Appendix to Chapter 5: Description of the Development – UWF Grid Connection

Appendix 5.3: Description of Development (UWF Related Works)

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

UWF Related Works Revised EIA Report

Volume C2: Revised EIAR Main Report

Chapter 5

Description of Development

(UWF Related Works)

ECOPOWER

Revised January 2019

Contents

List of Figures

Note: The numbering system for Figures follows the sequence 'Figure Number-Appendix Number'.

Above Figures and mapping at the end of this chapter.

Glossary of Terms

Term	Definition
EIA Directive	European Union Directive 2011/92/EU (as amended by Directive 2014/52/EU)
Environmental Factors	The factors in the environment required to be identified, described and assessed during the EIA process. These are specified in Article 3 (1) of the EIA Directive as Population and Human Health; Biodiversity; Land; Soils; Water; Air; Climate; Material Assets; Cultural Heritage and Landscape.
Competent Authority	The body legally delegated to decide on the Planning Application
Competent Expert	Experts who are qualified and competent in their field of expertise
Consented Windfarm	Upperchurch Windfarm – 22 wind turbines, substation, windfarm roads and ancillary works, consented in August 2014 under Planning Reference: Tipperary County Council 13/51/0003, ABP PL 22.243040
Element	One of the 5 No. elements listed in 'Whole UWF Project' below.
Project Design Environmental Protection Measures	Mitigation Measures for environmental protection, incorporated into the design of the project.
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.
Whole UWF Project	Project made up of 5 No. elements – UWF Grid Connection; UWF Related Works, UWF Replacement Forestry, Upperchurch Windfarm (UWF) and UWF Other Activities.

List of Abbreviations

Abbreviation	Full Term
ABP	An Bord Pleanála
EDL	Ecopower Developments Limited
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
PD	Ecopower Project Design Environmental Protection Measure developed by members of the EIAR Team
RFI	Response to Further Information
SAC	Special Area of Conservation
SPA	Special Protection Area (for wild birds)
OCM	Outline Construction Methodologies
UWF	Upperchurch Windfarm
UGC	Underground Cables

5. Description of the Development - UWF Related Works

5.1. Introduction to Chapter 5

There has been no revision to the location and characteristics; life-cycle stages; use of natural resources; emissions or wastes of UWF Related Works from the original planning application to Tipperary County Council, except for a revision on the characteristics on Haul Route Works HW7. Otherwise, this Chapter is only revised at Section 5.6 Cumulative Descriptions: 5.6.1.1 Element 1: UWF Grid Connection to reflect the refusal by An Bord Pleanála of UWF Grid Connection and in particular the 110kV UGC route. A new preferred preliminary 110kV UGC route is described in this revised Section 5.6.1.1.

UWF Related Works are described in this chapter, in the following order:

Section 5.2	• A Description of the Location and Characteristics of the subject development (the UWF Related Works). • The Project Design Environmental Protection Measures incorporated into the design to avoid, prevent or reduce likely significant adverse effects on the environment.
The Development as described in Section 5.2 At the conception of the UWF Related Works, the design team evaluated the potential or likely significant effects of the development, on the receiving environment. Any potential or likely significant effects were avoided, in most cases, by integrating environmental protection measures into the fundamental design of the UWF Related Works. Various measures, particularly options for mitigation by avoidance and mitigation by prevention, were considered; these included alternative locations, alternative designs and alternative processes. Once the chosen location, design and process was decided the proposal was examined for opportunities to incorporate further mitigation measures (generally mitigation by reduction) in the final iteration of the development to be evaluated in the EIA Report. The development, as described in Section 5.2, is the final iteration of the UWF Related Works. It is this final iteration that is examined in Chapters 6 to 17, for effects on the prescribed environmental factors, by the topic competent experts.	
Section 5.3	The durations and timing, main activities, personnel and material requirements for both the construction and operation stages. Any changes to the UWF Related Works, such as decommissioning.
Section 5.4	The use of natural resources, emissions and production of wastes for each stage.
Section 5.5	The vulnerability of the UWF Related Works to major accidents and natural disasters.
Section 5.6	Cumulative Descriptions: For the purposes of cumulative assessment of the whole Upperchurch windfarm (UWF) project, a description of the other elements of the Whole UWF Project namely; UWF Grid Connection; already licenced UWF Replacement Forestry; the already consented Upperchurch Windfarm (UWF) and UWF Other Activities, is provided. For the purposes of a cumulative assessment with Other Existing or Consented Projects or Activities, a description of Other Existing or Consented Projects or Activities that were scoped in by the EIAR Team is also provided.

5.2. Characteristics of UWF Related Works

The UWF Related Works proposal comprises of the following parts:

- Internal Windfarm Cabling
- Realigned Windfarm Roads
- Haul Route Roads
- Telecom Relay Pole
- RW Ancillary Works

5.2.1. Purpose of UWF Related Works

Internal Windfarm Cabling: to connect the Consented UWF Turbines to the Consented UWF Substation.

Realigned Windfarm Roads: to realign two lengths of Consented UWF Roads and to provide access to a new telecom relay pole.

Haul Route Works: to facilitate the haulage of turbine components to the Upperchurch Windfarm site.

Telecom Relay Pole: to be erected in order to carry telecoms relay equipment, which will mitigate communication links impacts from operational Consented UWF Turbines on the communication signals between Foilnaman Mast and Laghtseefin Mast. The Telecom Relay Pole will fulfil Condition No. 18 of the planning conditions associated with the Upperchurch Windfarm.

RW Ancillary Works: will facilitate the construction of the UWF Related Works.

Note: the Consented UWF Turbines, Consented UWF Roads and the Consented UWF Substation refer to components of Upperchurch Windfarm (UWF). UWF has already received planning consent, but is not yet constructed.

5.2.2. Location and overview description of UWF Related Works

The **Internal Windfarm Cabling** will connect the Consented UWF Turbines to the Consented UWF Substation, through the installation of underground cables in agricultural; forestry lands; and across public roads; in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Knockmaroe, Grousehall, Cummer, Foilnaman, Gleninchnaveigh, Coumnageeha, Coumbeg, Knocknamena Commons, Glenbeg and Seskin. Approximately 62% of the Internal Windfarm Cabling is located under Consented UWF Roads or Realigned Windfarm Roads, the remaining Cabling is located in the vicinity of the windfarm site.

The Internal Windfarm Cabling consists of electrical cables, communication cables and the copper conductor cables which are installed inside High Density Polyethylene (HDPE) ducting in underground trenches. Cable Protection and Warning Tapes will also be laid in the trench. The trench will be excavated, ducting and warning tapes installed and the trench backfilled and reinstated. When the ducting installation is finished and the trench reinstated, the electrical, communication and copper conductor cables will then be pulled through the ducting. The only surface expression of the Internal Windfarm Cabling will be the over-ground identification marker posts and marker plates which will be installed at regular intervals above the cables trench.

The **Realigned Windfarm Roads** (labelled RWR on the mapping) are two sections of the already consented windfarm roads which require realignment and one length of new road to link a telecoms mast to the windfarm road. These changes are proposed for windfarm roads in agricultural and forestry lands in the townlands of Shevry, Knockmaroe, and Grousehall, which are all within the Upperchurch Windfarm site.

The **Haul Route Works** (labelled HW on the mapping), are proposed for public road verges, roadside boundaries and grassland fields located adjacent to the L4139-0, L4138-12, L2264-50, L6188-0, L6185-13 and R503 roads in the following townlands: Shevry, Knockcurraghbola Commons, Knocknabansha, Knockmaroe and Grousehall. Works include the removal of soils and laying of crushed stone and hard-core in roadside verges; temporary removal or part-removal of roadside boundaries; opening of temporary entrances and the construction of temporary access roads on private lands.

The **Telecom Relay Pole** is an 18m wooden pole proposed for a location in Knockmaroe townland, close to the existing Foilnaman Mast. Laghtseefin Mast is 9.5km directly south. The Relay Pole will be contained within a small compound, and a low voltage power and communications supply will be provided from the existing Foilnaman Mast. A short length of access road, Realigned Windfarm Road No. RWR3, will provide access to the Telecom Relay Pole from the Consented UWF Road network.

RW Ancillary Works will facilitate the construction of the UWF Related Works and will include temporary access roads; temporary and permanent watercourse crossings (labelled WW on the mapping); temporary site entrances (labelled EW on the mapping); change of use from 'agriculture' to 'forestry and agriculture' at the UWF Replacement Forestry entrance at Foilnaman (labelled EW10 on the mapping); along with forestry felling; temporary and permanent hedgerow/tree removal; permanent hedgerow replanting; fencing; relocation of existing telephone poles and temporary storage of excavated materials; at various locations within construction works area boundaries.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.1: Location of UWF Related Works on OSI Discovery Mapping

Figure RW 5.2: Layout of UWF Related Works on Aerial Photography Mapping which comprises all the UWF Related Works in one large format map in order to provide a comprehensive overview.

Figure RW 5.3: UWF Related Works Construction Works Area Boundary.

Construction Works Area Boundary: All construction works e.g. machinery movement; excavations; excavated materials storage, will take place within the construction works area boundary as delineated on **Figure RW 5.3**. This construction works area is predominately 12m in width. On Figures RW 5.3, consecutive Sections along the Internal Windfarm Cabling routes, (numbered from SW1 to SW84) are identified. These section numbers are used throughout the EIA Report and Appendices to refer to a particular geographical area of the Internal Windfarm Cabling routes.

UWF Related Works is abbreviated throughout this chapter as RW. All the Figures Numbers are prefaced by RW per e.g. Figure RW 5.1

5.2.3. Characteristics of UWF Related Works

5.2.3.1. Realigned Windfarm Roads

The Upperchurch Windfarm Roads require realigning at three locations; RWR1, RWR2 and RWR3 as follows

- RWR1: The consented windfarm road to Turbine No.5 in Shevry is 560m in length, and it will replace this road in its entirety by the Realigned Windfarm Road RWR1, which will be 230m in length through forestry and will require forestry felling of 0.2ha, but will avoid the felling of 0.4Ha along the original consented route to Turbine No.5.
- RWR2: The consented windfarm road between Turbine No.19, Turbine No. 20 and Turbine No. 21, is 840m long in total. It will replace 370m of this road by Realigned Windfarm Road RWR2, which will also be 370m in length. 220m of RWR2 is located on grassland field, with the remaining length located on existing farm road. The existing farm road section will be upgraded during construction works.
- RWR3: A short length (30m) of new access road will be between the Upperchurch Windfarm Roads in Knockmaroe to the new Telecom Relay Pole.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.7: Layout of Realigned Windfarm Roads on Aerial Photography Mapping

Figure RW 5.8: Cross Section of Realigned Windfarm Road

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-04: Realigned Windfarm Roads

5.2.3.2. Internal Windfarm Cabling

Internal Windfarm Cabling will comprise c.17.9km of trenching, laid with ducts which will house 33kV electrical cables and communications cables. The cables trench will be 1.25m deep and 0.6 m wide. Closer to the windfarm substation in Knockcurraghbola Commons (in Section SW84, SW29, SW30 and SW31 where the electrical circuits from different directions are merging), a 400m length of the trench will be double width at 1.2m, to accommodate the double set of cabling. Cable Protection and Warning Tapes will also be laid in the trench as warning of the presence of electrical cables. Above ground identification marker posts and plates will be positioned to mark the location of the underground cables. The design of Internal Windfarm Cabling is typical of medium voltage windfarm cabling systems.

The majority (11.1km) of the Internal Windfarm Cabling will be installed under Consented UWF Roads or Realigned Windfarm Roads. The remainder of the Internal Windfarm Cabling will be installed in agricultural lands (4.6km), forestry lands (2.1km), and crossing under 9 No. public roads (40 meters) (labelled RW1 to RW9 on the mapping).

5.2.3.2.1. Public Road Works for Internal Windfarm Cabling

Road works will be required along the route of the **Internal Windfarm Cabling** where it crosses the public road on the L4139-0, L4139-16, L6188-0, L61881-0, L2264-50, L6185-13 and the L2264-34 local roads. In total there are 9 No. crossing points where the cables trench will be excavated across the road. **Traffic flow** will be maintained by placing a steel plate over the trench to allow traffic to pass over, while the works are on-going and flagmen will control a stop/go system.

Lane closures: A lane closure will be required on the L–2264-50 (Borrisoleigh Road). Flagmen will control a stop/go system for these lane closures.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.4: Layout of Internal Windfarm Cabling on Aerial Photography Mapping

Figure RW 5.5: Cross Section of Internal Windfarm Cables Trench

Figure RW 5.6: Cross Section of Internal Windfarm Cabling in Public Road Pavement

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-08: Internal Windfarm Cabling

5.2.3.3. Haul Route Works

Haul Route Works will be carried out at thirteen locations in the vicinity of Upperchurch Windfarm. A description of the Haul Route Works at each location is included in the table below.

The **Haul Route Works** will take place on the L4139-0, L4138-12, L6188-0, L2264-50 and the L6185-13 local roads, and mainly comprise works within the public road corridor and consist of widening of the public road into the verge and in some cases, the removal of the roadside boundary and the widening of the road into the boundary or across the boundary into private lands. Soil in the verge will be removed and temporarily stored nearby and hardcore will be laid and compacted on these verges to provide access onto construction works areas on lands adjacent to the road. Any existing drainage channels at these entrances will be piped under the hardcore layer. This hardcore will prevent any damage to the edges of road pavements. This widening of the public road network will facilitate the delivery of the turbine components for the Upperchurch Windfarm. The verges and boundaries will be reinstated following the completion of component deliveries.

Table 5-1: Description of Haul Route Works

Haul Route Works ID	Description of the Haul Route Works
HW1	Widening of the L4139-0 by 0.5m into both verges for a length of c.120m. Temporary removal of 130m of roadside boundary.
HW2	Widening of the L4139-0 by 1.5m on the eastern side, for a length of c.280m, by moving the roadside drain and roadside boundary (earthen bank) onto agricultural grassland. Temporary removal of 150m of roadside boundary. As a result the existing concrete culvert at watercourse WW12 will be widened by 1m, with minimal interference to the existing structure.
HW3	Widening of bend along the L4139-0 by 1.5m on western side and 3.5m on eastern side in agricultural grasslands for a length of c.70m. Temporary removal of 100m of roadside boundary.
HW4	Widening of the L4139-0 by 1.5m on the eastern side, for a length of c.270m, by moving the roadside drain and earthen bank onto agricultural grassland. Temporary removal of 130m of roadside boundary.
HW5	Construction of 170m of new temporary site access road on agricultural lands between the L4139-0 and the L4138-12. Temporary removal of 40m of roadside boundary.
HW6	Widening of the L4138-12 by 0.5m into both verges for a length of c.170m. Temporary removal of 45m of roadside boundary.
HW7	Widening of Coillte entrance on the R503 by 30m, ~~construction of 40m of new temporary site access road on forestry lands~~ and the use of an existing hardcored yard for turning manoeuvres. Temporary removal of 70m of roadside boundary. ~~Clearance of scrub and use of matting where required~~. *(changed here in Revised EIAR 2019)*
HW8	Widening of the L2264-50 on the eastern side by 13m for the initial 40m and then by 1.5m for the next 190m, by moving the roadside boundary (earthen bank) onto agricultural grassland. Temporary removal of 180m of roadside boundary.
HW9	Widening of the L2264-50 by 1.5m on the northern side, for a length of c.40m, by moving the roadside boundary (earthen bank) onto agricultural grassland. Temporary removal of 10m of roadside boundary.
HW10	Widening of the L2264-50 by 0.5m on the northern side, for a length of c.40m, by widening into the roadside verge.
HW11	80m of new temporary site access road on agricultural lands between the L2264-50 and the L6188-0. Temporary removal of 20m of roadside boundary.
HW12	Widening of the L6188-0 by 0.5m into both verges for a length of c.280m. Temporary removal of 160m of roadside boundary. As a result the existing concrete culvert at watercourse WW31 will be widened by 1m, with minimal interference to the existing structure.
HW13	Widening of the L6185-13 by 1.5m on the southern side, for a length of c.210m, by widening into the roadside verge. Permanent removal of 25m of roadside boundary. The public road pavement over watercourse crossing WW32 will be widened, by 1m, into the roadside verge with minimal interference to the existing structure.

In summary, the above Haul Route Works include widening of roadside verges for 1710m in total; temporary removal and reinstatement of 1035m of hedgerow and earthen banks which form roadside boundaries; permanent removal of 25m of roadside boundary and the construction of 290m temporary access roads on private lands.

All road works will be subject to a Road Opening License ---application to Tipperary County Council and will be carried out in accordance with the Tii Guidelines on the Opening, Backfilling and Reinstatement of Openings in Public Roads. The extensions to the existing structures at HW2 and HW12 will be carried out in accordance with the OPW guidelines Construction, Replacement or Alteration of Bridges and Culverts (2013). The detailed design will be agreed with the Tipperary County Council District Engineer prior to these extension works.

Following the delivery of turbine components to Upperchurch Windfarm, the Haul Route Works areas will be reinstated and roadside boundaries will be put back along their original alignment.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.9: Layout of Haul Route Works on Aerial Photography Mapping

Figure RW 5.10: Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Relevant **Appendix 5.1 UWF Related Works Outline Construction Methodology:**

RW.OCM-06: Haul Route Works

5.2.3.4. Telecom Relay Pole

The Telecom Relay Pole will comprise a wooden pole, up to 18m in height, with relay equipment attached to the top of the pole. A small compound, 5m X 5m in size, will enclose the relay pole, along with a ground based outdoor cabinet 2m high, 1.2m long and 1m wide and ancillary equipment. The compound will be fenced with 2.4m high palisade fencing; a native hedgerow will be planted on the berm created from the excavations. A communications and low voltage (LV) electricity supply will be cabled 300m to the compound, from the existing supply at the Foilnaman mast. The connection will be by underground cables which will be laid under Realigned Windfarm Road RWR3 and Upperchurch Windfarm Road.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.11: Location of the Telecom Relay Pole on Aerial Photography Mapping

Figure RW 5.12: Plan and Elevation of Telecom Relay Pole and Compound

Relevant **Appendix 5.1 UWF Related Works Outline Construction Methodology:**

RW.OCM-07: Telecom Relay Pole

5.2.3.5. RW Ancillary Works

5.2.3.5.1. Site Entrances

There is a change of use required for an existing entrance and 14 No. temporary site entrances required, for UWF Related Works. In addition, 11 No. site entrances that are already consented for UWF will be used for the UWF Related Works developments.

5.2.3.5.2. Change of Use of Existing Agricultural Entrance to Agricultural and Forestry Entrance

Replacement forestry is required for any felled forestry that occurs during the construction works for the whole UWF project. This forestry, the UWF Replacement Forestry, will be planted on lands in Foilnaman. An existing agricultural entrance leading off the L-2264-34 at Foilnaman, will be used to access these UWF Replacement Forestry lands. The existing permanent entrance is a farm entrance only. This will change use to an agricultural and forestry entrance and as before, remain in permanent use. No widening of the entrance is required as the existing sightlines comply with North Tipperary County Development Plan 2010 (as amended) Table 10.1: Sightline Requirements. This entrance is identified on the mapping as EW10.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.13: Location of "Change of Use at Existing Entrance" (including sightlines)

5.2.3.5.3. Temporary Site Entrances

To facilitate the installation of the Internal Windfarm Cabling and the construction of the Haul Route Works for the delivery of turbine components, a total of 14 No. temporary site entrances will be required. These entrances are identified on the mapping as EW. The EW ID number; whether the entrance is existing or new; the type of boundary to be opened and UWF element to which the entrance relates; are listed in Table 5-2.

Table 5-2: Temporary Site Entrances for UWF Related Works

Entrance ID	Existing Entrance	Type	Relevant part of the UWF Related Works
EW1	No	Earthen bank (removed)	Haul Route Works – HW5
EW2	Yes	Gate and concrete block wall (widened)	Haul Route Works – HW5
EW3	No	Hedgerow (removed)	Internal Windfarm Cable
EW4	No	Hedgerow (removed)	Internal Windfarm Cable
EW5	No	Post and Wire Fence (removed)	Internal Windfarm Cable
EW6	No	Earthen bank (removed)	Internal Windfarm Cable
EW7	No	Post and Wire Fence (removed)	Internal Windfarm Cable
EW8	No	Earthen bank (removed)	Internal Windfarm Cable
EW9	Yes	Farm & House Entrance (no widening)	Internal Windfarm Cable
EW11	No	Hedgerow (removed)	Internal Windfarm Cable
EW12	Yes	Field Entrance (no widening)	Internal Windfarm Cable
EW13	Yes	Yard Entrance - needs to be widened by hedgerow removal	Haul Route Works - HW7
EW14	No	Hedgerow (removed)	Haul Route Works - HW11
EW15	No	Post and Wire Fence (removed)	Haul Route Works - HW11

The above table does not include EW10, as this is a permanent entrance for the UWF Replacement Forestry.

In summary, 4 No. of the temporary site entrances will be through existing farm or forestry entrances. The remaining 10 No. will created by the removal of the roadside boundary, whether fence, earthen bank or hedgerow. Where widening is required, these entrances will be widened to 5m. All these entrances will be opened during the construction stage and closed after construction is complete. In the event of larger components such as blade or tower replacement at Upperchurch Windfarm during the operational phase, these entrances will need to be reopened to facilitate the delivery of the components, and will be closed again directly after the deliveries.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.2: Layout of UWF Related Works on Aerial Photography Mapping

Figure RW 5.4: Layout of Internal Windfarm Cabling on Aerial Photography Mapping

Figure RW 5.9: Layout of Haul Route Works on Aerial Photography Mapping

Figure RW 5.14: Plan View of Typical Temporary Site Entrance

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-03: Temporary Site Entrances

5.2.3.5.4. Temporary Access Roads

During the construction stage, up to 5.3km of temporary access roads will be constructed within the construction works area boundary, to facilitate the movement of machinery and vehicles along the Internal Windfarm Cabling areas. Three methods will be employed to provide temporary access roads, where needed: matting, excavate and fill, or floating road. In general, the method of temporary road construction employed at any particular location will depend on the prevailing soil and weather conditions at the time of construction, and will be determined by the Contractor in conjunction with the Environmental Clerk of Works. The layout and temporary access road cross sections are illustrated on:

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.4: Layout of Internal Windfarm Cabling on Aerial Photography Mapping

Figure RW 5.15: Cross Section of Temporary Access Roads

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-05: Temporary Access Roads

5.2.3.5.5. Watercourse Crossings

The construction of the UWF Related Works will involve crossing a total of 32 No. watercourses, which range in size from streams to small field drains, as outlined on Table 5-3.

Table 5-3: Watercourse Classifications at Crossing Points

Class	Watercourse Description	Number
1	EPA mapped blue line, major river or stream (fisheries value)	1
2	Headwater Stream Equivalent to EPA blue line but not mapped (fisheries value)	5
3	Sub-optimal, heavily vegetated with low or no flow during dry periods (low fisheries value)	2
4	Drain (no fisheries value)	24

The construction of the UWF Related Works will involves:

- Crossing of 6 No. existing structures (Watercourse Crossing Type A1 and A2),
- Replacement of 1 No. existing crossing structures, (Type B1),
- Widening of 2 No. existing crossing structures at Watercourse Crossings WW12 and WW31, (Type B2)
- Construction of 5 No. new permanent crossing structures (cable and traffic), (Type C1),
- Construction of 5 No. new temporary crossing structures (cable and traffic), (Type C2) ,
- Trenching and ducting of 9 No. crossings (cable only, no traffic), (Type C3),
- Construction of 3 No. new permanent crossing structures (no cable, traffic only), (Type C4),
- Construction of 1 No. new permanent clear-span bridge (no in-stream works, cable and traffic), (Type F)
- In order to progress construction works across watercourses subject to fisheries timing restriction, temporary bailey bridges will be used to facilitate the passage of traffic across the watercourse.

All permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be at least 900mm in diameter regardless of the anticipated flood flow. 900mm culverts will be embedded into the bed of the watercourse to a depth of 300mm, while 1200mm culverts will be embedded to a depth of 500mm.

New and replaced permanent crossing structures will be construction in accordance with the Office of Public Works (OPW) guidelines Construction, Replacement or Alteration of Bridges and Culverts (2013), and as agreed with OPW (telephone consultation, February 2018) will be subject to a Section 50 application to OPW following the grant of planning permission. Details of the proposed works at WW12 and WW31 (culvert widening at Haul Route Works locations) will be agreed in advance with the District Engineer. No works to the road pavement will be required for the culvert extensions.

The treatment of each watercourse crossing along the UWF Grid Connection is specified in **Volume C4: Revised EIAR Appendices:** Appendix 5-2: Classification and Crossing Method for UWF Grid Connection Watercourses.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.2: Layout of the UWF Related Works on Aerial Photography Mapping

Figure RW 5.16: Watercourse Crossing Type A1 & A2 – UWF Related Works at Existing Crossing Structure

Figure RW 5.17: Watercourse Crossing Type B1 & B2–UWF Related Works at Replaced and /or Widened Crossing Structure

Figure RW 5.18: Watercourse Crossing Type C1–New Permanent Structure

Figure RW 5.19: Watercourse Crossing Type C2 – New Temporary Structure & Watercourse Crossing Type C4 – New Permanent Structure

Figure RW 5.20: Watercourse Crossing Type C3 – Internal Windfarm Cable trench and ducting only

Figure RW 5.21: Watercourse Crossing Type E – Plan and Cross Section Views of Bailey Bridge

Figure RW 5.22: Watercourse Crossing Type F - New permanent clear-span bridge

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-09: Instream Works Preparation and Reinstatement

RW.OCM-10: Instream Works

RW.OCM-11: Bailey Bridge

5.2.3.5.6. Drainage Systems

New hard surface areas: An integrated drainage system will be installed along the newly Realigned Windfarm Roads and at the Telecom Relay Pole. This integrated drainage system will keep 'clean' water upslope of the works separate from 'dirty' water runoff from construction works areas, while maintaining the existing drainage regime through the regular piping and release of clean water from the upslope side the works area to the downslope side. The integrated drainage system will include the installation of check dams, settlement ponds, clean water cross drains and outfall weirs. These parts of the drainage system will effectively avoid any contribution to flooding risk, minimise erosion, maintain drainage regimes, and minimise the amount of sediment entering downslope watercourses, through the attenuation (slow-down) of water flow rates and the settlement of suspended solid (sediment).

Temporary roads will be constructed upslope of the cables trench so that any surface water runoff will flow into the trench. Where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather, all pumped water will be treated prior to discharge using an infiltration trench, settlement pond, suitable water treatment train such as a Siltbuster or controlled release across existing vegetation, as appropriate.

Existing roadside drainage which occurs close to works associated with the Internal Windfarm Cables trench; Haul Route Works and at Permanent and Temporary Entrances will be piped to maintain flow.

Following construction, the drainage system around permanent features, will be left in place for the operations phase except for settlement ponds, which will be removed. The drainage system at all temporary works locations will be removed.

5.2.3.5.7. Forestry Felling

Small areas of coniferous forestry at various locations along the Internal Windfarm Cabling and the Realigned Windfarm Roads will be permanently felled to facilitate construction and operation in these areas. In total, 0.3 hectares of forestry will be felled, 0.2Ha in Shevry along RWR1 and 0.1Ha in Knockcurraghbola Commons along the Internal Windfarm Cable route. This felling will be carried out under a felling license from the Forest Service, and an equivalent area of forestry will be replanted in Foilnaman townland (UWF Replacement Forestry) under the conditions of this license.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.4: Layout of Internal Windfarm Cabling on Aerial Photography Mapping

Figure RW 5.7 : Layout of Realigned Windfarm Roads on Aerial Photography Mapping

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-13: Forestry Felling

5.2.3.5.8. Fencing

Fencing will be erected at a number of locations during the construction of the UWF Related Works and will include:

- Temporary post and wire fencing which will be used to delineate construction works areas;
- Temporary battery powered electric fencing on the outside of construction works area boundaries, to prevent livestock from entering works areas. Electric fencing will also be used to protect reinstated lands until the grass is established;
- Temporary goal posts to mark the location of overhead electricity and telephone lines along construction works areas;
- Temporary timber post and rail fencing with gates which will be erected at the temporarily widened site entrances and at Haul Route Works locations, where required.
- Temporary bat crossing structures at selected hedgerow crossing locations along UWF Related Works areas.

Existing fencing and boundaries which are required to be removed from the works areas or from widened existing entrances or Haul Route Works locations will be reinstated, in the original alignment and position, following construction works.

5.2.3.5.9. Relocation of local overhead services

A number of existing telephone poles will be moved, in conjunction with the infrastructure owner, as follows:

- At HW3, 1 No. existing telephone pole will be moved behind the widened haul route area;
- At HW4, 1 No. existing telephone pole will be moved behind the widened haul route area;
- At HW6, 1 No. existing telephone pole will be moved behind the widened haul route area.
- At HW9, 1 No. existing telephone pole will be moved behind the widened haul route area.
- At HW13, 1 No. existing telephone pole will be moved behind the widened haul route area.

These telephone poles are identified with blue dot on Figure RW 5.10**.**

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.10: Location and Layout of Haul Route Works (Maps 1 and 2 of 3)

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-06: Haul Route Works

5.2.3.5.10. Storage of Excavated Materials

In total 11,830m^3 of material will be excavated from the UWF Related Works areas. This will include topsoil, subsoils and to a lesser extent bedrock, along with spoil from public road sections.

This excavated material will be managed as follows:

- 930m^3 will be permanently stored in berms on both sides of the Realigned Windfarm Roads and around the Telecom Relay Pole Compound;
- 10,850m^3 will be temporarily placed alongside the Internal Windfarm Cables and Haul Route Works construction works areas, in separate soils layers, and will be used for infilling the trenches and reinstatement of the works areas. No excavated materials will be stored within 50m of a Class 1 or Class 2 Watercourse;
- 50m^3 will consist of spoil from public road sections and will be removed to the licensed landfill at Thurles.

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-14: Overburden Storage Berms

5.2.3.5.11. Reinstatement of Construction Works Areas

Following the completion of construction works in an area, with the exception of new permanent infrastructure such as Realigned Windfarm Roads or Telecom Relay Pole hardstand, the lands under the construction works areas will be reinstated to their former condition and returned to the landowner for use as before.

Reinstatement of construction works areas: the temporarily stored excavated soils will be used to backfill and landscape the works areas. These areas will then be sown with native, Irish sourced, certified seeds, seedlings or plants to reflect the habitats that were present before the work.

Landholding boundaries including any existing, hedgerows, banks or gates will be reinstated on their original alignment.

Haul Route Works locations: will be reinstated, in the original alignment and boundary position, following construction works.

Reinstatement of hedgerow: will involve the replanting of hedgerow with established (at least 3 years old) native hedgerow plants in their original locations, following the completion of the works in the area.

Along **sensitive bat corridors**, the bat crossing structures which will be installed during construction works will remain in place post-construction until the hedgerow has sufficiently regrown to provide viable habitat for bats. These bat crossing structures will be monitored by a suitably qualified bat specialist and maintained on a yearly basis, until they are no longer required.

Relevant Appendix 5.1 UWF Related Works Outline Construction Methodology:

RW.OCM-15: Reinstatement of Land

5.2.3.5.12. Reinstatement of Public Roads

Trenches within road pavements will be reinstated in accordance with the Tii Guidelines on the Opening, Backfilling and Reinstatement of Openings in Public Roads. Where the cables trench crosses perpendicular to the road, full width surface overlay to a distance of 5m beyond either side of the trench will be carried out.

Along **construction materials haulage routes**, confirmatory condition surveys involving pre-construction and post-construction inspections, high definition video surveys and falling weight deflectometer (FWD) surveys will be undertaken along the routes of concentrated construction traffic between the R503 and the site access points. Whilst it is not expected to occur, any damage to structures or road pavements will be repaired to at least as good a condition as pre-works, and on damaged sections of roads where the Surface Curvature Index (SCI), measured during FWD testing, is greater than 250, full-width surface overlay will be carried out.

Reinstatement of **roadside boundaries**: All road boundaries at temporary site access points will be reinstated along the existing alignment.

5.2.3.6. EDL Response to RFI from Roads Department, Tipperary County Council

The 1st iteration EIAR (May 2018) was submitted with the planning application to Tipperary County Council for UWF Related Works on 17/07/2018. A Request for Further Information was issued on 10/09/2018. The Roads Department specifically requested;

The applicant is requested to provide:

(a) a schedule and accompanying road network map of public roads by road number identifying all roads impacted by haulage operations and construction traffic associated with the development. Same shall set out the length, width and grid coordinates of the start and finish point of each section of road together with facilitation and remedial works proposed,

(b) a schedule and accompanying map of all new entrances/amendments to existing entrances together with a layout plan for each entrance demonstrating appropriate sightlines, setbacks and forward stopping distances to satisfy the County Development Plan. Pavement construction specifications and surface water measures for each entrance are to be detailed,

(c) proposals for contribution or upgrade of the junction of the R497/L2264-50/R503 to accommodate the proposed development. A proposed upgrade may require revised site boundary and public notices.

5.2.3.6.1. EDL Response to Tipperary County Council Request – Roads and Entrances

A copy of EDL's response to the Roads and Entrances RFI, which was submitted on 14th November, 2018, is incorporated below and Figures and Appendices can be found in the EIAR volumes as indicated;

(a) Public road network impacted by haulage operations and construction traffic

A schedule of the public roads impacted by haulage operations and construction traffic has been compiled in reply to this request. The schedule sets out the length, width, and grid coordinates of the start and finish points of each section of road, together with a summary of the road works proposed for each section of road. These road sections are identified on the accompanying maps.

Relevant Volume C4: Revised Appendices

RW Appendix 5.8: Schedule of the Public Roads impacted by haulage operations and construction traffic and description of Haul Route Works.

Relevant Volume C3: Revised EIAR Figures:

UWF.RW.RFI-01 to UWF RW. RFI-04 – Figure UWF.RW.RFI-01: Reply to RFI Site Location Map
UWF.RW.RFI-01 to UWF RW. RFI-04 - Figure UWF.RW.RFI-02: Public Road Network Map.

(b) New entrances/Amendments to existing entrances

Temporary Site Entrances

To facilitate the construction of UWF Related Works, specifically the installation of the Internal Windfarm Cabling and the construction of the Haul Route Works for the delivery of turbine components, fourteen temporary site entrances will be required. These entrances will be used temporarily during the construction period for a short period of time. All temporary entrances, roadside boundaries, verges and roadside drainage will be reinstated to the satisfaction of Tipperary County Council following the completion of the works and following the delivery of turbine components, as relevant. It was agreed during consultation with Peter Fee, Executive Engineer Nenagh Municipal District, that flagmen may be used at these temporary entrances instead of providing sightlines and forward stopping distances, thereby avoiding the environmental effects which would have resulted from the removal of hedgerows and earthen banks to provide temporary sightlines.

Relevant Volume C3 Revised EIAR Figures:

UWF.RW.RFI-01 to UWF RW. RFI-04: Figure UWF.RW.RFI-03: Site Entrances (overview map)

UWF.RW.RFI-01 to UWF RW. RFI-04: Figures UWF.RW.RFI-03: Site Entrances Maps 1 to 11 comprising a layout plan; ITM co-ordinates; photo; description of works required; width of public road at that point; drainage; duration of use; total traffic movements and 85 percentile traffic design speed for the fourteen temporary site entrances and 1 No. 'Change of Use of Existing Entrance EW10' (see below).

UWF.RW.RFI-01 to UWF RW. RFI-04: Figures UWF.RW.RFI-04: Temporary Site Entrance Drainage Arrangements

See also:

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.2, Figure RW 5.4 and Figure RW 5.9 wherein the temporary entrances are identified as EW1 to EW9, and EW11 to EW15.

Already consented entrances (as part of Upperchurch Windfarm)

There are eleven other site entrances to be used to gain access to UWF Related Works, these entrances are the Upperchurch Windfarm entrances which have already been permitted under Upperchurch Windfarm planning permission Ref: 13/510003 and are identified as 'Consented UWF Site Entrance' on Drawing Numbers UWF RW 04 to 11: Site Layout Maps 1 to 8 in Volume B: Planning Drawings.

Change of Use of Existing Entrance EW10

There is a 'change of use' permit required for an existing permanent entrance off the L2264-34 at Foilnaman. This will be used as access to sow/plant and maintain replacement forestry which is required for any forestry felling that occurs during the construction works for the whole Upperchurch Windfarm project.

The existing entrance (E10) is an agricultural (farm) entrance leading onto a farm track. This will change use to an 'agricultural and forestry entrance' and as before, remain in permanent use. A change of use from 'agriculture' to 'agriculture and forestry' is now being sought from the local authority for EW10 as part of this UWF Related Works application.

The L2264-34 local road is a very lightly trafficked with 99.5% spare capacity. There will be no noticeable increase in traffic volumes on this road due to the extremely low traffic volumes associated with the UWF Replacement Forestry - the planting stage will generate 1-2 van/jeep vehicles movements per day over a one-month period, and as a comparative example this level of traffic is substantially less than the daily level of traffic generated by a single residential dwelling. During the growth stage, traffic will be in the region of a negligible 2 to 4 van/jeep vehicle movements per year. The UWF Replacement Forestry will be a permanent native woodland and will not be harvested and therefore no harvesting traffic will occur. The change of use and necessary sightlines was discussed and agreed with Peter Fee during the pre-planning stage.

Relevant Volume C3 Revised EIAR Figures:

UWF.RW.RFI-01 to UWF RW. RFI-04: Figure UWF.RW.RFI-03: Site Entrances (overview map)

UWF.RW.RFI-01 to UWF RW. RFI-04: Figure UWF.RW.RFI-03: Site Entrance Map 8 of 11 comprising a layout plan including sightlines, set back, and forward stopping distances; ITM co-ordinates; photo; description of works required; width of public road at that point; drainage; duration of use; total traffic movements and 85 percentile traffic design speed at EW10.

(c) Junction of the R497/L2264-50/R503

The Haul Route Works, which are included in the UWF Related Works, will facilitate the delivery of large turbine components. There are no Haul Route Works proposed or required at the junction of the R497/L2264-50/R503.

To clarify, the delivery of turbine components coming from the Thurles direction, will pass off the R497/L2264-50/R503 junction, and will continue down the regional road and turn in the area known locally as 'the Christmas Tree yard' (HW7). The delivery can then approach the R497/L2264-50/R503 junction from the south/Newport side and make the turn onto the L2264-50 without requiring modifications to the junction, save some hedge trimming and road sign removal and replacement.

EDL confirm that no works are required at the junction of the R497/L2264-50/R503 to accommodate the proposed development – UWF Related Works, or indeed to accommodate the already permitted Upperchurch Windfarm

Relevant Volume C3 Revised EIAR Figures:

UWF.RW RFI Attachment 5 OA2 Map 8 of 8 from Appendix A5.6 to Chapter 5: Description of Development, where UWF Other Activities are described, is reproduced here in the Figures volume. This Figure shows the vegetation trimming and temporary traffic sign removal required at this junction (**HA23 on Figure OA2**).

5.2.4. Environmental Protection Measures (Mitigation Measures) designed into the UWF Related Works

The design of the UWF Related Works includes the Project Design Environmental Protection Measures (Mitigation Measures) listed on Table 5-4, which were devised to avoid, prevent or reduce likely or potentially significant effects on the environment. Eleven Project Design Measures (mitigation measures) were updated in January 2019, to take account of the Reason for Refusal by Tipperary County Council of UWF Related Works; the 2 No. Tipperary County Council Planner's Reports; and the Submission to Tipperary County Council on UWF Related Works from NPWS. Any amendments to Project Design Measures is tracked, with additions in red and underlined text, and any ~~deleted text identified with a strikethrough~~.

Relevant individual Project Design Environmental Protection Measures from the list below are duplicated in the Environmental Factor topic chapters, and the list is duplicated in full as a set of Environmental Commitments in Volume D: Revised EMP for UWF Related Works with the planning application.

The interaction of Project Design Environmental Protection Measures across the various Environmental Factors is provided in matrix format in Chapter 18: Interaction of the Foregoing.

Table 5-4: Schedule of Project Design Environmental Protection Measures (mitigation measures)

PD ID	Schedule of Project Design Environmental Protection Measure (Mitigation Measure)
PD01	All construction works will be carried out during daylight hours.
PD02	Flag-men will be used at temporary site entrances rather than creating sightlines by the removal of roadside boundaries. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the local road network in a in a safe and efficient manner.
PD03	Construction works 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 Grid Connection or Upperchurch Windfarm.
PD04	Confirmatory consultations with Irish Water, Eir and ESB and confirmatory ground surveys at service locations will be carried out ahead of works; 'Goal Posts' will be used to identify and highlight the height of nearby overhead lines; and a foreman will look out for underground pipes during excavations near services.
PD05	Land reinstatement will not be carried out during very wet weather or when the soil is waterlogged.
PD06	If any compaction has occurred along the construction works area, these areas will be ploughed with a sub-soiler to loosen the subsoil layer
PD07	Construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted
PD08	All initial groundworks will be monitored by an archaeologist under license from the National Monuments Service, to archaeologically record and preserve, either in situ or by record, any structures, features or objects of archaeological significance which may be encountered during the works. Where excavations occur in areas of archaeological potential such as fording points and associated marsh lands and watercourses all excavated material will be spread out and metal detected (under licence to National Monuments Service) as part of the finds retrieval strategy.
PD09	New permanent access roads (Realigned Windfarm Roads) will have a permanent surface water drainage network in place which will include check dams. These check dams will settle suspended solids in water runoff while also slowing down the rate of water run-off from these areas.
PD10	Only precast concrete culverts or structures will be used at watercourse crossing locations. No batching of wet cement will take place on-site.
PD11	Instream construction works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach. Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and

PD ID	Schedule of Project Design Environmental Protection Measure (Mitigation Measure)
	character, creation of compound channels where necessary; reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and planting along the riparian margin to stabilise banks, add flood protection and provide riparian buffer.
PD12	A phased approach will be undertaken in relation to watercourse crossing works, earthworks, forestry felling and excavation dewatering, where these works occur within 50m of a Class 1 or Class 2 watercourse. The phased approach will only permit one of main potential sediment producing activities, listed above, to be carried out within 50m of a Class 1 or Class 2 watercourse, at any one time.
PD13	All excavated material will be removed for temporary or permanent storage at a suitable location more than 50m away from all other Class 1 and Class 2 watercourses. Spoil excavations from public roads being transported to landfill will be covered during transport.
PD14	Temporary silt control methods such as silt fencing or containment berms will be placed around all overburden storage areas.
PD15	Permanent overburden storage berms will be graded and seeded immediately after emplacement.
PD16	For works within 50m of a Class 1 or Class 2 watercourse, additional mitigation measures include double silt fencing, temporary drain blocking, placement of straw bale arrangements along preferential surface water flowpaths and, where necessary, the use of matting to prevent ground erosion and rutting.
PD17	Where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated prior to discharge using an infiltration trench or settlement pond or suitable water treatment train such as a Siltbuster, as appropriate.
PD18	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse
PD19	The main fuel stocks for, and chemical wastes arising from, construction activities will be stored in a designated location, away from main traffic activity, within the temporary compound (Consented Upperchurch Windfarm Site Compound No.1). All fuel will be stored in bunded, locked storage containers.
PD20	Overnight parking of plant and machinery will only be permitted at locations which are greater than 50m from watercourses and where there is an existing hard-core surface in place.
PD21	No refuelling of plant or equipment will be permitted within 100m of identified wells
PD22	In-stream works at Class 1 and Class 2 watercourses will only be undertaken during the IFI specified period (July, August and September) and will be carried out to best practice (IFI, 2016).
PD23	In-stream works will not be undertaken without isolation of flow within the watercourse, any fish within the isolated section will be removed using electrofishing and, following collection of biometrics, transferred immediately downstream of the crossing point and placed back in the water. The water will then be isolated from the works by over pumping, flume (pipe) or channel diversion methods.
PD24	All new permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be a minimum of 900mm in diameter regardless of the anticipated flood flow.
PD25	All new permanent culverts on Class 1 and Class 2 type watercourses will be bottomless or clear spanning.
PD26	~~If works are programmed to begin in the Hen Harrier breeding season (March to August)~~ Confirmatory hen harrier breeding surveys will be completed, ~~before such works~~, such that all pre breeding nuptial activity, nesting activity and active nests are recorded within 2km of the construction works area boundary. These surveys will be completed prior to the start-up of all construction activities, until construction is complete and for 3 years thereafter. No construction works for UWF Related Works will take place ~~within 500m of an active hen harrier breeding attempt or active nesting activity,~~ during the hen harrier breeding season (March to August).
PD27	During the hen harrier roosting season (October to February inclusive), construction works within 1000m of a roost will be limited to the period between one hour after sunrise to one hour before sunset.

PD ID	Schedule of Project Design Environmental Protection Measure (Mitigation Measure)
PD28	Hedgerow removal and clearance of any other breeding bird vegetation will take place outside of the bird breeding season *i.e.* not during the period of March to August inclusive~~, where possible~~. This includes hedgerow and scrub removal in addition to hedgerow trimming.
PD29	Confirmatory surveys for active Otter holts and activity (particularly holts at which breeding females or cubs are present) will be carried out 150m upstream and downstream of watercourse crossing locations.
PD30	All construction works within 150m of an active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hours after sunrise or before sunset during winter.
PD31	If an active holt (particularly holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken *while cubs are present in the holt* and NPWS will be notified immediately
PD32	No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under license.
PD33	The prohibited working area associated with otter holts will, where appropriate, be fenced with temporary fencing prior to any possibly invasive works and declared as 'out of bounds'. Fencing will be in accordance with Clause 303 of the NRA's Specification for Roadworks (National Roads Authority). Appropriate awareness of the purpose of the enclosure will be conveyed through toolbox talks with site staff and sufficient signage will be placed on each exclusion fence. All contractors or operators on site will be made fully aware of the procedures pertaining to each affected holt (NRA, 2006) and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.
PD34	Confirmatory surveys will be carried out within 50 m of either side of the construction works area boundary of identified badger setts to determine the current status of known badger setts (i.e. active or inactive) and to determine if any new setts have been established in the intervening period following initial pre-planning surveys and the commencement of construction activity. These confirmatory badger surveys will be undertaken no more than 10-12 months in advance of proposed construction activities, during the period November and April when vegetation cover is reduced. NWPS will be notified immediately if the sett previously identified is confirmed as active or if a further active sett is located within 50 meters of the footprint of the development. If sett exclusion is required, this will be undertaken by an experienced ecologist under the necessary license and following best practice guidance (NRA, 2005).
PD35	No construction works will be carried within 50m of an active sett during the main breeding season (December 1st to June 30th).
PD36	Construction activity in the environs of a known active badger sett outside of the breeding period will follow NRA (2005) guidelines, i.e. no heavy machinery will be used within 30m of badger setts (unless carried out under license); lighter machinery (generally wheeled vehicles) will not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10m of sett entrances.
PD37	All construction works will be carried out during daylight hours. Security lighting will be used at the Consented Upperchurch Windfarm Site Compound No.1~~compounds~~. All lighting will be cowled in order to prevent light spill and no lighting will be left turned on overnight. Lighting will be controlled by motion and time sensors to minimise the amount of time the lights are operational.
PD38	Confirmatory surveys will be carried out at all trees with bat suitability that will require felling or other major modifications (e.g. removal of rotten branches). These trees will be subject to a ground-level visual inspection by the Project Ecologist (or a bat specialist acting on their behalf) prior to site clearance works in order to confirm the findings of the 2016 / 2017 surveys.
PD39	Where a tree with moderate or high bat suitability is to be felled, a presence/absence bat surveys will be carried out. (Note. It is not expected that any trees with moderate or high suitability will be felled).

PD ID	Schedule of Project Design Environmental Protection Measure (Mitigation Measure)
PD40	Felling of trees with bat roost suitability will be undertaken in the period late-August to late-October/early-November. Trees with low suitability for bats will be felled carefully and slowly in order to avoid impact-related injuries to any bats that may be roosting inside them. Sections of the tree with potential roost features for bats (e.g. crevices, damaged branches) will be cut in sections, lowered carefully to the ground and left undisturbed for 48 hours before removal. (Note. It is not expected that any trees with moderate or high suitability will be felled).
PD41	Where the felling of trees with bat suitability is carried out, robust, weather-proof bat-boxes, for example Schwegler type 1FF and 2F models, will be placed in each of the affected sections to compensate for the loss of potential tree roosts. The number of bat boxes will match the number of trees with bat suitability to be felled. Bat boxes will be placed on an exposed section of tree trunk at a minimum height of 4-5m, providing a clear space in front of the box for bats to enter and exit. Boxes will be placed in locations that will receive at least 6-7 hours of sunlight during summer months, and will typically be placed on the southern side of the tree. The Project Ecologist will supervise the installation of bat boxes in order to ensure that they are sited appropriately.
PD42	Installation of bat crossing structures at severed hedgerows, proximate to areas of high bat activity or roost locations. And following the completion of construction works, the replanting of these severed hedgerows with at least the same number of semi-mature ~~shrubs/trees (like for like)~~ Irish-sourced, native trees and ~~limits on~~ no temporary construction works area lighting near hedgerows.
PD43	Pre-construction survey of the distribution of Devil's-bit Scabious (larval food plant of Marsh Fritillary) during the last available April prior to the commencement of construction works. This requires that any areas of Devil's-bit Scabious that are located within the construction works area boundary, will be strimmed/cut to ground level in the last available late April / early May period prior to the commencement of construction.

5.2.4.1. Environmental Management Plan

An Environmental Management Plan (EMP) is included with Volume D of the planning application. The purpose of the EMP is to communicate environmental control measures that apply to the development of the UWF Related Works to those with responsibility for carrying out works on site so that any likely significant adverse effects of the development on the receiving environment can be prevented.

The Environmental Management Plan includes the Schedule of Mitigation Measures - the Project Design Environmental Project Measures (Schedule in Table 5-4 above), along with the Best Practice Methods that are included at the end of topic Chapters 6 to 17. Management plans for Traffic, Waste, Surface Water Quality and Invasive Species are also included in the EMP.

The environmental protection measures for UWF Other Activities which relate to UWF Related Works will be monitored through the UWF Related Works Environmental Management Plan.

See: Volume D: Revised EMP for UWF Related Works

5.2.4.2. Response to RFI on Mitigation, Monitoring and Compensatory Measures

This EIAR was submitted with the planning application to Tipperary County Council on 17/07/2018. A Request for Further Information was issued on 10/09/2018. The request and response in relation to Mitigation, Monitoring and Compensatory Measures is incorporated below;

Request for Further Information under S.172 (1E) of the Planning and Development Act 2000 (as amended), as follows:

The applicant is requested to submit a comprehensive

- *Schedule of features/measures to avoid, prevent or reduce/offset adverse effects on the environment;*
- *Schedule of monitoring measures;*
- *Schedule of compensatory measures.*

5.2.4.2.1. EDL Response to Mitigation, Monitoring and Compensatory Measures RFI

Schedule of features/measures to avoid, prevent or reduce/offset adverse effects

The Project Design Environmental Protection Measures included in the application documents, constitute the features/measures to avoid, prevent or reduce/offset adverse effects on the environment. There are forty-three Project Design Environmental Protection Measures in total – named PD01 to PD43.

A Schedule of Project Design Environmental Protection Measures (Mitigation Measures) are located in the EIA Report in

- **Volume C2 EIA Report: Chapter 5: Description of Development: Section 5.2.4: Table 5-4 (above)**
- Volume C2 EIA Report: Chapters 6 to 17 where relevant
- Volume D: Environmental Management Plan (EMP): Table 7 (P. 19)

In response to Tipperary County Council on RFI, the features/measures to avoid, prevent or reduce/offset adverse effects on the environment were also reproduced in a separate schedule – the Schedule of Project Design Environmental Protection Measures (Mitigation Measures) in Volume D: Revised EMP for UWF Related Works: Section 5.1 Project Design Measures, Page 19.

Schedule of monitoring measures

Monitoring measures are included throughout the EIA Report and Environmental Management Plan (EMP). In particular, monitoring measures are part of the Project Design Environmental Protection Measures (PDs), the Traffic Management Plan, the Surface Water Management Plan, the Invasive Species Management Plan, the Waste Management Plan and the Best Practice Measures (BPMs), which plans are all part of UWF Related Works Environmental Management Plan (EMP).

In response to RFI, a Schedule of these Monitoring Measures has been collated from the EIA Report and the EMP and this Schedule is included at the end of the Monitoring Arrangements Chapter 19 of this Revised EIAR.

Schedule of compensatory measures

There is only one compensatory measure included in the UWF Related Works project:

Project Design Environmental Protection Measure PD41

PD41: Where the felling of trees with bat suitability is carried out, robust, weather-proof bat-boxes, for example Schwegler type 1FF and 2F models, will be placed in each of the affected sections to compensate for the loss of potential tree roosts. The number of bat boxes will match the number of trees with bat suitability to be felled.

5.3. Life Cycle Stages of UWF Related Works

5.3.1. Construction Stage - UWF Related Works

5.3.1.1. Overview of the Construction Process

The construction process for the UWF Related Works, is a relatively straightforward civil build. A number of separate dedicated 'crews' will work from the consented compound associated with the Upperchurch Windfarm Site Compound No.1, each working on a different part of the UWF Related Works. The workers will arrive and depart daily to and from the relevant construction compounds, parking spaces will be provided at the site compound. The various crews will then be transported to the specific works location by means of 'crew-cab' 4x4 vehicles or similar. Bulk deliveries of materials will be delivered to the windfarm site compound and stored there until needed. Materials required at works locations will be transported by way rigid body vehicle or tractor and trailer. Aggregate and concrete will be delivered directly to works locations.

5.3.1.2. Duration & Timing

The duration and timing of the construction of UWF Related Works is outlined in Table 5-5.

Table 5-5: Duration and timing of the construction of the UWF Related Works

Construction Activities	Duration of the Construction Stage	Timing of Construction Activities
Pre-Construction - Detailed design, confirmatory surveys, felling, hedgerow/tree removal or pruning etc.	3 - 6 months	Immediately prior to the commencement of the main construction period
Main Construction Activities - Construction of Internal Windfarm Cabling, Realigned Windfarm Roads, Haul Route Works, Telecom Relay Pole and RW Ancillary Works	6 – 8 months	Projected Start Date: 2018/2019 The UWF Related Works will take place during the same period as the construction of the Upperchurch Windfarm and Grid Connection (exceptions listed in Scheduling of Works below)

The duration of works provided are approximate and may be shorter or longer, depending on the final number of crews used, weather conditions etc. A formal programme of works will be prepared by the appointed Contractor prior to the commencement of construction activities.

5.3.1.2.1. Construction Hours of Work

Normal construction times will be 07.00 to 19.00hrs Monday to Friday and 08.00 – 16.30hrs on Saturdays. These normal hours of work will be further restricted at particular locations as outlined in Scheduling of Works.

5.3.1.2.2. Scheduling of Works

To protect residential amenity, surface water quality and biodiversity, the following timing or scheduling of works will be implemented during the Construction Stage:

- Construction works will be carried out during daylight hours.

- Construction works in Knockmaroe and Knockcurraghbola Commons townlands, which are within 350m of any local residences, will not take place at the same time as other elements of the Whole UWF Project.
- To reduce the potential for localised in-combination effects on surface water quality from the main potential sediment sources during construction works (i.e. Watercourse Crossing Works, Earthworks, Tree Felling and Excavation Dewatering), a phased approach will be undertaken during the construction works for these activities, where works within 50m of a Class 1 or Class 2 watercourse are required. The phased approach will only permit one of main potential sediment producing activities to be carried out at any one time within the local catchment to a watercourse (refer to Chapter 11: Water).
- In-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses.
- No construction works will take place within 2km of an active hen harrier nest, or active nesting activity, during the breeding season (March to August). Additionally, during the roosting season, (October to February), construction works will only be carried out during the period between one hour after sunrise and one hour before sunset in areas within 1000m of an active winter roost.
- No construction works will be carried within 50m of an active badger sett during the main breeding season (December 1st to June 30th).
- Felling of trees (if any) with bat roost suitability will be undertaken in the period late-August to late-October/early-November.
- If an active otter holt (holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken *while cubs are present in the holt.*
- All construction works within 150m of an active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hours after sunrise or before sunset during winter.

5.3.1.3. Construction Personnel

The civil and electrical construction personnel involved in the construction of the Upperchurch Windfarm will also be involved in the construction of the Internal Windfarm Cabling, Realigned Windfarm Roads, Haul Route Works and the construction of the Telecom Relay Pole compound and the installation of underground communication and electricity cables between the existing Foilnaman Mast and the Relay Pole compound, no extra personnel will be required for these works and c.5 personnel from the Upperchurch Windfarm construction crew will be involved in the UWF Related Works. A specialist communication engineering crew, made up of c. 3 personnel, will be involved in the erection and set up of the Telecom Relay Pole.

5.3.1.3.1. Welfare Facilities

Upperchurch Windfarm Site Compound No.1 will contain site offices, welfare, canteen and parking facilities, storage locations for oils and fuels, materials and wastes.

Welfare Facilities at active construction works areas will consist of solar powered, single, self-contained portable toilets.

Toilet Servicing: All toilets will be serviced on a weekly (Toilet blocks at Upperchurch Windfarm Site Compound No.1) or bi-weekly (portable toilets at construction works areas) basis. A record of servicing will be kept by the licensed waste removal operator. Servicing shall include internal cleansing, emptying and recharging with water and toilet additive and replenishing of all consumables.

5.3.1.4. Construction Stage Activities

Construction stage activities will involve the following works:

- Pre-Construction Activities
- Construction Works Area Preparation
- Temporary Site Entrances
- Realigned Windfarm Roads
- Temporary Access Roads
- Haul Route Works
- Telecom Relay Pole
- Internal Windfarm Cabling
- Instream Works Preparation and Reinstatement
- Instream Works
- Bailey Bridge
- Relocation of Overhead Lines
- Felling of Forestry
- Overburden Storage Berms
- Reinstatement of Land

Individual Outline Construction Methodologies (OCMs) for all of the above listed main works and activities of UWF Grid Connection can be found at **Appendix 5-1: Outline Construction Methodologies for UWF Related Works.** In the OCMs, a brief description of the work involved; the duration of this work; personnel, machinery, equipment and tools requirements; construction materials; details of the standard methodology for the construction activities and any variations to those methods are also outlined. These OCMs are specific to each distinct body of work or activity. The final Method Statements for the construction works will be developed by the appointed Contractor and will be based on these OCMs, prior to construction.

The OCMs are also provided in **Volume D: Revised EMP for UWF Related Works**

5.3.1.5. Use of Machinery and Equipment

The main machinery, equipment and tools which will be required during the construction stage are listed in Table 5-6. A full list of machinery, equipment and tools which will be used during the construction of the UWF Related Works is listed on the Outline Construction Methodologies in Appendix 5.1.

Table 5-6: Construction machinery, equipment and tools

Construction Machinery	Construction Equipment and Tools
1 No. 12ton excavator	Hand tools
1 No. 6ton excavator	Cable Jointing tools
2 No. dump trucks	1 No. dewatering pumps
1 No. Vibrating roller	1 No. water pumps and associated pipes
1 No. roller	1 No. Diesel generator
1 No. van	Sand bags
1 No. Cable Pulling winch	Silt traps and silt fences
Pole planter and auger drill	Oil absorbent booms
	Siltbuster units and skips
	Wooden stakes and wooden fencing lats
	Boundary tape and wire
	Battery powered electric fencers
	geotextile matting /plastic mats

5.3.1.6. Use of Hydrocarbons

Hydrocarbons will be used on UWF Related Works areas during construction activities and is limited to the diesel or petrol fuel and oils used by the site vehicles and machinery, delivery vehicles and any mobile generators used. Grease may be coated on the cables to aid in cable pulling during the construction stage.

5.3.1.7. Other Facilities - Fuel Storage & Tool Storage

All fuels required for construction activities will be stored in a designated location, away from main traffic flows, within Upperchurch Windfarm Site Compound No.1. All fuel will be stored in bunded, locked storage containers.

Tools and smaller pieces of equipment will be stored in locked containers, at Upperchurch Windfarm Site Compound No.1, during the construction stage.

5.3.1.8. Imported Construction Materials

The construction materials, which will be brought onto the UWF Related Works areas, are listed in Table 5-7 along with details of the quantity and source of the materials.

Table 5-7: Quantities, type and source of construction materials

Note: The quantities shown below are worst case volumes and will be lower than those stated.

Materials	Quantity	Source of Materials
Semi-dry Lean Mix Concrete	180m³ / 23 No. loads	Roadstone Killough, Co Tipperary Roadstone Bunratty, Co Clare
Aggregate (crushed stone)*Based on use of stone on all temporary access roads. Any stone used for the temporary access roads will be reused in the windfarm roads and hardstands.*	4620m³ / 285 No. loads	Shanballyedmond, Rear Cross
Hard core for temporary public road surface	50m³ / 7 No. loads	Clare
Surface dressing asphalt (public road sections)	12m³ / 2 No. loads	Clare
Geotextile	4 No. loads	Cork
Duct jointing collars	1 No. load	Cork
125mm outer diameter HDPE Duct	12 No. loads	Cork
50mm outer diameter HDPE Comms Duct	4 No. loads	Cork
33KV electrical cable	12 No. loads	Cork
Fibre Optic communication cables	3 No. loads	Cork
Red cable protection strip	1 No. load	Cork
Relay Pole and Telecommunication Equipment	1 No. load	Cork
Yellow warning tape	1 No. load	Cork
Marker posts and plates	1 No. load	Dundrum, Co Dublin
Hedging	1 No. load	Dundrum, Co Tipperary
Fencing materials, posts, rails, wire	1 No. load	Arrabawn Co-Op, Reiska
Precast concrete and HDPE culverts Plastic matting and bog mats	1 No. load	Thurles

5.3.1.8.1. Material and Delivery Traffic Management

Aggregate and Concrete

HGV loads of aggregate, concrete and public road dressing will be delivered directly to construction works areas. These HGVs will travel to the works areas using both the regional and local road networks, as specified on Figure RW 5.23. These haul routes have been agreed with the Area Roads Engineer.

Other Construction Material

Other materials, such as ducting, geotextile and other construction materials, will be sourced from various suppliers and will be transported to the Upperchurch Windfarm Site Compound No.1 via the national and regional road network, as identified on Figure RW 5.24.

This material will be stored at Upperchurch Windfarm Site Compound No.1 until required at works areas. Each day a smaller truck will be used to deliver the daily volume of ducting, matting, cable protection strip, warning tape, duct jointing collars etc. to each active works area.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.23: Haul Routes for Delivery of Aggregate, Concrete and Other Materials to UWF Site Compound No. 1

Figure RW 5.24: Haul Routes from UWF Site Compound No.1 to Construction Works Areas.

5.3.1.9. Traffic Management at Temporary Entrances and Road Work Locations

5.3.1.9.1. Road Licences

All road works will be subject to a Road Opening License application to Tipperary County Council and will be carried out in accordance with the Tii Guidelines on the Opening, Backfilling and Reinstatement of Openings in Public Roads.

5.3.1.9.2. Flagmen

Flagmen will be employed at temporary site entrances and road work locations to control the movement of traffic on the public road, so that road users can continue to use the local road network in a in a safe and efficient manner.

5.3.1.9.3. Advance warning signage

Advance warning signage will be erected on both approaches to temporary site entrance locations and road works locations. The placement of this signage has been designed based on the recorded 85th percentile traffic speeds, or the posted limit, whichever is the higher.

5.3.1.9.4. Reinstatement of road boundaries

Following the completion of construction works, all road boundaries at temporary site access points or at temporary road widening locations will be reinstated along the existing alignment.

5.3.1.9.5. Engagement with Local Residents regarding Traffic

Contact will be maintained with the landowners on the day to day timing of the works. A Community Liaison Officer (CLO) will be appointed as the point of contact between the developer, the local community and the

wider public. The CLO will keep very active contact with local residents on the traffic arrangements around the works day to day.

5.3.1.9.6. Traffic Management Plan

A Traffic Management Plan is included in Volume D: Revised EMP for UWF Related Works.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.25: Advance Warning Signage for Half Lane Closures

5.3.1.10. EMP for the UWF Related Works

An Environmental Management Plan (EMP) for the UWF Related Works is included as Volume D of the EIA Report. The purpose of the EMP is to communicate environmental control measures that apply to the development of the UWF Related Works to those with responsibility for carrying out works on site, so that any likely significant adverse effects of the development on the receiving environment can be prevented.

The EMP comprises the main EMP statement; environmental commitments, environmental control measures and management plans for Surface Water Quality; Traffic, Waste, and Invasive Species; a schedule of Project Design Mitigation Measures and a compiled schedule of Best Practice Measures from the environmental topic chapters.

During construction, an Environmental Clerk of Works will be appointed and it will be their responsibility to ensure that the EMP is implemented through liaising with the Construction Site Manager and the Project Manager and by carrying out weekly audits on EMP compliance.

EIAR Volume D: Revised EMP for UWF Related Works.

5.3.2. Operational Stage – UWF Related Works

Once constructed and commissioned, as required, the UWF Related Works will be operated and maintained as part of the Upperchurch Windfarm.

5.3.2.1. Duration and Timing of Operational Stage

Table 5-8: Duration and timing of Operation Phase of the UWF Related Works

Description	Duration
Operation of the UWF Related Works	The duration of the operational period for the UWF Related Works will correspond with the operational period of the Upperchurch Windfarm which is granted for 25 years from the date of commissioning of the wind turbines under Condition 4 of the grant of planning permission for Upperchurch Windfarm, unless a planning period for a further period is granted.
Internal Windfarm Cables	1 day per year to carry out a visual inspection
Realigned Windfarm Roads	30mins per month 1 day per 5 years
Haul Route Works	During any subsequent, although infrequent, turbine component delivery: 2 days to re-use Haul Route Works Areas 1 week to reinstate roadside boundaries and lands
Telecom Relay Pole	1 day per year
RW Ancillary Works	No works

5.3.2.2. Operational Personnel

The personnel involved in the operation and maintenance of the Upperchurch Windfarm will also be involved in the operation and maintenance of the UWF Related Works. In addition, 2-3 No. specialised telecommunications personnel will be involved in an annual inspection and maintenance of the Telecom Relay Pole.

5.3.2.3. Operational Activities

5.3.2.3.1. Internal Windfarm Cabling

Operational activities will include both annual visual inspections of the cable routes, using a four wheel drive vehicle along Upperchurch Windfarm Roads and Realigned Windfarm Roads, or by walking over cross-country sections. The cables will have a design life of 80 to 100 years. It is not expected that the cables will require replacement during their operation.

5.3.2.3.2. Realigned Windfarm Roads

Operational activities will include both monthly visual inspection of the Realigned Windfarm Roads, using a four wheel drive vehicle and annual maintenance of roads and the associated drainage network, using both hand tools and mini-diggers as required.

5.3.2.3.3. Haul Route Works

Annual visual inspection of Haul Route Works areas at H1 to H13. Occasional hedge trimming may be required, to accommodate the delivery of abnormal loads during major maintenance works at the Upperchurch Windfarm. To facilitate the occasional delivery of larger components, some roadside boundaries at Haul Route Works locations will be temporarily reopened (having been reinstated following construction) or temporarily removed. Geotextile material will laid over the concealed hard-core access roads in private lands where required. Once the components have been delivered, the roadside boundaries on these temporarily widened areas will be reinstated in their original alignment and ground cover on private lands will be reinstated.

5.3.2.3.4. Telecom Relay Pole

The support structure itself requires little maintenance during its operational lifetime; operational activities would consist of annual inspection and maintenance of the communications equipment mounted on the structure, outdoor cabinet, and compound area.

5.3.2.3.5. UWF Ancillary Works

No operational activities associated with these works are expected to take place during the operational stage.

5.3.2.4. Use of Machinery and Equipment

Table 5-9: Use of Machinery and Equipment during the Operation of the UWF Related Works

Machinery	Equipment	Materials
4x4 vehicle for routine inspection,	Tools for occasional maintenance works	Aggregate for Realigned Windfarm Road maintenance, if required
small excavator and roller for occasional maintenance and haul route works	Hand tools & testing equipment	Replacement communication equipment for the Telecom Relay Pole, if required
	fencing equipment	Replacement fencing for Haul Route Works locations, if required.

5.3.2.5. Use of Hydrocarbons

A small volume of hydrocarbons will be used on-site during operational activities and is limited to the diesel or petrol fuel used by the site vehicles and occasional machinery used.

5.3.2.6. Welfare Facilities

The Upperchurch Windfarm site office containing site offices, welfare, and canteen and parking facilities will be available to any personnel working on UWF Related Works.

5.3.2.7. Other Facilities - Fuel Storage & Tool Storage

There will be no requirement for fuel storage for the UWF Related Works. There will also be no requirement for tool storage facilities -all tools will be brought onto site as required.

5.3.3. Changes to UWF Related Works

5.3.3.1. Decommissioning

The UWF Related Works will cease to function following the decommissioning of the Upperchurch Windfarm. The following decommissioning works are relevant to the UWF Related Works:

Internal Windfarm Cables: The cables will be pulled from the ducts and will be re-used or recycled off-site in a licensed recycling facility.

Realigned Windfarm Roads will be left in situ, for use by the landowner. No works required.

Haul Route Works will be left in situ. No works required.

Telecom Relay Pole: The Relay Pole will be decommissioned following the decommissioning of the Upperchurch Windfarm. The communication links between Foilnaman Mast and Laghtseefin Mast will be restored, and then the antennae removed from the Relay Pole, the Pole, fence and the outdoor equipment will be decommissioned and removed. The footprint of the compound will be reinstated with the soils which formed the berms around the compound during construction.

5.4. Use of Natural Resources, Emissions & Wastes

5.4.1. Use of Natural Resources

The resources which will be imported onto the UWF Related Works areas or which will be obtained from within the works areas during the development of the UWF Related Works are described below.

5.4.1.1. Use of Resources: Land

5.4.1.1.1. Requirements for Land

Construction Stage Requirement: In order to safely accommodate the construction works and construction traffic, the land requirement for the construction of the UWF Related Works is greater than for the operation of the UWF Related Works. In total UWF Related Works will take place on 20.9 hectares of land within construction works areas, as follows; 0.3ha of farm roads, 6.9ha of agricultural land, 0.2ha of forestry road, 0.7ha of forestry firebreak, 0.4ha of forestry, 1.4ha of public road and 11.1ha of Upperchurch Windfarm Roads. These lands are outlined in red on Figure RW 5.3

Operational Stage Requirement: Following construction, with the exception of the 25m^2 Telecom Relay Pole compound, all of the lands will be returned to the landowner for their own use. The Realigned Windfarm Roads will be used by both the landowner and Upperchurch Windfarm.

5.4.1.1.2. Landuse Restrictions

Restrictions on the use of land by landowners is limited to the Construction Stage, during which the use of the lands by the landowner will be restricted to varying degrees depending on the location and type of works taking place, as per:

- The use of agricultural lands, firebreaks and felled forestry in the construction works area will be restricted during construction works on these areas, with restrictions continuing until vegetation has re-established following construction works; and
- The use of farm or forestry roads can continue during the construction works with some restrictions in place, forestry traffic if it occurs will use alternative routes along the forestry road network where available.
- Access will be maintained to lands at all times during construction, by arrangement with the individual landowners.
- Following construction, the majority of the lands will be returned to their former use.

5.4.1.1.3. Landuse Change

The construction of the UWF Related Works will result in the change of use of 25m^2 (0.0025Ha) of agricultural land to utility for the Telecom Relay Pole. In addition, 0.13ha of agricultural land will change use to Permanent Road, 0.09ha of forestry plantation will change use to Permanent Roads and 0.21ha will change use to Unplanted Forestry Firebreak.

During decommissioning, the Telecom Relay Pole will be removed, and 25m^2 of associated lands will be reinstated and returned to use as agricultural lands.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.3: UWF Related Works Construction Works Area Boundary.

Figure RW 5.26: Operational Stage Land Use Change

5.4.1.2. Use of Resources: Biodiversity

5.4.1.2.1. Field Boundaries – Earthen Banks/Hedgerow/Trees

Hedgerows and earthen banks occur at most field boundaries within the Internal Windfarm Cabling, Realigned Windfarm Roads and Haul Route Works locations. Some hedgerows also contain trees of varying maturity. The removal of field boundaries and the pruning or removal of hedgerows and trees is predominately limited to the construction stage. Field boundaries at Haul Route Works locations may also require temporary pruning or removal during the operational and decommissioning stage to facilitate the transport of turbine components.

Pruning: In total 540m of hedgerow will be pruned, 330m at Haul Route Works locations to facilitate delivery of turbine components and 210m close to works locations to facilitate the passage of machinery along works areas. All pruning will be conducted outside of the bird breeding season.

Permanent Removal: In total, 170m of hedgerow will be permanently removed to facilitate Haul Route Works (HR6 and HR13) and Realigned Windfarm Roads (RWR2). These hedgerows and trees will be replaced with an equivalent length of new native hedgerow along with an equivalent number of native trees immediately adjacent to the area.

Temporary Removal: In total, 145m of hedgerow and 4 No. trees will be temporarily removed at Internal Windfarm Cabling and some Haul Route Works locations.

Bat Crossing Structures: Bat crossing structures will be install at 2 no. locations. 1 no. at a 10m wide section of field boundary along Realigned Windfarm Road RWR2 and another at a 10m wide sections of roadside boundary (concrete wall) Haul Route Works HW5, a bat crossing structure in the form of 'goal posts' will be erected following the removal of a 10m section of each boundary. Vegetation and netting will be attached to these goal posts to provide a continuation of flight-line for bats during the construction works.

Reinstatement of Hedgerows: Following the completion of construction works in an area, **the temporarily removed** section of field boundary will be reinstated, with the formation of earthen banks and the replanting like for like with established (at least 3 year old) native hedgerow plant. Reinstatement will be carried out immediately following the completion of the works in the area.

Along **sensitive bat corridors**, the bat crossing structures installed during construction works will remain in place post-construction until the field boundary has been reinstated.

New Hedgerow created: c.370m of new hedgerow will be planted with locally sourced native species alongside the Realigned Windfarm Road RWR2.

Relevant Volume C3 Revised EIAR Figures:

Figure RW 5.2 : Layout of the UWF Related Works on Aerial Photography Mapping

Figure RW 5.27: Cross Section of Hedgerow Removal and Reinstatement

5.4.1.2.2. Forestry Felling

Forestry felling is limited to the construction stage. In total 0.3ha of coniferous forestry will be permanently felled[1], under a felling license from the Forest Service. Forestry felling will be carried out outside of the bird breeding season.

5.4.1.2.3. Invasive Species

Packaging will be checked for the presence of white toothed shrew and prior to arrival on site, contractor's vehicles and equipment will be thoroughly cleaned and then dried. High-pressure steam cleaning, with water hotter than 65 degrees Celsius, in addition to the removal of all vegetative material, will be required for all vehicles and equipment involved in construction works.

An Invasive Species Management Plan will be implemented to prevent the spread of knotweed species, this Plan is included in Volume D: Revised EMP for UWF Related Works.

5.4.1.3. Use of Resources: Water

5.4.1.3.1. Potable & Non-Potable Water

During construction, All water requirements for welfare facilities and drinking purposes will be supplied at Upperchurch Windfarm Site Compound No.1 during the Construction Stage, no additional water will be required for the UWF Related Works.

During operation, All water requirements for welfare facilities and drinking purposes will be supplied at the Upperchurch Windfarm Site Office during the Operational Stage, no additional water will be required for the UWF Related Works.

[1] A condition of the felling license will require that an equivalent area of forestry be replanted in another location. The New native woodland at Foilnaman, (UWF Replacement Forestry element of the whole UWF project) will fulfil this obligation.

5.4.1.4. Use of Resources: Soils

5.4.1.4.1. Excavated Soils

During the construction of the UWF Related Works, natural materials such as topsoil, subsoil and rock will arise from excavation works during the construction of the UWF Related Works. Approximately 4750m^3 topsoil, 6670m^3 subsoil and 360m^3 rock, will arise from excavation works. All of this excavated material will be used to backfill cables trenches, used to reinstate land along construction works areas. In addition, c.50m^3 of spoil will also arise during excavations in public roads

5.4.1.4.2. Permanent Storage

Some of the excavated material (930m^3) will be permanent stored in berms alongside Realigned Windfarm Roads and around the Telecom Relay Pole compound.

5.4.1.4.3. Temporary Storage

The remaining material excavated from UWF Related Works construction works areas will be temporarily stored, within the construction works area. Topsoil, subsoil and rock will be stored separately, with as much surface vegetation left intact on the topsoil layer as possible. Suitable excavated competent material will be used to backfill the Cables Trench and following the completion of works in any area; the temporarily stored soil will be used to reinstate and landscape the works areas.

5.4.1.4.4. Public Road Arising's and Contaminated Material

The excess material arising from short lengths of Internal Windfarm Cabling excavated in the public road at the 9 no. road crossing locations, or contaminated material arising during the construction of UWF Related Works will be collected by Arlo Group and transported to their approved licensed facilities at Thurles, County Tipperary,

5.4.1.4.5. Imported Rock

Approximately 4,600m^3 of graded crushed stone will be imported onto UWF Related Works areas from the local Rear Cross Quarry. This stone will be mainly used for the Realigned Windfarm Roads, telecom relay pole compound and temporary access roads for installing the internal windfarm cabling.

This calculation is based on a circumstances where there is not plastic/bog mats used for the temporary roads but all of the temporary roads are built with crushed stone. The volume of crushed stone will reduce substantially by the use of matting and the promoter intends to utilise matting as much as possible.

Also the amount of stone required for the realigned roads will offset a similar amount of rock that will not be required for the section of originally consented roadway because it will not be built so therefore there will be no overall increase in the volume of stone required for the windfarm roadways.

5.4.1.4.6. Operational Stage - Soil

No excavations of soils will be required during the routine operation of the UWF Related Works.

Small amounts of aggregate/hard core may be required from time to time, during occasional maintenance activities, to recap the Realigned Windfarm Roads.

5.4.2. Emissions

5.4.2.1. Dust

During the construction stage, dust may arise, due to the transportation of aggregate to UWF Related Works areas, the movement of excavated material within the works areas and from stored excavated materials at the works areas, particularly during dry and windy weather. Dust will not cause any significant adverse effects to Air Quality. During the operational stage, the works areas will be re-vegetated therefore dust emissions will not occur. Dust emission would be limited to that emanating from occasional maintenance of the Realigned Windfarm Roads.

5.4.2.2. Vehicle Exhausts

During the construction stage, operating machinery used during the construction stage will be run on hydrocarbons and will emit nitrogen dioxide and other greenhouse gas emissions during their operation. Exhaust emissions will not be at levels to cause significant adverse effects. During the operational stage, a van or four wheel drive vehicle will be used for c.12 half days per year for monthly visual inspections, larger machinery may be required for 2 – 3 days every five years or so for road maintenance on the Realigned Windfarm Roads or occasionally for re-use of Haul Route Works areas. This minimal use of vehicles will result in negligible amounts of nitrogen dioxide and other greenhouse gas emissions during operation.

5.4.2.3. Noise

During the construction stage, heavy machinery and vehicles which will be used at works areas during the construction stage will emit noise during their operation, noise will also be emitted from certain construction activities such as excavation or rock breaking or by mobile generators which may be used at work areas. Noise emissions will not be at levels to cause significant adverse effects. During the operational stage, the presence of vehicles, and therefore noise emissions, during operation is considered negligible with a van or four wheel drive vehicle being used c.2 days per year during monthly visual inspections, larger machinery may be required for 2 – 3 days every five years for road maintenance on the Realigned Windfarm Roads or occasionally for c.7 days longer during any re-use of Haul Route Works areas.

5.4.2.4. Vibration

Construction works, including excavations and the use of heavy machinery will cause low levels of ground vibration. No blasting or piling will occur at the UWF Related Works construction works areas. Vibration emissions will not be at levels to cause significant adverse effects. No vibration emissions are expected during the operation of the UWF Related Works.

5.4.2.5. Light

Lighting will be used at Upperchurch Windfarm Site Compound No.1 during construction. This lighting will use a cowled design along with motion-sensor and timer controlled lights which will not remain turned-on overnight. No lighting will be required at construction works areas associated with the UWF Related Works and all construction works will be carried out during daylight hours.

5.4.2.6. Electromagnetic Radiation

Low frequency electrical and magnetic fields (EMF) will be present anywhere electricity is generated, distributed or used and therefore these fields are a common occurrence in everyday life. The operational Internal Windfarm Cables will be a source of very low frequency (50Hz) electromagnetic fields.

Electromagnetic fields will not be at levels to cause significant effects. No emissions of electromagnetic fields will occur during the construction stage.

5.4.3. Waste

The greatest potential for waste occurs during the Construction Phase.

5.4.3.1. Waste Water

The UWF Related Works will be constructed by the personnel involved in the construction of the Upperchurch Windfarm. Self-contained toilets, with integrated waste water storage tanks, will be provided for construction workers at Upperchurch Windfarm Site Compound No.1. Waste water will be collected by licensed collector - by Arlo Group or other appropriately licensed operator, and transported to an approved water treatment plant in Thurles, County Tipperary or other appropriately licensed facility.

The personnel involved in the operation and maintenance of UWF Related Works will also be involved in the operation and maintenance of Upperchurch Windfarm, and will have access to the Upperchurch Windfarm site office facilities, including toilets serviced by an existing septic tank. Waste water will be collected by licensed collector - by Arlo Group or other appropriately licensed operator, and transported to an approved water treatment plant in Thurles, County Tipperary or other appropriately licensed facility.

5.4.3.2. General Waste

During the construction stage, general waste materials such as pallets, packaging, and excess construction and building materials will be generated in small quantities at construction works areas. All individual waste streams will be identified at source, and stored at a designated area at Upperchurch Windfarm Site Compound No.1 with other General Waste arising from the Upperchurch Windfarm construction works. General waste will be collected by licensed collector - Arlo Group or other appropriately licensed operator and transported to their approved licensed facilities at Thurles, County Tipperary or other appropriately licensed facility. No general waste is expected during the operation of the UWF Related Works

5.4.3.3. Chemical Waste

Any chemical waste which may be generated during the construction of the UWF Related Works will be limited to solid waste-oil such as oily rags or any oil contaminated material. Should any chemical waste arise, it will be stored in a secure, bunded container in a designated area at Upperchurch Windfarm Site Compound No.1 with other Chemical Waste arising from the Upperchurch Windfarm construction works. All chemical waste will be removed by Arlo Group or other appropriately licensed operator and transported to either Enva Ireland Limited approved licensed facilities at Shannon, Cork, Portlaoise or Dublin or to the Rilta Environmental Ltd. approved licensed facility in Dublin.

No chemical waste or contaminated material is expected during the operation of the UWF Related Works. However, should any chemical waste occur, it will be stored in a secure bunded container at the Upperchurch Windfarm site office with any other chemical waste arising from the Upperchurch Windfarm operational activities. All chemical waste will be removed from the Upperchurch Windfarm site office by Arlo Group or other appropriately licensed operator and transported to either Enva Ireland Limited approved licensed facilities at Shannon, Cork, Portlaoise or Dublin or to the Rilta Environmental Ltd. approved licensed facility in Dublin.

5.4.3.4. Arisings

During the construction stage, arisings from any excavations within the structure of the public road will consist of old chip, tar, subsoils and rock material. Arisings also include any contaminated soils from off-road construction works areas. All of this material will be collected by operator Arlo Group or other appropriately licensed operator and transported to their approved licensed facilities at Thurles, County Tipperary or other appropriately licensed facility. No arisings from the public road network are expected during operation.

5.4.3.5. Waste Management Plan

Any wastes which result from the operation of the UWF Related Works will be managed under the Waste Management Plan. The Plan includes a hierarchy of controls in relation to waste; Prevent, Reduce, Reuse, Recover and Responsibility and the controls and procedures which will be undertaken as part of the management of waste are specified. A strict chain of custody system will be set up as part of the Waste Management Plan to enable all wastes to be controlled in the appropriate manner.

The **Waste Management Plan** is included in **Volume D: Revised EMP for UWF Related Works.**

5.5. Vulnerability of the Project to Major Accidents and Natural Disasters

Major accidents or natural disasters which have the potential to affect the UWF Related Works are described hereunder. The vulnerability (exposure and resilience) of the UWF Related Works to major accidents and disasters and the risk of these accidents or disasters is classified according to the *Guide to Risk Assessment in Major Emergency Management* (DoEHLG, 2010). This Guide is included as Appendix 5.7 Volume C4: Revised EIAR Appendices**.**

5.5.1. Vulnerability to Major Accidents

It is clear from the EIA Directive that 'major accident' mainly applies to notified Seveso establishments which operate under the Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015, where Dangerous Substances are identified in Schedule 1.

The UWF Related Works **is not vulnerable to Major Accidents**, due to the minimal volumes of the Dangerous Substances which will be used, limited to small volumes of diesel fuel used by vehicles during the construction and operation of the UWF Related Works. Furthermore there are no Seveso sites in proximity to the UWF Related Works site, the closest being Grassland Agro in Limerick and MSD (pharmaceutical) in Kilsheelan, near Clonmel, Co Tipperary.

5.5.2. Vulnerability to Natural Disasters (Land slippage, Flooding)

Natural disasters which could potentially affect the UWF Related Works include land slippage and flooding. The likelihood of these natural disasters occurring is discussed below, with likelihood of the natural disaster occurring rated according to the DoEHLG 2010 Guidelines. The risk classification tables are included in Appendix 5.7: A Guide to Risk Assessment in Major Emergency Management Jan 2010.

5.5.2.1. Land-slippage

It is considered that the UWF Related Works is not vulnerable to natural disasters such as land slippage, due to the absence of peat or very shallow peats at the works locations. Therefore it is considered that the likelihood of land slippage disaster occurring along the UWF Related Works is **Extremely Unlikely**.

5.5.2.2. Flooding

In recent years, high rainfall events and subsequent flooding have become more frequent in Ireland. Where complete the Catchment Flood Risk Assessment and Management (CFRAM)[2] 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. CFRAM mapping is not currently available for the area of the Upperchurch Windfarm site and therefore the PFRA maps have been examined.

[2] 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.

A Stage II Flood Risk Assessment was completed for the subject development by Hydro Environmental Services, a specialist hydrological and hydrogeological consultancy, who concluded that there is a low risk of potential flooding because based on the PFRA mapping all of the works areas and infrastructure are located in mapped Flood Zone C (Low Risk) – where the probability of flooding is low (less than 0.1% or 1 in 1,000). The elevated nature of the UWF Related Works areas means no significant pluvial or fluvial flooding would be expected.

Also, there will be no potential of increased local flood risk as a result of the UWF Related Works as most of the subject development is located underground (i.e. windfarm cabling). The footprint of the above-ground permanent infrastructure (i.e. realigned windfarm access roads, relay pole base etc) is minimal and distributed over several catchments and all new permanent watercourse crossing culverts will be suitably designed to accommodate flood flows.

Therefore it is considered that the likelihood of flooding disaster affecting the UWF Related Works areas is **Unlikely.**

The Flood Risk Assessment can be found in Appendix 11.3: Flood Risk Assessment, of Volume C4 Revised EIAR Appendices.

5.5.2.3. Consequences of Natural Disasters Occurring

The consequence of the impact if the event occurs is described here.

Due to the low number of personnel working on-site at any one location, the consequence of any flooding or land slippage events, if they did occur, is considered to be **Limited**.

Due to the low number of people living or working locally, the consequence of any flooding or land slippage events, if they did occur, is also considered to be **Limited.**

The consequences to water quality due to land slippage or flooding could be **Serious** due to the widespread effects and extended duration of sedimentation effects in downstream watercourses.

5.5.2.4. Overall Risk

When the likelihood and the consequence of a potential land slippage or flooding event occurring is applied to the risk matrix from the DoEHLG 2010 guidelines, a broad indication of the critical nature of each risk can be determined.

In relation to on-site personnel and other people in the locality, a land slippage or flooding event would be classed a 'normal emergency' - based on a likelihood rating of Extremely Unlikely and a consequence rating of Limited.

In relation to downstream water quality, due to the higher level of effect (Serious) on water quality a land slippage or flooding event could be a major emergency. According to the DoEHLG 2010 guidelines, both flooding and landslip events would be at the lowest extreme of 'major emergency'.

5.5.2.5. Mitigation Measures

No measures are required for land slippage risk. In relation to flooding, instream works on Class 1 and Class 2 watercourses will also be carried out during dry periods in the months of July, August and September, and all new permanent crossing structures will be sized to cope with a minimum 100 year flood event.

Should a disaster occur, unconnected to the project but in the locality – the above mitigation measures already designed into the project will ensure that the project will not make the consequences of the event worst. In addition the presence of the project will not increase the likelihood of such an event occurring.

5.6. Cumulative Descriptions

Table 5-10: Subject Development: UWF Related Works - Element 2 of the Whole UWF Project

Element No.	The Subject Development	Composition of the Subject Development	Status
2	The Subject Development UWF Related Works (RW)	Internal Windfarm Cabling Realigned Windfarm Roads Haul Route Works Telecom Relay Pole RW Ancillary Works	This Appeal to An Bord Pleanála

An **overview of Element 2, UWF Related Works**, the subject development, is provided in Section 5.2.2 above. A **full description** of the subject development is provided in the successive Sections 5.2 to 5.5**.**

5.6.1. Description of the Other Elements of the Whole UWF Project

In order that a cumulative evaluation can be carried out for the UWF Related Works, an overview description is provided hereunder of all the other elements of the whole UWF project.

Table 5-11: Element 1 and Element 3 to 5 of the Whole UWF Project

	Element of the whole UWF project	Composition of each Element	Relevant Appendix Location for description of each element
1	UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Grid Connection Access Roads Grid Connection Ancillary Works	Appendix 5.3
3	UWF Replacement Forestry (RF)	Replacement Forestry at Foilnaman	Appendix 5.4
4	Upperchurch Windfarm (UWF)	Consented UWF Turbines Consented UWF Substation Consented UWF Roads UWF Ancillary Works	Appendix 5.5
5	UWF Other Activities (OA)	Haul Route Activities Upperchurch Hen Harrier Scheme Monitoring Activities Overhead Line Activities	Appendix 5.6

Relevant Volume C3 Revised EIAR Figures:

Figure CE 1.1: Location of UWF Related Works and the Other Elements of the Whole UWF Project on OSI Mapping.

This information on the other elements of the whole UWF project can be found in the following locations;

- **Full EIA Report** or EIS (as appropriate) for **Elements 3 and 4** in Volume F: Reference Documents for Other Elements of the Whole UWF Project.
- **Description of Elements 1 and 5** (presented in a format similar to this chapter and with smaller scale reference mapping and figures) in Appendix 5.3 and Appendix 5.6 see Volume C4: Revised EIAR Appendices**.**
- **Overview description of each elements 1, 3, 4, and 5** of each element in this Section hereunder.

5.6.1.1. Element 1: UWF Grid Connection

An application for planning permission for a revised UWF Grid Connection will most likely be submitted directly to An Bord Pleanála under Section 182A (9) of the Planning and Development (Strategic Infrastructure) Act (2006). The application will be accompanied by an EIA Report. A pre-application request was made to An Bord Pleanála on 4th January, 2019. ABP Ref. No. **303385-19.**

A **detailed description** of the revised UWF Grid Connection (presented in a format similar to 5.2 to 5.5 above) along with **accompanying figures** is included in Appendix 5.3: Description of Development (UWF Grid Connection).

A summary overview of the revised UWF Grid Connection is provided hereunder.

5.6.1.1.1. Location and Characteristics of UWF Grid Connection

There is no revision to Mountphilips Substation from the 1st SID application. The route of Mountphilips – Upperchurch 110kV UGC has been revised and therefore UWF Grid Connection Ancillary Works; life-cycle stages; use of natural resources; emissions or wastes have also been revised.

The UWF Grid Connection will comprise of the following:

Mountphilips Substation: A new substation is proposed for a location adjacent to the existing Killonan - Nenagh 110kV overhead line in agricultural grassland in Mountphilips townland, 2km north of Newport, 4km south of Birdhill, 17km north east of Limerick City and 23km west of the Upperchurch Windfarm. The new 110kV electrical substation will comprise 2 No. End Masts located at the Killonan – Nenagh 110kV overhead line; a compound, 230 meters east of the overhead line, measuring 95 meters x 94 meters which will contain a control building; 110kV busbars; circuit breakers; line disconnects; current and voltage measuring equipment; cable chairs; surge arresters; lightening protection monopoles and other electrical apparatus. The 2 No. End Masts will be connected to the electrical equipment in the compound via underground cable.

Mountphilips - Upperchurch 110kV UGC: The 110kV UGC will connect Mountphilips Substation to Upperchurch Windfarm through the Consented UWF Substation, through the installation of underground cables along the public road. The preferred preliminary route of the 110kV UGC, which is 28.9km in length, will follow a generally west/east course along the Public Road - Thurles to Newport Regional Road R503. The 110kV UGC route starting at Mountphilips Substation will be under a grassland field for 0.52km; under Local Road L2166-0 for 2.26km, under the Regional Road R503 for 23.14km; under the L2264-50 for 1.93km; the L6188-0 for 0.33km and under a Private Farm Road for 0.72km as far as UWF Substation. The route is through the townlands of Mountphilips, Coole, Freagh, Foildarrig, Newport, Tullow, Cooldrisla, Derryleigh, Kilnacappagh, Scraggeen, Derrygareen, Inchadrinagh, Knockancullenagh, Fanit, Lackamore, Tooreenbrien Upper, Tooreenbrien Lower, Reardnogy Beg, Reardnogy More, Shanballyedmond, Baurnadomeeny, Coonmore, Foildarragh, Kilcommon, Loughbrack, Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons. The 110kV UGC will be installed in trenches, which will be laid with ducts through which the electrical cables and communications cables will be pulled. The cable lengths will be pulled through and joined together at Joint Bay locations, in joint bay chambers. The ducts will be surrounded by concrete and the trench backfilled with aggregate and the road surface will be reinstated according to Local Authority specifications. The only surface expression of the 110kV UGC will be the man-hole type covers over the Joint Bays and the over-ground identification marker posts and marker plates.

UWF Grid Connection Ancillary Works will support the construction of UWF Grid Connection and will include the construction of a new Permanent Entrance at Coole townland (including the provision of sightlines) and

Permanent Access Road from the new entrance to the proposed substation at Mountphilips townland; construction and use of a Temporary Compound at Mountphilips; replacement of watercourse crossing structures; installation of drainage systems at Mountphilips Substation, around the Temporary Compound and along the new Access Road; fencing; protection of existing underground services; provision of electricity supply to Mountphilips substation; excavation and reinstatement and disposal of spoil; hedgerow/tree removal at Mountphilips and hedgerow replanting and site reinstatement.

5.6.1.1.2. UWF Grid Connection: Construction & Operation

UWF Grid Connection Construction Phase: All elements of the whole UWF project will be constructed at the same time. Construction of UWF is expected to commence in 2019 and will take approx. 12 months. Approximately 100 persons will be engaged in the pre-construction, main construction, cable jointing and commissioning works for the UWF Grid Connection. 1290 No. loads of concrete; 1320 No. loads of aggregate; and 210 No. loads of surface dressing (public road sections) will be imported from Roadstone Killough, Co Tipperary and Bunratty, Co Clare and Shanballyedmond, Rear Cross. 20 No. loads of general building materials including geotextile, and 310 No. loads of electrical plant and equipment including lattice towers, control building doors and switching gear, will be imported to the site from various suppliers throughout Ireland and the EU. The excavated material from the 110kV public road trenches will be classed as spoil and will amount to 23,810m3, all of which will be removed to a licensed waste facility.

UWF Grid Connection Operational Phase: Once commissioned and energised, the UWF Grid Connection will be taken in charge by ESB Networks and the Mountphilips Substation and the Mountphilips – Upperchurch 110kV UGC will become part of the national electricity network. The new asset will be managed and operated by ESB Networks. Scheduled inspection and maintenance activities will be carried out by ESB Networks personnel (2 men crews) over a total of 13 days per year. Very infrequent planned maintenance or unplanned repairs may be required, if at all, during the lifetime of the UWF Grid Connection, it is expected that one crew with c.6 ESB Networks personnel would be required for 1 – 2 weeks duration, depending on the nature of the repairs work. The UWF Grid Connection will remain permanently in place as part of the national electricity network and thus decommissioning is not envisaged.

UWF Grid Connection use of Natural Resources: Construction Phase – There will be 5.9 hectares of **land** required for the construction works site. The use of the Public Road corridor (24.1 hectares) is not considered a natural resource. 35m of **hedgerow** and 2 No. of **trees,** which are immature, will be permanently removed to facilitate either a permanently widened entrance off the public road or a new permanent access road. These hedgerows and trees will be replaced immediately adjacent to the area. c.700m of new hedgerow will be planted with locally sourced native species. **Water** required for welfare facilities will be brought onto site. Approximately 2,470m^3 of **topsoil**, 1,570m^3 of **subsoil** and 30m^3 of **rock** will be permanently excavated from the works areas. 300m^3 of the excavated topsoil will be used to reinstate the temporary access road to the End Masts. 3,770m^3 of the excavated material will be permanently stored around the Mountphilips Substation and along the Permanent Access Road as linear berms.

UWF Grid Connection use of Natural Resources: Operation Phase – The Land required will reduce considerably to just 2.0ha of land permanently changing use - comprising the footprint of the Mountphilips Substation and access road. No further **hedgerow** or **tree pruning or removal** will be required during the operational stage. Non-potable **water** requirements will be provided at the Mountphilips Substation via a rain water harvesting system, and drinking water will be brought onto site as needed. **No excavations of soils** will be required during the routine operation of the UWF Grid Connection. Planned maintenance or unplanned repairs, if any occur are likely to involve the re-opening of the underground chambers, at Joint Bays. This work which will result in very small volumes of crushed stone and sand being temporarily removed

from the area directly over the joint bay covers, stored adjacent to the Joint Bay, and re-used to reinstate the top of the Joint Bay following the completion of the repairs.

UWF Grid Connection Emissions: Dust, construction machinery exhaust, noise, vibration and light will be emitted during the construction stage, negligible levels are associated with the operation and maintenance activities. During operation, Mountphilips Substation will emit **noise** however this is unlikely to be audible above the existing background noise levels at nearest residence, which is 385m distant. The operational sub-station and 110kV underground cable will be a source of very low frequency (50Hz) **electromagnetic fields.**

UWF Grid Connection Waste: Waste water from construction stage welfare facilities will be contained in self-contained units and emptied by a licenced facility. General and chemical waste will be segregated and stored in allocated tanks, bins, skips or areas at the Temporary Compound. Waste will be collected by an appropriately licensed waste contractor. Any wastes which result from the construction of the UWF Grid Connection will be managed under a specific **Waste Management Plan**. Approximately 22,210m^3 of spoil will arise during excavations in public roads. This excess material or other contaminated material arising during the construction of UWF Grid Connection will be collected by a licenced operator and disposed of in a licenced facility.

There will be minimal general and chemical waste during the Operational Stage, with any waste taken offsite by ESBN personnel.

5.6.1.2. Element 3: UWF Replacement Forestry

An **afforestation license** for UWF Replacement Forestry **was granted by the Minister for Agriculture, Food and the Marine on 07/11/2018.** Forest Owner Number FO138819C. Contract Number CN81893. The application for the licence was accompanied by an EIA Report.

The full **EIA Report including mapping and figures for UWF Replacement Forestry** was submitted with the planning application for UWF Related Works to Tipperary County Council in Volume F: Reference Documents for Other Elements of the Whole UWF Project.

An extract from Volume F of the **detailed description** of the UWF Replacement Forestry (presented in a format similar to 5.2 to 5.5 above) along with **a copy of the accompanying figures** is included in Volume C4: Revised EIAR Appendix 5.4: Description of Development (UWF Replacement Forestry).

A summary overview of UWF Replacement Forestry is provided hereunder.

5.6.1.2.1. Location and Characteristics of UWF Replacement Forestry

UWF Replacement Forestry relates to the planting with forestry, of 6ha of agricultural lands as part of the whole UWF project.

Located at Foilnaman townland, near Upperchurch, County Tipperary, 6 hectares (6ha) of agricultural grassland at will be planted with native woodland species, set in clusters of well-matched native species. There will be varied spacing created between the clusters according to Forest Service recommendations. A mixture of tall trees and understory shrubs will be planted, and the design includes wide ride-lines between deeper areas of core woodland. The ride-lines will create open spaces with tree-lined boundaries, which is much favoured by birds of prey during the day (e.g. hen harrier) and bats at night as hunting ground. A mixture of land cover – tall grasses, short grasses and scrub will be maintained under the planting and in the ride lines. Tree guards will be used to protect the saplings and young trees from rabbit damage. A livestock-proof fence will be erected around the perimeter of the planting.

The lands to be afforested are currently in two agricultural landholdings. A small watercourse, with an existing culvert crossing, runs through the centre. The existing riparian habitat along this watercourse will be enhanced through planting with hazel, alder and willow species and the entire afforestation land will be protected from livestock by the perimeter fencing.

There is a change of use required for an existing agricultural entrance to agricultural and forestry entrance which will remain in permanent use. This change of use is part of UWF Related Works – RW Ancillary Works.

The UWF Replacement Forestry will be designed and planted in accordance with the *Forest Service (2006) Information Note No. 5: Establishment, Design and Stocking Densities of New Native Woodland* and *Felling and Reforestation Policy published by the Forest Service (May 2017).*

5.6.1.2.2. UWF Replacement Forestry: Planting and Growth Stage

UWF Replacement Forestry Planting Stage: Tree planting will be carried out by 4 No. forestry professionals. Tree saplings, wooden fence posts and fencing wire and gates will be imported to the site by 4WD vehicle.

UWF Growth Stage: Once planted, the trees will go through numerous stages of growth from sapling, through to maturity, old age and eventual decay with natural regeneration occurring through the lifecycle of the native wood. Other than thinning activities and grass/scrub management, natural maturation, old age and regeneration, no other changes to the native woodland are expected. Felling is not envisaged.

Use of Natural Resources: 6ha of agricultural land will be planted with mixed species to create a native woodland, comprising tall trees and understory shrubs, along with wide ride-lines, and a mix of tall grasses, short grasses and scrub land cover maintained during the growth stage. This will enhance biodiversity in the area. New trees and shrubs will be set back from the watercourse which runs through the UWF Replacement Forestry site. The existing riparian habitat will be enhanced through the planting with hazel, alder and willow species and the lands will be protected from livestock by the perimeter fence. Planting will be carried out by hand using spades. Small localised patches of disturbed soil will occur at the sapling tree trunks.

Emissions – Planting and Growth Stage: Negligible.

Waste - Planting and Growth Stage - such as packaging, and excess planting materials will be generated in very small quantities and this waste will be removed at source and disposed of in an appropriate licensed facility.

5.6.1.3. Element 4: Upperchurch Windfarm

An overview description of already consented Upperchurch Windfarm (UWF) is provided hereunder.

An application for planning permission for Upperchurch Windfarm (Consented UWF) was made to Tipperary County Council in January 2013. The **windfarm was permitted by Tipperary County Council in January 2014** and the permission was upheld by An Bord Pleanála in August 2014. The application was accompanied by an EIA Report (known as EIS at the time) and Natura Impact Statement. The full planning documents for consented UWF can be found in Volume F: Reference Documents for Other Elements of the Whole UWF Project**.**

5.6.1.3.1. Overview of the Location and Characteristics of Upperchurch Windfarm

UWF will comprise 22 wind turbines with an overall height up to 126.6 metres, 2 meteorological masts with an overall height of up to 80 metres, turbine foundation and crane hardstanding areas, access roads and an electrical substation.

The Upperchurch Windfarm site is located in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Knockmaroe, Grousehall, Cummer, Foilnaman, Gleninchnaveigh, Coumnageeha, Coumbeg, Knocknamena Commons, Glenbeg and Seskin. This is an area 2km west of Upperchurch village and 18km to the west of Thurles, County Tipperary.

The 22 wind turbines, associated crane hardstandings and ancillary works will be constructed on a series of small hills ranging in elevation from 280m to 401m OD, set out generally over four areas. The substation will be constructed in Knockcurraghbola Commons and the turbines will be connected by underground cables to the substation. There will be two meteorological masts erected, one in Grousehall and a second in Knocknamena townlands. Ancillary Works will include borrow pits in Shevry, Knocknamena, Knockmaroe and Grousehall; 1 No. site entrance from the R503 Regional Road at Graniera and; 10 No. site entrances from local public roads, through and around the site, which will provide access to the windfarm.

A document, with a **detailed description of the Upperchurch Windfarm,** has been compiled from the original 2013 Upperchurch Windfarm EIS, from the Reply to Further Information, the additional information submitted during the planning process and mitigation measures and planning conditions attaching to the Grant of Permission, to reflect a description of the development as it is now permitted. This compilation document has been prepared in the same format as the current application Chapter 5, for ease of cross referencing. The compilation document can be found in Appendix 5.4: Complied Description of Upperchurch Windfarm.

The full planning documents for Upperchurch Windfarm can be found in Volume F: Reference Documents for Other Elements of the Whole UWF Project**.**

Upperchurch Windfarm (UWF) is comprised of the following parts:

- **Consented UWF Turbines** - 22 No. wind turbines of the three-bladed, tubular tower model, light grey in colour and an overall height to blade tip upto 126.6m. The turbines will be constructed on concrete bases with an adjacent hard-core hardstand area. There is no requirement for fencing of turbine areas. The turbines will be connected by underground cables to the Consented UWF Substation.
- **Consented UWF Substation** - 110kV substation compound which includes a control building, main transformer and other electrical equipment enclosed in a compound by a palisade fence. The substation will measure 64m x 41m.

- **Consented UWF Windfarm Roads** - 11.6km of windfarm access roads will comprise 8km of newly built 5m wide roads and 3.6km of existing farm roads which will require upgrading and widening (by an average of 2m).
- **Consented Ancillary Works** - The main items of ancillary works will include, 2 No. meteorological masts up to 80m in height; 11 No. site entrances; 1 No. stream crossing; site drainage system; 2 No. construction site compounds; 6 No. borrow pits from which most of the aggregate required will be won; forestry felling, hedgerow removal and reinstatement; excavation, storage and reinstatement of soils.

5.6.1.3.2. Upperchurch Windfarm: Construction & Operation

UWF Construction Phase: All elements of the whole UWF project will be constructed at the same time.

Construction of UWF is expected to commence 2018/2019 and will take approx. 12 months. Approximately 277 persons will be engaged in the civil, electrical, project management, legal and financial services, material supply and component deliveries for the windfarm. Approximately 950 No. loads of concrete; 15 No. loads of reinforcing steel and 5 No. loads of general building materials and 212 No. loads of electrical plant and equipment (abnormal size loads) will be imported to the site by HGV. The abnormal turbine loads will be transported from Foynes Port.

UWF Operational Phase: UWF has been granted permission to operate for 25 years from the date of commissioning of the wind turbines, whereupon there will then be an option to apply for continuance of use or decommission the plant and restore the site. There will be 8 permanent jobs created in operation and maintenance activities, legal, electricity sales and asset management during the operational phase.

UWF use of Natural Resources: 56.3 hectares of land within the construction works site will reduced to 6.4 ha during the operational phase; Approx. 108,000m^3 of excavated soils; 43,000m^3 of aggregate mostly won on-site and otherwise imported from local quarry at Shanballyedmond, Rear Cross; small amounts of potable water, carried on-site; felling of 4.4 hectares of conifers; 960m of hedgerow removed.

UWF Emissions: Dust, construction machinery exhaust, noise, vibration and light will be emitted during the construction stage. There is no house within 200m of the construction works. During the **Operational Stage** there will be negligible dust, vehicle exhaust, vibration and light emitted. The turbines will emit noise during operation. Permitted noise emissions are prescribed by planning condition. The operational electrical plant will be a source of very low frequency (50Hz) electromagnetic fields but these will not be at levels to cause significant effects at the turbine locations, and no effects will occur at local residences.

UWF Waste: During construction, waste water from welfare facilities will be contained in self-contained units and emptied by a licenced facility or in the case of the Site Offices, will be treated in the existing septic tank. General and chemical waste will also arise from construction activities and processes. During operation, minimal general and chemical waste will arise on site. All waste will be stored in a designated and secure areas, for collection by an appropriately licenced operator. Any wastes which result from the construction, operation and decommissioning of the Windfarm will be managed under a specific Waste Management Plan.

5.6.1.4. Element 5: UWF Other Activities

Although UWF Other Activities do not require planning permission, they do form part of the whole UWF project and therefore are included in the cumulative evaluation. A **description of these activities,** along with **mapping and figures** is included in Appendix 5.6: Description of the UWF Other Activities.

An overview of UWF Other Activities is provided hereunder.

5.6.1.4.1. Location and Activities of UWF Other Activities

The **Haul Route Activities** will facilitate the transportation of turbine components to the Upperchurch Windfarm site and are located at various points on the national and regional road network along the UWF turbine component haul route between Foynes Port in County Limerick and junction of the R503 and R497 Regional Roads in Knockmaroe townland, County Limerick. Activities comprise the laying of matting over verges at up to 5 No. locations, removal and replacement of street furniture (mainly signposts) at 13 No. locations and the trimming of up to 960m of hedgerow/trees at up to 15 No. locations.

The **Upperchurch Hen Harrier Scheme** will enhance and protect habitat for hen harrier in the vicinity of Upperchurch Windfarm, in order to fulfil planning condition No.18, attaching to the windfarm. The Upperchurch Hen Harrier Scheme is located in Knockcurraghbola Commons, Coumnageeha, Foilnaman, Knockmaroe and Grousehall townlands on 128ha of agricultural lands between the Slievefelim to Silvermines SPA and the Upperchurch Windfarm. Activities associated with the Scheme includes once off activities such as planting of hedgerows and trees; enhancement of riparian corridors and scrub/wood areas; and the fencing off of watercourses and newly planted trees and shrubs. The Scheme also includes long-term farm management practices such as management of rush coverage, livestock grazing and the control of the use of lime, fertilizers and burning of gorse, amongst others. Nine local landowners are signed-up to the Scheme. Implementation involves a mix of initial once-off activities which will both create new habitat and protect and enhance existing habitat; and on-going farming practices which will result in the long term maintenance of hen harrier habitat.

Monitoring Activities will monitor the Whole UWF Project for compliance with the environmental protection measures and mitigation measures detailed in the UWF 2013 EIS and 2013 RFI (including the Construction Environmental Management Plan for Upperchurch Windfarm and the Ecological Management Plan for Upperchurch Windfarm); Planning Conditions attaching to the already consented UWF; and measures in the 2018 UWF Grid Connection EIA Report, the 2018 UWF Related Works EIA Report and the 2018 UWF Replacement Forestry EIA Report and associated UWF Grid Connection Environmental Management Plan and UWF Related Works Environmental Management Plans. Monitoring will also involve the supervision and recording of key construction activities, and monitoring of progress of land reinstatement.

Overhead Line Activities include re-sagging activities and fibre wrapping activities. The purpose of the re-sagging activities is to correct the tension of the existing overhead line, following the installation of the UWF Grid Connection End Masts, so that the lines are held within predefined tension parameters. The purpose of fibre wrapping is to provide a communication link to the newly installed Mountphilips Substation. The tension will be corrected on 2 no. Sections - i) between ESBN Angle Mast Structure No. 79 (c.200m south of Mountphilips substation) to New Mountphilips End Mast No. 1 and ii) between New Mountphilips End Mast No. 2 and ESBN Angle Mast Structure No. 90 (2.3 km north of Mountphilips substation). Wrapping the overhead line with fibre optic cable from Killonan ESBN substation (just east of Limerick City) to Mountphilips substation. The Overhead Line Activities will be carried out according to industry standard method statements, including standard health & safety and environmental management systems.

5.6.1.4.2. UWF Other Activities: Construction & Operation

Timing: The **Haul Route Activities** will occur prior to commencement of turbine component haulage and reinstatement will occur immediately after the passage of all components. The initial once-off activities associated with the **Upperchurch Hen Harrier Scheme** such as permanent planting and fencing of newly planted areas and watercourses will be carried out during the same period as the construction of UWF and UWF Related Works. There will be pre-construction **Monitoring Activities** before UWF and UWF Related Works commence. **Overhead Line Activities** will take place at the same time as the construction of Mountphilips substation.

UWF Other Activities Construction Phase: Approximately 50 persons will be engaged in UWF Other Activities including haul route activities, landowners involved in the hen harrier scheme, environmental experts engaged in the monitoring schemes and ESB Crews involved in overhead line activities. There will be very little materials delivered to the activity sites, these will include deliveries of geotextile matting, trees and shrubs, fencing materials and specialist ESB equipment.

UWF Other Activities Operational Phase: The same **Haul Route Activities** as for the construction phase, will be required in the occasional event of a large component delivery to UWF, if required, during the operational phase. The farming practices required under the **Upperchurch Hen Harrier Scheme** will continue throughout the lifetime of UWF. **Monitoring** of the success of Upperchurch Hen Harrier Scheme will be carried out during the operational lifetime of UWF. Monitoring will also include operational planning conditions and Ecological Management Plan compliance.

Use of Natural Resources: No land use changes required. No water or welfare facilities required. No mechanical excavations required; all planting will be carried out by hand. For haul route activities, up to 960m of roadside boundary hedges/treelines will be trimmed, outside of the general bird breeding season. For the Hen Harrier Scheme, 2.2ha of trees, 1.4km of riparian habitat and 2.8km of new hedgerow will be enhanced or created during initial activities. In total 128 hectares of agricultural lands will be management for the benefit of hen harrier.

There will be negligible **Emissions** from vehicles transporting personnel and any general **Waste** arising on-site will be removed by the crew themselves during the **construction** and **operational phase** of these Other Activities**.**

5.6.1.5. Cumulative Locational Context of all the Elements

The majority of the whole UWF project is located in County Tipperary with some minor activities along the Upperchurch Windfarm turbine component haul route and on the Killonan to Nenagh 110kV overhead line, in County Limerick (these activities are part of Element 5: UWF Other Activities).

The UWF Related Works is predominately located adjacent to and overlaps with Other Elements of the Whole UWF Project, in particular the consented Upperchurch Windfarm per:

- The majority of the Internal Windfarm Cabling overlaps the Consented UWF Roads,
- The Realigned Windfarm Roads will provide alternative access to Consented UWF Turbines,
- The Haul Route Works and Telecom Relay Pole are located in the immediate vicinity of various parts of the Upperchurch Windfarm
- The UWF Related Works overlap and are adjacent to the UWF Grid Connection and the Upperchurch Windfarm in Knocknabansha, Knockmaroe, Knockcurraghbola Commons and Knockcurraghbola Crownlands
- Haul Route Works are located adjacent to Haul Route Activities (UWF Other Activities) in the Knocknabansha/Knockmaroe area.

Relevant Volume C3 Revised EIAR Figures:

Figure CE 1.2: UWF Related Works and the Other Elements of the Whole UWF Project in the Upperchurch Windfarm area.

Figure CE 1.3: UWF Related Works and the Other Elements of the Whole UWF Project in Knocknabansha, Knockmaroe, Knockcurraghbola Commons and Knockcurraghbola Crownlands.

5.6.2. Secondary Projects

The development of the UWF Related Works is not expected to result in any secondary or consequential development.

In relation to the Other Elements of the Whole UWF Project, the addition of Mountphilips Substation (UWF Grid Connection) will add a new high voltage electrical substation in the Newport area. This may facilitate new connections to the Mountphilips substation in the future. There are no new connections planned at present.

5.6.3. Description of Other Projects and Activities

A cumulative evaluation of the effects of the subject development together with the Other Elements of the Whole UWF Project and Other Projects or Activities is presented in the Environmental Factor topic chapters.

Other Projects or Activities in the area were scoped using geographical and time-frame boundaries and conceptual site model exercises, see Appendix 2.3: Scoping of Other Projects or Activities. The results of this scoping exercise is presented in Table 5-12, where Other Projects or Activities which have been scoped in for cumulative evaluation are listed in the left hand column of the matrix table, and the relevant Environmental Factor topic is identified in grey shading in the matrix.

Table 5-12: List of Other Projects or Activities included in the Environmental Factor Cumulative Evaluation

Project *(These projects are identified on* Figure CE 2.1: Other Projects or Activities Scoped In for Cumulative Evaluation in the Environmental Factor topic chapters*)*	**Population**	**Human Health**	**Biodiversity**	**Land**	**Soils**	**Water**	**Air**	**Climate**	**Built Services**	**Roads**	**Cultural**	**Landscape**
Existing Killonan to Nenagh 110kV Overhead Line							■					
Existing Shannonbridge – Killonan 220kV Overhead Line							■					
Consented Bunkimalta Windfarm	■	■	■			■			■			
Consented Castlewaller Windfarm			■						■			
Existing Milestone Windfarm (includes permitted turbine at Inchivara) currently under construction											■	■
Operational Windfarms in the Republic of Ireland								■				
Existing Communication Structures - Foilnaman Mast - Cummermore Communications Pole											■	■
Activity – Forestry			■									■
Activity – Agriculture			■									■
Activity –Turf-cutting			■									

A brief overview of each of the above listed projects is provided below. The location of each project in relation to the elements of the Whole UWF Project is identified on Figure CE 2.1: Other Projects or Activities Scoped In for Cumulative Evaluation in the Environmental Factor topic chapters.

5.6.3.1. Existing Killonan to Nenagh 110kV Overhead Line

A high voltage (110kV) overhead line which runs between Killonan Station and Nenagh ESB substation (County Tipperary). The existing line is located to the west of the UWF Grid Connection and does not pass over the route of the 110kV UGC. The new Mountphilips Substation will be connected to this line via two new End Masts in farmland, west of the substation compound.

5.6.3.2. Existing Shannonbridge – Killonan 220kV Overhead Line

A high voltage (220kV) overhead line which runs between Shannonbridge ESB substation in County Offaly and Killonan ESB substation in County Limerick. A section of the line passes close to the UWF Grid Connection 110kV UGC in the townlands of Coole and Mountphilips.

5.6.3.3. Consented Bunkimalta Windfarm

The Bunkimalta Windfarm is a consented 16-turbine windfarm, located on Coillte lands, c.2.5km to the north of the UWF Grid Connection at Bunkimalta, Bauraglanna, Lackabrack, Knockfune and Foilduff at, Keeper Hill, Co. Tipperary.

Bunkimalta Windfarm will comprise 16 wind turbines, each having a rated electrical output of approximately 2,500 - 3,000 kilowatts, access tracks, a fenced Electrical Transformer Station comprising a single-storey Control Building and Substation, an effluent treatment system, three anemometer masts, repository areas, borrow pits and all associated site works, above and below ground. Each wind turbine will comprise a tower up to a maximum of 100 metres high, with a diameter of about 4 metres at the base. Three blades, up to a maximum of 50 metres in length, will be attached.

The Bunkimalta Windfarm will connect to the National Grid via an already consented underground grid connection to the existing Nenagh Substation, on the outskirts of Nenagh town.

The Bunkimalta Windfarm could be constructed during the same period as the UWF Grid Connection and the Whole UWF Project. Bunkimalta Windfarm, when built, will be operational during the operational stage of the Whole UWF Project.

An Environmental Impact Statement and Natura Impact Statement accompanied the planning application 13510035.

5.6.3.4. Consented Castlewaller Windfarm

The Castlewaller Windfarm is a 16-turbine windfarm, comprising 16 wind turbine generators (each with a maximum hub height of 100m, maximum rotor diameter of 90m, and with a total tip height of 145m), one permanent meteorological mast, 2 borrow pits, a sub-station including a control building, new internal access roads, upgrading of existing internal access roads, expansion of drainage system, turbine hardstands, wastewater holding tank, underground cables and ancillary works which is located along part of the 110kV UGC route in Castlewaller townland.

An Environmental Impact Statement and Natura Impact Statement accompanied the planning application 11/51/0251 for Castlewaller Windfarm.

Castlewaller Windfarm has not as yet secured a grid connection offer to connect to the National Grid from either Eirgrid or E.S.B Networks and therefore is not likely to be in construction at the same time as the construction of the Whole UWF Project.

5.6.3.5. Existing Milestone Windfarm

Milestone Windfarm is an operational (since 2018) 6-turbine windfarm located adjacent to the southwest of the consented Upperchurch Windfarm with 5 No. turbines consented under planning ref: 12510385 at Knockcurraghbola Commons, Knockcurraghbola Crownlands, Graniera, Shevry and 1 No. turbine consented under planning ref: 1410 at Inchivara and Knockduff. Milestone Windfarm comprises wind turbines each with a maximum tip height of 126m, along with new access tracks, and electrical substation, a borrow pit and associated works. The grid connection associated with the Milestone Windfarm is towards the south at ESBN Cauteen Station, cabled along the public road network. An Environmental Impact Statement accompanied the planning applications for Milestone Windfarm – Ref: 12510385 & 1410.

Part of the landholding associated with the Milestone Windfarm occurs within one of the landholdings associated with the 110kV UGC element of the UWF Grid Connection, in Knockcurraghbola Commons townland.

5.6.3.6. Operational Windfarms in the Republic of Ireland

The Republic of Ireland has a generating capacity of 2,909.66 MW based on 233 windfarms.

5.6.3.7. Existing Communication Structures

Foilnaman Mast: An existing communications mast comprising a 30m steel lattice mast structure at Knockmaroe townland, in the vicinity of the UWF Related Works/Upperchurch Windfarm site.

Cummermore Communications Pole: An existing communications structure comprising a 20m support pole, c.2km to the southwest of the Upperchurch Windfarm, and within 4km of the UWF Related Works (Telecom Relay Pole). This existing pole carries radio aerials and a communications dish, together with associated equipment, cabling, gantry pole, GPS timing antenna, cabinet and fencing. Planning Ref: 14600313

5.6.3.8. Activities – Forestry, Agriculture

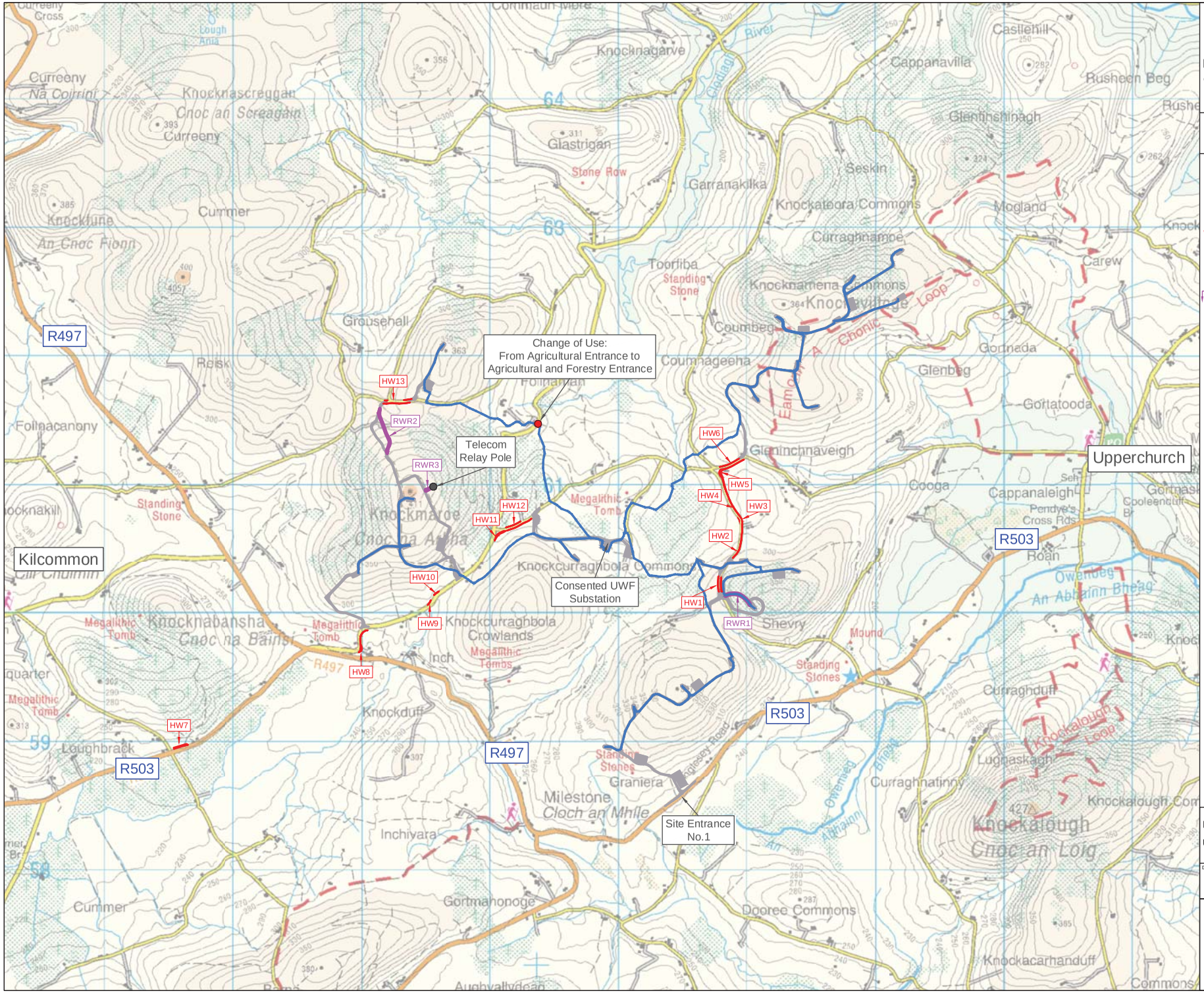
Agriculture and forestry are the predominant land uses in the area of the Whole UWF Project.

5.6.3.9. Activity – Turf-Cutting

Turbary (rights to cut turf) exists at Bleanbeg Bog immediately to the north of the UWF Grid Connection (110kV UGC) in the Castlewaller area.

The above projects and activities are included in the cumulative evaluations in the Environmental Topic chapters – Chapters 6 to 17. The relevant Environmental Factor topic is identified on Table 5-12.

Figures and Mapping



Title:
Figure RW 5.1

Location of UWF Related Works
on OSI Discovery Mapping

Map Number:
Map 1 of 1

Legend:

- Haul Route Works
- HW1 — Haul Route Works Numbers (HW1 - HW13)
- Realigned Windfarm Road
- RWR1 — Realigned Windfarm Road Numbers (RWR1 - RWR3)
- Internal Windfarm Cabling
- Telecom Relay Pole
- Upperchurch Windfarm (UWF)
- R503 — Regional Road Number

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn by:	Checked by:	Date:	Sheet Size:
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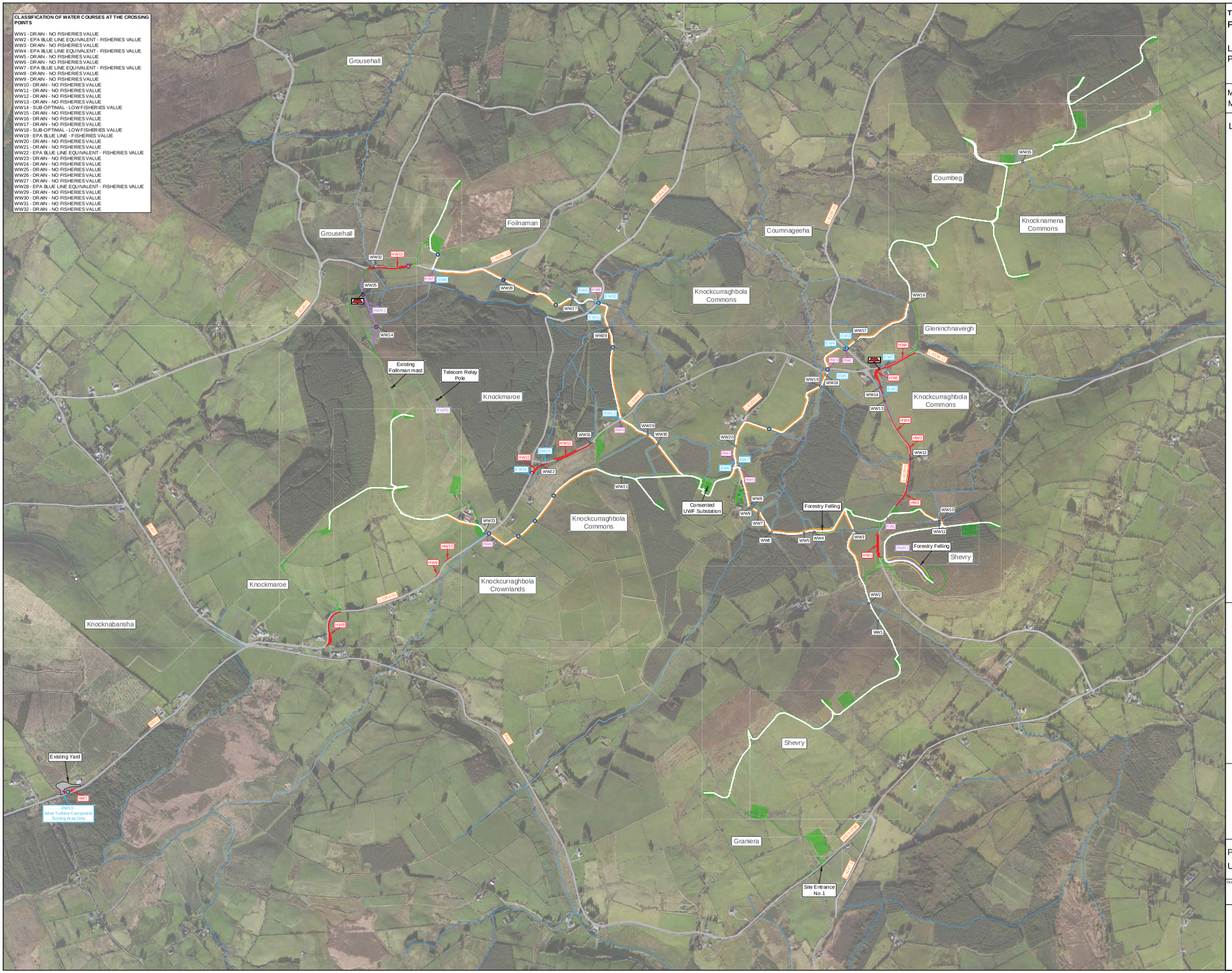
CLASSIFICATION OF WATER COURSES AT THE CROSSING POINTS
WW1 - DRAIN - NO FISHERIES VALUE
WW2 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW3 - DRAIN - NO FISHERIES VALUE
WW4 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW5 - DRAIN - NO FISHERIES VALUE
WW6 - DRAIN - NO FISHERIES VALUE
WW7 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW8 - DRAIN - NO FISHERIES VALUE
WW9 - DRAIN - NO FISHERIES VALUE
WW10 - DRAIN - NO FISHERIES VALUE
WW11 - DRAIN - NO FISHERIES VALUE
WW12 - DRAIN - NO FISHERIES VALUE
WW13 - DRAIN - NO FISHERIES VALUE
WW14 - SUB-OPTIMAL - LOW FISHERIES VALUE
WW15 - DRAIN - NO FISHERIES VALUE
WW16 - DRAIN - NO FISHERIES VALUE
WW17 - DRAIN - NO FISHERIES VALUE
WW18 - SUB-OPTIMAL - LOW FISHERIES VALUE
WW19 - EPA BLUE LINE - FISHERIES VALUE
WW20 - DRAIN - NO FISHERIES VALUE
WW21 - DRAIN - NO FISHERIES VALUE
WW22 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW23 - DRAIN - NO FISHERIES VALUE
WW24 - DRAIN - NO FISHERIES VALUE
WW25 - DRAIN - NO FISHERIES VALUE
WW26 - DRAIN - NO FISHERIES VALUE
WW27 - DRAIN - NO FISHERIES VALUE
WW28 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW29 - DRAIN - NO FISHERIES VALUE
WW30 - DRAIN - NO FISHERIES VALUE
WW31 - DRAIN - NO FISHERIES VALUE
WW32 - DRAIN - NO FISHERIES VALUE
Grousehall
Foilnaman
Coumnageeha
Coumbeg
Knocknamena Commons
Knockcurraghbola Commons
Glenlnchaveigh
Knockmaroe
Existing Foilnman mast
Telecom Relay Pole
Consented UWF Substation
Forestry Felling
Shevry
Knocknabansha
Knockcurraghbola Crownlands
Existing Yard
Site Entrance No.1
Graniera
Title:
Figure RW 5.2
Layout of UWF Related Works on Aerial Photography Mapping
Map Number:
Map 1 of 1
Legend:
PROPOSED
Haul Route Works
Haul Route Works Numbers (HW1 - HW13)
Realigned Windfarm Road
Realigned Windfarm Road Numbers (RWR1 - RWR3)
Internal Windfarm Cabling
Temporary Access Roads
Telecom Relay Pole
Water Crossings
Bat Crossing Locations
Site Entrance
Road Crossing (RW1 - RW9)
Forestry Felling
Temporary hedge/tree removal & pruning
Permanent hedge/tree removal
REFERENCE DOCUMENTS
EXISTING
Watercourse
Public Road
Public Road Number
Townlands
N
CONSENTED Planning Ref: ABP PL 22.243040
Consented Upperchurch Windfarm (UWF)
Project:
UWF Related Works (RW)
Drawn by: AB
Checked by: JB
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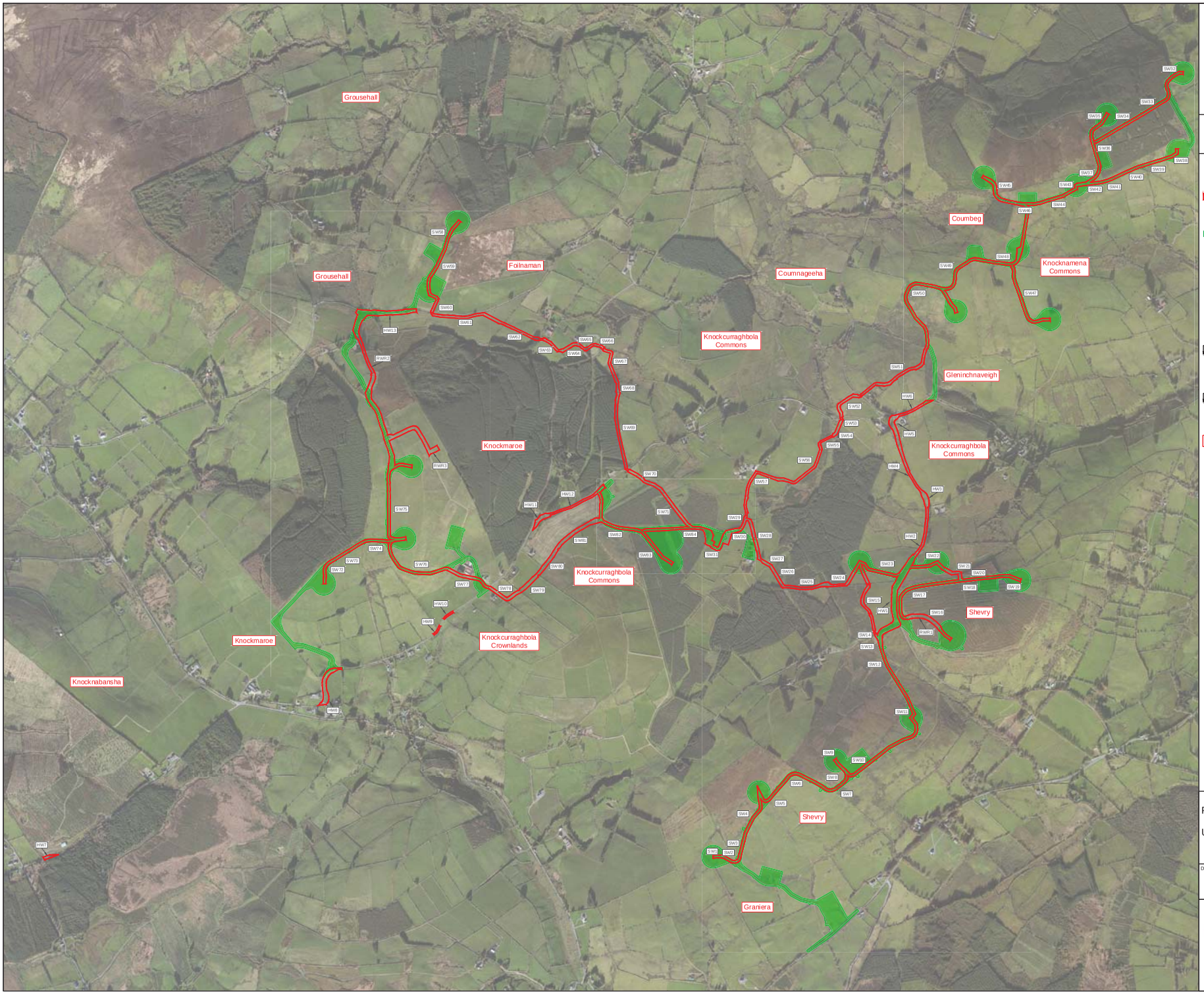

Title:
Figure RW 5.3

UWF Related Works Construction Works Area Boundary

Map Number:
Map 1 of 1

Legend:

- Construction Works Area
- Upperchurch Windfarm (Land requirement during construction phase)
- SW3 — Section numbers for Internal Windfarm Cabling (SW1 - SW84)
- HW2 — Section numbers for Haul Route Works (HW1 - HW13)
- RWR1 — Section numbers for Realigned Windfarm Roads (RWR1 - RWR3)
- Shevry — Townlands

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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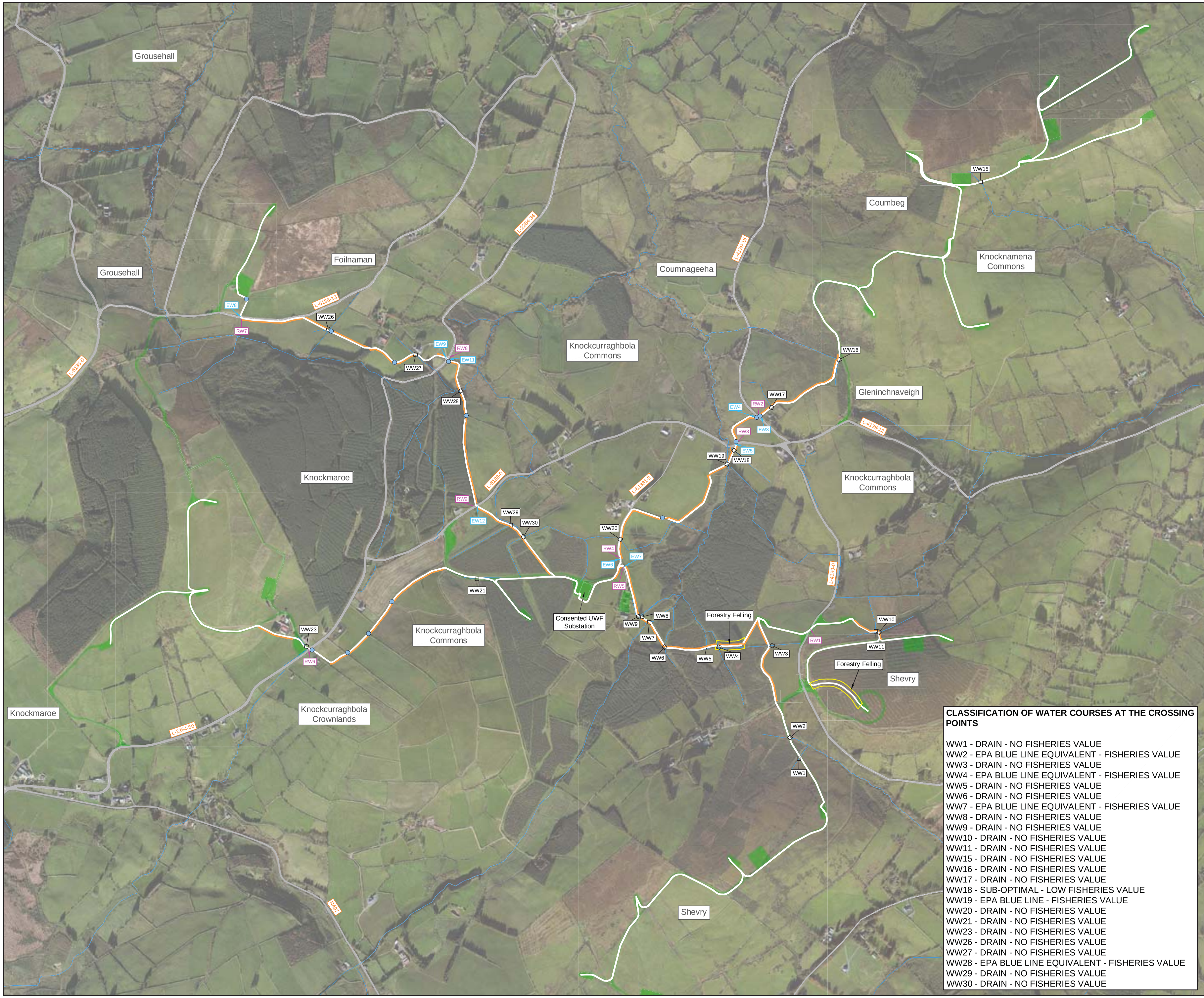

Title:
Figure RW 5.4

Layout of Internal Windfarm Cabling on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:
- Internal Windfarm Cabling
- Temporary Access Roads
- Water Crossings (WW6)
- Site Entrance Numbers (EW6)
- Road Crossing Numbers (RW2)
- Forestry Felling
- Temporary hedge/tree removal & pruning
- Watercourse
- Public Road
- Public Road Number (L-2166-0)
- Townlands (Shevry)
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

N

CLASSIFICATION OF WATER COURSES AT THE CROSSING POINTS

WW1 - DRAIN - NO FISHERIES VALUE
WW2 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW3 - DRAIN - NO FISHERIES VALUE
WW4 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW5 - DRAIN - NO FISHERIES VALUE
WW6 - DRAIN - NO FISHERIES VALUE
WW7 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW8 - DRAIN - NO FISHERIES VALUE
WW9 - DRAIN - NO FISHERIES VALUE
WW10 - DRAIN - NO FISHERIES VALUE
WW11 - DRAIN - NO FISHERIES VALUE
WW15 - DRAIN - NO FISHERIES VALUE
WW16 - DRAIN - NO FISHERIES VALUE
WW17 - DRAIN - NO FISHERIES VALUE
WW18 - SUB-OPTIMAL - LOW FISHERIES VALUE
WW19 - EPA BLUE LINE - FISHERIES VALUE
WW20 - DRAIN - NO FISHERIES VALUE
WW21 - DRAIN - NO FISHERIES VALUE
WW23 - DRAIN - NO FISHERIES VALUE
WW26 - DRAIN - NO FISHERIES VALUE
WW27 - DRAIN - NO FISHERIES VALUE
WW28 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW29 - DRAIN - NO FISHERIES VALUE
WW30 - DRAIN - NO FISHERIES VALUE

Project:
UWF Related Works (RW)

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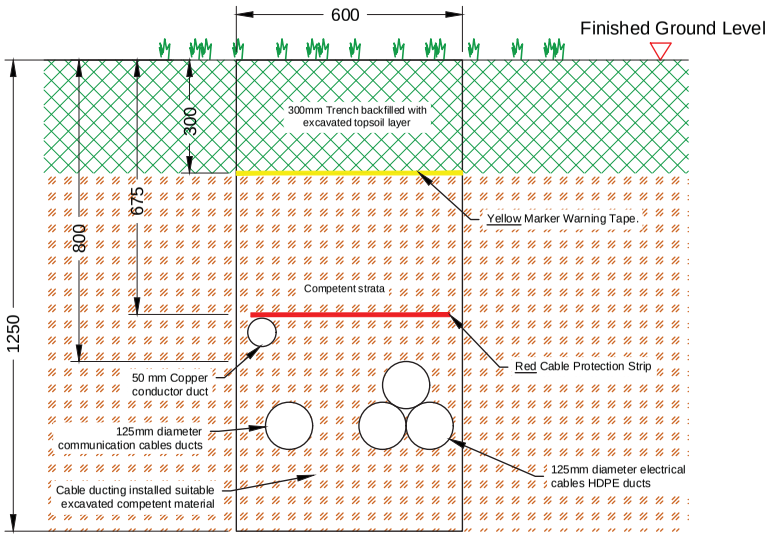
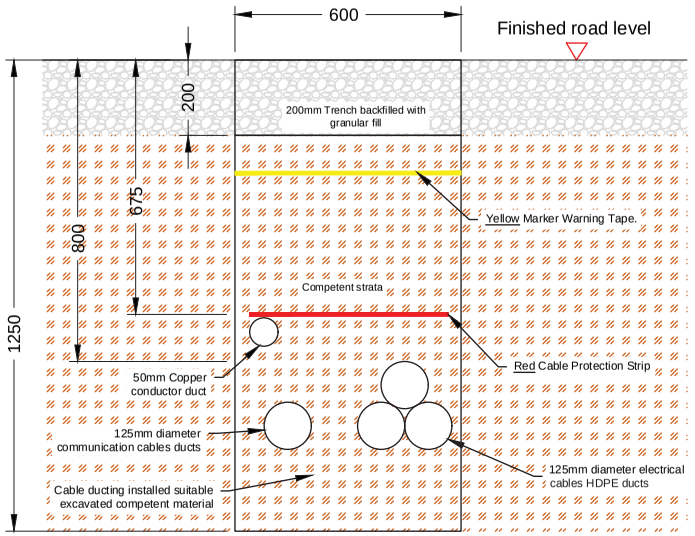
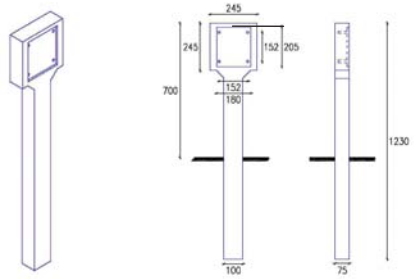


33kV CABLES TRENCH - TYPICAL SECTION THROUGH AGRICULTURAL LANDS AND FORESTRY LANDS



33kV CABLES TRENCH - TYPICAL SECTION THROUGH REALIGNED WINDFARM ROADS OR CONCENTED UWF WINDFARM ROADS



3D View **Front Elevation** **Side Elevation**

TYPICAL MARKER POST AND MARKER PLATE DIMENSIONS

Title:

Figure RW 5.5

Cross Sections of Internal Windfarm Cables Trench

Map Number:

N/A

Note :
Drawings not to scale. For illustration purposes only

REFERENCE DOCUMENTS

Designed in conjunction with

Project:

UWF Related Works (RW)

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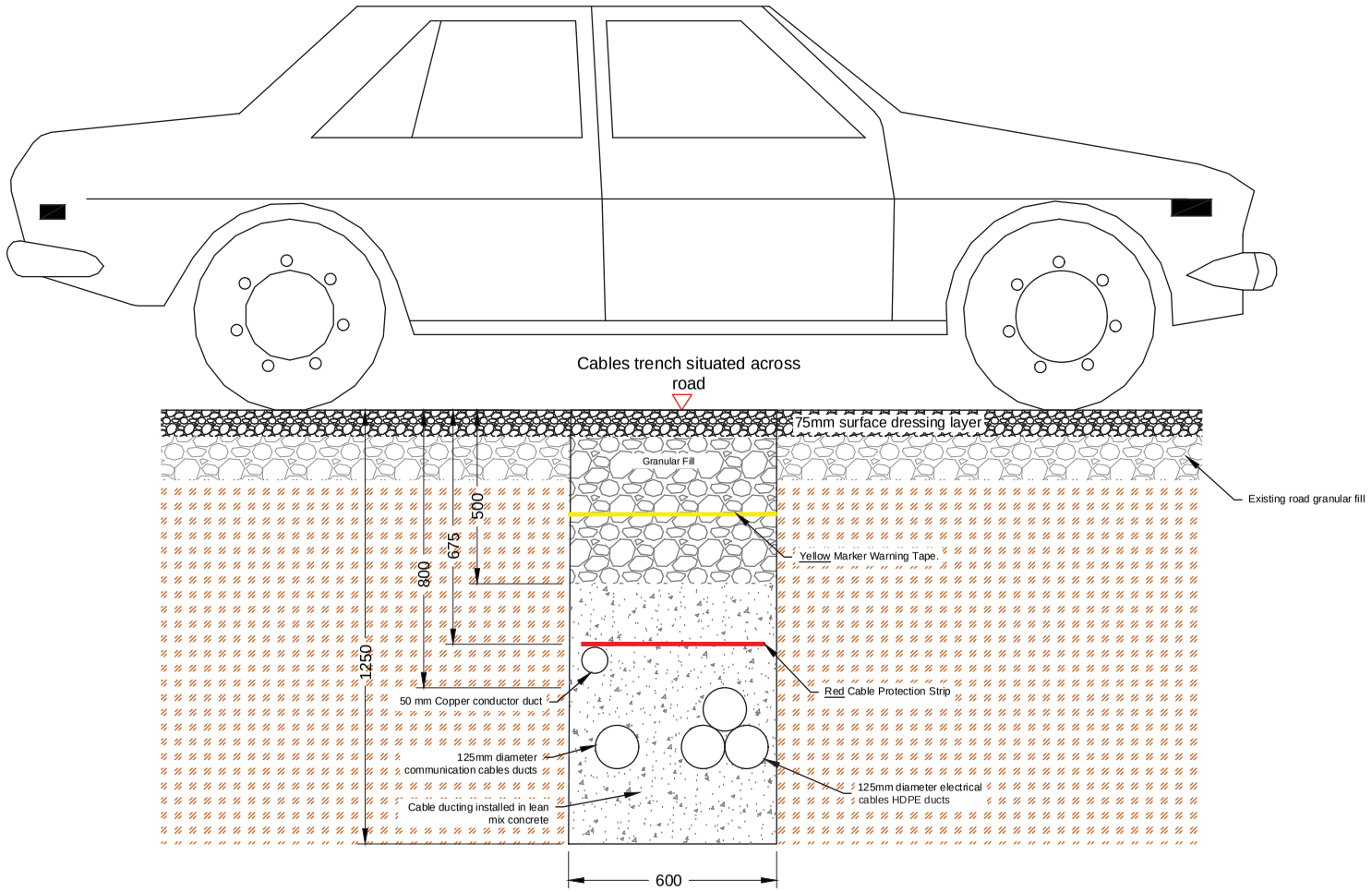

33kV TRENCH ACROSS PUBLIC ROADS (RW1 TO RW9)

Title:

Figure RW 5.6

Cross Section of Internal Windfarm Cabling in Public Road Pavement

Map Number:

N/A

Note :
Drawings not to scale. For illustration purposes only

REFERENCE DOCUMENTS

Designed in conjunction with

tli GROUP

Project:

UWF Related Works (RW)

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Title:
Figure RW 5.7

Layout of Realigned Windfarm Roads on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:

- Realigned Windfarm Road
- Realigned Windfarm Road Numbers (RWR1 - RWR3)
- Water Crossings
- Bat Crossing Locations
- Forestry Felling
- Permanent hedge/tree removal & pruning
- Watercourse
- Public Road
- Public Road Number
- Townlands
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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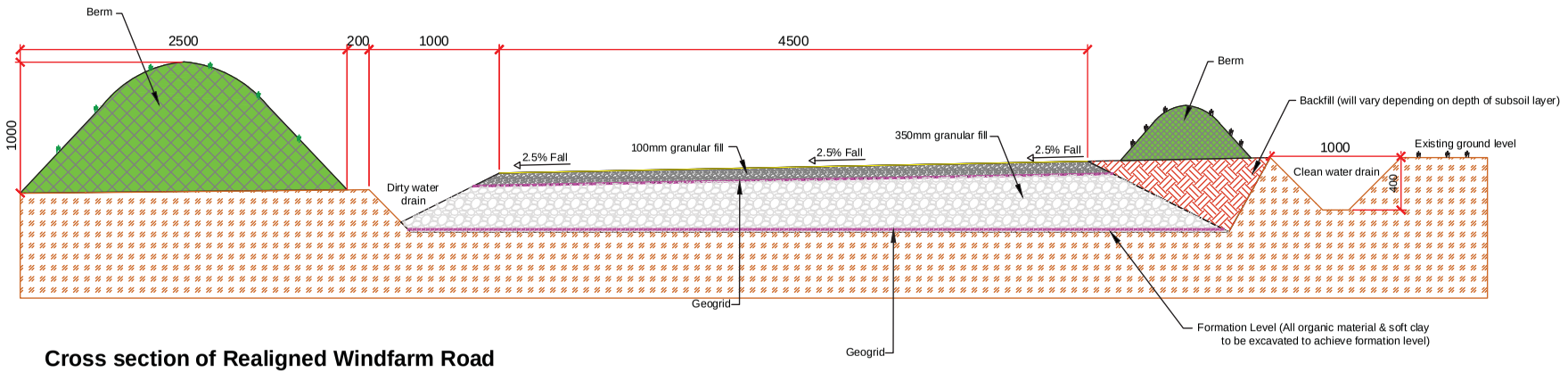

Cross section of Realigned Windfarm Road

Title:

Figure RW 5.8

Cross Section of Realigned Windfarm Road

Map Number:

N/A

Note :
Drawings not to scale. For illustration purposes only

REFERENCE DOCUMENTS

Project:

UWF Related Works (RW)

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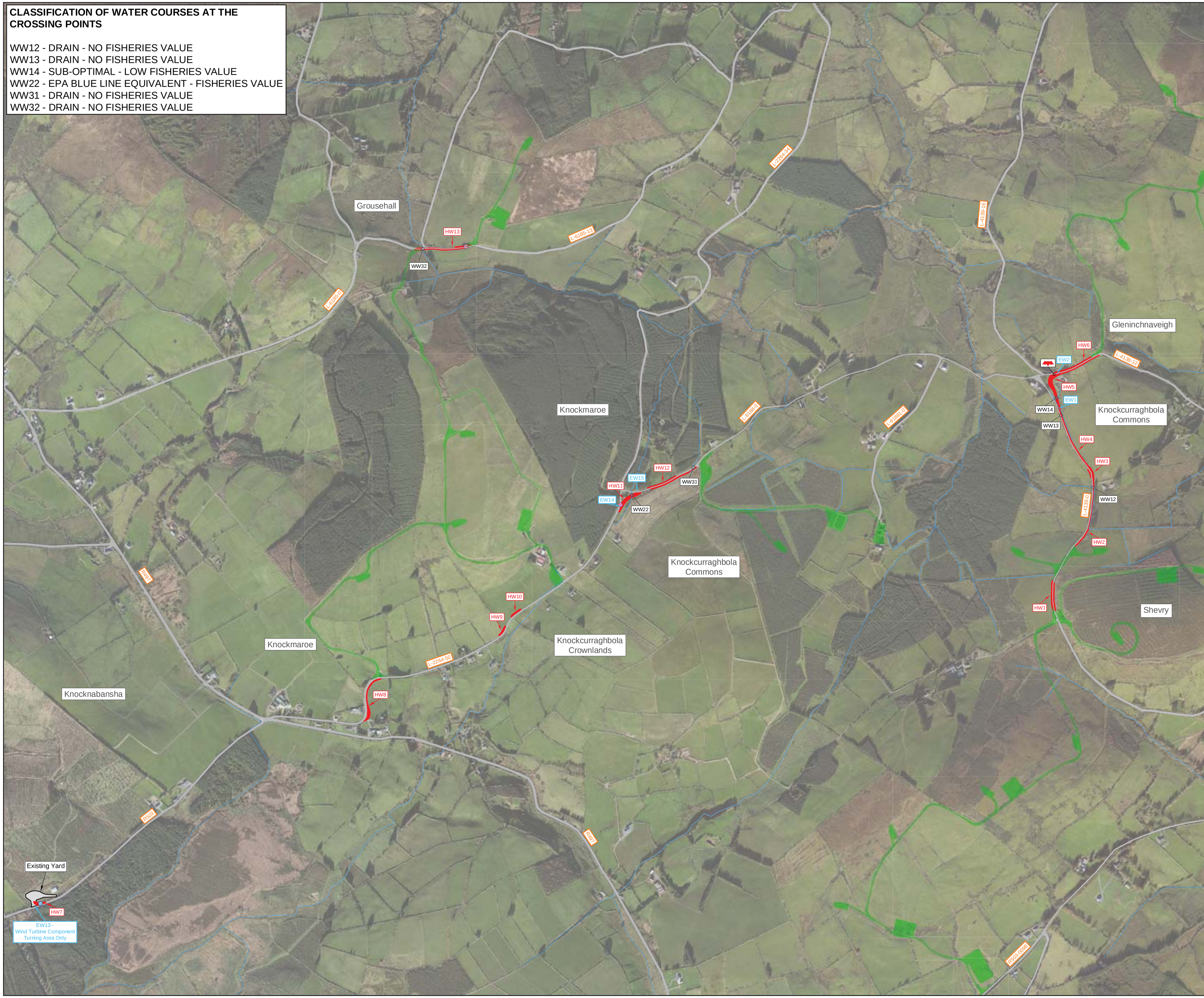

Title:
Figure RW 5.9

Layout of Haul Route Works on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:

- Haul Route Works
- Haul Route Works Numbers (HW1 - HW13)
- Water Crossings
- Bat Crossing Locations
- Site Entrances
- Temporary hedge/tree removal & pruning
- Permanent hedge/tree removal
- Watercourse
- Public Road
- Public Road Number
- Townlands
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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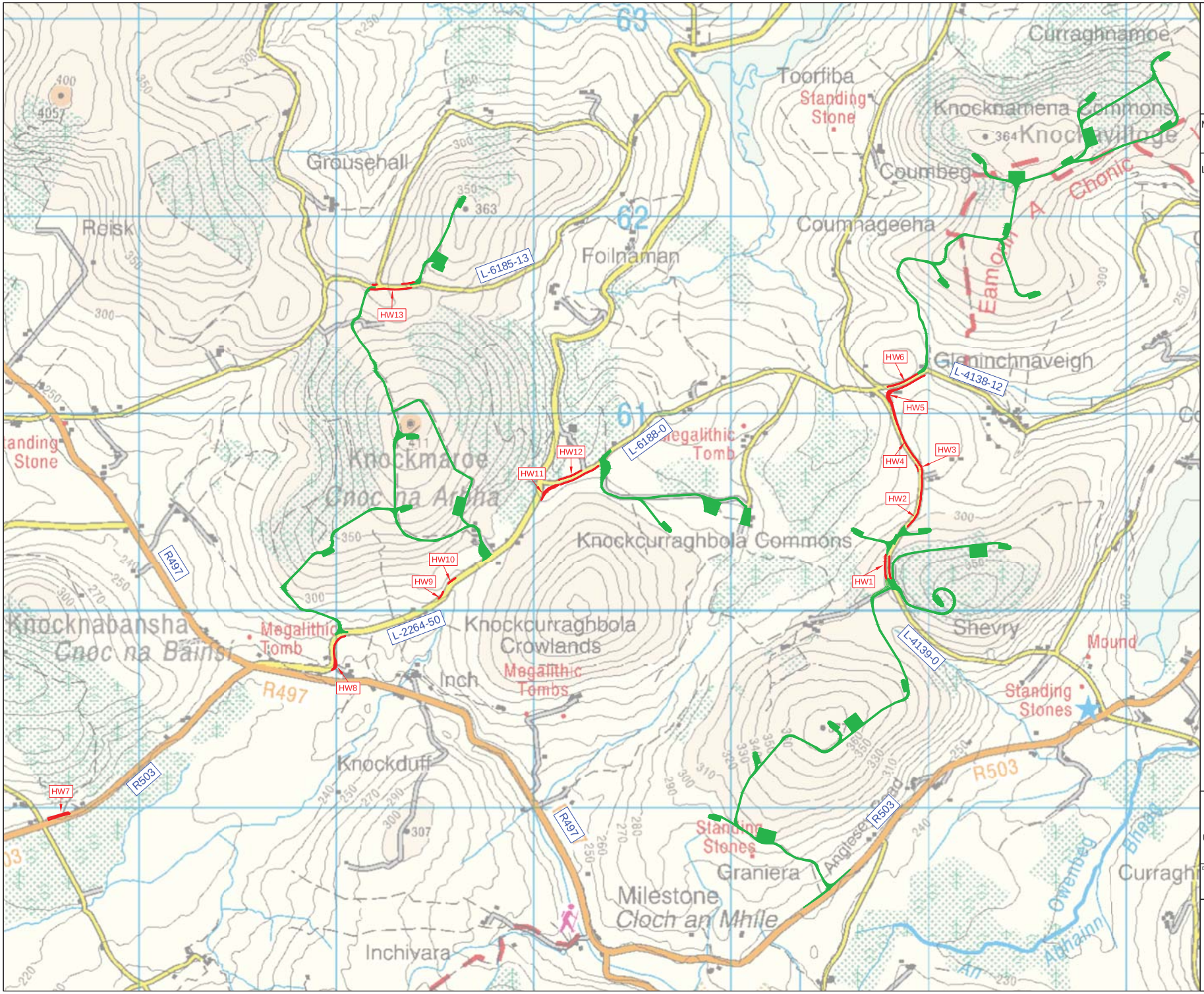

Title:
Figure RW 5.10

Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Map Number:
Map Overview

Legend:

- HW6 — Haul Route Works ID
- Haul Route Works
- Upperchurch Windfarm
- R503 — Public Road Numbers

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn by:	Checked by:	Date:	Sheet Size:
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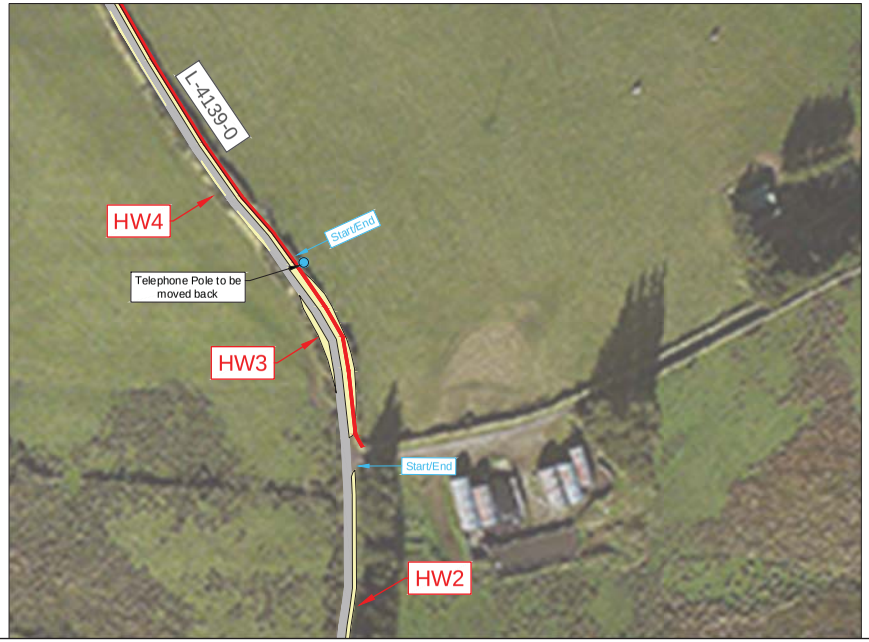

Title:

Figure RW 5.10

Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Map Number:
Map 1 of 3

Legend:

- Move Telephone Pole
- Road Widening
- Public Road
- Temporary Removal of Roadside Boundary
- L-4139-0 Public Road Number
- Upperchurch Windfarm

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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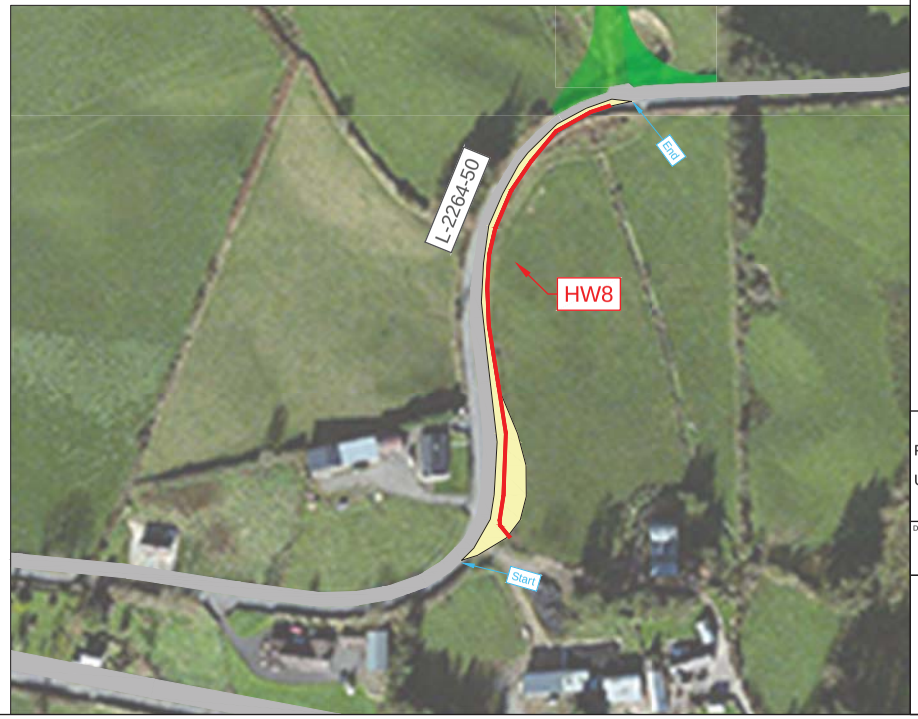

Title:
Figure RW 5.10

Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Map Number:
Map 2 of 3

Legend:

- Move Telephone Pole
- Road Widening
- Public Road
- Temporary Removal of Roadside Boundary
- L-4139-0 Public Road Number
- Upperchurch Windfarm

REFERENCE DOCUMENTS

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Project:
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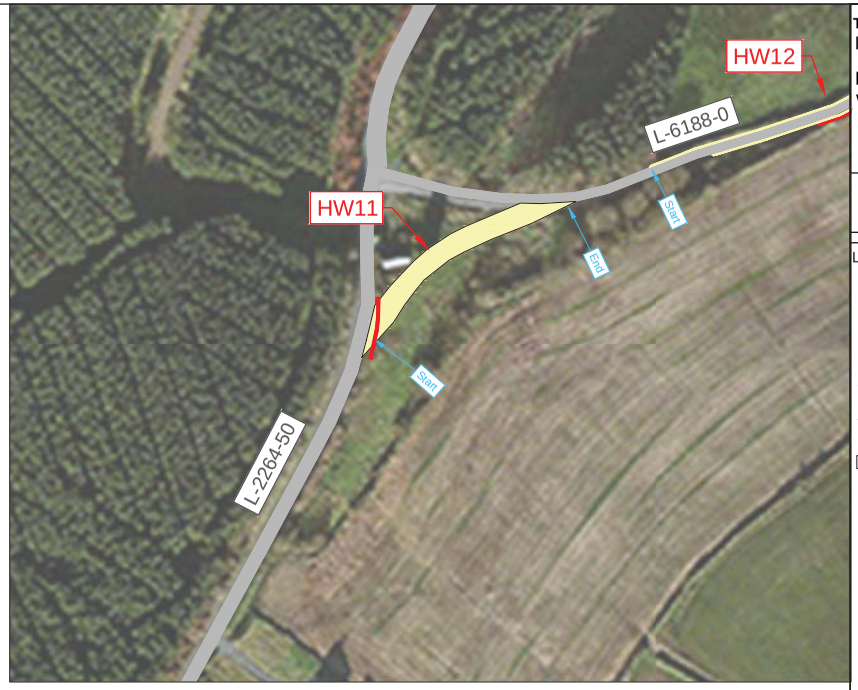

Title:
Figure RW 5.10

Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Map Number:
Map 3 of 3

Legend:

- Move Telephone Pole
- Road Widening
- Public Road
- Temporary Removal of Roadside Boundary
- L-4139-0 Public Road Number
- Upperchurch Windfarm

REFERENCE DOCUMENTS

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Title:

Figure RW 5.11

Location of the Telecom Relay Pole on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:

- Telecom Relay Pole and Compound
- Realigned Windfarm Road (RWR3)
- Public Road
- L-2166-0 Public Road Number
- Knockmaroe Townland
- Upperchurch Windfarm (UWF)

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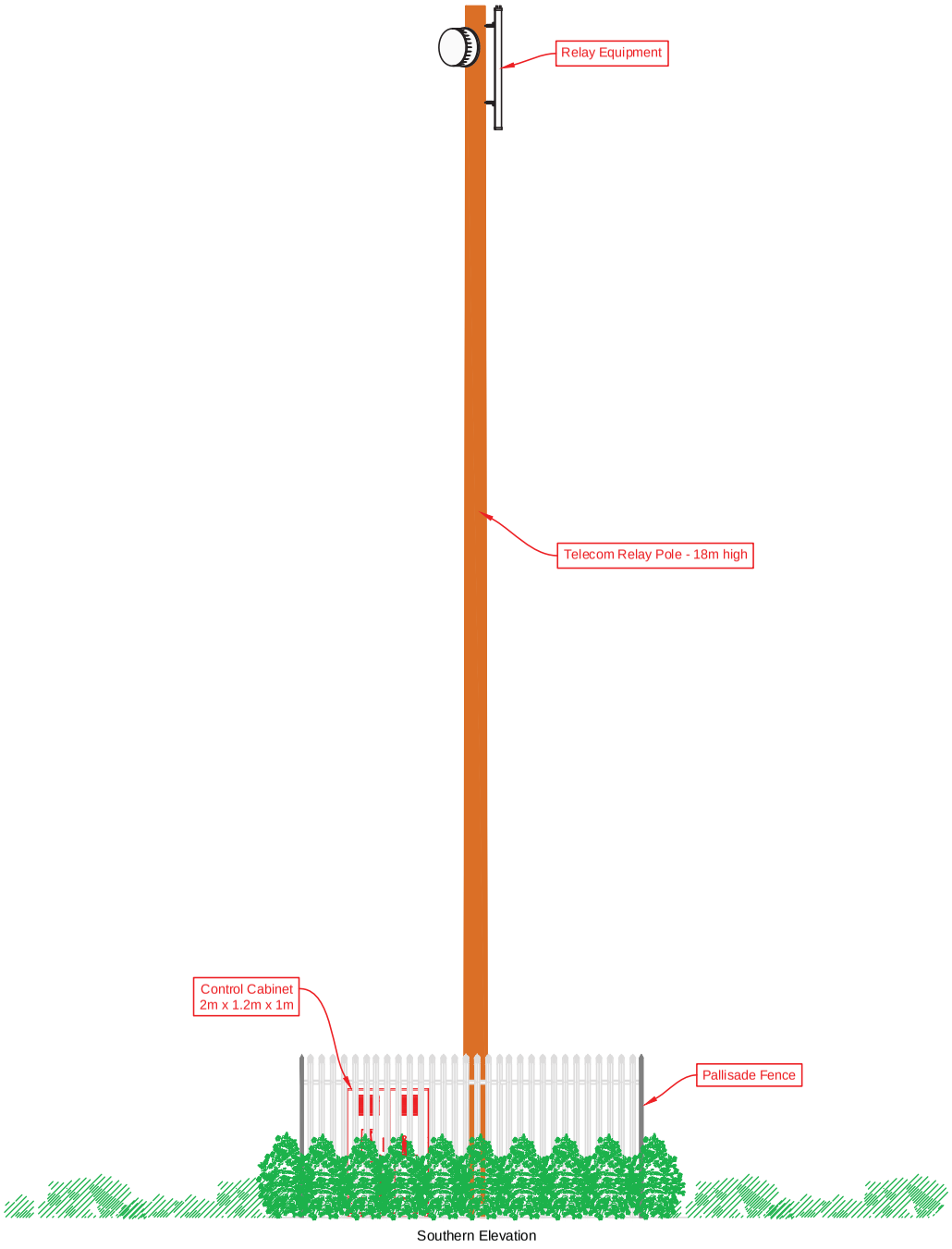
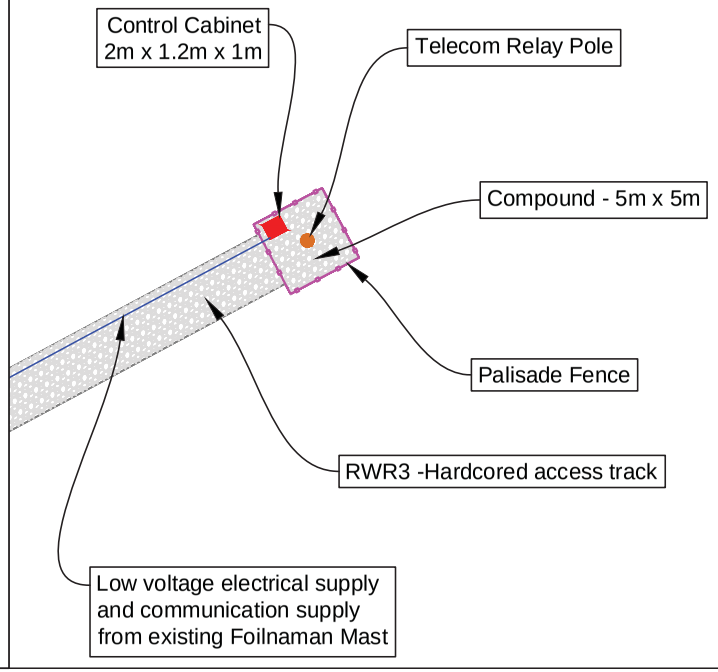


Southern Elevation



Title:

Figure RW 5.12

Plan and Elevation of Telecom Relay Pole and Compound

Map Number:

N/A

Note :
Drawings not to scale. For illustration purposes only

REFERENCE DOCUMENTS

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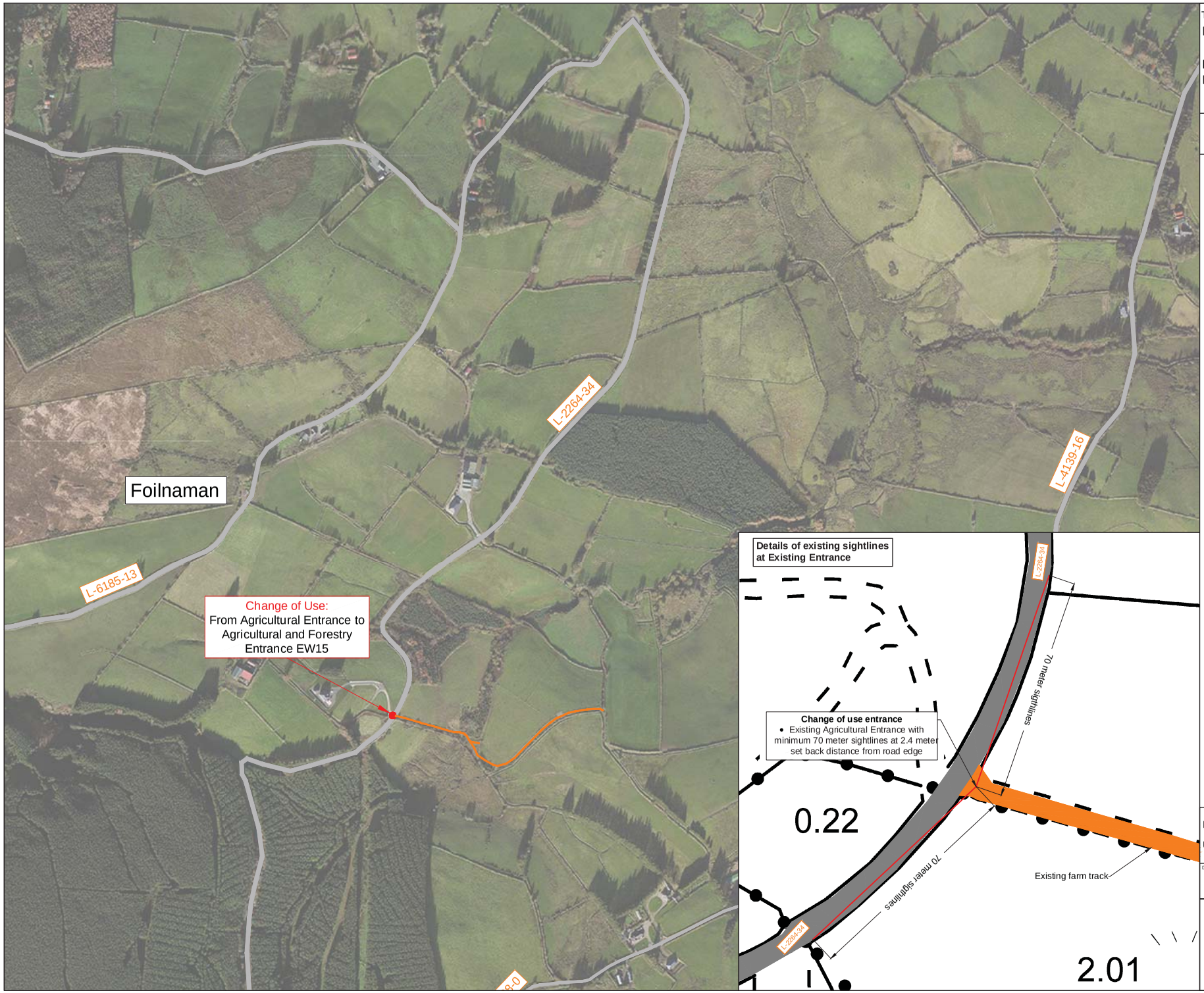

Title:

Figure **RW 5.13**

Location of "Change of Use at Existing Entrance" (including sightlines)

Map Number:

Map 1 of 1

Legend:

- Location of the change of use from Agricultural Entrance to Agricultural and Forestry Entrance
- Public Road
- Existing farm track
- L-2166-0 Public Road Number
- Foilnaman Townland
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

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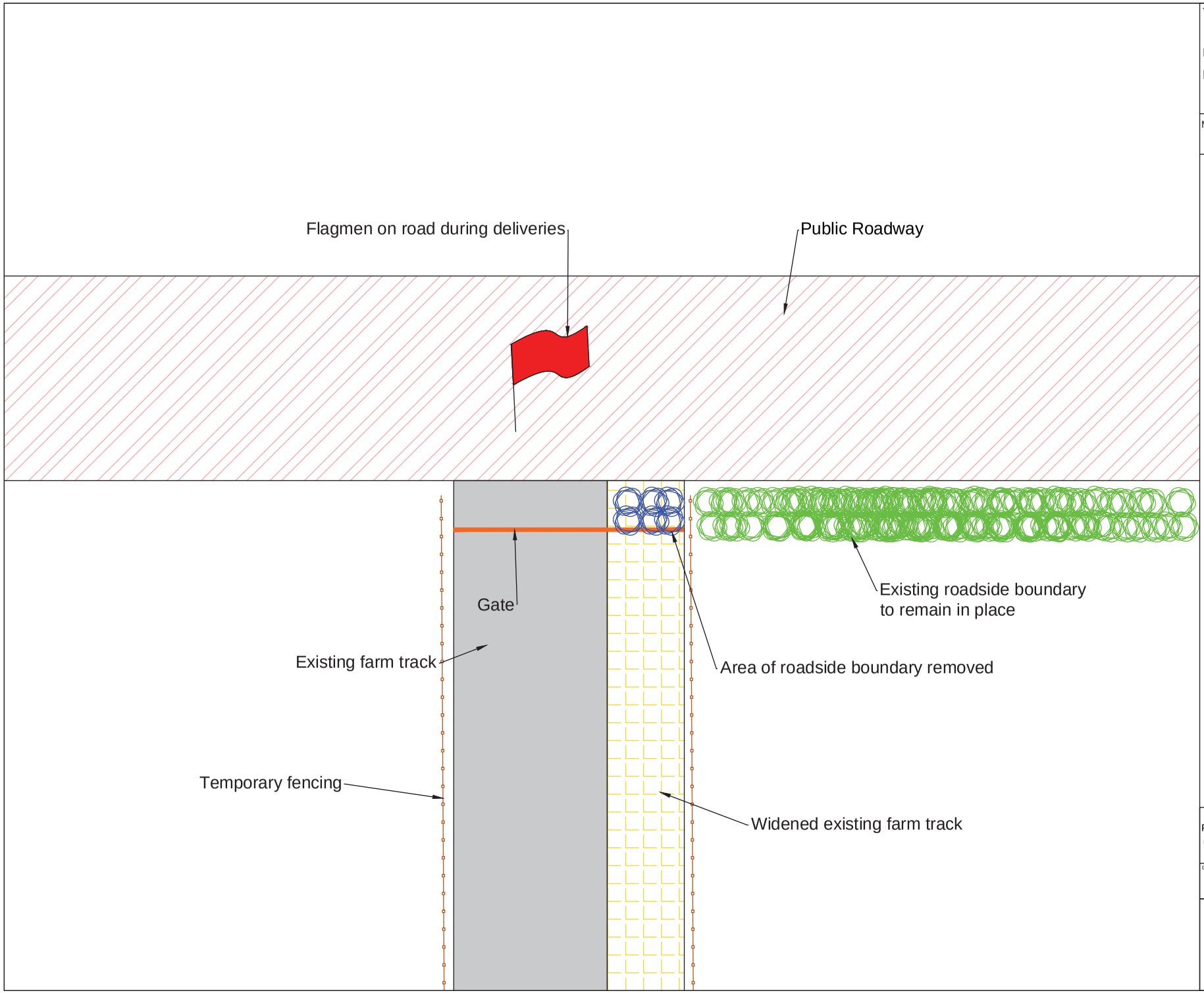

Title:

Figure RW 5.14

Plan View of Typical Temporary Site Entrance

Map Number:

N/A

Note :
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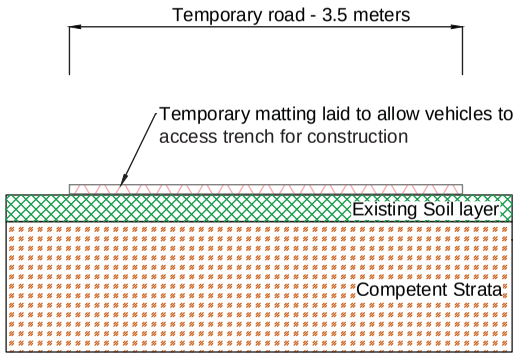
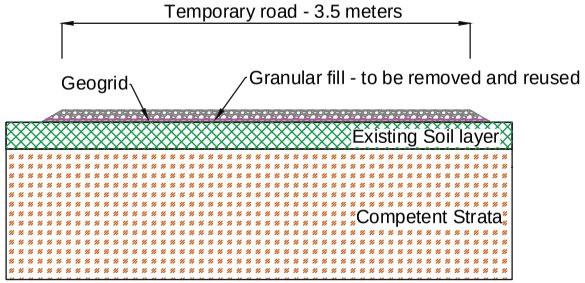
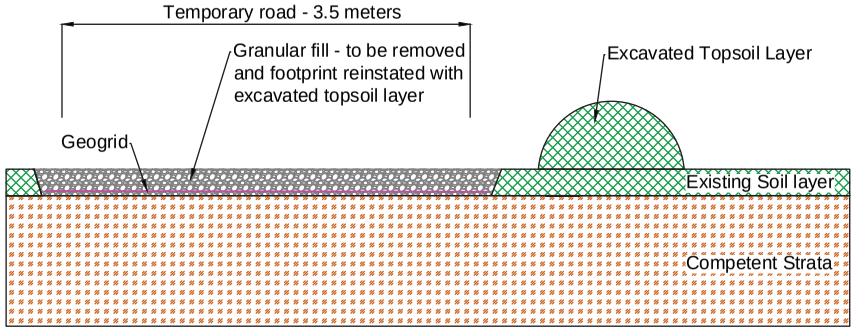


Cross Section of temporary access road - Matting



Cross Section of temporary access road - Floating road



Cross Section of temporary access road - Excavate and fill

Title:

Figure RW 5.15

Cross Section of Temporary Access Roads

Map Number:

N/A

Note :
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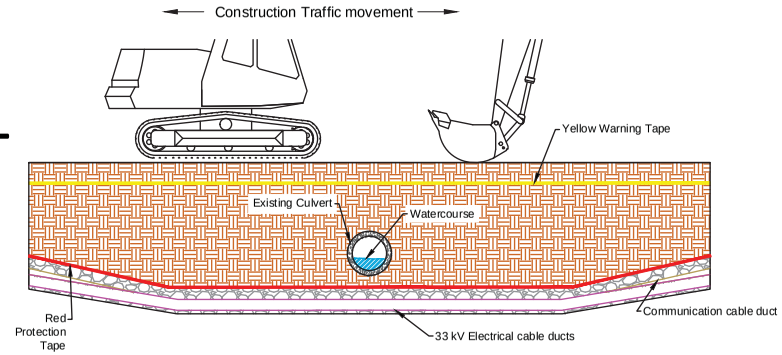
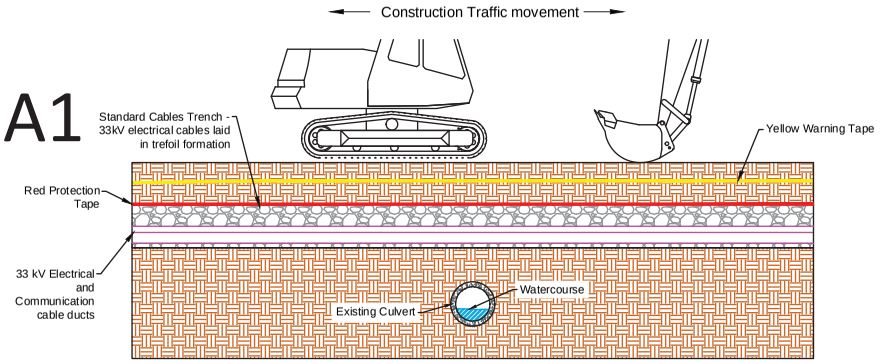
A1



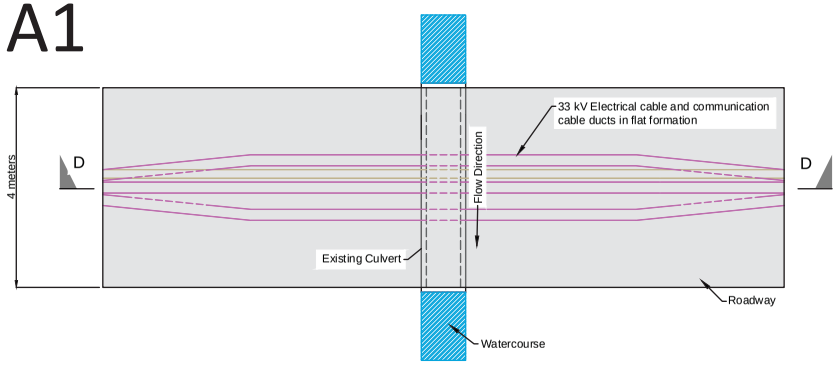
Cross Section D - D of watercourse crossing type A1 - Cables trench under existing structure

A1



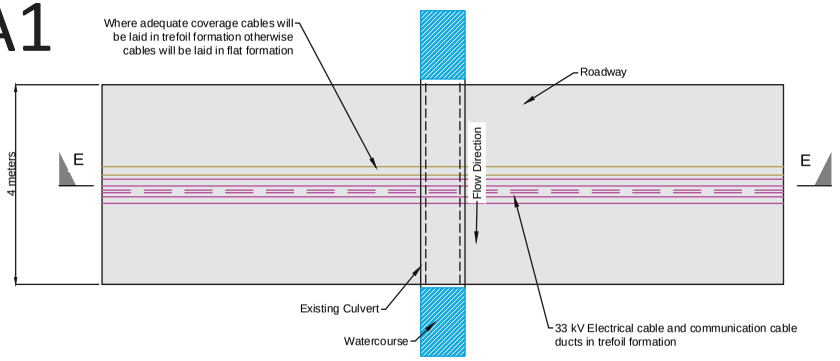
Cross Section E - E of watercourse crossing type A1 - Cables trench above existing structure

A1



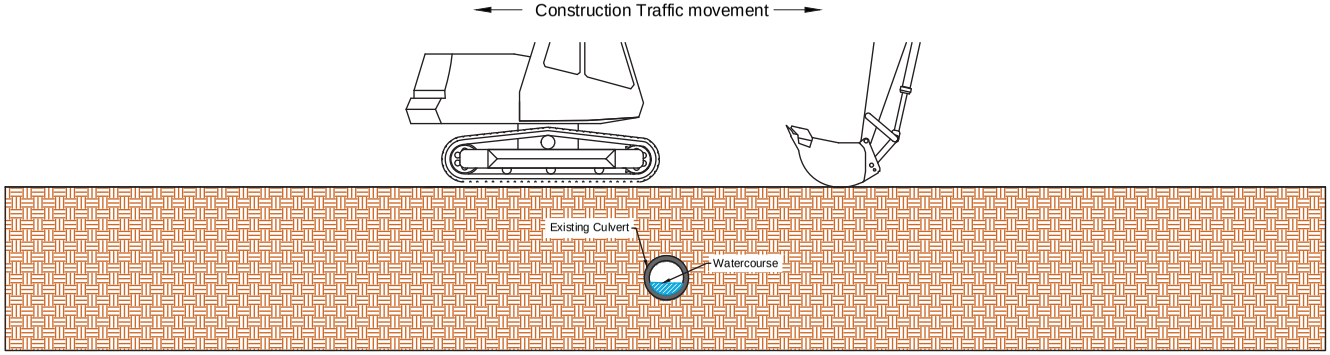
Plan View of watercourse crossing type A1 - Cable ducts laid in flat formation under existing structure
Excavation within 500mm of structure will be done by hand.
(No Instream works required)

A1



Plan View of watercourse crossing type A1 - Cable ducts laid in trefoil formation over existing structure
Excavation within 500mm of structure will be done by hand.
(No Instream works required)

A2



Cross Section of watercourse crossing type A2 - Traffic Movement only over structure (No instream works required)

Title:

Figure RW 5.16

Watercourse Crossing Type A1 & A2 - UWF Related Works at Existing Crossing Structure

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type A1 (Total 5)

Class 4 - Drain - No Fisheries Value: WW6, WW11, WW23, WW29, WW30

Description of Crossing Type A1

- Existing crossing structure
- No Instream Works
- Cable and Traffic crossing
- No works to existing watercourse crossing structure
- 33kV Cables and Ducting installed over or under existing structure

Watercourse Crossing Type A2 (Total

Class 4 - Drain - No Fisheries Value: WW32

Description of Crossing Type A2

- Existing crossing structure
- No Instream Works
- Traffic crossing only
- No works to existing watercourse crossing structure
- No Cables or Ducting installed

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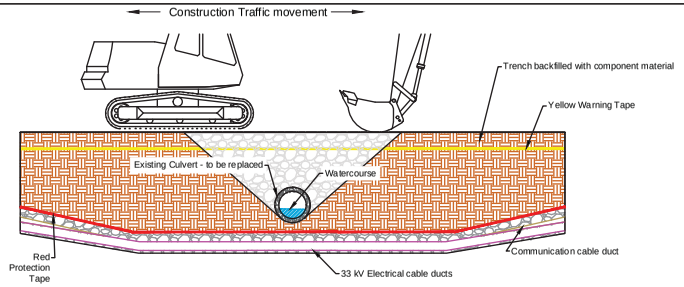
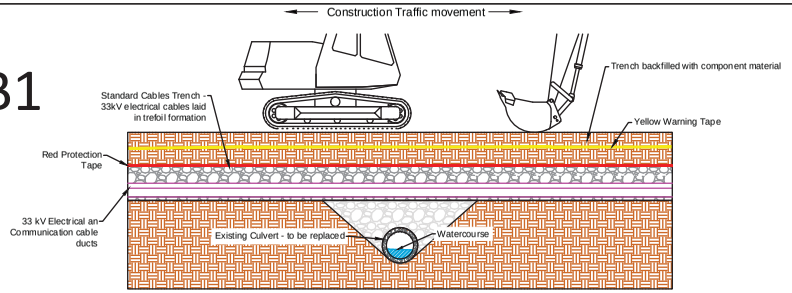
ECOPOWER

B1



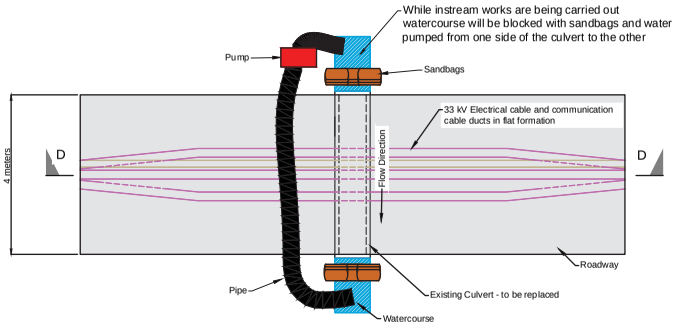
Cross Section D - D of watercourse crossing type B1 - Cables trench under replaced structure

B1



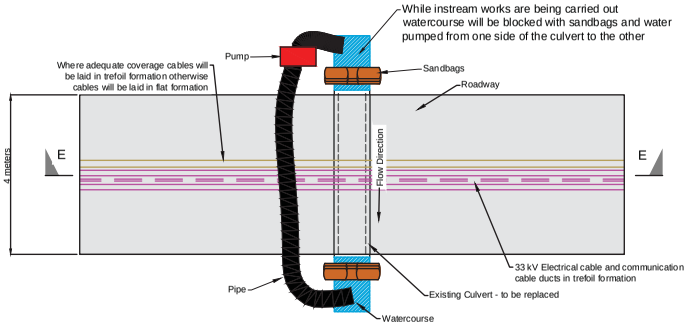
Cross Section E - E of watercourse crossing type B1 - Cables trench over replaced structure

B1

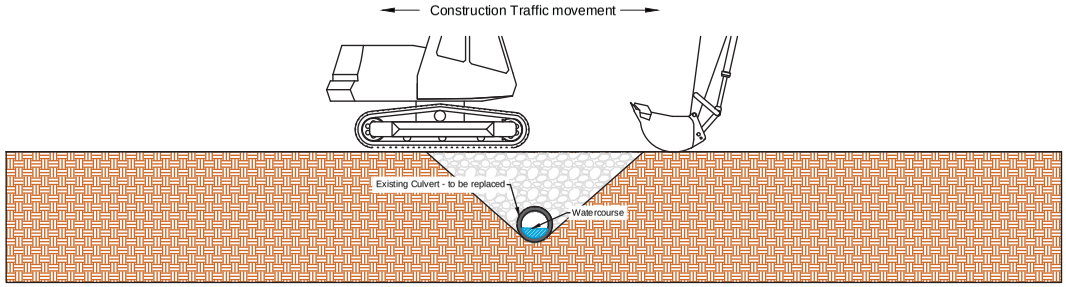


Plan View of watercourse crossing type B1 - Cable ducts laid in flat formation under replaced structure

B1

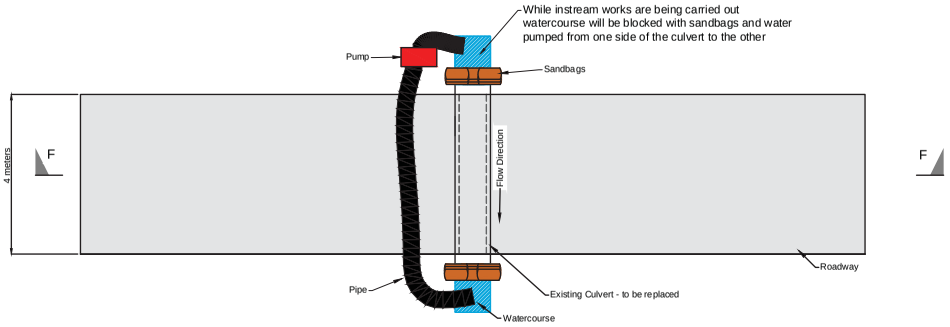


Plan View of watercourse crossing type B1 - Cable ducts laid in trefoil formation over replaced structure



Cross Section F - F of watercourse crossing type B2 - Construction Traffic crossing replaced existing structure

B2



B2

Plan view of watercourse crossing type B2 - Construction Traffic crossing replaced existing structure

Note:

The damming and over-pumping method will typically be carried out at watercourses where a permanent crossing structure is being installed or where an existing culvert is being replaced.

All permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be at least 900mm in diameter regardless of the anticipated flood flow. 900mm culverts will be set into the river bed to a depth of 300mm and 1200mm culverts will be set in 500mm.

Title:

Figure RW 5.17

Watercourse Crossing Type B1 & B2 - UWF Related Works at Replaced and/or widened Crossing Structure

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type B1 (Total 1)

Class 4 - Drain - No Fisheries Value: WW21

Description of Crossing Type B1

- Existing crossing structure
- Instream Works
- Cable and Traffic crossing
- Replacement of existing watercourse crossing structure
- 33kV Cables and Ducting installed over or under replaced existing crossing structure

Watercourse Crossing Type B2 (Total 2)

Class 4 - Drain - No Fisheries Value: WW12, WW31

Description of Crossing Type B2

- Existing crossing structure
- Instream Works
- Traffic crossing only
- Replacement of existing watercourse crossing structure
- No Cables or Ducting installed

REFERENCE DOCUMENTS

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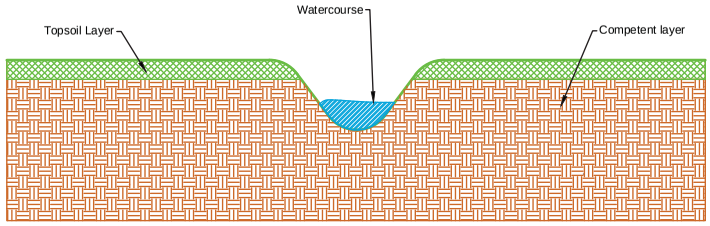
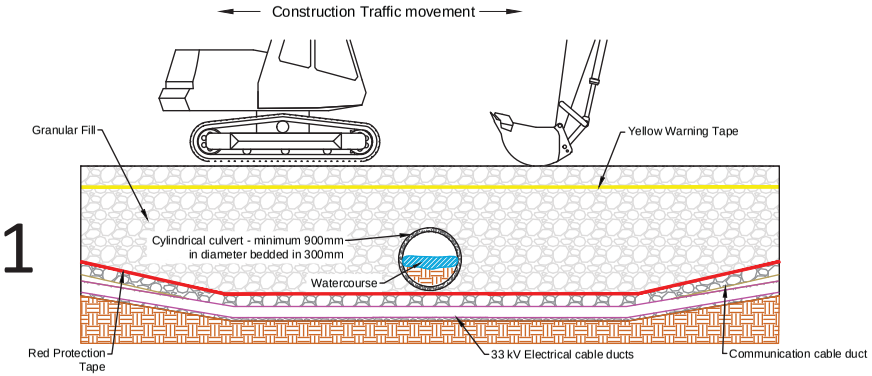
C1

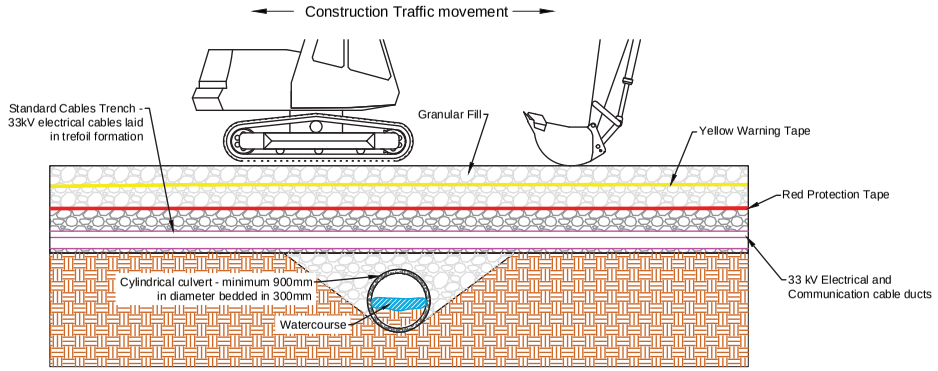


Cross Section View D - D of watercourse crossing C1 - Existing watercourse

C1



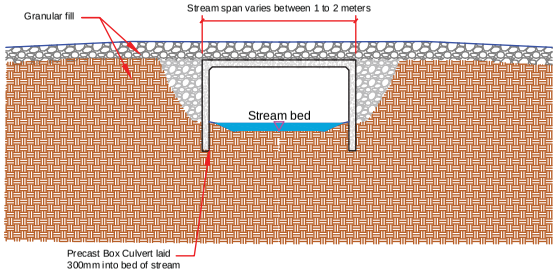
Cross Section View of watercourse crossing types C1 - Cables trench under new permanent crossing structure



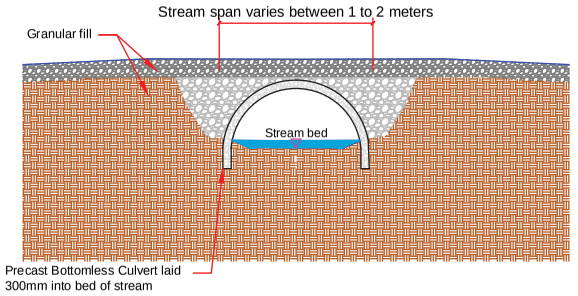
C1

Cross Section View of watercourse crossing C1 - Cables trench over new permanent crossing structure

(Watercourse dammed and over-pumped)



Permanent Crossing structure - Bottomless Box Culvert



Permanent Crossing structure - Bottomless Box Culvert

Note:

The damming and over-pumping method will typically be carried out at watercourses where a permanent crossing structure is being installed or where an existing culvert is being replaced.

All permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be at least 900mm in diameter regardless of the anticipated flood flow. 900mm culverts will be set into the river bed to a depth of 300mm and 1200mm culverts will be set in 500mm.

Title:

Figure RW 5.18

Watercourse Crossing Type C1 - New Permanent Structure

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type C1 (Total 5)

Class 2 - EPA Blue Line Equivalent - Fisheries Value: WW4

Class 4 - Drain - No Fisheries Value: WW1, WW15, WW,24, WW25

Description of Crossing Type C1

- No existing crossing structure
- Instream Works
- Cable and Traffic crossing
- Installation of New Permanent watercourse crossing structure
- 33kV Cables and Ducting installed over or under new permanent watercourse crossing structure

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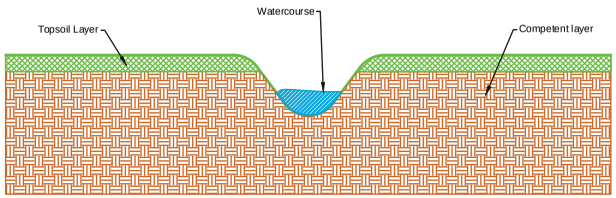
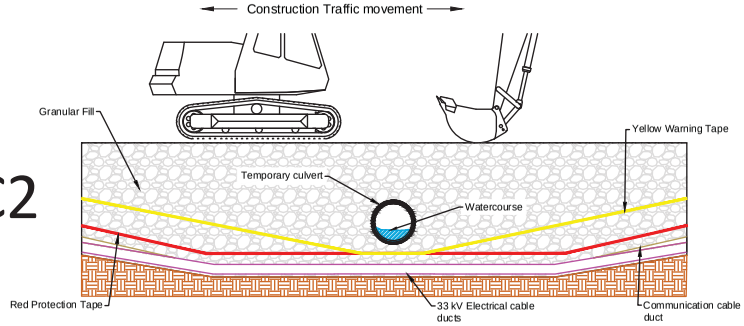
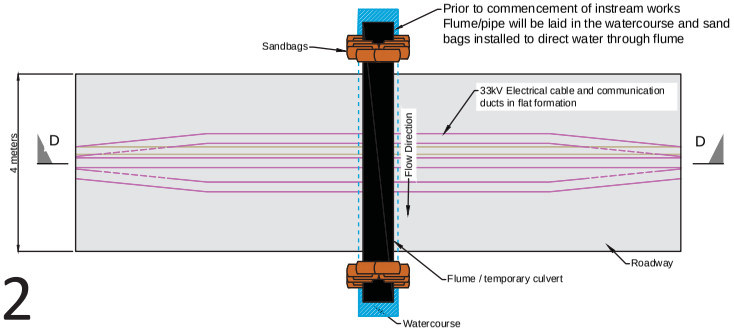
C2



Cross Section View D - D of watercourse crossing C2 - Existing watercourse



Cross Section View D - D of watercourse crossing types C2 -
Cables trench under new temporary crossing structure



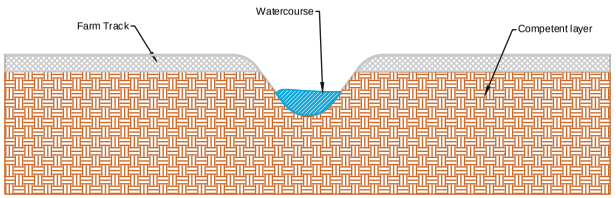
Plan View of watercourse crossing C2 - Cables trench under new temporary crossing structure

(Watercourse dammed and flume installed during instream works)

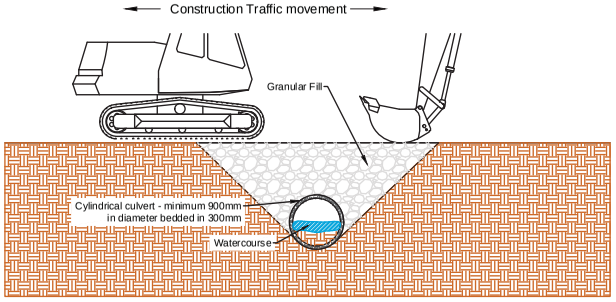
Note:

The flume/pipe watercourse crossing method will typically be used where a temporary watercourse crossing structure is proposed.

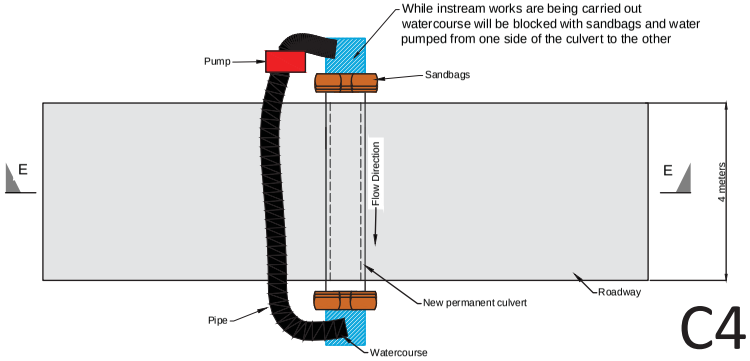
C4



Cross Section View D - D of watercourse crossing W90 - Existing watercourse



Cross Section View E - E of watercourse crossing types C4 -
Traffic over new permanent crossing structure



Plan of watercourse crossing types C4 - Traffic over new permanent crossing structure

(Watercourse dammed and over pumped during instream works)

Note:

The damming and over-pumping method will typically be carried out at watercourses where a permanent crossing structure is being installed or where an existing culvert is being replaced.

All permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be at least 900mm in diameter regardless of the anticipated flood flow. 900mm culverts will be set into the river bed to a depth of 300mm and 1200mm culverts will be set in 500mm

Title:

Figure RW 5.19

Watercourse Crossing Type C2 - New Temporary Structure & Watercourse Crossing Type C4 - New Permanent Structure

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type C2 (Total 5)

Class 2 -EPA Blue Line Equivalent - Fisheries Value: WW7

Class 4 - Drain - No Fisheries Value: WW5, WW8, WW16, WW27

Description of Crossing Type C2

- No existing crossing structure
- Instream Works
- Cable and Traffic crossing
- Installation of New Temporary watercourse crossing structure
- 33kV Cables and Ducting installed under new temporary watercourse crossing structure

Watercourse Crossing Type C4 (Total 4)

Class 2 - EPA Blue Line Equivalent - Fisheries Value: WW22

Class 3 - Sub-Optimal - Low Fisheries Value: WW14

Class 4 - Drain - No Fisheries Value: WW13

Description of Crossing Type C4

- No existing crossing structure
- Instream Works
- Traffic crossing only
- Installation of New Permanent watercourse crossing structure
- No Cables or Ducting installed

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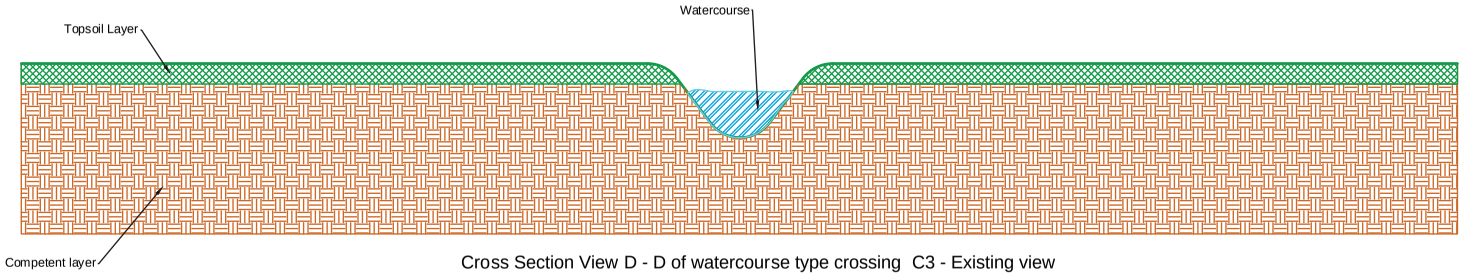
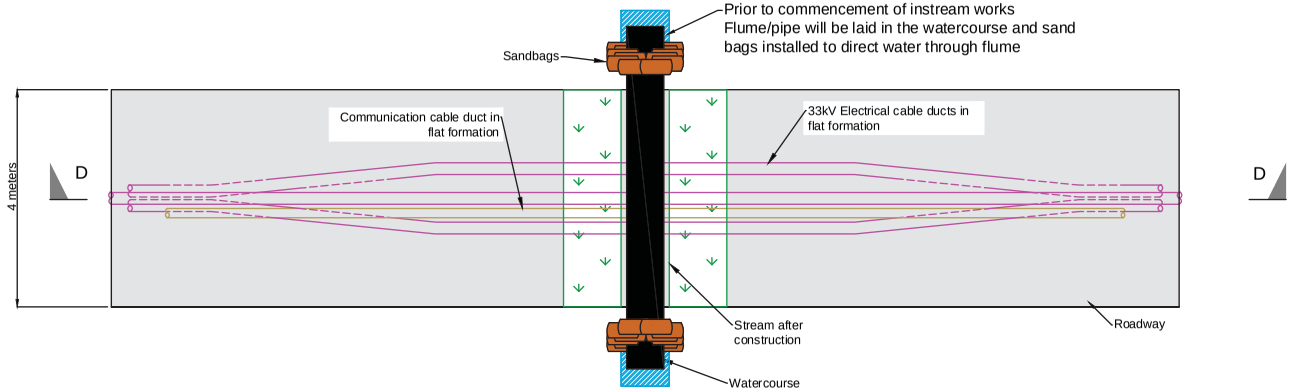
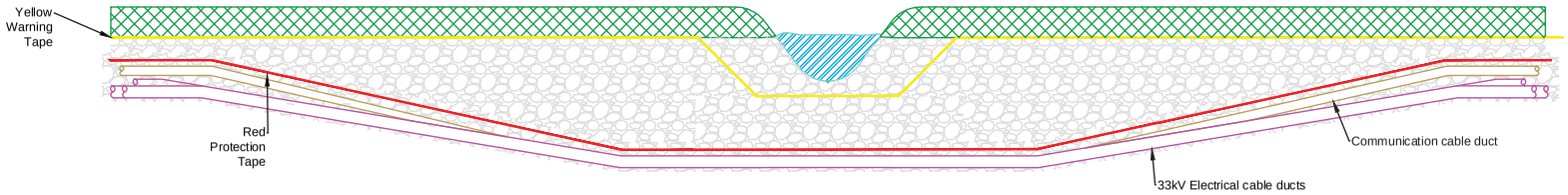


Cross Section View D - D of watercourse type crossing C3 - Existing view



Plan View of watercourse crossing type C3 - Cables trench across watercourse

(Watercourse dammed and over-pumped)



Cross Section D - D of watercourse crossing type C3 - Cables trench across watercourse

Note:

The damming and over-pumping method will also be used at cable-only crossings where flows are very low at the time of the proposed crossing works.

The flume/pipe watercourse crossing method will also be used or at cable-only crossings where flows are too large to be managed by the dam and over pump method at the time of the proposed crossing works.

Title:

Figure RW 5.20

Watercourse Crossing Type C3 - Internal Windfarm Cable trench and ducting only

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type C3 (Total 9)

Class 1 - EPA Blue Line - Fisheries Value: WW19

Class 2 - EPA Blue Line Equivalent - Fisheries Value: WW28

Class 3 - Sub-Optimal - Low Fisheries Value: WW18

Class 4 - Drain - No Fisheries Value: WW3, WW9, WW10, WW17, WW20, WW26

Description of Crossing Type C3

- No existing crossing structure
- Instream Works
- Cable crossing only
- No watercourse crossing structure required
- 33kV Cables and Ducting installed under watercourse

REFERENCE DOCUMENTS

HYDRO ENVIRONMENTAL SERVICES

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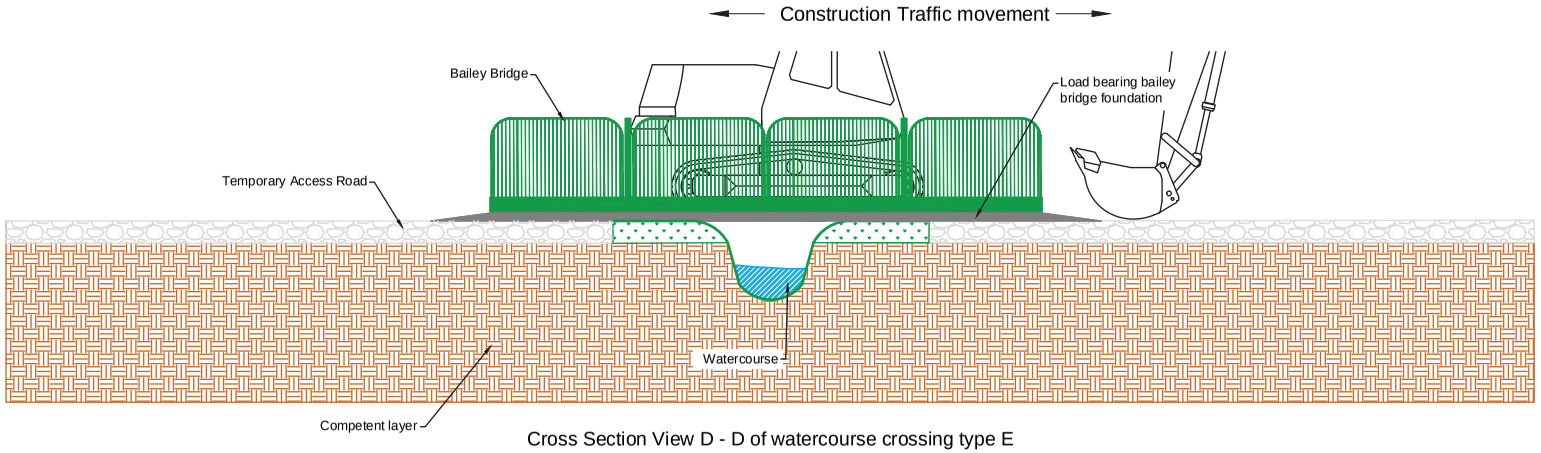
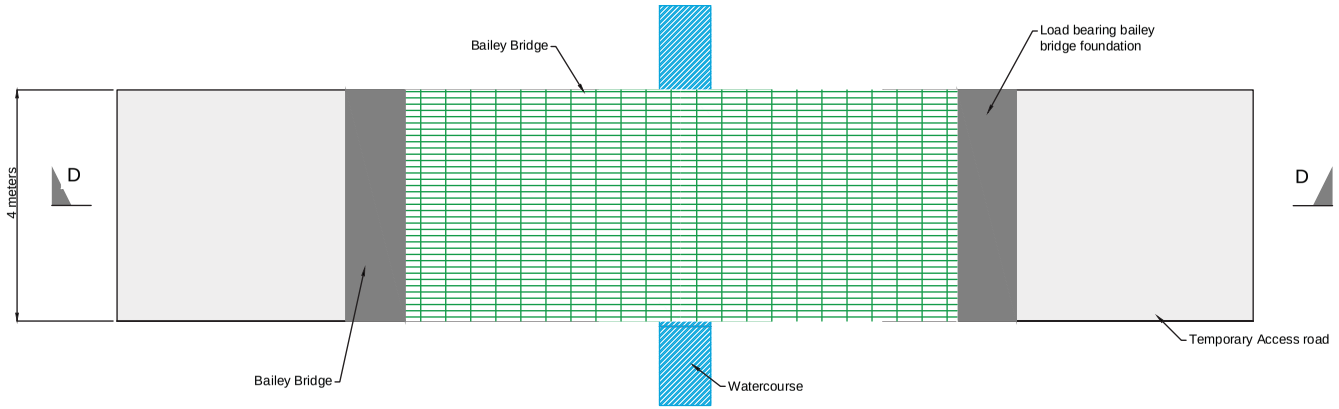
E



Cross Section View D - D of watercourse crossing type E
Bailey Bridge - (No Instream Works)

E



Plan View of watercourse crossing type E
Bailey Bridge - (No Instream Works)

Title:

Figure RW 5.21

Watercourse Crossing Type E - Plan and Cross Section Views of Bailey Bridge

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type E

Used at C type water crossings where required

Description of Crossing Type E

- No existing crossing structure
- No instream Works
- Traffic crossing only
- No Cables or Ducting installed

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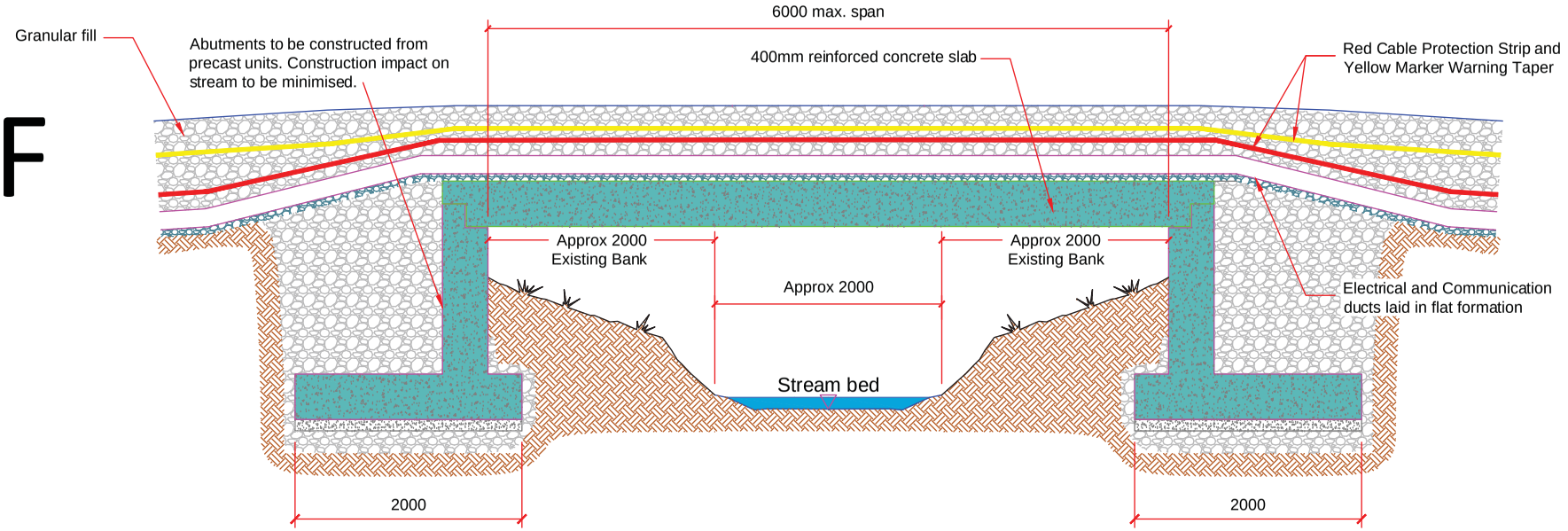
F

Note:
Slab to be designed to withstand all vehicular traffic loading.

Permanent Crossing structure - Clear span bridge



Title:
Figure RW 5.22

Watercourse Crossing Type F - New permanent clear-span bridge

Map Number:
N/A

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type F (Total 1)

Class 2 - EPA Blue Line Equivalent - Fisheries Value: WW2

Description of Crossing Type F

- No existing crossing structure
- No Instream Works
- Internal Windfarm Cabling installed over watercourse using the consented UWF Clear span bridge
- Cable and Traffic crossing

REFERENCE DOCUMENTS

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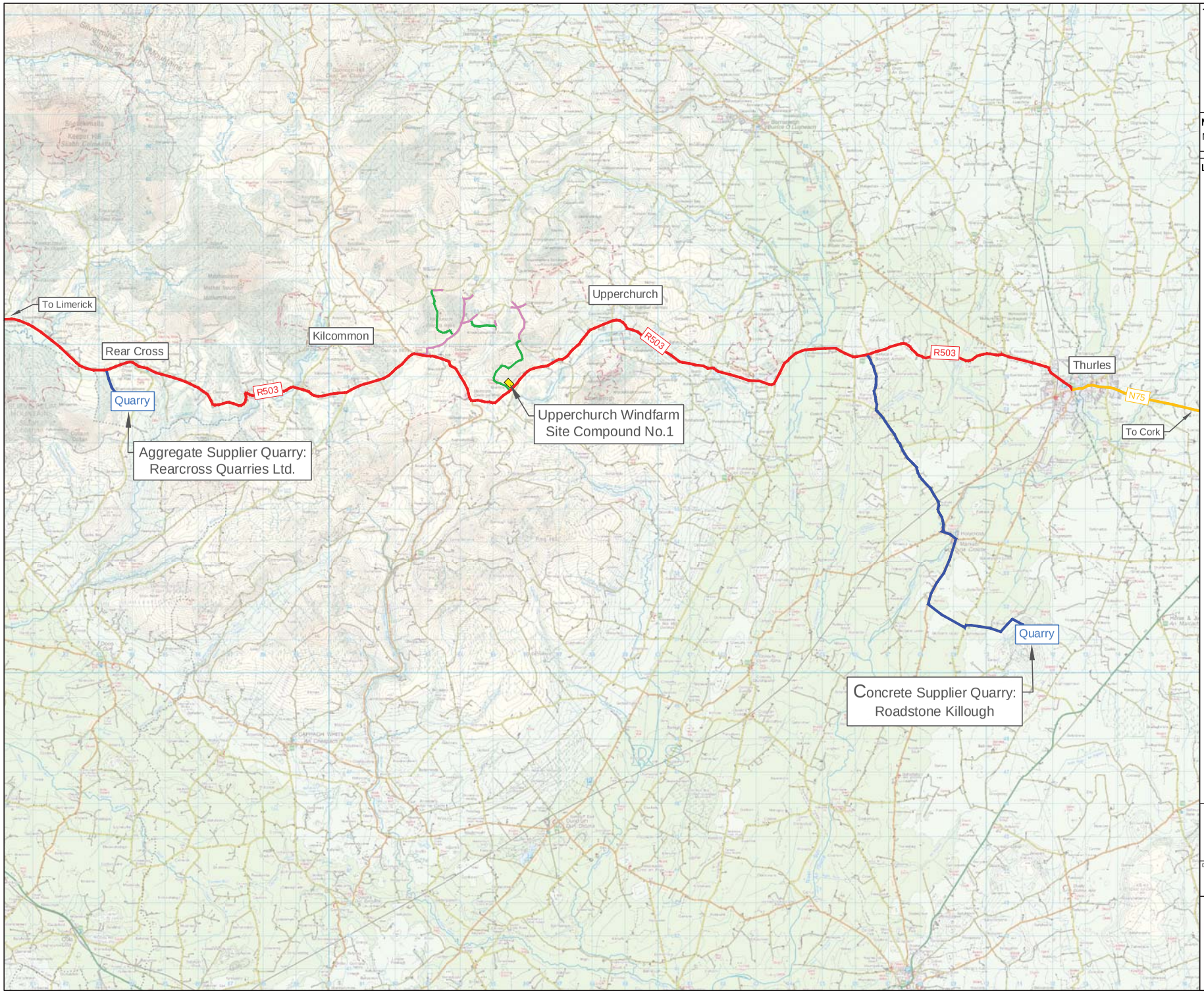

Title:

Figure RW 5.23

Haul Routes for Delivery of Aggregate, Concrete and Other Materials to UWF Site Compound No.1

Map Number:

Map 1 of 1

Legend:

- Haul Route from Local Quarries to the R503
- Regional Road R503
- National Road N75
- Upperchurch Windfarm Site Compound No.1
- Local Roads used to access the UWF Related Works Areas
- Consented UWF Roads used to access the UWF Related Works Areas

REFERENCE DOCUMENTS

N

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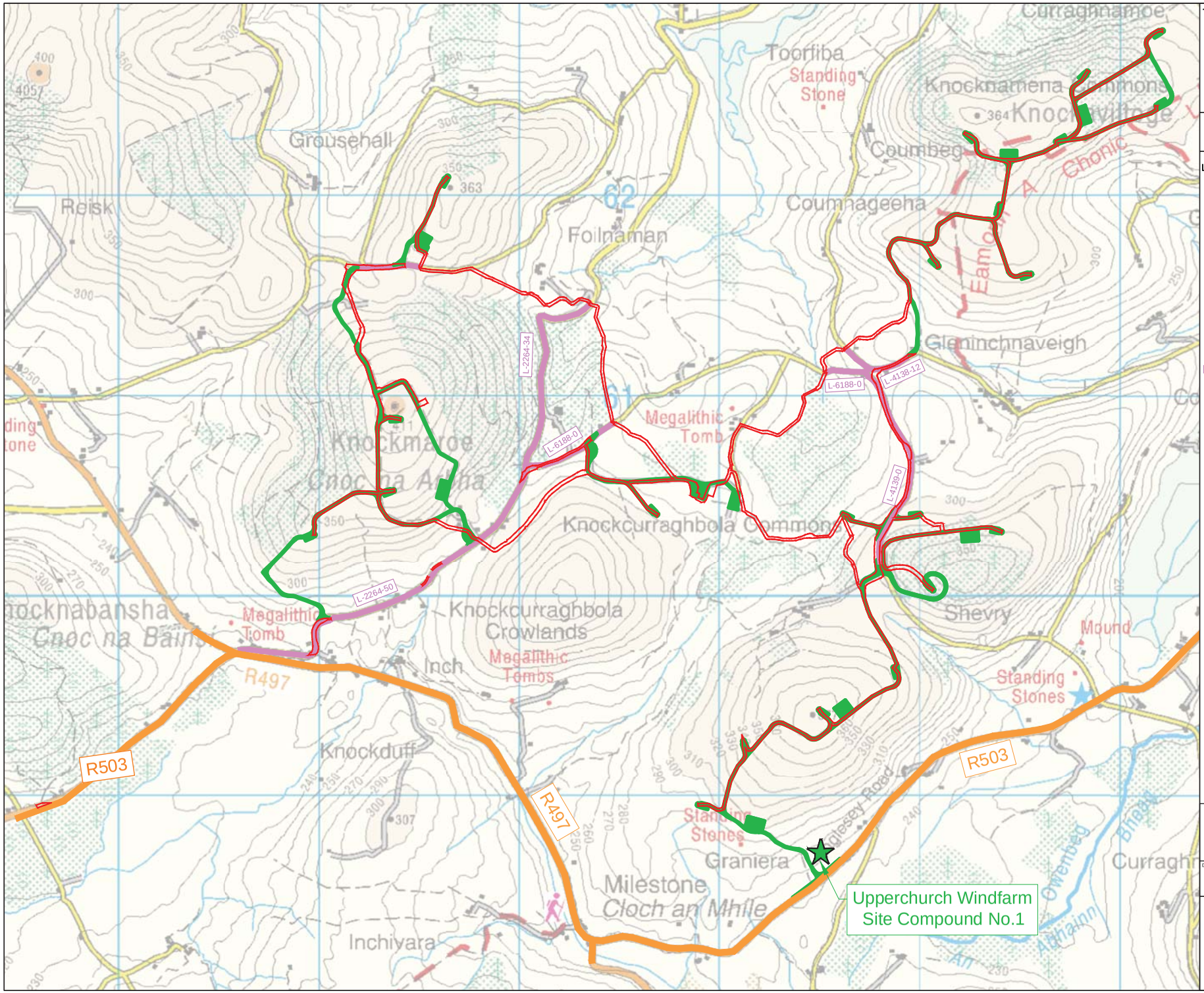

Title:

Figure RW 5.24

Haul Routes from UWF Site Compound No.1 to Construction Works Areas

Map Number:

Map 1 of 1

Legend:

- UWF Related Works Construction Works Area
- Haul Route along local roads from the R503 or the Upperchurch Windfarm Site Compound No.1 to the UWF Related Works Areas
- Consented UWF Roads
- Upperchurch Windfarm Site Compound No.1
- Regional Road
- L-4138-12 Public Road Number

REFERENCE DOCUMENTS

N

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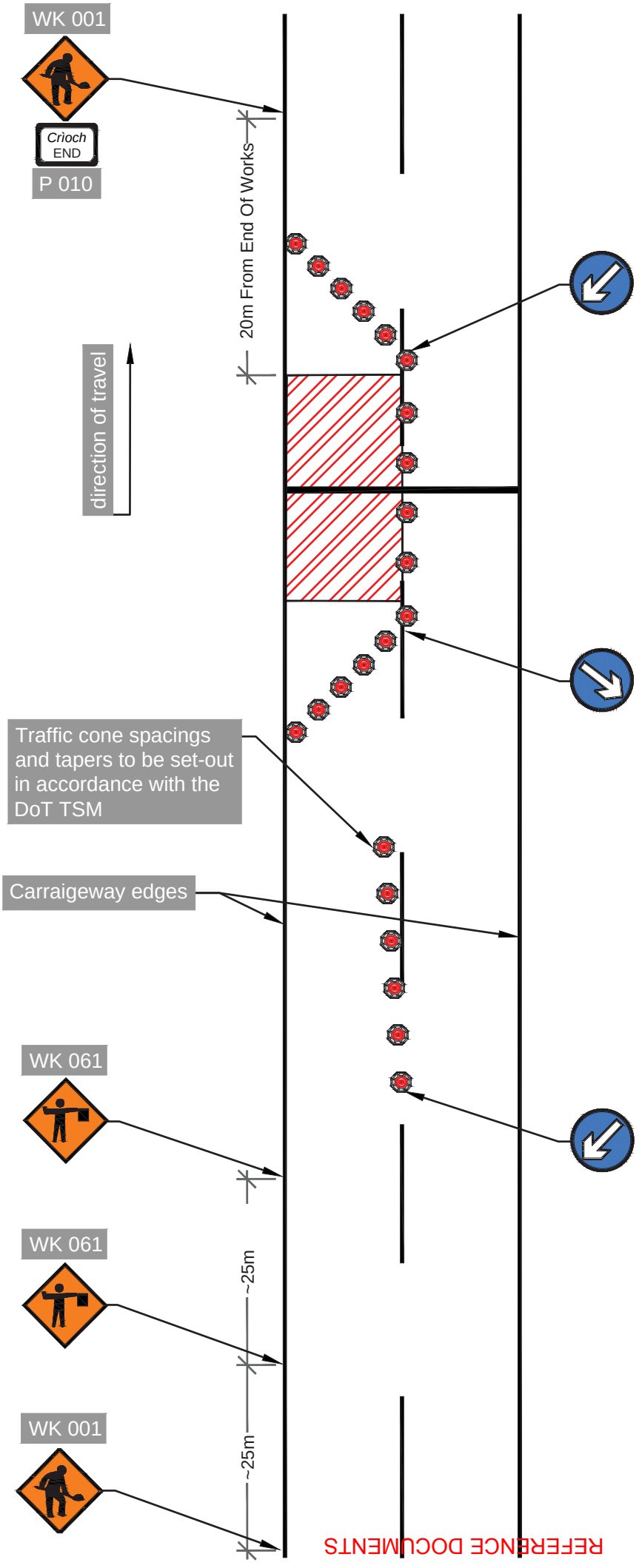

Title:

Figure RW 5.25

Advance Warning Signage for Half Lane Closures

Designed in conjunction with

NRB consulting engineers

Note: This drawing is not to scale

Department of Transport Traffic Signs Manual (DoT TSM)

Project:

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Title:

Figure RW 5.26

Operational Stage Land Use Change

Map Number:
Map 1 of 1

Legend:

- Agricultural Lands to New Permanent Road
- Forestry to Permanent Road
- Forestry to Forestry Firebreak

REFERENCE DOCUMENTS

N

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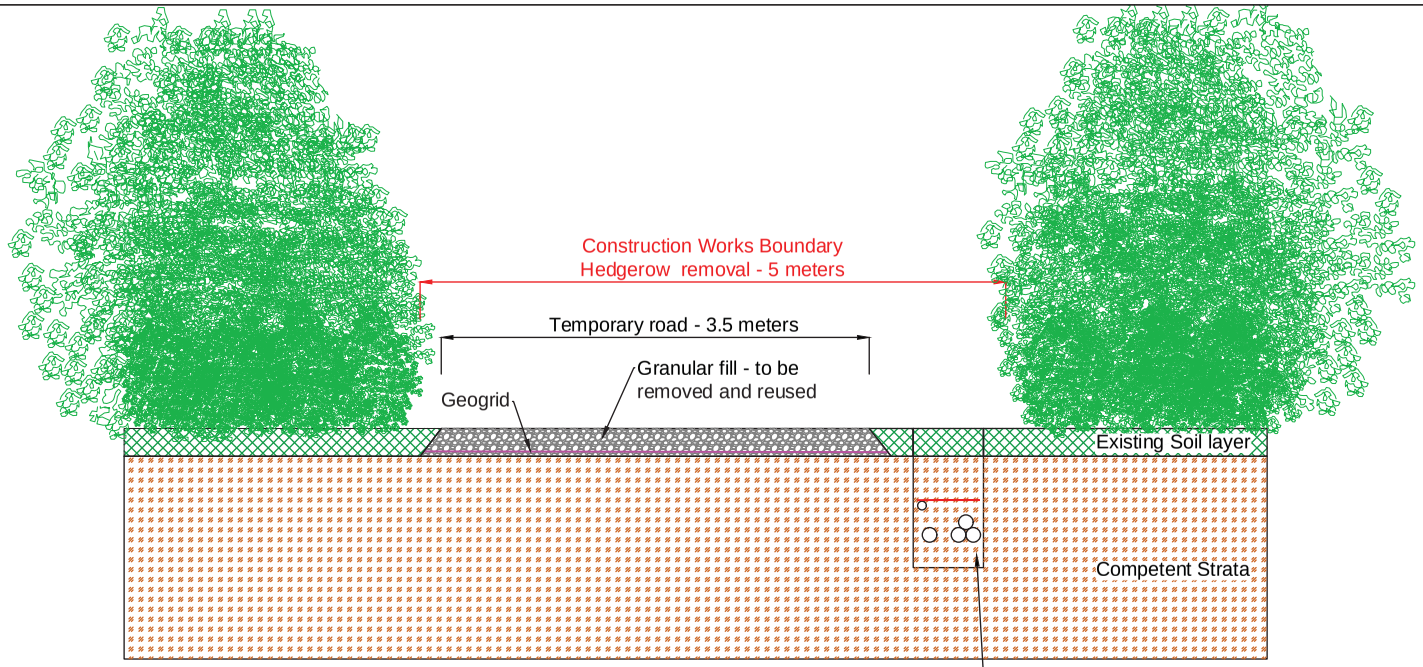
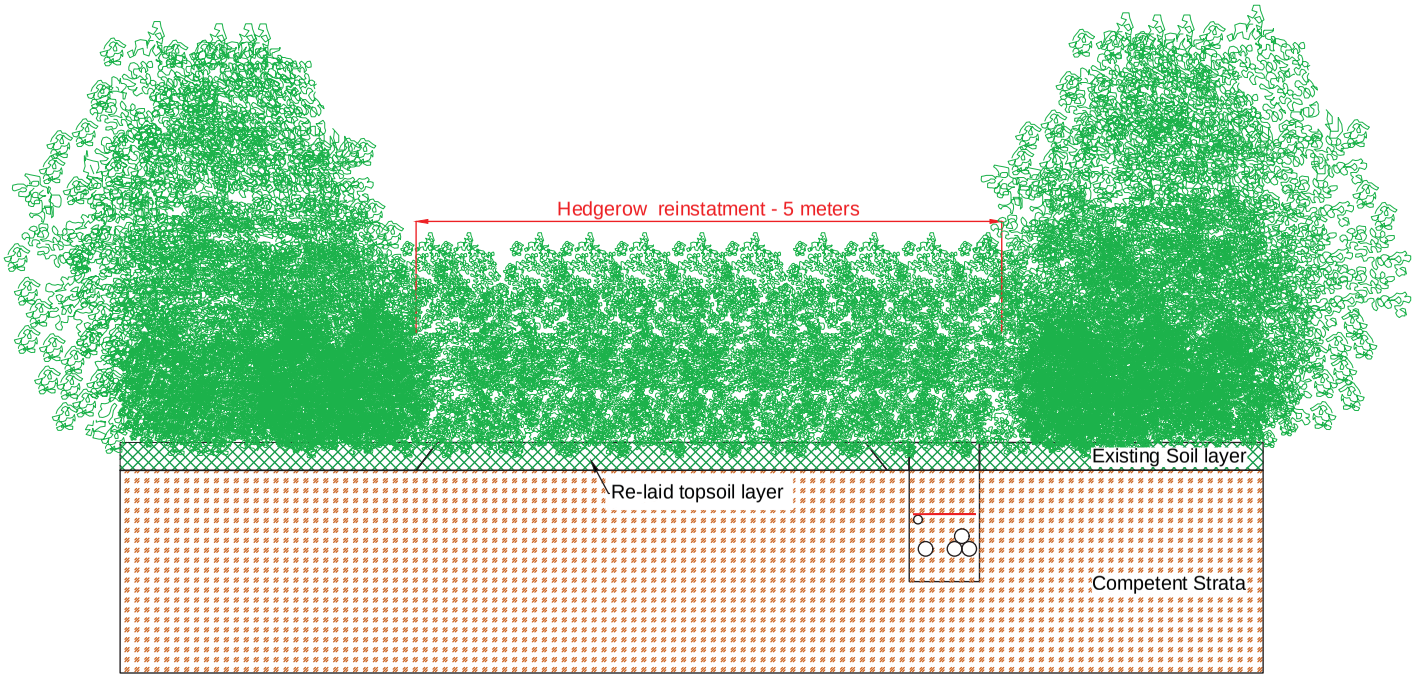


Cross Section of Hedgerow Removal and temporary access road - Construction Phase



Cross Section of Hedgerow Reinstatement and temporary access road - Post Construction

Title:

Figure RW 5.27

Cross Section of Hedgerow Removal and Reinstatement

Map Number:

N/A

Note :
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