflect similar level expected based on the maximum MVA load 155MW for the grid connection.

Table 4 Typical Magnetic Fields Household Appliances

Electric appliance	3 cm distance (μT)	30 cm distance (μT)	1 m distance (μT)	ICNIRP Limit
Hair dryer	6 – 2000	0.01 – 7	0.01 – 0.03	100μT
Electric shaver	15 – 1500	0.08 – 9	0.01 – 0.03	100μT
Vacuum cleaner	200 – 800	2 – 20	0.13 – 2	100μT
Fluorescent light	40 – 400	0.5 – 2	0.02 – 0.25	100μT
Microwave oven	73 – 200	4 – 8	0.25 – 0.6	100μT
Electric oven	1 – 50	0.15 – 0.5	0.01 – 0.04	100μT

The ICNIRP limit⁴ for EMF exposure for electric fields is 5000 V/m. As can be seen from Table 3, the typical exposure levels from common household appliances are below and in compliance with the ICNIRP limits in close proximity to the appliance. For example, an operational refrigerator can expose the user or resident to 120 V/m at a distance of 30cm from the appliance. Any exposure to electric fields at this level is typically for momentary or brief periods at any one time.

The ICNIRP limit⁵ for EMF exposure for magnetic fields is 100μT. Low voltage sources, such as home appliances, contribute significantly to our overall exposure to magnetic fields. In a recent study of homes in the UK, for example, 77% of homes had average magnetic field levels above 0.2 μT and 57% of homes had average magnetic field levels above 0.4 μT which were attributed to low voltage sources (i.e., wiring, appliances, and distribution circuits) (Mastanyi et al, 2007). The typical⁶ magnetic fields which people can be exposed to, at various distances from electrical equipment and appliances, in residential and public premises are presented in Table 4. As can be seen from Table 4, the use of a vacuum cleaner can expose the user to 200μT at a distance of 3cm and up to 20μT at a 30cm distance from the appliance.

While the comparison between operational 110kV substations or underground cables and domestic appliances provides valuable perspective, and indeed demonstrate that some common household appliances breaches the ICNIRP limit at very close proximity, it is limited by several differences between power lines and appliances. First, electric and magnetic fields are only associated with appliances for the duration that the appliance or tool is in use, while power lines are typically in service at all times. Furthermore, the field levels from appliances drop off at a faster rate with distance, compared to electricity transmission networks.

⁴ <http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf>

⁵ <http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf>

⁶ Source: <http://www.who.int/peh-emf/about/WhatIsEMF/en/index3.html>

A12.3.3 Criteria for Modelling Theoretical Worst-Case Effects

In order to categorically demonstrate that the maximum possible power load of the electric cables and equipment associated with the UWF Grid Connection, and associated with the Other Elements - UWF Related Works and the Upperchurch Windfarm, will comply with the EU EMF Exposure Recommendations and the ICNIRP limits, the theoretical worst-case contribution of the various electrical plant to EMF levels in the environment is evaluated in this report. The worst-case levels of EMF have been modeled using the criteria outlined in Table 5, the results of the modelling are summarized in Table 6.

Table 5 Criteria for modelling theoretical worst-case effects

Whole UWF Project Element	Worse-Case Scenario Criteria
UWF GRID CONNECTION	
Mountphilips Substation	The closest piece of electrical apparatus from the Substation Compound perimeter fence is 5m. The worst case scenario EMF from the equipment in the compound is modelled from the perimeter fence, and is referred to throughout this report as the measurement of EMF at '0 meters'
End Masts Underground Cables	EMF from the underground 110kV cables which will loop the Mountphilips 110kV Substation onto the existing OHL, via the 2 No. End Masts, was modelled using: an electrical current of 1149 Amps based on the maximum possible power load, which is the winter power load of 219 MVA and 120 kV maximum voltage variation as specified by EirGrid.
Mountphilips – Upperchurch 110kV Underground Cables (UWF Grid Connection)	The maximum capacity possible of the electricity which the 110kV Mountphilips – Upperchurch UWF Grid Connection will be capable of delivering – i.e. 155 MW, and the associated electrical current of 856 Amps. It should be noted that this is the maximum possible power load for the electrical cables and has been modelled to demonstrate categorically compliance with the EU EMF Exposure recommendation. The configuration of the cable design is the worst case flat configuration where the cable passes over existing services, which is a flat formation cable design (rather than trefoil formation), and therefore less cancelation of magnetic fields between cables. The minimum distance between the cables and the ground surface using this flat formation – i.e. 0.45m.
UWF RELATED WORKS	
Internal Windfarm Cables	The maximum capacity possible of the electricity which a 33kV wind turbine cable will be capable of delivering – i.e. 32 MW, and the associated electrical current of 280 Amps. And at the Consent Windfarm Substation there are two cable sets routed adjacent to each other, into the Substation, with a combined maximum of 64MW. It should be noted that this is the maximum possible power load for the electrical cables and has been modelled to demonstrate categorically compliance with the EU EMF Exposure Recommendation. The configuration of the cable design is the trefoil configuration. The minimum distance between the cables and the ground surface using this flat formation – i.e. 0.8m.
UPPERCHURCH WINDFARM	
Consented UWF Substation	The closest piece of electrical apparatus from the Substation Compound perimeter fence is 5m. The worst case scenario EMF from the equipment in the compound is modelled from the perimeter fence, and is referred to throughout this report as the measurement of EMF at '0 meters'
Consented UWF Turbines	The closest distance of a member of the public to electrical parts – i.e. at ground level, right beside the turbines (0m distance)

The results of this modelling (see Table 5 and Sections A-12.3.4 to A-12.3.7) demonstrate that the electric field and magnetic field emissions from the Mountphilips 110kV Substation, 110kV UWF Grid Connection, Consented UWF Turbines, Internal Windfarm Cable and Consented UWF Substation will be at a level **substantially less the ICNIRP limit of 5000 V/m and 100µT respectively**. Furthermore, the magnetic field levels will rapidly dissipate with increasing distance from the source.

A-12.3.3.1 Summary of Modelling Results

Table 6 Summary of Worst-case Scenario EMF Modelling Results

Whole UWF Project Elements	Electric Fields	Magnetic Fields
Mountphilips 110kV Substation	Electric fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the worst-case EMF from the substation are expected to be 40 V/m .	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the worst-case EMF from the substation are expected to be 1µT
Mountphilips Upperchurch 110kV UWF Grid Connection (UWF GC)	The electric fields generated by the underground cables will be <i>completely screened</i> by the earth materials such as soil and a metallic sheath which will surround each cable, and no electric fields will be emitted above ground.	Directly above the <u>UWF Grid Connection</u> , the maximum possible level of the magnetic fields, generated by the underground cables, will be 54 µT
Consented UWF Turbines	The electric field generated by the transformer, generator and cables are screened internally by the housing over the generator, and by the steel turbine tower. The turbine's transformer and generator are also at a substantial height above ground level and will not contribute to the ambient electric field levels .	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include turbine housings and steelwork. The turbine and transformer are also at a substantial height about ground level. Right beside the turbine, worst case EMF are expected to be 0.2µT⁷
Internal Windfarm Cables	The electric fields generated by the underground cables will be <i>completely screened</i> by the earth materials such as soil and a metallic sheath which will surround each cable, and no electric fields will be emitted above ground.	Directly above the Internal Windfarm Cables, the maximum level of the magnetic fields, generated by the underground cables, will be 7.6µT
Consented UWF Substation	Electric fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the worst-case EMF from the substation are expected to be 40 V/m .	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the worst-case EMF from the substation are expected to be 1µT .

A12.3.4 Worst Case EMF emissions from the UWF Grid Connection

The electric fields and magnetic fields were modelled, at various distances from electrical plant, using worst-case scenario criteria outlined in Table 5. The results of the modelling in relation to the 110kV Mountphilips Substation, Cables on End Masts and the 110kV UWF Grid Connection are presented in Table 7 (electric fields) and Table 8 (magnetic fields), and Plate 2.

Table 7 Contribution to ambient electric fields (worst case scenario) by the UWF Grid Connection

UWF Grid Connection	Distance from operational electrical apparatus or cables (m)	Existing Ambient Electric Fields (V/m) ⁸	Worst Case Electric Field Contribution from the UWF Grid Connection (V/m)	Predicted Worst Case Ambient Electric Field levels during the operation stage (V/m) ⁹	ICNIRP Guideline Limit (V/m)
Substation Compound	0m	less than 1	40	41	5000
Substation Compound	30m	less than 10	20	30	5000
Substation Compound	100m	less than 20	less than 1	21	5000
Cables on End Masts	0m	less than 20	1,040	1060	5000
Cables on End Masts	30m	less than 50	50	100	5000
Cables on End Masts	100m	less than 100	less than 10	110	5000
Mountphilips to Upperchurch 110kV GC	0m	less than 1	None	No increase	5000
Mountphilips to Upperchurch 110kV GC	30m	less than 1	None	No increase	5000
Mountphilips to Upperchurch 110kV GC	100m	less than 1	None	No increase	5000

Table 8 Contribution to ambient magnetic fields (worst case scenario) by the UWF Grid Connection

UWF Grid Connection	Distance from operational electrical apparatus or cables (m)	Existing Ambient Magnetic Fields (μT) ¹⁰	Worst Case EMF Contribution from the UWF Grid Connection (μT)	Predicted Worst Case Ambient EMF levels during the operation stage (μT)	ICNIRP Guideline Limit (μT)
Substation Compound	0m	0.05	1	1.05	100
Substation Compound	30m	0.02	0.4	0.42	100
Substation Compound	100m	0.07	0.16	0.23	100
Cables on End Masts	0m	0.01	35	35.01	100
Cables on End Masts	30m	0.04	1.3	1.34	100
Cables on End Masts	100m	0.1	0.1	0.2	100
Mountphilips to Upperchurch 110kV GC	0m	0.2	54	54.2	100
Mountphilips to Upperchurch 110kV GC	30m	0.2	0.13	0.33	100
Mountphilips to Upperchurch 110kV GC	100m	0.2	0.01	0.21	100

⁸ Assumption: Information based on distances approaching the existing 110 kV OHL to the west of the proposed substation

⁹ Assumption: Electric fields are cumulative which is unlikely

¹⁰ Assumption: Information based on distances approaching the existing 110 kV OHL to the west of the proposed substation

A12.3.5 Worst Case EMF emissions from the Upperchurch Windfarm

In order to facilitate a cumulative evaluation of the Whole UWF Project, the electric fields and magnetic fields were modelled, at various distances from Upperchurch Windfarm electrical plant, using worst-case scenario criteria outlined in Table 5. The results of the modelling in relation to the Consented UWF Substation and the Consented UWF Turbines are presented in Table 9 (electric fields) and Table 10 (magnetic fields).

Table 9: Contribution to ambient electric fields (worst case scenario) by the Upperchurch Windfarm

Upperchurch Windfarm part	Distance from operational electrical apparatus or cables (m)	Existing Ambient Electric Fields (V/m)	Worst Case Electric Field Contribution from the Upperchurch Windfarm (V/m) ¹¹	Predicted Worst Case Ambient Electric Field levels during the operation stage (V/m)	ICNIRP Guideline Limit (V/m)
Consented UWF Substation (compound)	0m	less than 1	40	41	5000
Consented UWF Substation (compound)	30m	less than 10	20	30	5000
Consented UWF Substation (compound)	100m	less than 20	less than 1	21	5000
Consented UWF Turbines	0m	less than 1	none	less than 1	5000
Consented UWF Turbines	30m	less than 1	none	less than 1	5000
Consented UWF Turbines	100m	less than 1	none	less than 1	5000

Table 10 Contribution to ambient magnetic fields (worst case scenario) by the Upperchurch Windfarm

Upperchurch Windfarm part	Distance from operational electrical apparatus or cables (m)	Existing Ambient Magnetic Fields (μT)	Worst Case EMF Contribution from the Upperchurch Windfarm (μT) ¹²	Predicted Worst Case Ambient EMF levels during the operation stage (μT)	ICNIRP Guideline Limit (μT)
Consented UWF Substation (compound)	0m	0.05	1	1.05	100
Consented UWF Substation (compound)	30m	0.02	0.4	0.42	100
Consented UWF Substation (compound)	100m	0.07	0.16	0.23	100
Consented UWF Turbines	0m	0.2	0.2	0.4	100
Consented UWF Turbines	30m	0.2	0.07	0.27	100
Consented UWF Turbines	100m	0.2	0.07	0.27	100

¹¹ The electric field generated by turbine’s transformer and generator are screened by the housing so will not contribute to the ambient electric field levels.

¹² Scaled to reflect similar level expected based on the expected MVA load from the Consented UWF Turbines.

A12.3.6 Worst Case EMF emissions from the UWF Related Works

The electric fields and magnetic fields were modelled, at various distances from UWF Related Works electrical plant, using worst-case scenario criteria outlined in Table 5. The results of the modelling in relation to the Internal Windfarm Cabling are presented in Table 11 (electric fields) and Table 12 (magnetic fields).

Table 11 Contribution to ambient electric fields (worst case scenario) by the UWF Related Works

UWF Related Works Relevant Electrical Plant	Distance from operational electrical apparatus or cables (m)	Existing Ambient Electric Fields (V/m)	Worst Case Electric Field Contribution from the Internal Windfarm Cabling (V/m)	Predicted Worst Case Ambient Electric Field levels during the operation stage (V/m)	ICNIRP Guideline Limit (V/m)
Internal Windfarm Cabling	0m	less than 1	None	No increase	5000
Internal Windfarm Cabling	30m	less than 1	None	No increase	5000
Internal Windfarm Cabling	100m	less than 1	None	No increase	5000

Table 12 Contribution to ambient magnetic fields (worst case scenario) by the UWF Related Works

UWF Related Works Relevant Electrical Plant	Distance from operational electrical apparatus or cables (m)	Existing Ambient Magnetic Fields (μT)	Worst Case EMF Contribution from the Internal Windfarm Cabling (μT)	Predicted Worst Case Ambient EMF levels during the operation stage (μT)	ICNIRP Guideline Limit (μT)
Internal Windfarm Cabling	0m	0.2	7.6	7.8	100
Internal Windfarm Cabling	30m	0.2	0.03	0.23	100
Internal Windfarm Cabling	100m	0.2	0.003	0.203	100

A12.3.7 Worst Case EMF emissions from Other Projects

In order to facilitate a cumulative assessment of the UWF Grid Connection with Other UWF Projects/Activities in the area, the existing Killonan to Nenagh 110kV Overhead Line, the Shannonbridge to Killonan 220kV Overhead Line and the potential Castlewaller Windfarm grid connection (underground cable) .

The worst case scenario electric fields and worst case magnetic fields associated with these three projects are illustrated on Plates 3 - 6 below.

A-12.3.7.1 Worst Case EMF emissions from Killonnan – Nenagh 110kV Overhead Line

Worst Case Magnetic Fields - Killonnan – Nenagh 110kV Overhead Line:

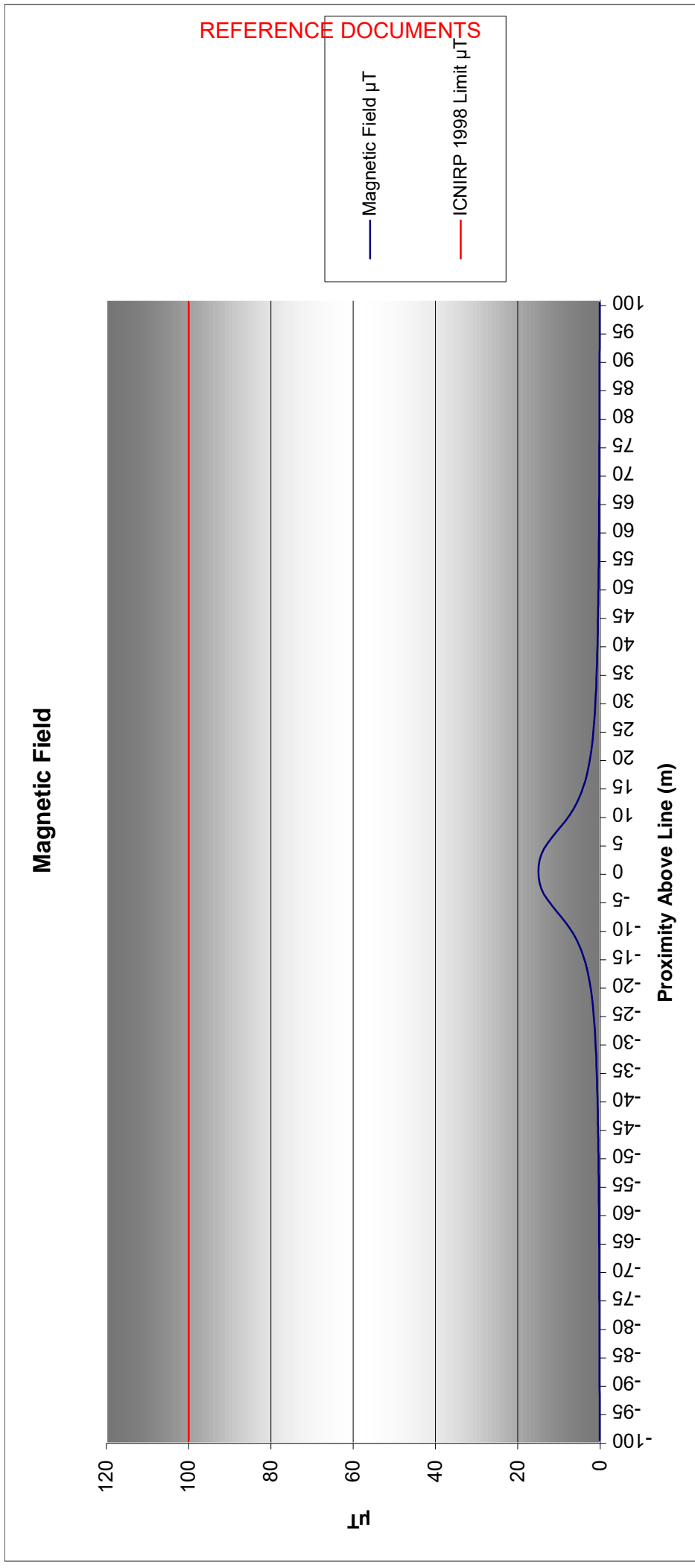


Plate 1: Maximum Possible Magnetic Field from the 110 kV OHL Cables (modelled at 127 MW)

Worst Case Electric Fields - Killonnan – Nenagh 110kV Overhead Line:

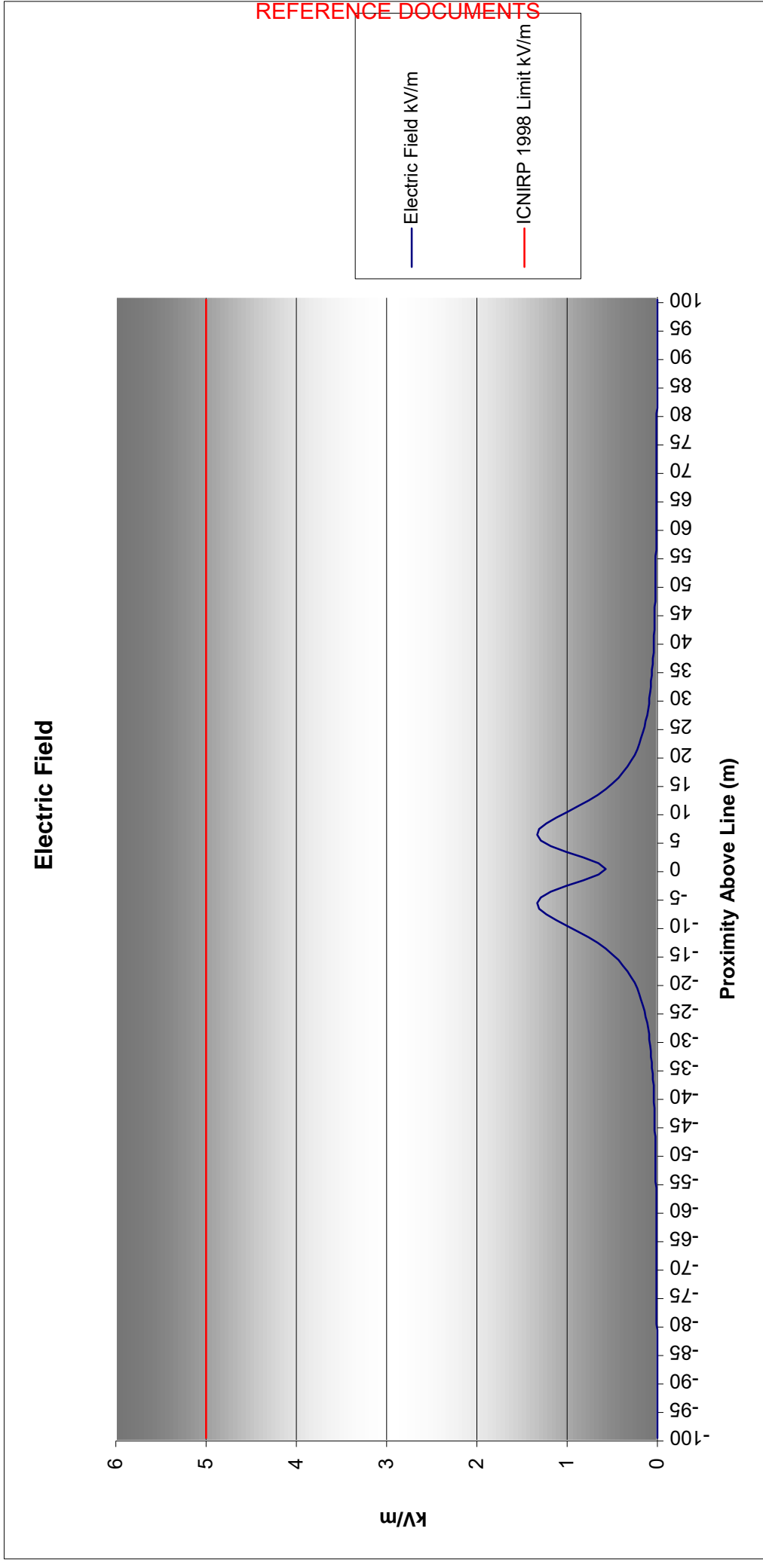


Plate 2: Maximum Possible Electric Field from the 110 kV OHL Cables (modelled at 127 MW)

A-12.3.7.2 Worst Case EMF emissions from Shannonbridge to Killonan 220kV Overhead Line
Worst Case Magnetic Fields - Shannonbridge to Killonan 220kV Overhead Line:

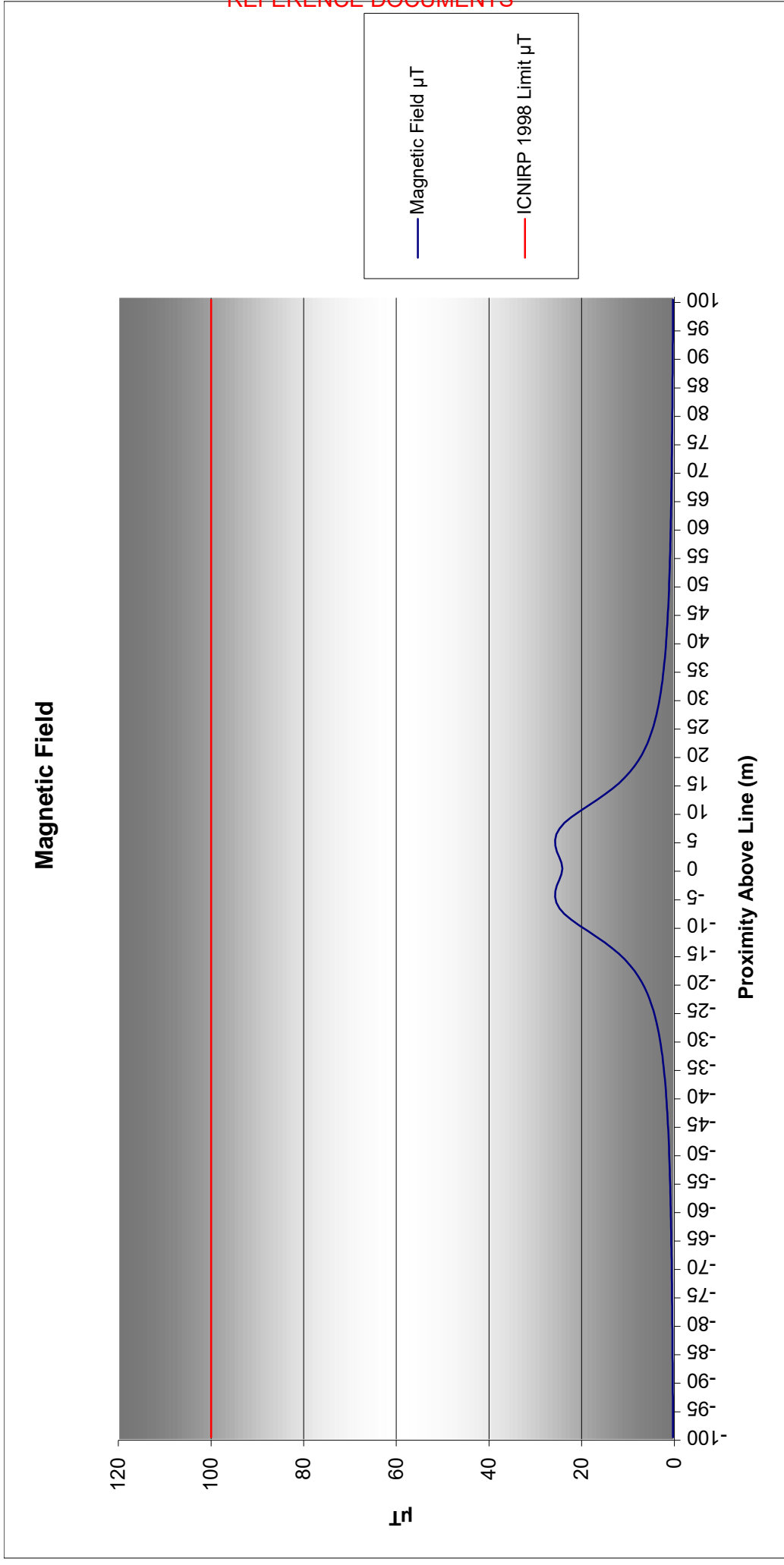


Plate 3: Maximum Possible Magnetic Field from the 220 kV OHL Cables (modelled at 376 MW)

Worst Case Electric Fields - Shannonbridge to Killonan 220kV Overhead Line:

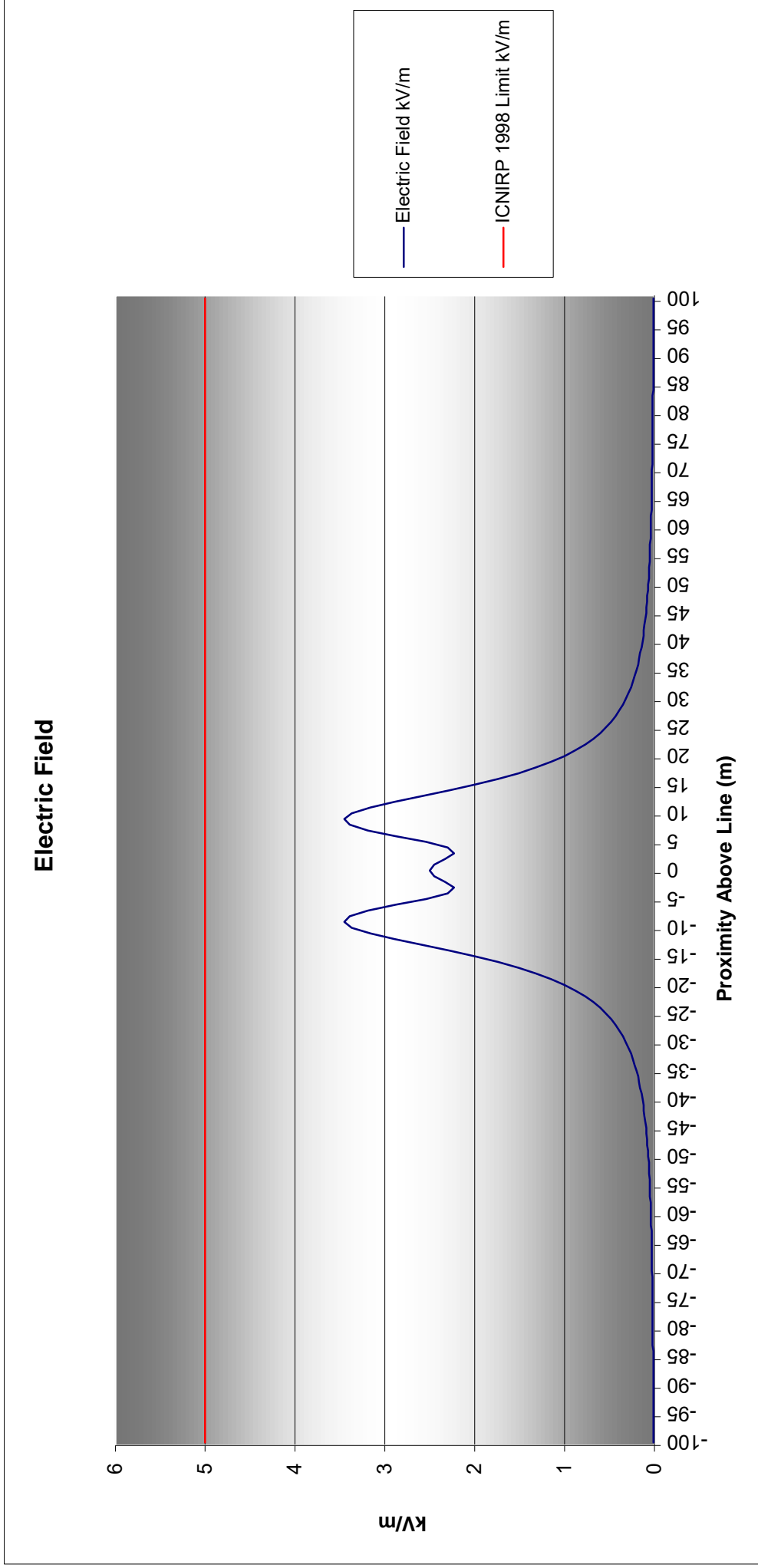


Plate 4: Maximum Possible Electric Field from the 220 kV OHL Cables (modelled at 376 MW)

A-12.3.7.3 Worst Case EMF emissions from the potential Castlewaller Windfarm grid connection (underground cable)

Worst Case Magnetic Fields - Potential Castlewaller Windfarm Grid Connection (underground cable):

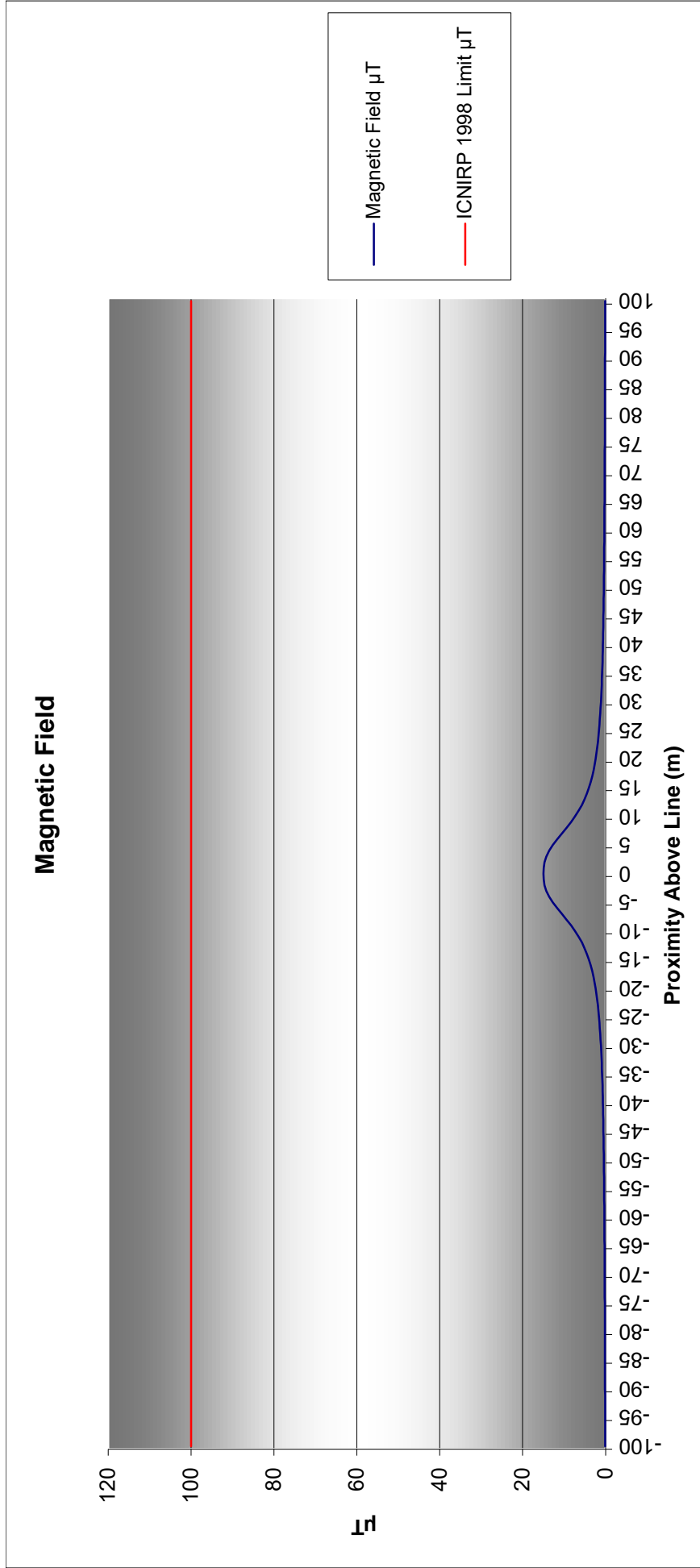


Plate 5: Maximum Possible Magnetic Field from the 110 kV Underground Cables (modelled at 40MW)

Worst Case Electric Fields - Potential Castlewaller Windfarm Grid Connection (underground cable):

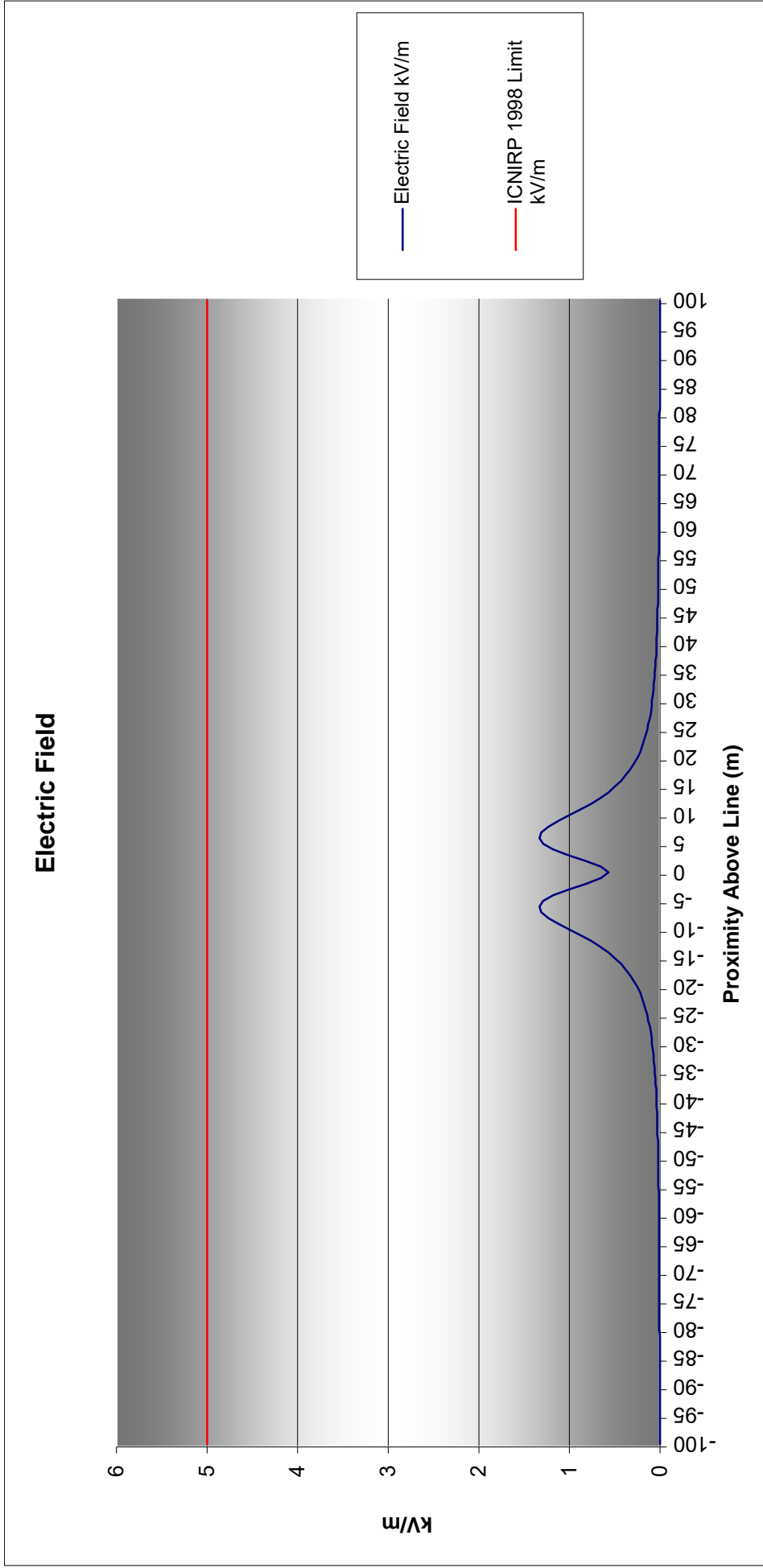


Plate 6: Maximum Possible Electric Field the 110 kV Underground Cables (modelled at 40MW)

Appendix to Chapter 13: Climate

There are no appendices associated with this topic chapter.

REFERENCE DOCUMENTS

Appendix to Chapter 14: Material Assets (Built Services)

There are no appendices associated with this topic chapter.

REFERENCE DOCUMENTS

Appendix to Chapter 15: Material Assets (Roads)

Appendix 15.1: Traffic and Transportation Assessment Report

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

TABLE OF CONTENTS

A15.1.1 Executive summary – (Non-Technical)..... 3

A15.1.2 Introduction to the Traffic & Transportation Assessment..... 4

A15.1.3 EXISTING CONDITIONS..... 4

A15.1.4 TRAFFIC FORECASTING 16

A15.1.5 DESCRIPTION OF THE INDIVIDUAL PROJECT ELEMENTS 17

A15.1.6 TRIP GENERATION, ASSIGNMENT & DISTRIBUTION 19

A15.1.7 IMPACT ASSESSMENT 20

A15.1.8 REQUIREMENT FOR MITIGATION MEASURES..... 26

A15.1.1 EXECUTIVE SUMMARY – (NON-TECHNICAL)

This Traffic & Transport Assessment Report assesses the cumulative impact of the subject development UWF Grid Connection, in addition to all other elements of the whole Upperchurch Windfarm Project.

The Whole UWF Project consists of a series of related supporting projects associated with the consented Upperchurch Windfarm (identified herein within Section A15.1.5). The whole project, when built, will involve the export of the renewable electricity generated at the permitted Upperchurch Windfarm to the national grid.

This report has been prepared in accordance with Transport Infrastructure Ireland's Traffic & Transportation Assessment Guidelines and addresses the worst case vehicular traffic impact of the Whole UWF Project, for both the construction and operational phases. The adequacy of the road network to safely and appropriately accommodate the worst-case Transportation demands of the development are addressed.

A comprehensive classified traffic survey (counts) of the road network in the vicinity of the projects was undertaken and this information, together with observation of the performance of the road network, forms the basis for this assessment. Traffic Data was collected using temporary Automatic Traffic Counters known as 'ATC tube counters', and these allowed full vehicle classification and traffic speeds to be measured and recorded.

The assessment included a photographic condition survey of the existing roads and associated affected structures. For UWF Grid Connection a Pavement Condition Survey was commissioned in order to determine the condition of the road. It is proposed to undertake another pavement condition survey following the works in order to confirm that no adverse impact has occurred. For UWF Related Works, Falling Weight Deflectometer (FWD) testing was carried out in order to determine the strength of the affected local roads.

The construction programme and plans prepared for the Whole UWF Project allowed the associated daily traffic volumes to be calculated. The worst case daily traffic associated with each element of the works was assigned to the roads in accordance with industry guidelines for an assumed commencement year of 2021. The impact of the traffic has been assessed and quantified.

The Report sets out the temporary and permanent traffic management measures which are to be put in place at the construction and operational access points in order to ensure the continued operation of the roads in a safe manner and without any impact upon capacity in order to ameliorate and minimise impact upon road users.

Based on our studies, we believe that, with some checks and balances in place in the form of temporary Traffic Management and road condition surveys, there will be no adverse traffic/transportation capacity or road safety issues associated with the construction or operation of the Whole UWF Project.

A15.1.2 INTRODUCTION TO THE TRAFFIC & TRANSPORTATION ASSESSMENT

This Traffic and Transportation Assessment has been written by David Tarrant, Ruairí Geary and Daithí Barrett with TLI Group. This Traffic and Transportation Assessment addresses the Traffic/Transportation and Construction/Operational Access issues arising from the development of the Whole UWF Project.

Evaluations contained within this Transportation Assessment are based upon site visits, observations of operational performance of the existing road network, a comprehensive classified interval movement and speed survey, a comprehensive Falling Weight Deflectometer (FWD) Test, a comprehensive Pavement Condition Survey and our experience in assessing and designing for developments of this nature.

The Report has been prepared following consultation with Tipperary County Council Roads Department and Transport Infrastructure Ireland. Further details on these consultations are included in Appendix 3.3 in Volume C4 of the EIA Report.

The Report has been prepared broadly in accordance the following information and industry accepted practices:

- Transport Infrastructure Ireland's (TII) Traffic and Transport Assessment Guidelines (2014)
- TII Design Manual for Roads and Bridges
- The Department for Transport Traffic Signs Manual (2010),
- TII Specification for the Reinstatement of Openings in National Roads (2013).
- Department of Transport, Tourism and Sport Guidelines for Managing Openings in Public Roads

A15.1.3 EXISTING CONDITIONS

The existing roads environment consists of a section of the Regional Road R503, along with a mix of local roads which are generally rural in nature and lightly trafficked and used for local residential access, forestry access and farming access purposes.

A15.1.3.1 ROADS

The affected roads include those subject to road works associated with cable laying or temporary road widening; roads with temporary or permanent site access points, and roads along the concentrated haulage routes.

All of these roads are 2-way roads, with the except of 3 local roads, with the trafficked pavement varying in width from 2.5 to 8.3m, with narrow verges, and are generally bounded by low level earthen embankments or hedgerows along either side.

The roads relevant to the UWF Grid Connection and the UWF Related Works elements of the Whole UWF Project are listed in Table 1, and identified on Figure GC 15.2 and Figure RW 15.2. The subject development figure is at Tab 15 of Volume C3: EIA Report Figures. The other element figures, i.e Figure RW 15.2, is in Volume F: Reference Documents to the Planning Application. These figures are also available on www.upperchurchwindfarmgridconnection.ie.

Any roads marked with an asterisk appear on both lists. It should also be noted that the roads associated with the UWF Related Works will also be used for access to the Consented Upperchurch Windfarm. The UWF Replacement Forestry entrance is located off the L2264-34, (also indicated on Figure RW 15.2, Reference Documents Volume F1).

Table 1: Roads affected by UWF Grid Connection and UWF Related Works

UWF Grid Connection	UWF Related Works
R503*	R503*
L2166-10	L4139-0
L6013-0	L4138-12
L2156-0	L4139-16
L2157-0	L6188-0*
L6009-0	L61881-0
L2264-50*	L2264-50*
L6188-0*	L6185-13
	L2264-34

A15.1.3.1.1 Road Pavements

The road pavements consist of traditional surface-dressed flexible pavement ('tar and chippings'), with narrow verges and road surface water drained to open drains, generally running along each of the roadsides.

Pavement Condition Survey: A Pavement Condition Survey typically comprises forward view Digital Video, IRI and PCI, or a combination of these. The ride quality (IRI) and digital video of a road network is assessed using a Video/Roughness survey vehicle. The ride quality of the road pavement is expressed in terms of IRI (International Roughness Index). The Video/Roughness vehicle takes a forward view video of the road surface using a broadcast quality high-definition video camera, and measures the ride quality of the road using two bump integrators located on the vehicle axle, for each 100 metres of roadway. The video and ride quality data are recorded using both chainage and GPS referenced coordinate systems by an on-board computer in the cab of the survey vehicle. The video record will show the condition of the road surface by chainage and can be viewed in digital format. The video recorded in the field for each road section can be post-processed in the office to produce the video Pavement Condition Index (VPCI). The PCI survey consists of identifying the type, severity and quantity of pavement distress for each 100 metre length of pavement from the video recorded. These distresses include defects such as bleeding, ravelling, patching, rutting, depressions, alligator cracking, potholes, edge break-up and road disintegration. The PCI rating, and the structural index and surface index based on distress type, are calculated for each 100 metres from the distress data collected. The Pavement Condition Survey for the UWF Grid Connection is included as Appendix 15.2.

Falling Weight Deflectometer (FWD) Testing: In order to accurately determine the load bearing capacity of the affected UWF Related Works local roads, a comprehensive FWD Test of the affected local road network was undertaken by specialist supplier, Milestone Pavement Technologies Ltd. The FWD is a non-destructive test which determines the load bearing capacity of a pavement structure. The FWD drops a known mass from a pre-defined height onto a loading plate. The load pulse generated is similar to the dynamic load pulse generated by a moving wheel of a heavy goods vehicle travelling at normal traffic speed. Measurements of the pavement deflection in response to the load provides information on the overall bearing capacity of the pavement. The extent of the testing and the results are included as Appendix 15.4.

In summary, the FWD testing shows that there is stiff to moderate subgrade support under the roads, and while the local road surfaces were observed during site investigations to be generally in good condition with few potholes, the FWD testing indicates that the pavements themselves are weak.

A15.1.3.1.2 Buried Structures

There are 65 No. buried structures located on the route of the 110kV UGC, 15 bridges and 50 concrete/stone culverts. 1 No. buried structure under the 2166-10 (1 culvert, W4), 2 No. buried structures (1 bridge and 1

culvert, W5 – W6) under the L6013-0, 1 No. buried structure (1 bridge, W7) under the L2156-0, 2 No. buried structures (2 bridges, W8 – W9) under the L6009-0, 52 No. buried structures (11 Bridge and 41 culvert, W10 – W61) under the R503, 3 No. buried structures (3 culverts, W62 – W64) under the L2264-50, 2 No. buried structures (2 culverts, W65 – W66) under the L6188-0 and 2 No. buried structures (2 culverts, W67 – W68) under the private paved road at Knockcurraghbola Commons. These structures were visually inspected by TLI Group (civil engineer) during site investigations. Photographs of these structures are included in Appendix 15.3.

At UWF Related Works locations, there are 3 No. buried structures under affected roads; concrete culverts routing storm water under the L6188-0 at WW31 and under the L4139-0 at WW12 and a square masonry culvert routing a small stream under the L6185-13 road at WW32. All three structures have been inspected by Wind Prospect Ireland (civil engineer) who found that the structures are in good condition and are not subject to vehicular weight restrictions, therefore it is considered that these structures will not be affected by either the 1m extension to the two concrete culverts or the additional construction traffic associated with the UWF Related Works and the Consented Upperchurch Windfarm.

A15.1.3.1.3 Current Weight Restrictions

There are no vehicle weight restrictions in place along any of the roads affected by the works. This provides a useful guide to the acceptability of the roads and buried structures and their adequacy to facilitate the movement of HGV vehicle types, subject to the normal legally allowable axle loading on Irish Roads.

A15.1.3.1.4 Road Boundaries

Road boundaries consist of a mix of hedgerows and simple mounded embankments, which are aligned beyond drainage channels that occur in many roadside verges.

A15.1.3.2 TRAFFIC

A15.1.3.2.1 Existing Traffic Volumes

7-day classified 'ATC Tube Counts' surveys were carried out at on each of the affected roads in order to establish background traffic conditions, in terms of volume and ambient speed. All vehicles recorded during the traffic survey are expressed in terms of "Passenger Car Units" (PCUs), sometimes referred to as "Car Equivalent". This is the methodology which has been employed here (with for example specific industry standard conversion factors to convert HGVs, Skip Lorries, Cars/Trailers and Bin Lorries to PCUs). The conversion factors used are in accordance with industry-standard recommendations.

The existing traffic conditions of the affected roads, as recorded during the surveys, are presented in Table 2 and Table 3. The Electoral Districts in which each of the affected roads are located, are also identified in the Table, for ease of reference to the CSO data in Table 4. In summary, it is clear from Tables 2 to 6, that the roads in the area are generally very lightly trafficked, reflecting the rural nature of the study area.

Table 2: Summary of Existing Traffic Conditions for the UWF Grid Connection

REFERENCE DOCUMENTS

APPENDIX 15.1: Traffic and Transportation Impact Assessment Report
 EIA 2019, Chapter 15: Material Assets (Road)

Traffic Locations	Count	Road ID	Electoral District	24Hr 2-Way AADT (PCUs)	% HGVs	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)
T1		L-2166-10	Kilcomenty	721	0.5%	94	66
T2		L6013-0	Kilcomenty	301	0.4%	35	27
T3		L2156-0	Kilnarath	1016	0.3%	97	108
T4		L2157-0	Kilnarath	967	0.7%	85	95
T5		L6009 at Castlewaller	Kilnarath	217	0.2%	31	21
T6		L6009 at Cooldrisla	Newport	407	0.7%	38	37
T7		R503 at Derryleigh	Newport	2046	0.9%	176	229
T8		R503 at Rear Cross	Abington	950	1.6%	80	110
T9		R503 at Knockmaroe	Foilynaman	709	1.9%	66	87
T10		L2264-50	Foilynaman	183	0.8%	19	23
T11		L6188-0	Foilynaman	76	0.6%	7	7

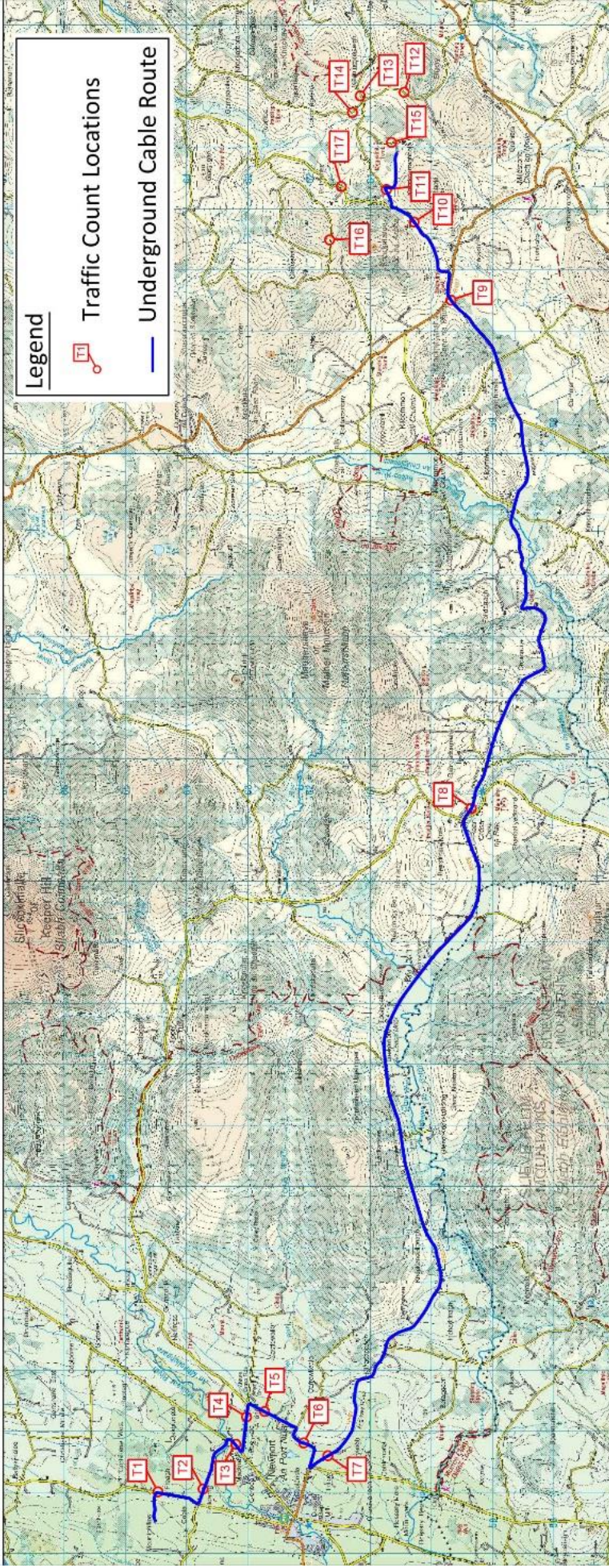
Table 3: Summary of Existing Traffic Conditions for the UWF Related Works

Traffic Locations	Count	Road ID	Electoral District	24Hr 2-Way AADT (PCUs)	% HGVs	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)
T9		R503 at Knockmaroe	Foilynaman	709	1.9%	66	87
T10		L2264-50	Foilynaman	183	0.8%	19	23
T11		L6188-0	Foilynaman	76	0.6%	7	7
T12		L4139-0	Foilynaman / Upperchurch	31	0.0%	5	2
T13		L4138-12	Foilynaman	92	0.0%	5	9
T14		L4139-16	Foilynaman	42	0.0%	4	2
T15		L61881-0	Foilynaman	17	0.0%	3	0
T16		L6185-13	Foilynaman	13	0.0%	0	1
T17		L2264-34	Foilynaman	147	0.7%	4	12

Survey results indicate that for UWF Related Works roads, on average 98.2% of traffic counted comprised cars or vans, 0.4% comprises heavy vehicles which would include buses, articulated and rigid trucks, and 1.4% comprises bicycles or motorcycles. Survey results indicate that for UWF Grid Connection roads, on average 98.6% of traffic counted comprised cars or vans, 0.9% comprises heavy vehicles which would include buses, articulated and rigid trucks, and 0.5% comprises bicycles or motorcycles.

The traffic count survey, in addition to observations during site investigations, confirms that the affected roads have low traffic volumes and are not congested roads.

Figure 1: Mapping showing Traffic Count Locations



A15.1.3.2.2 CSO Data

The POWSCAR 2016 Census, outlined in Table 4 and Table 5, shows a high usage of cars and a very low usage of bicycles and walking as modes of transport in the Electoral Districts associated with the UWF Related Works (Foilnaman and Upperchurch) and the UWF Grid Connection (Kilcomenty, Newport, Kilnarath, Killoscully, Abington, Foilnaman).

Table 4: Extract from CSO 2016 POWSCAR data – for both UWF Grid Connection and UWF Related Works.

	Kilcomenty	Newport	Killoscully	Kilnarath	Abington	Foilnaman (Related Works)	Upperchurch (Related Works)
POWSCAR 2016 - Theme 11 Commuting							
Commuting to Work							
On foot - Work	3	39	1	1	2	2	4
Bicycle - Work	0	7	0	0	0	0	0
Bus, minibus or coach - Work	2	11	2	0	4	0	0
Train, DART or LUAS - Work	0	1	1	0	1	1	1
Motorcycle or scooter - Work	0	2	0	1	0	1	0
Car driver - Work	232	868	158	113	158	88	86
Car passenger - Work	7	61	5	1	4	4	0
Van - Work	30	86	16	17	26	16	10
Other (incl. lorry) - Work	3	7	0	2	7	4	1
Work mainly at or from home - Work	22	42	19	12	26	21	27
Not stated - Work	5	30	8	6	6	4	11
Total – Commuting to Work	304	1154	210	153	234	141	140
Commuting to School or College							
On foot - School or college	15	189	0	2	14	5	4
Bicycle - School or college	0	3	0	1	0	0	0
Bus, minibus or coach - School or college	19	36	57	23	47	31	33
Train, DART or LUAS - School or college	1	0	0	0	0	0	2
Motorcycle or scooter - School or college	0	0	0	0	0	0	0
Car driver - School or college	14	39	7	5	9	2	4
Car passenger - School or college	150	473	53	41	61	39	21
Van - School or college	2	3	0	1	0	0	0
Other (incl. lorry) - School or college	0	0	0	0	0	0	0
Work mainly at or from home - School or college	4	0	0	0	0	0	0
Not stated - School or college	3	22	4	4	4	3	3
Total – Commuting to School or College	208	765	121	77	135	80	67
Total per Mode of Transport							

	Kilcomentry	Newport	Killoscully	Kilnarath	Abington	Foilnaman (Related Works)	Upperchurch (Related Works)
POWSCAR 2016 - Theme 11 Commuting							
On foot - Total	18	228	1	3	16	7	8
Bicycle - Total	0	10	0	1	0	0	0
Bus, minibus or coach - Total	21	47	59	23	51	31	33
Train, DART or LUAS - Total	1	1	1	0	1	1	3
Motorcycle or scooter - Total	0	2	0	1	0	1	0
Car driver - Total	246	907	165	118	167	90	90
Car passenger - Total	157	534	58	42	65	43	21
Van - Total	32	89	16	18	26	16	10
Other (incl. lorry) - Total	3	7	0	2	7	4	1
Work mainly at or from home - Total	26	42	19	12	26	21	27
Not stated - Total	8	52	12	10	10	7	14
Total per ED	512	1919	331	230	369	221	207

A15.1.3.2.3 Tourist/Walking/Cycling Routes

Both the R497 and the R503 are designated scenic routes in Tipperary North County Development Plan. The waymarked walking routes that exist in the area consist of the Slievefelim Way, Eamon a Chnoic Loop, Multeen Way, Kilcommon Pilgrim Walk and the Ormond Way walking route, (this walk is currently being developed). There is also a waymarked cycle route, the Ormond Way Cycle, part of which is routed along the L2264-50 and L2264-34 (locally called the Borrisoleigh Road) through Knockmaroe and Foilnaman. These walks and cycle route are identified on Figure GC 6.2 in Tab 6 of Volume C3 EIA Report Figures

All of these trails include public road sections to some degree; the Slievefelim Way is routed along the R503 for c. 1.3km just outside Rearcross village; part of the Ormond Way walking route (currently being developed) is along the L4139-0; and all of the Ormond Way Cycle route is along public roads, starting in Milestone and ending in Portumna.

Both the CSO data and the traffic count surveys show a very low usage of the road network by cyclists. A very low usage of the local roads by cyclists was recorded during 2017 traffic count surveys, with no cyclists recorded on half of the roads, and one or two trips on the vast majority of the remaining roads. The exception to this low usage was on the R503 in Newport where 54 cycle trips were recorded at one location and 36 cycle trips were recorded at a second location over separate 1 week periods in January 2019, which would correspond to the CSO data. There were also 2 groups of 4 cyclists, recorded on the L2264-34 and the eastern extent of the R503 in the study area during July 2017, the use of the L2264-34 road corresponds with it being a waymarked cycle route (Ormond Way Cycle). This road was surveyed again, for a one week period in November 2017, only one cyclist was recorded.

A15.1.3.3 Road Safety

A15.1.3.3.1 Recorded Traffic Speeds

The traffic data collected confirmed that the traffic speeds are generally maintained within the posted speed limits (i.e. less than 80kph which is generally the speed limit on the affected roads) – See Table 5 and Table 6.

Table 5: Summary of 85th percentile speeds at points along the UWF Grid Connection

Traffic Count Locations	Road ID	Entrance ID	85% ile Traffic Design Speed Km/Hr
T1	L-2166-10	UWF Grid Connection Site Entrance 1	84
T2	L6013-0	None	58.9
T3	L2156-0	None	59.6
T4	L2157-0	None	72.5
T5	L6009 at Castlewaller	None	67.5
T6	L6009 at Cooldrisla	None	52.4
T7	R503 at Derryleigh	None	83.4
T8	R503 at Rear Cross	None	69.5
T9	R503 at Knockmaroe	None	61.7
T10	L2264-50	None	70.4
T11	L6188-0	Entrance onto private paved road	54

Table 6: Summary of 85th percentile speeds at Permanent and Temporary Site Entrances for UWF Related Works

Traffic Count Locations	Road ID	Entrance ID	85% ile Traffic Design Speed Km/Hr
T9	R503 at Knockmaroe	EW18	61.7
T10	L2264-50	EW19, EW20 & EW21	70.4
T11	L6188-0	EW5, EW6, EW16, EW17 & EW22	54
T12	L4139-0	EW1	49
T13	L4138-12	EW2	58
T14	L4139-16	EW3 & EW4	50
T15	L61881-0	EW7, EW8, EW9 & EW10	48
T16	L6185-13	EW11 & EW12	46
T17	L2264-34	EW13, EW14 & EW15	53

A15.1.3.3.2 RSA Online Collision Database

A review of the Road Safety Authority (RSA) online collision database, between 2005-2015 inclusive, indicates that there were two serious collisions along the route of the 110kV on the R503 in 2006 and 2007, but no other record of any significant collision in the last 12 years., (save for some mostly single vehicle accidents which are classified as 'minor' on the database).

The RSA collision statistics demonstrate that the local and regional roads in the study area do not have a significant history of accidents.

The Data from the RSA on-line tool is reproduced below as *Plate 1* to Plate 5 below.

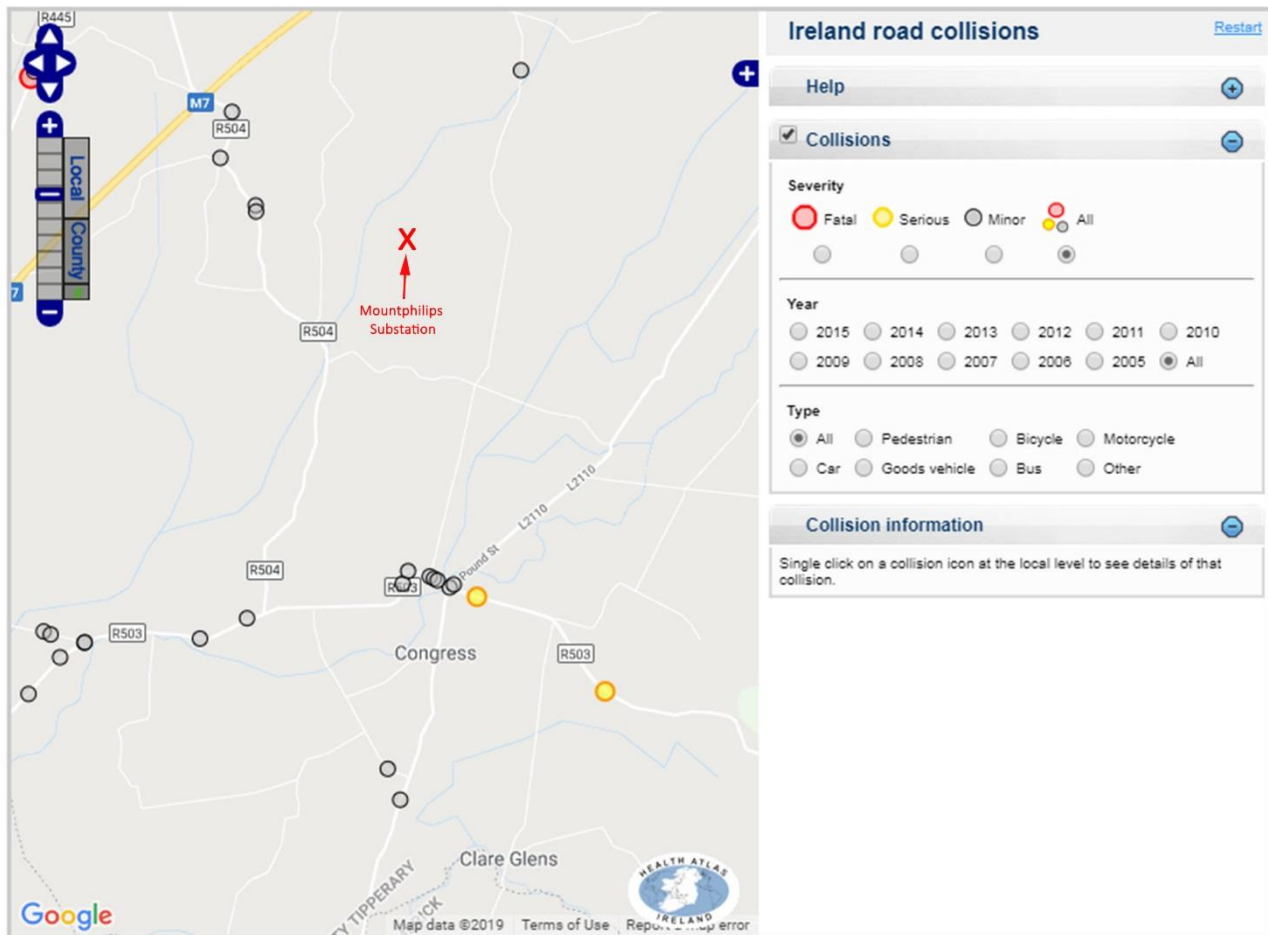


Plate 1: RSA Database Accident Statistics Extract - Map 1

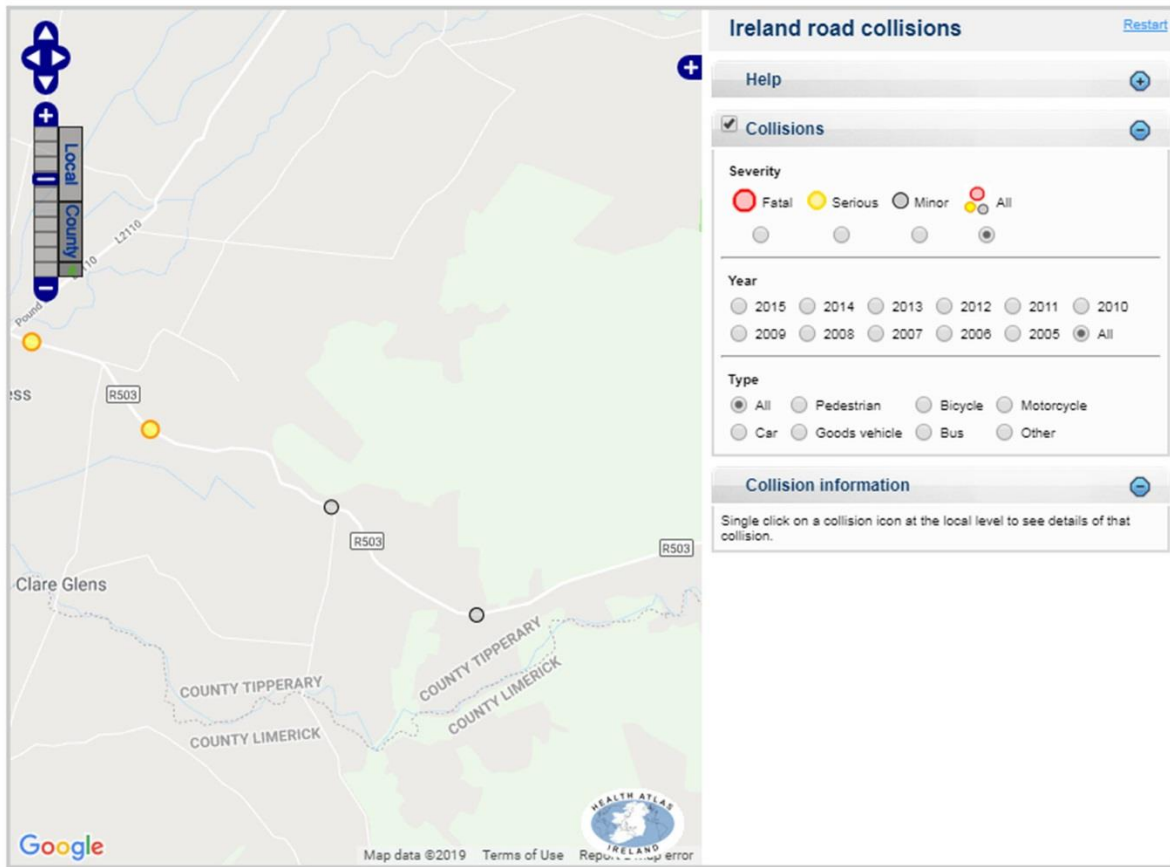


Plate 2: RSA Database Accident Statistics Extract - Map 2

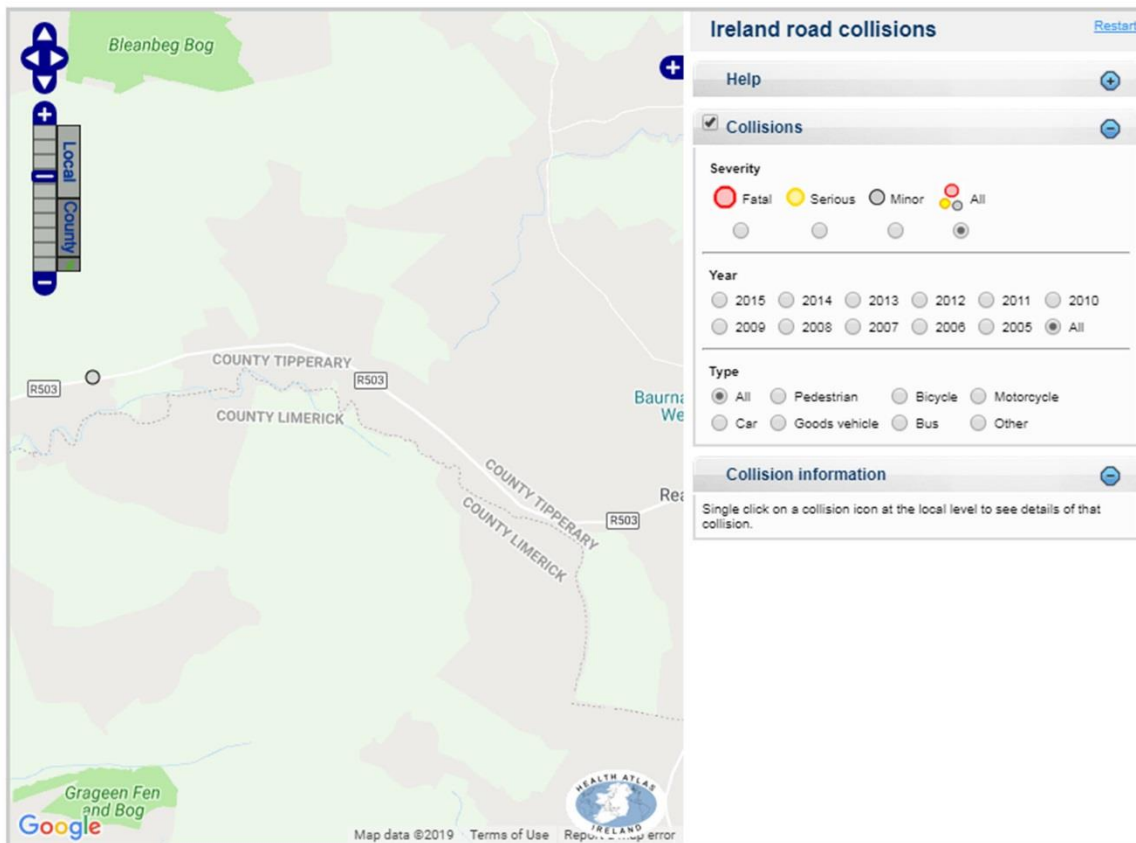


Plate 3: RSA Database Accident Statistics Extract - Map 3

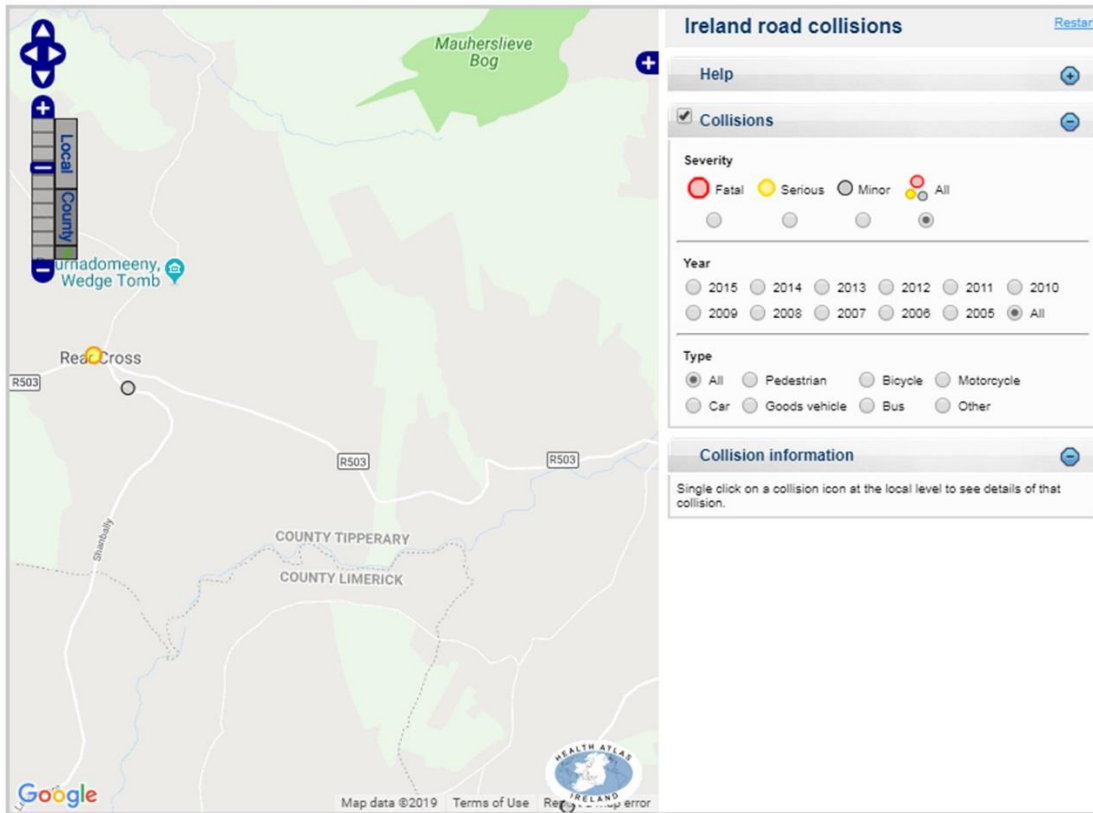


Plate 4: RSA Database Accident Statistics Extract - Map 4

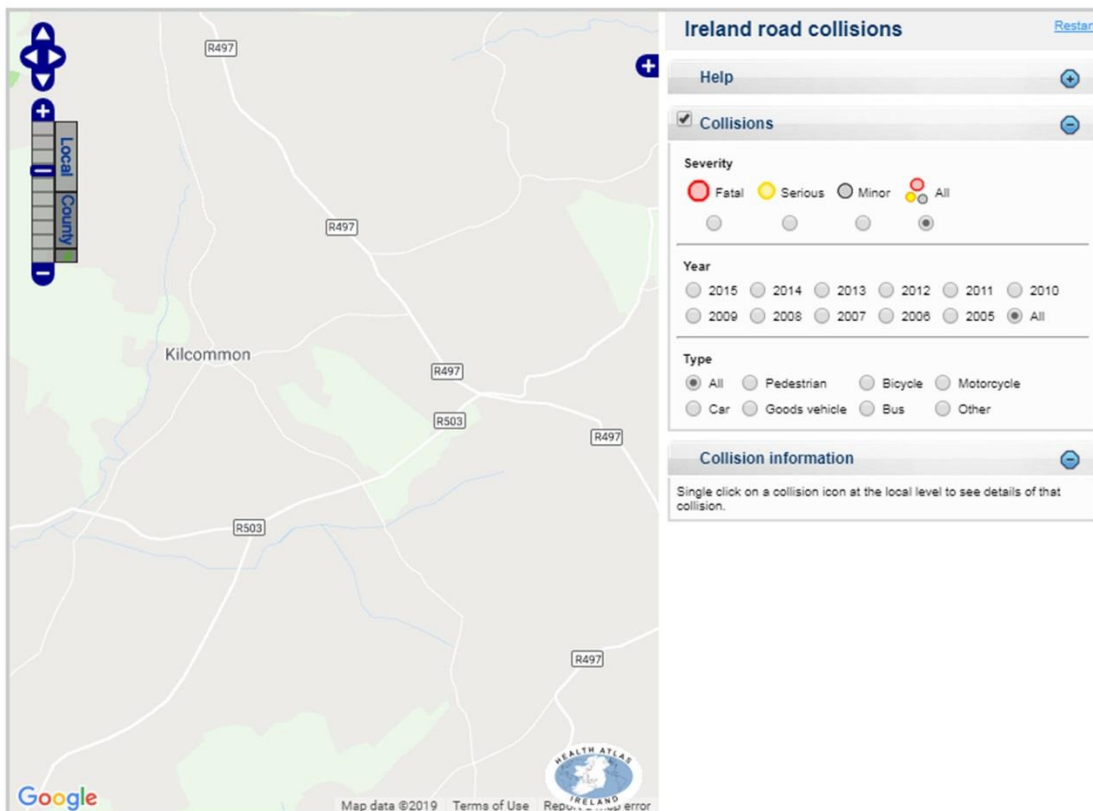


Plate 5: RSA Database Accident Statistics Extract - Map 5

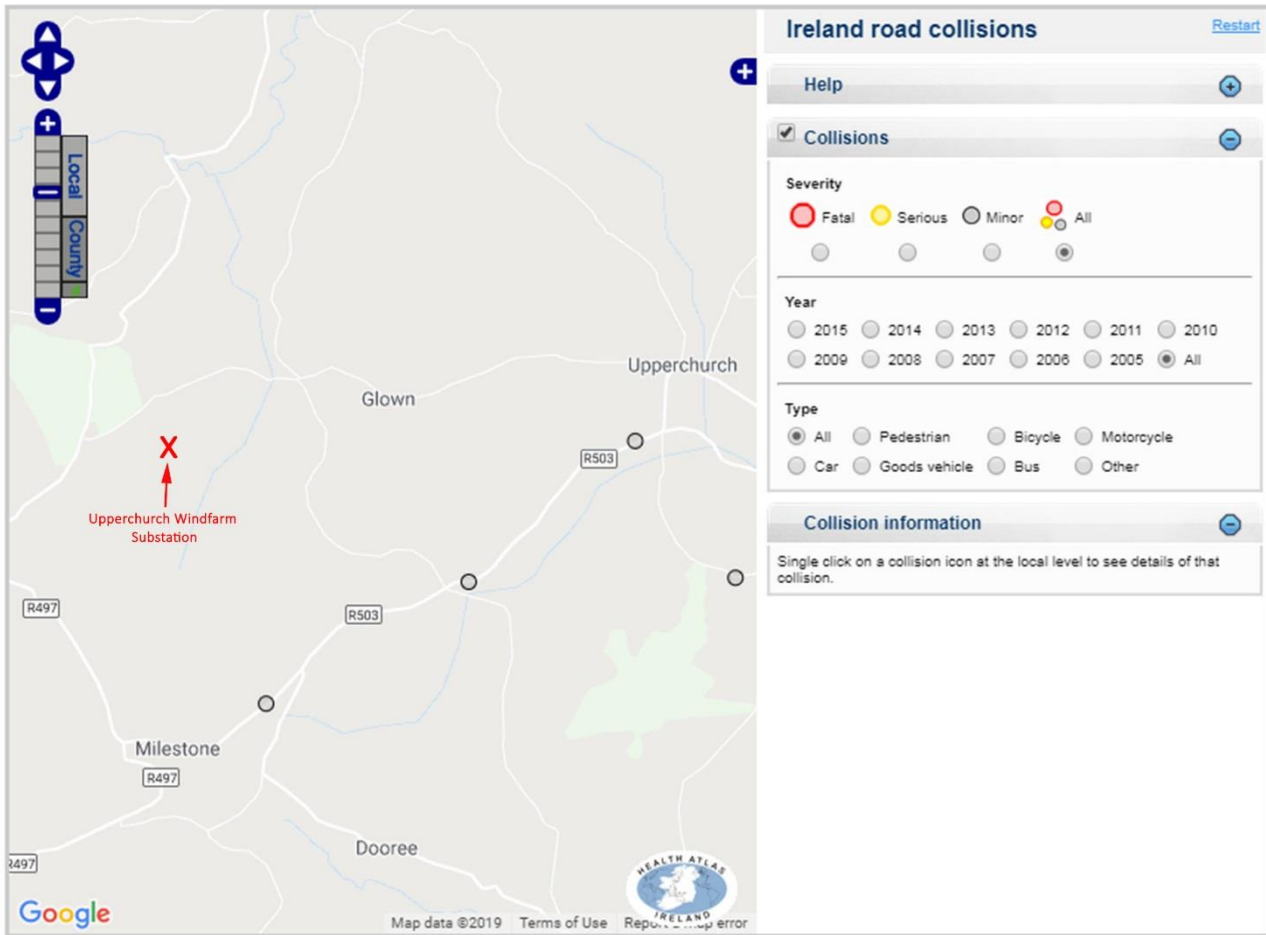


Plate 6: RSA Database Accident Statistics Extract - Map 6

A15.1.4 TRAFFIC FORECASTING

Construction traffic volumes were assigned to the various affected roads, based on the reasonable and industry standard assumption that the trip patterns associated with the construction stage will naturally gravitate to and from the temporary construction compound and works locations.

Construction is expected to commence in 2020/2021. In order to evaluate the worst case traffic volumes on the affected roads during construction works, an opening year of 2021 was selected for the purposes of this assessment.

Traffic growth factors for 2021 were calculated from data obtained in the TII PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 (Travel Demand Projections October 2016, Table 5.3.2: Link-Based Growth Rates: Annual Growth Factors) which provides the recommended method of predicting future year traffic growth on public roads.

Calculations of the relevant growth factors are included in Table 7.

Table 7: Tii Traffic Growth Rates

Traffic Growth		
From Year	To Year	NRA Link Based Growth Rate (1.014 per year)
2018/2019	2021	1.028

It should be noted that any requirement to use different or higher growth factors will have no implications for the conclusions of the study, as the available road capacity on the affected roads is very high (average 98%).

A15.1.5 DESCRIPTION OF THE INDIVIDUAL PROJECT ELEMENTS

The UWF Grid Connection, UWF Related Works, UWF Replacement Forestry, Upperchurch Windfarm (UWF) and UWF Other Activities are collectively referred to as the Whole UWF Project.

The purpose of the UWF Grid Connection, UWF Related Works, UWF Replacement Forestry and UWF Other Activities elements is to facilitate the construction and operation of the already consented Upperchurch Windfarm (UWF). Upperchurch Windfarm when operational, will produce renewable electricity from the wind to supply the National Grid.

Table 8: Overview of the Individual Elements of the Whole UWF Project

	Element of the whole UWF project	Composition of each Element	Planning Status and Competent Authority for each Element
1	UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Grid Connection Ancillary Works	Planning application to An Bord Pleanála
2	UWF Related Works (RW)	Internal Windfarm Cabling Realigned Windfarm Roads Haul Route Works Telecom Relay Pole RW Ancillary Works	Planning application to Tipperary County Council, current appeal to An Bord Pleanála
3	UWF Replacement Forestry (RF)	Replacement Forestry at Foilnaman	Already approved
4	Upperchurch Windfarm (UWF)	Consented UWF Turbines Consented UWF Substation Consented UWF Roads UWF Ancillary Works	Already consented under Planning Reference: Tipperary Co.Co. 13/51/0003, ABP PL 22.243040
5	UWF Other Activities (OA)	Haul Route Activities Upperchurch Hen Harrier Scheme Monitoring Activities Overhead Line Activities	No planning permission required

Three separate Environmental Impact Assessment Reports (EIA Report also called EIAR) have been prepared, one each for the UWF Grid Connection, the UWF Related Works and the UWF Replacement Forestry. The individual EIA Reports accompany the application to the relevant Competent Authorities, for example the UWF Grid Connection EIA Report accompanies the SID application to An Bord Pleanála.

The EIA Reports are included with the applications as **Volume C**. A description of the location, layout, size and design, the construction stage, operational stage, and changes to the project, along with a description of the use of natural resources, emissions and wastes, and the vulnerability of the element to natural disasters and events is provided in **Chapter 5 of the relevant EIA Report Main Report (Volume C2)**.

This information is also available on the following website: www.upperchurchwindfarmgridconnection.ie, where the **full UWF Grid Connection EIA Report** is available. A description of UWF Grid Connection is included in **Chapter 5: Description of Development (UWF Grid Connection)**. A description of the Other Elements of the Whole UWF Project are included as **Appendices 5.3, 5.4, 5.5 and 5.6 of the UWF Grid Connection EIA Report (EIAR Volume C4)**.

A15.1.5.1 Project Design Environmental Protection Measures

The design of the UWF Grid Connection includes the Project Design Environmental Protection Measures listed on Table 7, which were devised to avoid, prevent or reduce likely or potentially significant effects to public roads or road users. UWF Related Works includes similar project design measures.

Table 9: Project Design Environmental Protection Measures

Project Design Environmental Protection Measure	
PD04	All construction works will be carried out during daylight hours.
PD06	Construction works will not be carried out within 150m of Rearcross National School or Lackamore National School, during school hours. In addition, the project Community Liaison Officer will keep each school informed of construction timetables and scheduling.
PD07	110kV UGC construction works along the local roads L2264-50 and L6188-0, will not take place at the same time as the UWF Related Works Haul Route Works on these roads. The 110kV UGC construction works will also be scheduled so that the works do not occur on the same days as concrete deliveries for Consented UWF Turbines along these local roads.
PD10	Flag-men will be used at 110kV UGC works locations on the public roads subject to one lane closures. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the public road network in a safe and efficient manner. The works will be carried out according to the Traffic Management Plan for UWF Grid Connection. The Traffic Management Plan forms part of the Environmental Management Plan.
PD11	Construction works for the 110kV UGC in Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons townlands, which are within 350m of local residences, will not take place at the same time as either the UWF Related Works or Upperchurch Windfarm where those works also occur within 350m.
PD12	As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the works along the public road network will be scheduled to minimise impacts on schools and local businesses. The works will be scheduled so that they do not disrupt or interfere with Tipperary County Council’s road works programme on the R503 through Newport town.
PD13	As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the Promoter will fund the costs of Tipperary County Council engaging a chartered Civil Engineer to oversee quality control and compliance with drawings, specifications and road opening conditions for the duration of the works

A15.1.6 TRIP GENERATION, ASSIGNMENT & DISTRIBUTION

The trips associated with the construction stage only have been modelled. Operational stage trip generation will be negligible and does not require or warrant further evaluation.

Similar to the operational stage, **the trips associated with the UWF Replacement Forestry and the UWF Other Activities will be very low and will have no effect on traffic or transport.** Consequently, the very low number of trips generated by these two elements are not included in the model.

The construction traffic associated with the UWF Grid Connection and the UWF Related Works have been quantified and are included in the model. Furthermore, the cumulative volumes associated with both of these developments along with the already Upperchurch Windfarm have been calculated in order to evaluate the whole project impact on any local roads which are affected by more than one element of the whole project.

The modelling of trip generation, assignment and distribution to the road network has been based on information¹ in **Chapter 5 of the relevant EIA Report Main Report (Volume C2).**

In order to quantify the impact on traffic and transport, the construction traffic volumes and movements to and from the site compound and to and from quarries and the various construction works areas was calculated, and the daily and peak hour construction traffic movements associated with each site entrance or road works location was then calculated for the relevant local road.

This was undertaken for a typical 24 Hour Annual Average Daily Traffic volume, and for the traditional weekday AM and PM peak hours.

¹ This information is also available on the following website: www.upperchurchwindfarmgridconnection.ie, where the **full UWF Grid Connection EIA Report** is available. A description of UWF Grid Connection is included in **Chapter 5: Description of Development (UWF Grid Connection)**. A description of the Other Elements of the Whole UWF Project are included as **Appendices 5.3, 5.4, 5.5 and 5.6 of the UWF Grid Connection EIA Report (EIA Volume C4).**

A15.1.7 IMPACT ASSESSMENT

A15.1.7.1 Introduction

TII’s Traffic and Transportation Assessment Guidelines (2014), recommends that a threshold assessment & analysis is undertaken to determine the increases in traffic associated with any particular development, and whether this might be considered as significant. The threshold levels are outlined in Table 10.

Table 10: Tii Threshold Analysis

Traffic Management Guidelines Thresholds for Transport Assessments	Criteria met? Yes/No?
Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road.	Yes, due to the extremely low existing traffic volumes on some of the local roads in the study area.
Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists or the location is sensitive	No, There are no roads are classed as ‘congested’ (A junction or link is considered to be congested when traffic flows are at 85% of the estimated capacity of the junction or link)
Residential development in excess of 200 dwellings.	No Not applicable
Retail and leisure development in excess of 1,000m ² .	No Not applicable
Office, education and hospital development in excess of 2,500m ² .	No Not applicable
Industrial development in excess of 5,000m ² .	No Not applicable
Distribution and warehousing in excess of 10,000m ²	No Not applicable

As the construction related traffic on some of the local roads associated with the UWF Grid Connection and the UWF Related Works will meet the first listed threshold in Table 10 above, this Traffic and Transport Assessment has been prepared and the Annual Average Daily Traffic volumes in PCUs without the works, for each of the affected roads has been measured through traffic counts, which were carried out on each affected road.

The transport impact of the additional construction traffic has been evaluated against the existing volumes and the future volumes, together with the quantified road link capacity based on the existing pavement width and conditions, using industry standard methods (*TD76/99 Link Capacity Assessment*) of link capacity assessment traffic volumes and link capacity details for each affected road.

The distribution of traffic to the local road network for each separate site entrance or road works location associated with the UWF Grid Connection, UWF Related Works and cumulatively with the Upperchurch Windfarm are included on Table 11 & Table 12. The resultant increase in projected 2020/2021 traffic levels is provided in Table 13. It should be noted that some percentage changes in traffic conditions due to the addition of the cumulative construction traffic appear large because the existing traffic levels are so low.

The results of the transport modelling are presented below.

A15.1.7.2 Traffic and Transportation Modelling

Table 11: Construction Traffic Distribution in relation to the UWF Grid Connection

Road Label	Road 2-Way Capacity Based on conditions (PCUs/Hr 2-way)	UWF Grid Connection			
		24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	2-Way Flow
L-2166-10	2000	135	31	31	
L6013-0	1460	16	2	2	2
L2156-0	1760	16	2	2	2
L2157-0	1830	16	2	2	2
L6009 at Castlewaller	1530	16	2	2	2
L6009 at Cooldrisla	1460	16	2	2	2
R503 at Derryleigh	2000	75	8	8	8
R503 at Rear Cross	2000	58	6	6	6
R503 at Knockmaroe	2000	42	4	4	4
L2264-50	1555	16	2	2	2
L6188-0	1533	16	2	2	2

Table 12: Construction Traffic Distribution in relation to the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm and combined cumulative traffic

Road Label	Road Capacity Based on conditions (PCUs/Hr 2-way)	Projected Construction Related Development Traffic										Total Combined Works Traffic (Cumulative)					
		UWF Grid Connection					UWF Related Works					-Upperchurch Windfarm			24Hr AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)
		24Hr AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)				
L-2166-10	2000	135	31	31											135	31	31
L6013-0	1460	16	2	2											16	2	2
L2156-0	1760	16	2	2											16	2	2
L2157-0	1830	16	2	2											16	2	2
L6009 at Castlewaller	1530	16	2	2											16	2	2
L6009 at Cooldrisla	1460	16	2	2											16	2	2
R503 at Derryleigh	2000	75	8	8											75	8	8
R503 at Rear Cross	2000	58	6	6											58	6	6
R503 at Knockmaroe	2000	42	4	4	9	1	1	4	8	1	1	8	8	8	59	13	13
L2264-50	1555	16	2	2	21	3	3	22	22	4	4	4	4	4	59	9	9
L6188-0	1533	16	2	2	12	2	2	12	22	4	4	4	4	4	50	8	8
L4139-0	1310				12	2	2	12	22	4	4	4	4	4	34	6	6
L4138-12	1425				12	2	2	12	22	4	4	4	4	4	34	6	6
L4139-16	1325				3	1	1	0	0	0	0	0	0	0	3	1	1
L61881-0	1325				3	1	1	0	0	0	0	0	0	0	3	1	1
L6185-13	1310				3	1	1	22	22	4	4	4	4	4	25	5	5
L2264-34	1555				3	1	1	0	0	0	0	0	0	0	3	1	1

Table 13: Projected Increase in Traffic Volumes on Affected Roads during the Construction Stage

Road Label	Road Way Capacity Based on conditions (Daily)	Existing Conditions Development				Traffic Without Development				Projected Opening Year 2020/2021 using Annual Growth Rates Without Development Traffic				Total Combined Works Traffic (Cumulative)				2020/2021 Projected Traffic + Cumulative Works Traffic				Percentage Change in Conditions Associated with Cumulative Works				% Road Capacity Used With addition of Cumulative Works Traffic			
		24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)
L-2166-10	48000	721	94	66	741	97	68	135	31	31	876	128	99	18.2%	32.1%	45.7%	1.8%	98.2%											
L6013-0	35040	301	35	27	309	36	28	16	2	2	325	38	30	5.2%	5.6%	7.2%	0.9%	99.1%											
L2156-0	42240	1016	97	108	1044	100	111	16	2	2	1060	102	113	1.5%	2.0%	1.8%	2.5%	97.5%											
L2157-0	43920	967	85	95	994	87	98	16	2	2	1010	89	100	1.6%	2.3%	2.0%	2.3%	97.7%											
L6009 at Castlewaller	36720	217	31	21	223	32	22	16	2	2	239	34	24	7.2%	6.3%	9.3%	0.7%	99.3%											
L6009 at Cooldrisla	35040	407	38	37	418	39	38	16	2	2	434	41	40	3.8%	5.1%	5.3%	1.2%	98.8%											
R503 at Derryleigh	48000	2046	176	229	2103	181	235	75	8	8	2178	189	243	3.6%	4.4%	3.4%	4.5%	95.5%											
R503 at Rear Cross	48000	950	80	110	977	82	113	58	6	6	1035	88	119	5.9%	7.3%	5.3%	2.2%	97.8%											
R503 at Knockmaroe	48000	709	66	87	729	68	89	59	13	13	788	81	102	8.1%	19.2%	14.5%	1.6%	98.4%											
L2264-50	37320	183	19	23	188	20	24	59	9	9	247	29	33	31.4%	46.1%	38.1%	0.7%	99.3%											
L6188-0	36792	76	7	7	78	7	7	50	8	8	128	15	15	64.0%	111.2%	111.2%	0.3%	99.7%											
L4139-0	31440	31	5	2	33	5	2	34	6	6	67	11	8	103.8%	113.6%	283.9%	0.2%	99.8%											
L4138-12	34200	92	5	9	97	5	10	34	6	6	131	11	16	35.0%	113.6%	63.1%	0.4%	99.6%											
L4139-16	31800	42	4	2	44	4	2	3	1	1	47	5	3	6.8%	23.7%	47.3%	0.1%	99.9%											
L61881-0	31800	17	3	0	18	3	1	3	1	1	21	4	2	16.7%	31.5%	100.0%	0.1%	99.9%											
L6185-13	31440	13	0	1	14	1	1	25	5	5	39	6	6	182.0%	500.0%	473.1%	0.1%	99.9%											
L2264-34	37320	147	4	12	155	4	13	3	1	1	158	5	14	1.9%	23.7%	7.9%	0.4%	99.6%											

A15.1.7.3 Evaluation of Traffic and Transport Modelling Results

A15.1.7.3.1 Road Capacity Impact:

Table 13 serves to demonstrate that the existing affected road network has more than adequate capacity to accommodate the worst case cumulative traffic associated with the development. It confirms that the existing volumes of traffic together with the cumulative works traffic will in all cases leave in excess of c.98% of the traffic carrying reserve capacity available for each of the roads.

The increase in traffic associated with the Whole UWF Project will therefore have an imperceptible impact upon network capacity and operation, subject to adherence to traffic management measures at the works locations, which are included in the Traffic Management Plan, see Volume D: Environmental Management Plan, Tab7- Traffic Management Plan.

A15.1.7.3.2 Road pavements impact

The pavements along haulage routes are not expected to be adversely impacted by construction traffic associated with the works. In any case Pavement Condition Surveys will be carried out both before and after the construction period, and any pavements which are inadvertently damaged by construction traffic will be repaired to the satisfaction of Tipperary County Council.

The pavements at road work locations, particularly at trenching locations will be impacted during road works, and as agreed with Tipperary County Council Roads Department, all sections of roads subject to trenching works in the road pavement will be reinstated. This reinstatement of trenching locations within road pavements is in accordance with the Department of Transport, Tourism and Sport Guidelines for Managing Openings in Public Roads. This road reinstatement will ameliorate any impacts to road pavements, and therefore it is considered that no impacts to road pavements are likely to occur.

A15.1.7.3.3 Buried structures impact

It is considered that these road structures are currently in good condition and will be capable of supporting all works and the small increased traffic loading associated with the construction works.

Along the UWF Grid Connection, where the culvert is old and in bad repair (13 No. instances), the culvert will be replaced.

Along the UWF Related Works, 2 No. culverts at the UWF Related Works Haul Route Works locations will require works, these are 1m extension works and will be carried out without affecting the integrity of these two structures. All structures will be monitored during the construction stage, and inspected following completion of the works to ensure integrity is maintained.

A15.1.7.3.4 Traffic impact

The effect on road users has been comprehensively and cumulatively assessed and there is expected to be an imperceptible effect on journey times or use of the road by road users due to the small increase in traffic loading and the available capacity on the roads (c.98%).

At road work locations, local road users will be accommodated through minimising the amount of road closures required by using stop-go systems, steel plating and through the use of appropriately sized machines to ensure the continued use of one lane of the road.

For road closures, detour road signs will be erected on the closed road and along the detour route. Access for local residents will be in place during the duration of the works. In the event of emergency and should the need arise for the road to be fully opened, steel plates will be put in place across the excavation to all traffic to flow on both sides of the road.

A15.1.7.3.5 Road Safety impact

The predicted small increases in traffic associated with the works, the provision of adequate sightlines at the permanent site entrance and the use of advance warning signage for entrances and road works will ensure the continued safe use of the road and it is expected that there will be no impact upon traffic safety.

A15.1.7.3.6 Pedestrians and cyclists impact

The presence of road works and increases in traffic volumes due to construction traffic is expected to have an imperceptible effect upon the continued safe progression and passage of pedestrians and cyclists on the affected roads, due to the very low usage of the roads by walkers and cyclists (CSO data, observations during site visits, traffic count survey results), the small increase in traffic volumes due to the works, the available capacity on the affected roads, and the imposition of speed limits on all vehicles delivering construction materials to works areas along the local road network.

A15.1.8 REQUIREMENT FOR MITIGATION MEASURES

There is no requirement for mitigation measures as no significant adverse effects are expected to the affected roads in the study area.

Project Design measures, described in Section A15.1.5.1 and the traffic management measures and best practice measures, described in the dedicated **Traffic Management Plan** in the UWF Grid Connection Environmental Management Plan which accompanies the EIA Report as Volume D.

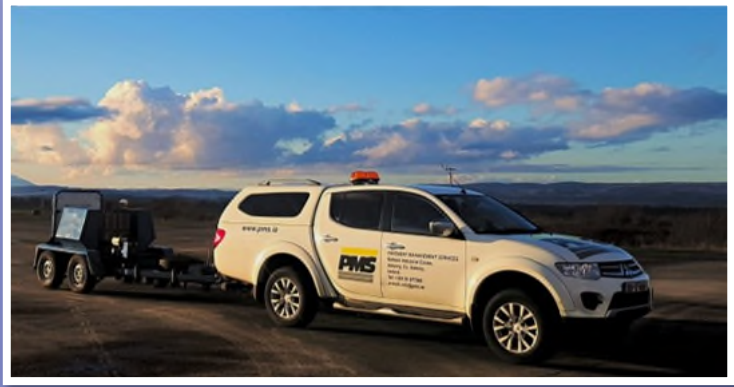
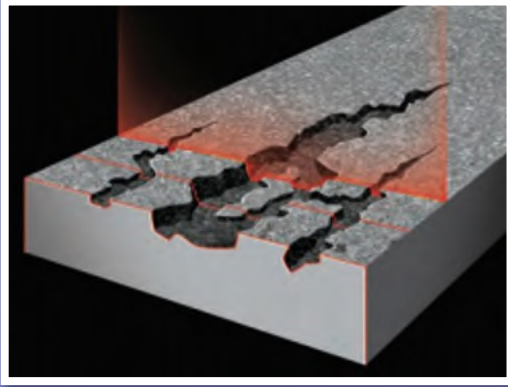
The adherence to the Plan will be audited weekly by the Environmental Clerk of Works, and a Community Liaison Officer will inform local residences of upcoming construction schedules, in particular those relating to road works in their area.

Appendix to Chapter 15: Material Assets (Roads)

Appendix 15.2: Pavement Condition Survey

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

REFERENCE DOCUMENTS



Pavement Condition Survey for Upperchurch Windfarm Grid Connection, Co. Tipperary

On behalf of:
Ecopower Developments Ltd.

Video Pavement Condition Index (vPCI) Survey Report



DOCUMENT CONTROL SHEET

Client	Ecopower Developments Ltd.					
Project Title	Pavement Condition Survey for Upperchurch Windfarm Grid Connection, Co Tipperary					
Document Title	Video Pavement Condition Index (vPCI) Survey Report					
Document No.	1.2					
This Document Comprises	DCS	TOC	Text	Tables	Figures	No. of Appendices
	1	1	7	7	0	2

Rev.	Status	Compiled by	Reviewed by	Office of Origin	Issue Date
1.0	Issue	D.O'Dea	J. Joyce	Galway	12/07/2019
1.1	Issue	D.O'Dea	J. Joyce	Galway	15/07/2019
1.2	Issue	D.O'Dea	J. Joyce	Galway	26/08/2019



Pavement Management Services Ltd.

Orion House, 53 Main Street,
Rathfarnham, Dublin 14
D14 W3K6
Tel: 01 - 4055588

Raheen Industrial Estate,
Athenry, Co. Galway
H65 PD37
Tel: 091 - 877040

www.pms.ie

*This report applies only to the tests performed and shall not be reproduced except in full,
without the written approval of PMS Ltd.*



Contents

1. Introduction.....	4
2. Data Collection.....	5
3. Pavement Condition Index (PCI).....	5
4. Survey Results.....	7
Appendix A – vPCI Results	10
Appendix B – Site Map.....	26

REFERENCE DOCUMENTS

1. Introduction

A pavement condition survey of the Upperchurch Windfarm Grid Connection, Co Tipperary was carried out by PMS Pavement Management Services Ltd. on behalf of Ecopower Developments Ltd. in January and June 2019. The pavement condition survey comprised a video survey and pavement condition index (vPCI) survey for the network. The video data collection survey in the field was carried out on the 21st of January and the 11th June 2019. This report presents the results of the vPCI survey carried out on these dates.

Table 1 gives a description of the road network surveyed including the road number, lane or survey direction and measured length for each section. GPS co-ordinates at the beginning and end of each section are also indicated in Table 1.

Road No.	Lane/Dir	Length (m)	ITM (From)		ITM (To)	
			E	N	E	N
L2166-0 Newport to Coole	NB	2290	572392.4	662364.0	572960.6	664559.3
L2166-0 Coole to Newport	SB	2290	572962.3	664565.0	572398.5	662367.6
L6013-0 Oakhampton to Coole	WB	1200	573820.7	663388.0	573621.1	663150.2
L2156-0 Rockvale	NB	300	573619.0	663141.1	574385.0	663040.3
L2156-0 Rockvale	SB	300	573611.4	663146.5	573819.5	663380.9
L2157-0 Ahane Cross to Rockvale	WB	790	574400.1	663037.5	573336.2	662024.7
L2157-0 Rockvale to Ahane Cross	EB	790	574387.4	663036.8	573610.6	663130.6
L6009-0 Derryleigh to Ahane Cross	NB	1800	573324.3	662048.2	574398.0	663029.2
R503 Newport to Knockmaroe	EB	23190	572396.3	662359.8	592544.4	659758.1
R503 Knockmaroe to Newport	WB	23190	592542.4	659757.2	572401.5	662356.7
L2264-50 at Knockmaroe	EB	1930	592551.6	659763.7	593983.6	660695.6
L6188-0 at Knockmaroe	EB	1230	593994.7	660697.2	595035.3	660572.9

Table 1: Network Description

2. Data Collection

The data collection survey of the road network in the field is carried out using a specialised video survey vehicle equipped with a high-definition video camera, distance measurement instrument (DMI), and GPS receiver. The video survey is typically carried out at normal traffic speeds, depending on road condition and road geometrics. The survey vehicle captures forward viewing video of the road surface using a high-definition video camera. The video data is recorded using both chainage and GPS referenced coordinate systems by an on-board computer. The condition of the roads surveyed can be assessed by a visual condition survey from the video recorded. Each video frame is stamped with road segment ID, date, time and chainage, and the frames are compressed to retain maximum definition at minimum storage space. The video frames and associated information are then written to a high-speed hard disk.

Once the data is collected in the field, all of the remaining post-processing can be carried out indoors. The visual assessment of the road sections was carried out in the office by viewing the video recording for each road and identifying the type, severity and quantity of the distresses present using the PCI methodology described below.

3. Pavement Condition Index (PCI)

The Pavement Condition Index (PCI) procedure was developed by the U.S. Army Corps of Engineers in the early 1970's. It is one of the most comprehensive visual pavement inspection systems and has been extensively refined and improved over the past 40 years. The detailed PCI rating procedures are outlined in U.S. Army Technical Manual 5-623 *"Pavement Maintenance Management"* and U.S. Army Construction Engineering Research Laboratory (CERL) Technical Report M-294 *"Pavement Maintenance Management for Roads and Parking Lots"*.

The PCI inspection system is based on a defined index of between 0 and 100 that all pavements must lie between. A new pavement (theoretically distress-free) has a PCI of 100. For each distress measured, a "deduct value" is calculated depending upon the nature of the distress, its severity and quantity. The deduct values are summed, adjusted to take into account the total number of distresses identified, and then subtracted from 100 to give the PCI index for the pavement.

A breakdown of pavement classification by PCI is given in Table 2.

PCI Range	Pavement Condition Rating
85 to 100	Very Good
65 to 85	Good
50 to 65	Fair
40 to 50	Poor
20 to 40	Very Poor
< 20	Fail

Table 2: Pavement Classification based on PCI

A modified version of the U.S. Army Corps of Engineers PCI methodology based on a windshield survey from a slow-moving vehicle was developed in Ireland in the 1990's.

Modifications to the windshield survey were then developed to provide a video PCI (vPCI) methodology. There were 19 original distresses specified under the U.S. PCI methodology and 10 distresses were retained for the Irish method. The distresses can be grouped into four categories as shown in Table 3.

Surface Defects	Openings in Surface	Cracking	Pavement Deformation
Bleeding	Potholes	Alligator Cracking	Rutting
Ravelling	Road Disintegration	Edge Break-up	Depressions
Patching		Cracking - Other	

Table 3: Irish Distresses Grouped by Category

The Non-National Roads Pavement Condition Study; *“Windshield Distress Catalogue Descriptions and Rating Procedures”* pavement inspection manual has been produced specifically for Irish road conditions. It describes each distress type, how to distinguish between severity levels and displays photographs for every distress type/severity combination. Depending upon the distress type there is one, two or three severity levels defined. Bleeding, for example, has only one severity level defined, while Potholes and Patching have three severity levels.

The vPCI survey is carried out on every 100-metre sample unit of the road network survey from the video recorded in the field. The type, severity and quantity of pavement distress for

each 100-metre length of pavement is identified and stored. The vPCI rating, structural index and surface index is calculated from the distress data collected.

The vPCI value provides an overall measure of the pavement condition based on the PCI scale, and provides information on the types and quantities of the pavement defects. The Structural Index reflects the percentage contribution of load-related distresses (potholes, rutting, alligator cracking, edge cracking, and road disintegration) to the overall vPCI value. The Surface Index reflects the percentage contribution of surface-related distresses (bleeding, ravelling) to the overall vPCI value. The remainder of the deduct is primarily attributable to patching, which is not classified as load or surface related in the present definitions.

4. Survey Results

Table 4 presents the overall average vPCI section results. The standard deviation of the vPCI values is shown to quantify the variability of vPCI values over the section. The Structural Index and Surface Index results for each section are also given in Table 4.

A breakdown of the distress data based on distress type is given in Tables 5, 6 & 7. Table 5 displays the distress types sorted by number of occurrences. Table 6 shows the distress type sorted by average quantity of distress per occurrence, expressed as a percentage of the total area of the sample unit. Table 7 shows the distress type sorted by average deduct value for each distress per occurrence.

Appendix A details the vPCI, Structural Index and Surface Index results for each 100-metre sample unit. The sample unit number increases in the direction of traffic on all sections. Detailed results of all distresses including type, severity and quantity for each 100-metre sample unit are also available, if a more detailed subsequent examination is required.

Resurfacing works were carried out in August 2019 on two sections of the R503. They are highlighted in Appendix A as section 123-130 and section 193-202.

Appendix B contains a site map showing the location and extent of each section.

Road No.	Lane/Dir	vPCI	Rating	Standard Deviation	% Structure	% Surface
L2166-0 Newport to Coole	NB	57	Fair	24	35	25
L2166-0 Coole to Newport	SB	46	Poor	23	33	20
L6013-0 Oakhampton to Coole	WB	62	Fair	24	38	32
L2156-0 Rockvale	NB	50	Fair	17	70	21
L2156-0 Rockvale	SB	49	Poor	4	63	26
L2157-0 Ahane Cross to Rockvale	WB	36	Very Poor	26	15	23
L2157-0 Rockvale to Ahane Cross	EB	57	Fair	28	41	27
L6009-0 Derryleigh to Ahane Cross	NB	81	Good	16	32	47
R503 Newport to Knockmaroe	EB	82	Good	23	50	27
R503 Knockmaroe to Newport	WB	81	Good	24	47	24
L2264-50 at Knockmaroe	EB	71	Good	24	46	24
L6188-0 at Knockmaroe	EB	73	Good	24	45	24

Table 4: PCI Section Results

Name	No. Of Occurrences
Ravelling	325
Rutting	222
Patching	208
Bleeding	207
Edge Breakup	58
Alligator	46
Depression	31
Other Cracking	22
Potholes	17
Disintegration	0

Table 5: Distresses Sorted by Number of Occurrences

Name	Average Quantity
Bleeding	14
Alligator	13
Patching	9
Ravelling	8
Rutting	7
Depression	2
Potholes	1
Edge Breakup	1
Other Cracking	1
Disintegration	0

Table 6: Distresses Sorted by Average Quantity per Occurrence

Name	Average Deduct
Alligator	45
Patching	31
Rutting	31
Edge Breakup	15
Bleeding	13
Depression	12
Ravelling	10
Potholes	8
Other Cracking	8
Disintegration	0

Table 7: Distresses Sorted by Average Deduct per Occurrence



Appendix A – vPCI Results

100m Sample Units



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
L2166-0 Newport to Coole	NB	1	0	100	10	71	17
L2166-0 Newport to Coole	NB	2	100	200	21	70	15
L2166-0 Newport to Coole	NB	3	200	300	44	34	34
L2166-0 Newport to Coole	NB	4	300	400	38	28	20
L2166-0 Newport to Coole	NB	5	400	500	35	31	9
L2166-0 Newport to Coole	NB	6	500	600	21	30	8
L2166-0 Newport to Coole	NB	7	600	700	41	0	19
L2166-0 Newport to Coole	NB	8	700	800	82	40	42
L2166-0 Newport to Coole	NB	9	800	900	80	0	100
L2166-0 Newport to Coole	NB	10	900	1000	80	0	100
L2166-0 Newport to Coole	NB	11	1000	1100	79	0	95
L2166-0 Newport to Coole	NB	12	1100	1200	36	27	27
L2166-0 Newport to Coole	NB	13	1200	1300	64	16	37
L2166-0 Newport to Coole	NB	14	1300	1400	51	51	38
L2166-0 Newport to Coole	NB	15	1400	1500	49	38	27
L2166-0 Newport to Coole	NB	16	1500	1600	67	75	25
L2166-0 Newport to Coole	NB	17	1600	1700	86	19	81
L2166-0 Newport to Coole	NB	18	1700	1800	86	0	30
L2166-0 Newport to Coole	NB	19	1800	1900	67	0	35
L2166-0 Newport to Coole	NB	20	1900	2000	85	0	29
L2166-0 Newport to Coole	NB	21	2000	2100	76	28	23
L2166-0 Newport to Coole	NB	22	2100	2200	85	11	49
L2166-0 Newport to Coole	NB	23	2200	2300	36	26	9
L2166-0 Coole to Newport	SB	23	0	100	31	37	17
L2166-0 Coole to Newport	SB	22	100	200	79	35	65
L2166-0 Coole to Newport	SB	21	200	300	52	44	15
L2166-0 Coole to Newport	SB	20	300	400	72	58	16
L2166-0 Coole to Newport	SB	19	400	500	37	30	22
L2166-0 Coole to Newport	SB	18	500	600	81	4	44
L2166-0 Coole to Newport	SB	17	600	700	94	0	100
L2166-0 Coole to Newport	SB	16	700	800	92	0	100
L2166-0 Coole to Newport	SB	15	800	900	28	34	25
L2166-0 Coole to Newport	SB	14	900	1000	38	28	20
L2166-0 Coole to Newport	SB	13	1000	1100	64	16	37
L2166-0 Coole to Newport	SB	12	1100	1200	17	35	19
L2166-0 Coole to Newport	SB	11	1200	1300	39	43	26
L2166-0 Coole to Newport	SB	10	1300	1400	34	34	21
L2166-0 Coole to Newport	SB	9	1400	1500	43	33	29
L2166-0 Coole to Newport	SB	8	1500	1600	54	13	25
L2166-0 Coole to Newport	SB	7	1600	1700	21	30	14
L2166-0 Coole to Newport	SB	6	1700	1800	17	26	18



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
L2166-0 Coole to Newport	SB	5	1800	1900	48	14	15
L2166-0 Coole to Newport	SB	4	1900	2000	44	10	20
L2166-0 Coole to Newport	SB	3	2000	2100	19	17	10
L2166-0 Coole to Newport	SB	2	2100	2200	35	53	14
L2166-0 Coole to Newport	SB	1	2200	2300	25	100	0
L6013-0 Oakhampton to Coole	WB	12	0	100	67	80	20
L6013-0 Oakhampton to Coole	WB	11	100	200	67	75	25
L6013-0 Oakhampton to Coole	WB	10	200	300	16	43	18
L6013-0 Oakhampton to Coole	WB	9	300	400	73	30	19
L6013-0 Oakhampton to Coole	WB	8	400	500	15	50	13
L6013-0 Oakhampton to Coole	WB	7	500	600	37	30	22
L6013-0 Oakhampton to Coole	WB	6	600	700	75	0	100
L6013-0 Oakhampton to Coole	WB	5	700	800	71	0	64
L6013-0 Oakhampton to Coole	WB	4	800	900	80	0	100
L6013-0 Oakhampton to Coole	WB	3	900	1000	80	0	100
L6013-0 Oakhampton to Coole	WB	2	1000	1100	80	0	100
L6013-0 Oakhampton to Coole	WB	1	1100	1200	80	0	100
L2156-0 Rockvale	NB	1	0	100	63	81	19
L2156-0 Rockvale	NB	2	100	200	60	54	32
L2156-0 Rockvale	NB	3	200	300	26	73	16
L2156-0 Rockvale	SB	3	0	100	55	63	23
L2156-0 Rockvale	SB	2	100	200	46	57	26
L2156-0 Rockvale	SB	1	200	300	46	69	31
L2157-0 Ahane Cross to Rockvale	WB	8	0	100	100	0	0
L2157-0 Ahane Cross to Rockvale	WB	7	100	200	39	35	21
L2157-0 Ahane Cross to Rockvale	WB	6	200	300	31	27	28
L2157-0 Ahane Cross to Rockvale	WB	5	300	400	22	0	29
L2157-0 Ahane Cross to Rockvale	WB	4	400	500	22	0	29
L2157-0 Ahane Cross to Rockvale	WB	3	500	600	22	0	22
L2157-0 Ahane Cross to Rockvale	WB	2	600	700	8	27	11
L2157-0 Ahane Cross to Rockvale	WB	1	700	790	44	10	29
L2157-0 Rockvale to Ahane Cross	EB	1	0	100	17	54	24
L2157-0 Rockvale to Ahane Cross	EB	2	100	200	50	61	39
L2157-0 Rockvale to Ahane Cross	EB	3	200	300	94	0	100
L2157-0 Rockvale to Ahane Cross	EB	4	300	400	89	0	56
L2157-0 Rockvale to Ahane Cross	EB	5	400	500	57	28	21
L2157-0 Rockvale to Ahane Cross	EB	6	500	600	17	41	19



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
L2157-0 Rockvale to Ahane Cross	EB	7	600	700	83	0	100
L2157-0 Rockvale to Ahane Cross	EB	8	700	790	47	30	19
L6009-0 Derryleigh to Ahane Cross	NB	1	0	100	30	42	16
L6009-0 Derryleigh to Ahane Cross	NB	2	100	200	83	0	100
L6009-0 Derryleigh to Ahane Cross	NB	3	200	300	83	0	100
L6009-0 Derryleigh to Ahane Cross	NB	4	300	400	89	0	100
L6009-0 Derryleigh to Ahane Cross	NB	5	400	500	67	63	37
L6009-0 Derryleigh to Ahane Cross	NB	6	500	600	70	0	49
L6009-0 Derryleigh to Ahane Cross	NB	7	600	700	89	0	100
L6009-0 Derryleigh to Ahane Cross	NB	8	700	800	83	0	100
L6009-0 Derryleigh to Ahane Cross	NB	9	800	900	55	69	31
L6009-0 Derryleigh to Ahane Cross	NB	10	900	1000	94	0	100
L6009-0 Derryleigh to Ahane Cross	NB	11	1000	1100	77	53	14
L6009-0 Derryleigh to Ahane Cross	NB	12	1100	1200	91	0	100
L6009-0 Derryleigh to Ahane Cross	NB	13	1200	1300	85	48	52
L6009-0 Derryleigh to Ahane Cross	NB	14	1300	1400	95	0	100
L6009-0 Derryleigh to Ahane Cross	NB	15	1400	1500	94	0	100
L6009-0 Derryleigh to Ahane Cross	NB	16	1500	1600	94	0	100
L6009-0 Derryleigh to Ahane Cross	NB	17	1600	1700	95	0	100
L6009-0 Derryleigh to Ahane Cross	NB	18	1700	1800	84	0	38
R503 Newport to Knockmaroe	EB	1	0	100	51	70	6
R503 Newport to Knockmaroe	EB	2	100	200	25	84	9
R503 Newport to Knockmaroe	EB	3	200	300	17	78	4
R503 Newport to Knockmaroe	EB	4	300	400	75	81	0
R503 Newport to Knockmaroe	EB	5	400	500	30	86	14
R503 Newport to Knockmaroe	EB	6	500	600	90	48	0
R503 Newport to Knockmaroe	EB	7	600	700	41	100	0
R503 Newport to Knockmaroe	EB	8	700	800	100	0	0
R503 Newport to Knockmaroe	EB	9	800	900	94	0	100
R503 Newport to Knockmaroe	EB	10	900	1000	62	78	22
R503 Newport to Knockmaroe	EB	11	1000	1100	62	78	22
R503 Newport to Knockmaroe	EB	12	1100	1200	90	0	48
R503 Newport to Knockmaroe	EB	13	1200	1300	94	0	100
R503 Newport to Knockmaroe	EB	14	1300	1400	81	0	26
R503 Newport to Knockmaroe	EB	15	1400	1500	100	0	0
R503 Newport to Knockmaroe	EB	16	1500	1600	94	0	100
R503 Newport to Knockmaroe	EB	17	1600	1700	92	0	100
R503 Newport to Knockmaroe	EB	18	1700	1800	51	43	8
R503 Newport to Knockmaroe	EB	19	1800	1900	100	0	0
R503 Newport to Knockmaroe	EB	20	1900	2000	94	0	100



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Newport to Knockmaroe	EB	21	2000	2100	95	0	100
R503 Newport to Knockmaroe	EB	22	2100	2200	100	0	0
R503 Newport to Knockmaroe	EB	23	2200	2300	100	0	0
R503 Newport to Knockmaroe	EB	24	2300	2400	100	0	0
R503 Newport to Knockmaroe	EB	25	2400	2500	100	0	0
R503 Newport to Knockmaroe	EB	26	2500	2600	100	0	0
R503 Newport to Knockmaroe	EB	27	2600	2700	94	0	100
R503 Newport to Knockmaroe	EB	28	2700	2800	92	0	100
R503 Newport to Knockmaroe	EB	29	2800	2900	94	0	100
R503 Newport to Knockmaroe	EB	30	2900	3000	87	42	24
R503 Newport to Knockmaroe	EB	31	3000	3100	83	10	35
R503 Newport to Knockmaroe	EB	32	3100	3200	94	0	100
R503 Newport to Knockmaroe	EB	33	3200	3300	100	0	0
R503 Newport to Knockmaroe	EB	34	3300	3400	94	0	100
R503 Newport to Knockmaroe	EB	35	3400	3500	100	0	0
R503 Newport to Knockmaroe	EB	36	3500	3600	90	59	41
R503 Newport to Knockmaroe	EB	37	3600	3700	87	100	0
R503 Newport to Knockmaroe	EB	38	3700	3800	100	0	0
R503 Newport to Knockmaroe	EB	39	3800	3900	94	0	100
R503 Newport to Knockmaroe	EB	40	3900	4000	100	0	0
R503 Newport to Knockmaroe	EB	41	4000	4100	100	0	0
R503 Newport to Knockmaroe	EB	42	4100	4200	100	0	0
R503 Newport to Knockmaroe	EB	43	4200	4300	100	0	0
R503 Newport to Knockmaroe	EB	44	4300	4400	100	0	0
R503 Newport to Knockmaroe	EB	45	4400	4500	100	0	0
R503 Newport to Knockmaroe	EB	46	4500	4600	100	0	0
R503 Newport to Knockmaroe	EB	47	4600	4700	91	0	100
R503 Newport to Knockmaroe	EB	48	4700	4800	75	10	90
R503 Newport to Knockmaroe	EB	49	4800	4900	100	0	0
R503 Newport to Knockmaroe	EB	50	4900	5000	94	0	100
R503 Newport to Knockmaroe	EB	51	5000	5100	51	43	8
R503 Newport to Knockmaroe	EB	52	5100	5200	94	0	100
R503 Newport to Knockmaroe	EB	53	5200	5300	92	0	100
R503 Newport to Knockmaroe	EB	54	5300	5400	74	25	21
R503 Newport to Knockmaroe	EB	55	5400	5500	76	32	68
R503 Newport to Knockmaroe	EB	56	5500	5600	92	0	100
R503 Newport to Knockmaroe	EB	57	5600	5700	100	0	0
R503 Newport to Knockmaroe	EB	58	5700	5800	76	23	46
R503 Newport to Knockmaroe	EB	59	5800	5900	86	77	23
R503 Newport to Knockmaroe	EB	60	5900	6000	100	0	0
R503 Newport to Knockmaroe	EB	61	6000	6100	100	0	0
R503 Newport to Knockmaroe	EB	62	6100	6200	87	0	100



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Newport to Knockmaroe	EB	63	6200	6300	87	0	100
R503 Newport to Knockmaroe	EB	64	6300	6400	87	0	100
R503 Newport to Knockmaroe	EB	65	6400	6500	53	58	42
R503 Newport to Knockmaroe	EB	66	6500	6600	81	33	67
R503 Newport to Knockmaroe	EB	67	6600	6700	57	50	50
R503 Newport to Knockmaroe	EB	68	6700	6800	40	41	23
R503 Newport to Knockmaroe	EB	69	6800	6900	38	37	24
R503 Newport to Knockmaroe	EB	70	6900	7000	87	0	100
R503 Newport to Knockmaroe	EB	71	7000	7100	16	43	18
R503 Newport to Knockmaroe	EB	72	7100	7200	100	0	0
R503 Newport to Knockmaroe	EB	73	7200	7300	100	0	0
R503 Newport to Knockmaroe	EB	74	7300	7400	94	0	100
R503 Newport to Knockmaroe	EB	75	7400	7500	89	0	100
R503 Newport to Knockmaroe	EB	76	7500	7600	89	0	100
R503 Newport to Knockmaroe	EB	77	7600	7700	100	0	0
R503 Newport to Knockmaroe	EB	78	7700	7800	100	0	0
R503 Newport to Knockmaroe	EB	79	7800	7900	100	0	0
R503 Newport to Knockmaroe	EB	80	7900	8000	100	0	0
R503 Newport to Knockmaroe	EB	81	8000	8100	92	0	100
R503 Newport to Knockmaroe	EB	82	8100	8200	92	0	100
R503 Newport to Knockmaroe	EB	83	8200	8300	92	0	100
R503 Newport to Knockmaroe	EB	84	8300	8400	100	0	0
R503 Newport to Knockmaroe	EB	85	8400	8500	100	0	0
R503 Newport to Knockmaroe	EB	86	8500	8600	94	0	100
R503 Newport to Knockmaroe	EB	87	8600	8700	100	0	0
R503 Newport to Knockmaroe	EB	88	8700	8800	100	0	0
R503 Newport to Knockmaroe	EB	89	8800	8900	94	0	100
R503 Newport to Knockmaroe	EB	90	8900	9000	94	0	100
R503 Newport to Knockmaroe	EB	91	9000	9100	100	0	0
R503 Newport to Knockmaroe	EB	92	9100	9200	100	0	0
R503 Newport to Knockmaroe	EB	93	9200	9300	92	0	100
R503 Newport to Knockmaroe	EB	94	9300	9400	74	25	0
R503 Newport to Knockmaroe	EB	95	9400	9500	94	0	100
R503 Newport to Knockmaroe	EB	96	9500	9600	100	0	0
R503 Newport to Knockmaroe	EB	97	9600	9700	96	0	0
R503 Newport to Knockmaroe	EB	98	9700	9800	94	0	100
R503 Newport to Knockmaroe	EB	99	9800	9900	100	0	0
R503 Newport to Knockmaroe	EB	100	9900	10000	100	0	0
R503 Newport to Knockmaroe	EB	101	10000	10100	100	0	0
R503 Newport to Knockmaroe	EB	102	10100	10200	100	0	0
R503 Newport to Knockmaroe	EB	103	10200	10300	94	0	100
R503 Newport to Knockmaroe	EB	104	10300	10400	95	0	100



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Newport to Knockmaroe	EB	105	10400	10500	100	0	0
R503 Newport to Knockmaroe	EB	106	10500	10600	100	0	0
R503 Newport to Knockmaroe	EB	107	10600	10700	93	14	86
R503 Newport to Knockmaroe	EB	108	10700	10800	92	0	0
R503 Newport to Knockmaroe	EB	109	10800	10900	96	0	0
R503 Newport to Knockmaroe	EB	110	10900	11000	100	0	0
R503 Newport to Knockmaroe	EB	111	11000	11100	60	0	15
R503 Newport to Knockmaroe	EB	112	11100	11200	100	0	0
R503 Newport to Knockmaroe	EB	113	11200	11300	85	49	51
R503 Newport to Knockmaroe	EB	114	11300	11400	28	37	19
R503 Newport to Knockmaroe	EB	115	11400	11500	10	49	15
R503 Newport to Knockmaroe	EB	116	11500	11600	76	27	61
R503 Newport to Knockmaroe	EB	117	11600	11700	42	36	17
R503 Newport to Knockmaroe	EB	118	11700	11800	18	55	19
R503 Newport to Knockmaroe	EB	119	11800	11900	62	16	26
R503 Newport to Knockmaroe	EB	120	11900	12000	92	0	100
R503 Newport to Knockmaroe	EB	121	12000	12100	100	0	0
R503 Newport to Knockmaroe	EB	122	12100	12200	94	0	100
R503 Newport to Knockmaroe*	EB	123	12200	12300	94	0	100
R503 Newport to Knockmaroe*	EB	124	12300	12400	88	15	85
R503 Newport to Knockmaroe*	EB	125	12400	12500	92	0	100
R503 Newport to Knockmaroe*	EB	126	12500	12600	49	37	35
R503 Newport to Knockmaroe*	EB	127	12600	12700	54	53	16
R503 Newport to Knockmaroe*	EB	128	12700	12800	92	0	100
R503 Newport to Knockmaroe*	EB	129	12800	12900	100	0	0
R503 Newport to Knockmaroe*	EB	130	12900	13000	85	0	29
R503 Newport to Knockmaroe	EB	131	13000	13100	100	0	0
R503 Newport to Knockmaroe	EB	132	13100	13200	100	0	0
R503 Newport to Knockmaroe	EB	133	13200	13300	100	0	0
R503 Newport to Knockmaroe	EB	134	13300	13400	100	0	0
R503 Newport to Knockmaroe	EB	135	13400	13500	100	0	0
R503 Newport to Knockmaroe	EB	136	13500	13600	100	0	0
R503 Newport to Knockmaroe	EB	137	13600	13700	87	0	100
R503 Newport to Knockmaroe	EB	138	13700	13800	49	75	25
R503 Newport to Knockmaroe	EB	139	13800	13900	100	0	0
R503 Newport to Knockmaroe	EB	140	13900	14000	59	60	40
R503 Newport to Knockmaroe	EB	141	14000	14100	38	71	29
R503 Newport to Knockmaroe	EB	142	14100	14200	48	39	24
R503 Newport to Knockmaroe	EB	143	14200	14300	56	61	30
R503 Newport to Knockmaroe	EB	144	14300	14400	83	0	18
R503 Newport to Knockmaroe	EB	145	14400	14500	100	0	0
R503 Newport to Knockmaroe	EB	146	14500	14600	95	0	100



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Newport to Knockmaroe	EB	147	14600	14700	78	12	23
R503 Newport to Knockmaroe	EB	148	14700	14800	100	0	0
R503 Newport to Knockmaroe	EB	149	14800	14900	100	0	0
R503 Newport to Knockmaroe	EB	150	14900	15000	100	0	0
R503 Newport to Knockmaroe	EB	151	15000	15100	94	0	100
R503 Newport to Knockmaroe	EB	152	15100	15200	72	0	11
R503 Newport to Knockmaroe	EB	153	15200	15300	94	0	100
R503 Newport to Knockmaroe	EB	154	15300	15400	86	0	30
R503 Newport to Knockmaroe	EB	155	15400	15500	49	74	0
R503 Newport to Knockmaroe	EB	156	15500	15600	89	64	36
R503 Newport to Knockmaroe	EB	157	15600	15700	89	64	36
R503 Newport to Knockmaroe	EB	158	15700	15800	86	0	30
R503 Newport to Knockmaroe	EB	159	15800	15900	85	0	55
R503 Newport to Knockmaroe	EB	160	15900	16000	100	0	0
R503 Newport to Knockmaroe	EB	161	16000	16100	100	0	0
R503 Newport to Knockmaroe	EB	162	16100	16200	100	0	0
R503 Newport to Knockmaroe	EB	163	16200	16300	100	0	0
R503 Newport to Knockmaroe	EB	164	16300	16400	100	0	0
R503 Newport to Knockmaroe	EB	165	16400	16500	100	0	0
R503 Newport to Knockmaroe	EB	166	16500	16600	90	0	58
R503 Newport to Knockmaroe	EB	167	16600	16700	94	0	100
R503 Newport to Knockmaroe	EB	168	16700	16800	100	0	0
R503 Newport to Knockmaroe	EB	169	16800	16900	10	50	9
R503 Newport to Knockmaroe	EB	170	16900	17000	34	29	11
R503 Newport to Knockmaroe	EB	171	17000	17100	92	0	100
R503 Newport to Knockmaroe	EB	172	17100	17200	57	74	19
R503 Newport to Knockmaroe	EB	173	17200	17300	92	0	100
R503 Newport to Knockmaroe	EB	174	17300	17400	67	80	20
R503 Newport to Knockmaroe	EB	175	17400	17500	62	62	17
R503 Newport to Knockmaroe	EB	176	17500	17600	100	0	0
R503 Newport to Knockmaroe	EB	177	17600	17700	100	0	0
R503 Newport to Knockmaroe	EB	178	17700	17800	100	0	0
R503 Newport to Knockmaroe	EB	179	17800	17900	100	0	0
R503 Newport to Knockmaroe	EB	180	17900	18000	100	0	0
R503 Newport to Knockmaroe	EB	181	18000	18100	100	0	0
R503 Newport to Knockmaroe	EB	182	18100	18200	100	0	0
R503 Newport to Knockmaroe	EB	183	18200	18300	100	0	0
R503 Newport to Knockmaroe	EB	184	18300	18400	100	0	0
R503 Newport to Knockmaroe	EB	185	18400	18500	100	0	0
R503 Newport to Knockmaroe	EB	186	18500	18600	95	0	100
R503 Newport to Knockmaroe	EB	187	18600	18700	94	0	100
R503 Newport to Knockmaroe	EB	188	18700	18800	100	0	0



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Newport to Knockmaroe	EB	189	18800	18900	100	0	0
R503 Newport to Knockmaroe	EB	190	18900	19000	100	0	0
R503 Newport to Knockmaroe	EB	191	19000	19100	100	0	0
R503 Newport to Knockmaroe	EB	192	19100	19200	94	0	100
R503 Newport to Knockmaroe*	EB	193	19200	19300	63	58	15
R503 Newport to Knockmaroe*	EB	194	19300	19400	1	74	0
R503 Newport to Knockmaroe*	EB	195	19400	19500	57	66	13
R503 Newport to Knockmaroe*	EB	196	19500	19600	62	18	19
R503 Newport to Knockmaroe*	EB	197	19600	19700	67	66	34
R503 Newport to Knockmaroe*	EB	198	19700	19800	45	75	25
R503 Newport to Knockmaroe*	EB	199	19800	19900	17	57	13
R503 Newport to Knockmaroe*	EB	200	19900	20000	33	72	28
R503 Newport to Knockmaroe*	EB	201	20000	20100	45	62	38
R503 Newport to Knockmaroe*	EB	202	20100	20200	22	77	22
R503 Newport to Knockmaroe	EB	203	20200	20300	100	0	0
R503 Newport to Knockmaroe	EB	204	20300	20400	100	0	0
R503 Newport to Knockmaroe	EB	205	20400	20500	94	0	100
R503 Newport to Knockmaroe	EB	206	20500	20600	94	0	100
R503 Newport to Knockmaroe	EB	207	20600	20700	92	0	100
R503 Newport to Knockmaroe	EB	208	20700	20800	59	60	40
R503 Newport to Knockmaroe	EB	209	20800	20900	65	72	28
R503 Newport to Knockmaroe	EB	210	20900	21000	87	0	100
R503 Newport to Knockmaroe	EB	211	21000	21100	45	62	38
R503 Newport to Knockmaroe	EB	212	21100	21200	57	45	44
R503 Newport to Knockmaroe	EB	213	21200	21300	74	0	62
R503 Newport to Knockmaroe	EB	214	21300	21400	35	27	18
R503 Newport to Knockmaroe	EB	215	21400	21500	43	44	23
R503 Newport to Knockmaroe	EB	216	21500	21600	66	61	39
R503 Newport to Knockmaroe	EB	217	21600	21700	83	0	100
R503 Newport to Knockmaroe	EB	218	21700	21800	66	61	39
R503 Newport to Knockmaroe	EB	219	21800	21900	63	58	42
R503 Newport to Knockmaroe	EB	220	21900	22000	50	50	24
R503 Newport to Knockmaroe	EB	221	22000	22100	43	69	31
R503 Newport to Knockmaroe	EB	222	22100	22200	59	46	33
R503 Newport to Knockmaroe	EB	223	22200	22300	86	33	42
R503 Newport to Knockmaroe	EB	224	22300	22400	63	81	19
R503 Newport to Knockmaroe	EB	225	22400	22500	92	0	100
R503 Newport to Knockmaroe	EB	226	22500	22600	46	66	11
R503 Newport to Knockmaroe	EB	227	22600	22700	46	77	23
R503 Newport to Knockmaroe	EB	228	22700	22800	90	50	50
R503 Newport to Knockmaroe	EB	229	22800	22900	100	0	0
R503 Newport to Knockmaroe	EB	230	22900	23000	100	0	0



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Newport to Knockmaroe	EB	231	23000	23100	100	0	0
R503 Newport to Knockmaroe	EB	232	23100	23200	100	0	0
R503 Knockmaroe to Newport	WB	232	0	100	90	0	100
R503 Knockmaroe to Newport	WB	231	100	200	100	0	0
R503 Knockmaroe to Newport	WB	230	200	300	100	0	0
R503 Knockmaroe to Newport	WB	229	300	400	100	0	0
R503 Knockmaroe to Newport	WB	228	400	500	90	0	100
R503 Knockmaroe to Newport	WB	227	500	600	63	58	42
R503 Knockmaroe to Newport	WB	226	600	700	83	35	65
R503 Knockmaroe to Newport	WB	225	700	800	86	0	100
R503 Knockmaroe to Newport	WB	224	800	900	83	0	100
R503 Knockmaroe to Newport	WB	223	900	1000	80	31	69
R503 Knockmaroe to Newport	WB	222	1000	1100	63	58	42
R503 Knockmaroe to Newport	WB	221	1100	1200	60	66	34
R503 Knockmaroe to Newport	WB	220	1200	1300	64	64	36
R503 Knockmaroe to Newport	WB	219	1300	1400	82	0	55
R503 Knockmaroe to Newport	WB	218	1400	1500	18	94	6
R503 Knockmaroe to Newport	WB	217	1500	1600	53	77	18
R503 Knockmaroe to Newport	WB	216	1600	1700	46	81	19
R503 Knockmaroe to Newport	WB	215	1700	1800	65	72	28
R503 Knockmaroe to Newport	WB	214	1800	1900	53	78	22
R503 Knockmaroe to Newport	WB	213	1900	2000	56	48	32
R503 Knockmaroe to Newport	WB	212	2000	2100	37	40	22
R503 Knockmaroe to Newport	WB	211	2100	2200	22	42	15
R503 Knockmaroe to Newport	WB	210	2200	2300	94	0	100
R503 Knockmaroe to Newport	WB	209	2300	2400	75	78	22
R503 Knockmaroe to Newport	WB	208	2400	2500	60	59	18
R503 Knockmaroe to Newport	WB	207	2500	2600	100	0	0
R503 Knockmaroe to Newport	WB	206	2600	2700	100	0	0
R503 Knockmaroe to Newport	WB	205	2700	2800	100	0	0
R503 Knockmaroe to Newport	WB	204	2800	2900	94	0	100
R503 Knockmaroe to Newport	WB	203	2900	3000	95	0	0
R503 Knockmaroe to Newport*	WB	202	3000	3100	62	68	32
R503 Knockmaroe to Newport*	WB	201	3100	3200	71	23	28
R503 Knockmaroe to Newport*	WB	200	3200	3300	87	0	100
R503 Knockmaroe to Newport*	WB	199	3300	3400	78	0	36
R503 Knockmaroe to Newport*	WB	198	3400	3500	87	0	100
R503 Knockmaroe to Newport*	WB	197	3500	3600	100	0	0
R503 Knockmaroe to Newport*	WB	196	3600	3700	84	36	64
R503 Knockmaroe to Newport*	WB	195	3700	3800	34	38	17
R503 Knockmaroe to Newport*	WB	194	3800	3900	30	51	13



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Knockmaroe to Newport*	WB	193	3900	4000	94	0	100
R503 Knockmaroe to Newport	WB	192	4000	4100	94	0	100
R503 Knockmaroe to Newport	WB	191	4100	4200	100	0	0
R503 Knockmaroe to Newport	WB	190	4200	4300	100	0	0
R503 Knockmaroe to Newport	WB	189	4300	4400	100	0	0
R503 Knockmaroe to Newport	WB	188	4400	4500	97	0	100
R503 Knockmaroe to Newport	WB	187	4500	4600	100	0	0
R503 Knockmaroe to Newport	WB	186	4600	4700	100	0	0
R503 Knockmaroe to Newport	WB	185	4700	4800	100	0	0
R503 Knockmaroe to Newport	WB	184	4800	4900	100	0	0
R503 Knockmaroe to Newport	WB	183	4900	5000	97	0	100
R503 Knockmaroe to Newport	WB	182	5000	5100	100	0	0
R503 Knockmaroe to Newport	WB	181	5100	5200	100	0	0
R503 Knockmaroe to Newport	WB	180	5200	5300	100	0	0
R503 Knockmaroe to Newport	WB	179	5300	5400	100	0	0
R503 Knockmaroe to Newport	WB	178	5400	5500	100	0	0
R503 Knockmaroe to Newport	WB	177	5500	5600	100	0	0
R503 Knockmaroe to Newport	WB	176	5600	5700	100	0	0
R503 Knockmaroe to Newport	WB	175	5700	5800	95	0	100
R503 Knockmaroe to Newport	WB	174	5800	5900	86	54	46
R503 Knockmaroe to Newport	WB	173	5900	6000	56	44	23
R503 Knockmaroe to Newport	WB	172	6000	6100	80	0	100
R503 Knockmaroe to Newport	WB	171	6100	6200	49	73	27
R503 Knockmaroe to Newport	WB	170	6200	6300	54	47	37
R503 Knockmaroe to Newport	WB	169	6300	6400	59	62	18
R503 Knockmaroe to Newport	WB	168	6400	6500	100	0	0
R503 Knockmaroe to Newport	WB	167	6500	6600	100	0	0
R503 Knockmaroe to Newport	WB	166	6600	6700	100	0	0
R503 Knockmaroe to Newport	WB	165	6700	6800	100	0	0
R503 Knockmaroe to Newport	WB	164	6800	6900	100	0	0
R503 Knockmaroe to Newport	WB	163	6900	7000	100	0	0
R503 Knockmaroe to Newport	WB	162	7000	7100	100	0	0
R503 Knockmaroe to Newport	WB	161	7100	7200	100	0	0
R503 Knockmaroe to Newport	WB	160	7200	7300	100	0	0
R503 Knockmaroe to Newport	WB	159	7300	7400	100	0	0
R503 Knockmaroe to Newport	WB	158	7400	7500	87	0	100
R503 Knockmaroe to Newport	WB	157	7500	7600	100	0	0
R503 Knockmaroe to Newport	WB	156	7600	7700	85	0	38
R503 Knockmaroe to Newport	WB	155	7700	7800	100	0	0
R503 Knockmaroe to Newport	WB	154	7800	7900	67	78	22
R503 Knockmaroe to Newport	WB	153	7900	8000	96	0	0
R503 Knockmaroe to Newport	WB	152	8000	8100	94	0	100



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Knockmaroe to Newport	WB	151	8100	8200	94	0	100
R503 Knockmaroe to Newport	WB	150	8200	8300	100	0	0
R503 Knockmaroe to Newport	WB	149	8300	8400	92	0	100
R503 Knockmaroe to Newport	WB	148	8400	8500	94	0	100
R503 Knockmaroe to Newport	WB	147	8500	8600	90	89	0
R503 Knockmaroe to Newport	WB	146	8600	8700	92	0	100
R503 Knockmaroe to Newport	WB	145	8700	8800	88	0	100
R503 Knockmaroe to Newport	WB	144	8800	8900	87	0	100
R503 Knockmaroe to Newport	WB	143	8900	9000	51	59	41
R503 Knockmaroe to Newport	WB	142	9000	9100	38	56	44
R503 Knockmaroe to Newport	WB	141	9100	9200	23	49	23
R503 Knockmaroe to Newport	WB	140	9200	9300	30	41	31
R503 Knockmaroe to Newport	WB	139	9300	9400	41	65	13
R503 Knockmaroe to Newport	WB	138	9400	9500	84	45	55
R503 Knockmaroe to Newport	WB	137	9500	9600	29	67	25
R503 Knockmaroe to Newport	WB	136	9600	9700	87	0	46
R503 Knockmaroe to Newport	WB	135	9700	9800	100	0	0
R503 Knockmaroe to Newport	WB	134	9800	9900	100	0	0
R503 Knockmaroe to Newport	WB	133	9900	10000	100	0	0
R503 Knockmaroe to Newport	WB	132	10000	10100	100	0	0
R503 Knockmaroe to Newport	WB	131	10100	10200	100	0	0
R503 Knockmaroe to Newport*	WB	130	10200	10300	100	0	0
R503 Knockmaroe to Newport*	WB	129	10300	10400	100	0	0
R503 Knockmaroe to Newport*	WB	128	10400	10500	92	0	100
R503 Knockmaroe to Newport*	WB	127	10500	10600	64	59	16
R503 Knockmaroe to Newport*	WB	126	10600	10700	21	70	6
R503 Knockmaroe to Newport*	WB	125	10700	10800	89	0	100
R503 Knockmaroe to Newport*	WB	124	10800	10900	56	16	29
R503 Knockmaroe to Newport*	WB	123	10900	11000	89	0	100
R503 Knockmaroe to Newport	WB	122	11000	11100	94	0	100
R503 Knockmaroe to Newport	WB	121	11100	11200	100	0	0
R503 Knockmaroe to Newport	WB	120	11200	11300	85	0	38
R503 Knockmaroe to Newport	WB	119	11300	11400	94	0	100
R503 Knockmaroe to Newport	WB	118	11400	11500	100	0	0
R503 Knockmaroe to Newport	WB	117	11500	11600	91	0	100
R503 Knockmaroe to Newport	WB	116	11600	11700	56	55	5
R503 Knockmaroe to Newport	WB	115	11700	11800	47	40	15
R503 Knockmaroe to Newport	WB	114	11800	11900	14	55	9
R503 Knockmaroe to Newport	WB	113	11900	12000	17	65	7
R503 Knockmaroe to Newport	WB	112	12000	12100	100	0	0
R503 Knockmaroe to Newport	WB	111	12100	12200	83	0	18
R503 Knockmaroe to Newport	WB	110	12200	12300	100	0	0



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Knockmaroe to Newport	WB	109	12300	12400	100	0	0
R503 Knockmaroe to Newport	WB	108	12400	12500	96	0	0
R503 Knockmaroe to Newport	WB	107	12500	12600	90	0	0
R503 Knockmaroe to Newport	WB	106	12600	12700	100	0	0
R503 Knockmaroe to Newport	WB	105	12700	12800	95	0	0
R503 Knockmaroe to Newport	WB	104	12800	12900	69	0	22
R503 Knockmaroe to Newport	WB	103	12900	13000	100	0	0
R503 Knockmaroe to Newport	WB	102	13000	13100	100	0	0
R503 Knockmaroe to Newport	WB	101	13100	13200	86	0	0
R503 Knockmaroe to Newport	WB	100	13200	13300	90	0	0
R503 Knockmaroe to Newport	WB	99	13300	13400	69	0	0
R503 Knockmaroe to Newport	WB	98	13400	13500	77	0	0
R503 Knockmaroe to Newport	WB	97	13500	13600	38	82	8
R503 Knockmaroe to Newport	WB	96	13600	13700	100	0	0
R503 Knockmaroe to Newport	WB	95	13700	13800	87	0	45
R503 Knockmaroe to Newport	WB	94	13800	13900	48	58	7
R503 Knockmaroe to Newport	WB	93	13900	14000	95	0	0
R503 Knockmaroe to Newport	WB	92	14000	14100	93	34	0
R503 Knockmaroe to Newport	WB	91	14100	14200	90	0	0
R503 Knockmaroe to Newport	WB	90	14200	14300	90	0	0
R503 Knockmaroe to Newport	WB	89	14300	14400	99	0	0
R503 Knockmaroe to Newport	WB	88	14400	14500	75	21	0
R503 Knockmaroe to Newport	WB	87	14500	14600	95	0	0
R503 Knockmaroe to Newport	WB	86	14600	14700	100	0	0
R503 Knockmaroe to Newport	WB	85	14700	14800	90	0	0
R503 Knockmaroe to Newport	WB	84	14800	14900	67	81	17
R503 Knockmaroe to Newport	WB	83	14900	15000	90	0	0
R503 Knockmaroe to Newport	WB	82	15000	15100	90	0	0
R503 Knockmaroe to Newport	WB	81	15100	15200	94	0	82
R503 Knockmaroe to Newport	WB	80	15200	15300	94	0	82
R503 Knockmaroe to Newport	WB	79	15300	15400	90	0	0
R503 Knockmaroe to Newport	WB	78	15400	15500	90	0	0
R503 Knockmaroe to Newport	WB	77	15500	15600	90	0	0
R503 Knockmaroe to Newport	WB	76	15600	15700	84	0	27
R503 Knockmaroe to Newport	WB	75	15700	15800	90	0	0
R503 Knockmaroe to Newport	WB	74	15800	15900	83	35	20
R503 Knockmaroe to Newport	WB	73	15900	16000	90	0	0
R503 Knockmaroe to Newport	WB	72	16000	16100	95	0	0
R503 Knockmaroe to Newport	WB	71	16100	16200	54	51	21
R503 Knockmaroe to Newport	WB	70	16200	16300	87	0	59
R503 Knockmaroe to Newport	WB	69	16300	16400	29	34	18
R503 Knockmaroe to Newport	WB	68	16400	16500	18	59	11



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Knockmaroe to Newport	WB	67	16500	16600	23	32	16
R503 Knockmaroe to Newport	WB	66	16600	16700	71	9	11
R503 Knockmaroe to Newport	WB	65	16700	16800	84	0	65
R503 Knockmaroe to Newport	WB	64	16800	16900	77	0	0
R503 Knockmaroe to Newport	WB	63	16900	17000	86	0	64
R503 Knockmaroe to Newport	WB	62	17000	17100	100	0	0
R503 Knockmaroe to Newport	WB	61	17100	17200	65	71	7
R503 Knockmaroe to Newport	WB	60	17200	17300	69	5	31
R503 Knockmaroe to Newport	WB	59	17300	17400	69	0	0
R503 Knockmaroe to Newport	WB	58	17400	17500	84	0	27
R503 Knockmaroe to Newport	WB	57	17500	17600	87	0	59
R503 Knockmaroe to Newport	WB	56	17600	17700	80	0	44
R503 Knockmaroe to Newport	WB	55	17700	17800	69	0	32
R503 Knockmaroe to Newport	WB	54	17800	17900	67	27	8
R503 Knockmaroe to Newport	WB	53	17900	18000	69	0	19
R503 Knockmaroe to Newport	WB	52	18000	18100	69	0	16
R503 Knockmaroe to Newport	WB	51	18100	18200	77	0	27
R503 Knockmaroe to Newport	WB	50	18200	18300	89	0	100
R503 Knockmaroe to Newport	WB	49	18300	18400	92	0	100
R503 Knockmaroe to Newport	WB	48	18400	18500	29	59	25
R503 Knockmaroe to Newport	WB	47	18500	18600	65	72	28
R503 Knockmaroe to Newport	WB	46	18600	18700	100	0	0
R503 Knockmaroe to Newport	WB	45	18700	18800	100	0	0
R503 Knockmaroe to Newport	WB	44	18800	18900	100	0	0
R503 Knockmaroe to Newport	WB	43	18900	19000	100	0	0
R503 Knockmaroe to Newport	WB	42	19000	19100	100	0	0
R503 Knockmaroe to Newport	WB	41	19100	19200	100	0	0
R503 Knockmaroe to Newport	WB	40	19200	19300	100	0	0
R503 Knockmaroe to Newport	WB	39	19300	19400	100	0	0
R503 Knockmaroe to Newport	WB	38	19400	19500	100	0	0
R503 Knockmaroe to Newport	WB	37	19500	19600	100	0	0
R503 Knockmaroe to Newport	WB	36	19600	19700	100	0	0
R503 Knockmaroe to Newport	WB	35	19700	19800	94	0	100
R503 Knockmaroe to Newport	WB	34	19800	19900	87	0	100
R503 Knockmaroe to Newport	WB	33	19900	20000	92	0	100
R503 Knockmaroe to Newport	WB	32	20000	20100	92	0	100
R503 Knockmaroe to Newport	WB	31	20100	20200	92	0	100
R503 Knockmaroe to Newport	WB	30	20200	20300	94	0	100
R503 Knockmaroe to Newport	WB	29	20300	20400	92	0	100
R503 Knockmaroe to Newport	WB	28	20400	20500	88	0	100
R503 Knockmaroe to Newport	WB	27	20500	20600	96	0	0
R503 Knockmaroe to Newport	WB	26	20600	20700	65	100	0



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
R503 Knockmaroe to Newport	WB	25	20700	20800	100	0	0
R503 Knockmaroe to Newport	WB	24	20800	20900	100	0	0
R503 Knockmaroe to Newport	WB	23	20900	21000	100	0	0
R503 Knockmaroe to Newport	WB	22	21000	21100	100	0	0
R503 Knockmaroe to Newport	WB	21	21100	21200	91	88	0
R503 Knockmaroe to Newport	WB	20	21200	21300	76	27	15
R503 Knockmaroe to Newport	WB	19	21300	21400	94	0	100
R503 Knockmaroe to Newport	WB	18	21400	21500	94	0	100
R503 Knockmaroe to Newport	WB	17	21500	21600	82	10	33
R503 Knockmaroe to Newport	WB	16	21600	21700	62	27	10
R503 Knockmaroe to Newport	WB	15	21700	21800	94	0	100
R503 Knockmaroe to Newport	WB	14	21800	21900	81	38	11
R503 Knockmaroe to Newport	WB	13	21900	22000	94	0	100
R503 Knockmaroe to Newport	WB	12	22000	22100	94	0	100
R503 Knockmaroe to Newport	WB	11	22100	22200	48	33	28
R503 Knockmaroe to Newport	WB	10	22200	22300	70	0	49
R503 Knockmaroe to Newport	WB	9	22300	22400	100	0	0
R503 Knockmaroe to Newport	WB	8	22400	22500	97	0	100
R503 Knockmaroe to Newport	WB	7	22500	22600	65	79	21
R503 Knockmaroe to Newport	WB	6	22600	22700	18	94	6
R503 Knockmaroe to Newport	WB	5	22700	22800	10	60	13
R503 Knockmaroe to Newport	WB	4	22800	22900	2	54	13
R503 Knockmaroe to Newport	WB	3	22900	23000	7	60	9
R503 Knockmaroe to Newport	WB	2	23000	23100	18	55	13
R503 Knockmaroe to Newport	WB	1	23100	23200	30	92	8
L2264-50 at Knockmaroe	EB	1	0	100	54	73	27
L2264-50 at Knockmaroe	EB	2	100	200	80	39	49
L2264-50 at Knockmaroe	EB	3	200	300	76	3	25
L2264-50 at Knockmaroe	EB	4	300	400	81	27	73
L2264-50 at Knockmaroe	EB	5	400	500	40	70	10
L2264-50 at Knockmaroe	EB	6	500	600	89	0	100
L2264-50 at Knockmaroe	EB	7	600	700	85	49	51
L2264-50 at Knockmaroe	EB	8	700	800	43	64	29
L2264-50 at Knockmaroe	EB	9	800	900	47	65	22
L2264-50 at Knockmaroe	EB	10	900	1000	85	49	51
L2264-50 at Knockmaroe	EB	11	1000	1100	94	0	100
L2264-50 at Knockmaroe	EB	12	1100	1200	30	66	16
L2264-50 at Knockmaroe	EB	13	1200	1300	83	35	65
L2264-50 at Knockmaroe	EB	14	1300	1400	83	35	37
L2264-50 at Knockmaroe	EB	15	1400	1500	53	41	24
L2264-50 at Knockmaroe	EB	16	1500	1600	77	0	100



Road No.	Lane/Dir	Section Number	Chainage (m)		PCI	% Structure	% Surface
			From	To			
L2264-50 at Knockmaroe	EB	17	1600	1700	77	24	53
L2264-50 at Knockmaroe	EB	18	1700	1800	89	22	78
L2264-50 at Knockmaroe	EB	19	1800	1900	91	0	100
L6188-0 at Knockmaroe	EB	1	0	100	94	0	100
L6188-0 at Knockmaroe	EB	2	100	200	94	0	100
L6188-0 at Knockmaroe	EB	3	200	300	100	0	0
L6188-0 at Knockmaroe	EB	4	300	400	73	24	20
L6188-0 at Knockmaroe	EB	5	400	500	75	0	31
L6188-0 at Knockmaroe	EB	6	500	600	62	19	11
L6188-0 at Knockmaroe	EB	7	600	700	40	44	6
L6188-0 at Knockmaroe	EB	8	700	800	71	28	19
L6188-0 at Knockmaroe	EB	9	800	900	40	32	11
L6188-0 at Knockmaroe	EB	10	900	1000	94	0	100
L6188-0 at Knockmaroe	EB	11	1000	1100	31	30	10
L6188-0 at Knockmaroe	EB	12	1100	1200	88	0	43
L6188-0 at Knockmaroe	EB	13	1200	1300	86	0	30

* sections resurfaced in August 2019

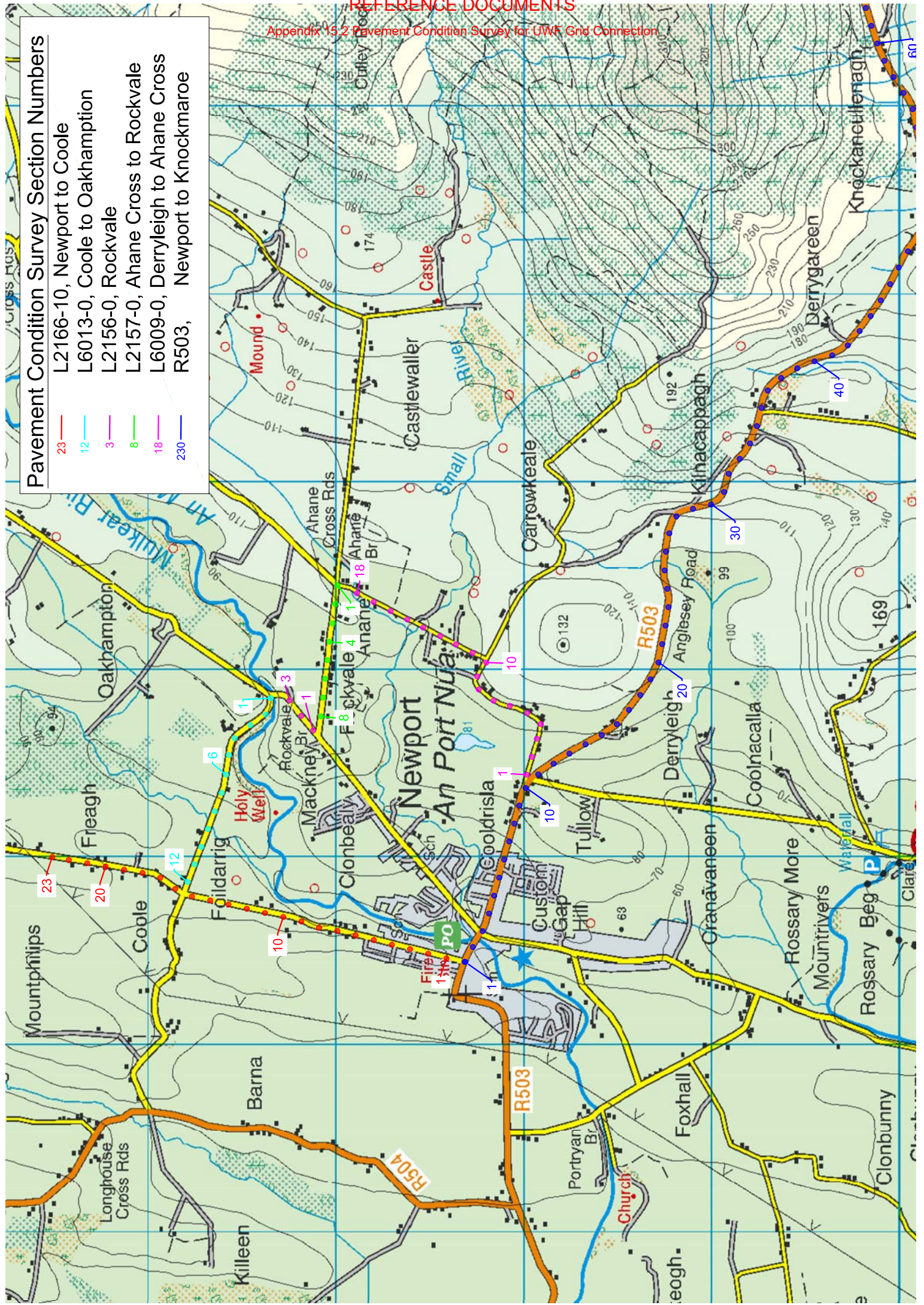


Appendix B – Site Maps

Pavement Condition Survey Section Numbers

- L2166-10, Newport to Coole
- L6013-0, Coole to Oakhampton
- L2156-0, Rockvale
- L2157-0, Ahane Cross to Rockvale
- L6009-0, Derryleigh to Ahane Cross
- R503, Newport to Knockmaroe

- 23
- 12
- 3
- 8
- 18
- 230

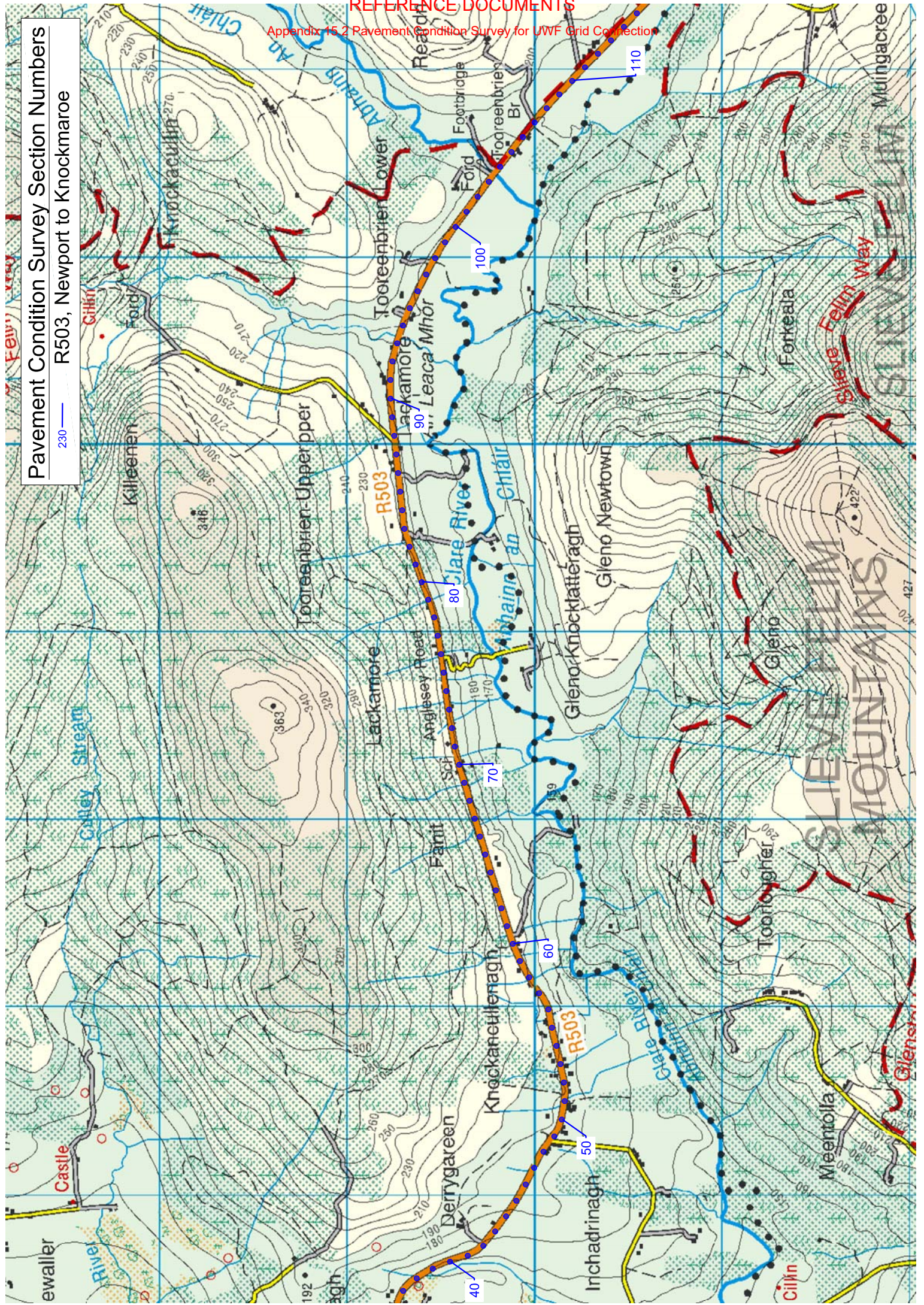


REFERENCE DOCUMENTS

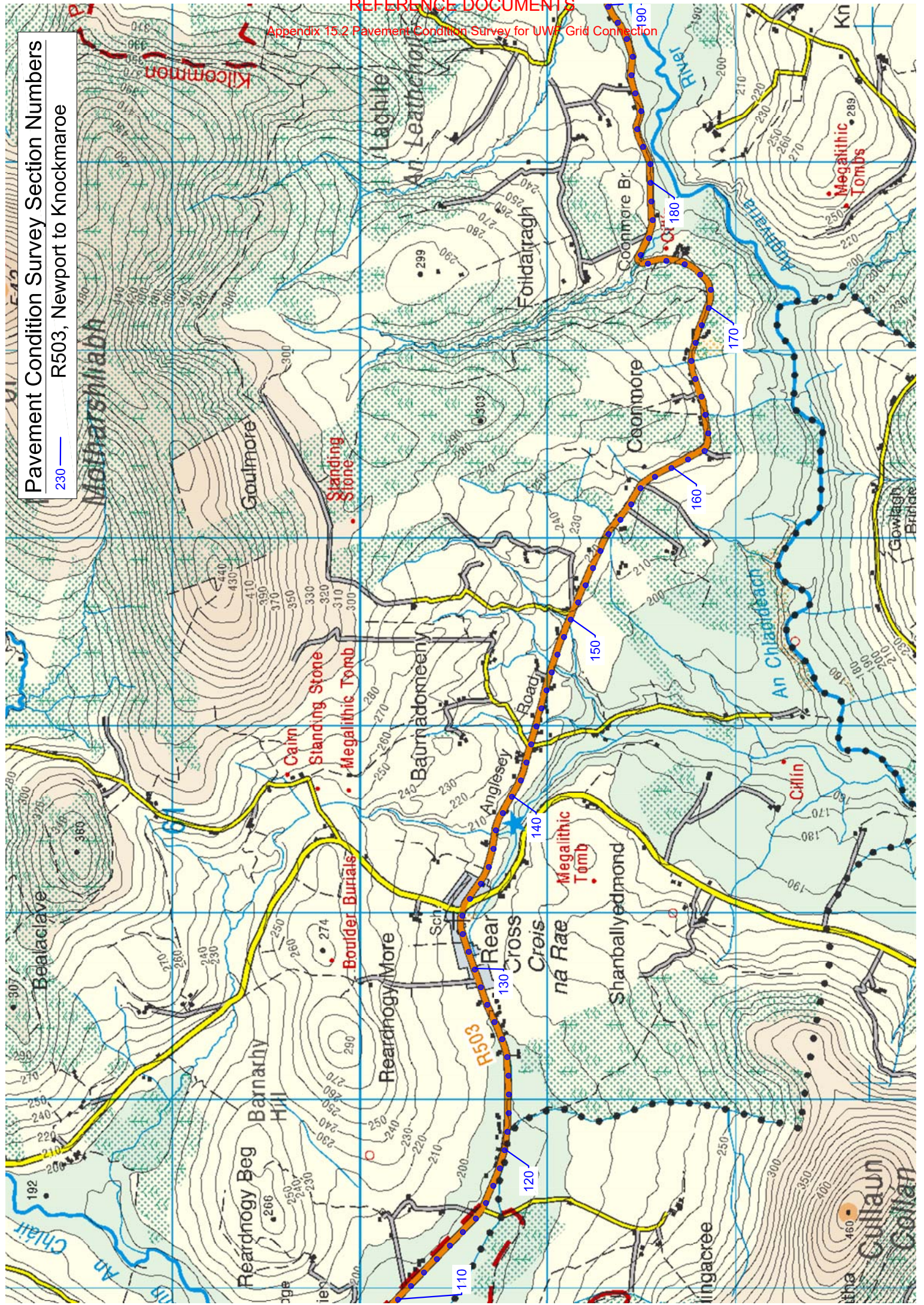
Appendix 15.2 Pavement Condition Survey for UJWF Grid Connection

Pavement Condition Survey Section Numbers
R503, Newport to Knockmaroe

230

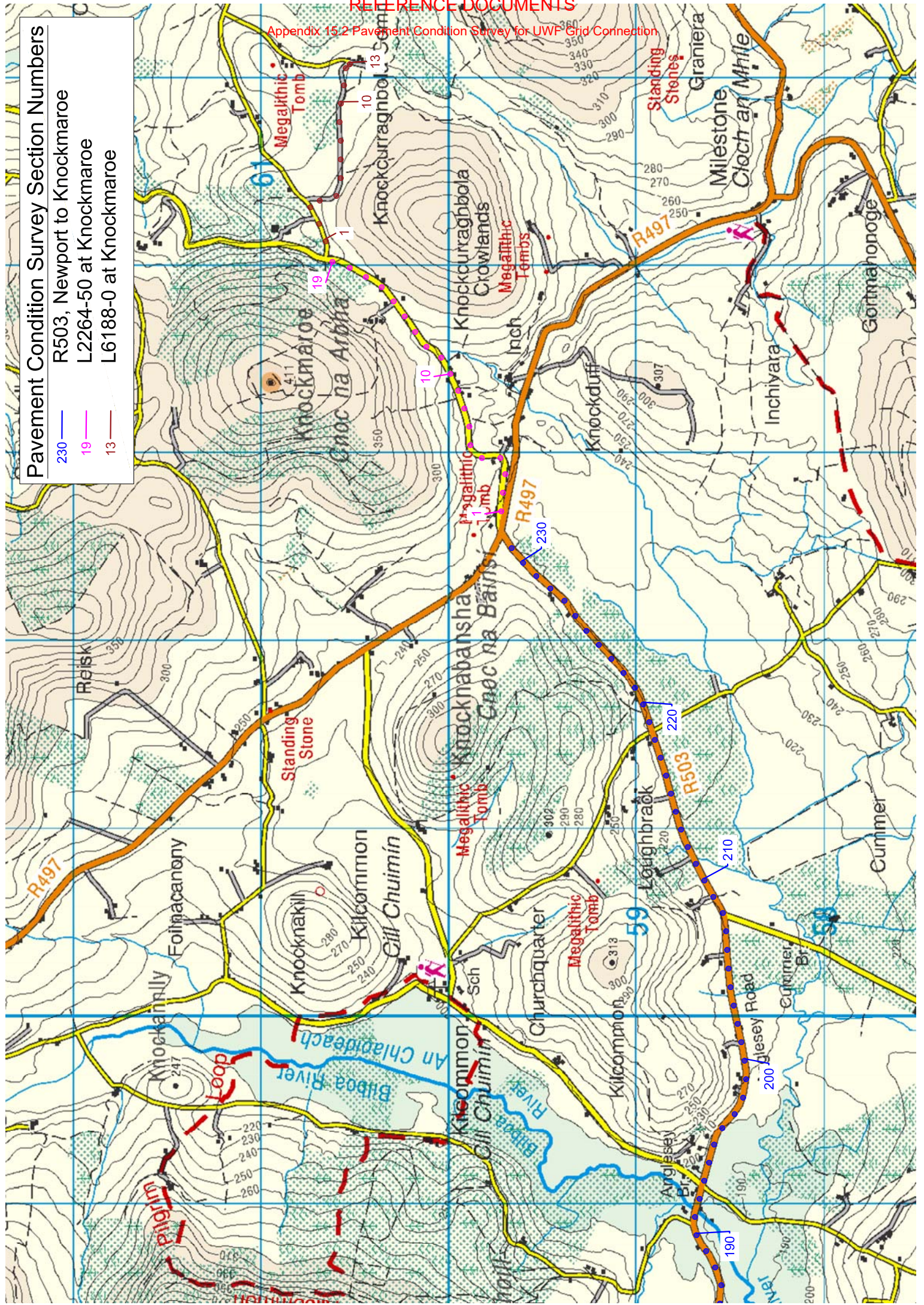


Pavement Condition Survey Section Numbers
R503, Newport to Knockmaroe
230 —



Pavement Condition Survey Section Numbers

- R503, Newport to Knockmaroe
- L2264-50 at Knockmaroe
- L6188-0 at Knockmaroe





REFERENCE DOCUMENTS

Appendix to Chapter 15: Material Assets (Roads)

Appendix 15.3: Site Photographs of UWF Grid Connection Roads, Bridges & Culverts

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Photos of UWF GRID CONNECTION Roads	
	<p>L2166-0 at Coole</p>
	<p>L6013-0 at Freagh</p>



L2156-0 at Rockvale



L2157 at Ahane



L6009 at Castlewaller



L503 at Derryleigh



R503 at Rear Cross



R503 at Knockmaroe

REFERENCE DOCUMENTS

APPENDIX 15.3: Site Photographs
EIA 2019, Chapter 15: Material Assets (Roads)



L2264-50 at Knockmaroe



L6188-0 at Knockmaroe

Photos of UWF GRID CONNECTION Bridges / Culverts



Watercrossing Structure W4



Watercrossing Structure W5



Watercrossing Structure W6



Watercrossing Structure W7



Watercrossing Structure W8



Watercrossing Structure W9



Watercrossing Structure W10



Watercrossing Structure W11



Watercrossing Structure W12



Watercrossing Structure W13



Watercrossing Structure W14



Watercrossing Structure W15



Watercrossing Structure W16



Watercrossing Structure W17



Watercrossing Structure W18



Watercrossing Structure W19



Watercrossing Structure W20



Watercrossing Structure W21



Watercrossing Structure W22



Watercrossing Structure W23



Watercrossing Structure W24



Watercrossing Structure W25



Watercrossing Structure W26



Watercrossing Structure W27



Watercrossing Structure W28



Watercrossing Structure W29



Watercrossing Structure W30



Watercrossing Structure W31



Watercrossing Structure W32



Watercrossing Structure W33



Watercrossing Structure W34



Watercrossing Structure W35



Watercrossing Structure W36



Watercrossing Structure W37



Watercrossing Structure W38



Watercrossing Structure W39



Watercrossing Structure W40



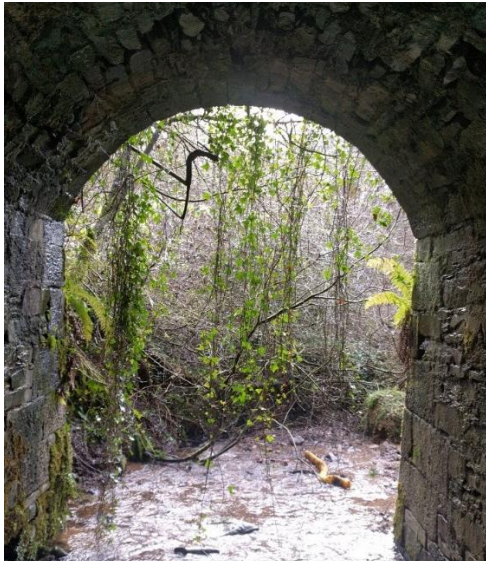
Watercrossing Structure W41



Watercrossing Structure W42






Watercrossing Structure W43



Watercrossing Structure W44



Watercrossing Structure W45

	<p>Watercrossing Structure W46</p>
	<p>Watercrossing Structure W47</p>
	<p>Watercrossing Structure W48</p>



Watercrossing Structure W49



Watercrossing Structure W50



Watercrossing Structure W51



Watercrossing Structure W52



Watercrossing Structure W53



Watercrossing Structure W54



Watercrossing Structure W55



Watercrossing Structure W56



Watercrossing Structure W57



Watercrossing Structure W58



Watercrossing Structure W59



Watercrossing Structure W60



Watercrossing Structure W61



Watercrossing Structure W62



Watercrossing Structure W63



Watercrossing Structure W64



Watercrossing Structure W65



Watercrossing Structure W66



Watercrossing Structure W67



Watercrossing Structure W68

Appendix to Chapter 15: Material Assets (Roads)

Appendix 15.4: Stage 1 Road Safety Audit and Review

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

REFERENCE DOCUMENTS

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | Limerick | London

ECOPOWER Developments Ltd.

**Proposed Upperchurch Windfarm
Grid Connection (UWF Grid
Connection), County Tipperary**

**Stage 1 Road Safety Audit and
Review**

Project No.: 20815
Document No.: 6001/Rev.B
Date: October 2019

ECOPOWER Development Ltd.

Proposed Upperchurch Windfarm Grid Connection (UWF Grid Connection), County Tipperary

Stage 1 Road Safety Audit and Review

Project No.	Doc. No.	Rev.	Date	Prepared By	Checked By	Approved By	Status
20815	6001	A	02.09.2019	S. Quigley	S Doyle	S Quigley	Draft
20815	6001	B	02.10.2019	S. Quigley	S Doyle	S Quigley	Draft
20815	6001	B	14.10.2019	S. Quigley	S Doyle	S Quigley	Final

Malachy Walsh and Partners, Engineering and Environmental Consultants

Address: Park House, Mahon Technology Park, Bessboro Road, Blackrock, Cork

CONTENTS

1.0	INTRODUCTION	2
2.0	FINDINGS OF THE STAGE 1 ROAD SAFETY AUDIT AND REVIEW	8
3.0	AUDIT AND REVIEW TEAM STATEMENT.....	18
	APPENDIX A – LIST OF DOCUMENTS PROVIDED FOR THIS AUDIT AND REVIEW	19
	APPENDIX B – DESIGNER’S FEEDBACK.....	23

1.0 INTRODUCTION

- 1.1 This report details the findings of a Stage 1 Road Safety Audit and Review of the proposed Upperchurch Windfarm Grid Connection (UWF Grid Connection), County Tipperary. This Road Safety Audit and Review was commissioned by Ecopower Developments Ltd.
- 1.2 The scope of this Audit and Review includes a Stage 1 Road Safety Audit of the proposed public road works design and the proposed temporary construction public road traffic management design during the construction works; and a Road Safety Review of the existing Local Roads and R503 Regional Road along the proposed UWF Grid Connection public road route.
- 1.3 Malachy Walsh and Partners' Road Safety Auditors carried out the Audit and Review, as follows:-
- | | |
|------------------------------------|----------------------------|
| Sean Doyle, BE CEng MIEI | Malachy Walsh and Partners |
| Seamus Quigley, BE CEng MIEI MCIHT | Malachy Walsh and Partners |
- 1.4 Sean Doyle and Seamus Quigley inspected the site on the 28th August 2019, between 10.00 a.m. and 1.30 p.m., in daylight, by foot and in a car, during dry weather conditions. Record photographs were taken.
- 1.5 The proposed UWF Grid Connection extends from the proposed Mountphilips Substation in Mountphilips townland, north of Newport, to the permitted Upperchurch Windfarm at Knockcurraghobola Commons townland, on the west side of Upperchurch, County Tipperary. The UWF Grid Connection extends approximately 30.5 kms from the proposed Mountphilips Substation, via the L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, R503, L2264-50 and L6188-0, to the consented Upperchurch Windfarm.
- 1.6 The proposed UWF Grid Connection public road works include a new access junction at an existing farm gate on the west side of the L2166-10 Local Road for the proposed Mountphilips Substation; and works to an existing watercourse bridge on the L2156-0 over the Newport River (at watercourse crossing W7, Bridge No.2) and two watercourse bridges on the R503 over the Claire River (at watercourse crossing W36, Bridge No.11) and the Bilboa River (at watercourse crossing W53, Bridge

- No.15). These watercourse crossings and bridge references are as per the UWF Grid Connection EIAR. All the proposed public road works are located within the existing 80 km/hour rural speed limit zone.
- 1.7 Adjacent to the proposed Mountphilips Substation access, the L2166-10 Local Road has a typical road carriageway width of 5.2 metres, with variable width grass verges and hedgerow boundaries. The existing horizontal alignment is relatively straight and the vertical alignment is on a slight inclining gradient northbound. There is an existing farm gate at the location of the proposed access to Mountphilips Substation. The proposed Mountphilips Substation access junction on the west side of the L2166 includes junction sight visibility splays of 160 metres along the L2166, from a setback distance of 2.4 metres. A new gate is proposed at a setback distance of 4.5 metres from the L2166 road carriageway. The existing site boundary hedgerow and trees would be removed, cut back and replanted, accordingly.
- 1.8 The L6013-0 has a crossroads junction with the L2166-10 south of the proposed Mountphilips Substation access. The L6013-0 has a typical road carriageway width of 4.2 metres, with a narrowed section of circa 3.6 metres, locally.
- 1.9 The L2156-0 forms a Stop T-junction on the west side of the L6013-0, immediately north of the L2156-0's watercourse bridge with the Newport River (watercourse crossing W7, Bridge No.2). There are white on red Slow road marking warnings on the L2156-0 on its approaches to its Newport River bridge. The vertical alignment on both L2156-0 bridge approaches are on declining gradients, while the horizontal alignment is on an S-curve at the bridge location.
- 1.10 The L2156-0 has a 4.9 metres wide road carriageway, between the bridge no.2 parapet walls. The existing bridge parapet walls are 1.3 metres in height, and are splayed on both sides of the bridge. Open ditch drainage channels are provided along the L2156-0 on both sides of the bridge location. At the bridge, the vertical alignment of the L2156-0 is on a slight decline from north to south, and has a slight cross fall from east to west.

- 1.11 The road works to bridge no.2 (W7) includes the reinstatement and build up of the road pavement to a level of up to approximately 140 mm above existing, with 2.5% camber to each side from the road centreline. The extent of proposed road pavement build up is at the bridge between its straight parapet walls' section. The works also include a handrail to the west side parapet wall.
- 1.12 South of its Newport River Bridge (W7, bridge no.2), the L2156-0 has a typical road carriageway width of 5.1 metres and extends south to the Local Road L5337-1, which is within the Newport Town 50 km/hour urban area.
- 1.13 The L2157-0 forms a T-junction with the L2156-0 on the east side of the L2157-0 at Rockvale cemetery. The L2157-0 Local Road has a typical road carriageway width of 4.2 metres, with set-back property boundaries and a south side footway along its western section. The eastern section of the L2156-0 has a typical road carriageway width of 6 metres. The L2156-0 has a relatively straight horizontal alignment and slight declining vertical gradient eastbound.
- 1.14 The L6009-0 has a crossroads junction with the L2157-0 on the west side of the L2157-0 at Ahane. The L6009-0 Local Road has a typical road carriageway width of 3.0 metres, with intermittent set-back property boundaries. The L6009-0 horizontal alignment includes a series of relatively straight sections with connecting 90 degrees horizontal bends, and a relatively level vertical alignment.
- 1.15 East of Newport, the R503 has a typical road carriageway width of 5.0 metres within its 80 km/hour speed limit zone.

- 1.16 The R503 crosses the Claire River (W36, bridge no.11) over the Toorenbrien Bridge, west of Rear Cross. This watercourse bridge has Tipperary County Council bridge reference TN-R503-005. The R503 has a road carriageway width, between the bridge parapet walls of 6.4 metres. The existing parapet walls are 0.4 metres in height. In the vicinity of the bridge, the horizontal alignment of the R503 is relatively straight, while the vertical alignment is relatively level. There are property accesses immediately on both sides of the bridge onto the eastbound carriageway; and a farm gate access on the west side of the bridge onto the westbound carriageway. At the bridge, the vertical levels decline slightly to both ends from the approximate bridge centre.
- 1.17 The road works to bridge no.11 (W36) includes the reinstatement and build up of the road pavement to a level of up to 140 mm above existing, with 2.5% camber to each side from the road centreline. The extent of proposed road pavement build up is at the bridge between its parapet walls. The works also include the build up of the parapet walls.
- 1.18 The R503 has a typical road carriageway width of 5.8 metres in the vicinity of the bridge, with centreline and road edge markings. Centreline road studs and cats eyes are provided, including along the bridge.
- 1.19 East of the bridge, the R503 has a 50 km/hour urban speed limit at Rear Cross. East of Rear Cross, the R503 has a typical road carriageway width of 5.0 metres.
- 1.20 East of Rear Cross, the R503 has a restricted horizontal alignment curve radius at Tipperary County Council bridge reference TN-503-006 and watercourse crossing reference W49 and bridge no.14 in the UWF Grid Connection EIAR. There are warning signs on the R503 approaches including Dangerous Bridge Ahead.

- 1.21 Further east, the R503 crosses the River Bilboa (watercourse crossing W53, bridge no.15) at Anglesey Bridge, at Kilcommon. The R503 has a road carriageway width of 4.9 metres, and a clear width between bridge parapets of 6.6 metres. The existing north and south bridge parapet walls are 0.7 metres and 0.8 metres in height, respectively. In the vicinity of the bridge, the horizontal alignment of the R503 is relatively straight with a horizontal curve on its south side, including at its north side L6086 junction. The vertical alignment is on a slight crest curve at the bridge, with a slight sag curve on the west side of the bridge.
- 1.22 The road works to bridge no.15 (W53) includes the reinstatement and build up of the road pavement to a level of up to 348 mm above existing, with 2.5% camber to each side from the road centreline. The extent of proposed road pavement build up is at the bridge between its parapet walls. The works also include the build up of the parapet walls and the installation of handrails to the parapet walls.
- 1.23 The L2264-50 has a Stop junction on the north side of the R503, immediately east of the R503/R497 T-junction. There are warning signs and road markings on the R503 approaches, including Slow Dangerous Junction Ahead. The L2264-50 is on a declining gradient to its R503 junction. The L2264-50 has a typical road carriageway width of 4.0 metres.
- 1.24 The L6188-0 forms a Stop junction on the east side of the L2264-50, with a road carriageway width of 4.0 metres, locally, at the junction. The L2264-50 has a horizontal curve west of its L6188-0 junction. East of the junction, the L6188-0 has a typical road carriageway width of 3.5 metres.
- 1.25 The proposed temporary construction traffic management on public roads for the UWF Grid Connection includes short period road closures on the L6013-0, L6009-0 and L6188-0; and one traffic lane closures, with alternating traffic, on the R503, L2166-10, L2156-0, L2157-0 and L2264-50.
- 1.26 The drawings and other documents provided to carry out the Road Safety Audit and Review are listed in Appendix A.

1.27 This Audit and Review have been carried out in accordance with the procedures provided in the relevant sections of the TII Road Safety Audit GE-STY-01024 December 2017 and TII Road Safety Audit Guidelines GE-STY-01027 December 2017; and with reference to the DoTTS Design Manual for Urban Roads and Streets. The Auditors have examined and reported only on those features of the design considered to have road safety implications and have not examined or verified the compliance of the scheme to any other criteria.

1.28 Section 2 of this report presents the findings of the Stage 1 Road Safety Audit and Review of the proposed UWF Grid Connection.

Designer's Feedback in Response to the Audit and Review

1.29 The Designer's Feedback is provided in Appendix B and includes revised drawings in response to the audit.

1.30 The Designer has accepted all of the problems and recommended measures identified in the findings of the Stage 1 Road Safety Audit and Review. The revised drawings provided in response to the Audit and Review incorporate the audit recommended measures.

1.31 The Designer's Feedback Form is signed by the Designer, Employer and Audit Team Leader.

2.0 FINDINGS OF THE STAGE 1 ROAD SAFETY AUDIT AND REVIEW

MOUNTPHILIPS SUBSTATION ACCESS JUNCTION

2.1 Comment – Potential Landscaping Growth within Junction Sight Visibility Splays

The partial removal/pruning of hedges and trees; and replanting hedge and trees behind sight lines are proposed at the junction. It is recommended that landscaping located adjacent to the junction sight visibility splays is cut back and maintained, as required, to ensure that junction sight visibility splays are maintained clear of landscaping obstruction.

L2156-0 NEWPORT RIVER BRIDGE ROAD WORKS (WATERCOURSE CROSSING W7, BRIDGE No.2)

2.2 Problem – No Details of Proposed Vertical Levels at Tie-Ins

There are no details of the vertical levels proposed at the tie-ins, with the existing L2156-0 road pavement surface, at either end of the proposed road pavement reinstatement and build up. The risks are that tie-ins without appropriate transition could result in sharp ramped edges, and consequent possible damage to vehicles and to the road pavement; and result in inadequate drainage, with ponding and ice during cold weather, and consequent potential skidding, collisions and injuries.

Recommendation:

Provide appropriate vertical tie-ins and transitions, maintaining the existing drainage from north to south along the L2156-0 across the bridge.

2.3 Comment – Bridge Parapet Walls’ Warning Markings Obscured by Vegetation

During the site inspection, the black and yellow warning markings on the bridge parapet and splay walls were obscured by vegetation. This reduces awareness for drivers and increases the risk of collisions and consequent injuries. It is recommended that the vegetation should be cut back and maintained and the markings renewed and maintained, as appropriate, by Tipperary County Council.

Photograph: View Southbound on L2156-0 Approach to Newport River Bridge



R503 CLAIRE RIVER BRIDGE ROAD WORKS (WATERCOURSE CROSSING W36, BRIDGE NO.11)**2.4 Problem – No Details of Proposed Vertical Levels at Tie-Ins**

There are no details of the vertical levels proposed at the tie-ins with the existing R503 road pavement surface at either end of the proposed road pavement reinstatement and build up. The risks are that tie-ins without appropriate transition could result in sharp ramped edges, and consequent possible damage to vehicles and to the road pavement; and result in inadequate drainage, with ponding and ice during cold weather, and consequent potential skidding, collisions and injuries.

Recommendation:

Provide appropriate vertical tie-ins and transitions, maintaining the existing drainage along the R503 from the approximate centre of the bridge to both ends, with appropriate tie-ins with the existing adjacent accesses.

R503 RIVER BILBOA BRIDGE ROAD WORKS (WATERCOURSE CROSSING W53, BRIDGE NO.15)**2.5 Problem – No Details of Proposed Vertical Levels at Tie-Ins**

There are no details of the vertical levels proposed at the tie-ins with the existing R503 road pavement surface at either end of the proposed road pavement reinstatement and build up. The risks are that tie-ins without appropriate transition could result in sharp ramped edges, and consequent possible damage to vehicles and to the road pavement; and result in inadequate drainage, with ponding and ice during cold weather, and consequent potential skidding, collisions and injuries.

Recommendation:

Provide appropriate vertical tie-ins and transitions, maintaining the existing drainage along the R503 from the approximate centre of the bridge to both ends.

2.6 Problem – Increased Vertical Crest Curve and Reduced Visibilities

The existing bridge is on a vertical crest curve on the R503, with vertical sag curves on either side of the bridge. The vertical sag curve on the west side of the bridge is more pronounced than on the east side. The proposed road level build up of up to 348 mm on the bridge would increase the abruptness of both the crest and sag curves and reduce forward visibilities for drivers, particularly westbound. This would increase the risk of vehicle collisions, including for vehicles turning at the L6086 junction on the west side of the bridge, with possible consequent injuries for vehicle occupants. The risk of collisions and injuries for cyclists and pedestrians would also be increased, by reduced visibilities.

Recommendation:

Provide an appropriate vertical alignment at the bridge, to maintain existing visibilities, by increasing the length of the vertical curves from east of the L6086 junction on the west side, to west of the properties and existing drainage gullies on the east side of the bridge. Refer also to item 2.5 above.

2.7 Problem – No Details of Parapet Containment Level

The existing bridge parapet walls are less than the 1.0 metres height for vehicle parapets identified by the TII publication The Design of Vehicle and Pedestrian Parapets, for structures carrying roads. It is proposed to install handrails on both parapets. It is unclear if the proposed parapets would meet the H2 parapet containment level identified by the TII requirements for structures carrying roads. Without appropriate containment, the proposed road level build up could increase the risk of an errant vehicle leaving the road carriageway at the bridge, with possible consequent injuries for vehicle occupants.

Recommendation:

Provide appropriate parapet containment level, with reference to the TII Standards, in consultation with Tipperary County Council.

TEMPORARY TRAFFIC MANAGEMENT

2.8 Comment – Road Works Traffic Lane Closures Sign Distances

The proposed temporary construction traffic management on public roads for the UWF Grid Connection includes one traffic lane closure, with alternating traffic, on the R503, L2166-10, L2156-0, L2157-0 and L2264-50. The drawing provided for audit indicates distances between advance signs of 25 metres. This is in accordance with the DoTTS Traffic Signs Manual Chapter 8 for 50 km/hour and 60 km/hour single carriageway roads. The Traffic Signs Manual identifies a longer distance for 80 km/hour roads. The drawing provided for audit does not include a sign visibility distance to the first road works sign. The Traffic Signs Manual identifies sign visibility distances to the first sign of up to 75 metres for 50/60 km/hour roads, and 120 metres for 80 km/hour roads. It is recommended that sign distances are in accordance with Chapter 8 of the Traffic Signs Manual, with provision for traffic queues, as appropriate.

L6013-0 STOP JUNCTION WITH THE L2166-10

2.9 Comment – Possible Inconspicuous Junction with See Through

The L6013-0 Stop junction with the L2166-10 is a see through crossroads junction on the westbound approach, and may not be conspicuous for all westbound drivers on the L6013 approach. There is no junction warning sign on the approach and there are no road markings visible at the junction from near distance on approach. The risk is that westbound drivers on the L6013-0 approach may not stop at the junction or brake late, putting them and other drivers on the L2166-10 at risk of serious collisions with consequent injuries for vehicle occupants. It is recommended that Tipperary County Council should provide appropriate junction warning and definition, to mitigate the see through at the crossroads junction and enhance its conspicuousness.

Photograph: View Westbound on L6013-0 Approach to L2166-10 Crossroads Junction



L2156-0 AT ROCKVALE CEMETERY**2.10 Comment – Faded Road Marking Warnings**

The white on red road markings on the L2156-0 northbound, located adjacent to Rockvale Cemetery and south of the L2156-0 Newport River bridge, are faded. This could reduce awareness for drivers. It is recommended that Tipperary County Council should renew and maintain the faded road marking warnings.

Photograph: View Northbound on L2156-0 Approach to Newport River Bridge (W7, Bridge No.2)



R503 BRIDGE TN-503-006 (W49, BRIDGE No.14)**2.11 Comment – Obscured Warning Markings and Incorrect Road Marking**

During the site inspection, the black and yellow warning markings on the TN-503-006 bridge parapet walls (W49, bridge no.14) were obscured by vegetation. This reduces awareness for drivers and increases the risk of collisions and consequent injuries. It is recommended that the vegetation should be cut back and maintained; and the road markings renewed and maintained, as appropriate, by Tipperary County Council.

A 'Rumble Strips' worded road marking is provided on the westbound approach to the bridge, on the restricted horizontal bend. It is considered that this is incorrect and that actual rumble strip road markings were envisaged at this location to warn drivers. It is recommended that this should be corrected by Tipperary County Council.

Photograph: View Westbound on R503 Approach to TN-503-006 Bridge (W49, bridge no.14)



L2264-50 STOP JUNCTION WITH THE R503

2.12 Comment – No Advance Junction Warning Sign

There is no advance junction warning sign on the L2264-50 approach to its R503 junction. The L2264-50 approach is on a declining vertical gradient. There are two disused sign poles on the L2264-50 approach to the junction. Lack of appropriate warning for drivers increases the risk of vehicle late braking and overshooting out onto the R503 carriageway, putting them at risk of side impact collisions and consequent injuries for vehicle drivers. Eastbound drivers on the R503 could swerve across the centreline, around a protruding vehicle on the L2264-50, into the path of an opposing vehicle, with potential head on collisions and serious injuries for occupants. It is recommended that appropriate advance warning of the junction should be provided by Tipperary County Council, with reference to the DoTTS Traffic Signs Manual.

2.13 Comment – Stop Sign in Advance of Junction

There is a Stop sign on the L2264-50 in advance of its junction with the R503 and in advance of the horizontal bend on the L2264-50 immediately on approach to the junction. Incorrect or lack of appropriate information for drivers could result in early or late braking and potential collisions and injuries. It is recommended that the existing Stop sign should be relocated to the junction and replaced with a Stop Ahead warning sign by Tipperary County Council, with reference to the DoTTS Traffic Signs Manual.

L6188-0 STOP JUNCTION WITH THE L2264-50**2.14 Comment – Vegetation in Junction Visibility Splay**

During the site inspection, vegetation was observed within the existing junction sight visibility splay on the north side of the L6188-0 at its Stop junction with the L2264-50. This restricts visibilities for drivers, increasing the risk of drivers pulling out into the path of southbound vehicles, with potential collisions and injuries. It is recommended that the vegetation should be cut back and maintained.

Photograph: View North from L6188-0 Stop Junction along L2264-50



Proposed Upperchurch Wind Farm (UWF) Grid Connection, County Tipperary

Stage 1 Road Safety Audit and Review

Document No. 20815/6001 Rev. B

3.0 AUDIT AND REVIEW TEAM STATEMENT


We certify that we have examined the drawings and other information listed in Appendix A of this report. The examination has been carried out for the sole purpose of identifying any features of the design that could be removed or modified in order to improve the safety of the scheme. The problems we have identified are noted in the report, together with suggestions for improvement, which we recommend should be studied for implementation.

Signed: 

14/10/2019

Date: _____

Sean Doyle, BE CEng MIEI
 Audit and Review Team Member
 For and on behalf of Malachy Walsh and Partners
 Engineering and Environmental Consultants
 Reen Point
 Blennerville
 Tralee
 Co. Kerry

Signed: 

Date: 14/10/2019

Seamus Quigley, BE CEng MIEI MCIHT
 Audit and Review Team Member
 For and on behalf of Malachy Walsh and Partners
 Engineering and Environmental Consultants
 Park House
 Mahon Technology Park
 Blackrock
 Cork

APPENDIX A – LIST OF DOCUMENTS PROVIDED FOR THIS AUDIT AND REVIEW

Drawings:-

Ecopower

Title: Figure GC 5.1

Location of the UWF Grid Connection on OSI Discovery Mapping

Date: 30-May-19

Ecopower

Title: Figure GC 5.2

Location of the Mountphilips Substation Site on Aerial Photography Mapping

Date: 30-May-19

Ecopower and TLI Group

Title: Figure GC 5.9

Cross Sections of Mountphilips – Upperchurch 110kV Underground Cables Trench

Date: 30-May-19

Ecopower and TLI Group

Title: Figure GC 5.11

Cross Sections 110kV UGC in the Public Road

Date: 30-May-19

Ecopower

Title: Figure GC 5.14

Plan View of Permanent Site Entrance 1 at Coole (Mountphilips Substation & Temporary Compound)

Date: 30-May-19

Ecopower and NRB Consulting Engineers

Title: Figure GC 5.17

Advance Warning Signage for Road Works & Site Entrances

Date: 30-May-19

Ecopower

Title: Figure GC 15.1

Location of the UWF Grid Connection

Date: June 19

Ecopower

Title: Figure WP 15.2

Public Roads within the Whole Project Cumulative Evaluation Study Area

Date: June 19

Ecopower

Title: Figure WP 15.3

Road Users within the Whole Project Cumulative Evaluation Study Area

Date: June 19

Ecopower

Title: Figure GC 15.3

Road Users within the UWF Related Works Study Area

Date: June 19

TLI Group

Title: Bridge 11 (W36) Crossing Details

Road Users within the UWF Related Works Study Area

Drawing Number: 05652-525

Revision: 03

Date: 11.07.19

TLI Group

Title: Bridge 15 (W53) Crossing Details: Site Layout Plan & Duct Detail – Sheet 1 of 2

Drawing Number: 05652-536

Revision: 04

Date: 17.07.19

TLI Group

Title: Bridge 15 (W53) Crossing Details: Elevations – Sheet 2 of 2

Drawing Number: 05652-537

Revision: 03

Date: 17.07.19

TLI Group

Title: Bridge 2 (W7) Crossing Details

Drawing Number: 05652-545

Revision: 04

Date: 17.07.19

Other Documents:-

Ecopower

UWF Grid Connection Volume C2: EIAR Main Report

Chapter 5 Description of Development – UWF Grid Connection

Date: July 2019

Ecopower and TLI Group

UWF Grid Connection Volume C2: EIAR Main Report

Chapter 15: Material Assets – Roads

Date: July 2019

Ecopower and TLI Group

Appendix 15.1: Traffic and Transportation Assessment

Ecopower

Appendix 15.2 Pavement Condition Survey for UWT Grid Connection

PMS Pavement Management Services

Pavement Condition Survey for Upperchurch Windfarm Grid Connection, Co. Tipperary

Date: 15/07/2019

Ecopower

Email to Malachy Walsh and Partners

Date: 19/08/2019

APPENDIX B – DESIGNER'S FEEDBACK

Paragraph No. in Safety Audit: 2.1

Comment: Potential Landscaping Growth within Junction Sight Visibility Splays

Ecopower Developments Response: Yes, landscaping located adjacent to the junction sight visibility splays will be cut back and maintained, as required, to ensure that junction sight visibility splays are maintained clear of landscaping obstruction.

Paragraph No. in Safety Audit: 2.2

Problem: No Details of Proposed Vertical Levels at Tie-Ins at Bridge No.2

Ecopower Developments Response: Drawing “05652-545_Bridge 2 (W7)” attached showing vertical levels at Tie-Ins.

Paragraph No. in Safety Audit: 2.3

Comment: Bridge Parapet Walls’ Warning Markings Obscured by Vegetation

Ecopower Developments Response: Ecopower Developments will engage with Tipperary Council regarding vegetation cut back and renewing road markings.

Paragraph No. in Safety Audit: 2.4

Problem: No Details of Proposed Vertical Levels at Tie-Ins at Bridge No.11

Ecopower Developments Response: Drawing “05652-525_Bridge 11 (W36)” attached showing vertical levels at Tie-Ins.

Paragraph No. in Safety Audit: 2.5

Problem: No Details of Proposed Vertical Levels at Tie-Ins at Bridge No.15

Ecopower Developments Response: Drawing “05652-536_Bridge 15 (W53) Sh 2 of 2” attached showing vertical levels at Tie-Ins.

Paragraph No. in Safety Audit: 2.6

Problem: Increased Vertical Crest Curve and Reduced Visibilities at Bridge No.15

Ecopower Developments Response: Drawing “05652-536_Bridge 15 (W53) Sh 2 of 2” attached showing increased vertical levels for visibility.

Paragraph No. in Safety Audit: 2.7

Problem: No Details of Parapet Containment Level at Bridge No.15

Ecopower Developments Response: Drawing “05652-536_Bridge 15 (W53) Sh 1 of 2” attached showing dimensions of appropriate containment wall.

Paragraph No. in Safety Audit: 2.8

Comment: Road Works Traffic Lane Closures Sign Distances Drawing

Ecopower Developments Response: Drawings “NRB Road Signage Layout Drawing 50kmhr” and “NRB Road Signage Layout Drawing 80kmhr” attached showing appropriate distances between advance signage and advance visibility.

Paragraph No. in Safety Audit: 2.9

Comment: Possible Inconspicuous Junction with See Through at L6013-0 / L2166-0 Junction

Ecopower Developments Response: Ecopower Developments will engage with Tipperary Council regarding road markings and signage.

Paragraph No. in Safety Audit: 2.10

Comment: Faded Road Marking Warnings along L2156-0

Ecopower Developments Response: Ecopower Developments will engage with Tipperary Council regarding road markings.

Paragraph No. in Safety Audit: 2.11

Comment: Obscured Warning Markings and Incorrect Road Marking at Bridge No.14

Ecopower Developments Response: Ecopower Developments will engage with Tipperary Council regarding road markings.

Paragraph No. in Safety Audit: 2.12

Comment: No Advance Junction Warning Sign at the L2264-50 / R503 Junction

Ecopower Developments Response: Ecopower Developments will engage with Tipperary Council regarding signage.

Paragraph No. in Safety Audit: 2.13

Comment: Stop Sign in Advance of Junction at the L2264-50 / R503 Junction

Ecopower Developments Response: Ecopower Developments will engage with Tipperary Council regarding signage

Paragraph No. in Safety Audit: 2.14

Comment: Vegetation in Junction Visibility Splay at L2264-50 / L6188-0 Junction

Ecopower Developments Response: Ecopower Developments will engage with Tipperary Council regarding vegetation cut back.



Regional Office
Breeagh,
Tralee, Co. Kerry
Ireland
Tel: 00353 86 7152710
Tel: 0044 125450664

PROJECT
1.10kV Underground Cabling
for Upperchurch Wind Farm
Grid Connection

CLIENT



CONSULTANTS

NOTES:-

LEGEND -

ISSUE/REVISION

NO	DATE	DESCRIPTION
06	16.09.19	Issued for Planning
05	06.09.19	Issued for Planning
04	17.07.19	Issued for Planning
03	12.07.19	Issued for Planning
02	11.07.19	Issued for Planning
01	29.06.19	Issued for Planning
00	05.06.19	Issued for Information
TR	DATE	DESCRIPTION

PROJECT NUMBER

05-652

SHEET TITLE

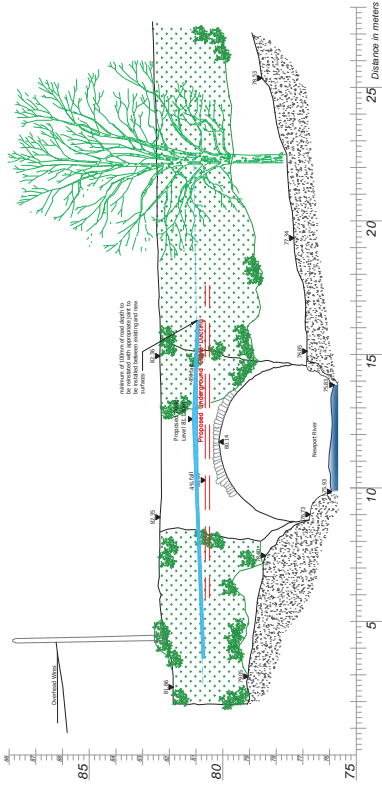
Bridge 2 (W7)

Crossing Details

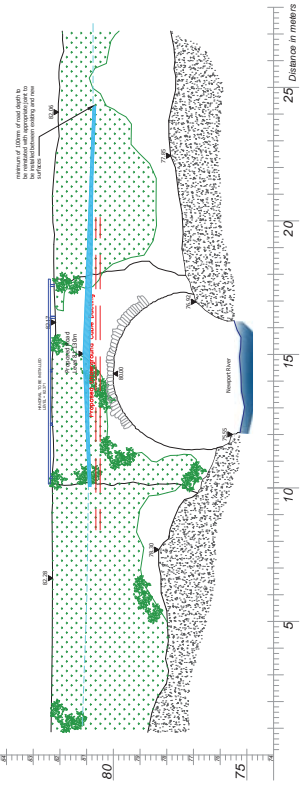
SHEET NUMBER

05652-545

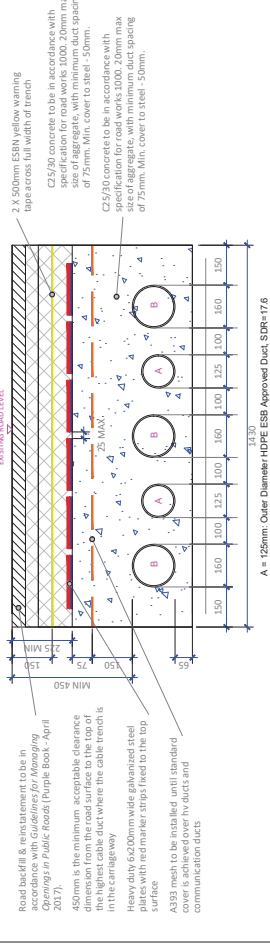
- Notes**
- This drawing is to be used only for the purpose of the planning application and is subject to detailed design.
 - This drawing is to be read in conjunction with all other relevant information.
 - All dimensions are in millimetres. All changes, levels and coordinates are in millimetres unless defined otherwise.
 - Coordinates shown on this site plan are in terms of grid and not of any other system. The accuracy thereof cannot be guaranteed. No liability is accepted for any discrepancy, omission or deviation and the actual position of individual services must be verified and established on site before commencing the works.
 - Hand dig only within 500mm of existing services.
 - Drawings are in compliance with ESBN specification requirements for shallow formation, bridge crossings, etc.



Bridge Elevation 1
Scale: 1:100

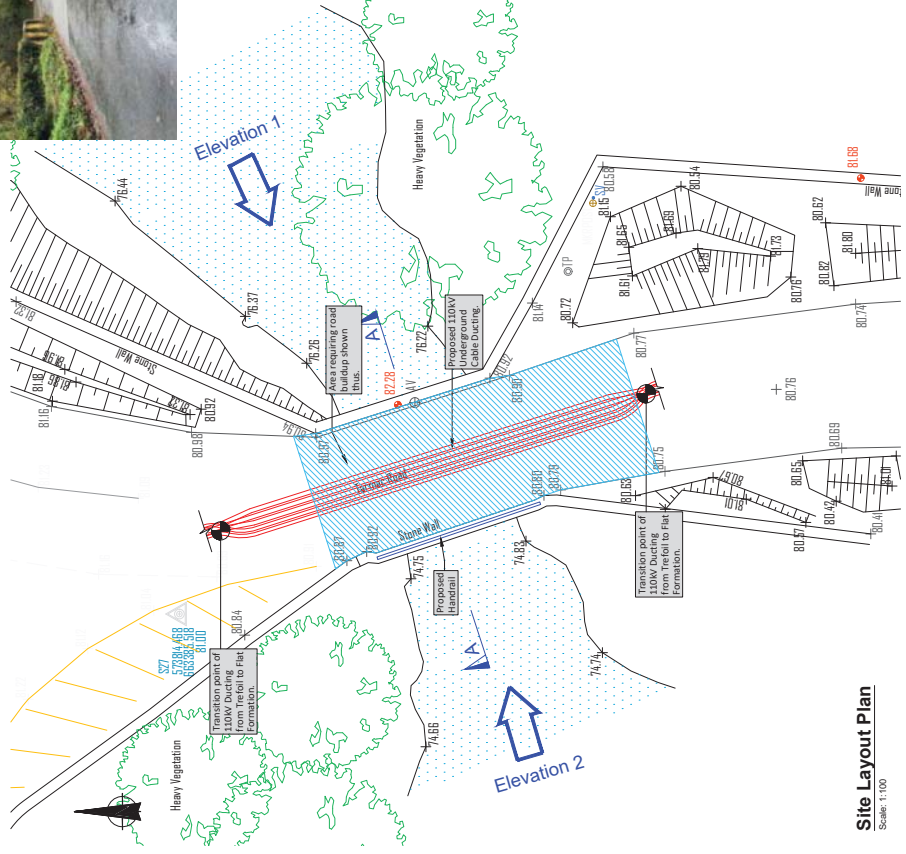


Bridge Elevation 2
Scale: 1:100

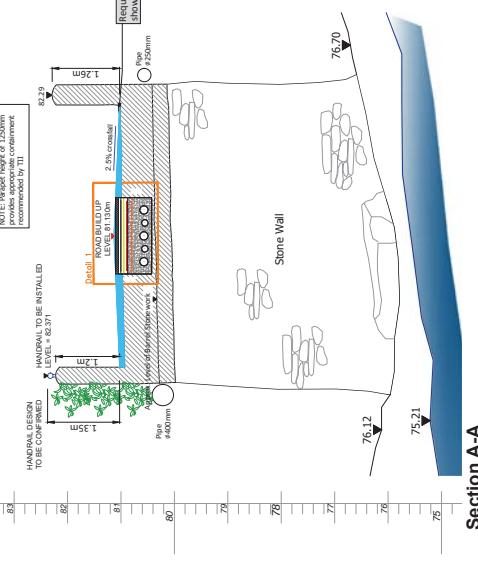


Detail 1 - Duct Specification in Flat Formation
Scale: 1:10

TLI Group Bridge Ref: Bridge 2
Watercrossing Ref: W7.



Site Layout Plan
Scale: 1:100



Section A-A
Scale: 1:50



PROJECT
 110KV Underground Cabling
 for Upperchurch Wind Farm
 Grid Connection



CLIENT

CONSULTANTS

NOTES:-

LEGEND:-

- Proposed 110kV Underground Cable
- Proposed Steel Bars in
- Proposed the new Wall Back-Up

ISSUE/REVISION

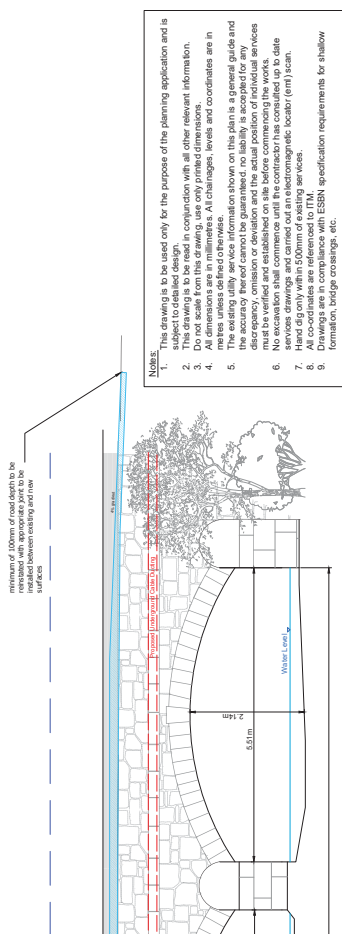
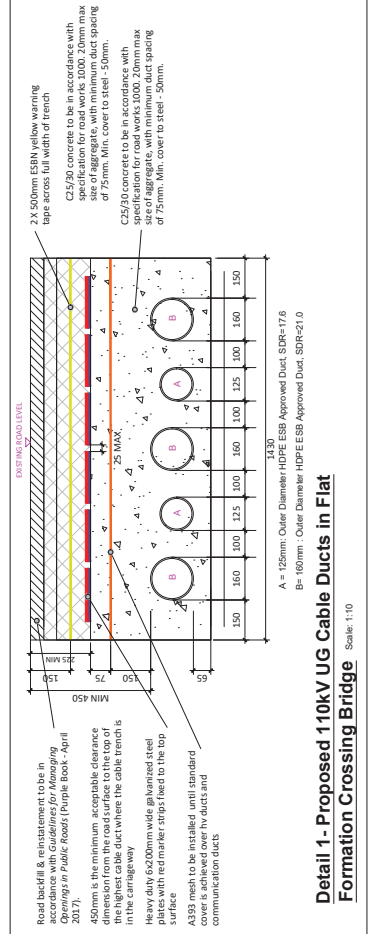
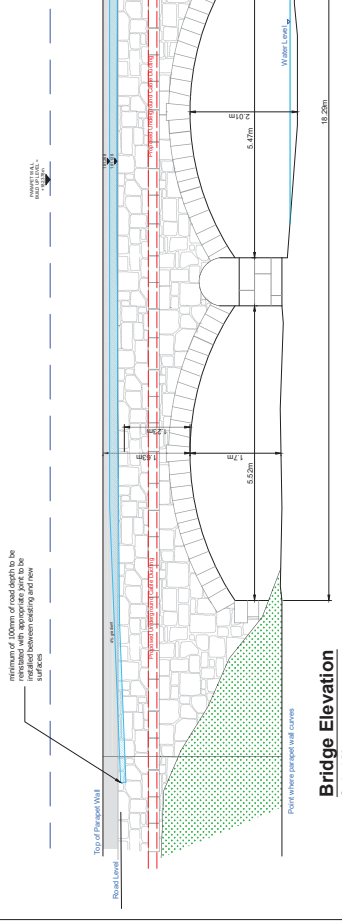
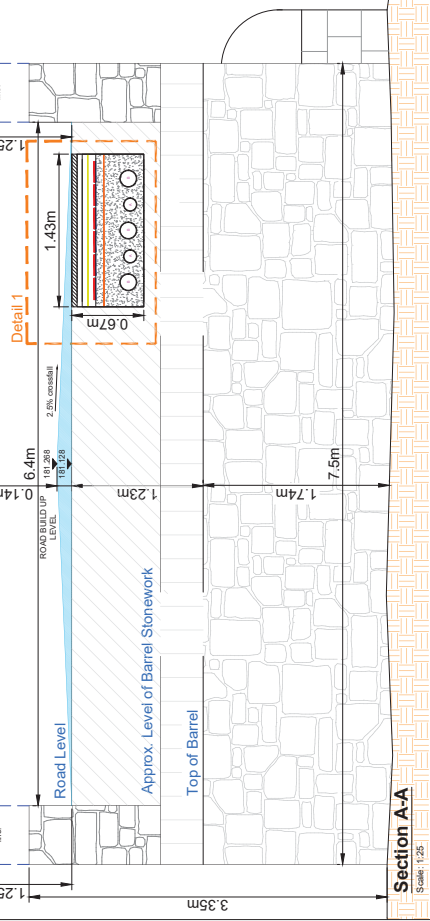
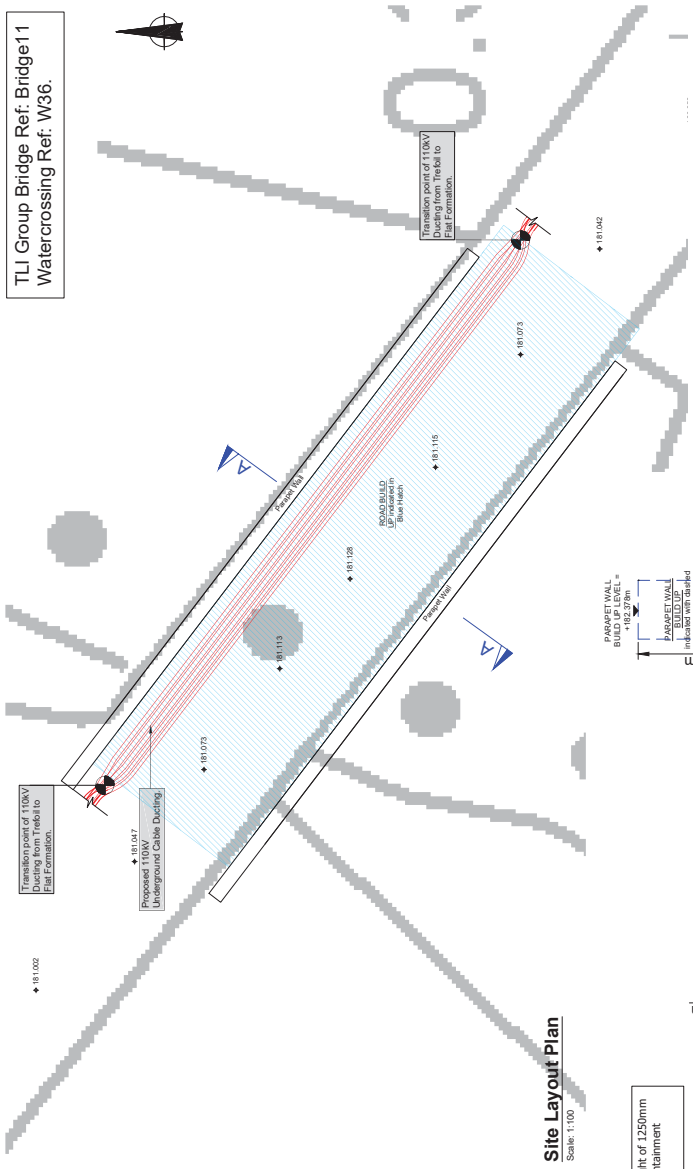
05	16.09.19	Issued for Planning
04	06.09.19	Issued for Planning
03	11.07.19	Issued for Planning
02	25.06.19	Issued for Planning
01	12.03.19	Issued for Information
00	06.03.19	Issued for Information
IR		DESCRIPTION

PROJECT NUMBER
05-652

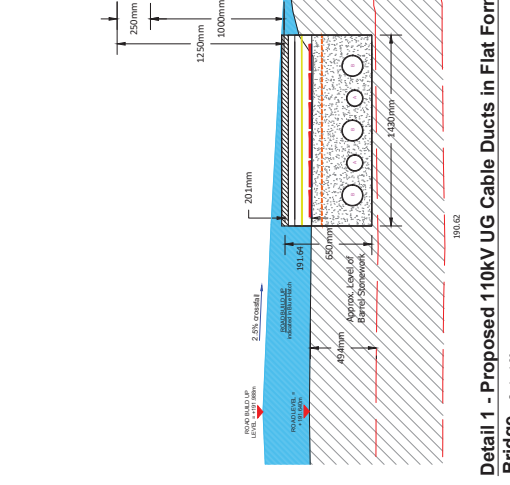
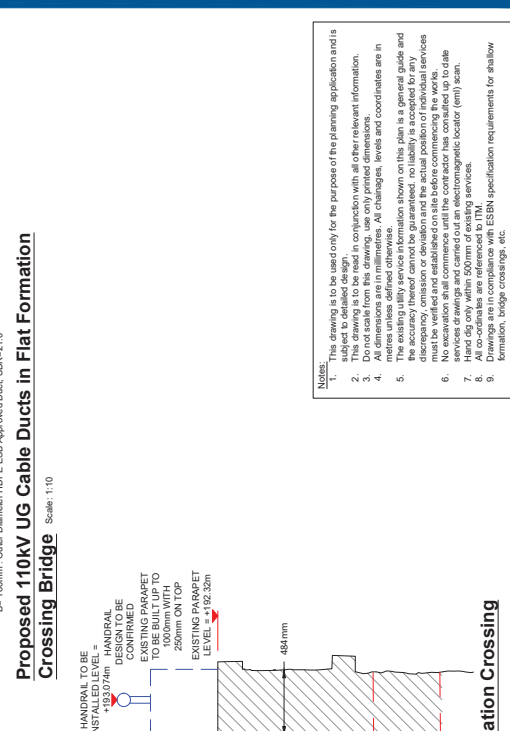
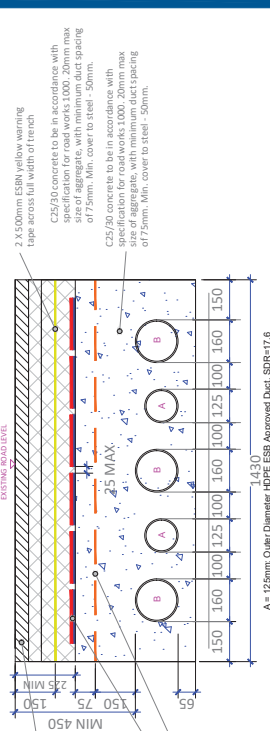
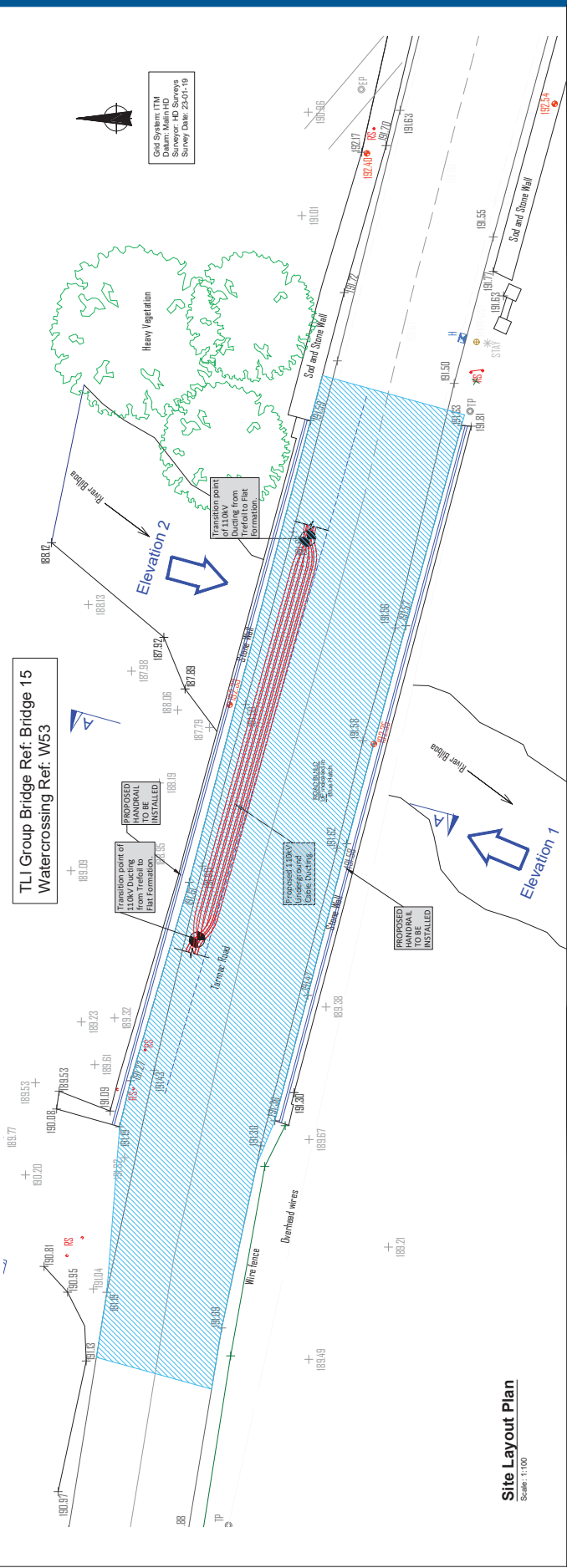
SHEET TITLE
Bridge 11 (W36).
Cross-ign Details

SHEET NUMBER
05652-5/25

TLI Group Bridge Ref: Bridge 11
 Watercrossing Ref: W36.



- NOTE:**
- The drawing is to be used only for the purpose of the planning application and is not to be used for construction.
 - The drawing is to be read in conjunction with all other relevant information.
 - Do not scale from this drawing, use only printed dimensions.
 - Check the accuracy of the information shown on this plan is a general guide and the accuracy thereof cannot be guaranteed, no liability is accepted for any errors or omissions. All changes, levels and coordinates are in reference to the datum shown.
 - The existing utility service information shown on this plan is a general guide and the accuracy thereof cannot be guaranteed, no liability is accepted for any errors or omissions. All changes, levels and coordinates are in reference to the datum shown.
 - No excavation shall commence until the contractor has consulted up to date utility service information and obtained all necessary permits.
 - Head dip only with 500mm of existing services.
 - All co-ordinates are referred to ITM.
 - Drawings are in compliance with ESB specification requirements for shallow formation, bridge coverings, etc.



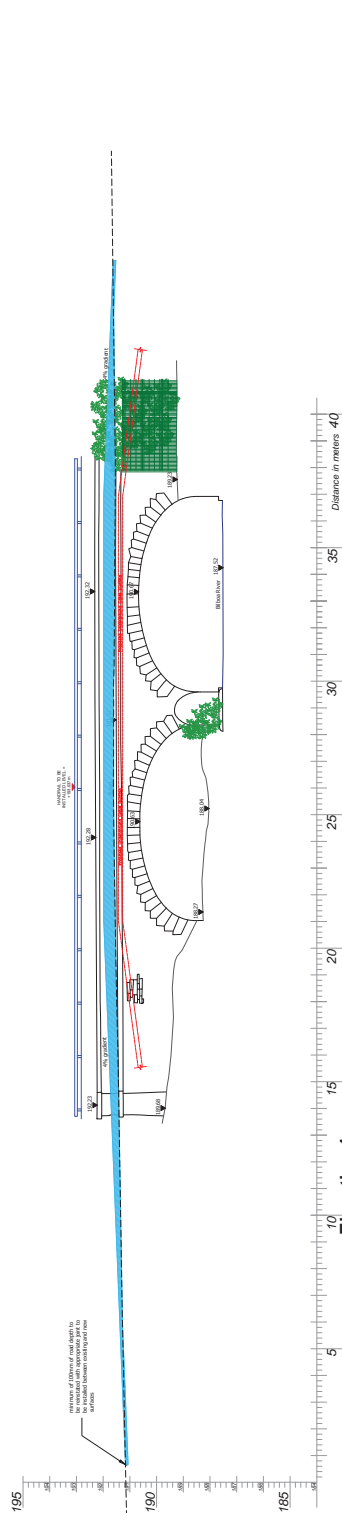
- Notes:
- The drawing is to be used only for the purpose of the planning application and is not to be used for construction.
 - This drawing is to be used in conjunction with all other relevant information.
 - Do not scale from this drawing. Use only printed dimensions.
 - All dimensions are in millimetres. All changes, levels and coordinates are in accordance with the existing utility service information shown on this plan is a general guide and the accuracy thereof cannot be guaranteed. No liability is accepted for any errors or omissions that may occur in the drawing.
 - The existing utility service information shown on this plan is a general guide and the accuracy thereof cannot be guaranteed. No liability is accepted for any errors or omissions that may occur in the drawing.
 - No excavation shall commence until the contractor has contacted up to date services drawings and confirmed the location of all services.
 - All co-ordinates are referenced to TLM (Irish Grid) survey.
 - Drawings are in compliance with ESRB specification requirements for shallow formation, bridge coverages, etc.

ISSUE/REVISION	NO	DATE	DESCRIPTION
	05	16.09.19	Issued for Planning
	04	17.07.19	Issued for Planning
	03	12.07.19	Issued for Planning
	02	11.07.19	Issued for Planning
	01	28.06.19	Issued for Planning
	00	12.03.19	Issued for Information
	IR		DESCRIPTION

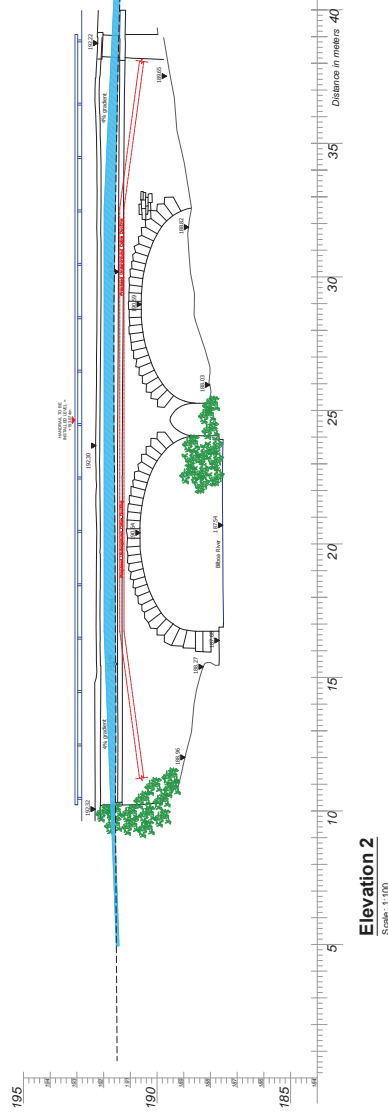
PROJECT NUMBER	05-652
SHEET TITLE	Bridge 15 (W53) & Duct Details - Sheet 1 of 2
SHEET NUMBER	05652-536

TLI Group Bridge Ref: Bridge 15
Watercrossing Ref: W53

Grid System: TLI
Client: HD
Surveyor: HD Surveys
Survey Date: 23-01-19



Grid System: TLI
Client: HD
Surveyor: HD Surveys
Survey Date: 23-01-19



- Notes:**
- This drawing is to be used only for the purpose of the planning application and is subject to detailed design.
 - This drawing is to be read in conjunction with all other relevant information.
 - Dimensions are in millimetres. All challenges, levels and coordinates are in metres unless defined otherwise.
 - The accuracy of the information shown on this plan (e.g. general outline and discrepancy, omission or deviation) and the actual position of individual services is not guaranteed.
 - No warranty, express or implied, is made by the contractor in relation to the accuracy of the information shown on this plan.
 - No additional comments on the contractor's drawings shall be made to date services drawings and carried out an electromagnetic locator (em) scan.
 - Hand dig only within 500mm of existing services.
 - Drawings are in compliance with ESEN specification requirements for shallow formation, bridge crossings, etc.



PROJECT

**110kV Underground Cabling
for Upperchurch Wind Farm
Grid Connection**



CONSULTANTS

NOTES:-

LEGEND -

- Proposed 110kV Underground Cable
- Proposed Roadway
- Proposed Road Mark-Up

ISSUE/REVISION

NO	DATE	DESCRIPTION
04	16.09.19	Issued for Planning
03	17.07.19	Issued for Planning
02	11.07.19	Issued for Planning
01	25.06.19	Issued for Planning
00	12.03.19	Issued for Information

PROJECT NUMBER
05-652

SHEET TITLE

**Bridge 15 (W53)
Crossing Details:
Elevations - Sheet 2 of 2**

SHEET NUMBER
05652-537

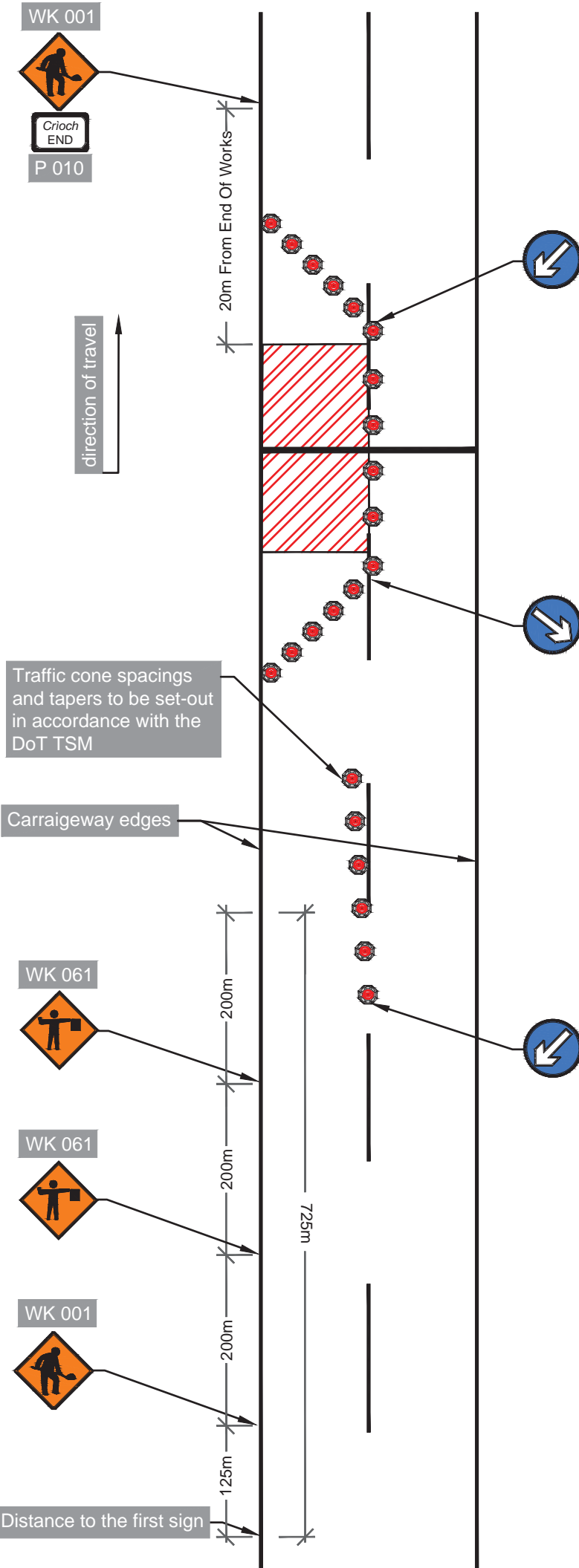


Figure GC 5.24
Advance Warning Signage
for Road Works on 80km/hr Roads

Designed in conjunction with
Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | Limerick | London

Note: This drawing is not to scale
Department of Transport
Traffic Signs Manual 2010 (DoT TSM)

Project: UWF Grid Connection (2019)			
Drawn by: AB	Checked by: PK	Date: October 19	Sheet Size: A3

 Aoife Butler
Ecopower Developments Ltd
Zetec House,
Purcellsinch Business Park, Kilkenny
TEL: +353 56 7750140
MOB: +353 83 8805644

ECOPOWER

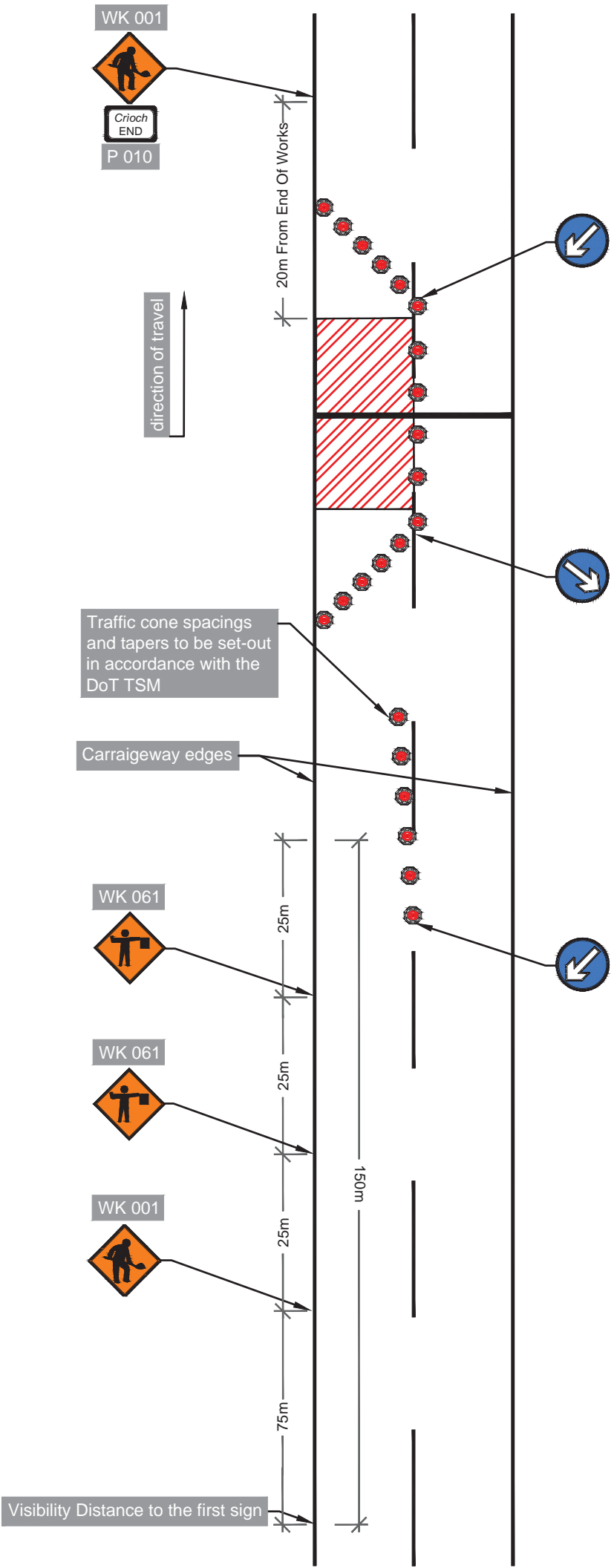


Figure GC 5.23
Advance Warning Signage for Road Works on 50km/hr Roads

Designed in conjunction with
Malachy Walsh and Partners
 Engineering and Environmental Consultants
 Cork | Tralee | Limerick | London

Note: This drawing is not to scale
 Department of Transport
 Traffic Signs Manual 2010 (DoT TSM)

Project:
 UWF Grid Connection (2019)

Drawn by:	Checked by:	Date:	Sheet Size:
AB	PK	October 19	A3


 Aoife Butler
 Ecopower Developments Ltd
 Zetec House,
 Purcellsinch Business Park, Kilkenny
 TEL: +353 56 7750140
 MOB: +353 83 8805644
ECOPOWER

ROAD SAFETY AUDIT FEEDBACK FORM

SCHEME: PROPOSED UPPERCHURCH WINDFARM GRID CONNECTION (UWF GRID CONNECTION),
COUNTY TIPPERARY

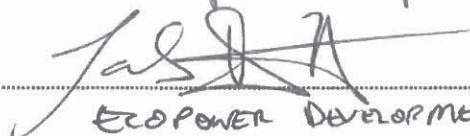
ROUTE(S): L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, R503, L2264-50 & L6188-0

AUDIT STAGE: STAGE 1 & REVIEW **DATE AUDIT COMPLETED:** 28TH AUGUST 2019

Paragraph No. In Safety Audit	To Be Completed By Designer			To Be Completed by Audit Team Leader
	Problem Accepted (Yes/ No)	Recommended Measure Accepted (Yes/ No)	Describe Alternative Measure(s). Give Reasons for Not Accepting Recommended Measure	Alternative Measures Accepted by Auditors (Yes/ No)
2.1	Yes	Yes		
2.2	Yes	Yes		
2.3	Yes	Yes		
2.4	Yes	Yes		
2.5	Yes	Yes		
2.6	Yes	Yes		
2.7	Yes	Yes		
2.8	Yes	Yes		
2.9	Yes	Yes		
2.10	Yes	Yes		
2.11	Yes	Yes		
2.12	Yes	Yes		
2.13	Yes	Yes		
2.14	Yes	Yes		

SIGNED:  **DESIGNER** **DATE:** 10/10/19
DANIEL PARNANT C. ENG. MIEI
TLI GROUP

SIGNED:  **AUDIT TEAM LEADER** **DATE:** 14/10/19
SEAMUS QUIGLEY
JER MW P



SIGNED:  **EMPLOYER** **DATE:** 10/10/19
PAUL A. O'CONNELL
ECOPower DEVELOPMENTS



Appendix to Chapter 15: Material Assets (Roads)


Appendix 15.5: Peat Probe Survey

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table 1: Peat Probe Survey Results

	<p>Probe Survey Details <u>Probe ID:</u> P1 <u>ITM:</u> 580825,660626 <u>Depth of Probe:</u> 0m, No peat <u>Below road level:</u> 1m <u>Ground Conditions:</u> Wet ground, grasses</p>
	<p>Probe Survey Details <u>Probe ID:</u> P2 <u>ITM:</u> 581024,660508 <u>Depth of Probe:</u> 0m, No peat <u>Below road level:</u> 2m <u>Ground Conditions:</u> Dry ground, grasses</p>


	<p>Probe Survey Details <u>Probe ID:</u> P3 <u>ITM:</u> 581568,660100 <u>Depth of Probe:</u> 0m, No peat <u>Below road level:</u> 1m <u>Ground Conditions:</u> Dry ground, grasses</p>
	<p>Probe Survey Details <u>Probe ID:</u> P4 <u>ITM:</u> 581689,659999 <u>Depth of Probe:</u> 0m, No peat <u>Below road level:</u> 1m <u>Ground Conditions:</u> Dry ground, grasses</p>



	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P5</p> <p><u>ITM:</u> 581791,659916</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 0m</p> <p><u>Ground Conditions:</u> Dry ground, wet in places, grasses</p>
	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P6</p> <p><u>ITM:</u> 581770,659987</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 0m</p> <p><u>Ground Conditions:</u> Dry ground</p>



	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P7</p> <p><u>ITM:</u> 581969,659723</p> <p><u>Depth of Probe:</u> 4m</p> <p><u>Below road level:</u> 2m</p> <p><u>Ground Conditions:</u> Boggy ground, however closer to road on south side is firm dry ground. High side of road is firm dry ground.</p>
	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P8</p> <p><u>ITM:</u> 582227,659482</p> <p><u>Depth of Probe:</u> 4m</p> <p><u>Below road level:</u> 2m</p> <p><u>Ground Conditions:</u> Boggy ground, however closer to road on south side is firm dry ground. High side of road is firm dry ground.</p>



	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P9</p> <p><u>ITM:</u> 582413,659352</p> <p><u>Depth of Probe:</u> 1m</p> <p><u>Below road level:</u> 1m</p> <p><u>Ground Conditions:</u> Boggy ground, however closer to road on south side is firm dry ground. High side of road is firm dry ground.</p>
	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P10</p> <p><u>ITM:</u> 582780,659237</p> <p><u>Depth of Probe:</u> 2m</p> <p><u>Below road level:</u> 2m</p> <p><u>Ground Conditions:</u> Boggy ground, however closer to road on south side is firm dry ground. High side of road is firm dry ground.</p>

	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P11</p> <p><u>ITM:</u> 583134,659235</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 2m</p> <p><u>Ground Conditions:</u> Dry ground, grasses</p>
	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P12</p> <p><u>ITM:</u> 589315,658605</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 2m</p> <p><u>Ground Conditions:</u> Dry ground, grasses</p>

	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P13</p> <p><u>ITM:</u> 590414,658553</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 1m</p> <p><u>Ground Conditions:</u> Dry ground, grasses & forestry</p>
	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P14</p> <p><u>ITM:</u> 590657,658656</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 1m</p> <p><u>Ground Conditions:</u> Dry ground, grasses & forestry</p>

	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P15</p> <p><u>ITM:</u> 591112,658837</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 1m</p> <p><u>Ground Conditions:</u> Dry ground, grasses & forestry</p>
	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P16</p> <p><u>ITM:</u> 590929,658865</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 0m</p> <p><u>Ground Conditions:</u> Dry ground, grasses</p>

	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P17</p> <p><u>ITM:</u> 591498,658954</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 0m</p> <p><u>Ground Conditions:</u> Dry ground, grasses</p>
	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P18</p> <p><u>ITM:</u> 591887,659181</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u> 0m</p> <p><u>Ground Conditions:</u> Dry ground, forestry</p>

	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P19</p> <p><u>ITM:</u> 592133,659368</p> <p><u>Depth of Probe:</u> 1m</p> <p><u>Below road level:</u> 1m</p> <p><u>Ground Conditions:</u> Boggy ground, grasses</p>
	<p><u>Probe Survey Details</u> <u>Probe ID:</u> P20</p> <p><u>ITM:</u> 592457,659694</p> <p><u>Depth of Probe:</u> 0m, No peat</p> <p><u>Below road level:</u>1m</p> <p><u>Ground Conditions:</u> Dry ground, grasses</p>

Appendix to Chapter 15: Material Assets (Roads)

Appendix 15.6: Inventory & Classification of Watercourses at Crossing Locations

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
EIAR 2019, Chapter 15: Material Assets (Roads)




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

Photos of Watercourse Crossings at the Mountphilips Substation site	
	<p>Watercrossing Structure W1 (<i>Temporary Crossing</i>)</p> <p>Type: 1st Order Stream</p> <p>Fisheries: Class 2, Optimal Fisheries</p> <p>Location: Mountphilips Substation Site</p> <p>Existing Structure: No existing crossing structure</p> <p>Works at Crossing: Cable trenching under stream bed using dam & pump (flume) method. Temporary Bailey Bridge.</p> <p>Ecology Notes: c. 2 m wide, c. 10 cm deep, gravel (70), cobbles (5), boulders (5), sands/silts (20)</p>
	<p>Watercrossing Structure W2</p> <p>Type: Drainage Ditch</p> <p>Fisheries: Sub-Optimal Fisheries</p> <p>Location: Mountphilips Substation Site</p> <p>Existing Structure: No existing crossing structure</p> <p>Works at Crossing: Installation of new permanent culvert. Cable trenching under new culvert.</p> <p>Ecology Notes: c. 0.5 m wide, c. 10 cm deep, silts/muds (100)</p>
	<p>Watercrossing Structure W3</p> <p>Type: 1st Order Stream</p> <p>Fisheries: Class 2, Optimal Fisheries</p> <p>Location: Mountphilips Substation Site</p> <p>Existing Structure: No existing crossing structure</p> <p>Works at Crossing: Installation of new permanent culvert. Cable trenching under new culvert.</p> <p>Ecology Notes: c. 1 m wide, c. 10 cm deep, cobbles (20), gravels (40), sands/silts (40)</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

Photos of UWF GRID CONNECTION Bridges / Culverts along Public Roads	
	<p>Watercrossing Structure W4 Type: Stream Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: L2166-0, Coole/Freagh Existing Structure: Concrete Block Box Culvert Works at the Crossing: Cable trenching under structure Ecology Notes: Downstream - Slow flowing, Coble (60), Gravel (40). Overgrown, vegetation shading. 1 metre wide and ~30cm deep.</p>
	<p>Watercrossing Structure W5 Type: River Fisheries: Class1, Optimal Fisheries Location/Townland: L6013-0, Foildarrig/Freagh Existing Structure: Masonry Single Arch Bridge Works at the Crossing: Cable trenching over structure Ecology Notes: Upstream - riffle/glide sequence and pool. Bolder (30), cobble (30), sand/gravel (40). Culvert pipe also flowing into river. Downstream - Riffle and pool present. Sand gravel under bridge (60), boulders/cobble(40).</p>
	<p>Watercrossing Structure W6 Type: Stream Fisheries: Class 3, Sub-Optimal Fisheries Location/Townland: L6013-0, Oakhampton Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure Ecology Notes: Pipe culvert with stream through it. Bolder (50), mud/gravel (50).</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)




	<p>Watercrossing Structure W7</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: Rockvale Bridge, L2156-0, Oakhampton/Rockvale</p> <p>Existing Structure: Masonry Single Arch Bridge</p> <p>Works at the Crossing: Cable trenching over structure. Additional works to raise road level & parapet wall height</p> <p>Ecology Notes: Upstream - riffle and white water. Bedrock (70), cobble (20), sand (10). Deep water - could not judge depth. Downstream - white water, small riffle and some pooling. Deep water.</p>
	<p>Watercrossing Structure W8</p> <p>Type: Stream</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: L6009-0, Ahane/Castlewaller</p> <p>Existing Structure: Concrete Slab Bridge</p> <p>Works at the Crossing: Directional Drill under stream bed.</p> <p>Ecology Notes: Upstream - small riffle and glide. Pooling. Moderate flow. Cobble (70), gravel (30). Downstream - riffle and glide, pool at bridge. Cobble (60), gravel (40).</p>
	<p>Watercrossing Structure W9</p> <p>Type: Stream</p> <p>Fisheries: Class 1, Optimal Fisheries</p> <p>Location/Townland: L6009-0, Castlewaller/Carrowkeale</p> <p>Existing Structure: Concrete Slab Bridge</p> <p>Works at the Crossing: Directional Drill under stream bed.</p> <p>Ecology Notes: Upstream - riffle and glide and pool (with sand). Sand (30), cobble (50), gravel (20). Downstream - flat rock (40), boulders (30), cobble (30), riffle. Some pooling at edge, no visible build-up of sand. Fast flowing.</p>

REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)




	<p>Watercrossing Structure W10 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Kilnacappagh</p> <p>Existing Structure: HDPE Plastic Circular Culvert Works at the Crossing: Cable trenching over structure</p> <p>Ecology Notes: deep, drained, flow</p>
	<p>Watercrossing Structure W11 Type: Stream Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Scrageen/Derrygareen</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure</p> <p>Ecology Notes: c. 1 m wide, c. 20 cm deep</p>
	<p>Watercrossing Structure W12 Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Derrygareen</p> <p>Existing Structure: Masonry Box Culvert & Circular Concrete Culvert Works at the Crossing: Cable trenching under structure</p> <p>Ecology Notes: c. 0.8m wide, c. 15 cm deep</p>

REFERENCE DOCUMENTS

	<p>Watercrossing Structure W13 Type: Stream, 1st Order Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: No Fisheries Potential</p>
	<p>Watercrossing Structure W14 Type: Stream, 1st Order Fisheries: Class1, Optimal Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: steep gradient, cobble/gravel. 100% shade</p>
	<p>Watercrossing Structure W15 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Knockancullenagh Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing. Ecology Notes: No Fisheries Potential</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W16 Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Knockancullenagh</p> <p>Existing Structure: Plastic Circular Culvert.</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>
	<p>Watercrossing Structure W17 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Knockancullenagh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Potential, steep</p>
	<p>Watercrossing Structure W18 Type: Stream, 2nd Order Fisheries: Class 1, Optimal Fisheries Location/Townland: R503, Knockancullenagh/Fanit</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: steep, boulder cobble pool riffle. Downstream 100% shade, steep gradient</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)



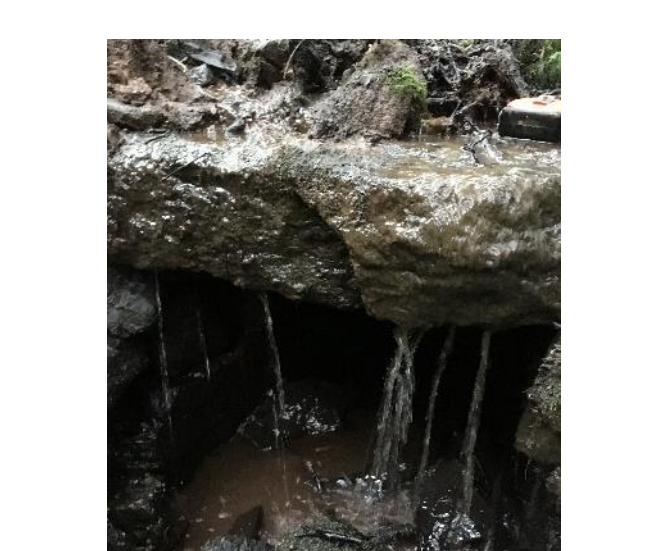
	<p>Watercrossing Structure W19 Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Fanit</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Potential</p>
	<p>Watercrossing Structure W20 Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Fanit</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Potential 100% shade downstream</p>
	<p>Watercrossing Structure W21 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Fanit</p> <p>Existing Structure: Masonry Single Arch Bridge</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential 100% shade downstream</p>

REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
EJAR 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W22 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Fanit/Lackamore</p> <p>Existing Structure: Masonry Single Arch Bridge</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: steep/cascade</p>
	<p>Watercrossing Structure W23 Type: Stream Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Lackamore</p> <p>Existing Structure: Masonry Arch Bridge Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential Upstream: 100% shade. Minor steep cascades Downstream: 100% shade</p>
	<p>Watercrossing Structure W24 Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Lackamore</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>

REFERENCE DOCUMENTS

	<p>Watercrossing Structure W25</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Plastic Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>
	<p>Watercrossing Structure W26</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>
	<p>Watercrossing Structure W27</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential, Steep Gradient</p>



REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W28</p> <p>Type: Stream</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Lackamore/Tooreenbrien Upper</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value Upstream: steep/cascade Boulder/cobble</p>
	<p>Watercrossing Structure W29</p> <p>Type: Stream</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper</p> <p>Existing Structure: Concrete Slab Bridge Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value 100% cover, steep gradient. Boulder cascade.</p>
	<p>Watercrossing Structure W30</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)




	<p>Watercrossing Structure W31</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper</p> <p>Existing Structure: Concrete Circular Culvert</p> <p>Works at the Crossing: Crossing under new existing culvert</p> <p>Ecology Notes: No Fisheries Value, Steep Gradient</p>
	<p>Watercrossing Structure W32</p> <p>Type: Minor Stream</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W33</p> <p>Type: Stream</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Upper/Tooreenbrien Lower</p> <p>Existing Structure: Masonry Arch Bridge - Single</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: cobble substrate, drained, channelised, riffle/glide</p>

REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)




	<p>Watercrossing Structure W34</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Lower</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W35</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Tooreenbrien Lower</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W36</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: Tooreenbrien Bridge, R503, Tooreenbrien Lower/Reardnogy Beg</p> <p>Existing Structure: Masonry Arch Bridge - Double</p> <p>Works at the Crossing: Cable trenching over structure. Additional works to raise road level & parapet wall height</p> <p>Ecology Notes: c. 5 m wide, c. 100cm deep</p>

REFERENCE DOCUMENTS

	<p>Watercrossing Structure W37</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy Beg</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Crossing over culvert</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W38</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy Beg/Reardnogy More</p> <p>Existing Structure: Plastic Circular Culvert</p> <p>Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: c. 0.7 m wide, c. 140cm deep</p>
	<p>Watercrossing Structure W39</p> <p>Type: Stream, 2nd Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy More</p> <p>Existing Structure: Plastic Circular Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: c. 0.6 m wide, c. 100cm deep</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W40</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Rear Cross Village, Reardnogy More/ Shanballyedmond</p> <p>Existing Structure: Concrete Circular Culvert X 3</p> <p>Works at the Crossing: Cable trenching under structures.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W41</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Reardnogy More/Baurnadomeeny</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Downstream:, cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W42</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Baurnadomeeny</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Potential</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W43</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Bournadomeeny</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W44</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Bournadomeeny</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: cobble gravel substrate, riffle, steep banks</p>
	<p>Watercrossing Structure W45</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Bournadomeeny/Coonmore</p> <p>Existing Structure: Concrete Circular Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Riffle / glide, cobble substrate, channelised</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W46</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W47</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W48</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Coonmore</p> <p>Existing Structure: Plastic Circular Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W49</p> <p>Type: River</p> <p>Fisheries: Class1, Optimal Fisheries</p> <p>Location/Townland: R503, Coonmore/Foildarragh</p> <p>Existing Structure: Masonry Arch</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: Cobble/gravel, channelised, riffle</p>
	<p>Watercrossing Structure W50</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, Very steep gradient, in gorge, 100% cover.</p>
	<p>Watercrossing Structure W51</p> <p>Type: Stream, 1st Order</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, Very steep gradient, in gorge, 100% cover.</p>




REFERENCE DOCUMENTS




APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W52</p> <p>Type: Stream, 1st Order Fisheries: Class 3, Sub-optimal Fisheries Location/Townland: R503, Foildarragh</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value, steep, drained</p>
	<p>Watercrossing Structure W53</p> <p>Type: River Fisheries: Class1, Optimal Fisheries Location/Townland: Anglesey Bridge, R503, Foildarragh/Kilcommon</p> <p>Existing Structure: Double Masonry Arch Works at the Crossing: Cable trenching over structure, additional works to raise road level & parapet wall height Ecology Notes: U/s: riffle, glide channelized, cobble gravel, sand</p>
	<p>Watercrossing Structure W54</p> <p>Type: Drain Fisheries: Class 4, Poor Fisheries Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Plastic Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>

REFERENCE DOCUMENTS




APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
 EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W55</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W56</p> <p>Type: Drain</p> <p>Fisheries: Class 3, Sub-optimal Fisheries</p> <p>Location/Townland: R503, Kilcommon</p> <p>Existing Structure: Concrete Circular Culvert</p> <p>Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value, some flow</p>
	<p>Watercrossing Structure W57</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Kilcommon/Loughbrack</p> <p>Existing Structure: Masonry Box Culvert</p> <p>Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>

	<p>Watercrossing Structure W58</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W59</p> <p>Type: Upstream: Drain, Downstream: Stream, 1st Order</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Concrete Culvert & Masonry Box Culvert Works at the Crossing: Cable trenching under structures.</p> <p>Ecology Notes: No Fisheries Value. Downstream: flow, through forestry</p>
	<p>Watercrossing Structure W60</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Loughbrack</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>




REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W61</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: R503, Knocknabansha/Knockmaroe</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W62</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: L2264-50, Knockmaroe</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching over structure.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W63</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: L2264-50, Knockmaroe/Knockcurraghbola Crownlands</p> <p>Existing Structure: Circular Concrete Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>



REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
EIA 2019, Chapter 15: Material Assets (Roads)

	<p>Watercrossing Structure W64</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: L2264-50, Knockmaroe</p> <p>Existing Structure: Masonry Box Culvert Works at the Crossing: Cable trenching under structure. Culvert may need replacing.</p> <p>Ecology Notes: No Fisheries Value</p>
	<p>Watercrossing Structure W65</p> <p>Type: Stream</p> <p>Fisheries: Class 2, Optimal Fisheries</p> <p>Location: L6188-0, Knockmaroe</p> <p>Existing Structure: Concrete Circular Culvert Works at Crossing: Cable trenching under structure.</p> <p>Ecology Notes: Steady flow to 20 cm deep with wetted width of c. 1 m. gravel bed.</p>
	<p>Watercrossing Structure W66</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: L6188-0, Knockmaroe</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value</p>

REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
EIA 2019, Chapter 15: Material Assets (Roads)

Photos of UWF GRID CONNECTION Bridges / Culverts along Private Paved Road	
	<p>Watercrossing Structure W67</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: Private Paved Road, Knockcurraghbola Commons</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: c. 0.5 m wide, 10 cm deep</p>
	<p>Watercrossing Structure W68</p> <p>Type: Drain</p> <p>Fisheries: Class 4, Poor Fisheries</p> <p>Location/Townland: Private Paved Road, Knockcurraghbola Commons</p> <p>Existing Structure: Concrete Circular Culvert Works at the Crossing: Cable trenching under structure.</p> <p>Ecology Notes: No Fisheries Value, Slow flowing</p>

REFERENCE DOCUMENTS

APPENDIX 15.6: Inventory & Classification of Watercourses at Crossing Locations
EIAR 2019, Chapter 15: Material Assets (Roads)

Appendix to Chapter 16: Cultural Heritage

Appendix 16.1: Detailed Description of Cultural Heritage Sites

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

TABLE OF CONTENTS

A16.1.1 Recorded Legally Protected Cultural Heritage Sites within the UWF Grid Connection Study Area...3
A16.1.2 Other Recorded Cultural Heritage Sites within the UWF Grid Connection Study Area17
A16.1.3 Previously Unrecorded Cultural Heritage Sites within the UWF Grid Connection Study Area21

A16.1.1 Recorded Legally Protected Cultural Heritage Sites within the UWF Grid Connection Study Area

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GL1	RMP	TN031-009----	Bullaun stone	571716	666067	BALLYARD	Situated on a low SE-facing slope of rising ground in an upland area with a nearby stream to the SE and a church (TN031-010001) some 200m to the SW. Although at some distance this is possibly associated with the church site to the SW as there is a holy well called 'St Commaneth's Well' (TN031-010002) close to the church. A large earthfast boulder (dims. 2m x 0.9m x 0.65m) with two deep depressions (dims. 0.35m x 0.17m; 0.38m x 0.10m) and one shallow one on its upper surface.	1610m to the NW	None	Avoidance
GL2	RMP	TN031-010001-1-	Church	571590	665889	BALLYARD	Situated at the base of a W-facing slope with a stream immediately to the S, a holy well (TN031-010002-) to the SE and a bullaun stone (TN031-009----) to the NE. Present remains consist of a low rise of ground where the church was located in the centre of a graveyard (TN031-010003-) enclosed by a stone wall. Several architectural fragments are located in the SW sector of the graveyard and others are reused as grave surrounds. Berry (1904, 99-110) described the church as surviving to foundation level only measuring internally 60ft x 26ft (18m x 8.7m) with architectural fragments of a late medieval date scattered around the graveyard. An octagonal-shaped limestone stoup which rested on a four-clustered column is now located in the grounds of Newport RC church.	1510 m to the NW	None	Avoidance
GL3	RMP	TN031-010002-	Ritual site - holy well	571630	665877	BALLYARD	Situated at the base of a W-facing slope of rising ground with a church and graveyard (TN031-010001-) to the NW. A disused holy well originally enclosed by a drystone wall and now enclosed by a modern concrete surround with broken statues on a shelf to the N of the well.	1510 m to the NW	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area

Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GL4	RMP	TN031-010003-	Graveyard	571580	665884	BALLYARD	Situated at the base of a W-facing slope with a stream immediately to the S, a holy well (TN031-010002-) to the SE and a bullaun stone (TN031-009----) to the NE. Present remains consist of a low rise of ground where the church (TN031-010001-) was located in the centre of a graveyard enclosed by a stone wall. Several architectural fragments are located in the SW sector of the graveyard and others are reused as grave surrounds. Berry (1904, 99-110) described the church as surviving to foundation level only measuring internally 60ft x 26ft (18m x 8.7m) with architectural fragments of a late medieval date scattered around the graveyard. An octagonal-shaped limestone stoup or font (TN031-010004-/TN037-046----) which rested on a four-clustered column is now located in the grounds of Newport RC church.	1480m to the NW	None	Avoidance
GL5	RMP	TN031-010004-	Font	571580	665888	BALLYARD	An octagonal-shaped limestone stoup or font (TN037-046----) which rested on a four-clustered column is now located in the grounds of Newport RC church, originally came from the church (TN031-010001-) and graveyard (TN031-010003-) at Ballyard.	1480m to the NW	None	Avoidance
GL6	RMP	TN031-011001-	Ringfort - rath	571784	665776	BALLYARD	Situated on the N-facing slope of an E-W ridge in an upland area overlooking a church (TN031-010) to NW. The present remains consist of a semicircular area (diam. 33m E-W) enclosed by an earth and stone bank (Wth 1.45m; int. H 0.4m ; ext. H 1.7m) visible from S through W through N to E, elsewhere destroyed with external fosse (Wth 3m; D 0.7m) visible at W only. Possible entrance gap at NE. Field fence intersects site at SE on a NE-SW axis.	1330m to the NW	None	Avoidance
GL7	RMP	TN031-048001-	Castle tower house	571035	665428	CRAGG	Situated on rock outcrop in an upland area with extensive views. Described in the Civil Survey (1654-6) as 'the walls of a castle and a Barbicon' (Simington 1934, vol. 2, 179). John Ryan is listed as proprietor in 1640 (ibid.). Present remains consist of a rectangular	1530 to the NW	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
GL8	RMP	TN031-048002-	Bawn	571014	665445	CRAGG	<p>tower house (ext. dims. 8.7m N-S; 6.6m E-W; wall T 1.7m) three storeys high built with roughly coursed sandstone rubble with a high pronounced base-batter. There is good evidence of lime plaster on the internal faces of the walls of the tower house chambers. The external face of the S wall is destroyed and originally contained a round-arched rebated limestone doorway of which only one jambstone survives on the W side with evidence of a yett-hole. The main doorway led into a lobby protected by an overhead murder-hole. Access to spiral stairs (now destroyed) in the SW angle was via this lobby, with the main ground-floor barrel-vaulted chamber being reached via a round-arched limestone doorway in the N wall of the lobby. This chamber has a single-light flat-headed window set into the centre of the W, N and E walls with a brick fireplace inserted into the N end of the W wall. The first floor, which was accessed through a doorway in the centre of the S wall, had a wooden ceiling carried in the thickness of the wall. This floor was lit by single-light flat-headed windows set into the centre of the W, N and E walls. The second floor has a barrel-vaulted ceiling and is accessed from a round-arched limestone doorway in the centre of the S wall. In the NW angle there is a flat-headed doorway, now inaccessible, which probably led to a garderobe. Nineteenth-century outhouses now obscure a possible bawn area (TN031-048002-) located to the N and W of the tower.</p> <p>Situated on rock outcrop in an upland area with extensive views. Described in the Civil Survey (1654-6) as 'the walls of a castle and a Barbicon' (Simington 1934, vol. 2, 179). John Ryan is listed as proprietor in 1640 (ibid.). Present remains consist of a rectangular tower house (TN031-048001) three storeys high built with roughly coursed sandstone rubble with a high pronounced base-batter.</p>	1510 to the NW	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
GL9	RMP	TN031-061---	Ringfort - Rath	574186	663943	OAKHAMPTON	Nineteenth-century outhouses now obscure a possible bawn area (TN031-048002) located to the N and W of the tower. Situated on a rise of ground in an upland area in the front garden of Oakhampton House with a nearby cliff-edge fort (TN031-062) to the E. A raised circular platform (diam. 42m N-S) defined by a scarp (H 2-3m) with traces of a shallow external fosse best visible at S and a possible causewayed entrance at SE. A possible ringfort of platform type reused as a landscape feature. A cobblestone surface is visible underneath a yew tree in the S sector of the interior.	1310m to the E	None	Avoidance
GL10	RMP	TN031-072---	Ritual site - holy well	573184	663369	FOILDARRIG	Situated in a slight depression in undulating countryside with the nearby Mulkear River to the S. A disused holy well consisting of a natural spring (dims. 0.9m x 0.5m) with water flowing S towards the nearby river. According to a local landowner the well was known as St Bridget's Well (FitzPatrick 1985b, 160).	500m to the E	None	Avoidance
GL11	RMP	TN031-070002-	Children's burial ground	572906	663612	FOILDARRIG	Situated on an E-facing slope in an upland area with a bowl-barrow (TN031-071) to the SW. Described in the OS Namebooks (1840) as a place for 'still born infants or children dying without baptism'. No visible remains of any children's burial ground in the vicinity of the church site (TN031-070001).	190m to the E	None	Avoidance
GL12	RMP	TN031-070001-	Church	572905	663603	FOILDARRIG	This church site was located on an E-facing slope of rising ground overlooking a river with a nearby bowl-barrow (TN031-071) to the SW. The OS Letters describe the site as consisting of the wall-footings of a church which measures 5.7m N-S by 12m approx. E-W with a wall thickness of 1m (O'Flanagan 1930, vol. 2, 7). Described in the OS Namebooks (1840) as a children's burial ground (TN031-070002). No visible remains at ground level.	180m to the E	None	Avoidance
GL	RMP	TN031	Barrow	572831	663577	FOILDARRIG	Situated on flat, poorly drained land in an upland area with church	125m to the E	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
13		-071---	bowl-barrow				site (TN031-070001) to NE. A poorly preserved round-topped mound (diam. 23m N-S; H 1.2m) enclosed by a wide, flat-bottomed fosse (Wth 7.5m; ext. D 0.4m) which was waterlogged at time of visit.			
GL 14	RMP	TN031-073---	Earthwork	572776	663172	CLONBEALY	Situated on the W face of a low N-S ridge overlooking the Mulkear River to the W. Present remains consist of a roughly circular area covered in dense overgrowth with no evidence of an enclosing element. Rock outcrop protrudes from the surface of the interior. Of doubtful antiquity; dense cover of vegetation makes detailed examination impossible.	165m to the E	None	Avoidance
GL 15	RMP	TN031-079---	Souterrain	574906	662922	CASTLEWALLER	Located on high ground in an upland area. A souterrain discovered by a local farmer in the early 1950s. The site was visited by National Museum staff (NMI file) who described the souterrain as an L-Plan lintelled roofed passage with drystone side walls (L 5m; H 0.7m approx.; Wth 0.5-0.8m) found approximately 0.3m below ground surface. Not visible at ground level.	520m to the E	None	Avoidance
GL 16	RMP	TN037-007---	Earthwork	574526	662562	CASTLEWALLER	Situated on high ground overlooking a nearby ringfort (TN037-008) to the E and the River Small to the N. Outlined on the 1st ed. (1840) OS 6-inch map. Not visible at ground level.	315m to the E	None	Avoidance
GL 17	RMP	TN037-006---	Ringfort - Rath	574368	662287	CARROWKEALE	Situated on a N-facing slope of rising ground in an upland area overlooking the nearby Small River to the N. A circular area (diam. 25m N-S; 31m E-W) enclosed by an earth and stone bank (Wth 2m; int. H 0.3m; ext. H 1.5m) reduced to a scarp in places with a wide flat-bottomed external fosse (Wth 5m; D 0.6m) best preserved from W to N with possible traces of an outer bank best preserved from N to E. A D-shaped area defined by a scarp (H 1m) is attached to the outer fosse of the ringfort from N to E and may be a conjoined enclosure. A field fence intersects the inner bank at S on an E-W axis and at E on a	300m to the E	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
GL 18	RMP	TN037-005---	Ringfort - Rath	573393	662000	DERRYLEIGH	N-S axis. No visible entrance feature. Situating on the E face of a N-S ridge in undulating countryside. Depicted as a circular enclosure on the latest ed. OS 6-inch map between two roads which intersect the site, one at N on an E-W axis and one at S on a NW-SE axis. Not visible at ground level.	8m to the N	None	Avoidance
GL 19	RMP	TN037-009---	Castle - unclassified	573874	661494	DERRYLEIGH	Situating on a S-facing slope of rising ground in an upland area. Described in the Civil Survey (1654-6) as the 'ruines of a Castle and Barbicon, a Courte leete & Courte Barron to be held by the sd. William oge Ryan his heires or Assignes belongeth to the sd. lands by Grant as wee are informed. The sd. lands are intermixt wth. wood &ould oake trees & now totally waste' (Simington 1934, vol. 2, 191). According to the OS Name Books (1840) the castle was destroyed in 1839. The Ordnance Survey field name books for the parish of Killenale recorded that 'until the year 1839, part of this old castle was standing. Mr Hanrahan razed it to the ground. Nothing remains of it now but a bank of rubbish' (SMR File). No visible remains at ground level.	82m to the N	None	Avoidance
GL 20	RMP	TN037-023---	House - indeterminate date	574443	660865	DERRYLEIGH	Situating on a low hillock on poorly drained land in upland area. The poorly preserved foundations of a small square-shaped building (int. dims. 5.2m NE-SW x 5.6m NW-SE; wall T 1m) the SE wall of which is totally destroyed, with the remaining walls surviving to a maximum height of 0.7m. A possible enclosing bank is visible to the N of house only, where it survives as a scarp. The walls are built with roughly coursed rubble with a rounded corner at N and a possible square corner at W. These are the possible foundations of a stronghold with associated enclosure.	405m to the S	None	Avoidance
GL	RMP	TN037	Barrow	574501	661111	KILNACAPPA	Situating on top of a low hillock on poorly drained land in an upland	174m to the S	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
21		-044---	ring-barrow			GH	area. A low circular mound (diam. 4m; H 0.2m) enclosed by a fosse (Wth 1m; ext. D 0.2m) with slight traces of an outer bank.			
GL 22	RMP	TN037-037---	Redundant record	574753	661420	KILNACAPPA GH	No surface remains of any site of archaeological significance in area marked on OS 6-inch map. Site identified from GSI aerial photograph (R. 285/6) taken in 1974.	154m to the N	None	Avoidance
GL 23	RMP	TN037-022---	Enclosure	574996	661213	KILNACAPPA GH	No surface remains visible, site depicted as a semi-circular enclosure on 1st ed. OS 6-inch map, doubtful antiquity.	180m to the N	None	Avoidance
GL 24	RMP	TN037-018---	Ringfort - cashel	575147	661336	KILNACAPPA GH	Situated on high ground in a mountainous area with a nearby cashel (TN037-019) to the NE. The barely visible outline of a heather-covered cashel wall (T 1.3m) enclosing a circular area (diam. 19m E-W) with no evidence of an entrance feature. Detailed examination of the site was impossible due to a dense cover of heather.	360m to the N	None	Avoidance
GL 25	RMP	TN037-019---	Ringfort - cashel	575229	661381	CARROWKE ALE (Kivellane Par.)	Situated on high ground with extensive views and a nearby cashel (TN037-018) to the SW. A circular area (diam. 22.5m NW-SE) enclosed by a well-preserved drystone wall (T 2m; H 1.5m) with no entrance feature visible. Field walls intersect the site at NW and E. A millstone roughout lies nearby to the SE.	450m to the N	None	Avoidance
GL 26	RMP	TN037-024---	Ringfort - cashel	575012	660732	DERRYLEIGH ,SCRAGGEE N	Situated on a N-facing slope in an upland area. A circular area (diam. 22m N-S) enclosed by a well-preserved drystone wall (T 1.2m; H 2m) with possible entrance gap (Wth 1.5m) at E. A townland boundary intersects the enclosing wall at W on a NE-SW axis.	160m to the S	None	Avoidance
GL 27	RMP	TN037-030---	Ringfort - cashel	575197	660968	KILNACAPPA GH	Situated on a hillock in an area of rock outcrop in a mountainous region. A circular area (diam. 31m E-W) originally enclosed by two drystone walls of which only the wall-footings survive with intervening fosse (Wth 2.5m; D 0.6m) and causewayed entrance (Wth	125m to the N	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
GL 28	RMP	TN037-031---	Enclosure	575464	660669	SCRAGGEEN	4m) at E. The inner bank (Wth 1.5m; ext. H 1m; int. H 0.5m) is mainly reduced to a scarp while the outer bank (Wth 1.5m; ext. H 0.6m) is best visible from E to S. A field fence intersects the fosse at W on a N-S axis. Situating on the NE face of a N-S ridge in an upland area. A circular area (diam. N-S 25m) enclosed by an earth and stone bank (Wth 2m; int. H 0.3m; ext. H 1.5m) and an outer fosse (Wth 3m; D 0.7m) with no entrance feature visible. Located in centre of nineteenth-century forest plantation and possibly contemporary with the plantation. A possible landscape feature.	40 to the S	None	Avoidance
GL 29	RMP	TN037-039001-	Redundant record	575646	660763	DERRYGARE EN	Situated on S facing slope of rising ground in mountainous area. Pennanular enclosure defined by a low dry stone wall as indicated on OS 6-inch map, enclosing element visible from S through W to N with no remains visible elsewhere. Probable 19th century field fence as indicated on OS 6-inch map.	150m to the N	None	Avoidance
GL 30	RMP	TN037-039002-	Redundant record	575666	660773	DERRYGARE EN	This is a 19th century field wall adjoining onto a larger 19th century field wall in mountainous region.	180m to the N	None	Avoidance
GL 31	RMP	TN037-032001-	Ringfort - Rath	575675	660889	DERRYGARE EN	Situated on a SW slope of rising ground in a mountainous area. A circular area (diam. 25m N-S) enclosed by a well-preserved flat-topped earth and stone bank (Wth 1.5-2m; int. H 0.5-1m; ext. H 2.5m), intervening fosse and outer bank (Wth 1-1.5m; H 0.5m), with entrance gap (Wth 1.2m) at SE. There is a small portable bullaun stone (TN037-032002) in the N sector of the ringfort.	250m to the N	None	Avoidance
GL 32	RMP	TN037-032001-	Bullaun stone	575680	660897	DERRYGARE EN	A small portable bullaun stone (diam. 0.24m; D 0.05m) situated in the N sector of a ringfort (TN037-032001) in an area that appears to have	260m to the N	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
		032002-					been quarried.			
GL 33	RMP	TN037-033---	Fulacht fia	576426	660023	KNOCKANCU LLENAGH	Situated on a S-facing slope of poorly drained rising ground in an upland area. A well-preserved horseshoe-shaped mound of burnt material (H 1m; dims. 14m N-S; 13m E-W); open (Wth 1.5m; L 4m; D 1m) to ENE.	130m to the N	None	Avoidance
GL 34	RMP	TN038-020---	Mine - copper	578805	660496	LACKAMORE (Kilvellane Par.)	Situated on a S-facing slope of rising ground in an upland region overlooking the Clare River valley. According to Kinahan (1886) 'ancient tools were found in the "old mens" workings' at this mine. These artefacts were probably found when the mine was exploited between 1810 and 1859 (pers. comm. Dr William O'Brien; Cowman 1992, 109-12). Several shafts have collapsed leaving large open pits with evidence of spoil heaps all over the area containing copper ore. There is no evidence for prehistoric mining visible in the area although the site is heavily overgrown making detailed examination of the exposed cliff faces impossible.	40m to the S	None	Avoidance
GL 35	RMP	TN038-006---	Megalithic tomb - wedge tomb	583583	659745	REARDNOGY MORE	This monument, removed in 1956, stood close to the foot of the southern slope of Barnarhu Hill. A plan of the tomb (Crawford 1910, 44, 'Bairnadoomeeny West') shows the remains of a gallery, open at both ends, aligned W-E, measuring approximately 2.7m long and 1m wide. Each side of the gallery consisted of two stones set end to end. An outer-wall or doubling of the gallery side consisting of three stones was present on the S side and there was a single stone outside the most westerly sidestone on the N side. (De Valera and Ó Nualláin 1982, 83-4, No.5)	300m to the N	None	Avoidance
GL 36	RMP	TN038-012---	Pit-burial	584284	659423	REARDNOGY MORE	Situated on an E-facing slope of rising ground overlooking a nearby river to the E in an upland area. Cremated human bones found in a	80m to the N	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
		-					pit (0.65m D; 0.52m W) with flagstone floor and capstone with prostrate pointed stone (1.7m x 0.8m x 0.25m) which may have been erected over the site (Lucas 1961, 89). The second burial was found 10m to the W and consisted of the cremated remains of a burial placed in a pit protected by three small slabs with accompanying bronze blade (Waddell 1969, 3-5). No visible remains at ground level.			
GL 37	RMP	TN039-013---	Redundant record	587493	658373	COONMORE	Small square-shaped field on 2nd (1905) OS ed. and depicted as an irregular field on 1st (1840) ed. It formerly contained an orchard and now has within its boundaries an early twentieth-century house with modern extensions has been built in this field. Non-archaeological.	55m to the W	None	Avoidance
GL 38	RMP	TN039-012---	Children's burial ground	587489	658441	COONMORE	Situated on level ground at the base of a high natural scarp, overlooking a river valley to the NE. The Clasher River runs c. 2m NE of the site. An irregular, roughly circular enclosure (34.6 N-S; 34m E-W) in a level area between the river and the cliff-edge. The enclosure is defined by a denuded, moss-covered wall of earth and stone construction (Wth 1.3-2.1m; int. H 0.25-1m; ext. H 0.75-1m). There is a heavy growth of scrub in the NW quadrant. The site was described as 'disused keel' or children's burial ground in 1910 (Crawford 1910, 51), however, no grave-markers were apparent. A low linear mound (TN039-012001) in the SW quadrant, running NW-SE (L 6.1m x W 1.3m; H 0.4m), is constructed of earth and stone. It appears to be a section of a low field boundary and is not a megalithic structure.	50m to the W	None	Avoidance
GL 39	RMP	TN039-012001-	Mound	587493	658456	COONMORE	Situated on level ground at the base of a high natural scarp, overlooking a river valley to the NE. The Clasher River runs c. 2m NE of the site. An irregular, roughly circular enclosure (TN039-012) in a level area between the river and the cliff-edge. The enclosure is defined by a denuded, moss-covered wall of earth and stone construction. There is a heavy growth of scrub in the NW quadrant.	55m to the W	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
GL 40	RMP	TN039-024---	Redundant record	588663	658923	FOILDARRA GH	The site was described as 'disused keel' or children's burial ground in 1910 (Crawford 1910, 51), however, no grave-markers were apparent. A low linear mound in the SW quadrant, running NW-SE (L 6.1m x W 1.3m; H 0.4m), is constructed of earth and stone. It appears to be a section of a low field boundary and is not a megalithic structure. Site identified as possible enclosure from aerial photograph (GSI April 1974, R.362/1). This is a natural, roughly circular knoll at highest point of E-W ridge. Ridge continues E at slightly lower level. Non-archaeological.	230m to the N		RMP - Not on website
GL 41	RMP	TN039-030---	Ringfort - Rath	588773	658513	FOILDARRA GH	Located on the level ground of a river valley with the Aughrara River to the S and the Bilboa River to the N. The site was identified on an aerial photograph (GSIAP, R 362/361). A large roughly circular enclosure (diam. c. 63m N-S; 55m E-W) consisting of a raised interior surrounded by a wide fosse (Wth 4.5-6m) which is evident as lush grass growth. A field boundary which transected the W sector has been removed as have field boundaries to the N. The field has been reclaimed and the site has been levelled. A deep drainage ditch skirts the S limit of the site making the edge difficult to define.	165m to the S		
GL 42	RMP	TN039-025001-	Enclosure	589493	658773	KILCOMMO N (Templebeg Par.)	Situated just below the summit of a hill on a steep SW-facing slope, in pastureland with another possible enclosure site (TN039-025002) c. 20m to the NE. Identified on an aerial photograph taken in April 1974 (GSIAP, R 362/1). Not visible at ground level. A raised curving area roughly in the NW portion of the site may represent the flattened remains of a bank, however, the field is full of slight undulations which may be misleading.	220m to the N	None	Avoidance
GL	RMP	TN039	Enclosure	589553	658793	KILCOMMO	Situated near the summit of a gentle W-facing slope, in pasture with	270m to the	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
43		-025002-	e			N (Templebeg Par.)	another possible enclosure site (TN039-025001) c. 20m to the SW. Identified on an aerial photograph taken in 1974 (GSIAP, R 362/1). Not visible at ground level.	N		
GL 44	RMP	TN039-026---	Redundant record	589583	658613	KILCOMMO N (Templebeg Par.)	Possible enclosure identified on GSI aerial photograph (April 1974, R.362/1). This is natural outcrop forming a rocky, roughly circular knoll in pasture field. Non-antiquity.	140m to the N	None	Avoidance
GL 45	RMP	TN039-008---	Megalithic tomb - wedge tomb	592512	659913	KNOCKMAR OE	Situated close to the foot of the S-facing slope of Knockmaroe Hill. The remains consist of a mound about 9m in diameter and 1m high with a hollow towards its western perimeter where there are three stones. One of these is an orthostat aligned WSW-ENE. This stone, which declines in height from W to E, may have formed part of a chamber side. Resting against the last is a large slab, possibly a displaced roofstone. A thin slab beneath this may have been detached from its underside. Some stones exposed at the edge of the hollow and at the perimeter of the mound are of uncertain origin. The scant remains seem to be those of a wedge tomb. (De Valera and Ó Nualláin 1982, 89, No.9)	145m to the N	None	Avoidance
GL 46	RMP	TN039-050---	Megalithic tomb - unclassified	594849	660334	KNOCKCURR AGHBOLA COMMONS	Situated in upland region, in pasture with good panoramic views in all directions, view of Galtee More to the SW on a clear day. Good views of Wedge tomb (TN039-009) located 670m to N. A roughly rectangular chamber, 1m long by 0.85m wide and 0.3m high at the open SW end formed by four low upright stones with a large capstone (H 0.55m; L 2m; Wth 2m) sitting on top of the side stones. A second capstone may be a displaced roofstone from the SW end of the chamber. Not clear whether this is a megalithic tomb or not however the arrangement of the capstone sitting on side stones forming a chamber suggests that it is a possible megalithic structure.	400m to the NE	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
GL 47	RMP	TN039-009---	Megalithic tomb - wedge tomb	595031	660986	KNOCKCURR AGHBOLA COMMONS	<p>It also has an impressive siting in the landscape with fine panoramic views of hilltops within this mountain region.</p> <p>Situated on a hillock at the NE end of a low ridge. It consists of a long, narrow, partly roofed gallery closed at the SW by a septal-stone. Both sides of the gallery are flanked by outer-walling with the more westerly stone at either side set in advance of the septal-stone. These two stones would have served as the sides of a portico or, alternatively, represent a doubling of the portico sides since removed. The structure is 7m in overall length. The main chamber, open at its more easterly end, is 5.3m long and 1.2m wide at the septal-stone whence it narrows slightly towards the E. Two roofstones cover its forward end. There are five sidestones on the N side and three on the S side. There are six outer-wall stones to the N and four to the S. These are set close to the gallery walls and two of those to the N double as buttress-stones. Beyond the easternmost at the S there is a small stone which may be the butt of a taller one, probably another outer-wall stone. There are traces of a mound around the structure. A large rectangular slab lies prostrate at the SW end of the gallery. (De Valera and Ó Nualláin 1982, 90, No.10)</p>	320m to the NE		
GL 48	RMP	TN039-052---	Stone row	595083	660868	KNOCKCURR AGHBOLA COMMONS	<p>Situated in pasture on SE facing slope of rising ground in upland area with good views of mountain valley to S and E, higher ground to N. Nearby wedge tomb (TN039-009) to NNW and fulacht fiadh (TN 039-051) to SE. Monument consists of two low limestone orthostats, aligned E-W, and 2.48m apart. Both stones are roughly triangular in shape with rectangular sections and the tops of the stones are tapering towards a point. The W stone measures 0.9m H; 0.58m x 0.21m. The E stone measures 0.8m H; 0.60m x 0.30m. Local landowner has no recollection that they were ever erected as</p>	310m to the NE	None	Avoidance

Recorded Legally Protected Sites within the UWF Grid Connection Study Area										
Site No.	Source	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Boundary	Impact	Recommendation
GL 49	RMP	TN039-051--- -	Fulacht fia	595166	660772	KNOCKCURR AGHBOLA COMMONS	scratching posts for livestock. Situating in wet marshy field in upland area with stream immediately to the S, field has recently been planted with conifer trees. Possible two stone row (TN039-052) and wedge tomb (TN039-009) to NW. During the planting of trees in this field a drainage ditch (with 0.70m; D 0.40m) was cut through the middle of the mound on an E-W axis revealing the burnt material of the monument. The monument consists of a large circular mound (diam. 16m N-S ; 20m E-W; H 1m) of burnt material with stream immediately to S of mound. No visible sign of any trough.	200m to the S	None	Avoidance

A16.1.2 Other Recorded Cultural Heritage Sites within the UWF Grid Connection Study Area

Other Recorded Sites within the UWF Grid Connection Study Area										
ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GR1	First Edition Ordnance Survey		Demesne	571003	665365	CRAGG	The extent of Cragg demesne is shown at this location on the first edition Ordnance Survey (1838).	1570m to the NW	None	Avoidance
GR2	NIAH	22403 113	Cragg House	570830	665216	CRAGG	Detached two-pile three-bay single-storey with dormer floor house, built c. 1880, with lower three-bay two-storey block to rear of west end. Gabled porch projecting to middle bay and gabled ends with projecting chimneystacks to north elevation. Pitched slate roofs with decorative timber bargeboards with finials and cut limestone chimneystacks with single, paired and tripled round-profile chimneys. Rendered walls. Square-headed openings with single, double and paired one-over-one pane timber sash windows, latter with combined sills. U-plan layout of former stable blocks comprising L-plan single-storey blocks flanking central three-bay two-storey block, latter with integral segmental carriage arches and whole now converted to dwellings, with pitched slate roofs, gabled dormers and snecked dressed limestone walls. enclosing wall with gate piers. Limestone entrance gate piers with stone caps.	1240m to the NW	None	Avoidance
GR3	First Edition Ordnance Survey		Demesne	572186	664398	MOUNTPHIL IPS	The extent of Mount Philips demesne is shown at this location on the first edition Ordnance Survey (1838).	CWB within Demense	None	Avoidance
GR4	First Edition Ordnance Survey		Demesne	572043	663805	BARNA	The extent of Barna demesne is shown at this location on the first edition Ordnance Survey (1838).	380m to the W	None	Avoidance

Other Recorded Sites within the UWF Grid Connection Study Area										
ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GR5	NIAH	22403 114	Oakhampton House	574129	663987	OAKHAMPTON	Detached three-bay two-storey house, with projecting gabled central bay, built c. 1820, with earlier lower four-bay two-storey house, c. 1760, at right angles to rear. Pitched slate roofs, reconstructed to front block, with rendered chimneystacks and with stone eaves course to rear block. Exposed rubble sandstone walls with dressed quoins and voussoirs to openings. Square-headed openings with six-over-six pane timber sash windows and glazed timber door. Recent single- and two-storey additions to south gable. Courtyard to rear of house has detached six-bay two-storey stable block with pitched slate roof, exposed sandstone walls and square-headed openings with replacement timber windows and doors. Three-bay single-storey rubble sandstone outbuilding to south-east of house with integral carriage arches. Single-storey stone pavilion with hipped slate roof built c. 2000 connected to north-east of main block with flanking arched stone wall. Rubble limestone boundary walls with square-profile gate piers with plinths and flat caps, topped by carved stone eagles.	1130m to the E	None	Avoidance
GR6	First Ordnance Survey		Demesne	574356	663944	OAKHAMPTON	The extent of Oakhampton demesne is shown at this location on the first edition Ordnance Survey (1838).	850m to the E	None	Avoidance
GR7	First Ordnance Survey		Demesne	573226	663147	ROCKVALE	The extent of Rockvale demesne is shown at this location on the first edition Ordnance Survey (1838).	360m to the E	None	Avoidance
GR8	NIAH	22311 001	Charter School	572983	662736	CLONBEALY	Detached four-bay two-storey over basement former charter school, built c. 1820, with entrance porch. Later used as barracks and now a house. Pitched slate roof with	470m to the E	None	Avoidance

Other Recorded Sites within the UWF Grid Connection Study Area										
ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GR 9	NIAH	TN-59-R-736614	Derryleigh House	573597	661466	DERRYLEIGH	rendered chimneystacks at gables. Rendered walls with render quoins. Replacement uPVC windows, set in square-headed openings to ground and first floors and segmental-headed to basement and upper south gable. Porch has gabled roof with gable front and uPVC door approached by flight of curved steps. Rendered gate piers and wrought-iron entrance gate. Remnants of rubble garden walls.	100m to the S	None	Avoidance
GR 10	NIAH	22403801	Church of the Visitation	583908	659528	REARDNOG YMORE	Detached gable-fronted cruciform-plan church, built c. 1840, relocated and re-erected c. 1877, restored c. 2000. Composed of three-bay side elevations to nave, with single-bay transepts, and single-bay sacristy to north. Square bell tower to east of entrance with metal clad broached spire above louvres, and pitched roof with pressed metal imitation shingling below.	13m to the N	None	Avoidance
GR 11	NIAH	22403802	Rear Cross National School	583943	659529	REARDNOG YMORE	Detached eight-bay single-storey former national school, built 1881, with central two-bay gabled projecting porch. Pitched slate roof with rendered chimneystack. Roughcast rendered walls with limestone date plaque to porch. Replacement uPVC and some six-over-six pane timber sash windows to front and fixed timber windows to rear. Timber battened doors, with steps and with paned overlight to west door. Green area to front of building.	18m to the N	None	Avoidance

Other Recorded Sites within the UWF Grid Connection Study Area										
ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GR 12	NIAH	22403 905	Anglesea Bridge	588921	658727	FOILDARRA GH,KILCOM MON (AGLISHCLO GHANE PR)	Double-arch sandstone road bridge, built c.1800, over Aughvaria River, with U-plan cut-waters to south elevation. Dressed stone voussoirs to arches and snecked rubble walls, dressed below springing point, with rubble stone above brought to courses and separated from snecked stone parapet by dressed stone string course dressed stone capping.	UGC Crosses over Bridge	None	Avoidance

A16.1.3 Previously Unrecorded Cultural Heritage Sites within the UWF Grid Connection Study Area

Previously Unrecorded Sites within the UWF Grid Connection Study Area										
ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GU1	First Edition Ordnance Survey	NA	Pond	572066	665098	Mountphilips	Pond shown at this location on the first edition Ordnance Survey (1838)	654m to the NW	None	Avoidance
GU 2	25 Inch Ordnance Survey	NA	House	572066	664351	Mountphilips	A house is shown at this location on the 25 Inch edition of the Ordnance Survey (1905). This appears to have been the main residence for Mount Philips Demesne (Site 13).	259m to the W	None	Avoidance
GU 3	25 Inch Ordnance Survey	NA	Ford	573616	664363	Oakhampton	A ford is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	10m to the S	None	Avoidance
GU 4	First Edition Ordnance Survey	NA	Bridge	571588	664145	Mountphilips	Bridge shown at this location on the first edition Ordnance Survey (1838)	955m to the W	None	Avoidance
GU 5	First Edition Ordnance Survey	NA	House	572645	664133	Coole	House shown at this location on the first edition Ordnance Survey (1838). This appears to have been the main residence for Coole Demesne (Site 19).	358m to the SE	None	Avoidance
GU 6	25 Inch Ordnance Survey	NA	Stepping Stones	571531	664002	Barna	Stepping stones is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	1.01km to the SW	None	Avoidance
GU 7	First Edition Ordnance Survey	NA	Demesne	572433	664069	Coole	The extent of Coole demesne is shown at this location on the first edition Ordnance Survey (1838).	215m to the S	None	Avoidance
GU 8	25 Inch Ordnance Survey	NA	House	570985	663961	Killeen	A house is shown at this location on the 25 Inch edition of the Ordnance Survey (1905). It is referred to as "Killeen House" within a cluster of	1.53km to the SW	None	Avoidance

Previously Unrecorded Sites within the UWF Grid Connection Study Area										
ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
							farm buildings.			
GU 9	25 Inch Ordnance Survey	NA	Lodge	571972	663948	Barna	The Gate Lodge for Barna Demesne is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	699m to the S	None	Avoidance
GU 10	25 Inch Ordnance Survey	NA	House	572027	663855	Barna	A house is shown at this location on the 25 Inch edition of the Ordnance Survey (1905). This appears to have been the main residence for Barna Demesne (Site 24).	740m to the SE	None	Avoidance
GU 11	First Edition Ordnance Survey	NA	Gate Lodge	572654	663889	Foildarrig	Gate Lodge at the entrance to Coole Demesne shown at this location on the first edition Ordnance Survey (1838)	593m to the S	None	Avoidance
GU 12	25 Inch Ordnance Survey	NA	Stepping Stones	573098	663674	Foildarrig	A stepping stone is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	784m to the S	None	Avoidance
GU 13	25 Inch Ordnance Survey	NA	House	572999	663543	Foildarrig	Brook Lodge is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	956m to the S	None	Avoidance
GU 14	First Edition Ordnance Survey	NA	Mill	573803	663337	Rockvale	Mill shown at this location on the first edition Ordnance Survey (1838)	1.01km to the S	None	Avoidance
GU 15	First Edition Ordnance Survey	NA	Bridge	573817	663356	Rockvale	Bridge shown at this location on the first edition Ordnance Survey (1838)	1.05km to the S	None	Avoidance
GU 16	First Edition Ordnance Survey	NA	House	573339	662976	Mackney (Bourke)	Fort Emil House shown at this location on the first edition Ordnance Survey (1838)	1.45km to the S	None	Avoidance
GU 17	First Edition Ordnance Survey	NA	School	572961	662690	Clonbealy	School shown at this location on the first edition Ordnance Survey (1838)	1.98km to the S	None	Avoidance
GU	First Edition	NA	Demesne	572647	662556	Clonbealy	The extent of Rose Hill demesne is shown at this	1.73km to the	None	Avoidance

Previously Unrecorded Sites within the UWF Grid Connection Study Area

ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
18	Ordnance Survey						location on the first edition Ordnance Survey (1838).	S		
GU 19	First Edition Ordnance Survey	NA	Demesne	571873	662399	Newport	The extent of Newport demesne is shown at this location on the first edition Ordnance Survey (1838).	1.87km to the S	None	Avoidance
GU 20	25 Inch Ordnance Survey	NA	Smithy	570759	665625	Touknockane	A smithy is shown at this location on the 25 Inch edition of the Ordnance Survey (1905). It is shown as a cluster of farm buildings at a crossroads.	1.99km to the NW	None	Avoidance
GU 21	25 Inch Ordnance Survey (1905).	NA	Ford	574366	662943	Castlewall	GU22 is shown at this location on the 25 Inch Ordnance Survey (1905).	0m	None	Avoidance
GU 22	25 Inch Ordnance Survey (1905).	NA	Foot Bridge	574385	662936	Castlewall	GU23 is shown at this location on the 25 Inch Ordnance Survey (1905).	10m to the E	None	Avoidance
GU 23	First Edition Ordnance Survey (1838).	NA	Spring	574228	662620	Castlewall	GU24 is shown at this location on the First Edition Ordnance Survey (1838).	20m to the E	None	Avoidance
GU 24	First Edition Ordnance Survey (1838).	NA	Spring	574269	662617	Castlewall	GU25 is shown at this location on the First Edition Ordnance Survey (1838).	60m to the E	None	Avoidance
GU 25	25 Inch Ordnance Survey (1905).	NA	Ford	574174	662614	Castlewall	GU26 is shown at this location on the 25 Inch Ordnance Survey (1905).	0m	None	Avoidance
GU 26	25 Inch Ordnance Survey (1905).	NA	Foot Stick	574194	662606	Castlewall	GU7 is shown at this location on the 25 Inch Ordnance Survey (1905).	10m to the E	None	Avoidance
GU 27	25 Inch Ordnance Survey (1905).	NA	Well	573253	662087	Cooldrisla	GU28 is shown at this location on the 25 Inch Ordnance Survey (1905).	19m to the N	None	Avoidance

Previously Unrecorded Sites within the UWF Grid Connection Study Area

ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GU 28	25 Inch Ordnance Survey (1905).	NA	Lime Kiln	574816	661249	Kilnacappagh	GU29 is shown at this location on the 25 Inch Ordnance Survey (1905).	23m to the N	None	Avoidance
GU 29	25 Inch Ordnance Survey (1905).	NA	Lime Kiln	575704	660331	Derrygareen	GU30 is shown at this location on the 25 Inch Ordnance Survey (1905).	18m to the N	None	Avoidance
GU 30	25 Inch Ordnance Survey (1905).	NA	Well	576890	659921	Knockancullena	GU31 is shown at this location on the 25 Inch Ordnance Survey (1905).	33m to the S	None	Avoidance
GU 31	25 Inch Ordnance Survey (1905).	NA	Lime Kiln	577120	660084	Knockancullena	GU32 is shown at this location on the 25 Inch Ordnance Survey (1905).	5m to the N	None	Avoidance
GU 32	25 Inch Ordnance Survey (1905).	NA	Lime Kiln	578476	660430	Lackamore	GU33 is shown at this location on the 25 Inch Ordnance Survey (1905).	55m to the S	None	Avoidance
GU 33	25 Inch Ordnance Survey (1905).	NA	Lime Kiln	578572	660555	Lackamore	GU34 is shown at this location on the 25 Inch Ordnance Survey (1905).	48m to the N	None	Avoidance
GU 34	First Edition Ordnance Survey (1838).	NA	Shaft	579160	660684	Toorenbrien Upper	GU35 is shown at this location on the First Edition Ordnance Survey (1838).	25m to the N	None	Avoidance
GU 35	First Edition Ordnance Survey (1838).	NA	Lackamore Lodge	579475	660650	Toorenbrien Upper	GU36 is shown at this location on the First Edition Ordnance Survey (1838).	70m to the S	None	Avoidance
GU 36	First Edition Ordnance Survey (1838).	NA	Lackamore Post Office	580216	660849	Toorenbrien Upper	GU37 is shown at this location on the First Edition Ordnance Survey (1838).	10m to the N	None	Avoidance
GU 37	First Edition Ordnance Survey (1838).	NA	Ford	580514	660745	Toorenbrien Lower	GU38 is shown at this location on the First Edition Ordnance Survey (1838).	22m to the S	None	Avoidance

Previously Unrecorded Sites within the UWF Grid Connection Study Area										
ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
GU 38	25 Inch Ordnance Survey (1905).	NA	Well	583242	659251	Shanballyedmond	GU39 is shown at this location on the 25 Inch Ordnance Survey (1905).	18m to the S	None	Avoidance
GU 39	First Edition Ordnance Survey (1838).	NA	Creamery	583653	659488	Reardnogy More	GU40 is shown at this location on the First Edition Ordnance Survey (1838).	10m to the N	None	Avoidance
GU 40	First Edition Ordnance Survey (1838).	NA	Smithy	583763	659507	Reardnogy More	GU41 is shown at this location on the First Edition Ordnance Survey (1838).	10m to the N	None	Avoidance
GU 41	25 Inch Ordnance Survey (1905).	NA	Constab Bk	583842	659539	Reardnogy More	GU42 is shown at this location on the 25 Inch Ordnance Survey (1905).	30m to the N	None	Avoidance
GU 42	25 Inch Ordnance Survey (1905).	NA	Well	583926	659449	Reardnogy More	GU43 is shown at this location on the 25 Inch Ordnance Survey (1905).	48m to the S	None	Avoidance
GU 43	25 Inch Ordnance Survey (1905).	NA	Well	583993	659376	Reardnogy More	GU44 is shown at this location on the 25 Inch Ordnance Survey (1905).	86m to the S	None	Avoidance
GU 44	25 Inch Ordnance Survey (1905).	NA	Well	584350	659346	Reardnogy More	GU45 is shown at this location on the 25 Inch Ordnance Survey (1905).	12m to the N	None	Avoidance
GU 45	25 Inch Ordnance Survey (1905).	NA	Lime Kiln	584931	659178	Bairnadomeen	GU46 is shown at this location on the 25 Inch Ordnance Survey (1905).	55m to the N	None	Avoidance
GU 46	25 Inch Ordnance Survey (1905).	NA	Well	584965	659070	Bairnadomeen	GU47 is shown at this location on the 25 Inch Ordnance Survey (1905).	30m to the South	None	Avoidance
GU 47	First Edition Ordnance Survey (1838).	NA	Smithy	588705	658706	Foildarragh	GU48 is shown at this location on the First Edition Ordnance Survey (1838).	25m to the N	None	Avoidance
GU 48	First Edition Ordnance Survey (1838).	NA	Kilcommon	588848	658785	Foildarragh	GU49 is shown at this location on the First Edition Ordnance Survey (1838).	40m to the N	None	Avoidance

Previously Unrecorded Sites within the UWF Grid Connection Study Area										
ID	Source	Ref No.	Classification	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recommendation
48	Ordnance Survey (1838).		Creamery				Ordnance Survey (1838).			
GU 49	First Edition Ordnance Survey (1838).	NA	Constab Bk	588986	658666	Kilcommon	GU50 is shown at this location on the First Edition Ordnance Survey (1838).	25m to the S	None	Avoidance
GU 50	First Edition Ordnance Survey (1838).	NA	Townland Boundary	659578	660770	Mountphilips / Coole	GU51 is shown at this location on the First Edition Ordnance Survey (1838).	0m	Section removed	Monitoring
GU 51	First Edition Ordnance Survey (1838).	NA	Townland Boundary	665998	668108	Coole / Freagh	GU52 is shown at this location on the First Edition Ordnance Survey (1838).	0m	Section removed	Monitoring

Appendix to Chapter 16: Cultural Heritage

Appendix 16.2: Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

TABLE OF CONTENTS

A16.2.1 Introduction 3
A16.2.2 the author of the ARCHITECTURAL HERITAGE IMPACT ASSESSMENT 4
A16.2.3 description of the structure 5
A16.2.4 history of the structure 6
A16.2.5 Impact assessment..... 8
A16.2.6 options for raising the parapets walls..... 9
A16.2.7 recommendations & Conclusions 11
A16.2.8 references 12
A16.2.9 photographs..... 13

A16.2.1 INTRODUCTION

Upperchurch Windfarm (UWF) has already received planning permission but is not yet constructed. This planning application is for grid connection works (UWF Grid Connection) to connect the windfarm to the national electricity system.

UWF Grid Connection comprises two main parts; the first part is the proposed '110kV UGC' which is a 30.5km long underground electrical cabling network at high voltage (110 kilovolts (kV)), to connect the already consented Upperchurch Windfarm substation at Knockcurraghbola Commons townland to a new proposed substation at Mountphilips townland. The second part is a proposed 110kV electrical substation 'Mountphilips Substation', which will manage and control the power coming from the consented Upperchurch Windfarm (via the 110kV UGC), and from there the power will be transported to national electricity system, at an adjacent point on the existing Killonan to Nenagh 110kV overhead line.

The route of the 110kV UGC follows the Regional Road R503 and crosses over the Anglesey Bridge in the townland of Foildarragh. Anglesey Bridge is a NIAH protected structure. This report accompanies the Planning Application and covers the conservation related aspects of the proposed development relating to Anglesey Bridge.



Figure 1: Anglesey Bridge

A16.2.2 THE AUTHOR OF THE ARCHITECTURAL HERITAGE IMPACT ASSESSMENT

This assessment was written by James Powell BSc MIEI CEng, is a Chartered Engineer and has completed a post graduate diploma in Applied Building Repair and Conservation at Trinity College Dublin in 2008. He is also a member of ICOMOS and was a Committee member of the Building Limes Forum Ireland. He has been working as a built heritage conservation consultant since 2008 and has prepared Architectural Heritage Impact Assessments, Method Statements and other conservation related reports for more than 80 projects throughout Ireland.

A16.2.3 DESCRIPTION OF THE STRUCTURE

The Anglesey Bridge is a twin arched sandstone bridge over the Bilboa river built around 1830. The stepped voussoirs are dressed, and surrounded with coursed random rubble in a lime mortar. There is a dressed string course at road level and cut coping stones to finish. The parapet is in poor condition, with areas of sand and cement repairs to the outer faces. Inside the parapet, either side of the roadway, the ashlar facing stones have slipped in places revealing the rubble core. Some of the coping stones are missing and dislodged. Much of the bridge would benefit from re- pointing.

Property: Anglesey Bridge, Foildarragh, North Tipperary
 Status: Protected Structure No.S805
 NIAH No. 22403905 - Rated: Regional
 Coordinates: 588913, 658722
 Owner: Tipperary County Council

A16.2.4 HISTORY OF THE STRUCTURE

The bridge appears on both the first and second OS maps, named as Anglesey Bridge. So was clearly built before c.1841. The NIAH record states the bridge was being built c.1800.

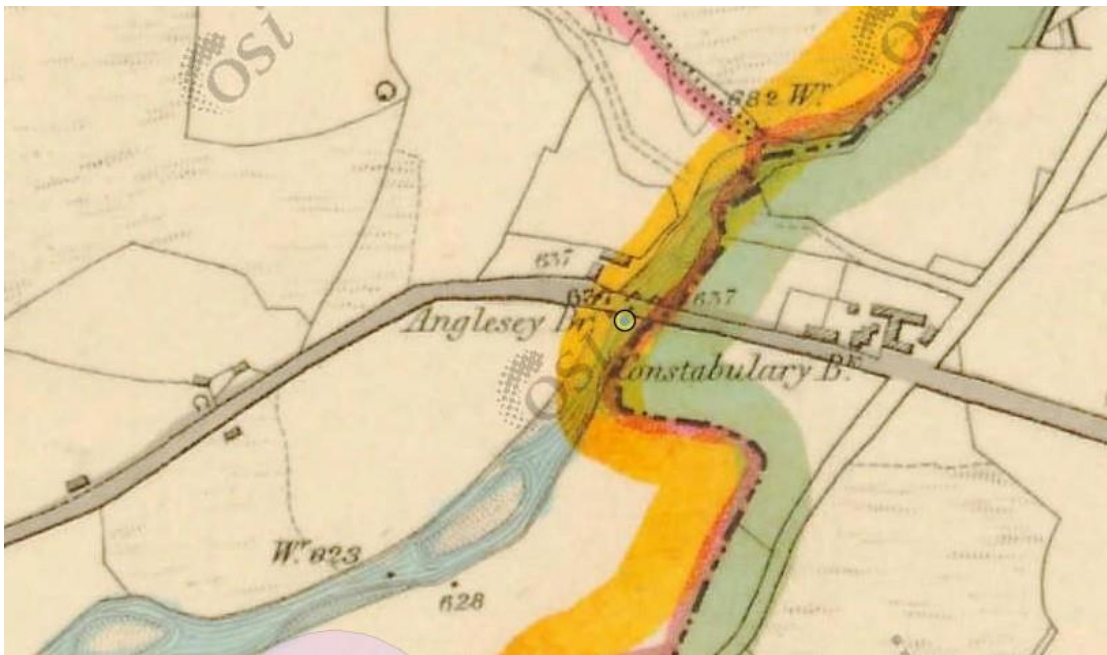


Figure 2: Detail from First OS map c.1839



Figure 3: Detail from Second OS map c. 1901

Extensive road improvements were carried out in Cork, Kerry, Tipperary and Limerick in response to the famine of 1822 as a road building relief program under the charge of Richard Griffith (1784-1878) of Griffith Valuation fame. Griffith is known to have directed the construction of the road from Newport to Thurles, completing the work in 1830. The R503, Anglesey Road, would appear to be that road as it runs between the two towns, and Anglesey Bridge would have been part of those works. The road and bridge were named after William Henry Paget, 1st Marquess of Anglesey, who was Lord Lieutenant of Ireland at the time.

(1) Anglesey famously lost a leg at Waterloo remarking to the Duke of Wellington "By God sir I've lost my leg" to which the Duke replied "By God sir you have!"

REFERENCE DOCUMENTS

APPENDIX 16.2: Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905
EIA 2019, Chapter 16: Cultural Heritage

The design of the bridge shows some similarities to Goulburn Bridge (NIAH 21904302) near Abbeyfeale which was known to have been designed by Griffiths in c.1831, however Goulburn Bridge is of clearly better quality construction.



Figure 4: Goulburn Bridge Co. Limerick, shows similar design features to Anglesey Bridge (photo from NIAH Record 21904302) Note: Stepped voussoirs, the similar string course and the coping stones



Figure 5: Detail of Goulburn Bridge Co. Limerick (photo from NIAH Record 21904302)

A16.2.5 IMPACT ASSESSMENT

- 1) Over Anglesey Bridge, the proposed works include cutting a trench approximately 675mm deep and 1430mm wide into the roadway in order to lay 5 cable ducts through which the cables will be pulled. The trench is designed to cut through the road surface and the infill below but to avoid contact with the stonework of the barrel of the arch.
- 2) The surface of the roadway must then be raised to allow provision of sufficient depth of cover over the ducts (450mm cover must be achieved). The entire trench is then filled with C25/30 concrete and the road surface reinstated.
- 3) Due to the increase in the height of the road surface the parapets of the bridge will need to be raised by around 850mm to provide safety against accidental falls from the bridge. The existing parapet walls are in a poor state and will need to be dismantled in places and rebuilt in random rubble and lime mortar by a suitable conservation stonemason before raising the height. See below options for raising the parapet walls.

A16.2.6 OPTIONS FOR RAISING THE PARAPETS WALLS

The cutting of the trench through the road surface and into the fill is unlikely to damage the bridge. However the necessity to raise the road surface to provide cover for the cables will clearly effect the appearance when crossing the bridge on the road. Further the increase in road surface height will necessitate an increase in the height of the parapet walls. This inevitably will have an effect on the appearance of the bridge.

Firstly the existing parapet is in poor condition and will need to be repaired using a sand/lime mortar. Fresh ashlar and other stones will be needed to replace those that have been lost. Care should be taken to avoid damaging the existing bridge masonry units during construction of the additional parapet wall by power tools etc.

There are a number of possible ways to raise the parapet which can be considered. Below outlines three options:

- 1) Remove coping stones and build up the masonry, complete with new ashlar over random rubble core. Replace the coping stones onto the new wall top. See figure 6 below.
- 2) Leave existing coping stones and build up the wall capping with new coping stones to leave the storey of the bridge intact and make the intervention a clear one. The extended wall should be built in a lime mortar but the masonry blocks may be chosen to be deliberately different to the historic structure. See figure 6 below.
- 3) Repairing the existing parapet, raising the parapet as described in option 1 or option 2 and then adding a stainless steel railing along the top to provide safety while minimising the impact on the appearance of the bridge. See figure 7 below.

It was investigated whether a slim modern railing installed on the inside of the parapets and separate to the bridge structure. This would allow the original bridge design to be read whilst providing a practical solution to raising the parapets. However, the roadway is too narrow to permit the installation of a railing between the parapet walls and therefore not considered an appropriate solution.

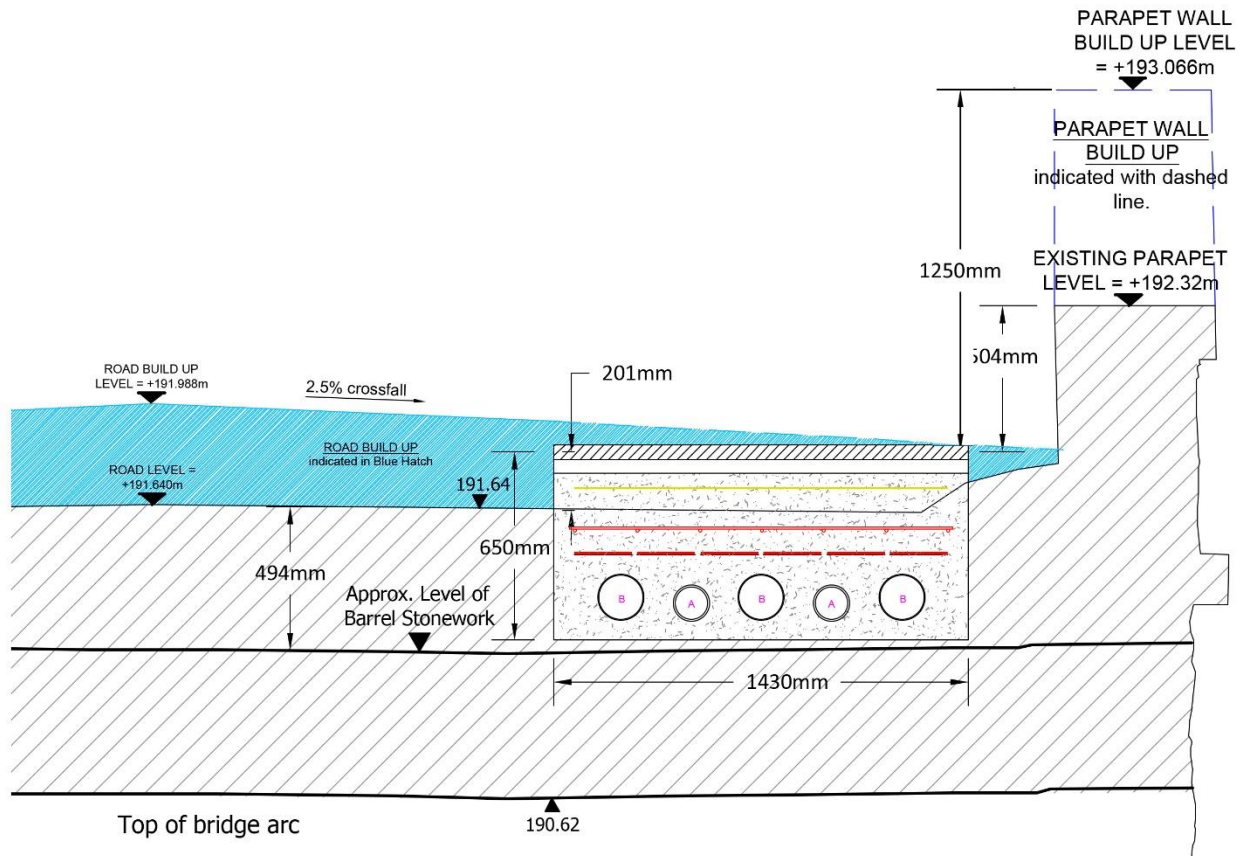


Figure 6: Option 1, raising the parapet by build-up of masonry in same style stone or Option 2, raising the parapet by build-up of masonry in deliberately different stone

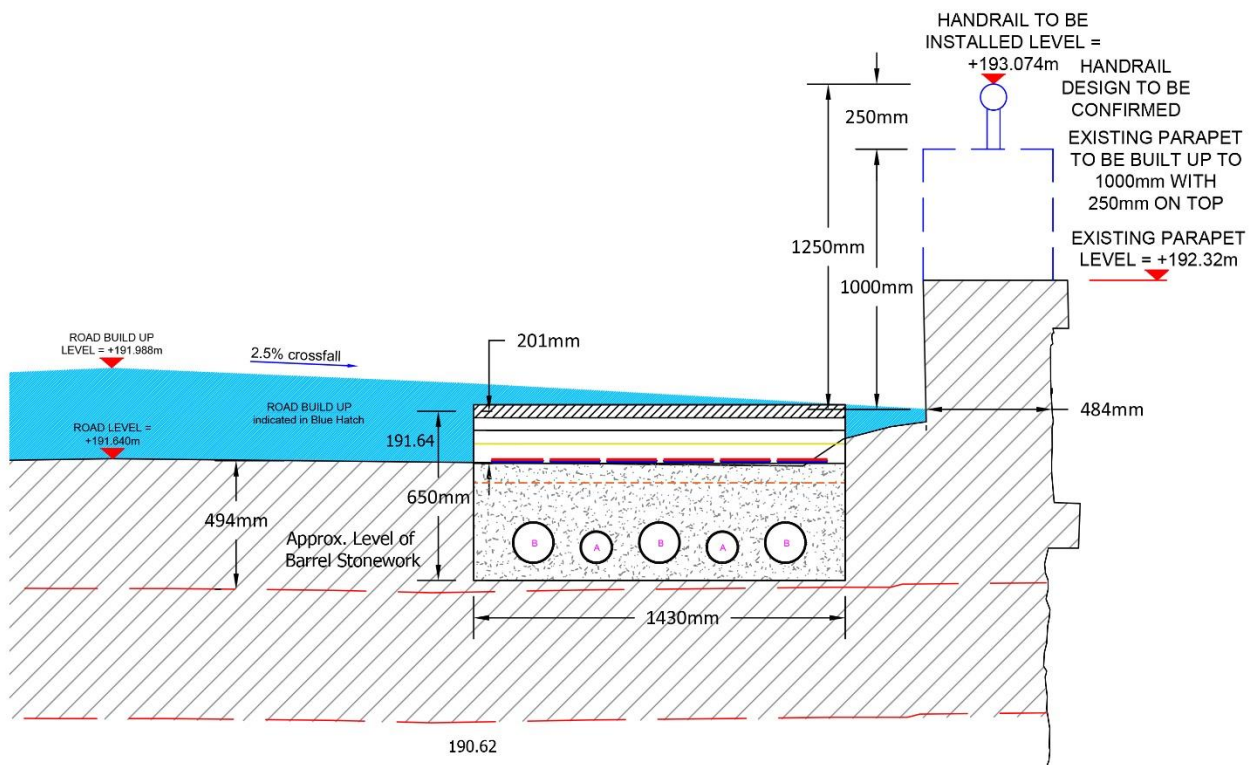


Figure 7: Option 3, raising the parapet by adding a stainless steel railing.

A16.2.7 RECOMMENDATIONS & CONCLUSIONS

In the event of the Planning Authority approving the proposed development it is suggested that strict conservation principles should be applied throughout the intended works to the existing bridge and in all aspects of workmanship. The methodology to be adopted should observe the recommendations contained in Architectural Heritage Protection – guidelines for planning authorities (2004), published by the DoEHLG. The Building Regulations 1997 – 2012, as appropriate, will be observed. Further, the works will use traditional materials where practical taking due regard of the status of the bridge, and will be carried out in accordance with good building conservation principles as stated in the ICOMOS Charters (1979-88). The overall repair specification, at all times, will be the faithful replacement of what exists, or did exist, as is appropriate to good conservation practice, i.e.; repair with like materials or replace with what was – and in like manner – where at all possible..

Construction works on a the Anglesey Bridge, will be carried by a specialist architectural restoration stonemason and will be supervised by a suitable qualified conservation engineer, observation notes and a photographic record will be maintained throughout the parapet wall works which will be certified by a suitably qualified conservation engineer on completion.

These recommendations have been incorporated into the design of UWF Grid Connection.

REFERENCE DOCUMENTS

APPENDIX 16.2: Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905
EIA 2019, Chapter 16: Cultural Heritage

A16.2.8 REFERENCES

(1) Richard Griffith - A Mallow Resident of National Influence by AJ Coughlan. Mallow Field Club Journal No.19 2001

A16.2.9 PHOTOGRAPHS



Figure 8: Showing the existing low parapet wall on Anglesey Bridge. Note lost ashlars



Figure 9: Showing the condition of the south western pier, note damaged coping stone



Figure 10: Detail of north eastern end of parapet, note loss of stones

REFERENCE DOCUMENTS

*APPENDIX 16.2: Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905
EIA 2019, Chapter 16: Cultural Heritage*

Appendix to Chapter 17: Landscape

Appendix 17.1: Contextual Photographs and Theoretical Visibility within the Study Areas

The data and descriptions in this appendix have informed the cumulative evaluations in the EIA Main Report.

Table of Contents, overleaf

TABLE OF CONTENTS

A-17.1.1 Contextual Photographs of the Study Area 3
A-17.1.2 Zone of Theoretical Visibility: Mountphilips Substation within the 2km Study Area 9

A-17.1.1 Contextual Photographs of the Study Area

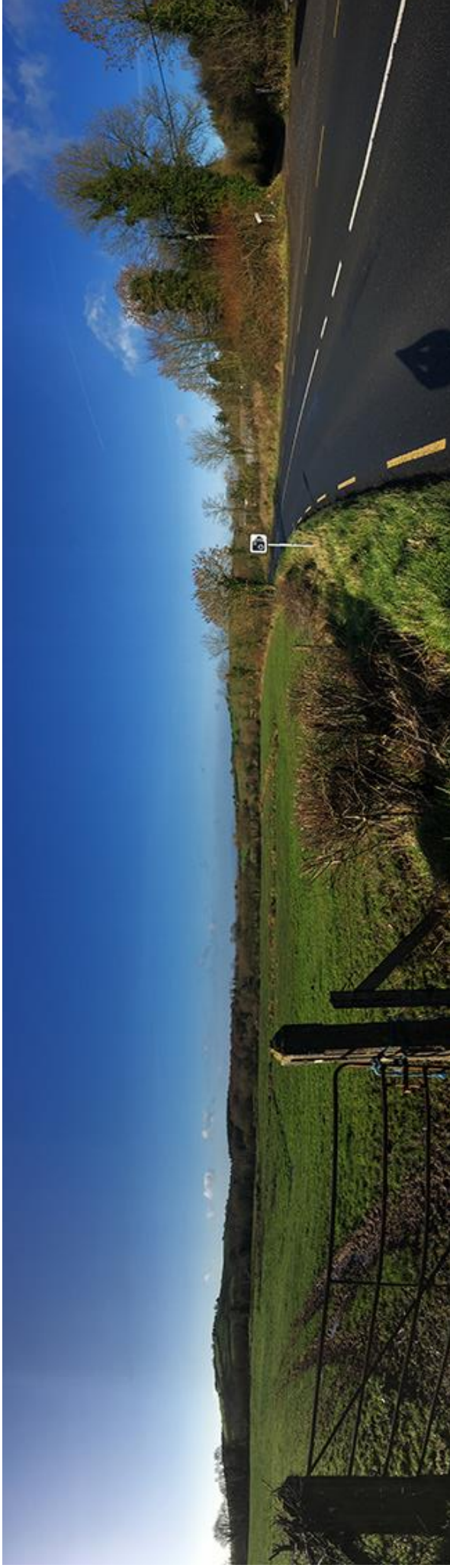
UWF Grid Connection Study Area

Image 1 - Portion of Grid Connection study area (along the L2166-0) in the townlands of Coole within LCA12 'River Shannon – Newport'



UWF Grid Connection Study Area

Image 2 - Portion of Grid Connection study area (along the R503) in the townlands of Kilnacappagh on border between LCA12 'River Shannon – Newport' and LCA18 – 'Silvermines – Rearcross'



UWF Grid Connection Study Area

Image 3 - Portion of UWF Grid Connection study area (along the R503) in the townlands of Baurnadomeeny within LCA18 – ‘Silvermines – Rearcross’



UWF Grid Connection Study Area

Image 4 - Portion of Grid Connection study area (along the R503) in the townlands of Kilcommon on border between LCA18 – ‘Silvermines – Rearcross’ and LCA17 – ‘Upperchurch, Kilcommon & Hollyford Mountain Mosaic’



UWF Grid Connection Study Area

Image 5 - Portion of UWF Grid Connection study areas (along the L2264-50) in townland of Knockmaroe within LCA17 – ‘Upperchurch, Kilcommon & Hollyford Mountain Mosaic’



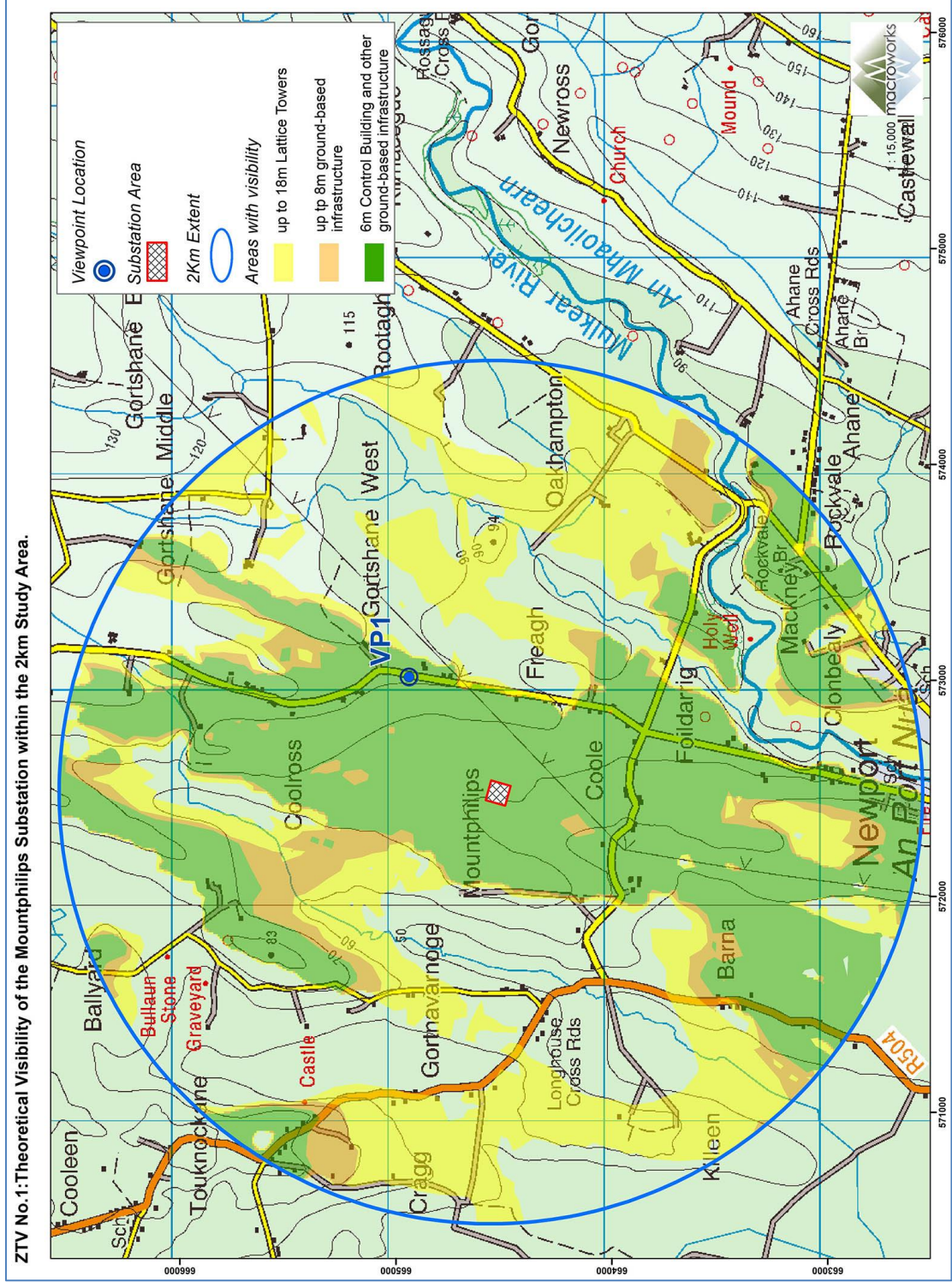
UWF Grid Connection Study Area

Image 6 - Portion of UWF Grid Connection Study Area (along the L2264-50) in townland of Knockmaroe within LCA17 – ‘Upperchurch, Kilcommon & Hollyford Mountain Mosaic’



A-17.1.2 Zone of Theoretical Visibility: Mountphilips Substation within the 2km Study Area

The Zone of Theoretical Visibility (ZTV) map below indicated from where in the surrounding landscape of the study area the Mountphilips Substation is potentially visible in a 'bare-ground' scenario and does not take account of screening by existing vegetation and buildings.



Appendix to Chapter 18: Interaction of the Foregoing

There are no appendices associated with this topic chapter.

REFERENCE DOCUMENTS

Appendix to Chapter 19: Mitigation Measures & Monitoring Arrangements

There are no appendices associated with this topic chapter.

REFERENCE DOCUMENTS