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

REFERENCE DOCUMENT 20 of 36

This document contains the following:

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

- **2019 UWF Grid Connection EIA Report - Volume C2: EIAR Main Report (2 of 2)**
  - Chapter 9 – Land
  - Chapter 10 – Soils
  - Chapter 11 – Water
  - Chapter 12 – Air
  - Chapter 13 – Climate
  - Chapter 14 – Material Assets (Built Services)
  - Chapter 15 – Material Assets - Roads
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UWF Grid Connection EIA Report (2019)

Volume C2: EIAR Main Report

Chapter 9: Land

Environmental Agricultural Engineering Consultancy

ECOPOWER

October 2019

Topic
Land

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Land Topic

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There are no appendices associated with this topic chapter.	

Glossary of Terms

Term	Definition
Afforestation	The planting of land with woody plants with a view to forest establishment.
Agriculture	The growing of crops and the rearing of animals for food, fibre or sporting purposes
Low Intensity Farming	Lands which are lightly used and lightly stocked and subject to low levels of farming management.
Felling	The process of cutting down and extracting timber from a forest.
Grassland	Land which has been sown with productive grass species.
Improved grassland	Land which has been sown with particularly productive grass species and whose continued productivity is dependent on regular supplemental inputs of fertiliser and lime
Landuse	The use to which land is put by human activity
Landholding	The land area operated by a farming entity, usually a farmer.
Natura 2000	Lands designated for wildlife on an EU wide basis and having legal standing. Includes SPA and SAC designated land.
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.
Special Protection Area (SPA)	Areas of land designated for the protection of certain species of wild birds under the EU Birds Directive (Dir 79/409/EEC) and normally subject to certain landuse limitations.
Slievefelim to Silvermine Mountains Upland Area	The wider Slievefelim to Silvermines upland area south of Keeper Hill, Mother Mountain and Knockmaroe, between Newport and Upperchurch, County Tipperary. Much of the site is over 200 metres in altitude
Plantation Forestry	Forest sown by man, usually for commercial reasons and mostly of a small number of tree species.
Project Design Measure	Measures for environmental protection, incorporated into the design of the project.

List of Abbreviations

Abbreviation	Full Term
BPM	Ecopower Best Practice Measure developed by members of the EIAR Team
PD	Ecopower Project Design Environmental Protection Measure developed by members of the EIAR Team
UGC	Underground Cables
UWF	Upperchurch Windfarm

Executive Summary of the Land Chapter

Baseline Environment: The dominant land usage in the baseline environment is permanent agricultural grassland with a notable commercial plantation forestry component. Some small areas of low intensity farmed Natura 2000 designated land, also occurs. Public roads comprising both regional and county roads, and private access roads serving domestic houses, farms and forest, also feature in the existing land use pattern.

Survey Results for Sensitive Aspects in the Baseline Environment: Construction works areas are located on 4.8 hectares of agricultural land spread over 2 No. agricultural landholdings at the Mountphilips Substation site, with a total landholding area of c.21.1 hectares. Livestock farming, dairying and beef cattle rearing, are the main activities carried out in lands adjacent to the road network along the route of the 110kV UGC. Where there is an SPA designation farming is effectively restricted to low impact grazing. Forestry Land comprises commercial forestry plantations within the upland area.

Effects to Agricultural and Forestry Land were considered. Only Loss of Use and Connectivity of Agricultural Landholdings during construction was evaluated in-depth for likely effects. In relation to Forestry Land, the 110kV UGC will be installed within an existing private paved road which passes through a forestry landholding - no works will be carried out off this road, and therefore **no impacts will occur to Forestry Land**.

Summary of the Likely Impact to Agricultural Lands: The **agricultural lands** at the works area at Mountphilips Substation Site will be fenced off and unavailable for farming use during construction and, in the early operational stage until vegetation has re-established on reinstated land. The impact is evaluated as **Imperceptible** due to the moderate scale (23% of the project) of agricultural lands subject to works; the availability of agricultural lands in the surrounding area; the small extent of permanent effects which are limited to 2 No. of the landholdings.

Summary of the Likely Cumulative Impact: There is no interaction of **agricultural land holdings** between UWF Grid Connection and Upperchurch Windfarm/UWF Related Works and therefore there is **No Cumulative Impact**. The effect of the **Whole UWF Project** (whether the project Elements interact or not) will be **Imperceptible**.

Conclusion: The UWF Grid Connection will not cause significant adverse effects to Land.

Topic **Land**

9 Environmental Factor: Land

9.1 Introduction to the Land Chapter

9.1.1 What is Land?

Land is the portion of the earth's surface not covered by water. In this chapter land and landuse are addressed. Landuse relates to the various ways in which society uses land. Land take is the removal of productive land from agricultural or other beneficial uses. In the Irish context, land is used for agriculture, forestry, extractive uses, urbanisation, recreation, and infrastructure provision. Certain development undertakings can change current landuse to other landuse types.

9.1.2 Overview of Land in the Local Environment

From a land and landuse perspective the existing environment is rural countryside. The dominant usage is permanent agricultural grassland with a notable commercial plantation forestry component. Some areas of low intensity farmed Natura 2000 designated land also occurs. Public roads comprising both regional and county roads, and private access roads serving domestic houses, farms and forest also feature in the existing land use pattern.

The location of the UWF Grid Connection is illustrated on OSI Mapping on Figure GC 9.1: Location of the UWF Grid Connection.

Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

9.1.3 Sensitive Aspects of the Land Environment included for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspects **are included in this topic chapter** as they could be potentially impacted:

Sensitive Aspect No. 1	Agricultural Land	Section 9.2
Sensitive Aspect No. 2	Forestry Land	Section 9.3

Each of the above listed Sensitive Aspects are evaluated individually in Sections 9.2 to 9.3 of this Chapter.

To help readers navigate to individual sensitive aspect sections, the colour codes for each Sensitive Aspect used above are also used in the Sensitive Aspect sections Section 9.2 to 9.3. The colour-codes have been applied to section headings, tables and on side-tabs on the edge of the pages.

9.1.4 Sensitive Aspects excluded from further evaluation

No Sensitive Aspects **were excluded from this topic chapter**:

9.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of a current application to An Bord Pleanála. The main parts of the UWF Grid Connection are identified in Table 9-1 below.

Table 9-1: Subject Development – UWF Grid Connection

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Ancillary works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 EIAR Main Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

9.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.
- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. ***Note***: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

9.1.6 The Author of the Land Chapter

This report has been written by Andy Dunne (B.Agr.Sc., M.Sc.(Agr.)) director of Environmental Agricultural Engineering Consultancy (EAEC), a firm of agricultural and engineering consultants. Andy has been involved in a great variety of land use and agricultural development activity for more than 20 years and he is familiar with national and EU regulation and policy in the area.

9.1.7 Sources of Baseline Information

The information sources outlined in Table 9-2 were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 9-2: Sources of Baseline Information for Land

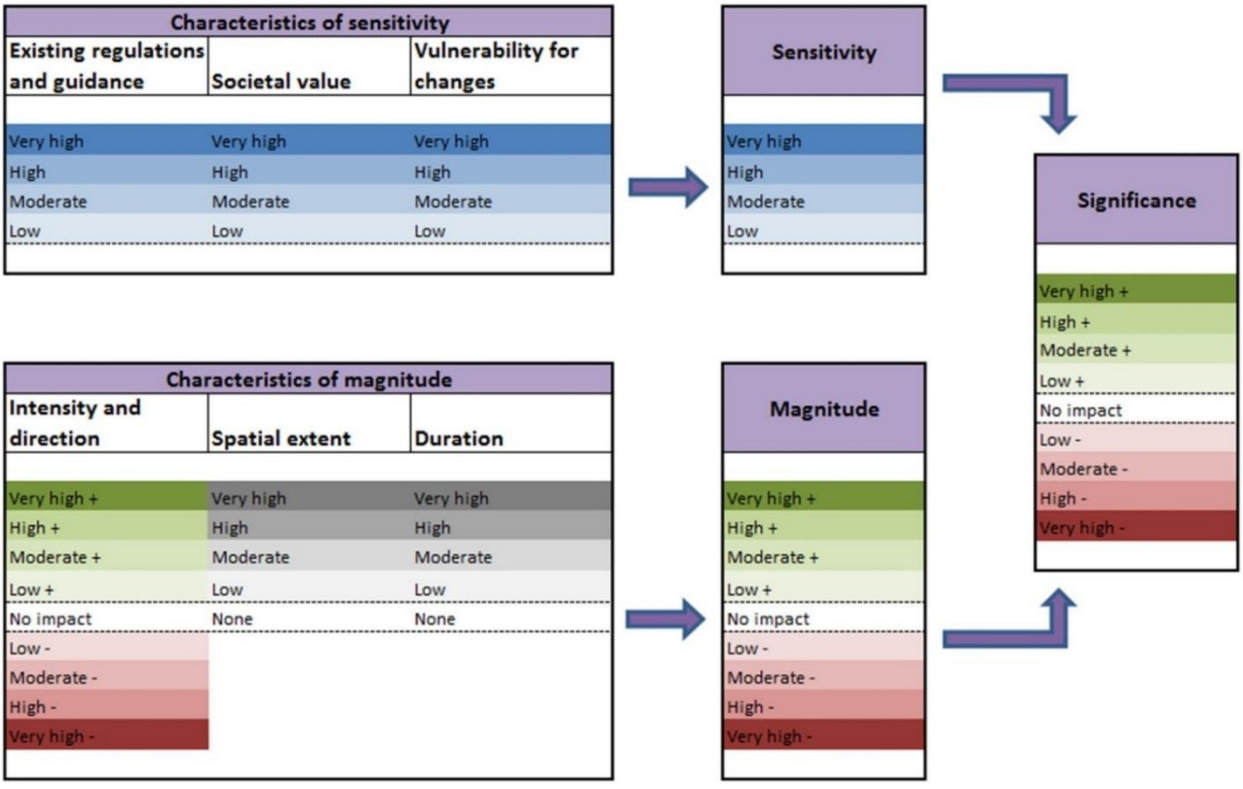
Type	Source
Consultation	No feedback was received from consultees with regard to land or land use. See Chapter 3: The Scoping Consultations, Chapter 3 Appendices for further details.
Desktop	• Department of Agriculture, Food and Forestry's Rural Development Programme 2014-2020 • 2016 State of the Environment Report • North Tipperary County Development Plan (2010) • Available online aerial imagery from National Parks and Wildlife Service, Bing and Google • Chapter 10 Soil • Chapter 11: Water • Review of planning/ environmental information documents for the Other Elements of the Whole UWF Project as contained in Volume F of the planning application
Fieldwork	• Site Visit

9.1.8 Methodology for Evaluating Effects

There is no specific guidance on the evaluation of Land for an EIA Report. However, extensive experience with EIA and agricultural and forestry management together with the EPA guidance on EIS preparation (2002 & 2017) has informed the production of this report. As there are no industry guidelines/standards for the evaluation of effects to Land, a standard methodology – the IMPERIA methodology – is employed. The IMPERIA methodology is described in Section 9.1.8.1 below.

9.1.8.1 Overview of the IMPERIA Methodology

In the framework developed under the EC LIFE project - IMPERIA, the evaluation of impact significance uses a replicable, multi-criteria decision analysis, where the sensitivity of the receptor (i.e. the sensitivity of a Sensitive Aspect of the environment) and the magnitude of the change caused by a project are rated using sub-criteria or scales, and then the overall significance is evaluated using a matrix.



The criteria for determining the overall sensitivity of a receptor and magnitude of the change (impact) to the receptor, is provided in the tables below. The matrix for determining the significance of the impact to the receptor is provided after these tables.

9.1.8.1.1 Criteria for Evaluating the Sensitivity of a Receptor

Sensitivity of the receptor is a description of the characteristics of the receptor or aspect of the environment which will be affected by the development. It is a measure of 1) existing regulations and guidance, 2) societal value and 3) vulnerability for the change. The sensitivity of a receptor is estimated in its current state prior to any change implied by the project.

Existing regulations and guidance describes whether there are any such objects in the impact area, which have some level of protection by law or other regulations (e.g. prohibition against polluting groundwater and Natura areas), or whose conservation value is increased by programs or recommendations (e.g. landscapes designated as nationally valuable).

Societal value describes the value of the receptor to the society and depending on the type of impact may be related to economic values (e.g. water supply), social values (e.g. landscape or recreation) or environmental values (e.g. natural habitat). Societal value measures general appreciation from the point of view of the society. When relevant, the number of people impacted is taken into account.

Vulnerability for the change describes how liable the receptor is to be influenced or harmed by changes to its environment.

Sensitivity	Criteria Existing regulations/guidance	Criteria Societal value	Criteria Vulnerability to change
Low	Few or no recommendations which add to the conservation value of the impact area, and no regulations restricting use of the area (e.g. zoning plans).	The receptor is of small value or uniqueness. The number of people impacted is small.	Even a large external change would not have substantial impact on the status of the receptor. There are only few or none vulnerable receptors in the area.
Moderate	Regulation sets recommendations or reference values for an object in the impact area, or the project may impact an area conserved by a national or an international program.	The receptor is valuable and locally significant but not very unique. The number of people impacted is moderate.	At least moderate changes are needed to substantially change the status of the receptor. There are some vulnerable receptors in the area.
High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is unique and valuable to society. It may be deemed nationally significant and valuable. The number of people impacted is large.	Even a small external change could substantially change the status of the receptor. There are many vulnerable receptors in the area.
Very High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is highly unique, very valuable to society and possibly irreplaceable. It may be deemed internationally significant and valuable. The number of people affected is very large.	Even a very small external change could substantially change the status of the receptor. There are very many vulnerable receptors in the area.

The **overall sensitivity of a receptor** is assessed by the competent expert on the basis on his/her assessment of the components of sensitivity. A general guide for deriving the overall sensitivity is to pick the maximum of existing regulations and guidance and societal value and then adjust that value depending on the level of vulnerability.

Determining the Overall Sensitivity of a Receptor	
Low	The receptor has minor social value, low vulnerability for the change and no existing regulations and guidance. Even a receptor which has major or moderate social value may have low sensitivity if it's not liable to be influenced by the development.
Moderate	The receptor has moderate value to society, its vulnerability for the change is moderate, regulation may set reference values or recommendations, and it may be in a conservation program. Even a receptor which has major social value may have moderate sensitivity if it has low vulnerability, and vice versa.
High	Legislation strictly conserves the receptor, or it is very valuable to society, or very liable to be harmed by the development.
Very High	Legislation strictly conserves the receptor, or it is irreplaceable to society, or extremely liable to be harmed by the development. Even minor influence by the proposed development is likely to make the development unfeasible.

9.1.8.1.2 Criteria for Evaluating the Magnitude of an Impact

Magnitude of the impact describes the characteristics of the changes or effects that the planned project is likely to cause. Magnitude is a combination of 1) intensity and direction, 2) spatial extent, and 3) duration. Assessment of magnitude evaluates the likely changes affecting the receptor *without* taking into account the receptors sensitivity to those changes.

Intensity describes the physical dimension of a development. The direction of the change/effect is either positive (brown) or negative (red).

Magnitude	Criteria – Intensity & Direction
Very High	The proposal has an extremely beneficial effect on nature or environmental load. A social change benefits substantially people's daily lives.
High	The proposal has a large beneficial effect on nature or environmental load. A social change clearly benefits people's daily lives.
Moderate	The proposal has a clearly observable positive effect on nature or environmental load. A social change has an observable effect on people's daily lives.
Low	An effect is **positive** and observable, but the change to environmental conditions or on people is small.
No impact	An effect so small that it has no practical implication. Any benefit or harm is negligible.
Low	An effect is **negative** and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has a clearly observable negative effect on nature or environmental load. A social change has an observable effect on people's daily lives and may impact daily routines.
High	The proposal has a large detrimental effect on nature or environmental load. A social change clearly hinders people's daily lives.
Very High	The proposal has an extremely harmful effect on nature or environmental load. A social change substantially hinders people's daily lives.

Spatial extent describes the geographical reach of, or the range within which, an effect is observable.

Duration describes the length of time during which an impact is observable and it also takes other related issues such as timing and periodicity into account. These are relevant for impacts which aren't observable all the time such as periodic impacts.

Magnitude	Criteria Spatial Extent	Criteria Duration
Low	Impact extends only to the immediate vicinity of a source. Typical range is < 1 km.	An impact whose duration is at most one year, for instance during construction and not operation. A moderate-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
Moderate	Impact extends over one municipality. Typical range is 1-10 km.	An impact lasts from one to a number of years. A long-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
High	Impact extends over one region. Typical range is 10-100 km.	An impact lasts several years. The impact area will recover after the project is decommissioned.
Very High	Impact extends over several regions and may cross national borders. Typical range is > 100 km.	An impact is permanent. The impact area won't recover even after the project is decommissioned.

Deriving the overall magnitude of the change from components of magnitude

Magnitude of the change is a comprehensive synthesis of its component factors. In a case, where intensity, spatial case and duration all get the same value, the magnitude would also be given this value. In other cases, intensity should be taken as a starting point, and the assessment should be adjusted based on spatial extent and duration to obtain an overall estimate. The aim is that the overall assessment should capture the characteristics of an effect. The table below describes some example descriptions of different categories for the magnitude of the change.

Determining the Overall Magnitude of the Change/Effect	
Very High	The proposal has beneficial effects of very high intensity and the extent and the duration of the effects are at least high.
High	The proposal has beneficial effects of high intensity and the extent and the duration of the effects are high.
Moderate	The proposal has clearly observable positive effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
Low	An effect is positive and observable, but the change to environmental conditions or on people is small.
No impact	No change is noticeable in practice. Any benefit or harm is negligible.
Low	An effect is negative and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has clearly observable negative effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
High	The proposal has harmful effects of high intensity and the extent and the duration of the effects are high.
Very High	The proposal has harmful effects of very high intensity and the extent and the duration of the effects are at least high.

9.1.8.2 Assessing the significance of an impact

The **assessment of the overall significance uses the matrix below,** where positive impacts are in green and negative in red. The matrix is based on the **magnitude of the change** affecting a receptor and on the **sensitivity of the receptor** to those changes.

The values obtained from the table are indicative because the most relevant dimensions for characterising an impact are dependent on the type of impact. Thus, some discretion from the expert is required, in particular in cases, where the one component is low and the other one high or very high.

Determining the Overall Significance of an Impact

Impact Significance		Magnitude of change								
		Very High	**High**	**Moderate**	**Low**	**No Change**	**Low**	**Moderate**	**High**	**Very High**
Receptor Sensitivity	**Low**	Significant*	Moderate*	Slight	Imperceptible	Neutral	Imperceptible	Slight	Moderate*	Significant*
	Moderate	Significant	Significant	Moderate	Slight	Neutral	Slight	Moderate	Significant	Significant
	High	Profound	Significant	Significant	Moderate*	Neutral	Moderate*	Significant	Significant	Profound
	Very High	Profound	Profound	Significant	Significant*	Neutral	Significant*	Significant	Profound	Profound

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

Note on Terms used in 'Determining the Overall Significance of an Impact' Table: *The Significance rating ascribed in the Table above have been refined from the ARVI tool, to provide a more nuanced understanding of the significance and also to be compatible with the terms used throughout this EIA Report, which have been informed by the EPA Guidelines on Information to be contained in EIAR (2017) for description of effects.*

In the above Table - Low has been refined as Slight or Imperceptible depending on context; High has been renamed as Significant; Very High has been renamed as Profound; No Impact is understood to also mean Neutral effect, which is defined in the EPA Guidelines as 'no effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error'.

9.1.9 Certainty and Sufficiency of Evaluation/Information

A documentary trail is provided throughout this chapter to verify the competency of data and methods used and the rationale for selection of same. The information used to compile this chapter is collated from reports and documents generated by local authorities and statutory agencies, with remit in the regulatory field, including the Department of Agriculture, Food and the Marine and North Tipperary County Development Plan 2010 (as varied). In all cases the most recent publications are relied on. All documentation used is referenced at the end of the chapter.

In respect of Land no significant limitations or difficulties were encountered.

9.2 Sensitive Aspect No.1: Agricultural Land

This Section provides a description and evaluation of the Sensitive Aspect - Agricultural Land.

9.2.1 BASELINE CHARACTERISTICS of Agricultural Land

9.2.1.1 STUDY AREA for Agricultural Land

The study area for Agricultural Land in relation to the UWF Grid Connection is described in Table 9-3 and illustrated on Figure GC 9.2: UWF Grid Connection Study Area for Agricultural Lands (Volume C3 EIAR Figures).

Table 9-3: UWF Grid Connection Study Area for Agricultural Land

Study Area for Agricultural Land	Justification for the Study Area Extents
Boundary of construction works areas in general, and the individual landholdings where there is any potential to split parcels of land	Impacts limited to areas of physical disturbance and any restriction of access.

9.2.1.2 Baseline Context and Character of Agricultural Land in the UWF Grid Connection Study Area

UWF Grid Connection will be developed in rural countryside in County Tipperary.

Construction works areas are located on 4.8 hectares of agricultural land spread over 2 No. agricultural landholdings, with a total landholding area of c.21.1 hectares. The two landholdings are at the Mountphilips Substation site. It should be noted that while there is a grassland field at the eastern extremity of the 110kV UGC route where the already Consented Upperchurch Windfarm Substation will be located - construction works in this field will only be in the future compound area, and this grassland field is not considered to be an agricultural holding in this EIAR because UWF Grid Connection will not be the cause of landuse change at this location – the land will have already changed use before UWF Grid Connection works can occur there. There are no other agricultural landholdings within the study area.

Within the study area, the farmed area at the Mountphilips Substation site is under permanent grassland. No tillage farming was observed. The quality of the grassland varies with some being well improved from a farming perspective to grassland which is noticeably less productive. Livestock farming, dairying and beef cattle rearing, are the activities carried out on the landholdings of Mountphilips Substation site.

Agriculture comprising livestock farming, dairying and beef cattle rearing, are also the main activities carried out within the wider area, outside the substation site, and outside of construction works areas along the road network for the 110kV UGC. Such farming practice is long established and although there has been notable production upscaling, restructuring of farm holdings, enlargement of field layouts and technological improvement over time, the use of the land for milk and livestock production in these districts stretches back to post-famine times.

The setting of the wider area is the Slievefelim to Silvermine uplands area, the highest points of which remain generally unenclosed and are only used for low intensity farming. Significant parts of these uplands are also designated a Special Protection Area (SPA 4165 – Slievefelim to Silvermines Mountain) under the Birds Directive principally because of the occurrence of the hen harrier (*Circus cyaneus*). The SPA designation effectively restricts farming usage to low impact grazing. Pasture improvement, land reclamation and afforestation is not generally permitted within the SPA.

Agricultural Land

Sensitive Aspect

9.2.1.3 Importance of Agricultural Land

Farming is an important use of land in both the study area and in the wider area around the development. This landuse contributes at a notable level to the local economy in the commercial production of food and therefore to rural livelihoods. On a broader scale however, there is no particular strategic or significant aspect to the farming hereabouts at regional or national level.

9.2.1.4 Sensitivity of Agricultural Land

The farming use of land as it occurs in this area is a practice that modifies and maintains what would otherwise be natural systems into productive agricultural usage. Agricultural land is a dynamic entity and land maintenance and development works are routine and ongoing in the management of farmland.

No sensitivity is therefore anticipated around agricultural landuse.

9.2.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

In terms of landuse trends in the area, no particularly strong tendency is apparent in farming. Agricultural usage is the dominant landuse and will remain so for the foreseeable future, although over time, emphasis on a particular farm enterprise may alter arising from consumer demand or policy changes. Such change is well accommodated in farmed land. The SPA designation in the Slievefelim to Silvermines uplands area will also tend to hold existing farming patterns in the wider surrounding area.

It is, however, likely that the size of individual farm holdings will increase with the passage of time and there may be some relatively small further movement from agricultural to forestry use.

9.2.1.6 Receiving Environment (the Baseline + Trends)

Change in farming is very slow. Modification to the existing environment will be at a rate that is barely perceptible over time. Therefore it is assumed in this report that the baseline environment identified above will be the receiving environment.

Land

Topic

9.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

9.2.2.1 Cumulative Evaluation Study Areas

9.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Agricultural Land	Justification for the Study Area Extents
Boundary of works areas in general, and the individual landholdings where there is any potential to split parcels of land	Impacts limited to areas of physical disturbance and any restriction of access.

The study area is illustrated on Figure CE 9.2: UWF Grid Connection Cumulative Evaluation Study Area for Agricultural Lands.

9.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project. A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 9.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 9-4, and illustrated on Figure WP 9.2: Whole Project Study Area for Agricultural Lands.

Table 9-4: Whole Project Cumulative Evaluation Study Area for Agricultural Land

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Boundary of works areas in general, and the individual landholdings where there is any potential to split parcels of land	Impacts limited to areas of physical disturbance and any restriction of access.
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

9.2.2.2 Scoping for Other Projects or Activity & Potential for Impacts

The evaluation of cumulative impacts to Agricultural Land also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Agricultural Land with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic author is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.14).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Agricultural Land.

9.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Agricultural Land

An evaluation was carried out by the topic author of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Agricultural Land. The results of this evaluation are included in Table 9-5.

The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 9.2.

Table 9-5: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: Neutral effect/No potential for effects due to: • There will be no temporary loss of use of lands or loss of connectivity due to planting activities, • Neutral impacts as a result of change of landuse - while 6ha of agricultural land (on a landholding area of 70ha) will change use to forestry at the UWF Replacement Forestry site, the use of land is changing from one productive use to another. In addition both of these landuses are the predominant landuses in this upland area. • No potential for permanent loss of connectivity as the existing farm access road will continue to be used by the landowner to gain access to other lands.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effect/No potential for effects due to: • The Haul Route Activities are located entirely within the public road corridor and do not require any works to adjoining lands, therefore no impacts to agricultural land or landuse can occur. • Monitoring Activities do not require any works to land or result in land use change, therefore no impacts can occur. • Upperchurch Hen Harrier Scheme: Once off activities will take place initially, and comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will generally take place on the periphery of fields and will not cause any impacts to landuse or connectivity. During the Operational Stage of the Upperchurch Windfarm, farming practices under the Upperchurch Hen Harrier Scheme will, to a certain extent, cause lands to revert back to wet grassland. It

	is considered that due to the current low productivity level on the lands, combined with the scheme payments that the landowners will receive, no impacts are expected to farm productivity levels. • The Overhead Line Activities will involve access over agricultural lands using established access routes mainly along existing tracks. No works are required to lands, and activities are limited to in situ pole sets and angle masts and the existing overhead line, therefore there is no potential for effects to agricultural lands or landuse.

9.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

9.2.2.3.1 Element 2: UWF Related Works

Just over a half of UWF Related Works construction works areas relate to sections of Internal Windfarm Cabling which will be located within Consented UWF Roads. In relation to the remaining UWF Related Works areas, one third of the construction works areas will be located on agricultural lands, with 7.2 hectares of land within construction works areas spread across 41 no. agricultural landholdings. These 41 No. landholdings together have a total area of c.1133 hectares.

9.2.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 9.2.2.2.1.

9.2.2.3.3 Element 4: Upperchurch Windfarm

The footprint of the Upperchurch Windfarm will be 56.3ha of lands, 46.5ha of which are agricultural lands. In relation to landholdings, 23 No. agricultural landholdings, which together have a total area of c.1050 hectares, are associated with the Upperchurch Windfarm.

Consideration of the Passage of Time: There has been no material changes in landholdings in the Upperchurch Windfarm since 2013, as there has been no change to the proportion of agricultural land at the windfarm. It is therefore considered that the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this 2019 EIAR for UWF Grid Connection.

9.2.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 9.2.2.2.1

9.2.2.3.5 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 9.2.2.2.

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9.2.3 PROJECT DESIGN MEASURES for Agricultural Land

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 9-6 are relevant to the Environmental Factor, Land, and in particular to the sensitive aspect **Agricultural Land**.

Table 9-6: UWF Grid Connection Project Design Measures relevant to Agricultural Land

PD ID	Project Design Environmental Protection Measure (PD)
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).

It should be noted that in order to mitigate splitting of land parcels, the design of the new access road at Mountphilips Substation site includes gates located along the access road which will provide access across the new access road to the agricultural lands on either side of the access road. These gates are located in each of the fields through which the new access road is routed.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works, and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5, in Volume C4: EIAR Appendices.

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9.2.4 EVALUATION OF IMPACTS to Agricultural Land

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Agricultural Land.

As a result of the exercise, some impacts were included and some were excluded.

Table 9-7: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Loss of Use and Connectivity of Landholdings (Construction stage/Early Operational Stage)	*Reduction in grass growth rates due to a change in the drainage regime (construction stage)*
	Change of land use (operational stage)
	Improvement in infrastructure (operational stage)
	Loss of use and connectivity of land through the splitting of parcels of land (operational stage)
	Decommissioning Effects

The source-pathway-receptor links for the impact included are described in the Impact Evaluation Table in the next section - **Section 9.2.4.1.**

The source-pathway-receptor links and the rationale for impacts excluded are described in the section directly after the Impact Evaluation Table in Section 9.2.4.2.

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9.2.4.1 Impact Evaluation Table: Loss of Use and Connectivity of Landholdings

Impact Description	
Project Life Cycle Stage:	Construction stage and early operational stage

Impact Source: Construction works areas
Cumulative Impact Source: Construction works areas
Impact Pathway: Fences, presence of construction machinery

Impact Description: Agricultural Lands within the construction works areas will be fenced off and unavailable for farming use during construction and in the early operational stage until vegetation has re-established on reinstated land. Such fencing and access modification at times will prevent access to and the use of farmlands, which will result in plots of land becoming disconnected and potentially unavailable for farming use.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Loss of Use and Connectivity of Landholdings

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Construction works areas are located on 4.8 hectares of agricultural land spread over 2 No. agricultural landholdings, with a total landholding area of c.21.1 hectares. Loss of use and connectivity impacts only relate to the Mountphilips Substation site.
It should be noted that there will be no loss of use or connectivity at the agricultural landholding at the eastern extremity of the 110kV UGC as construction works for the UWF Grid Connection will take place in the future compound area for the Consented Upperchurch Windfarm substation.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- the moderate scale (23%) of agricultural lands subject to works, limited to 2 agricultural landholdings in the context of the availability of agricultural lands in the surrounding area;
- the small extent of permanent effects which are limited to 2 no. landholdings.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Cumulative impacts mainly relate to landholdings where both UWF Grid Connection works and works for Other Elements of the Whole UWF Project will take place, and are limited to the 1 No. landholding at the eastern extremity of the 110kV UGC in Knockcurraghbola Commons - at the site of the Consented Upperchurch Windfarm Substation. As UWF Grid Connection works, in this agricultural landholding, will only take place within the future compound area, it is considered that cumulative effects will not occur because the impact to land will already have taken place during building of the compound for Upperchurch Windfarm and the UWF Grid Connection cannot add to impact magnitude, as the land will already have changed use (i.e. land use will only change to utility/infrastructure use once). As UWF Grid Connection will not cause any loss of land or change of use in the Knockcurraghbola Commons area, the magnitude of cumulative impacts will be none.

Significance of the Cumulative Impact: No Cumulative Impact

Rationale for Cumulative Impact Evaluation:

- UWF Grid Connection will not cause any additional loss of use or connectivity impacts to the agricultural land-holding at the Consented Upperchurch Windfarm Substation site.

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Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works
Impact Magnitude: The construction works areas are located on 7.2 hectares of agricultural land spread over 41 No. landholdings, with a total landholding area of c.1133 hectares. Works will generally take place through landholdings rather than on the periphery of holdings.
Significance of the Impact: Neutral effect
Rationale for Impact Evaluation: • the very small extent of lands subject to works (less than 1%), in the context of the size of agricultural landholdings, will not cause any impacts greater than Neutral to the productivity levels on the land-holdings, • the temporary duration (up to 1 year maximum), and • the alternative access available on many landholdings
Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 9.2.2.2.1*
Element 4: Upperchurch Windfarm
Impact Magnitude: The footprint of the Upperchurch Windfarm comprises 56.3 hectares. Construction works will take place on 46.5 hectares of land over 23 No. landholdings, with a total landholding area of c.1,050 hectares.
Significance of the Impact: Imperceptible
Rationale for Impact Evaluation: • the small scale (4%) of lands subject works, in the context of the size of agricultural landholdings • the short-term duration (up to 1.5 years) • the alternative access available on many landholdings, and • the ease with which such alternative access can be provided.
Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 9.2.2.2.1*
Evaluation of Other Cumulative Impacts – Loss of Use and Connectivity of Landholdings
Whole UWF Project Effect
Magnitude: In total, 58 hectares of agricultural lands are located within construction works areas associated with the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm. These lands are spread over 43 No. landholdings, with a total landholding area of c.1147 hectares. Loss of use and connectivity impacts to agricultural lands will occur on both the western side of the Slievefelim and Silvermines Mountain upland area in Mountphilips and Coole townlands for the UWF Grid Connection only, and on the eastern side of the upland area for the consented Upperchurch Windfarm and UWF Related Works only. No agricultural landholdings will be affected between these two areas, which are separated by a distance of c.22km.
Significance of the Whole Project Effect: Imperceptible
Rationale for Impact Evaluation: • the very small scale of land area subject to works, 5% of farmed area on average for all landholdings, • the location of the majority of the 110kV UGC for UWF Grid Connection on public roads • the location of the majority of Internal Windfarm Cables for UWF Related Works within Consented UWF Roads, • the temporary to short-term duration (up to 1.5 years) of impacts in the Upperchurch area, • the reversibility of the impact with the restoration of lands, and • the alternative access available on many landholdings.

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• the scale of the permanent nature of landuse change in the Mountphilips area, in the context of the very small number of landholdings involved (2) within a broader area of extensive agricultural use; and the separation of landholdings associated with UWF Grid Connection.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Agricultural Land with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 9.2.2.2).

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9.2.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 9-7 below.

Table 9-8: Description and Rationale for Excluded Impacts to Agricultural Land

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Trench and Foundation excavations	1,2,4	Ground-water flow paths	Reduction in grass growth rates due to a change in the drainage regime	Rationale for Excluding: Neutral impact, As per Chapter 11: Water, due to the shallow nature of the trenches and excavations associated with the Individual Project Elements, the impact on groundwater will be of imperceptible significance within 30m and Neutral beyond this distance. Based on the evaluation contained in Chapter 11 Water, it is considered that any reduction in grass growth rates caused by a change in the drainage regime will have a Neutral effect on the productivity of land.
Operational Stage				
Forestry felling, presence of above ground structures	1,2,4	Land cover	Change of land use	Rationale for Excluding: Neutral impact, In relation to the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm, it is considered that due to the very small scale of land use change (less than 1% of the landholding area) that a Neutral effect to agricultural lands will occur.
Construction of new access roads & upgrading of existing private roads	1,2,4	Private Roads	Improvement in infrastructure	In relation to the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm, although the upgrade of existing farm roads and the construction of some short lengths of new roads will be a positive effect on agricultural landholdings, the scale of road upgrading or construction will equate to less than 1% of the landholding areas. Therefore, it is considered that the upgrade/construction of roads will have a Neutral effect to the productivity or use of agricultural lands.
Operational activities	1,2,4	Work area boundaries	Loss of use and connectivity of land through the splitting of parcels of land	Maintenance activities will range from routine monthly and annual testing of the UWF Grid Connection, to monthly inspection of UWF Related Works, to weekly maintenance of the Upperchurch Windfarm. All of these activities will take place from compound and hard-core road areas, with the vast majority of activity taking place on the turbine hardstands, and there will be no requirement for a works area boundary to be erected. Therefore, operational activities will have a Neutral effect on land use.
Decommissioning Stage				
Rationale for Excluding: No potential for impacts/Neutral impacts, UWF Grid Connection will remain part of the National Grid, therefore no impacts can occur.				

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Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
UWF Related Works: The cables will be pulled from the Internal Windfarm Cabling ducts at the turbines or at the substation; the ducting, Realigned Windfarm Roads and Haul Route Works will remain in-situ; therefore no decommissioning works to lands are required. The Telecom Relay Pole will be removed, and the compound area reinstated and returned to agricultural use. Due to the very small size of the compound in the context of the land holding (less than 0.005%), Neutral impacts to the landholding will occur. Upperchurch Windfarm: It is likely that the Consented UWF Substation will remain in-situ for use by ESBN and that the Consented UWF Roads will also remain in-situ for use by the landowner. Decommissioning works will be limited to the Consented UWF Turbines, hardstanding areas and associated drainage systems, along with the meteorological masts. All decommissioning works will take place from hard-core areas, with the vast majority of activity taking place on the turbine hardstands. Works area boundaries will not be required for decommissioning activities. Therefore, it is considered that decommissioning activities will have a Neutral effect on land use.				

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9.2.5 Mitigation Measures for Impacts to Agricultural Land

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Agricultural Land**.

9.2.6 Evaluation of Residual Impacts to Agricultural Land

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Agricultural Land above (Section 9.2.4) – i.e. **no significant adverse impacts**.

9.2.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.
The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

9.2.8 Summary of Impacts to Agricultural Land

A summary of the Impact to Agricultural Land is presented in Table 9-8.

Table 9-9: Summary of the impacts to Agricultural Land

Impact to Agricultural Land:	**Loss of Use and Connectivity of Landholdings**
Evaluation Impact Table	*Section 9.2.4.1*
Project Life-Cycle Stage	*Construction/Early Operation*
UWF Grid Connection *direct/indirect impact*	**Imperceptible**
UWF Grid Connection *cumulative impact*	**No Cumulative Impact**
Element 2: UWF Related Works	Neutral Effect
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 9.2.2.2.1
Element 4: Upperchurch Windfarm	Imperceptible
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 9.2.2.2.1
Cumulative Impact:	
Whole UWF Project Effect	**Imperceptible**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Agricultural Land with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 9.2.2.2).

9.3 Sensitive Aspect No.2: Forestry Land

This Section provides a description and evaluation of the Sensitive Aspect - Forestry Land.

9.3.1 UWF Grid Connection – EVALUATED AS EXCLUDED

9.3.1.1 Baseline Context and Character of Forestry Land in the UWF Related Works Study Area

Forest cover as a landuse in Ireland was very low at the time of the foundation of the state but since the 1930's there has been a gradual increase in the national forest estate and land cover under forest is now approaching 12%. Afforestation was solely in the hands of the state until the late 1980's but has largely become the domain of private landowners since then. A review of aerial imagery indicates a level of forest cover in the Slievefelim to Silvermines uplands area which is substantially greater than the national average, and is estimated to be 30 to 35% of the land cover.

The UWF Grid Connection traverses one forestry landholding, at the eastern end of the 110kV UGC route, however in this landholding all construction works for the 110kV UGC will take place on an existing private paved road. No felling or off-road works will be required.

9.3.1.2 Evaluation of UWF Grid Connection

UWF Grid Connection was evaluated for its potential to cause impacts to Forestry Lands.

It was evaluated by the topic authors that UWF Grid Connection **will cause Neutral impacts to Forestry Lands,** for the following reasons

- There will be no loss of use impact, as the UWF Grid Connection is not located within any forestry plots
- The magnitude of connectivity loss impacts will be neutral, as the extent of UWF Grid Connection on forestry land is limited to one private paved road through one landholding.
- There will be no landuse change in this landholding, as the private paved road through forestry lands will be reinstated following construction works.
- There will be no potential for improvements to forestry infrastructure, as the UWF Grid Connection will not involve upgrading or new access roads in forestry lands.
- There will be no potential for effects to growth or harvesting of the adjacent forestry due to the location of the 110kV UGC under the existing private paved road.

9.3.1.3 Cumulative Evaluation for the Other Elements of the Whole UWF Project (grey background)

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

UWF Grid Connection will cause Neutral impacts to Forestry Lands by itself, and therefore any cumulative effects will be negligible. However, the Other Elements must be considered because the UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in Section 9.3.2 to Section 9.3.4 and included in the summary table in Section 9.3.8 in order to show the totality of the project.

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9.3.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

9.3.2.1 Cumulative Evaluation Study Areas

9.3.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection have been excluded as a source of impacts (either positive or negative) to Forestry Lands primarily due to the location of works on the existing private paved road, with no works in off-road plots.

9.3.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

UWF Grid Connection will cause Neutral impacts to Forestry Lands by itself, and therefore will not cause noticeable cumulative effects. However, the Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in Section 9.3.2 to Section 9.3.4 and included in the summary table in Section 9.3.8 in order to show the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 9.3.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 9-9, and illustrated on Figure WP 9.3: Whole Project Study Area for Forestry Lands.

Table 9-10: Cumulative Evaluation Study Area for Forestry Land

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 2: UWF Related Works	Boundary of works areas in general, and the individual landholdings where there is any potential to split parcels of land	Impacts limited to areas of physical disturbance and any restriction of access.
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

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9.3.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Forestry Land also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Forestry Land with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic author is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1 .4.15).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF

Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Forestry Land.

9.3.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Forestry Lands

An evaluation was carried out by the topic author of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Forestry Land. The results of this evaluation are included in Table 9-10. The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 9.3.

Table 9-11: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: Neutral effect/No potential for effects due to • No potential for loss of use or loss of connectively impacts, as the land is currently set to agricultural grassland. • Neutral positive land use change impacts - While 6ha of agricultural land will change use to forestry at the UWF Replacement Forestry site, it is considered that a Neutral effect to Land will occur as the use of land is changing from one main land use to another. • No potential for improvements to forestry infrastructure, as there will be no new or upgraded roads associated with the UWF Replacement Forestry. • No potential for effects during the growth stage, due to the very small scale of activities associated with site management, and the absence of any requirement to restrict access along the existing farm access road. • No potential for harvesting related impacts, as the UWF Replacement Forestry will be permanent woodland and will not be harvested.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effect/No potential for effects due to: • The Haul Route Activities are located entirely within the public road corridor and do not require any works to adjoining lands, therefore no impacts to forestry land or landuse can occur. • Monitoring Activities do not require any works to land or result in land use change, therefore no impacts can occur. • Upperchurch Hen Harrier Scheme: no potential for impacts, as all activities and management practices will take place on agricultural lands. • The Overhead Line Activities will involve access over forestry lands using established access routes mainly along existing tracks and along forestry firebreaks. No works are required to lands, and activities are limited to in situ pole sets and angle masts and the existing overhead line, therefore there is no potential for effects to forestry lands or landuse.

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9.3.2.3 Cumulative Information: Baseline Characteristics – Context & Character

In the Whole UWF Project context, forestry lands occurs within the landholdings the subject of the Upperchurch Windfarm and the UWF Related Works.

9.3.2.3.1 Element 2: UWF Related Works

Just over a half of UWF Related Works construction works areas relate to sections of Internal Windfarm Cabling which will be located within Consented UWF Roads. In relation to the remaining UWF Related Works areas, a small proportion (6%) will be located on forestry lands with 1.3 hectares of land within construction works areas spread across 6 no. forestry landholdings. These 6 No. landholdings together have a total area of c.112 hectares. 5 of the 6 No. forestry landholdings will also contain Upperchurch Windfarm works areas.

9.3.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 9.3.2.2.1

9.3.2.3.3 Element 4: Upperchurch Windfarm

The footprint of the Upperchurch Windfarm will be 56.3 hectares of lands, 9.8 hectares of which are forestry lands. In relation to landholdings, 5 No. forestry landholdings, which together have a total area of c.104 hectares, are associated with the Upperchurch Windfarm.

Consideration of the Passage of Time: There has been no material changes in landholdings in the Upperchurch Windfarm since 2014, as there has been no change to the proportion of forestry land at the windfarm. It is therefore considered that the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this 2019 EIAR for UWF Grid Connection.

9.3.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 9.3.2.2.1

9.3.2.3.5 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 9.3.2.2.

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9.3.3 PROJECT DESIGN MEASURES for Forestry Land

Impacts to Forestry Lands were avoided through Alternatives Considered which avoided any UWF Grid Connection works within forestry plots. There are no additional Project Design Environmental Protection Measures specific to Forestry Land.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5, in Volume C4: EIAR Appendices.

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9.3.4 EVALUATION OF IMPACTS to Forestry Land

It is evaluated that UWF Grid Connection has no potential to cause impacts greater than Neutral to Forestry Lands, and therefore this sensitive aspect has been excluded in relation to the UWF Grid Connection project, see Section 9.3.1.

This Section evaluates the **likely cumulative effects of Other Elements** of the Whole UWF Project (in particular the Upperchurch Windfarm) and Other Projects or Activities.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Forestry Land.

As a result of the exercise, some impacts were included and some were excluded.

Table 9-12: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Loss of Use and Connectivity of Landholdings (Construction stage)	*Reduction in forest growth rates due to a change in the drainage regime (construction stage)*
	Change of land use (operational stage)
	Improvement in infrastructure (operational stage)
	Loss of use and connectivity of land through the splitting of parcels of land (operational stage)
	Decommissioning Effects

The source-pathway-receptor links for the impact included are described in the Impact Evaluation Table in the next section - **Section 9.3.4.1.**

The source-pathway-receptor links and the rationale for impacts excluded are described in the section directly after the Impact Evaluation Table, in Section 9.3.4.2.

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9.3.4.1 Impact Evaluation Table: Loss of Use and Connectivity of Landholdings

Evaluation of UWF Grid Connection Excluded: As the location of UWF Grid Connection is limited to an existing private paved road through 1 No. forestry landholding, impacts to Forestry Lands will be Neutral as a result of the construction of the UWF Grid Connection, and consequently this project will not cause measurable cumulative effects.

However, the Other Elements must be considered because the UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluation for the Other Elements of the Whole UWF Project are included in this Impact Evaluation Table, in order to show the totality of the project.

Impact Description for the Other Elements of the Whole UWF Project	
Project Life Cycle Stage:	Construction & Early Operational Stage
Cumulative Impact Source: Construction works, forestry felling, haul routes on forestry roads Impact Pathway: Forestry plots, forestry roads, presence of construction/delivery machinery Impact Description: Forestry lands (not forestry roads) within the construction works areas associated with UWF Related Works and Upperchurch Windfarm will be fenced off and unavailable for forestry use during construction and in the early operational stage until vegetation has re-established on construction works areas. Construction machinery and construction works will also be present on some sections of forestry roads, although alternative access routes are available in forestry lands, which will avoid the disconnection of forestry lands in most instances. Impact Quality: Negative	
Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	
Impact Magnitude: The construction works areas are located on 1.3 hectares of forestry land spread over 6 No. landholdings, with a total forestry landholding area of c.112 hectares. Haul routes are located on 0.9 km of the existing forestry road network.	
Significance of the Impact: Imperceptible	
Rationale for Impact Evaluation: • the small scale (1%) of lands subject to works, in the context of the size of forestry landholdings • the temporary duration (up to 1 year), • the reversibility of the impact with the completion of the works, and • the alternative access available on forestry landholdings.	
Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 9.3.2.2.1*	
Element 4: Upperchurch Windfarm	
Impact Magnitude: The footprint of the Upperchurch Windfarm comprises 56.3 hectares. Construction works will take place on 9.8 hectares of forestry land over 5 No. landholdings, with a total landholding area of c.104 hectares.	
Significance of the Impact: Slight	
Rationale for Impact Evaluation: • the small scale (9%) of lands subject to works, in the context of the size of forestry landholdings, • the temporary to short-term duration (up to 1.5 years), and,	

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• the alternative access available on forestry landholdings.
Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 9.3.2.2.1*
Evaluation of Other Cumulative Impacts – Loss of Use and Connectivity of Landholdings
Whole UWF Project Effect
Magnitude: In total, construction works are located on 11.2 hectares of forestry lands, spread over 6 landholdings with a total landholding area of c.112 hectares.
Significance of the Whole Project Effect: Imperceptible
Rationale for Impact Evaluation: • the small scale (10%) of lands subject to works, in the context of the size of forestry landholdings, • in the context of the abundance of forestry landholdings in this upland area; • the temporary duration • the reversibility of the impact with the completion of the works, and, • the alternative access available on forestry landholdings.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Forestry Land with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 9.3.2.1).

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9.3.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 9-12 below.

Table 9-13: Description and Rationale for Excluded Impacts to Forestry Land

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Trench and Foundation excavations	1,2,4	Ground-water flow paths	Reduction in forestry growth rates due to a change in the drainage regime	Rationale for Excluding: Neutral impact, As per Chapter 11: Water, due to the shallow nature of the trenches and excavations associated with the Individual Project Elements, the impact on groundwater will be of imperceptible significance within 30m and Neutral beyond this distance. Based on the evaluation contained in Chapter 11 Water, it is considered that any reduction in forest growth rates caused by a change in the drainage regime will have a Neutral effect on the productivity of land.
Operational Stage				
Forestry felling, afforestation, presence of above ground structures	2,4	Land cover	Change of land use	Rationale for Excluding: Neutral impact, in relation to the UWF Related Works and Upperchurch Windfarm, it is considered that due to the very small scale of land use change (less than 1% of the landholding area) that a Neutral effect to forestry lands will occur.
Construction of new access roads & upgrading of existing private roads	2,4	Private Roads	Improvement in infrastructure	Rationale for Excluding: Neutral impact, in relation to the UWF Related Works and Upperchurch Windfarm, although the upgrade of forestry roads and the construction of some short lengths of new roads will be a positive effect on forestry landholdings, the scale of road upgrading or construction will equate to 3.3% of the landholding areas. Therefore, it is considered that the upgrade/construction of roads will have a Neutral effect to the productivity or use of forestry lands.
Operational activities	1,2,4	Work area boundaries	Loss of use and connectivity of land through the splitting of parcels of land	Rationale for Excluding: Neutral impact, maintenance activities will range from annual testing of the UWF Grid Connection 110kV, to monthly inspection of UWF Related Works, to weekly maintenance of the Upperchurch Windfarm. All of these activities will take place from road/hard-core areas, with the vast majority of activity taking place on the turbine hardstands, and there will be no requirement for a works area boundary to be erected. Therefore operational activities will have a Neutral effect on land use.
Decommissioning Stage				
Rationale for Excluding: No potential for impacts/Neutral impacts: UWF Grid Connection will remain part of the National Grid, therefore no impacts can occur. UWF Related Works: The cables will be pulled from the Internal Windfarm Cabling ducts at the turbines or at the substation; the ducting, Realigned Windfarm Roads and Haul Route Works will remain in-situ; therefore, no decommissioning works to lands are required.				

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Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Upperchurch Windfarm: It is likely that the Consented UWF Substation will remain in-situ for use by ESBN and that the Consented UWF Roads will also remain in-situ for use by the landowner. Decommissioning works will be limited to the Consented UWF Turbines, hardstanding areas and associated drainage systems, along with the meteorological masts. All decommissioning works will take place from hard-core areas, with the vast majority of activity taking place on the turbine hardstands. Works area boundaries will not be required for decommissioning activities. Therefore, it is considered that decommissioning activities will have a Neutral effect on land use.				

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9.3.5 Mitigation Measures for Impacts to Forestry Land

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Forestry Land**.

9.3.6 Evaluation of Residual Impacts to Forestry Land

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Forestry Land above (Section 9.3.4) – i.e. **no significant adverse impacts**.

9.3.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.
The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

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9.3.8 Summary of Impacts to Forestry Land

A summary of the Impact to Forestry Land is presented in Table 9-13.

Table 9-14: Summary of the impacts to Forestry Land

Impact to Forestry Land:	**Loss of Use and Connectivity of Landholdings**
Evaluation Impact Table	*Section 9.3.4.1*
Project Life-Cycle Stage	*Construction/early operational*
UWF Grid Connection Impact	**Neutral Impact - evaluated as excluded**
Element 2: UWF Related Works	Imperceptible
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 9.3.2.2.1
Element 4: Upperchurch Windfarm	Slight
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 9.3.2.2.1
Cumulative Impact:	
Whole UWF Project Effect	**Imperceptible**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Forestry Land with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 9.3.2.2).

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9.4 Reference List

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Chapter 10: Soils

HYDRO ENVIRONMENTAL SERVICES

ECOPOWER

October 2019

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Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

List of Appendices

Appendix No.	Appendix Title
Appendix 10.1	Trail Pit Investigations

Appendices referenced in this topic chapter can be found in **Volume C4 EIAR Appendices.**

Glossary of Terms

Term	Definition
Alluvium	Deposits of clays, silts, sands and gravels associated with river action.
Blanket Bog	Blanket bog is an area of peatland, forming where there is a climate of high rainfall and a low level of evapotranspiration, allowing decomposed organic material to accumulate over large expanses of undulating ground.
Boulder Clay	See glacial till.
Glacial Till	Glacial sediment that is deposited directly from glacial ice and therefore not sorted. Also can be called overburden or boulder clay.
Greywacke	A variety of argillaceous sandstone that is highly indurated and poorly sorted.
Fluvio-glacial Deposits	Sediments deposited by river or/and glacial action.
Limestone	A sedimentary rock composed primarily of calcium carbonate. Some 10% to 15% of all sedimentary rocks are limestones. Limestone is usually organic, but it may also be inorganic.
Mineral Subsoil	Subsoil derived from parent bedrock material such as sandstone and limestone
Metasediments	Material derived from pre-existing rock which has undergone metamorphism.
Mudstone	Argillaceous or clay-bearing sedimentary rock which is non-plastic and has a massive non-

Term	Definition
	foliated appearance.
Overburden	See glacial till.
Project Design Measure	Measures for environmental protection, incorporated into the design of the project.
Sandstone	A clastic rock composed of particles that range in diameter from 1/16 millimetre to 2 millimetres in diameter. Sandstones make up about 25% of all sedimentary rocks.
Schist	A strongly foliated metamorphic rock that develops from mudstone or shale and splits easily into flat, parallel slabs.
Shale	A rock formed from fine-grained clay-size sediment.
Siltstone	A typically layered and flaggy rock composed of two thirds silt-sized particles.
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.
Topsoil	The uppermost mineral or organic layer of soil
Volcanic	An igneous rock formed from lava that has flowed out onto the Earth's surface, characterised by rapid solidification.

List of Abbreviations

Abbreviation	Full Term
BPM	Ecopower Best Practice Measure developed by members of the EIAR Team
NHA	National Heritage Area as defined by the National Parks and Wildlife Services
PD	Ecopower Project Design Environmental Protection Measure developed by members of the EIAR Team
SAC	Special Areas of Conservation as defined by the National Parks and Wildlife Services
UGC	Underground Cables
UWF	Upperchurch Windfarm

Executive Summary of the Soils Chapter

Baseline Environment: Soils (i.e. superficial geology including subsoils) in the study area comprise mainly poorly draining mineral or peaty topsoil over glacial tills, sandstone tills with bedrock close to the surface along much of the 110kV UGC route along the Regional Road R503. Alluvium and fluvio-glacial sand and gravels are present along the larger watercourses such as the Newport River, Bilboa River and Clare River. The underlying bedrock in the study area comprises a mixture of sandstone, limestone and volcanic meta-sediments, with the latter being most predominant.

Survey Results for Sensitive Aspects in the Baseline Environment: Review of geological mapping of the Mountphilips Substation site and the 110kV UGC route was carried out and surveys of the site including trial pit investigations at the Mountphilips Substation site (5 No.) and the Consented UWF Substation site (1 No.), were carried out to assess soil / subsoil lithology, subsoil depth and ground conditions**.** Soils are generally shallow at the UWF Grid Connection locations with 'bedrock close to surface' mapped along much of the 110kV UGC route. There are also some 'blanket peat' soils mapped by EPA adjacent to the central part of the 110kV UGC on the R503 Regional Road, peat probes at these locations found that this regional road is predominately constructed on competent ground. Project design of the cables trench includes the use of geotextile material in any sections of trench where competent ground is not encountered, this will ensure that the 110kV UGC does not affect the structure of public roads or affect the stability of the soils below.

The UWF Grid Connection will be located on agricultural grassland at Mountphilips Substation and within road pavements for the 110kV UGC outside of the Mountphilips Site (c.84% of the development). The soils in the agricultural lands and underlying the public road pavements have been heavily altered by the existing landuse. The soils, subsoils and bedrock are largely not designated and have a low to medium geological importance.

In total, approximately 28,680m^3 of geological material will be permanently excavated and this will mainly arise from the ground works and new access road for Mountphilips Substation and the trenching/joint bays for the 110kV UGC; comprising topsoil (4,060m^3), subsoil (1,240m^3) and spoil from public road excavations (23,380m^3); 5,000m^3 of the excavated material will be permanently stored along the new access road to Mountphilips Substation and around the Mountphilips Substation Compound as linear berms around the substation and along both sides of the new access road. The remaining excavated soils (300m^3) will be reinstated within the works area at Coole/Mountphilips. All material excavated (23,380m^3) from trench and joint bay excavations along the 110kV UGC, outside the Mountphilips Substation site, will be removed to licenced waste facilities.

The cabling works are located within the boundary of the Lower River Shannon SAC at six locations along public road carriageways only, for a total length of 1025m of trenching. Within the SAC, 760m^3 of public road spoil, comprising 90m^3 of public road bitumen material; 60m^3 of public road base layer stone and 610m^3 of subsoil, will be excavated. No Joint Bays are located within the SAC boundary.

Summary of the Likely Impact on Local Soils, Subsoils & Bedrock: Soils and geology can be sensitive to processes such as excavation and relocation, erosion, compaction and contamination. Soil is biologically active and supports complex ecosystems which are sensitive to chemical and biological changes. The impact on Soils is evaluated as **Imperceptible** for compaction, erosion and contamination by oils or cement; and **Slight** for excavation and relocation, because the soil and geology at the Mountphilips Substation and along the 110kV UGC are abundant in the area and of low to medium importance; all works will be temporary and generally transient in nature; the excavations required for the 110kV UGC works will be spread out over a large geographical area and will be relatively shallow; Mountphilips Substation site will be backfilled,

and the soils surrounding new permanent hard-core areas will be fully reinstated and landscaped immediately after the works; environmental protection measures are designed into the project to prevent compaction, erosion and contamination of soils; no batching of wet cement will take place on-site and only precast concrete structures will be used at joint bays and at watercourse crossing locations as required. **Summary of the Likely Cumulative Impact on Local Soils, Subsoils & Bedrock**: Where the UWF Grid Connection interacts with Other Elements of the Whole UWF Project the cumulative compaction, erosion or contamination by fuels/oils will be **Imperceptible** due to limited interaction at the 110kV UGC with the Other Elements of the Whole UWF Project. **Slight** cumulative excavation/relocation impact due to the large volumes of excavations required for the whole project, with **Slight to Moderate** cumulative impacts in relation to contamination by cementious products which reflects the volumes of concrete which will be required for the Consented Upperchurch Windfarm turbine foundations. Concrete control measures will be implemented as part of the Consented Upperchurch Windfarm as per planning condition.

Summary of the Likely Impact on the Lower River Shannon SAC: Soils and geology are not a qualifying feature of the Lower River Shannon SAC and the construction of the 110kV UGC will not directly affect the qualifying interests of River Shannon SAC (which are largely water based aquatic habitats / species). There will be no excavation of the river bed or banks within the boundary of the SAC, and all UWF Grid Connection works within the boundary of the SAC will take place within road pavements and over existing bridge structures. The direct impact on Soils in the Lower River Shannon SAC is evaluated as **imperceptible** because the interaction of the development with the SAC is entirely within the paved public road surface and existing bridge structures, which will provide a protective cover to the underlying subsoils; use of wet cement within the SAC will be limited to the placement of very small volumes of cement mix, in the cables trench and environmental protection measures such as the lining of trenches within the SAC with impermeable material, are designed into the project to protect soils from contamination. There is **No Potential for cumulative effects with the Other Elements** of the Whole UWF Project because only the UWF Grid Connection (110kV UGC route) overlaps the boundary of the Lower River Shannon SAC.

Conclusion: The UWF Grid Connection will not cause significant adverse effects to Soils.

Topic **Soils**

10 Environmental Factor: Soils

10.1 Introduction to the Soils Chapter

10.1.1 What are Soils?

Soil is a biologically active, complex mixture of weathered minerals, organic matter, organisms, air and water. This mixture supports a range of critical functions such as supporting terrestrial ecosystems and biological diversity, agricultural food production, flood alleviation, water filtration and storage, and carbon capture.[1] This Soils chapter relates to the topsoil and subsoil (collectively referred to as overburden) along with the underlying bedrock.

10.1.2 Overview of Soils in the Local Environment

The UWF Grid Connection will be located on agricultural grassland at the Mountphilips Substation site and within public road pavements outside of the Mountphilips Station site. The eastern end of the 110kV UGC is located within a short section of private paved road and within the Consented Upperchurch Windfarm Substation. See Figure GC 10.1: Location of the UWF Grid Connection**.** Figures and mapping which are referenced in this topic chapter can be found in Volume C3 EIAR Figures**.**

Soils (*i.e.* superficial geology including subsoils) in the study area comprise mainly poorly draining mineral or peaty topsoil over glacial tills. Alluvium and fluvio-glacial sand and gravels are present along the larger watercourses such as the Newport River, Bilboa River and Clare River. The underlying bedrock in the study area comprises a mixture of sandstone, limestone and volcanic meta-sediments, with the latter being most predominant.

A small number of County Geological Heritage Sites occur in valleys and on the lower slopes of the Slievefelim and Silvermine Mountain upland areas, a small number of National Heritage Areas (NHAs and pNHAs) occur generally on upland blanket bogs, while the Lower River Shannon SAC occurs along river valleys in the area. Overall, the soils, subsoils and bedrock at the majority of the study area are largely not designated, can be considered to have a low to medium geological importance (refer to Table 10-3).

10.1.3 Sensitive Aspects of the Soils Environment included for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspects **are included in this topic chapter** as they could be potentially impacted:

Sensitive Aspect No. 1	Local Soils, Subsoils and Bedrock	Section 10.2
Sensitive Aspect No. 2	Lower River Shannon SAC	Section 10.3

Each of the above listed Sensitive Aspects are evaluated individually in Sections 10.2 to 10.3 of this Chapter.

[1] www.epa.ie/irelandsenvironment/landandsoil/

To help readers navigate to individual sensitive aspect sections, the colour codes for each Sensitive Aspect used above are also used in the Sensitive Aspect sections Section 10.2 to 10.3. The colour-codes have been applied to section headings, tables and on side-tabs on the edge of the pages.

10.1.4 Sensitive Aspects excluded from further evaluation

The following Sensitive Aspects **are excluded from this topic chapter**:

Lower River Suir SAC	Evaluated as having no potential for impacts due to: The Lower River Suir SAC is located to the south of the elements of the Whole UWF Project - 5.8km from UWF Grid Connection, 5.5km from UWF Related Works, 6km from Upperchurch Windfarm and 8.5km from UWF Replacement Forestry No element of the Whole UWF Project Interacts directly with the River Suir as there are no works located within the SAC boundary and therefore no direct impacts on soil and geology within the SAC will take place. The potential for indirect effects from sediment laden runoff into the SAC are considered in Chapter 11 Water.
Bleanbeg Bog NHA	Evaluated as having no potential for impacts due to: Bleanbeg Bog NHA is an upland blanket bog which is located approximately 2.5km north of the UWF Grid Connection (110kV UGC), 12.2km west of the UWF Related Works and Upperchurch Windfarm and 13.2km west of the UWF Replacement Forestry. As no element of the Whole UWF Project is located within this NHA, direct effects on soils and geology within the NHA are scoped out from further evaluation, as no impacts will take place.
Mauherslieve Bog NHA	Evaluated as having no potential for impacts due to: Mauherslieve Bog NHA is an upland blanket bog which is located approximately 3km north of the UWF Grid Connection, 5km west of the UWF Related Works and Upperchurch Windfarm and 6.5km west of the UWF Replacement Forestry. As no element of the Whole UWF Project is located within this NHA, direct effects on soils and geology within the NHA are scoped out from further evaluation, as no impacts will take place.
Clare Glen Moraine	Effects evaluated as having no potential for impacts due to: Moraines are mapped in a valley c.2km to the south of the UWF Grid Connection (110kV UGC). All works for the UWF Grid Connection are contained within the carriageway of the public road, and therefore there is no potential for impacts. UWF Related Works, UWF Replacement Forestry, Upperchurch Windfarm and UWF Other Activities are located c.20km to the east and due to the intervening distance will not cause any effects to the moraine.
Rear Cross Moraine	Effects evaluated as having no potential for impacts due to: Moraines are mapped in a valley c.1.4km to the north of the UWF Grid Connection (110kV UGC) at Rear Cross. All works are contained within the carriageway of the public road, and therefore there is no potential for impacts. UWF Related Works, UWF Replacement Forestry, Upperchurch Windfarm and UWF Other Activities are located greater than 5km from these Moraines and due to the intervening distance will not cause any effects to the Rear Cross Moraines.
Owenbeg Moraine	Evaluated as having no potential for impacts due to: The construction works areas are located at a distance from and do not intercept the unaudited mapped boundary of the Owenbeg Moraine, which is mapped in the Owenbeg River valley to the south of the UWF Grid Connection, UWF Related Works, Upperchurch Windfarm, and UWF Replacement Forestry.

10.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of a current application to An Bord Pleanála.

The main parts of the UWF Grid Connection are identified in the table below.

Table 10-1: Subject Development – Element 1 of the Whole UWF Project

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC (110kV UGC) Ancillary Works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in this EIA Report in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 EIAR Main Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

10.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.
- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. ***Note***: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

10.1.6 The Authors of the Soils Chapter

This report on the Environmental Factor Soils has been written by David Broderick (BSc, H. Dip Env Eng, MSc): Hydrogeologist; and Michael Gill (P. Geo., B.A., B.A.I., M.Sc., Dip. Geol, MIEI): Environmental Engineer and Hydrogeologist of Hydro-Environmental Services (HES). HES was established in 2005 as a hydrological, hydrogeological and environmental practice, specialising in soils and geology, and peatland and upland hydrology.

10.1.7 Sources of Baseline Information

The information sources outlined in Table 10-2 were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 10-2: Sources of Baseline Information for Soils

Type	Source
Consultation	No Feedback received from consultees See Chapter 3: The Scoping Consultations, Chapter 3 Appendices for further details.
Industry Guidelines	• National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes; and, • Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements
Desktop	• Environmental Protection Agency database (www.epa.ie); • Geological Survey of Ireland Database (www.gsi.ie); • National Parks & Wildlife Services Public Map Viewer (www.npws.ie); • Review of Chapter 9: Land • Review of planning/ environmental information documents for the Other Elements of the Whole UWF Project as contained in Volume F of the planning application
Fieldwork	• Surveys and geological mapping of the Mountphilips Substation site and 110kV UGC; • Trial pit investigations at the Mountphilips Substation site and the Consented Windfarm Substation site to assess soil / subsoil lithology, subsoil depth and ground conditions (Appendix 10.1: Trail Pit Investigations) • Review of peat probing undertaken on lands adjacent to the R503 at Tooreenbrien Lower, Reardnogy Beg, Reardnogy More, Kilcommon, Loughbrack and Knocknabansha townlands - Appendix 15.5: Peat Probe Survey • A visual survey of the R503 Regional Road to assess potential road settlement

10.1.7.1 Certainty and Sufficiency of Information Provided

The criteria used for soils appraisals are derived from the National Roads Authority (2008) guidance document. A clear documentary trail is provided throughout this chapter and chapter appendices to the competency of data and methods used and the rationale for selection of same. The information used to compile this chapter is collated from site specific investigations, data and documents generated by public bodies and statutory agencies. The online baseline data was verified in the field.

Impacts on soils and geology are generally quantifiable to a high degree of certainty as impacts are typically direct and measurable (i.e. excavation volumes, storage volumes and working area footprints susceptible to compaction and erosion). All excavation volumes for the UWF Grid Connection have been clearly tabulated in this EIAR.

In respect of Soil no significant limitations or difficulties were encountered.

10.1.8 Methodology used to Describe the Baseline Environment and to Evaluate Impacts

10.1.8.1 NRA Soil Evaluation Criteria

The criteria used for this Soils appraisal are derived from the above listed NRA Guidelines. Whilst this is tailored to the soil appraisal, the significance judgements correspond very closely with the EPA significance criteria with the main point of note being that significance of impacts range from "Imperceptible to Profound". The criteria and approach for evaluation of soil are set out below.

Using the National Roads Authority (2008) guidance, an estimation of the importance of the soil and geological environment within the study area is quantified, using the criteria set out in Table 10-3 below. An estimation of the magnitude of the impact is assessed using criteria in Table 10-4 (NRA, 2008) and the rating of environmental impacts is then assessed using criteria in Table 10-5 (NRA, 2008).

Table 10-3: NRA Criteria for Determining the Importance of Soil and Geology

Importance	Criteria[1]	Typical Example
Very High	• Attribute has a high quality, significance or value on a regional or national scale. • Degree or extent of soil contamination is significant on a national or regional scale. • Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	• Geological feature rare on a regional or national scale (NHA/SAC). • Large existing quarry or pit. • Proven economically extractable mineral resource.
High	• Attribute has a high quality, significance or value on a local scale. • Degree or extent of soil contamination is significant on a local scale. • Volume of peat and/or soft organic soil underlying site is significant on a local scale.	• Contaminated soil on site with previous heavy industrial usage. • Large recent landfill site for mixed wastes. • Geological feature of high value on a local scale (County Geological Site). • Well drained and/or high fertility soils. • Moderately sized existing quarry or pit. • Marginally economic extractable mineral resource.
Medium	• Attribute has a medium quality, significance or value on a local scale. • Degree or extent of soil contamination is moderate on a local scale. • Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	• Contaminated soil on site with previous light industrial usage. • Small recent landfill site for mixed Wastes. • Moderately drained and/or moderate fertility soils. • Small existing quarry or pit. • Sub-economic extractable mineral resource.
Low	• Attribute has a low quality, significance or value on a local scale. • Degree or extent of soil contamination is minor on a local scale. • Volume of peat and/or soft organic soil underlying site is small on a local scale.	• Large historical and/or recent site for construction and demolition wastes. • Small historical and/or recent landfill site for construction and demolition wastes. • Poorly drained and/or low fertility soils. • Uneconomically extractable mineral resource.

High quality and a high degree of site contamination are put side by side in this table, because either could be a potentially constraining factor when developing a site. High quality will likely be more relevant to a Greenfield site, while the extent of contamination will likely be more relevant to a Brownfield site. The higher the quality/contamination means the higher the potential for constraints, the higher the importance

Table 10-4: NRA Estimation of Magnitude of Impact (NRA, 2008)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	• Loss of high proportion of future quarry or pit reserves • Irreversible loss of high proportion of local high fertility soils • Removal of entirety of geological heritage feature • Requirement to excavate / remediate entire waste site • Requirement to excavate and replace high proportion of peat, • Organic soils and/or soft mineral soils beneath alignment
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	• Loss of moderate proportion of future quarry or pit reserves • Removal of part of geological heritage feature • Irreversible loss of moderate proportion of local high fertility soils • Requirement to excavate / remediate significant proportion of waste site • Requirement to excavate and replace moderate proportion of peat, • organic soils and/or soft mineral soils beneath alignment
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	• Loss of small proportion of future quarry or pit reserves • Removal of small part of geological heritage feature • Irreversible loss of small proportion of local high fertility soils and/or • High proportion of local low fertility soils • Requirement to excavate / remediate small proportion of waste site • Requirement to excavate and replace small proportion of peat, • Organic soils and/or soft mineral soils beneath alignment
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	• No measurable changes in attributes

Table 10-5: NRA Rating of Environmental Impacts at EIAR Stage (NRA, 2008)

	Magnitude of Impact			
Importance of Tribute	**Negligible**	**Small Adverse**	**Moderate Adverse**	**Large Adverse**
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/Moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/Moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

10.2 Sensitive Aspect No.1: Local Soils, Subsoils & Bedrock

This Section provides a description and evaluation of the Sensitive Aspect - Local Soils, Subsoils & Bedrock.

10.2.1 BASELINE CHARACTERISTICS of Local Soils, Subsoils & Bedrock

10.2.1.1 STUDY AREA for Local Soils, Subsoils & Bedrock

The study area for Local Soils, Subsoils & Bedrock in relation to the UWF Grid Connection is described in Table 10-6 and illustrated on Figure GC 10.2.1 UWF Grid Connection Study Area for Local Soils & Subsoils and Figure GC 10.2.2: UWF Grid Connection Study Area for Local Bedrock**.**

Table 10-6: UWF Grid Connection Study Area for Local Soils, Subsoils & Bedrock

Study Area for Local Soils, Subsoils & Bedrock	Justification for the Study Area Extents
Within the footprint of construction works and immediate adjacent lands that adjoin the works areas	Only direct effects on soils and geology are anticipated.

10.2.1.2 Baseline Context & Character of Local Soils, Subsoils & Bedrock in the UWF Grid Connection Study Area

To put the soil and geological environment into context, the current landuse in the study area is briefly described here.

The UWF Grid Connection will be located in the Slievefelim to Silvermine Mountain upland area. The UWF Grid Connection will be located predominately on public roads, with a smaller area on agricultural lands at Mountphilips Substation site, as outlined on Table 10-7.

The Mountphilips Substation will be constructed on a grassland site near Newport. The 110kV UGC will run in an easterly direction from the new Mountphilips Substation, and will cross under the southern hills of the Silvermine Mountains on the regional road R503 towards the Consented UWF Substation. The straight line distance between the Mountphilips Substation and the Consented UWF Substation is ~23km while the actual length of the 110kV UGC route is 30.5km.

10.2.1.2.1 Overview of Landuse

An overview of the current landuse at the UWF Grid Connection areas is shown in Table 10-7 below. Please refer to the Land Chapter (Chapter 9) for full details relating to landuse within the UWF Grid Connection study area. For information relating to historical landuse at the construction works areas, please refer to the Cultural Heritage Chapter (Chapter 16).

Table 10-7: Overview of Landuse within the UWF Grid Connection Study Area

Element	Total Landuse (Ha)	Agricultural	Public Roads	Forestry (private bitumen paved road)
UWF Grid Connection	29.6	16%	82%	2%

10.2.1.2.2 Summary of Soils and Bedrock within the Study Area

A summary of the Geological Survey of Ireland (GSI) mapped subsoil and bedrock geology within the study areas is shown in Table 10-8 below. The GSI mapping for subsoils and bedrock geology is illustrated on Figure GC 10.2.1 and on and Figure GC 10.2.2

Table 10-8: Summary of the GSI Mapped Geology within the UWF Grid Connection Study Area

UWF Grid Connection part	**Townlands**	**Length (km)** -Figure GC 10.2.2	**General Bedrock Unit Name** -Figure GC 10.2.2	**GSI Local Bedrock Formation Description**	**Main Subsoil Type** -Figure GC 10.2.1	**Main Soil Type**
Mountphilips End Masts & Mountphilips Substation	Mountphilips	0.1 km	Dinantian Lower Impure Limestone	Dark, muddy Limestone and Shale	Sandstone Tills	Poorly Draining Mineral soil
Mountphilips Substation & New Permanent Access Road	Mountphilips, Coole	0.7 km	Dinantian Sandstones, Shales and Limestone	Sandstone, Mudstone and thin Limestone	Sandstone Tills	Poorly Draining and Well Draining Mineral soil
110kV UGC	Freagh, Foildarrig, Oakhampton, Rockvale, Mackney (O'Brien), Mackney (Bourke), Ahane, Newross, Castlewaller, Carrowkeale, Tullow, Cooldrisla, Derryleigh, Kilnacappagh, Scraggeen, Derrygareen, Inchadrinagh, Knockancullenagh, Fanit	10.5 km	Devonian Old Red Sandstones	Pale red Sandstone, Grit and Claystone	Sandstone Tills Devonian, Bedrock at Surface and Cutover Peat	Poorly Draining Mineral soil and Peaty Soil
110kV UGC & Private Paved Road at the Consented UWF Substation	Lackamore, Tooreenbrien Upper, Tooreenbrien Lower, Reardnogy Beg, Reardnogy More, Shanballyedmond, Baurnadomeeny, Coonmore, Foildarragh, Kilcommon, Loughbrack, Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons	19.2 km	Silurian Meta-sediments and Volcanics	Greywacke, Siltstone and Grit	Sandstone Tills Devonian, Bedrock at Surface, Cutover Peat, Blanket Peat, Made Ground	Peaty Soil and Poorly Draining Mineral Soil

10.2.1.2.3 Results of Fieldwork Investigations

The detailed walkover surveys and site investigations at the Mountphilips Substation site, were undertaken in 2016 and 2017. The soils in the vicinity of the Consented UWF Substation were also investigated.

Peat probe surveys were undertaken in mapped Blanket Peat along the central sections of the 110kV UGC route on the R503.

The findings of the walkover surveys and site investigations are summarised in Table 10-9. The location of site investigations is identified on the Local Subsoil Maps on Figure GC 10.2.1.

Table 10-9: Summary of Local Geology and Ground Conditions in UWF Grid Connection Study Area

Location	Townlands	Landuse	Site Investigations -Figure GC 10.2.1	Summary of Local Geology and Ground Conditions
Mountphilips Substation (and End Masts)	Mountphilips, Coole	Grassland	5 no. Trial Pits	• Poorly draining mineral soil over sandstone tills • Alluvium adjacent to stream flowing between Compound site and End Masts • Trial Pits intercepted sandy SILT over gravelly sandy CLAY • Depth to bedrock >3m at End Mast location; • Depth to bedrock >1.4m at Substation location.
110kV UGC Section Section XX	Tooreenbrien Lower, Reardnogy Beg, Reardnogy More, Kilcommon, Loughbrack and Knocknabansha	Public Road R503	20 no. peat probes adjacent to the R503 road	• Mapped peat adjacent to the R503 • 15 no. probes identified only peaty topsoil over mineral soil • 5 no. locations encountered peat depths between 1 and 4m • The peat was typically upslope of road • The road itself underlain by competent soil and not peat
110kV UGC At the consented UWF Substation	Knockcurraghbola Commons	Grassland with some Forestry track	1 no. Trial Pits	• Poorly draining soil or well draining soil over Sandstone and Shale Tills in grassland and forestry areas • Gravelly SILT/CLAY or gravelly SILT was encountered in grassland and forestry areas • Bedrock not met

Further information on these surveys and investigations can be found in Appendix 10.1: Trail Pit Investigations and Appendix 15.5: Peat Probe Survey (Volume C4: EIAR Appendices). The results of peat probe surveys is also examined in Chapter 15: Material Assets (Roads).

10.2.1.3 Importance of Local Soils, Subsoils & Bedrock

Soil, subsoil and bedrock in the area are for the most part not designated (*i.e.* SAC) and the soil types are locally and regionally abundant and are not unique in any way. The soils in agricultural lands at the Mountphilips Substation site and the soils underlying the public road pavements and the private paved road pavements have been heavily altered by the existing landuse. The soils at the Consented UWF Substation will have been altered by the time works for the 110kV UGC take place within the compound. Therefore, based on the criteria set out in Table 10-3, the importance of the soils at the vast majority of the UWF Grid Connection study area is classed as having a **low to medium importance**.

The exception to this importance rating occurs along the UWF Grid Connection, where the 110kV UGC (within public road pavements and within bridge structures) briefly passes through the boundary of the Lower River Shannon SAC at 6 locations, the soils of the Lower River Shannon SAC are described separately in Section 10.3.1.2 of this chapter. The UWF Grid Connection is not located within, or in close proximity to,

any NHA, pNHA or other Geological Heritage Site (see also Section 10.1.4: Sensitive Aspects excluded from further evaluation, where the potential for impacts to national and geological heritage sites is evaluated).

10.2.1.4 Sensitivity of Local Soils, Subsoils & Bedrock

Soils and geology can be sensitive to processes such as erosion, compaction and drainage. The rate of these processes can be increased by certain landuse practices or landuse changes such as deforestation. Soil is also biologically active and it supports complex ecosystems which are sensitive to chemical and biological changes.

10.2.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

The soils and subsoils in the study areas have all been altered to some extent by drainage or by other land improvement works or land use changes related to the existing land use (*i.e.* forestry and agriculture, and public roads). These landuse improvement practices are expected to continue, as agricultural land and forestry regularly needs continued ploughing, seeding, planting etc to improve soil and subsoil structure. This leaves land susceptible for periods to erosion and compaction. Forestry tracks and farm tracks are also regularly upgraded. The other main, on-going, land use improvement practice that will directly affect soil and subsoil is drainage works.

10.2.1.6 Receiving Environment (the Baseline + Trends)

Rates of natural processes (i.e. erosion and weathering) and changes made by landuse practices are typically relatively slow. Therefore it is assumed in this report that the baseline environment for soils as identified above will be the receiving environment at the time of construction.

10.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

10.2.2.1 Cumulative Evaluation Study Areas

10.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Local Soils, Subsoil & Bedrock	Justification for the Study Area Extents
Footprint of UWF Grid Connection construction works areas and immediate adjacent lands that adjoin the works areas	Only direct effects on soils and geology are anticipated

The study is illustrated on Figure CE 10.2.1: UWF Grid Connection Cumulative Evaluation Study Area for Local Soils & Subsoil and on Figure CE 10.2.2: UWF Grid Connection Cumulative Evaluation Study Area for Local Bedrock.

10.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 10.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements and Other Projects or Activities which are described in Table 10-10 and illustrated on Figure WP 10.2.1: Whole Project Study Area for Local Soils & Subsoils and Figure WP 10.2.2: Whole Project Study Area for Local Bedrock (Volume C3 EIAR Figures).

Table 10-10: Whole Project Cumulative Evaluation Study Area for Local Soils, Subsoils & Bedrock

Cumulative Project	**Cumulative Study Area Boundary**	**Justification for Study Area Extent**
Element 1: UWF Grid Connection	Boundary of works areas and activity locations	Only direct effects on soils and geology are anticipated.
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

10.2.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Local Soils, Subsoils & Bedrock also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Local Soils, Subsoils & Bedrock with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Sections A2.1.4.16).

The results of this scoping exercise are that: no other projects or activities will cause cumulative effects to Local Soils, Subsoils & Bedrock with UWF Grid Connection or with the Other Elements.

10.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Local Soils, Subsoils & Bedrock

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Local Soils, Subsoils and Bedrock. The results of this evaluation is included in Table 10-11.

The location of, and study area boundary associated with, the Other Elements is illustrated on Figure WP 10.2.1: and Figure WP 10.2.2. The baseline character of the areas around these projects is described in Section 10.2.2.3.

Table 10-11: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Element of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: Neutral effect/No potential for effects due to: • Neutral excavation/relocation effects or erosion effects to local soils or subsoils as there will be no requirement for mechanical excavations with the UWF Replacement Forestry being planted by hand using spades (Project Design Measure), any excavation of soil will be very localized and shallow. • No potential for compaction effects, as there will be no use of heavy machinery during the planting or maintenance activities, • No potential for impacts to bedrock, as there will be no requirement to excavate bedrock. • Neutral contamination effects, as there will be no refuelling of vehicles, no storage of fuels and no overnight parking permitted within the site (Project Design Measure), • No potential for contamination of soils by pesticides, fertilizers or cementitious materials, as pesticides or fertilizers will not be used (Project Design Measure) and there will be no requirement for cement based products for the UWF Replacement Forestry, • No effects on soils and geology are expected during the growing (operational) phase as there is no requirement for any excavations. • The UWF Replacement Forestry will be permanent woodland (project design) therefore no harvesting (changes to the project) will occur.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effect/No potential for effects due to: • Haul Route Activities: no potential for impacts as matting will be laid over any reinstated verges as necessary; these activities will not require any works, excavations or

	relocation of soils. • Overhead Line Activities: Neutral impact, these activities will involve cable wrapping and re-sagging of the overhead existing lines and there and will not involve mechanical excavation or relocation of soils, therefore effects on soils will be Neutral. • Upperchurch Hen Harrier Scheme: Neutral impact, this activity will comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will generally take place on the periphery of fields and will not involve mechanical excavation or moving soils, therefore effects on soils will be Neutral. During the Operational Stage of UWF, farming practices under the Upperchurch Hen Harrier Scheme will, to a certain extent, cause lands to revert back to wet grassland which will have a neutral effect on soils over time, due to the extent of the Scheme area in the context of the extent of soils in the surrounding area. • Monitoring Activities: No potential for impacts, these activities will not require any works, excavations or relocation of soils.

10.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

10.2.2.3.1 Element 2: UWF Related Works & Element 4: Upperchurch Windfarm

The Consented Upperchurch Windfarm is located on land comprising mainly upland agricultural grassland and some forestry.

The UWF Related Works which will be located in the area of the Consented Upperchurch Windfarm are also located on land comprising mainly upland agricultural grassland and some forestry. Some of the related Haul Route Works are located along the verges of local existing public roads.

An overview of the current landuse at Upperchurch Windfarm and UWF Related Works is shown in Table 10-12 below.

Table 10-12: Overview of Landuse within the Cumulative Evaluation Study Area (Other Elements)

Element	Total Landuse (Ha)	Forestry	Agricultural	Public Roads
Upperchurch Windfarm	56.3	17%	83%	0%
UWF Related Works	20.9	34%	59%	7%

A summary of the Geological Survey of Ireland (GSI) mapped subsoil and bedrock geology within the Upperchurch Windfarm/UWF Related Works study areas is shown in Table 10-13 below. The GSI mapping for subsoils and bedrock geology is illustrated on Figure WP 10.2.1 and Figure WP 10.2.2.

Table 10-13: Summary of the GSI Mapped Geology within the UWF Related Works Study Area

UWF Related Works	General Bedrock Unit Name - Figure WP 10.2.2	GSI Local Bedrock Formation Description	Main Subsoil Type - Figure WP 10.2.1	Main Soil Type
All parts of the Upperchurch Windfarm and UWF Related Works	Silurian Meta-sediments and Volcanics	Greywacke, Siltstone and Grit	Bedrock at Surface, underlain by Sandstone and Shale Tills. Some Blanket Peat	Well Draining and Poorly Draining Mineral soil

Detailed site investigations, were undertaken in 2012 as part of the original Upperchurch Windfarm site investigation works. Walkover surveys of the UWF Related Works area were completed between January

2016 and September 2017. The locations of site investigations are identified on Figure WP 10.2.1. The findings of the walkover surveys and 2012 site investigations are summarised in Table 10-15.

Table 10-14: Summary of Local Geology and Ground Conditions on the Upperchurch Windfarm

Location	Landuse	Site Investigations	Summary of Local Geology and Ground Conditions
Upperchurch Windfarm	Grassland Forestry	20. Trial Pits 2 no. Peat Probes	• Poorly draining peaty soil and well draining soil over Sand-stone and Shale Tills • Most peat has been removed due to past agriculture im-provements • Thin peat remains in some forested areas (<1m) • Trial pits mainly encountered peaty topsoil on gravelly CLAY over weathered SILTSTONE bedrock • Depth to bedrock ranged from 1.2 to 2.9m with an average of 1.9m • Peat probes undertaken at consented turbine locations T05 and T14 recorded peats depth less than 1m

Consideration of the Passage of Time: There has been no changes to the soils, subsoils and bedrock of the Upperchurch Windfarm area, and the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this EIAR. Therefore it is considered that there has been no material changes in the baseline environment.

10.2.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 10.2.2.2.1.

10.2.2.3.3 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 10.2.2.2.1.

10.2.2.3.4 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 10.2.2.2.

10.2.3 PROJECT DESIGN MEASURES for Local Soils, Subsoils & Bedrock

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 10-16 are relevant to the Environmental Factor, Soils, and in particular to the sensitive aspect **Local Soils, Subsoils & Bedrock**.

Table 10-15: UWF Grid Connection Project Design Measures relevant to Local Soils, Subsoils & Bedrock

PD ID	Project Design Environmental Protection Measure (PD)
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD17	At Mountphilips Substation, water for operational stage welfare facilities will be obtained from a Rain Water Harvesting system. Waste water will be collected in tanks and removed from site by an appropriately licensed operator, for treatment in a licensed water treatment plant. These two measures will avoid the need for a new well or mains water connection and will avoid the need to treat waste water on-site.
PD21	At Mountphilips Substation site, the permanent storage berms will be along the new access road and around the substation compound will be planted with local provenance native fruiting hedge species, with grasses and native flower species common to the surrounding vegetation sown along the sides of the berms. Local provenance native wildflower seed of flowering plants like clovers, vetches and knapweed will be included. Revegetation works will take place at the soonest practicable opportunity after emplacement.
PD34	Only precast concrete culverts or structures will be used at the watercourse crossing locations at Mountphilips Substation site and for any culvert replacements along the 110kV UGC. Only precast concrete chambers will be used at Joint Bay locations. No batching of wet cement will take place on-site.
PD42	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD43	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 at the Mountphilips Substation site. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored at the designated location in the temporary compound and all operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be im-

	plemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD44	Overnight parking of plant and machinery will only be permitted at the temporary compound at the Mountphilips Substation site and at a distance greater than 50m from watercourses.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5 in Volume C4: EIAR Appendices.

10.2.4 EVALUATION OF IMPACTS to Local Soils, Subsoils & Bedrock

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Local Soils, Subsoils & Bedrock.

As a result of the exercise, some impacts were included and some were excluded.

Table 10-16: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Excavation and relocation of soil, subsoil and bedrock (Construction Stage)	*Ground instability (construction stage)*
Soil and subsoil compaction (Construction Stage)	*Operational stage effects*
Soil and subsoil erosion (Construction Stage)	*Decommissioning stage effects*
Contamination from Oils, Fuels & Chemicals (Construction Stage)	
Contamination from Cement Based Compounds (Construction Stage)	

The source-pathway-receptor links for included impacts are described in the **Impact Evaluation Tables,** which are presented **in the following sections 10.2.4.1 to 10.2.4.5.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections- Section 10.2.4.6.

10.2.4.1 Impact Evaluation Table: Excavation & Relocation of soils, subsoil, bedrock

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Groundworks, earthworks
Cumulative Impact Source: Groundworks, earthworks, extraction from borrow pits
Impact Pathway: Excavation, drilling, movement and mounding of overburden

Impact Description: The physical excavation and relocation of soil, subsoil and to a lesser extent bedrock from its natural location to a different location. All excavated and relocated soil will be contained within the boundary of construction works areas.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Excavation & Relocation of soils, subsoil and bedrock

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:

- In total, approximately 28,680 m^3 of geological material will be permanently excavated and this will mainly arise from the ground works and new access road for Mountphilips Substation (total 5,300m^3) and the trenching/joint bays for the 110kV UGC ; comprising topsoil (4,060m^3), subsoil (1,240m^3) and spoil from public road excavations (23,380m^3);
- 5,000m^3 of the excavated material will be permanently stored along the new access road to Mountphilips Substation and around the Mountphilips Substation compound as linear berms along both sides of the road, and the remainder (300m^3) will be reinstated within the works area at Coole/Mountphilips.
- The 23,380m^3 of spoil from the public road excavations will be removed to a licensed waste facility.
- It is considered that the impact magnitude will be Small Adverse (refer to Table 10-4) as the excavation volumes, which are relatively small, will be spread out over a large geographical area over the length of the UWF Grid Connection (i.e. 23km latitudinal distance).

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- As per Table 10-4, Small Adverse magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- The excavations required for the 110kV UGC works will be spread out over a large geographical area - 23km latitudinal distance, therefore are not concentrated in any one area, thereby distributing the overall effect on soils and geology over a wide geographical area);
- The relatively shallow nature of the excavation works required for the 110kV UGC, Mountphilips Substation, new access roads and site entrance;
- All permanent excavated areas at Mountphilips Substation site will be backfilled, and the soils surrounding new permanent hard-core areas will be fully reinstated and landscaped with local provenance native fruiting hedge species, with grasses and native flower species at the soonest practicable opportunity after emplacement by virtue of the project design;
- All excavations along the 110kV UGC will be will be backfilled immediately after the works by virtue of the design (i.e. backfilling and reinstatement of the 110kV UGC cable trench);
- All effects will be direct and relatively localised;
- The soil and geology at the Mountphilips Substation and along the 110kV UGC are abundant and are not unique in any way;
- With the exception of the short sections of the 110kV UGC route within the Lower River Shannon SAC (which is assessed separately below), the soil and geology is of low to medium importance; and,

- All works will be temporary and generally transient in nature.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude:
The potential for cumulative impacts is limited to the eastern end of the 110kV UGC route in 1 No. forestry landholding in Knockcurraghbola Commons. Cumulative impacts relate to the combined excavation and relocation of soils in this landholding, where 140m^3 of bitumen layer and 400m^3 sub-soil will be excavated from the private paved road for the 110kV UGC trench, and 960m^3 of soils for the Internal Windfarm Cabling (UWF Related Works) and windfarm access roads and turbine hardstand (Upperchurch Windfarm) in the forestry landholding (off the paved road).

It is considered that the cumulative impact magnitude will be Negligible in the Forestry landholding due to the location of the 110kV UGC in a paved road, with no land-use change, and excavations relating to soils which have already been excavated and heavily modified during the laying of the roadway.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- location of the 110kV UGC within an existing paved road within the zone of cumulative impacts;
- The transient and temporary nature of the construction works.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
In total, approximately 11,830m^3 of natural material will be excavated and this will mainly arise from the Internal Windfarm Cabling trenching, Haul Route Works, Realigned Windfarm Roads and Telecom Relay Pole. This will include topsoil (4,750m^3), subsoil (6,670m^3 to a much lesser extent bedrock (360m^3) and spoil (50m^3); and, ~930m^3 of overburden will be permanently stored within the windfarm and the remainder (10,850 m^3) will be reinstated within the works area. The impact magnitude will be Moderate Adverse (refer to Table 10-4) as the excavation volumes which are relatively small, will be spread out over the area of the Upperchurch Windfarm

Significance of the Impact: Slight to Moderate

Rationale for Impact Evaluation:

- As per Table 10-4, Moderate Adverse magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- The relatively small excavation volumes required for the Internal Windfarm Cabling trench by it being virtue of a narrow, relatively shallow excavation;
- Approximately 62% (11.1 of the total 17.9km) of the Internal Windfarm Cabling will be within the Consented UWF Roads thereby reducing overall excavations volume requirements;
- The small area of lands subject to works, in the context of the abundance of the soil types in the surrounding area;
- The relatively shallow nature of the excavation works required for UWF Related Works;
- All works will be temporary and transient in nature;
- All excavations will be fully reinstated and landscaped immediately after the works by virtue of the design (i.e. backfilling and reinstatement of the Internal Windfarm Cabling trenching);
- Following the completion of construction works in an area, lands will be reinstated to at least their former (or better) condition and returned to the landowner for use as before;
- The soil and geology at the UWF Related Works area is abundant and not unique in any way; and,

- The soil and geology is only of low to medium importance and is not designated (i.e. SAC, NHA or pNHA).

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 10.2.2.2.1.*

Element 4: Upperchurch Windfarm

Impact Magnitude:

- As per the 2013 EIS, construction of the Upperchurch Windfarm will result in the removal of 108,000m3 of overburden. This will comprise soil (25,500m3), subsoil (79,600m3) and peat (2,900m3);
- There will be a total of 6 no. borrow pits within the site extracting bedrock with the total rock volume estimated at 43,000m3 (EIAR, 2017);
- Up to 56,000m^3 of overburden will be reinstated and used for landscaping;
- Up to 52,000m^3 of overburden will be permanently stored in bunds along Consented UWF Roads and at Consented UWF Turbine hardstanding areas and around the met mast areas; and,
- As per the ABP Inspectors Report (2014, Section 2.0 Reference Documents – Volume F10), the footprint of the Upperchurch Windfarm comprises 11ha within a total landholding area of c.1,050 hectares. Therefore, the footprint of the development accounts for only 1% of the total Upperchurch Windfarm landholding.

It was assessed in the 2013 EIS that the effects on soils and geology will not be significant in light of the consented mitigation measures. This is equivalent to 'Not Significant' in respect of terminology used herein.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- the small scale (~1%) of lands subject works, in the context of the size of total windfarm landholding.
- the volume of overburden / bedrock to be excavated is minimal in the context of the natural resources present within the windfarm landholding; and,
- Following the completion of construction works in an area, lands outside the hard-core footprint of the Upperchurch Windfarm will be reinstated to their former condition and returned to the landowner for use as before.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 10.2.2.2.1.*

Evaluation of Other Cumulative Impacts – Excavation & Relocation of soils, subsoil and bedrock

Whole UWF Project Effect- Excavation & Relocation of soils, subsoil and bedrock

Cumulative Impact Magnitude:

The Whole UWF Project effect relates to the combined excavations and relocation of soils for the UWF Grid Connection and the UWF Related Works and the Upperchurch Windfarm elements. Combined excavation volumes will involve the excavation and relocation (from its natural location) of up to 148,510m^3 of overburden (topsoil, peat and subsoil) and the excavation of 360m^3 of bedrock within a combined landholding area of approximately 1,290 hectares across at latitudinal distance of ~25km.

It is considered that the overall impact magnitude will be Moderate Adverse (refer to Table 10-4) as the excavation volumes, which are moderate proportions, will be spread out over a large geographical area along the UWF Grid Connection and within the UWF Related Works/Upperchurch Windfarm site.

Significance of the Cumulative Impact: Slight to Moderate

Rationale for Cumulative Impact Evaluation:

- As per Table 10-4, Moderate Adverse magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- Due to the direct nature effects of excavation works on soils and geology (i.e. impacts will be limited to the construction works area) and the fact that each of the project development elements will largely have their own construction works area (with the exception of a short overlap of the 110kV UGC and the UWF Related Works/Upperchurch Windfarm and described below), increased excavations at any one element of the de-

velopment will not be greater as a result of the works at another element of the development;

- Only approximately 0.7km of the 110kV UGC route exists within the UWF Related Works/Upperchurch Windfarm landholding on its approach to the Consented UWF Substation and therefore the effect of increased excavation volumes on soils and geology within the UWF Related Works/Upperchurch Windfarm site is negligible;
- With respect to the UWF Related Works. Approximately 62% of the UWF Related Works Internal Windfarm Cabling will be within the Consented UWF Roads thereby reducing overall excavations volumes;,
- The transient and temporary nature of the construction works; and
- In the context of the abundance of soils in the surrounding area.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Local Soils, Subsoils or Bedrock with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.2.2.2).

10.2.4.2 Impact Evaluation Table: Compaction of Soil and Subsoil

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Construction traffic movement, temporary infrastructure and temporary storage of overburden
Cumulative Impact Source: Construction traffic movement, temporary infrastructure and temporary storage of overburden
Impact Pathway: Physical Compression

Impact Description: The compaction of the soil and subsoil layers beneath compounds, access roads, and storage berms, due to the additional weight of this infrastructure along with any traffic, and the additional weight of soils in temporary and permanent overburden storage berms.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Compaction of Soil and Subsoil

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The potential for compaction mainly relates to the Mountphilips Substation site, as no compaction is likely to occur as a result of 110kV UGC construction works along the public road network, private paved road or at the future compound location of the Consented UWF Substation.

Within the construction works area boundary at the Mountphilips Substation site, soil and subsoil compaction is likely to occur under the new Mountphilips Substation compound area, (under the new permanent access road, under the End Mast locations, under the temporary access road to the End Masts, and under permanent storage berms. Some compaction of soils (overburden) in the permanent storage berms will also occur due to mounding.

Given the fact that the vast majority of the 110kV UGC route is along existing public roads where no compaction is likely to occur, with compaction impacts limited to the Mountphilips Substation site where the extent of compaction will be small and limited to two landholdings, it is considered that the magnitude will be Negligible (refer to Table 10-4).

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- The majority of the UWF Grid Connection is along the carriageway of public roads (for the 110kV UGC) where no further soil compaction is likely;
- Works, machinery and traffic at the Mountphilips Substation site will be restricted to the construction works area and particularly to the new permanent and temporary access roads and compound locations, and tracking across adjacent ground will not be permitted (project design measure).

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: No cumulative impacts are likely to occur, as the UWF Grid Connection project will not cause compaction impacts in the Upperchurch Windfarm/UWF Related Works area due to the location of UWF Grid Connection works within the public road, private paved road and future consented UWF Substation compound location in this area.

Significance of the Cumulative Impact: No Cumulative Impact

Rationale for Cumulative Impact Evaluation:

- Due to its location on paved roads and in hardcore compound areas, the UWF Grid Connection project will not cause compaction effects in the Upperchurch Windfarm/UWF Related Works area, and therefore there is no potential for cumulative effects.

Cumulative Information for Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
There is expected to be some soil and subsoil compaction due to construction traffic along the Internal Windfarm Cabling working corridor. Soil and subsoil compaction can also be expected locally under the Telecom Relay Pole, the new Realigned Windfarm Roads and at Haul Route Works locations.
Given the small size of construction works areas within the overall landholding (<1%), it is considered that the magnitude will be Negligible (refer to Table 10-4).

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- Approximately 62% of the Internal Windfarm Cabling will be within the Consented UWF Roads thereby reducing the need to track off-road;
- Where permanent access roads are not being installed, temporary roads will be used along the working corridor and these roads will offer some protection from compaction to the underlying soil/subsoils by distribution of weight;
- The temporary access road footprint will account for <1% of the UWF Related Works landholding area;
- Construction work in the area of the Realigned Windfarm Roads (3 no. locations) and the Telecom Relay Pole will be localised to the permanent windfarm footprint area and construction traffic will use the Consented UWF Roads to access these works locations;
- The Haul Route Works will largely require construction vehicles working off public roads. The potential for compaction will largely be limited construction of access roads on private lands which only accounts for less <1% of the UWF Related Works landholding area; and,
- Any compaction that would be caused by the temporary footprint is reversible by reinstatement involving chisel ploughing and leveling.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 10.2.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude: Soil and subsoil compaction was assessed in the 2013 Upperchurch Windfarm EIS with respect to construction activity. As per the 2013 EIS: short to medium term effects are expected to occur within the development footprint It was assessed in the 2013 EIS that the effects on soils and geology will not be significant in light of the consented mitigation measures. This is equivalent to 'Not Significant' in respect of terminology used herein.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- Most of the traffic movement within the site during the construction phase will be over new or existing access roads;
- Vehicular movement will be restricted to the footprint of the consented development, particularly with respect the new constructed access roads; and,
- The small scale of lands subject works, in the context of the size of total Upperchurch Windfarm landholding.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 10.2.2.2.1*

Evaluation of Other Cumulative Impacts – Compaction of Soil and Subsoil
Whole UWF Project Effect
Cumulative Impact Magnitude: The potential for soil and subsoil compaction will be limited to the construction works area (57.9ha) associated with the combined UWF Grid Connection (at the Mountphilips Substation site), and UWF Related Works and Upperchurch Windfarm, with construction works areas occurring on 5% of the total landholding area. The overall potential for additional compaction of the soil and subsoil is reduced by the direct nature of compaction effects on soils and geology (i.e. impacts will be limited to the footprint of the construction works areas); the overlap of approximately 62% of the Internal Windfarm Cabling for UWF Related Works will be within the Consented UWF Roads Given the small size of the construction works areas within the overall size of landholdings (5%), it is considered that the magnitude of the whole project effect will be Negligible (refer to Table 10-4).
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area; • The majority of the UWF Grid Connection is along the carriageway of public roads where no further soil compaction is likely; • Permanent access roads within the Upperchurch Windfarm will remain in place permanently for the benefit of the landowner and therefore any loss of soil productivity due to compaction will likely have an overriding positive effect in terms of improved land accessibility during wet weather events; and, • The small scale (5%) of lands subject to works, on average for all landholdings.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Local Soils, Subsoils or Bedrock with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.2.2.2).

10.2.4.3 Impact Evaluation Table: Erosion of Soil and Subsoil

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Groundworks and storage of overburden
Cumulative Impact Source: Groundworks and storage of overburden
Impact Pathway: Excavations, tracking of construction traffic and wind and rain action

Impact Description: Erosion of soil and subsoil as a result of construction traffic and also as a result of natural process such as rain and wind action on exposed soil and subsoil.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Erosion of Soil and Subsoil

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The potential for erosion of soils is limited to the new permanent berms at the Mountphilips Substation site. Erosion from the new berms will be reduced through the immediate seeding of the berms, which will minimise the length of time soils are exposed on the berms. There is likely to be some limited erosion of exposed soils and subsoils due to the storage of overburden at the Mountphilips Substation site. Tracking of construction traffic along off-road sections of the works areas has also the potential to cause erosion.

Erosion from other construction works areas is limited by the carrying out of works within excavated areas which will be overlaid with aggregate and hardcore (e.g. the new permanent access road, new substation compound and hardstanding area at the new End Masts). The potential for erosion is also reduced through the avoidance of excavations for the temporary road to the End Masts (this road will be constructed by placing geotextile on the grass surface with an overlay of aggregate).

Erosion of exposed subsoils in open trenches at works locations along the 110kV UGC along the public road and along the private paved road may also occur during wet periods. Due to the underground nature of the 110kV UGC trench, the exposed soils are not likely to be affected by wind erosion. All excavated material from the 110kV UGC trenches and joint bay excavations outside the Mountphilips Substation site will be removed immediately to a licensed facility, and therefore there is no potential for erosion of overburden from this excavated material.

Given the large geographical spread of the UWF Grid Connection, the fact that the majority of excavations (82%) relate to the excavated material from 110kV UGC trenches and joint bays within the paved public/private road surfaces, with the remainder relating to the relatively small storage volumes at the Mountphilips Substation site, which are also spread out over the works area, it is considered that the magnitude will be Negligible (refer to Table 10-4).

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- The majority of the proposed UWF Grid Connection 110kV UGC is along the carriageway of public roads (or along the paved surface of the private paved road) which provide a hard surface for construction traffic;
- The exposed in-situ subsoil along the 110kV UGC route will be contained within a trench and therefore the potential for erosion and transport by water and wind action is low;
- The 110kV UGC trench will be filled and reinstated very soon after excavation;
- The potential erosion of permanent overburden storages at Mountphilips Substation site will be eventually

limited by reseeding and vegetation growth;

- On agricultural grassland, a new permanent/temporary access roads will be used to access the Mountphilips Substation / End Masts and these roads will offer protection to the underlying soil/subsoils from erosion.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: the potential for cumulative soil erosion effects is limited to the works area for UWF Grid Connection, where other Elements also occur – i.e. in the townlands of Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola townlands.

It is considered that UWF Grid Connection will not contribute to erosion effects in these townlands, as the trenching and joint bay works for UWF Grid Connection are within paved public and private road pavements. Therefore any cumulative impacts with UWF Related Works or Upperchurch Windfarm works which occur on adjacent road verges or on adjacent lands will be negligible. Where the 110kV UGC overlaps the footprint of the Consented UWF Substation, the consented substation compound will have already been excavated and overlaid with hard-core by the time of trenching works for the 110kV UGC, and therefore will not contribute to erosion effects with the 110kV UGC trenching works in the compound area.

The 110kV UGC also overlaps with the UWF Related Works along the local roads L2264-50 and L6188-0 at Haul Route Works H8 – H12. However the 110kV UGC is in the public road along this section, and any additional erosion effects will be negligible.

Overall the magnitude of cumulative impact of UWF Grid Connection with Upperchurch Windfarm and UWF Related Works area will be negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
There is likely to be some erosion of exposed soils and subsoils at the UWF Related Works areas where excavations take place and also during the permanent storage of overburden. Tracking of construction traffic along off-road sections of the works areas has also the potential to cause erosion.

Given the small area of the construction works areas within the overall landholding (<2%), it is considered that the magnitude will be Negligible (refer to Table 10-4).

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- The exposed in-situ soil along the Internal Windfarm Cabling will be largely contained within a trench and therefore the potential for erosion from water and wind is low;
- The internal cabling trench will be backfilled and reinstated very soon after excavation;
- The surface area of the permanent overburden storage berms is negligible compared to the total landholding area;
- The potential erosion of permanent overburden storages will be eventually limited by reseeding and vegetation growth;
- Approximately 62% of the Internal Windfarm Cabling will be within the Consented UWF Roads thereby re-

ducing the need to track off-road;

- Where no Consented UWF Roads are present, temporary access roads will be used to access the Internal Windfarm Cabling areas and these roads will offer protection to the underlying natural soil/subsoils from erosion;
- Construction work in the area of the Realigned Windfarm Roads (3 no. locations) and the Telecom Relay Pole will be localised to the construction works area and construction traffic will use consented roads to access these new locations; and,
- The Haul Route Works will largely require construction vehicles working off public roads. In addition, any natural soils and subsoils exposed under the footprint of the road widening will be surfaced with hard-core, thereby reducing the potential for erosion.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 10.2.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude:
There is likely to be some erosion of exposed soils and subsoils at the Upperchurch Windfarm construction works areas where excavations take place and also during the permanent storage of overburden.

It was assessed in the 2013 EIS that the effects on soils and geology will not be significant in light of the small area of lands subject to works and the consented mitigation measures. This is equivalent to 'Not Significant' in respect of terminology used herein.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- Most of the traffic movement within the site during the construction phase will be over new access roads;
- Vehicular movement will be restricted to the boundary of the construction works areas, particularly with respect the new constructed access roads; and
- The small scale (1%) of lands subject to works, in the context of the total size of the Upperchurch Windfarm landholding.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 10.2.2.2.1*

Evaluation of Other Cumulative Impacts – Erosion of Soil and Subsoil

Whole UWF Project Effect

Cumulative Impact Magnitude:
The potential for soil and subsoil erosion will be limited to the construction works areas (57.9ha) associated with the combined UWF Grid Connection, UWF Related Works and Upperchurch Windfarm construction works area which accounts for 5% of the total landholding area of 1,266ha.

Due to the direct nature effects of erosion on soils and geology (i.e. impacts will be limited to the footprint of the construction works area) and the fact that each of the project development elements will largely have their own construction works area (with the exception of the overlap of the UWF Related Works and the Upperchurch Windfarm, described below), increased erosion at any one element of the development will not be greater as a result of the works for another element of the development.

The potential for erosion effects due to UWF Grid Connection mainly relates to the Mountphilips Substation site. Cumulatively, only approximately 740m of the 110kV UGC route exists within landholdings associated with the Other Elements - UWF Related Works and Upperchurch Windfarm landholdings, where the 110kV UGC is located within the existing private paved road and the future compound for the consented UWF Substation, and due to the location of the 110kV UGC, the effect of increased erosion on soils and geology within this landholding is negligible; The 110kV UGC also overlaps with the UWF Related Works along the local roads L2264-50 and L6188-0 at Haul Route Works H8 – H12. However the 110kV UGC is in the public road along this section, and any additional erosion effects will be negligible.

With respect of the UWF Related Works (within the Upperchurch Windfarm site). Approximately 62% of the Internal Windfarm Cabling will be within the Consented UWF Roads thereby reducing the overall potential for erosion due to construction traffic; Given the small size of the construction works area, it is considered that the magnitude will be Negligible (refer to Table 10-4).
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area; and, • The small scale (5%) of lands subject to works, on average for all landholdings.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Local Soils, Subsoils or Bedrock with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.2.2.2).

10.2.4.4 Impact Evaluation Table: Contamination by Oils, Fuels & Chemicals

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Oils, Fuels and Chemicals
Cumulative Impact Source: Oils, Fuels and Chemicals
Impact Pathway: Soil, subsoil and bedrock pore space

Impact Description: The plant and equipment that will be used during the construction phase will be run on fuels and oils. This creates the potential for spillage and leakage of hydrocarbons from plant during refuelling or storage of oils and fuels. The effect on soil, subsoil and bedrock will be a direct, local effect.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Contamination by Oils, Fuels & Chemicals

Element 1: UWF Grid Connection - direct/indirect impact

Impact Magnitude:
Plant and equipment will be used at all works areas for UWF Grid Connection, however the potential for contamination effects is limited to the construction works areas in agricultural lands at the Mountphilips Substation site, because all material (made up of asphalt/bitumen road surfacing material, hardcore and natural subsoil), from 110kV UGC outside of the Mountphilips Substation site will be treated as spoil and removed to a licensed waste facility.

At the Mountphilips Substation site, construction works will take place on 4.7ha of lands. Any contamination effects will be minor - only relatively small volumes of fuels or oils will be on-site at any one time and therefore there is no significant spills, and any spillages, should they occur, will be limited to small accidental spillage (i.e. small spillage volumes) during storage of oils, fuels and chemicals and during refuelling of construction or excavation plant with petroleum hydrocarbons.

Given the large geographical spread of the works area, the fact that the majority of UWF Grid Connection works will be along asphalt/bitumen covered public roads and the small volumes of fuel that will be present on-site and any one time, it is considered that the magnitude will be Negligible (refer to Table 10-4).

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- 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 at the Mountphilips Substation site. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse (Project Design Measure);
- Overnight parking of plant and machinery will only be permitted at the temporary construction compound in Mountphilips and at a distance greater than 50m from watercourses and this reduces the risk posed by leaks (Project Design Measure); and,
- Any effects that do occur will be very localised to the soils and subsoils at the source / works activity area.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: the potential for cumulative contamination effects is limited to the works area for UWF Grid Connection, where other Elements also occur – i.e. in the townlands of Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola townlands.

It is considered that UWF Grid Connection will not contribute to contamination effects in these townlands, as the trenching and joint bay works for UWF Grid Connection are within paved public and private road pavements, and all materials excavated from the 110kV UGC trenches and joint bays in the UWF Grid Connection Cumulative Evaluation Study Area will be removed to a licensed waste facility. Therefore there will be no material present which can cause cumulative contamination effects with any contamination associated with the Other Elements. It is evaluated that the magnitude of cumulative impacts will be Negligible (refer to Table 10-4).

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Plant and equipment will be used at all the UWF Related Works areas and therefore contamination effects could in theory occur at any of the construction works areas, which are 20.9ha in total. However, any effects will be minor - only relatively small volumes of fuels or oils will be on-site at any one time and therefore there is no significant spills, and any spillages, should they occur, will be limited to small accidental spillage (i.e. small spillage volumes) during storage of oils, fuels and chemicals and during refueling of construction or excavation plant with petroleum hydrocarbons. Given the small size of the construction works area within the overall landholding (<1%) and the small volume of fuels that will be present on-site at any one time, it is considered that the magnitude will be Negligible (refer to Table 10-4).

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- All fuels required for construction activities will be stored in a designated location within the windfarm site, away from main traffic activity, within the Site Compound No. 1. All fuel will be stored in bunded, locked storage containers (Project Design Measure);
- Overnight parking of plant and machinery will only be permitted at designated sites where there is a hardcore surface in place and this reduces the risk posed by leaks (Project Design Measure);
- All chemical wastes will be stored in secure, bunded and covered storage containers, in a designated secure part of the Site Compound No. 1, and will be removed from site and transported to either Enva Ireland Limited approved licensed facilities (Project Design Measure);
- Any effects that do occur will be localised to the soils and possibly shallow subsoils at the source / works activity area.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 10.2.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude: The effects on soils and geology from hydrocarbon leaks are assessed in the Upperchurch Windfarm EIS. The EIS states that potential effects can occur to 'earth materials at and downhill from the development site'. Contamination effects could in theory occur at any of the construction works areas, which are 56.3ha in total. It was assessed in the 2013 EIS that the residual effects on soils and geology will not be significant in light of the small area of lands subject to works and the consented mitigation measures. This is equivalent to 'Not Significant' in respect of terminology used herein.

Significance of the Impact: Not significant

Rationale for Impact Evaluation:

- Condition No. 15 of the Grant of Permission requires the implementation of a Construction Environmental Management Plan, and Ecological Management Plan and an Environmental Management Plan. Furthermore, Condition No.15 specifies that: (a) all oils and fuels shall be stored in an area bunded to 110% of the total volume of stored oils and fuels; and (b) re-fuelling or machine servicing shall take place only within designated impermeable bunded areas, which shall be drained through an oil interceptor; and,
- The Environmental Management Plan (EMP) includes a Fuel Management Plan, which provides for the regular checking of vehicles, equipment, plant and material storage areas; and best practice measures for storing and handling of fuels/oils and procedures to deal with emergency incidents and spills

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 10.2.2.2.1*

Evaluation of Other Cumulative Impacts – Contamination by Oils, Fuels & Chemicals

Whole UWF Project Effect

Cumulative Impact Magnitude:
Plant and equipment will be used at all works areas and therefore soil, subsoil and bedrock along construction works areas associated with UWF Grid Connection, UWF Related Works, Upperchurch Windfarm could potentially be affected by contamination effects (with the exception of the 110kV UGC route outside the Mountphilips Substation site where all excavated material will be treated as spoil and removed to a licensed waste facility). However, any effects to soils are only likely to be minor and localised within the construction works areas.

Due to the direct nature effects of spills and leaks on soils and geology (i.e. impacts will largely be limited to the footprint of the works area) and the fact that each of the project development elements will largely have their own construction works area, increased soil or subsoil contamination at any one element of the development is not expected to be increased contamination as a result of the works at another element of the development;
It is considered that the overall magnitude will be Negligible (refer to Table 10-4).

Significance of the Whole Project Effect: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- Location of the UWF Grid Connection 110kV UGC predominately along public road which are asphalt/bitumen surfaced;
- Minor accidental spillage (i.e. small spillage volumes) during storage and refuelling of construction / excavation plant with petroleum hydrocarbons is only likely to occur (worst case);
- Only relatively small volumes of fuels / oils will be on-site at any one time and therefore no significant effects are expected;
- The large geographical spread of the Whole UWF Project means that large accumulation of spills / leaks at any one location is not possible; and,
- Implementation of the Environmental Management Plan for the Upperchurch Windfarm.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Local Soils, Subsoils or Bedrock with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.2.2.2).

10.2.4.5 Impact Evaluation Table: Contamination by Cement Based Compounds

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Cement Based compounds
Cumulative Impact Source: Cement Based compounds
Impact Pathway: Soil, subsoil and bedrock pore space

Impact Description: Contamination of Soil, Subsoil and Bedrock due to direct contact with cement based construction compounds used for construction. Concrete and other cement-based products are highly alkaline and corrosive and can have impacts specifically on the soil and subsoils in terms of toxicity to its flora and fauna. The effects will largely localised to the soil in direct contact area with cementitious material.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Contamination by Cement Based Compounds

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The main use of cement based compounds will be in the 110kV UGC cable trench and during the construction of foundations at the Mountphilips Substation and End Masts. The underlying subsoils at these locations may come in direct contact with the subsoils. All effects will be directly localised to the footprint of the Mountphilips Substation and End Masts and cable trenches for the 110kV UGC (i.e. soil and subsoil in direct contact with the foundations).

The magnitude of impact is reduced by: the location of the 110kV UGC (outside of the Mountphilips Substation site) within public road pavements where the majority of the trench walls will comprise asphalt/bitumen/hardcore rather than natural soil/subsoil; no batching of wet cement will take place on-site therefore large volumes of cement will not be present on-site at any one time; and only precast concrete structures will be used at joint bays and at watercourse crossing locations (as required).

Only a temporary (and reversible) increase in the pH of the soil, subsoil and bedrock in direct contact with the cement is likely to occur. The effects, which will be localised to the cable trench and Mountphilips substation / End Mast foundations will only persist until the cement mix has hardened and the high alkalinity leachate flushed out / diluted by rainfall. Indirect effects on groundwater quality and surface water quality from cement based compounds are assessed in the Water Chapter (Chapter 11). Given the large geographical spread of the UWF Grid Connection works areas and the relatively small volumes of cement involved, the impact magnitude is expected to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- No batching of wet cement will take place on-site therefore large volumes of cement will not be present on-site at any one time;
- Only precast concrete structures will be used at joint bays and at watercourse crossing locations as required;
- Only a temporary (and reversible) increase in the pH of the soil, subsoil and bedrock in direct contact with the cement is likely to occur.

Element 1: UWF Grid Connection – cumulative impact

Impact Magnitude: The potential for cumulative impacts relates to the eastern end of the 110kV UGC where it is located within the Consented UWF Substation compound in Knockcurraghbola Commons. Concrete for UWF

Related Works at the Telecoms Relay Pole, and concrete for Consented UWF Turbines are not located close to the 110kV UGC and therefore will not cause cumulative effects. Any cumulative effects within the Consented UWF Substation compound will be negligible as the compound will already have been excavated and overlaid with aggregate before the 110kV UGC trench is excavated within the compound, therefore concrete for the 110kV UGC in the Consented UWF Substation compound will be in contact with aggregate rather than soil/subsoil.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with the Medium to Low Importance of soils and geology within the study area.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Cement will only be used at the Telecom Relay Pole foundation and at the 9 No. Internal Windfarm Cabling public road crossings (c.3 – 5m each). Due to the small scale of the works, the impact magnitude is expected to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- Small scale of works (e.g. 5m^2 compound), volumes of cement to be used will be negligible.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 10.2.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude:
The primary use of cement at the windfarm will be construction of the Consented UWF Turbine foundations and in the foundations of the control building structure at the Consented UWF Substation. The volumes of cement that will be imported on-site will be considerable, but given that the Consented Upperchurch Windfarm is spread out over several landholding areas, the impact magnitude is considered to be Small Adverse (refer to Table 10-4).

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- As per Table 10-4, Small Adverse magnitude combined with the Medium to Low Importance of soils and geology within the study area;
- No batching of wet cement will take place on-site and therefore large volumes will not be present on-site at any one time;
- The pouring of turbine bases (22 no.) will be done over 3 - 4 months and therefore large volumes of wet cement will not be on-site at any one time;
- A precast concrete structure, in the form of a clear span bridge, will be used at the watercourse crossing on the Upperchurch Windfarm site
- Only a temporary (and reversible) increase in the pH of the soil, subsoil and bedrock in direct contact with the cement or indirectly via seepage water is likely to occur.
- The effects, which will be localized, will only last until the cement mix has hardened and the high alkalinity leachate flushed out / diluted by rainfall;
- The implementation of Cement Control Procedures under the Environmental Management Plan for the Upperchurch Windfarm (See 2013 RFI).

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 10.2.2.2.1*

Evaluation of Other Cumulative Impacts – Contamination by Cement Based Compounds
Whole UWF Project Effect
Magnitude: Cement based compounds will be used for the UWF Grid Connection at Mountphilips Substation, End Masts and along the 110kV UGC. Cement based compounds will also be used at Upperchurch Windfarm turbine foundations and substation, and to a much lesser extent at UWF Related Works Telecoms Relay Pole. Any soil, subsoil and bedrock at these locations are a potential receptor. Due to the direct nature effects of cement based compounds on effects on soils and geology (i.e. impacts will largely be limited to the construction works area) and the fact that the 110kV UGC for UWF Grid Connection is within road pavements (outside of the proposed Mountphilips Substation site); and that each of the Elements of the Whole UWF Project will largely have their own construction works areas, increased cement exposure to soils and subsoils at any one Element of the Whole UWF Project is not expected to be increased as a result of the works at another Element of the Whole UWF Project. Only a temporary (and reversible) increase in the pH of the soil, subsoil and bedrock in direct contact with the cement or indirectly via seepage water is likely to occur. The overall impact magnitude of the whole project is considered to be **Small Adverse**.
Significance of the Whole Project Effect: Slight
Rationale for Impact Evaluation: • As per Table 10-4, Small Adverse magnitude combined with the Medium to Low Importance of soils and geology within the study area; and, • Only a temporary (and reversible) increase in the pH of the soil, subsoil and bedrock in direct contact with the cement or indirectly via seepage water is likely to occur. • Temporary duration and reversibility of the effect

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Local Soils, Subsoils or Bedrock with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.2.2.2).

10.2.4.6 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in the table below.

Table 10-17: Description and Rationale for Excluded Impacts to Local Soils, Subsoils & Bedrock

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding
Construction Stage				
Excavations	1	Soil	Ground instability	Rationale for Excluding: No Likely Impacts: In relation to UWF Grid Connection 110kV UGC works through mapped peat along the central part of the route, site investigations (see Appendix 15.4) showing the stable nature of roads within the construction works areas being predominantly of 'excavate and fill' construction and their location on firm ground and not peat. At the sections of road along the 110kV UGC on the R503 where it occurs through mapped peat areas will use a floating road cable trench detail and 2.6m reinstatement of the road surface following works, this will improve the strength of the road in these locations. In all other locations, the public road is located on competent ground. All other parts of the UWF Grid Connection and the Other Elements of the Whole UWF Project are located on competent ground with no potential for ground instability.
Operational Stage Effects				
Neutral effect: Major excavations or groundworks are not expected to occur during the operation of Upperchurch Windfarm or UWF Related Works. In relation to UWF Grid Connection, excavations or groundworks will not occur as part of normal operation, and any excavations required along the 110kV UGC as part of major maintenance or repair work is likely to relate to the pulling of new cables at joint bay locations – all works will occur in aggregate/already altered ground, no soils or subsoils will be directly impacted. In addition, all ground that was previously exposed during excavation works, along with permanent overburden storage berms will have vegetated over and therefore there will be no potential for erosion. Any impacts on soils and geology that do occur during the operational phase will be Neutral				
Decommissioning Stage Effects				
UWF Grid Connection: No potential for impacts - the UWF Grid Connection will remain part of the National Grid on a permanent basis and is not expected to be decommissioned. UWF Related Works: No potential for impacts - The cables will be pulled from the Internal Windfarm Cabling ducts at the Consented UWF Turbines or at the Consented UWF Substation; the ducting, Realigned Windfarm Roads and Haul Route Works will remain in-situ; therefore no decommissioning works to soils or lands are required. The Telecom Relay Pole will be removed, and its compound area reinstated and returned to agricultural. Neutral impacts to soils and geology will occur due to the very small footprint of the compound ($25m^2$). Upperchurch Windfarm; Neutral impact –It is likely that the Consented UWF Substation will remain in-situ for use by ESBN and that the Consented UWF Roads will also remain in-situ for use by the landowner. Decommissioning works will be limited to the Consented UWF Turbines, Turbine Hardstanding areas, Meteorological Masts and associated drainage systems, where the turbines and will be removed and the remaining hardstanding areas and associated drainage will be reinstated using the soils in the adjacent storage permanent overburden storage berms, this soil will be reseeded and will re-vegetate quickly, Neutral effects to soils are expected due to the small extent of the hardstands in the context of the large extent of soils in the surrounding area.				

10.2.5 Mitigation Measures for Impacts to Local Soils, Subsoils & Bedrock

Mitigation measures were incorporated into the project design including the Project Design Measures No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Local Soils, Subsoils & Bedrock**.

10.2.6 Evaluation of Residual Impacts to Local Soils, Subsoils & Bedrock

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Local Soils, Subsoils & Bedrock above (Section 10.2.4) – i.e. **no significant adverse impacts**.

10.2.7 Application of Best Practice and the EMP for Local Soils, Subsoils & Bedrock

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment.

The following Best Practice Measures have been developed, for the protection of **Local Soils, Subsoils & Bedrock,** by the authors of this topic chapter, using industry best practice:

GC-BPM-05	Protection of Surface Water and Groundwater Quality during use of Cement Based Compounds
GC-BPM-06	Protection of Surface Water and Groundwater Quality During Storage and Handling of Fuels, Oils and Chemicals
GC-BPM-07	Surface Water Quality Protection Measures During Storage of Overburden at the Mountphilips Substation Site

These Best Practice Measures form part of the UWF Grid Connection Environmental Management Plan, which is appended to the EIA Report as Volume D.

10.2.8 Summary of Impacts to Local Soils, Subsoils & Bedrock

A summary of the Impact Evaluation Tables is presented in Table 10-19.

Table 10-18: Summary of the impacts to Local Soils, Subsoils & Bedrock

Impact to Local Soils, Subsoils & Bedrock:	**Excavation & Relocation of soils, subsoil and bedrock**	**Soil & Subsoil Compaction**	**Soil & Subsoil Erosion**	**Contamination from Oil, Fuels & Chemicals**	**Contamination from Cement Based Compounds**
Evaluation Impact Table	*Section 10.2.4.1*	*Section 10.2.4.2*	*Section 10.2.4.3*	*Section 10.2.4.4*	*Section 10.2.4.5*
Project Life-Cycle Stage	Construction Stage	Construction Stage	Construction Stage	Construction Stage	Construction Stage
UWF Grid Connection *Direct/indirect Impact*	**Slight**	**Imperceptible**	**Imperceptible**	**Imperceptible**	**Imperceptible**
UWF Grid Connection *Cumulative Impact*	**Imperceptible**	**No Cumulative Impact**	**Imperceptible**	**Imperceptible**	**Imperceptible**
Element 2: UWF Related Works	Slight to moderate	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 10.2.2.2.1				
Element 4: Upperchurch Windfarm	Not Significant	Not Significant	Not Significant	Not Significant	Slight
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 10.2.2.2.1				
Cumulative Impact:					
Whole UWF Project Effect	**Slight to Moderate**	**Imperceptible**	**Imperceptible**	**Imperceptible**	**Slight**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Local Soils, Subsoils or Bedrock with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.2.2.2).

Local Soils, Subsoil & Bedrock

Sensitive Aspect

Topic **Soils**

10.3 Sensitive Aspect No.2: Lower River Shannon SAC

This Section provides a description and evaluation of the Sensitive Aspect - Lower River Shannon SAC.

10.3.1 BASELINE CHARACTERISTICS of Lower River Shannon SAC

10.3.1.1 STUDY AREA for Soils - Lower River Shannon SAC

The study area for Lower River Shannon SAC in relation to the UWF Grid Connection is described in Table 10-20 and illustrated on Figure GC 10.3: UWF Grid Connection Study Area for Lower River Shannon SAC (Volume C3 EIAR Figures).

Table 10-19: UWF Grid Connection Study Area for the Lower River Shannon SAC

Study Area for Lower River Shannon SAC	Justification for the Study Area Extents
The extent of the construction works area boundary associated with the UWF Grid Connection where it occurs within the Lower River Shannon SAC	Only direct effects on soils and geology are anticipated.

10.3.1.2 Baseline Context of the Lower River Shannon SAC within the UWF Grid Connection Study Area

Soils and geology are not a qualifying feature of the Lower River Shannon SAC. However, soils and geology are important from an overall habitat perspective. Its inclusion in the assessment also facilitates the evaluation of indirect effects to the SAC in Chapter 11: Water and Chapter 8: Biodiversity.

The Lower River Shannon SAC encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head.

Overlap with the SAC Boundary

The overlap of UWF Grid Connection works is limited to the 110kV UGC, where the 110kV UGC works are located within the boundary of the Lower River Shannon SAC at six locations along public road carriageways, as listed below and identified on Figure GC 10.3;

- 190m along a section of the local public road L6013-0 to the north of Newport;
- 230m along a section of local public roads L2156-0 and L2157-0 on either side of, and over, Rockvale Bridge. Rockvale Bridge crosses the Newport River, to the north of Newport town, at Watercourse Crossing W7;
- 100m, 80m and 390m sections along the Regional Limerick to Thurles Road R503 to the east of Rear Cross; and
- 35m along a section of the Regional Road R503 at Anglesey Bridge, near Kilcommon. Anglesey Bridge crosses over the Bilboa River, to the south of Kilcommon village, at Watercourse Crossing W53.

The qualifying interests of River Shannon SAC are largely aquatic and estuarine related. The interaction of the route of the 110kV UGC with the SAC is entirely within the paved public road surface and existing bridge structures, where the roads are topped with asphalt/bitumen, underlain with hardcore. Some mineral subsoil (sandstone tills) will be excavated from the bottom of the trenches in the public roads. All of the excavated material will be removed immediately to a licenced waste facility. Where the 110kV UGC is located within the SAC boundary at the Newport River and Bilboa River crossing (W7 and W53), the 110kV UGC will cross the watercourse within the bridge structure, and no excavations of soils is will occur.

It is considered that the construction of the 110kV UGC will not directly affect the qualifying interests of River Shannon SAC.

10.3.1.3 Importance of Lower River Shannon SAC

The Lower River Shannon is a designated SAC and contains many Annexed l habitats, including the most extensive area of estuarine habitat in Ireland. Based on the NRA (2008) criteria as shown in Table 10-3 (Section 10.1.8.1), the SAC is of Very High Importance. However, as stated above, the 110kV UGC will not directly affect the qualifying interests of River Shannon SAC.

10.3.1.4 Sensitivity of Lower River Shannon SAC

The primary sensitivities in respect of the UWF Grid Connection will be surface water quality and its water dependant ecosystems and not soils and geology (indirect effects on surface water quality within the SAC from excavations are assessed in Chapter 11 Water). However, soils and geology are important from an overall habitat perspective and therefore effects have been evaluated.

10.3.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

The location of the 110kV UGC within the River Shannon SAC is along sections of the public roads L6013-0, L2156-0, L2157-0 and R503, which have already been altered for public road use. This use is expected to continue, and no further alteration of soils under public roads is expected to occur.

10.3.1.6 Receiving Environment (the Baseline + Trends)

No landuse changes are expected to occur that would alter the character of the soils and geology within the River Shannon SAC, where it overlaps the UWF Grid Connection Study Area. Therefore it is assumed in this report that the baseline environment identified above will be the receiving environment at the time of construction.

10.3.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

10.3.2.1 Cumulative Evaluation Study Areas

10.3.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Lower River Shannon SAC	Justification for the Study Area Extents
The extent of the construction works area boundary associated with the UWF Grid Connection where it occurs within the Lower River Shannon SAC	Only direct effects on soils and geology are anticipated.

The study is illustrated on Figure CE 10.3: UWF Grid Connection Cumulative Evaluation Study Area for Lower River Shannon SAC

10.3.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 10.3.2.2.1 below.

The Whole Project Cumulative Study Area for the evaluation of cumulative effects is described in Table 10-21, and illustrated on Figure WP 10.3: Whole Project Study Area for Lower River Shannon SAC (Volume C3 EIAR Figures).

Table 10-20: Whole Project Cumulative Evaluation Study Area for the Lower River Shannon SAC

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Boundary of construction works areas, planting lands or activity locations where they interact/overlap with the boundary of the Lower River Shannon SAC	Only direct effects on soils and geology are anticipated.
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

10.3.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Lower River Shannon SAC also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Lower River Shannon SAC with any of the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Sections A2.1.4.18).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Lower River Shannon SAC.

10.3.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Lower River Shannon SAC

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Lower River Shannon SAC. The results of this evaluation are included in Table 10-22.

The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 10.3. The baseline character of the areas around these projects is described in Section 10.2.2.3.

Table 10-21: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Element of the Whole UWF Project	
Element 2: UWF Related Works	Evaluated as excluded: No potential for effects due to: • all UWF Related Works construction works areas occur at least 1.5km outside the boundary of the Lower River Shannon SAC
Element 3: UWF Replacement Forestry	Evaluated as excluded: No potential for effects due to: • the entirety of the UWF Replacement Forestry lands occur outside both the boundary of the Lower River Shannon SAC and the River Shannon regional catchment area.
Element 4: Upperchurch Windfarm (UWF)	Evaluated as excluded: No potential for effects due to: • all Upperchurch Windfarm construction works areas occur at least 3km outside the boundary of the Lower River Shannon SAC.
Element 5: UWF Other Activities	Evaluated as excluded: No potential for effects due to: • the UWF Other Activities will not occur within the boundary of the Lower River Shannon SAC.

10.3.2.3 Cumulative Information: Baseline Characteristics – Context & Character

10.3.2.3.1 Element 2: UWF Related Works

Not applicable – Element evaluated as excluded. See Section 10.3.2.2.1

10.3.2.3.2 Element 3: UWF Replacement Forestry

Not applicable –Element evaluated as excluded. See Section 10.3.2.2.1.

10.3.2.3.3 **Element 4: Upperchurch Windfarm**

Not applicable – Element evaluated as excluded. See Section 10.3.2.2.1

10.3.2.3.4 **Element 5: UWF Other Activities**

Not applicable – Element evaluated as excluded. See Section 10.3.2.2.1.

10.3.2.3.5 **Other Projects or Activities**

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 10.3.2.2.

10.3.3 PROJECT DESIGN MEASURES for Lower River Shannon SAC

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 10-23 are relevant to the Environmental Factor Soils, and were specifically developed for the sensitive aspect **Lower River Shannon SAC**. The Project Design Measures listed above at Table 10-16 for Local Soils, Subsoils & Bedrock are also relevant to the Lower River Shannon SAC.

Table 10-22: UWF Grid Connection Project Design Measures relevant to Lower River Shannon SAC

PD ID	Project Design Environmental Protection Measure (PD)
PD36	The sections of 110kV UGC trenches that overlap the Lower River Shannon SAC will be lined with an impermeable geotextile material to prevent potential migration of cement from the trench base or sides into the SAC.
PD37	In addition to PD22, there will be no storage of overburden within the Lower River Shannon SAC.
PD38	110kV UGC works outside of Mountphilips Substation site will be carried out entirely on paved roads and where the 110kV UGC crosses watercourses, the works will be carried out over the existing bridges and over/under existing culverts. No in-streams works are proposed at any watercourse crossing points (including the Newport River and Bilboa River crossings) within the boundary of the Lower River Shannon SAC and therefore there will be no placement of cement or other materials within the river channels or on the river banks within the SAC.
PD39	In addition to PD42, there will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within 100m of the boundary of the Lower River Shannon SAC.
PD40	In addition to PD29, all 110kV UGC works within the boundary of the Lower River Shannon SAC will only be completed during dry weather in the dryer months of the year – i.e. February to September included.

10.3.4 EVALUATION OF IMPACTS to Lower River Shannon SAC

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Lower River Shannon SAC.

As a result of the exercise, some impacts were included and some were excluded.

Table 10-23: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Excavation & Relocation of Soil, Subsoil and Bedrock (construction stage)	*Soil Erosion and/or Compaction (construction stage)*
Contamination from Oils, Fuels & Chemicals (construction stage)	*Operational Stage Effects*
Contamination from Cement Based Compounds (construction stage)	*Decommissioning Stage Effects*

The source-pathway-receptor links for included impacts are described in **the Impact Evaluation Tables,** which are **presented in the following sections 10.3.4.1 to 10.3.4.3.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Tables, in Section 10.3.4.4.

10.3.4.1 Impact Evaluation Table: Excavation & Relocation of Soil, Subsoil and Bedrock

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Groundworks, relocation and storage of overburden
Cumulative Impact Source: n/a
Impact Pathway: Excavation, movement and mounding of overburden

Impact Description: The physical excavation and relocation of soil and subsoil and to a lesser extent bedrock from its natural location to a different location. The removal of soils from an SAC can have a direct effect on local habitats.

Impact Quality: Negative

Evaluation of the Subject Development – Excavation & Relocation of Soil, Subsoil and Bedrock

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The UWF Grid Connection works are located within the boundary of the Lower River Shannon SAC at six locations, 760m³ of public road spoil, comprising 90m³ of public road Bitumen material; 60m³ of public road base layer stone and 610m³ of subsoil, will be excavated over a total distance of 1025m, as follows;

- 140m³ of spoil along a 190m section of the local public road L6013-0 to the north of Newport;
- 170m³ of spoil along a 230m section of local public roads L2156-0 and L2157-0 on either side of, and over, Rockvale Bridge. Rockvale Bridge crosses the Newport River, to the north of Newport town, at Watercourse Crossing W7;
- 80m³, 60m³ and 290m³ of spoil along a 100m, 80m and 390m sections, respectively, along the Regional Limerick to Thurles Road R503 to the east of Rear Cross; and
- 20m³ of spoil along a 35m section of the Regional Road R503 at Anglesey Bridge, near Kilcommon. Anglesey Bridge crosses over the Bilboa River, to the south of Kilcommon village, at Watercourse Crossing W53.

As all excavations will be within the road pavement, there is no potential for effects to the soils within the SAC at these points. As there will be no effects on the qualifying features of the SAC, which are largely aquatic habitats and species, the impact magnitude is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with Very High Importance of the SAC;
- There will be no excavation of the river bed or banks or any off-road locations within the boundary of the SAC;
- There will be no direct effects on the qualifying feature of the SAC which are largely aquatic habitats / species;
- The effects will be limited to excavations within public road pavements;
- All works will be temporary and transient in nature;
- There will be no removal of mineral subsoil within the SAC;
- there will be no storage of overburden within the Lower River Shannon SAC (project design)
- All 110kV UGC works within the boundary of the Lower River Shannon SAC will only be completed during dry weather in the dryer months of the year – i.e. February to September included (project design)

Element 1: UWF Grid Connection – cumulative impact
Cumulative Magnitude: There is no potential for cumulative effects of the UWF Grid Connection with the Other Elements of the Whole UWF Project as only the UWF Grid Connection (110kV UGC route) is located within the boundary of the Lower River Shannon SAC.
Significance of the Whole Project Effect: No Cumulative Impact
Rationale for Impact Evaluation: • None of the Other Elements are located within the boundary of the Lower River Shannon SAC.
Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works *– N/A, evaluated as excluded, see Section 10.3.2.2.1*
Element 3: UWF Replacement Forestry *– N/A, evaluated as excluded, see Section 10.3.2.2.1*
Element 4: Upperchurch Windfarm *– N/A, evaluated as excluded, see Section 10.3.2.2.1*
Element 5: UWF Other Activities *– N/A, evaluated as excluded, see Section 10.3.2.2.1*
Evaluation of Other Cumulative Impacts – Excavation & Relocation of Soil, Subsoil and Bedrock
Whole UWF Project Effect
Magnitude: No potential for cumulative effects of the UWF Grid Connection with the Other Elements of the Whole UWF Project - only the UWF Grid Connection (110kV UGC route) overlaps the boundary of the Lower River Shannon SAC. The whole project effect is in the order of UWF Grid Connection – i.e. Imperceptible.
Significance of the Whole Project Effect: No Cumulative Impact
Rationale for Impact Evaluation: • The UWF Grid Connection (110kV UGC route) is the only element which overlaps the boundary of the Lower River Shannon SAC.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Lower River Shannon SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.3.2.2).

10.3.4.2 Impact Evaluation Table: Contamination from Oils, Fuels & Chemicals

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Oils, Fuels and Chemicals
Cumulative Impact Source: n/a
Impact Pathway: Soil, subsoil and bedrock pore space

Impact Description: The plant and equipment that will be used during the construction phase will be run on fuels and oils. This creates the potential for spillage and leakage of hydrocarbons from machinery or plant during the operation of the machinery or during refuelling. Any spillages onto soil will contaminate the soil with toxic chemical and may cause secondary effects to water quality and biodiversity. Indirect effects on water quality and biodiversity are discussed in Chapter 11 and Chapter 8 respectively.
There will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within 100m of the boundary of the Lower River Shannon SAC (project design).

Impact Quality: Negative

Evaluation of the Subject Development Impact– Contamination from Oils, Fuels & Chemicals

Element 1: UWF Grid Connection

Impact Magnitude:
The UWF Grid Connection 110kV UGC works overlap the Lower River Shannon SAC at 6 no. locations, with a total length of 1025m of trenching for the 110kV UGC within the SAC. No Joint Bays are located within the SAC boundary. Works within the SAC will take place over a total of 13 no. days as follows;

- 2 days of works along a 190m section of the local public road L6013-0 to the north of Newport;
- 6 days of works along a 230m section of local public roads L2156-0 and L2157-0on either side of, and over, Rockvale Bridge. Rockvale Bridge crosses the Newport River, to the north of Newport town, at Watercourse Crossing W7;
- 1 day, 1 day, 4 days of works along a 100m, 80m and 390m sections, respectively, of the Regional Limerick to Thurles Road R503 to the east of Rear Cross; and
- 4 days of works along a 35m section of the Regional Road R503 at Anglesey Bridge, near Kilcommon. Anglesey Bridge crosses over the Bilboa River, to the south of Kilcommon village, at Watercourse Crossing W53.

As all excavations will be within the road pavement, there is low potential for contamination effects to the soils within the SAC at these points. Given the small scale and short duration of the works within the SAC, the location of excavations within the road pavement, the small volume of fuels/oils that will be present and unlikelihood of large spills/leaks, the impact magnitude is considered to be Negligible

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with Very High Importance of the SAC; and,
- Soils and geology is not a qualifying feature of the SAC. The qualifying interests are largely aquatic, habitats and species;
- The works area in the area of the SAC is overlain by asphalt/bitumen which will provide a protective cover to the underlying subsoils;
- Minor accidental spillage (i.e. small spillage volumes) from leaks or dripping from machinery engines/hydraulics is only likely to occur (worst case);
- There will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within 100m of the boundary of the Lower River Shannon SAC (project design). (Project Design Measure); and,
- Any effects that do occur will be very localised to the soils and subsoils at the works activity area.

Element 1: UWF Grid Connection – cumulative impact
Cumulative Magnitude: There is no potential for cumulative effects of the UWF Grid Connection with the Other Elements of the Whole UWF Project as only the UWF Grid Connection (110kV UGC route) is located within the Lower River Shannon SAC.
Significance of the Whole Project Effect: No Cumulative Impact
Rationale for Impact Evaluation: • None of the Other Elements are located within the boundary of the Lower River Shannon SAC.
Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works – *N/A, evaluated as excluded, see Section 10.3.2.2.1*
Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 10.3.2.2.1*
Element 4: Upperchurch Windfarm – *N/A, evaluated as excluded, see Section 10.3.2.2.1*
Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 10.3.2.2.1*
Evaluation of the Cumulative Impact – Contamination from Oils, Fuels & Chemicals
Whole UWF Project Effect
Magnitude: No potential for cumulative effects of the UWF Grid Connection with the Other Elements of the Whole UWF Project - only the UWF Grid Connection (110kV UGC route) overlaps the boundary of the Lower River Shannon SAC. The whole project effect is in the order of UWF Grid Connection – i.e. Imperceptible.
Significance of the Cumulative Impact: No Cumulative Impact
Rationale for Impact Evaluation: • The UWF Grid Connection is the only element which overlaps the boundary of the Lower River Shannon SAC.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Lower River Shannon SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.3.2.2).

10.3.4.3 Impact Evaluation Table: Contamination from Cement Based Compounds

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Cement based compounds such as concrete
Cumulative Impact Source: n/a
Impact Pathway: Soil, subsoil and bedrock pore space

Impact Description: Contamination of soil, subsoil and bedrock due to direct contact with cement based construction compounds used for construction. Concrete and other cement-based products are highly alkaline and corrosive and can have impacts directly on the soil and subsoils in terms of toxicity to its flora and fauna. The effects will largely be localised to the soil or subsoil in direct contact with the cementations material.
The sections of 110kV UGC trenches that overlap the Lower River Shannon SAC will be lined with an impermeable geotextile material to prevent potential migration of cement from the trench base or sides into the SAC (project design).

Impact Quality: Negative

Evaluation of the Subject Development Impact – Contamination from Cement Based Compounds

Element 1: UWF Grid Connection

Impact Magnitude:
The UWF Grid Connection 110kV UGC trenching works are located within the boundary of the Lower River Shannon SAC at six locations, where a total of 360m³ of concrete will be laid in the cable trench, as follows;

- 70m³ of concrete along a 190m section of the local public road L6013-0 to the north of Newport;
- 80m³ of concrete along a 230m section of local public roads L2156-0 and L2157-0 on either side of, and over, Rockvale Bridge. Rockvale Bridge crosses the Newport River, to the north of Newport town, at Watercourse Crossing W7;
- 40m³, 30m³ and 130m³ of concrete along a 100m, 80m and 390m sections, respectively, of the Regional Limerick to Thurles Road R503 to the east of Rear Cross; and
- 10m³ of concrete along a 35m section of the Regional Road R503 at Anglesey Bridge, near Kilcommon. Anglesey Bridge crosses over the Bilboa River, to the south of Kilcommon village, at Watercourse Crossing W53.

The use of cement within the SAC will be limited to the placement of concrete in the cable trenches in the public road which will comprise mainly asphalt/bitumen and hardcore. The cement will likely have some direct contact with the mineral subsoil beneath the existing public roadway. The cement will be covered and backfilled with aggregate and road surfacing materials.

Given the small scale nature of the works within the SAC, the location of trenches and the placement of cement in the public road pavement; and the small volume of cements involved at these 6 locations, the impact magnitude is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 10-4, Negligible magnitude combined with Very High Importance of the SAC;
- The volume of cement to be used within the SAC will be minimal (c.360m³) due to the relatively short length of works within or in close proximity to the boundary;
- Contact with the cement will be limited to mainly asphalt/hardcore underneath the existing public roadways;
- Only a temporary (and reversible) increase in the pH of the soil, subsoil and bedrock in direct contact with the cement is likely to occur. The effects, which will be localised to the cable trench will only persist until after the cement mix has hardened and the residual high alkalinity leachate flushed out / diluted by rainfall.

Element 1: UWF Grid Connection – cumulative impact
Cumulative Magnitude: There is no potential for cumulative effects of the UWF Grid Connection with the Other Elements of the Whole UWF Project as only the UWF Grid Connection (110kV UGC route) is located within the boundary of the Lower River Shannon SAC.
Significance of the Whole Project Effect: No Cumulative Impact
Rationale for Impact Evaluation: • None of the Other Elements are located within the boundary of the Lower River Shannon SAC.
Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works – N/A, evaluated as excluded, see Section *10.3.2.2.1*
Element 3: UWF Replacement Forestry – N/A, evaluated as excluded, see Section *10.3.2.2.1*
Element 4: Upperchurch Windfarm – N/A, evaluated as excluded, see Section *10.3.2.2.1*
Element 5: UWF Other Activities – N/A, evaluated as excluded, see Section *10.3.2.2.1*
Evaluation of the Cumulative Impact – Contamination from Cement Based Compounds
Whole UWF Project Effect
Magnitude: No potential for cumulative effects of the UWF Grid Connection with the Other Elements of the Whole UWF Project - only the UWF Grid Connection (110kV UGC route) overlaps the boundary of the Lower River Shannon SAC. The whole project effect is in the order of UWF Grid Connection – i.e. Imperceptible.
Significance of the Cumulative Impact: No Cumulative Impact
Rationale for Impact Evaluation: • The UWF Grid Connection (110kV UGC route) is the only element which overlaps the boundary of the Lower River Shannon SAC.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Lower River Shannon SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.3.2.2).

10.3.4.4 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in the table below.

Table 10-24: Description and Rationale for Excluded Impacts to Lower River Shannon SAC

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding
Construction Stage				
Excavations, construction machinery and traffic, storage of Overburden	1	Movement and mounding	Soil Compaction	Rationale for Excluding: No potential for impacts/Neutral Impacts: Project design has ensured that construction traffic and construction works will be confined to the public roadway, with constructions relating to trenching for the 110kV UGC, with no sources of effects such as no temporary or new permanent access roads within the SAC; no temporary or permanent storage of overburden within the SAC. Trenching works within the SAC boundary will be brief in duration. There will be no potential for soil compaction as the road is overlain by asphalt/bitumen surfaced public roadway, Soils within the SAC boundary at the 6 no. locations are limited to spoil under the public road pavements, circa. 580m³. The location of construction works within the existing road will avoid effects to subsoils by construction traffic – any effects will be Neutral. There are no soil based qualifying features of the SAC - the qualifying features are largely aquatic habitats / species, therefore there is no potential for direct effects to the qualifying features of the SAC– any effects will be Neutral.
Operational Stage Effects				
UWF Grid Connection: There will be no requirement for any excavation work or groundworks within the SAC boundary during the operational phase. All Joint Bays are located outside the boundary of the SAC.				
Decommissioning Stage Effects				
UWF Grid Connection: No potential for impacts: The UWF Grid Connection will remain part of the National Grid on a permanent basis and is not expected to be decommissioned. The Other Elements of the Whole UWF Project are located outside the boundary of the Lower River Shannon SAC.				

10.3.5 Mitigation Measures for Impacts to the Lower River Shannon SAC

Mitigation measures were incorporated into the project design including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur** to occur to Lower River Shannon.

10.3.6 Evaluation of Residual Impacts to the Lower River Shannon SAC

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for the Lower River Shannon SAC above (Section 10.3.4) – i.e. **Imperceptible**.

10.3.7 Application of Best Practice and the EMP for the Lower River Shannon SAC

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment.

The following Best Practice Measures have been developed, for the protection of **Lower River Shannon SAC,** by the authors of this topic chapter, using industry best practice:

GC-BPM-05	Protection of Surface Water and Groundwater Quality during use of Cement Based Compounds
GC-BPM-06	Protection of Surface Water and Groundwater Quality During Storage and Handling of Fuels, Oils and Chemicals

As these Best Practice Measures primarily relate to Water protection, they are included at the end of the Water topic chapter (Chapter 11). These Best Practice Measures form part of the UWF Grid Connection Environmental Management Plan, which is appended to the EIA Report as Volume D.

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10.3.8 Summary of Impacts to the Lower River Shannon SAC

A summary of the Impact Evaluation Tables is presented in Table 10-26.

Table 10-25: Summary of the impacts to the Lower River Shannon SAC

Impact to Lower River Shannon SAC:	**Excavation & Relocation of Soil, Subsoil and Bedrock**	**Contamination from Oils, Fuels & Chemicals**	**Contamination from Cement Based Compounds**
Evaluation Impact Table	*Section 10.3.4.1*	*Section 10.3.4.2*	*Section 10.3.4.3*
Project Life-Cycle Stage	Construction	Construction	Construction
UWF Grid Connection *Direct/indirect Impact*	**Imperceptible**	**Imperceptible**	**Imperceptible**
UWF Grid Connection *Cumulative Impact*	**No Cumulative Impact**	**No Cumulative Impact**	**No Cumulative Impact**
Element 2: UWF Related Works	No Potential for Impact - Evaluated as Excluded, see Section 10.3.2.2.1		
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 10.3.2.2.1		
Element 4: Upperchurch Windfarm	No Potential for Impact - Evaluated as Excluded, see Section 10.3.2.2.1		
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 10.3.2.2.1		
Cumulative Impact:			
Whole UWF Project Effects	No Cumulative Impact	No Cumulative Impact	No Cumulative Impact

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Lower River Shannon SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 10.3.2.2).

10.4 Reference List

Geological Survey of Ireland (2004) Bedrock Geology 1:100,000 scale map series, Sheet 18 (Geology of Tipperary).

Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements.

National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

National Parks and Wildlife Services (2004): Bleanbeg Bog NHA Site Synopsis Report (002450).

National Parks and Wildlife Services (2013): Lower River Shannon SAC Site Synopsis Report (002165).

National Parks and Wildlife Services (2013): Lower River Suir SAC Site Synopsis Report (002137).

Tipperary County Council (December 2017 Edition): North Tipperary County Development Plan 2010 – 2016 (As Varied).

UWF Grid Connection EIA Report (2019)

Volume C2: EIAR Main Report

Chapter 11: Water

HYDRO ENVIRONMENTAL SERVICES

ECOPOWER

October 2019

REFERENCE DOCUMENTS

Contents

List of Figures

Figures and mapping referenced in this topic chapter can be found in Volume C3 EIAR Figures.

List of Appendices

Appendices referenced in this topic chapter can be found in Volume C4 EIAR Appendices.

Glossary of Terms

Term	Definition
Aquifer	A permeable geological stratum or formation that can both store and transmit water in significant quantities.
Baseflow	Water which enters streams/rivers from groundwater flow and maintains streamflow during dry periods.
Blanket Bog	Blanket bog is an area of peatland, forming where there is a climate of high rainfall and a low level of evapotranspiration, allowing decomposed organic material to accumulate over large expanses of undulating ground.
Biochemical Oxygen Demand	A measure of the amount of oxygen used in water by bacteria in the degradation of organic matter.
Electrical Conductivity	A measure of the ability of water to conduct an electrical current and is proportional to the concentration of irons in the solution.
Fluvial Flooding	Fluvial flooding occurs when rivers and streams break their banks and water flows out onto the adjacent low-lying areas (the natural floodplains).
Fluvio-glacial Deposits	Sediments deposited by river or/and glacial action.
Groundwater	Water under a pressure greater than atmospheric pressure which is present in the saturated zone of the soil.
Groundwater Catchment	The surface area determined by groundwater flow within which recharged rainfall will contribute to (i.e. well, spring, river, Lake etc.)
Groundwater Body	A distinct volume of groundwater within an aquifer or system of aquifers, which is hydraulically isolated or partially isolated from nearby groundwater bodies.
Groundwater Flowpath	The path of groundwater flow through soil or rock via pores, fractures, bedding planes etc.
Groundwater Gradient	The direction of groundwater flow as a result of the slope of the groundwater table.
Groundwater Table	The surface at which pore water pressure in an aquifer is equal to atmospheric pressure, and which separates the saturated zone from the unsaturated zone.
Permeability	The rate at which a fluid flows through a porous medium under the hydraulic head operating within the medium. Usually, the greater the porosity, the greater the permeability.
Pluvial Flooding	Pluvial flooding occurs when the amount of rainfall exceeds the capacity of urban storm water drainage systems or the ground to absorb it.
Recharge	Infiltration of rainfall into the local groundwater system.
Surface Water Runoff	Overland flow of water as a result of rainfall
Saturated Zone	The zone below the groundwater table in which all the soil pores and rock fractures are filled with water. It underlies the unsaturated zone (see below).
Spring	A flow of groundwater on the ground surface that occurs where the water table intercepts the ground surface.
Surface Water Catchment	The surface area determined by topographic features within which falling rain will contribute to run-off at a particular point under consideration.
Suspended Sediments	Particulate solids (i.e. sand, clay, silt, peat particles) entrained in surface water flow.
Unsaturated Zone	The zone below the land surface and above the groundwater table which contains water and air in the open spaces, or pores.

List of Abbreviations

Abbreviation	Full Term
BPM	Ecopower Best Practice Measure developed by members of the EIAR Team
NHA	National Heritage Area as defined by the National Parks and Wildlife Services
EPA	Environmental Protection Agency
SWB/GWB	Surface Water Bodies / Groundwater Bodies
GSI	Geological Survey of Ireland
WFD	Water Framework Directive
PD	Ecopower Project Design Environmental Protection Measure developed by members of the EIAR Team
SAC	Special Areas of Conservation as defined by the National Parks and Wildlife Services
UGC	Underground Cables
UWF	Upperchurch Windfarm

Executive Summary of the Water Chapter

Baseline Environment: UWF Grid Connection is located within the Lower Shannon & Mulkear River hydrometric area and the River Suir hydrometric area, both of which contain Natura 2000 designated sites downstream of the development (i.e. Lower River Shannon SAC and Lower River Suir SAC respectively). Subcatchments include Kileengarrif_SC_010, Newport[Tipperary]_SC_010, Bilboa_SC_010 and Suir_SC_030. The Mountphilips Site and the majority of the 110kV UGC route exists (c.29km of the total 30.5km) within the Slieve Phelim Groundwater Body (GWB) with the far eastern section of the 110kV UGC route extending into the Templemore A GWB.

Survey Results for Sensitive Aspects in the Baseline Environment: The vast majority of the footprint of UWF Grid Connection is within the River Shannon (surface water catchment) i.e. Mountphilips Substation site and c.29km of the 110kV UGC. The remainder is located in the River Suir surface water catchment i.e. c.1.5km of the 110kV UGC route. There is a total of 68 No. watercourses within the construction works area boundary that require crossing. 63 of the watercourse crossing points are along the 110kV UGC route on the public roads, 3 are agricultural lands (Mountphilips Substation site) and the remaining 2 No. are on a private paved road (Consented UWF Substation site). 65 of the 68 watercourse crossings will take place at existing bridges (15) or culverts (50) on the public roads and the paved private road. Due to the primarily upland nature of the area, the majority of the watercourses intercepted are either drains or minor headwater streams. Replacement of the existing culverts may be required at upto 13 No. locations along the public road. Most of these 13 No. culverts are drains crossing under the regional road. Three larger watercourse crossings on the public road of note will occur, at bridges over the Newport River, the Clare River and the Bilboa River. These rivers will be crossed by installing the cable trench in the road over the bridge structures. Works to raise the road level and increase the height of parapet walls will be required at these 3 bridges.

All watercourse crossings along the construction route were mapped and characterised. Two rounds of water sampling were completed at nineteen of the watercourse crossings across the development site in January 2019 and twelve water samples were taken in June 2019. The results of the water sampling were consistent with EPA and Water Framework Directive values of typically 'Good to High' and 'Not at Risk.

Local water supplies were identified through fieldwork, door to door surveys and consultation with the local Newport Regional Water Supply office. There are private and public water supplies from surface water abstractions from local streams or rivers and from groundwater abstractions (wells) and springs. There are ten wells (including an old pump) downslope within 50m of the 110kV works boundary, and one well at 100m downslope. These include three Irish Water wells near the Newport Regional Water Supply plant.

Flood Risk Assessment: A flood risk assessment was conducted to identify potential flood risks associated with the proposed development. No instances of historical flooding were identified in historic OS maps and no instances of recurring flooding were identified on OPW Preliminary Flood Risk Assessment (PFRA) maps. The Mountphilips Substation site, is not located within a mapped fluvial flood zone. Due to the elevated nature of the majority of the 110kV UGC construction works areas, these areas are not located within PFRA mapped fluvial or pluvial flood extent zones and are considered to be at low risk to flooding. The PFRA mapping indicates that there are sections of the 110kV UGC route located in the fluvial Flood Zone A (100-year flood zone). The areas of mapped fluvial flood zones involve the larger stream and river crossings at eight places along the cable route, including one Joint Bay location, all on the public road. Cables and the one joint bay will be placed within the existing bridge structure and road. i.e. no instream works are required. Also, there will be no potential of increased local flood risk as a result of the proposed developments as the majority of the works are underground along the public road and the footprint of the over ground permanent infrastructure is minimal and outside of mapped flooding areas (Mountphilips

substation). Where existing culverts require replacement for the 110kV UGC, the hydraulic capacity of the culvert will be will be sized to cope with a minimum 100-year flood and will be at least 900mm in diameter.

Effects to water that were examined: This chapter examined the potential for construction stage effects to surface water quality from suspended solids in site runoff due to earthworks, excavations, storage of overburden, dewatering of excavations, and watercourse crossing works; effects to surface water quality due to contamination by fuels, oils, chemicals and cement based compounds; increased flood risk and suspended solids runoff during the operational stage due to new permanent crossing structures and new hardstanding areas at Mountphilips Substation site and replacement of culverts along the public road.

Project Design Measures: The UWF Grid Connection development as evaluated in the EIA Report incorporates Project Design Measures or mitigation measure to avoid, prevent or reduce negative impacts. There are thirty-four measures relevant to the protection of Water, which will prevent sedimentation release into watercourses, prevent contamination of surface water and groundwater, and avoid contributing to flood risk in the area. Protection of the water quality and the existing drainage regime will be managed under a Surface Water Management Plan (SWMP) which will be implemented through the UWF Grid Connection Environmental Management Plan by the appointed Contractor during the construction stage of the UWF Grid Connection. The implementation of the Surface Water Management Plan/Environmental Management Plan will be supervised and audited by a full time Environmental Clerk of Works who will be independent of the Contractor.

Summary of the Likely Impact to Local Surface Water Bodies (LSWB): The impact of the development is evaluated as **Imperceptible** because the vast majority of the watercourse crossing points for the development are at existing culverts along the public road network; the works will be distributed within four sub-catchments (i.e. impacts will not be concentrated within one sub catchment) across a large geographical area (latitudinal distance of 23km). The majority of the watercourses intercepted by the works area (74%) are drains or marginal headwater watercourses with low flows, and therefore the potential for these watercourses acting as a surface water flowpath to downstream watercourses is limited. Project Design Measures will control run-off and contamination. There will be temporal restrictions on instream works, culvert replacement works and at specified locations along the Regional Road R503. Only relatively small volumes of fuels / oils will be on-site at any one time and all fuels will be stored in the Temporary Compound at the Mountphilips Substation Site. Precast concrete structures only, will be used at joint bays and at culvert watercourse crossing locations. All new or replaced watercourse crossing structures will be designed to cope with a 100-year flood. The permanent hardstanding areas are limited to Mountphilips Substation site and will be negligible in scale in comparison to the area of the local surface water body. **Cumulative Impacts** with the Other Elements will **range from Imperceptible to Slight**, mainly due to the location of the majority of the UWF Grid Connection in the River Shannon catchment, and the location of the majority of the Upperchurch Windfarm/UWF Related Works in the River Suir catchment. Cumulative Impacts with Other Projects (consented Newport Town Park, consented/potential Castlewaller Windfarm and potential Bunkimalta Windfarm) will be Slight adverse, in part due to the large size of the surface water catchment area and the transient nature of the UWF Grid Connection works.

Summary of the Likely Impact to Ground Water Bodies (GWB): Effects on groundwater quality is evaluated as **Imperceptible** because the use of fuel, oil and chemicals will be negligible and storage of same will be controlled by virtue of project design. Relatively small volumes will be required at Mountphilips Substation. Very small amounts of cement are required per metre of trench (~0.4m^3) for the 110kV UGC, the total volume of semi-dry lean-mix cement placed within local groundwater catchments for UWF Grid Connection will be small. Effects on groundwater levels or flows are not likely to occur due to the shallow nature of the substation excavations and of the cable trench / joint bays in the public road. Cumulative impacts with Other Elements of the Whole UWF Project will be **Imperceptible** due to the shallow nature of excavations,

very small volumes of cementious material for UWF Related Works and the implementation of Concrete Controls as part of the Upperchurch Windfarm works.

No Likely Impact to Local Wells and Springs due to the location of construction works, plant and machinery in/on hardcore/paved road surfaces, the small number of local wells and springs with water supply mainly through public water mains, the use of wet cement will be limited to the trench with imperceptible impacts to the underlying groundwater or local surface water expected.

Summary of the Likely Impacts to the Lower River Shannon SAC: The 110kV UGC passes within the boundary of the Lower River Shannon SAC, at six locations (all within the Mulkear River catchment). The impact on the SAC of the development is evaluated as **Imperceptible** because the working footprint will be spread out over a large geographical area within the Mulkear River catchment, all excavated material from public roads will be removed to licensed waste facilities; the majority of the watercourses intercepted by the works area (74%) are drains or marginal headwater watercourses with low flows, and therefore the effectiveness of them acting as a surface water flowpath to the downstream Lower River Shannon SAC is limited; the transient nature of the works within local surface water bodies upstream of the SAC; all works within the SAC will be confined to public road surface, and where works traversing the Rockvale Bridge and Anglesey Bridge, works will be confined to the bridge. Project Design Measures for works within the SAC, include that works in the SAC boundary will take place during dry weather; no chute washout within the boundary of the SAC; a row of silt fencing will be placed along the edge of the public road to capture any site runoff which will then be treated prior to discharge; there will be no direct discharge of pumped water into any watercourse or drain; and works within the boundary of the SAC will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice Measures are followed. **Cumulative Impacts** with the Other Elements will be **Imperceptible**, mainly due to the location of the majority of the UWF Grid Connection in the River Shannon catchment, and the location of the majority of the Upperchurch Windfarm/UWF Related Works in the River Suir catchment. Cumulative Impacts with Other Projects (consented Newport Town Park, consented/potential Castlewaller Windfarm and potential Bunkimalta Windfarm) will be **Imperceptible**, in part due to the large size of the Mulkear River catchment area and the transient nature of the UWF Grid Connection works which will predominately take place place on public roads.

Summary of the Likely Impacts to the River Suir SAC: The 110kV will be located c.12km upstream of the River Suir SAC. The 110kV UGC will cross five watercourses at existing crossing points (all culverts) along paved road in the Suir sub-catchment. Four out of the five watercourses to be crossed are drains with no fisheries value. The existing culvert at 1 No. drain along the public road may potentially require replacement during construction works. The impact is evaluated as **Imperceptible** due to the small scale of the works in the River Suir catchment and the large downstream distance to the SAC. **Cumulative impacts** with the Other Elements will also be **imperceptible** due to the location of the majority of the UWF Grid Connection in the River Shannon catchment, and the location of the majority of the Upperchurch Windfarm/UWF Related Works in the River Suir catchment, and the separation distance between works and the SAC.

Summary of the Significance of the Potential Impacts to Local Water Dependant Habitat: Impacts are **No Likely Impact** due to the absence of suitable marsh fritillary habitat on or adjacent to, construction works areas for UWF Grid Connection. The impact of the whole project is evaluated as **Slight**.

Conclusion: The UWF Grid Connection will not cause significant adverse effects to Water

Introduction, Authors, Sources, Methodology

Topic **Water**

11 Environmental Factor: Water

11.1 Introduction to the Water Chapter

11.1.1 What is Water?

Water relates to the hydrology and hydrogeology in the area of the Whole UWF Project. Hydrology is the term used for surface water drainage within regional and local catchments. Hydrogeology is the distribution and flow of groundwater within aquifers in the local groundwater bodies. The local hydrology and hydrogeology are assessed with respect surface water bodies, groundwater bodies, water dependant designated sites (i.e. SACs, NHAs etc.), drinking water supplies and local water dependent habitats.

11.1.2 Overview of Water in the Local Environment

Ireland is divided into 40 hydrometric areas. Each Hydrometric Area comprises a single large river basin, or a group of smaller ones, and neighbouring coastal areas. The catchment of the River Shannon and its tributaries which, because of its size, was divided into two hydrometric areas, 25 (Lower Shannon) and 26 (Upper Shannon). With respect of surface water, the existing environment comprises local and regional and surface water bodies within the Lower Shannon & Mulkear and the River Suir hydrometric areas see Figure GC 11.1.1 Location of the UWF Grid Connection – Hydrometric Areas.

An overview of the regional hydrology is shown in the table below, and illustrated on Figure GC 11.1.2: Location of the UWF Grid Connection – Sub-Catchments and Local Surface Water Bodies (sub-basins).

Figures and mapping referenced in this topic chapter can be found in Volume C3 EIAR Figures.

Hydrometric Area	Sub-Catchment	Local Surface Water Body (Sub-basin)
Lower Shannon & Mulkear hydrometric area	Newport (Tipperary)_SC_010	Newport_040
	Killeengarriff_SC_010	Ballyard_010
		Annagh(Tipperary)_030
		Annagh(Tipperary)_020
	Bilboa_SC_010	Bilboa_010
		Inch (Bilboa)_010
River Suir hydrometric area	Suir_SC_030	Clodiagh (Tipperary)_010

The Lower Shannon & Mulkear and River Suir hydrometric areas both contain Natura 2000 designated sites downstream of the development (i.e. Lower River Shannon SAC and Lower River Suir SAC respectively).

In respect of groundwater, the existing environment comprises 2 no. local groundwater bodies (GWBs) - the Slieve Phelim GWB and the Templemore A GWB. Both GWBs mainly comprise Locally Important and Poor Bedrock Aquifers types in terms of their potential productivity as a groundwater supply sources.

Public and private water supplies comprise surface water abstractions from local streams or rivers; groundwater abstractions, using groundwater wells from the underlying bedrock aquifers, or springs discharges from shallow groundwater flow along the subsoil and bedrock interface.

11.1.3 Sensitive Aspects of the Water Environment included for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspects **are included in this topic chapter** as they could be potentially impacted:

Sensitive Aspect No. 1	Local Surface Water Bodies (inclusive of local watercourses that intercept the development)	Section 11.2
Sensitive Aspect No. 2	Local Groundwater Bodies	Section 11.3
Sensitive Aspect No. 3	Local Wells & Springs	Section 11.4
Sensitive Aspect No.4	Lower River Shannon SAC	Section 11.5
Sensitive Aspect No.5	Lower River Suir SAC	Section 11.6
Sensitive Aspect No.6	Local Water Dependent Habitats	Section 11.7

Each of the above listed Sensitive Aspects are evaluated individually in Sections 11.2 to 11.7 of this Chapter.

To help readers navigate to individual sensitive aspect sections, the colour codes for each Sensitive Aspect used above are also used in the Sensitive Aspect sections Section 11.2 to 11.7. The colour-codes have been applied to section headings, tables and on side-tabs on the edge of the pages.

11.1.4 Sensitive Aspects excluded from further evaluation

The following Sensitive Aspects are excluded from this topic chapter:

Mauherslieve Bog NHA	Evaluated as having no potential for effects due to: **No likely impacts** Mauherslieve Bog NHA is an upland blanket bog located in separate local surface water bodies upstream of the development, on high ground approximately c.3.6km upstream of the UWF Grid Connection (where the 110kV UGC is routed along the Regional Road R503 through Rear Cross village). The Other Elements (Upperchurch Windfarm, UWF Related Works and UWF Replacement Forestry) are located much further to the east, and in different local surface water catchments. Due to the location in separate upstream local surface water bodies, large down-gradient distance to UWF Grid Connection and the nature of the excavation works (i.e. shallow trench in public road pavement) no hydrological impacts on Mauherslieve Bog NHA are expected.
Bleanbeg Bog NHA	**Evaluated as having no potential for effects due to: No likely impacts** Bleanbeg Bog NHA is an upland blanket bog, located in separate local surface water bodies upstream of the development, on high ground approximately c.6.8km upstream of the of the UWF Grid Connection (where the 110kV UGC is routed along the Regional Road R503 at Lackamore). The Other Elements (Upperchurch Windfarm, UWF Related Works and UWF Replacement Forestry) are located much further to the east, and in different local surface water catchments. Due to the location in separate upstream local surface water bodies, the large down-gradient distance to UWF Grid Connection and the nature of the excavation works (i.e. shallow trench in public road pavement) no hydrological impacts on Bleanbeg Bog NHA are expected.
Grageen Fen and Bog NHA	**Evaluated as having no potential for effects due to: No potential for impacts** Grageen Fen and Bog NHA is an upland blanket bog and alkaline fen located in a separate local surface water body (the Mulkear (Limerick)_030), approximately c.3.2km south of the UWF Grid Connection (where the 110kV UGC is routed along the Regional Road R503 at Lackamore). The Other Elements (Upperchurch Windfarm, UWF Related Works and UWF Replacement Forestry) are located much further to the

	east, and in different local surface water catchments. Due to the large down-gradient distance to UWF Grid Connection and its location in a separate local surface water body, there is no potential for hydrological impacts on Grageen Fen and Bog NHA.
Clare Glen SAC	Evaluated as having no potential for effects due to: Clare Glen SAC is located in a wooded area on both banks of the Clare River approximately c.2.2km downstream of the UWF Grid Connection (110kV UGC) within the Annagh (Tipperary)_030 local surface water body. The qualifying interests, which includes Old Oak Woodlands and Killarney Fern, are terrestrial habitats, rather than water or watercourse based habitats. Regardless, with the implementation of the project design measures, any effects to water quality within the downstream SAC will be imperceptible of less. The UWF Related Works, UWF Replacement Forestry, Upperchurch Windfarm and UWF Other Activities are not located within the Annagh (Tipperary)_030 local surface water body catchment therefore there is no potential for effects by these Elements.
Surface Water abstraction for Newport Regional Water Supply	Evaluated as having **no potential for or likely effects** due: The surface water source for the Regional Supply is abstracted from the Newport River, c.370m upstream of Rockvale Bridge (UWF Grid Connection watercourse crossing point W7). The installation of the 110kV UGC in the public road over the Rockvale Bridge will not cause any impacts to this supply, due to the location of works downstream of the abstraction point. The potential for effects to the groundwater source for the Newport Regional Water Supply is evaluated in Section 11.4. The potential for effects to underground pipes for the Newport Regional Water Supply is evaluated in Chapter 14: Material Assets (Built Services).
Other Surface Water Abstractions (Public / private water abstractions from local stream or rivers)	Evaluated as having no likely effects due to: No other surface water abstractions within 100m of UWF Grid Connection construction works were identified during desktop or field surveys, during door to door surveys or by the public consultations meetings. Notwithstanding this, the Project Design and Project Design Measures described in this chapter, the Surface Water Management Plan appended to this EIA Report in the UWF Grid Connection Environmental Management Plan, and the related Best Practice Measures in terms of surface water quality protection, will ensure no significant impacts are likely to occur.

11.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of the current application to An Bord Pleanála. The main parts of the UWF Grid Connection are identified in Table 11-1 below.

Table 11-1: Subject Development – UWF Grid Connection

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Ancillary Works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 Main EIA Report of this EIA Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

11.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.
- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. ***Note***: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

11.1.6 The Authors of the Water Chapter

This report on the Environmental Factor Water has been written by David Broderick (BSc, H. Dip Env Eng, MSc): Hydrogeologist and Michael Gill (P.Geo., B.A., B.A.I., M.Sc., Dip. Geol, MIEI): Environmental Engineer of Hydro-Environmental Services (HES) which was established in 2005 as a hydrological, hydrogeological and environmental practice, specialising in peatland and upland hydrology in Ireland and Northern Ireland.

11.1.7 Sources of Baseline Information

The information sources outlined in Table 11-2 were used to gather information on the baseline environment and evaluate impacts, including cumulative impacts. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 11-2: Sources of Baseline Information for Water

Type	Source
Consultation	Feedback was received from • Inland Fisheries Ireland • Health Services Executive • Irish Water • Office of Public Works • National Federation of Group Water Schemes • Members of the public during door-to-door survey and the Public Consultation and Information Day See Chapter 3: The Scoping Consultations, Chapter 3 Appendices for further details.
Legislation, Regulations, & Policy	• EU Water Framework Directive (WFD) (2000/60/EC) • European Communities (Water Policy) Regulations, 2003; • European Communities (Surface Waters) Regulations, 2009; • European Communities (Groundwater) Regulations, 2010; • European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011; and, • European Union (Water Policy) Regulations, 2014. • International River Basin Management Plans second cycle 2018 – 2021
Industry Guidance	• Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements; • National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes; • Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes • Wind Farm Development Guidelines for Planning Authorities (2006); • Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh; • Coillte (2009): Forest Operations & Water Protection Guidelines; • Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford; • UK Pollution Prevention Guidelines (PPG) PPG1 - General Guide to Prevention of Pollution and PPG5 – Works or Maintenance in or Near Watercourses; • CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006); • CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006; • Inland Fisheries Ireland 2016: Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters; • DoELG, EPA, and GSI (1999): Groundwater Protection Schemes. Department of the Envi-

Type	Source
	ronment and Local Government (DOELG), Environmental Protection Agency (EPA) and the Geological Survey of Ireland (GSI); • EPA Drinking Water Advice Note No. 7: Source Protection and Catchment Management to Protect Groundwater Supplies; • EPA Drinking Water Advice Note No. 8: Developing Drinking Water Safety Plans; and, • EPA Drinking Water Advice Note no. 14: Borehole Construction and Wellhead Protection
Desktop	• Environmental Protection Agency (www.catchments.ie) • Environmental Protection Agency database and Hydrotool Map Viewer (www.epa.ie); • Geological Survey of Ireland Databases (www.gsi.ie); • Met Eireann Meteorological Databases (www.met.ie); • National Parks & Wildlife Services Public Map Viewer (www.npws.ie); • Water Framework Directive "WaterMaps" Map Viewer (www.wfdireland.ie); • OPW Indicative Flood Maps (www.floodmaps.ie); • CFRAM Flood Risk Assessment maps (www.cfram.ie); • Department of Environment, Community and Local Government (www.myplan.ie); and, • Pre-surveyed dwelling house locations as an indicator of potential local groundwater supplies (i.e. wells). • Review of EIAR Chapter 10: Soil, Chapter 8: Biodiversity • Review of planning/ environmental information documents for the Other Elements of the Whole UWF Project as contained in Volume F of the planning application; • Review of environmental information/planning documents for Castlewaller Windfarm (consented windfarm and potential grid connection), Bunkimalta Windfarm (consented grid connection and potential windfarm based on previously proposed windfarm), and the consented Newport Town Park.
Fieldwork	• Walkover survey and hydrological mapping of the UWF Grid Connection Mountphilips Substation Site and route of 110kV UGC was undertaken; • Mapping and characterisation of all watercourse crossings along the construction works areas; • Inventory and Survey of Watercourse Crossings; (refer to Appendix 11.1) • Surface water sampling (a total of 57 no. samples were taken at 32 no. sampling locations along the UWF Grid Connection route); (refer to Appendix 11.2) • Identification of local water supplies along the works area through door to door surveys; • A site specific Flood Risk Assessment (Stage II) for UWF Grid Connection (refer to Appendix 11.3).

11.1.8 Methodology for Evaluating Effects

The criteria used for evaluation of Local Surface Water Bodies was based on the NRA (2008) guidance which is also an approach that was referenced by the Institute of Geologists Ireland (IGI) guidance (2013).

11.1.8.1 NRA Criteria for Estimating the Importance of Hydrology Attributes

Using the National Roads Authority (2008) guidance, an estimation of the importance of the hydrological and hydrogeological environment within the study area is quantified, using the criteria set out in Table 11-3 and Table 11-4 below.

Table 11-3: Estimation of Importance of Hydrology Attributes (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on international scale.	River, wetland or surface water body ecosystem protected by EU legislation, e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale.	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities.
High	Attribute has a high quality or value on a local scale.	Salmon fishery Locally important potable water source supplying >1000 homes. Quality Class B (Biotic Index Q3-4). Flood plain protecting between 5 and 50 residential or commercial properties from flooding. Locally important amenity site for wide range of leisure activities.
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery. Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale.	Locally important amenity site for small range of leisure activities. Local potable water source supplying <50 homes. Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people.

Table 11-4: Estimation of Importance of Hydrogeology Attributes (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale.	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g. SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale.	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale.	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale.	Locally Important Aquifer Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale.	Poor Bedrock Aquifer Potable water source supplying <50 homes.

11.1.8.2 NRA Criteria for Estimating the Magnitude of Impacts on Hydrology Attributes

The magnitude of the impact is evaluated using the NRA (2008) criteria outlined Table 11-5 and Table 11-6.

Table 11-5: Estimation of Magnitude of Impact on Hydrology Attributes (NRA, 2008)

Magnitude	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Loss or extensive change to a waterbody or water dependent. Habitat Increase in predicted peak flood level >100mm. Extensive loss of fishery Calculated risk of serious pollution incident >2% annually. Extensive reduction in amenity value
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Increase in predicted peak flood level >50mm. Partial loss of fishery. Calculated risk of serious pollution incident >1% annually. Partial reduction in amenity value.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted peak flood level >10mm. Minor loss of fishery. Calculated risk of serious pollution incident >0.5% annually. Slight reduction in amenity value.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Negligible change in predicted peak flood level. Calculated risk of serious pollution incident <0.5% annually.

Table 11-6: Estimation of Magnitude of Impact on Hydrogeology Attributes (NRA, 2008)

Magnitude	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer. Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Potential high risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >2% annually.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >1% annually.

Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >0.5% annually.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually.

Table 11-7: Rating of Environmental impact at EIAR Stage (NRA, 2008)

Importance of Tribute	**Magnitude of Impact**			
	Negligible	**Small Adverse**	**Moderate Adverse**	**Large Adverse**
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/Moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/Moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

11.1.8.3 Methodology for Evaluating Cumulative Impacts (Other Projects or Activities)

Cumulative effects with Other Projects or Activities are evaluated at the end of the Impact Evaluation Table sections, for example the evaluation of the cumulative effect to Local Surface Water Bodies of the elements of the Whole UWF Project with Other Projects or Activities is evaluated in Section 11.2.4.11. In addition, the cumulative effect is evaluated individually for each local surface water body, for example, Killleengarrif_SC_010, then Newport (Tipperary)_SC_010 sub-catchments as required.

11.1.8.4 Methodology for Identifying Wells & Springs

Scoping for local groundwater supplies via wells and springs in the study area using the following methods:

- GSI Well Database for wells within 100m of construction works areas (mapped accuracy of 50m);
- Locations of private dwellings (houses/property) within 50m of construction works areas);
- Consultation response from the NFGWS[1] (NFGWS had no records of group water schemes in the area);
- Door to door survey of dwellings within 50m of construction works areas;

A scoping in distance of 50m was used for identification and assessment of impacts on local wells, and this distance is based on the EPA Code of Practice - Wastewater Treatment and Disposal Systems Serving Single Houses (EPA, 2009) which recommends a minimum distance of 30m from percolation units and down-gradient private wells. Due to the shallow nature of the earthworks associated with the UWF Grid Connection or with Other Elements of the Whole UWF Project, and the fact that no discharges to ground are proposed, a distance of 50m is considered to be more than adequate for assessment of potential impacts on local wells.

[1] NFGWS - National Federation of Group Water Schemes

11.1.9 Certainty and Sufficiency of Information Provided

A clear documentary trail is provided throughout this chapter and chapter appendices to the competency of data and methods used and the rationale for selection of same. The information used to compile this chapter is collated from site-specific investigations, data and documents generated by public bodies and statutory agencies. The online baseline data was verified in the field.

The criteria used for water (hydrology and hydrogeology) appraisals are derived from the National Roads Authority (2008) guidance document. All documentation used is referenced at the end of the chapter. In respect of Water, no significant limitations of difficulties were encountered

It should be noted that the EPA and www.catchments.ie database names for Rivers/Waterbodies, River Sub Basins and Catchments have been used in this Chapter, and differ in some instances to those names used in the 2013, 2018 and 2019 planning documents for Other Elements of the Whole UWF Project, which used the WFD database, correct at that time. For ease of cross referencing to the 2013 EIS and 2013 RFI for Upperchurch Windfarm, and the 2018 EIAR for UWF Replacement Forestry, and the 2019 Revised EIAR for UWF Related Works (currently under appeal to An Bord Pleanála):

Name under WFD database *(used for 2013 Upperchurch Windfarm, 2018 UWF Replacement Forestry and 2019 UWF Related Works reports)*	**Name under EPA Database (used for this current EIAR)**
Newport River catchment	Newport_SC_010 sub-catchment
Clare River catchment	Kileengariff_SC_010 sub-catchment
Bilboa River catchment	Bilboa_SC_010 sub-catchment
Clodiagh River catchment	Suir_SC_030 sub-catchment
Kilcomenty, Trib of Mulkear - IE_SH_25_1981	Ballyard_010
Newport, Trib of Mulkear - IE_SH_25_320	Newport_040
Small, Trib of Mulkear - IE_SH_25_2323	Annagh(Tipperary)_030
Annagh, Trib of Mulkear - IE_SH_25_2029	Annagh(Tipperary)_020
Abington, Trib of Mulkear - IE_SH_25_2521	Bilboa_010
Abington, Trib of Mulkear - IE_SH_25_1924	Inch (Bilboa)_010
ClodiaghUpper, Trib of SuirClodiagh - IE_SE_16_3320	Clodiagh (Tipperary)_010

11.2 Sensitive Aspect No.1: Local Surface Water Bodies

This Section provides a description and evaluation of the Sensitive Aspect - Local Surface Water Bodies.

11.2.1 BASELINE CHARACTERISTICS of Local Surface Water Bodies

11.2.1.1 STUDY AREA for Water - Local Surface Water Bodies

The study area for Local Surface Water Bodies (which includes the actual surface watercourses which intercept the development) in relation to the UWF Grid Connection is described in Table 11-8 and illustrated on Figure GC 11.2.1 to GC 11.2.4: UWF Grid Connection Study Area for Local Surface Water Bodies (Volume C3 EIAR Figures).

Table 11-8: UWF Grid Connection Study Area for Local Surface Water Bodies

Study Area for Local Surface Water Bodies	Justification for the Study Area Extents
Local surface waterbody catchments within which the UWF Grid Connection is located	Defined by local topography, flow patterns and drainage as defined by the EPA mapping on www.catchments.ie

11.2.1.2 Baseline Context and Character of Local Surface Water Bodies in the UWF Grid Connection Study Area

11.2.1.2.1 Regional and Local Hydrology

The majority of the footprint of the UWF Grid Connection is located within the River Shannon (surface water catchment, with the remainder located in the River Suir surface water catchment. Within the River Shannon catchment, the Mountphilips Substation site and c.29km of the 110kV UGC exist within the Lower Shannon & Mulkear hydrometric area (HA25D). The sub-catchments within the Lower Shannon & Mulkear hydrometric area include, (listed from west to east) the Killeengarriff_SC_010, Newport (Tipperary)_SC_010 and the Bilboa_SC_010. Within the River Suir catchment, the remaining c.1.5km of the 110kV UGC route is located within the Suir_SC_030 sub catchment. These sub catchments are further divided into river sub basins as tabulated in Ttable 11-8 and seen on Figure GC 11.2.1 to GC 11.2.4.

There is a total of 68 no. watercourses within the construction works area boundary associated with the UWF Grid Connection, 3 no. of these are at the Mountphilips Substation site (2 no. of these watercourses are new crossings located along the new access road to Mountphilips Substation, 1 no. temporary watercourse crossing between Mountphilips and the End Masts). 63 no. watercourse crossings are located along the route of the 110kV UGC on the public road network (road numbers: L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, R503, L2264-50 and L6188-0) and the remaining 2 no. are located along the private paved road close to the Consented UWF Substation on the eastern extremity of the 110kV UGC route.

Due to the primarily upland nature of the study area, the majority of the watercourses intercepted by the UWF Grid Connection are either drains or minor headwater (1st - 2nd order) streams. Three larger watercourse crossings of note will occur, these watercourses include

- the Newport River at Rockvale Bridge (W7) on the L2156-0 north of Newport town;
- the Clare River at Tooreenbrien Bridge (W36) on the R503 near Lackamore; and
- the Bilboa River at Anglesey Bridge (W53) on the R503 near Kilcommon.

These rivers will be crossed by installing the trench in the road over the bridges.

A summary of regional and local surface water bodies as defined by the EPA GIS Mapping that the UWF Grid Connection passes through and the number of watercourse crossings required in each surface water body are shown on Table 11-9 below. Mountphilips Substation is located in the Ballyard_010 catchment, which is within the Killeengarrif_SC_010 sub catchment. The Ballyard_010 catchment drains into the Newport River (at a point below Newport town) c. 6km downstream of the Mountphilips Substation site. The occurrence of the 110kV UGC, instream works, potential culvert replacement works and joint bays, are also identified for each surface water body in Table 11-9.

Table 11-9: Summary of Regional Hydrology, Local Hydrology and Proposed Infrastructure along the UWF Grid Connection (110kV UGC)

Hydrometric Area	EPA Sub-Catchments[1]	EPA - Local Surface Water Bodies[2]	Length of 110kV UGC (km)	No. Water-course Crossings	Potential Culvert Replace-ment Works[3]	Instream Works	No. Joint Bays
Lower Shannon and Mulkear	Killeengarriff_SC_010	Ballyard_010	1.3	4	0	3 (at Mountphilips Substation site)	1
	Newport (Tipperary)_SC_010	Newport_040	3.5	5	0	0	6
	Killeengarriff_SC_010	Annagh(Tipperary)_030	4	7	0	0	5
		Annagh(Tipperary)_020	8.4	23	8	0	11
	Bilboa_SC_010	Bilboa_010	6.4	18	2	0	10
		Inch (Bilboa)_010	5.4	6	2	0	7
Suir	Suir_SC_030	Clodiagh (Tipperary)_010	1.5	5	1	0	2

[1] Catchments are listed from west to east along the UWF Grid Connection route from the Mountphilips Substation to the Consented UWF Substation

[2]Catchment areas as now defined in https://gis.epa.ie/EPAMaps/

[3]Potential culvert replacement at W13, W14, W15, W17, W19, W20, W32, W34, W55, W57, W60, W61 and W64. While these works will include instream works to some degree, they are called 'Culvert Replacement Works' throughout the EIA Report to distinguish them from the works at W1, W2 and W3 at Mountphilips Substation site. The works at W1, W2 and W3 are referred to as 'instream works' throughout.

11.2.1.2.2 Existing Water Quality Monitoring Data and WFD Waterbody Status

Biological water quality monitoring and rating refers to the EPA Q-Value system of ranges and is calculated on the in-stream macro-invertebrate community present in a river or stream. A Q-value of 5 indicates very high-water quality while a Q-value of 1 indicates poor water quality. A summary of the EPA Values (Biotic Index) for surface water within the study area of the UWF Grid Connection are shown in Table 11-10. A Q-Value is generally only available for the main rivers and streams downstream of the works area. The Q-Value for the main watercourses within the local surface water bodies are typically Good to High. However, a Moderate Q-Value was reported for one location, and this was for a tributary of the Bilboa River.

The EPA and Water Framework Directive "Status" and "Risk Result" for surface water bodies in the area of the UWF Grid Connection are shown in Table 11-11. The status of the surface water bodies at the study area is typically Good. The majority of the SWBs are *Not at Risk* with the exception of the Inch (Bilboa)_010 and Clodiagh (Tipperary)_010 which are reported to be At Risk of morphological and forestry related effects such as suspended sediment and eutrophication.

Table 11-10: Summary of EPA Q-Values for Surface Water Bodies in the UWF Grid Connection Study Area

EPA Watercourse	EPA Location Description	Easting / Northing	EPA Q Status
Newport River	Bridge downstream of Annagh Bridge	E168236 , N156331	Good
Newport River	Bridge south of Shower	E170270 , N161830	High
Newport River	Rockvale Bridge	E173860 , N163330	High
Small River	Upstream of Newport River confluence	E174250 , N162570	Good
Tooreenbrien Stream	Tooreenbrien Bridge	E181444 , N160200	Good
Clare River	Bridge u/s of Inchinmathea Bridge	E184950 , N162060	Good
Tributary of Bilboa River	Bridge in Kilcommon	E190280 , N159990	Good
Tributary of Bilboa River	Bridge u/s of Bilboa Confluence	E188903 , N158321	Good
Tributary of Bilboa River	Bridge SE of Loughbrack	E191722 , N158507	Moderate
Clodaigh River	Bridge North of Castlehill	E198165 , N165026	High
Clodaigh River	Bridge East of Rathcarden	E202314 , N163807	Good

11.2.1.2.3 EPA WFD Waterbody Status and Risk Result

The Water Framework Directive "Status" and "Risk Result" for surface water bodies in the area of the UWF Grid Connection are shown in Table 11-11.

The status of the surface water bodies at the study area is typically Good. The majority of the SWBs are *Not at Risk* with the exception of the Inch (Bilboa)_010 and Clodiagh (Tipperary)_010 which are reported to be At Risk of not meeting the Water Framework Directive objectives due to morphological and forestry related effects such as suspended sediment and eutrophication.

Table 11-11: EPA WFD Waterbody Status and Risk Result

Regional Catchment	EPA Sub-Catchments	EPA - Local Surface Water Bodies[2]	WFD Status	WFD Risk Results
Shannon	Killeengarriff_SC_010	Ballyard_010	Good	Not at risk
	Newport (Tipperary)_SC_010	Newport_040	Good	Not at risk
	Killeengarriff_SC_010	Annagh (Tipperary)_030	Good	Not at risk
		Annagh (Tipperary)_020	Good	Not at risk
	Bilboa_SC_010	Bilboa_010	Good	Review*
		Inch (Bilboa)_010	Moderate	At risk
Suir	Suir_SC_030	Clodiagh (Tipperary)_010	Good	At risk

* Water bodies for Review are not considered to be At Risk, but require further evidence that the objectives are being met, typically with ongoing monitoring and/or possibly modelling. Water bodies characterised as Review as the degree of confidence in the characterisation is weak

11.2.1.2.4 Results of Surface Water Sampling

Due to the lack of existing water quality data/biotic data for the majority of the watercourses at the works areas, 2 no. round of surface water sampling were completed at 19 no. of the larger Class 1 / Class 2 watercourse crossings along the UWF Grid Connection route in January and June 2019. In addition, 7 no. samples (DSW1 – DSW7) were taken further downstream of the development in the Killeengarriff_SC_010 and Bilboa_SC_010 sub-catchments. This survey data is presented in Appendix 11.2 Surface Water Sampling Results.

Based on a comparison of the results (particularly for ammonia, BOD and ortho-phosphate) with respect to the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009), the results are consistent with a waterbody status of Good to High. Results for suspended solids were typically below 10mg/L with the occasional sample been elevated above the Freshwater Fish Directive 2006/44/EC threshold value of 25mg/L. The majority of the samples were well below this threshold.

11.2.1.2.5 Classification of Watercourses at Crossing Locations

Detailed hydrological and aquatic surveys were undertaken along the works area in order to characterise and categorise watercourses where crossings are required as part of the works. This survey data is presented in Appendix 11.1 Inventory and Survey of Watercourse Crossings, 65 of the 68 no. watercourse crossings are existing culverts/bridges. Most of the larger watercourse crossings consist of bridges, with culverts typically used on smaller watercourse crossings.

Based on the field surveys, the watercourses are categorised Class 1 (highest fisheries value) to Class 4 (no fisheries value) as shown in Table 11-12

Shown in Table 11-12 below is a summary classification of the watercourses which will be crossed by the 110kV UGC route. A large proportion of the watercourses at the crossing locations are Drains (~40%, Class 4). Approximately ~20% of the watercourses are natural streams with potentially good fisheries value (Class 1 and Class 2).

Table 11-12: Summary Watercourse Characterisation at the 110kV UGC Crossing Locations

Class	Watercourse Description	Total No.	Total with potential Culvert Replacement Works	Total In-stream Works
1	EPA mapped blue line, major river or stream (fisheries value)	13	1	0
2	Headwater Stream Equivalent to EPA blue line but not mapped (fisheries value)	3	0	2
3	Sub-optimal, heavily vegetated with low or no flow during dry periods (low fisheries value)	27	3	1
4	Drain (no fisheries value)	25	9	0
	Total	**68**	**13**	**3**

11.2.1.2.6 Flood Risk Assessment

A site-specific flood risk assessment was undertaken (in accordance with the guidance document 'The Planning System and Flood Risk Management Guidelines for Planning Authorities - DoEHLG, 2009) for the UWF Grid Connection and this report is attached as Appendix 11.3 Flood Risk Assessment. A summary of the flood risk assessment is provided below.

The primary objective of the Flood Risk Assessment is to identify areas potentially prone to fluvial and pluvial flooding along the UWF Grid Connection route with a focus being on residual risk to permanent infrastructure that will be present during the operational phase of the development – such as the new permanent access road to the Mountphilips Substation. The potential impacts of the development on flooding were also assessed.

Due to the elevated nature of the majority of the construction works areas, the majority of the works areas are not located within any mapped fluvial flood zones, being located within fluvial Flood Zone C (Low Risk). In addition the majority of construction works areas are not located within any pluvial flood extent zones. It is therefore considered that the location of the UWF Grid Connection is at low risk to flooding.

Interaction with mapped fluvial flooding zones, which are associated with 100-year flooding events or greater, is generally limited to the crossing locations of larger watercourses. It is considered that the locations of the UWF Grid Connection are, for the most part, not susceptible to significant flooding.

The OPW Preliminary Flood Risk Assessment (PFRA) mapping for the study area indicates that fluvial flooding along the 110kV UGC route is relatively localised to the larger stream and river crossing locations, namely; crossing locations W5, W7 (Newport River), W8, W9 (Small River), W33, W36 (Clare River), W39, W49 and W53 (Bilboa River). Access to these crossing locations will only be required during the construction stage (no new permanent infrastructure is required at these watercourses crossing locations). The Mountphilips Substation site is also not located within a mapped fluvial flood zone.

11.2.1.3 Importance of Local Surface Water Bodies

The majority of the local surface water bodies within the study area have been assigned Good to High Status by the WFD. Where a Good to High Status has been assigned, there will be a requirement to prevent deterioration and maintain at least a Good status. Regardless of existing status, there will also be a requirement to protect, enhance and restore all waters with an aim to achieve at least Good Status for all waterbodies.

However, as described above, the majority of the watercourses at construction works areas associated with the UWF Grid Connection are located within the public road and are either drains or watercourses of low ecological value with no fisheries potential and therefore there is no requirement for these watercourses to achieve at least Good status. However, these drains / watercourses are pathways to the larger streams and rivers downstream of the works areas which are required to achieve at least Good Status under the WFD.

Overall, Local Surface Water Bodies are evaluated as having **High** importance.

11.2.1.4 Sensitivity of Local Surface Water Bodies

The primary sensitivities with respect to the local surface water bodies will be effects on water quality and effects on morphology which will be important to protect in terms of the overall WFD status of the waterbody. As stated above, the majority of the watercourses at the works areas are drains or watercourses of low ecological value, and there are typically, themselves, not sensitive to impact but are potential pathways.

11.2.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Based on the EPA database, with the exception of the Inch (Bilboa)_010, the Shannon Regional catchment waterbodies in the study areas, are reported to be **Not at Risk** from water quality impacts (diffuse and point source) or morphological impacts. This suggests that there are no significant negative rising trends relating to water quality or morphology to the majority of the River Shannon catchment in the study areas.

In the River Suir catchment, similarly with the exception of the Clodiagh (Tipperary)_010, based on the WFD surface waterbody reports (www.wfdireland.ie), the Suir Regional catchment waterbodies in the study areas are reported to be **Not at Risk** from water quality impacts (diffuse and point source) or morphological impacts. The Clodiagh (Tipperary)_010 catchment is **At Risk** from morphological impacts (channelization) and forestry related impacts, and it is therefore considered that there are potential negative rising trends relating to water quality or morphology.

It is noted that the status and risk characterisations have not been updated in the current RBMP (2018-2021), thus characterisation and water quality status are cited as indicative

11.2.1.6 Receiving Environment (the Baseline + Trends)

Due to the slow rate of change, it is expected that the status of waterbodies will be the same at the time of construction (2020/2021). However, it is assumed that the status of the surface water bodies within the study area will be at least Good during the lifetime of the UWF Grid Connection. This is based on the assumption that surface waterbodies will have to achieve at least Good Status.

11.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

11.2.2.1 Cumulative Evaluation Study Areas

11.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Related Works Cumulative Evaluation Study Area for Local Surface Water Bodies	Justification for the Study Area Extents
As defined by local surface water catchments. The cumulative assessment for UWF Grid Connection was completed on a Local Surface Water Body scale.	Only other developments within the same local surface water body as the subject development can contribute to cumulative impacts within the surface water body.

The study is illustrated on Figure CE 11.2 UWF Grid Connection Cumulative Evaluation Study Area for Local Surface Water Bodies

11.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 11.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements and Other Projects or Activities which are described in Table 11-13 and illustrated on Figure WP 11.2 Whole Project Study Area for Local Surface Water Bodies

Table 11-13: Cumulative Evaluation Study Area for Local Surface Water Bodies

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	As defined by local surface water catchments and regional surface water catchments. The cumulative assessment was completed on a Local Surface Water Body scale and at Regional Catchment scale (the regional catchment scale was done to assess impacts on downstream SAC's as described further below in the chapter).	Only other developments within the same local surface water body as the subject development or the regional surface water catchment as Other Elements of the Whole UWF Project can contribute to cumulative impacts within the surface water body.
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

11.2.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Local Surface Water Bodies also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Local Surface Water Bodies with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.18).

The results of this scoping exercise are that: Newport Town Park, Castlewaller Windfarm, and Bunkimalta Windfarm have been scoped in for evaluation of cumulative effects to Local Surface Water Bodies.

11.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Local Surface Water Bodies

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Local Surface Water Bodies. The results of this evaluation are included in Table 11-14.

The location of, and study area boundary associated with, the Other Elements and Other Projects or Activities which are included for cumulative evaluation is illustrated on Figure WP 11.2 (Volume C3 EIAR Figures). The baseline character of the areas around these Elements is described in Section 10.2.2.3.

Table 11-14: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Included for the evaluation of cumulative effects
Element 4: Upperchurch Windfarm	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effect/No potential for effects due to: The Haul Route Activities are located entirely within the public road corridor. There will be no requirement for earthworks/groundworks and therefore no hydrological / water quality effects are likely. Overhead Line Activities: These works involve upgrade works to the overhead existing lines such as cable wrapping which do not require any major excavations. Therefore neutral surface water impacts are expected. Monitoring Activities do not require any major construction activities. Therefore, neutral surface water impacts are expected. Once off activities will take place during the pre-construction stage, and comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will generally take place on the periphery of fields and are not expected to impact on water quality. During the Operational Stage, farming practices under the Upperchurch Hen Harrier Scheme will, to a certain extent, cause lands to revert back to wet grassland. All associated potential hydrological effects are expected to be Neutral. During decommissioning of UWF, the Upperchurch Hen Harrier Scheme will finish, but no activities will be required, therefore no impacts are expected.
Other Project or Activity	
Consented Newport Town Park	Yes, included for the evaluation of cumulative sedimentation effects.

Castlewaller Windfarm *(consented windfarm and potential grid connection)* Potential Bunkimalta Windfarm *(potential windfarm and consented grid connection)*	Evaluated as excluded: cumulative impacts in relation to fuel/oil or cementious material contamination, increased flood risk or runoff from permanent surfaces: Neutral cumulative water quality effects due to oils/cement contamination, as it is expected/planned to develop these projects using best practice oil, fuel and cement measures. No cumulative morphological impacts due to separation distance from UWF Grid Connection. Cumulative increases in flood risk due to the Other Projects are not expected due to the upland locations of consented Castlewaller Windfarm and potential Bunkimalta Windfarm (i.e. in low risk flood zones), the location of all Other Projects outside of the Ballyard_010 catchment where watercourse crossing works and new hardstanding areas for Mountphilips Substation site are proposed for UWF Grid Connection; the sizing of replaced/new watercourse structures for UWF Grid Connection to cope with a minimum 100-year flood event, the absence of any changes to watercourse crossing structures and the absence of any new watercourse crossing structures in the Newport (Tipperary) SC_010 (where all Other Projects are located). Cumulative impacts to water quality due to surface water runoff from hardstanding areas will be neutral due to assimilative capacity and dilution factors within the large sub catchment areas.

11.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

The majority of the footprint of the UWF Grid Connection is located within the River Shannon (Shannon River Basin District) surface water catchment, with the remainder located in the River Suir (South Eastern River Basin District) surface water catchment. In contrast, the majority of the footprint of the UWF Related Works and the Upperchurch Windfarm are located in the River Suir catchment with the remainder located in the River Shannon catchment. The UWF Replacement Forestry is located entirely within the River Suir catchment.

11.2.2.3.1 Element 2: UWF Related Works

The majority of the UWF Related Works areas (16.2km of Internal Windfarm Cabling, all Realigned Windfarm Roads and the Telecom Relay Pole) are located in the River Suir catchment with the remainder (c 1.7km of Internal Windfarm Cabling and some of the Haul Route Works) in the River Shannon catchment.

Within the River Suir catchment, of the c 16.2km of the Internal Windfarm Cabling within the River Suir catchment, c 11.4km exists within the Clodiagh (Tipperary)_010catchment, c 3.8km within the Owenbeg_010 catchment and c 0.8km within the Multeen (East)_010 catchment.

A summary of regional and local surface water bodies, including the surface water bodies as defined by the Water Framework Directive (WFD), that the UWF Related Works pass through along with the number of watercourse crossings required for the Works in each surface water body are shown on Table 11-15 below. The occurrence of the Internal Windfarm Cabling, Realigned Windfarm Roads or Haul Route Works, is also identified for each surface water body in Table 11-15.

Table 11-15: Summary of Regional and Local Hydrology at the UWF Related Works Areas

HW – Haul Route Works, RWR – Realigned Windfarm Roads

Regional Catchment	EPA sub-catchment	EPA Local Surface Water Bodies	Internal Cable (km)	HW works	RWR works	No. WC Crossings
Suir	Multeen[East]_SC_010	Multeen (East)_010	0.88	-	-	0
	Suir_SC_030	Clodiagh (Tipperary)_010	11.44	HW1 to HW6 HW11 – HW13	RWR1-RWR2	26
	Suir_SC_030	Owenbeg_010	3.84	-	RW3	5

Shannon	Bilboa_SC_010	Inch (Bilboa)_010	1.45	HW7 to HW10	-	1
		Bilboa_010	0.29	-	-	0

As shown in Table 11-15 above there are a total of 32 no. watercourse crossings required for the UWF Related Works and there are largely required for the Internal Windfarm Cabling (24 of 32 no.). The majority of the watercourse crossings are located within Clodiagh (Tipperary)_010 surface water body (26 no. of 32 no. crossings). There is only 1 no. watercourse crossing in the River Shannon catchment. Refer to Table 11-15 above for the distribution of the watercourse crossings within the local surface water bodies.

Existing Water Quality Monitoring Data and WFD Waterbody Status

A summary of the EPA Values (Biotic Index) for surface water within the study area of the UWF Related Works are shown in Table 11-17. A Q-Value is generally only available for the main rivers and streams downstream of the works area.

Biological water quality monitoring and rating refers to the EPA Q-Value system of ranges and is calculated on the in-stream macro-invertebrate community present in a river or stream. A Q-value of 5 indicates very high-water quality while a Q-value of 1 indicates poor water quality. The Q-Value for the main watercourses within the local surface water bodies are typically Good to High. However, a Moderate Q-Value was reported for one location, and this was for a tributary of the Bilboa River.

Table 11-16: Summary of Q-Values for Surface water Bodies in the UWF Related Works Study Area (EPA)

EPA Watercourse*	EPA Location Description	Easting / Northing	EPA Q Status
Tributary of Bilboa River	Bridge in Kilcommon	E190280, N159990	Good
Tributary of Bilboa River	Bridge u/s of Bilboa Confluence	E188903, N158321	Good
Tributary of Bilboa River	Bridge SE of Loughbrack	E191722, N158507	Moderate
Clodaigh River	Bridge North of Castlehill	E198165, N165026	High
Clodaigh River	Bridge East of Rathcarden	E202314, N163807	Good
Owenbeg River (Suir)	Northeast of Knockmehil	E199682, N160113	Good
Owenbeg River (Suir)	Bridge SW of Rossoulty	E201650, N159238	Good

The Water Framework Directive "Status" for surface water bodies in the area of the UWF Related Works are typically Good. The majority of the SWBs are Not at Risk of achieving Good Status with the exception of the Clodiagh (Tipperary)_010 and the Inch (Bilboa)_010 which are reported to be At Risk of morphological and forestry related effects such as suspended sediment and eutrophication.

Classification of Watercourses at Crossing Points

32 no. watercourse crossings will be required to facilitate the UWF Related Works and these are largely located along the route of the Internal Windfarm Cabling. Shown in Table 11-18 below is a summary classification of the watercourses which will be crossed by the UWF Related Works. Due to the elevated nature of the location of the construction works associated with the UWF Related Works, the majority of the watercourse crossings relate to forestry drains or agricultural drains (~75%), and this is a reflection of the setting and topography of the area of the windfarm (i.e. upland agriculture and forestry).

There are only 6 no. natural stream crossings of note (18%, Class 1 and Class 2) and these are mainly located at headwater streams (first / second order) of the Clodaigh River (5 no.), with 1 no. being located at a headwater stream of the Owenbeg River.

Table 11-17: Characterisation of Watercourse Crossings at the UWF Related Works areas

Class	Watercourse Description	Total No.	Total With In-Stream Works
Class 1	EPA mapped blue line, major river or stream (fisheries value)	1	1
Class 2	Headwater Stream Equivalent to EPA blue line but not mapped (fisheries value)	5	4
Class 3	Sub-optimal, heavily vegetated with low or no flow during dry periods (low fisheries value)	2	2
Class 4	Drain (no fisheries value)	24	18
	Total	32	25

Results of Surface Water Sampling

2 no. rounds of surface water sampling were completed at 5 no. sampling locations at the larger Class 1 / Class 2 watercourse crossing locations at the works areas (11 no. samples in total). Based on a comparison of the results with respect to the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009), the results are consistent with a waterbody status of High to Good.

Flood Risk Assessment

Due to the elevated nature of the majority of the construction works areas, the majority of the works areas are not located within any mapped fluvial or pluvial flood extent zones and are considered to be areas at low risk to flooding (located within fluvial Flood Zone C (Low Risk). There are no mapped fluvial or pluvial flood zones at the UWF Related Works areas which includes the watercourse crossing locations. The works will have no potential to cause increased flood risk.

11.2.2.3.2 Element 3: UWF Replacement Forestry

All of the UWF Replacement Forestry is located within the Clodiagh (Tipperary)_010 catchment, which is part of the River Suir Catchment. The UWF Replacement Forestry site is located in the townland of Foilnaman to the northwest of the Upperchurch Windfarm. The lands to be planted comprise two agricultural landholdings that are separated by a watercourse. The watercourse is a headwater stream of the Clodiagh River and flows in an easterly direction through the UWF Replacement Forestry site.

Existing Water Quality Monitoring Data and EPA Waterbody Status

A summary of the EPA Values (Biotic Index) for surface water within the study area of the UWF Replacement Forestry is shown in Table 11-19. A Q-Value is generally only available for the main rivers and streams downstream of the works area.

Biological water quality monitoring and rating refers to the EPA Q-Value system of ranges and is calculated on the in-stream macro-invertebrate community present in a river or stream. A Q-value of 5 indicates very high-water quality while a Q-value of 1 indicates poor water quality. The Q-Value for the main watercourses within the local surface water bodies are typically Good to High.

Table 11-18: Summary of Q-Values for Surface water Bodies in the UWF Replacement Forestry Study Area (EPA)

EPA Watercourse	EPA Location Description	Easting / Northing	EPA Q Status

EPA Watercourse	EPA Location Description	Easting / Northing	EPA Q Status
Clodaigh River	Bridge North of Castlehill	E198165, N165026	High
Clodaigh River	Bridge East of Rathcarden	E202314, N163807	Good

The Water Framework Directive "Status" for surface water bodies in the area of the UWF Replacement Forestry are shown in Table 11-19. The status of the surface water bodies at the study area is typically Good. The Clodiagh (Tipperary)_010 is reported to be At Risk of morphological and forestry related effects such as suspended sediment and eutrophication.

Watercourse Crossing Points

A watercourse with fisheries value (Class 1 blue line watercourse, marked on WFD mapping) flows through the western part of the afforestation lands. This stream will be crossed using existing crossing structures. No new structures, or works to the existing structure are required.

Results of Surface Water Sampling

2 no. rounds of surface water sampling were completed at 1 no. sampling location at the Class 1 watercourse that flows through the site (taken at WW28 for the UWF Related Works). Based on a comparison of the results with respect to the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009), the results are consistent with a waterbody status of High to Good.

Flood Risk Assessment

A section of the UWF Replacement Forestry site at Foilnaman is within a mapped fluvial flood zone. However, there is no new permanent infrastructure associated with this afforestation site.

11.2.2.3.3 Element 4: Upperchurch Windfarm

As stated previously, the majority of the Upperchurch Windfarm infrastructure (20 no. of the 22 no. Consented UWF turbines, the Consented UWF Substation and associated Upperchurch Windfarm Roads) is located in the River Suir catchment.

Only 2 no. turbines are located within the River Shannon catchment, and these turbines are located locally within the Bilboa River catchment. Within the River Suir catchment, 10 no. turbines are located in the Clodiagh River catchment, 8 no. in the Owenbeg River catchment and 2 no. in the Multeen River surface water catchment.

The drainage in and around the Upperchurch Windfarm is dominated by forestry and agricultural drains, and this is due to the elevated nature of the site above the local valleys. There will be a requirement for 1 no. watercourse crossing along the Upperchurch Windfarm footprint and this is over a headwater stream (with no in-stream works) of the Owenbeg River.

Due to elevated and hilly nature of the topography in the area of the Upperchurch Windfarm no significant fluvial or pluvial flooding would be expected. The Sediment Control Plan for the windfarm means no increased flood risk downstream is expected.

Consideration of the Passage of Time: A comparison of water quality sampling results and EPA monitoring data used for the 2013 EIS compared to the 2019 Revised EIAR for UWF Related Works data demonstrates that water quality in the windfarm area has improved slightly, with an improvement of Good to High in the Suir Clodiagh catchment, and Poor/Moderate to Moderate in the Bilboa catchment, this change is not considered to be material in the context of the assessments, and therefore it is considered that the descriptions in the 2013 and 2014 documents for Upperchurch Windfarm remain relevant to the cumulative evaluations in this 2019 UWF Grid Connection EIA Report.

11.2.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 11.2.2.2.1.

11.2.2.3.5 Other Projects or Activities

Newport Town Park (consented): A public park in Newport town is consented by Tipperary County Council, which is also located in the Newport (Tipperary)_SC_010 sub-catchment, and downstream of the UWF Grid Connection development. The park includes excavations, groundworks. Landscaping and car-parking facilities on lands immediately adjacent to the Newport River and overlaps the boundary of the Lower River Shannon SAC. No instream works associated with the Newport Town Park project.

Castlewaller Windfarm (consented): The 16 no. turbines and 1 no. substation of this consented windfarm development are all located within the Newport (Tipperary)_SC_010 sub-catchment, all upstream of the UWF Grid Connection development. The route of the associated potential grid connection is assumed in this report to be predominately within the public road corridor to Killonan Station and is also within the River Shannon Catchment, The potential grid connection route may overlap with the UWF Grid Connection along the public road L6009-0. Although it is not likely that Castlewaller Windfarm or its grid connection will be constructed during the same period as UWF Grid Connection, this Other Project is nonetheless included in the cumulative evaluation on a precautionary basis and the potential for windfarm construction works taking place during the same period as UWF Grid Connection works is evaluated. The construction of the consented windfarm will involve both instream works and works in close proximity to watercourses.

Bunkimalta Windfarm (potential): Although it is not expected that the Bunkimalta Windfarm will be constructed at the same time as Upperchurch Windfarm or UWF Grid Connection (due to the recent annulment of the Bunkimalta Windfarm planning permission following the European Court of Justice ruling C-164/17), this project and its associated gird connection are nonetheless included in the cumulative evaluation on a precautionary basis. The potential Bunkimalta Windfarm is expected to be located in the same general area, upstream of the UWF Grid Connection only. The Bunkimalta Windfarm is assumed in this report to be similar to the previous application for 16 no. turbines and a substation compound. The turbines are assumed to be located within both the Kileengarrif_SC_010 sub-catchment and the Newport (Tipperary)_SC_010 sub-catchment. The construction of the windfarm is assumed to involve both instream works and works in close proximity to watercourses. The grid connection (consented) associated with the potential Bunkimalta is predominately within the public road corridor to Nenagh town and is also within the River Shannon Catchment, though does is not located close to the UWF Grid Connection.

11.2.3 PROJECT DESIGN MEASURES for Local Surface Water Bodies

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 11-20 are relevant to the Environmental Factor, Water, and in particular to the sensitive aspect **Local Surface Water Bodies**.

Please Note: The Project Design Measures will be implemented through the Environmental Management Plan for UWF Grid Connection, which includes a Surface Water Management Plan (See Volume D appended to this EIA Report)

Table 11-19: UWF Grid Connection Project Design Measures relevant to Local Surface Water Bodies

PD ID	Project Design Environmental Protection Measure (PD)
PD17	At Mountphilips Substation, water for operational stage welfare facilities will be obtained from a Rain Water Harvesting system. Waste water will be collected in tanks and removed from site by an appropriately licensed operator, for treatment in a licensed water treatment plant. These two measures will avoid the need for a new well or mains water connection and will avoid the need to treat waste water on-site.
PD18	The new substation compound and the new permanent access road at the Mountphilips Substation site will have a permanent surface water drainage network in place which will include check dams. These check dams will allow the settlement of suspended solids in water runoff while also slowing down the rate of water run-off from these areas.
PD19	At Mountphilips Substation location, where dewatering of trenches or excavations is required, there will be no direct discharge of untreated 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 to the volume of water requiring treatment (if any) to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD20	At Mountphilips Substation site, all excavated material will be removed for temporary or permanent storage at designated berms, which will be located more than 25m away from the watercourses on Mountphilips Substation site. All storage berms will be graded and sealed following emplacement. The berms will be covered if there is a risk of erosion. Temporary silt control methods such as silt fencing will be placed around all overburden storage areas. The existing vegetative buffer between the berms and the nearest watercourses will be maintained and no works will occur in the buffer zone.
PD21	At Mountphilips Substation site, the permanent storage berms will be along the new access road and around the substation compound will be planted with local provenance native fruiting hedge species, with grasses and native flower species common to the surrounding vegetation sown along the sides of the berms. Local provenance native wildflower seed of flowering plants like clovers, vetches and knapweed will be included. Revegetation works will take place at the soonest practicable opportunity after emplacement.

PD22	Outside of the Mountphilips Substation site, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the UWF Grid Connection Waste Management Plan. Loads of excavated material will be covered during transportation to prevent spillages of excavated material.
PD23	All Joint Bays for the 110kV UGC will be located at least 50m from a Class 1 or Class 2 watercourse and at least 25m from Class 3 or Class 4 watercourses.
PD24	Outside of the Mountphilips Substation site, where dewatering of trenches or excavations is required for the 110kV UGC, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated using a mobile water treatment train and then discharged via a silt bag to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD25	Construction works along the 110kV UGC route will cease during heavy or prolonged rainfall events, and any open trenches or excavations will be covered. Use of weathering forecasting will be undertaken in advance of works.
PD26	A phased approach will be undertaken in relation to excavations, excavation dewatering and any culvert replacement works, where these works occur within 50m of a watercourse. The phased approach will only permit one of main potential sediment producing activities (i.e. excavations, excavation dewatering or culvert replacement works), to be carried out within 50m of a watercourse, at any one time.
PD27	At Mountphilips Substation site, works within 50m of watercourses, 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.
PD28	Along the 110kV UGC on the public road, where works will take place within 50m of a watercourse, additional mitigation measures will be implemented which include silt fencing and placement of sandbag arrangements along preferential surface water flowpaths on the road pavement. Following works on any particular section, any works debris will be removed from the road before the sandbags and silt fences are removed.
PD29	Cable trenching works, joint bay chamber installation and culvert replacement works on the section of 110kV UGC between W13 and W20 (inclusive) and the culvert replacement works at W32 and W34 will only be completed during dry weather in the dryer months of the year – i.e. February to September included. This will minimise/avoid the requirement for any excavation dewatering as a result of waterlogged soils or surface water runoff. None of these 110kV UGC sections are within the Lower River Shannon SAC.
PD30	Lines of silt fencing and sandbags will be erected along the edge of the road so that surface water runoff from adjacent construction works areas is captured and directed to the excavated trench, where it can be pumped and treated before being released, as per PD24.
PD31	Works to bridge parapet walls at watercourse crossings W7, W36, W53 will be carried out during dry weather, and debris netting will be fixed to the outside of the walls in order to prevent any debris falling into the watercourse below.
PD32	At Mountphilips Substation site, instream construction works at the watercourse crossings W1, W2 and W3 will be followed by site-specific reinstatement measures to ensure the equilibrated restoration of flow character and morphology within the affected reach to achieve baseline character and avoid any deterioration in morphology as required under the Water Framework Directive (WFD). Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and 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 margins to stabilise banks, add flood protection and provide riparian buffer; and the use of deflector plates during the restoration of flow. Instream works at W1, W2 and W3 at the Mountphilips Substation site will be undertaken during dry weather within the IFI instream works window (July – September inclusive). As per PD41, instream works at W1, W2 and W3 will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures

	and Best Practice are followed. Although intended for the purpose of the WFD, this measure will also indirectly contribute to downstream water quality protection in the SAC.
PD33	All new permanent watercourse culverts at the Mountphilips Substation site and any replacement culverts along the public road for the 110kV UGC will be sized to cope with a minimum 100-year flood event.
PD34	Only precast concrete culverts or structures will be used at the watercourse crossing locations at Mountphilips Substation site and for any culvert replacements along the 110kV UGC. Only precast concrete chambers will be used at Joint Bay locations. No batching of wet cement will take place on-site.
PD35	Concrete pours will be required for the 110kV UGC cables trench. Only chutes will be washed out at the works locations into the cable trench, with the washout of the tank taking place at the concrete supplier depot. Concrete chute washouts within the SAC boundary will take place into designated bins for removal to the designated concrete wash settlement pond at the Mountphilips Substation site.
PD36	The sections of 110kV UGC trenches that overlap the Lower River Shannon SAC will be lined with an impermeable geotextile material to prevent potential migration of cement from the trench base or sides into the SAC.
PD37	In addition to PD22, there will be no storage of overburden within the Lower River Shannon SAC.
PD38	110kV UGC works outside of Mountphilips Substation site will be carried out entirely on paved roads and where the 110kV UGC crosses watercourses, the works will be carried out over the existing bridges and over/under existing culverts. No in-streams works are proposed at any watercourse crossing points (including the Newport River and Bilboa River crossings) within the boundary of the Lower River Shannon SAC and therefore there will be no placement of cement or other materials within the river channels or on the river banks within the SAC.
PD39	In addition to PD42, there will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within 100m of the boundary of the Lower River Shannon SAC.
PD40	In addition to PD29, all 110kV UGC works within the boundary of the Lower River Shannon SAC will only be completed during dry weather in the dryer months of the year – i.e. February to September included.
PD41	The instream works at W1, W2 and W3 at Mountphilips Substation site, and the culvert replacement works at the 13 existing culverts on the public road, and all works (including concrete placement) within the boundary of the Lower River Shannon SAC, will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice Measures are followed.
PD42	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD43	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 at the Mountphilips Substation site. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored at the designated location in the temporary compound and all operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD44	Overnight parking of plant and machinery will only be permitted at the temporary compound at the Mountphilips Substation site and at a distance greater than 50m from watercourses.
PD45	The horizontal directional drilling works at W8 and W9 will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will advise

	the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized water tight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures; In the event of break-out occurring in the river bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures; In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point; and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the UWF Grid Connection Environmental Management Plan (see Volume D).
PD46	All construction works will be monitored on a daily basis by the Environmental Clerk of Works and by members of the Environmental Clerk of Works team (for example Site Ecologist) as required, for compliance with the Environmental Commitments, which include the Project Design Measures, as per the UWF Grid Connection Environmental Management Plan (see Volume D).
PD47	Surface water quality monitoring of the main watercourses downstream of the works will be carried out to ensure that the downstream water quality status in the receiving water is maintained and that there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009. Where non-compliance in water quality is measured or recorded, works will stop until the issue is resolved. The surface water monitoring locations and sampling programme are defined in the Surface Water Management Plan for UWF Grid Connection. The Surface Water Management Plan is part of the UWF Grid Connection Environmental Management Plan (see Volume D).
PD48	The new permanent cross structures at the Mountphilips Substation site and the replacement culvert at W14 along the R503 will be bottomless or clear spanning.
PD49	In-stream works at Mountphilips Substation site and culvert replacement works at W14 along the R503 Regional Road will only be undertaken during the IFI specified period (July, August and September) and will be carried out to best practice (IFI, 2016).
PD50	Culvert replacement works along the 110kV UGC will not be undertaken without isolation of flow within the watercourse. Isolation of flow will be achieved through the use of sandbags filled with clean, washed sand. Any fish within the isolated section will be removed prior to works commencing. This will require the engagement of licensed fisheries personnel to deplete the works area 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 using a flume (pipe), with deflector plates used on the downstream side of the flume to reduce the hydraulic power of the water. Construction works at the crossing will be followed by site-specific reinstatement measures to ensure the equilibrated restoration of flow character and morphology within the affected reach to achieve baseline character and avoid any deterioration in morphology as required under the Water Framework Directive (WFD). Measures will include: bank stabilization measures, reinstatement of bank slope and character; and reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and the use of deflector plates during the restoration of flow. As per PD41, culvert replacement works will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice are followed. These measures will ensure that the baseline character is maintained and will ensure that a deterioration in morphology is avoided, as required under

	the Water Framework Directive. This in turn will protect Aquatic Ecology.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the fundamental design of the UWF Related Works, UWF Replacement Forestry and UWF Other Activities and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3, 5.4, 5.5 and 5.6, in Volume C4: EIAR Appendices.

11.2.4 EVALUATION OF IMPACTS to Local Surface Water Bodies

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Local Surface Water Bodies.

As a result of the exercise, some impacts were included and some were excluded.

Table 11-20: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	**Impacts Excluded (Justification at the end of the Impact Evaluation Table sections)**
Surface water quality impacts due to earthworks (excavations and storage of overburden), (construction stage)	*Surface Water Quality Impacts due to Nutrient Input(construction stage)*
Water quality impacts from dewatering of excavations (i.e. cable trench and substation works), (construction stage)	*Decommissioning Stage effects*
Morphological Impacts to watercourses due to in-stream works (construction stage)	
Surface water quality impacts due to watercourse crossing works, (construction stage)	
Surface Water Impacts due to Contamination by Fuels, Oils and Chemicals, (construction stage)	
Water Quality Impacts from Cement Based Compounds, (construction stage)	
Surface Water Quality Impacts during Directional Drilling Works (construction stage)	
Surface water quality impacts during forestry felling (construction stage) *(Other Elements only)*	
Increased flood risk due to runoff from permanent hardstanding areas and from new permanent watercourse crossings (culverts), (operational stage)	
Surface water quality impacts due to runoff from permanent hardstanding surfaces, (operational stage)	
Cumulative Impact *with Other Projects*: Surface Water Quality Effects from Suspended Solids - in the Killleengarrif_SC_010 sub-catchment - in the Newport (Tipperary)_SC_010 sub-catchment	

The source-pathway-receptor links for included impacts are described in the Impact Evaluation Tables in the next sections. **The Impact Evaluation Tables are presented in the following sections 11.2.4.1 to 11.2.4.10. Cumulative evaluation with Other Projects is presented in Section 11.2.4.11.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections, in Section 11.2.4.12.

Local Surface Water Bodies

Sensitive Aspect

11.2.4.1 Impact Evaluation Table: Surface water quality impacts due to earthworks

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Earthworks/Storage of Overburden
Cumulative Impact Source: Earthworks/Storage of Overburden, UWF Replacement Forestry planting works
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Indirect surface water quality impacts from entrained sediment in surface water runoff arising during excavations and groundwork associated with the compounds, foundations, access roads, trenching, and joint bays. There will also be a requirement for temporary and permanent overburden storage areas along the works area and these storage areas also have the potential to create entrained sediment in runoff as a result of their erosion. Temporary overburden storage areas relate to the movement of excavated material away from the excavation site and stored temporarily at a designated location. Permanent storage of overburden will be as berms along the works area.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Surface water quality impacts due to earthworks

Element 1: UWF Grid Connection– direct/indirect impact

Impact Magnitude:
Indirect surface water quality impacts from entrained sediment in surface water runoff arsing during excavations and groundwork across the project footprint and also the storage of overburden associated with the Mountphilips Substation site. Approximately 5000m^3 of overburden will be permanently excavated and stored along the construction works area boundary as linear berms along the permanent access road and around the substation compound at the Mountphilips Substation site. Temporary excavation and storage of a small volume of soils will also occur at the End Mast crane hardstand location for a short period of time. It should be noted that the works at the Mountphilips Substation site will be in the Ballyard_010 catchment which drains into the Newport River c.6km downstream at a point to the south of Newport town.

It is possible that earthworks could result in negligible surface water quality impacts locally. This is due to the small scale of the works, their location away from water courses and the implementation of detailed comprehensive mitigation measures close to and at watercourse crossing locations.

Excavations (totalling 23,380m^3) on the public road section of the 110kV UGC will not involve storage of overburden, with all excavations from the trench being removed to licensed waste facilities.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the **High** Importance of the local surface water bodies;
- The work is spread out over a large geographical area (latitudinal distance of 23km) and within sub catchments (Killeeengarriff_SC_010, Newport (Tipperary)_SC_010, Bilboa_SC_010 and Suir_SC_030);
- The transient nature of the works (i.e. construction work will be carried out in stages over a period of 10 - 12 months over an 18 month period, within a very large geographical areas);
- The majority of the 110KV UGC is along public roads;
- Due to the relatively small footprint area of the works at Mountphilips Substation the potential to generate large volumes of sediment in runoff is low; all excavated material will be removed for temporary or permanent storage at designated berms, which will be located more than 25m away from the watercourses on Mountphilips Substation site (Project Design Measure);

Water

Topic

- At Mountphilips Substation site, works within 50m of watercourses, 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. (Project Design Measure);
- The permanent storage berms will be seeded at the soonest practicable opportunity after emplacement (Project Design Measure); and,
- Surface water quality effects will be localised to the works areas, brief to temporary in duration and reversible

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects relates to the following local waterbodies: Inch (Bilboa)_010 (Shannon catchment) and the Clodiagh (Tipperary)_010 (Suir catchment), where works for UWF Grid Connection and UWF Related Works and Upperchurch Windfarm will take place.

All arising occurring due to the UWF Grid Connection Works within the Clodiagh (Tipperary)_010, Inch (Bilboa)_010 surface water bodies will be removed from works areas to licensed waste facilities. No storage of overburden material. Storage of overburden material due to the UWF Grid Connection occurs only at Mountphilips substation which do not share the same surface water bodies of the Other Elements.

Due to the transient and spread out nature of UWF Grid Connection and the fact that three-quarters of the local watercourses, are drains or marginal watercourses, the magnitude of impact is considered to be **Negligible**.

The potential for the consented Newport Town Park, consented Castlewaller Windfarm and potential Bunkimalta Windfarm, to cause cumulative effects with UWF Grid Connection is evaluated in Section 11.2.4.11 below.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- In-combination effects on surface water quality within the River Shannon are likely to be negligible due to the small extent of in-combination works in this catchment – i.e. the majority of UWF Related Works, Upperchurch Windfarm and UWF Replacement Forestry are located in the Suir catchment, which limits the potential for cumulative impacts.
- the localised nature of UWF Related Works effects due to the scale of these works;
- imperceptible effects associated with UWF Replacement Forestry;
- the implementation of the Sediment & Erosion Control Plan for the consented Upperchurch Windfarm;
- Temporary nature of the works

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
The potential for water quality effects will arise during excavations required for the Internal Windfarm Cable trench (17.9km), temporary access roads (5.3km), Haul Route Works, Realigned Windfarm Raods and the Telecom Relay Pole works.
Up to 930m^3 of overburden will be permanently stored along the internal cabling route as linear berms and up to 10,850m^3 will be temporarily be stored for later reinstatement along the wind farm works area. It is possible that erosion of these storage areas could result in surface water quality impacts locally.
Due to the transient and spread out nature of the works around the windfarm site and the fact that most of the local watercourses are drains or marginal watercourses, the magnitude of impact is considered to be Small Adverse.

Significance of the Impact: Slight to Moderate

Rationale for Impact Evaluation:

- As per Table 11-7, Small Adverse magnitude combined with the High Importance of the local surface water bodies;
- The majority of the works relating to the UWF Related Works are located within the Clodiagh River catchment, and therefore the potential for surface water quality impacts is higher than that of the 110kV UGC works;
- The overall significance of effects is reduced as the majority of the watercourses intercepted by the works are drains (Class 4 watercourse) with low flows or no flows, and therefore the effectiveness of them acting as a surface water flowpath to the more sensitive downstream surface water bodies is limited;
- The vast majority of the works area (with the exception of watercourse crossings) are located more than 50m from a watercourse;
- Only approximately 200m of the internal cabling will be completed in any one day (two crews completing up to 100m/day each);
- The earthworks required for the Haul Route Works and Realigned Windfarm Roads are distributed around the windfarm site, and works will be relatively localised in nature. This work will be completed in stages over 6 – 8 months;
- Temporary and permanent overburden storage areas are located more than 50 meters from a Class 1 and Class 2 watercourse (Project Design Measure);
- Temporary overburden storages will only remain in place for less than 1 week before the material is reinstated along construction works area and the next section of the cable trench excavation is started. Therefore, only relatively small volumes of material will be in temporary storage (and susceptible to erosion at any one time);
- The amount of overburden for permanent storage is relatively small, and the permanent storage berms will be seeded immediately after emplacement (Project Design Measure);
- The majority of the temporary overburden areas are located in grassland, and therefore the grass vegetation surrounding the storage areas acts as an effective natural vegetation filter for removal of potential suspended sediments;
- Approximately 62% of the Internal Windfarm Cabling will be installed within the Upperchurch Windfarm access roads, thereby reducing the need for additional excavations; and,
- Surface water quality effects will be localised to the works areas, brief to temporary in duration and reversible

Element 3: UWF Replacement Forestry

Impact Magnitude:

The UWF Replacement Forestry area is approximately 6ha in area. The UWF Replacement Forestry drains to a headwater stream of the Clodiagh River. Tree planting will be completed by hand, and there will be no requirement for rill ploughing or any earthworks. The potential for the planting works to generate sediments in runoff is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The tree planting will be completed by hand, and therefore there will be no requirement for rill ploughing or any earthworks. The potential for the planting works to generate sediments in runoff is negligible;
- The riparian strips/grassland adjacent to the existing watercourse are to be maintained as part of the forestry layout as a water quality protection measure (Project Design Measure); and,
- All works will be completed as per the Forest Service best practice guidance in relation to water quality

Element 4: Upperchurch Windfarm

Impact Magnitude:

Based on Chapter 15 (Hydrology Chapter, see Reference Documents Volume F8) and the Sediment and Erosion and Control Plan from the 2013 EIS, release of sediment during the construction phase is likely to have a

temporary negative effect locally during excavation work. The residual effects were considered to be Not Significant.

Impact Evaluation: Not Significant

Rationale for Impact Evaluation:

- The upland nature of the site (remote from the main local streams and rivers) and the small number of drainage features within the site;
- A 50m watercourse buffer zone will be maintained from the limited number of sensitive watercourses at the site (Class 1 and Class 2 watercourses) and 20m from drains (Class 3 and Class 4);
- All temporary and permanent overburden will be located more than 50m from a watercourse; and,
- The measures outlined in the EIS and within the Sediment and Erosion and Control Plan will ensure the development of the wind farm will not have a significant impact on the surface water quality.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Consented Newport Town Park, Consented Castlewaller Windfarm, and *Potential* Bunkimalta Windfarm - *Please refer to Section 11.2.4.11 for cumulative information and evaluation*

Evaluation of Other Cumulative Impacts – Surface water quality impacts due to earthworks

Whole UWF Project Effect

Cumulative Impact Magnitude:
The Whole UWF Project has the potential to impact on surface water bodies in both the River Shannon and River Suir catchments. The localised effects are likely to be transient in nature.

The overall magnitude of impacts is considered to remain at Small Adverse given the transient nature of the works which will be distributed over a large geographical area and within two separate regional surface water catchments.

Significance of the Cumulative Impact: Slight

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Small Adverse magnitude combined with the High Importance of the local surface water bodies;
- The vast majority of the 110KV UGC is along public roads
- The majority of the 110kV UGC is contained within the River Shannon catchment while the majority of the Upperchurch Windfarm and UWF Related Works, including all of the UWF Replacement Forestry are located in the River Suir catchment. Therefore, the in-combination effects on surface water quality within the River Shannon are likely to be negligible;
- The majority of the Upperchurch Windfarm and UWF Related Works, including all of the UWF Replacement Forestry, are located within the River Suir catchment. However, as a large portion of the Internal Windfarm Cabling is within the Upperchurch Windfarm roads (i.e. reduced excavation requirements), the imperceptible effects of the UWF Replacement Forestry and that the effects of the Haul Route works and Realigned Windfarm Roads are likely to be localised, no significant in-combination effects to the River Suir are expected (i.e. in-combination effects of Slight to Moderate); and,
- Works relating to the Upperchurch Windfarm, UWF Related Works and the UWF Replacement Forestry will be completed over a period of 6 – 8 months.

All Elements of the Whole UWF Project with Other Projects or Activities

- Please refer to Section 11.2.4.11 below for cumulative Impacts Evaluation: Surface Water Quality Effects from Suspended Sediments in the Killleengarrif_SC_010 and *Newport (Tipperary)_SC_010 sub-catchments.*

11.2.4.2 Impact Evaluation Table: Water quality impacts from dewatering of excavations

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Excavation Dewatering
Cumulative Impact Source: Excavation Dewatering
Impact Pathway: Runoff and surface water flowpaths
Impact Description: There will be a requirement to have the cable trenches and foundation excavations dry prior adding of the granular cement. Any pumped water (from potential groundwater inflows and surface water inflows) will likely have high levels of sediments and therefore has the potential to impact on local surface water quality.
Impact Quality: Negative

Evaluation of Subject Development Impact–Water quality impacts from dewatering of excavations

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Significant dewatering is not expected at the Mountphilips Substation site. The majority (29.2km of 30.5km) of the UWG Grid Connection is along the carriageway of public roads or private paved road and therefore significant groundwater or surface water inflows into the cable trench are not anticipated. Existing road drainage is likely to limit any significant inflows into the trench.

Given that any pumped water will be treated and then discharged at a location away from any local watercourses (Project Design Measure), the effects are likely to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- There will be no direct discharge of pumped water into any watercourse or drain (Project Design Measure). All pumped water will be treated using a mobile water treatment train and then discharged via a silt bag;
- The route of the 110kV is predominately along the carriageway of public roads and therefore significant trench dewatering is not anticipated;
- Cable trenching works, joint bay chamber installation and culvert replacement works on the section of 110kV UGC between W13 and W20 (inclusive) and the culvert replacement works at W32 and W34 will only be completed during dry weather in the dryer months of the year – i.e. February to September included. (Project Design Measure);
- Lines of silt fencing and sandbags will be erected along the edge of the road so that surface water runoff from adjacent construction works areas is captured and directed to the excavated trench, where it can be pumped and treated before being released (Project Design Measure);
- Works will not be completed during extreme or prolonged rainfall events in order reduce the risk of surface water inflows into the trench (project design); and,
- All effects will be localised, brief to temporary in duration and reversible.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects relates to the following local waterbodies: Inch (Bilboa)_010, Bilboa_010, and Clodiagh (Tipperary)_010, local surface water bodies.
No significant dewatering requirement is anticipated for the 110kV UGC as the route is entirely within the carriageway of public roads or paved and all of the watercourse crossings are already culverted or will be crossed by installing the cables within the structure of bridges.
No significant excavation dewatering is expected for Internal Windfarm Cabling or the Upperchurch Windfarm

due to the upland location and shallow nature of excavations for these works.
Effects associated with excavation dewatering will be rare, isolated within separate catchments and brief in duration if they occur and therefore the in-combination magnitude of effect is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- Shallow nature of excavations, location of the 110kV UGC within the public road pavements, combined with the upland location of most UWF Related Works and Upperchurch Windfarm works areas;
- No significant dewatering requirement is anticipated along the 110kV UGC as the cable will be installed within the carriageway of public roads (outside of the Mountphilips Substation site);
- There will be no direct discharge of pumped water into any watercourse or drain (Project Design Measure); and,
- All pumped water from the Upperchurch Windfarm works or UWF Related Works will be captured and treated prior to release away from local watercourses.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Trial holes undertaken as part of the 2013 windfarm EIS investigations reported no groundwater inflows in any of the 20 no. trial pits undertaken. Localised impacts may occur as a result of pumping out surface water inflows during very wet periods. The magnitude of effects is likely to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The elevated nature of the Internal Windfarm Cabling route and shallow excavation works means significant groundwater inflows are not expected (the 20 no. trial holes undertaken at the windfarm site show this also);
- Excavation dewatering with respect to the cable trench is likely to be only be required if there was significant surface water inflows into the trench following heavy rainfall;
- There will be no direct discharge of pumped water into any watercourse or drain (Project Design Measure);
- All effects will be localized, brief to temporary in duration and reversible.

Element 3: UWF Replacement Forestry

Impact Magnitude: None

Significance of the Impact: No Potential for Impact

Rationale for Impact Evaluation:

- No excavations will be undertaken, and therefore there will be no requirement for dewatering

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013 EIS, limited and discontinuous seepage is expected from the sides of the turbine bases in sloping ground, and this is more likely to occur wetter winter periods.

Significance of the Impact: Not Significant.

Local Surface Water Bodies

Sensitive Aspect

Rationale for Impact Evaluation:

- The lack of significant groundwater inflows:
- Use of interceptor drainage to prevent runoff entering excavations;
- All pumped water will be captured and treated prior to release; and,
- There will be direct discharge of treated pumped water into the existing drainage network

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Consented Newport Town Park, Consented Castlewaller Windfarm, and *Potential* Bunkimalta Windfarm - *Please refer to Section 11.2.4.11 for cumulative information and evaluation*

Evaluation of Other Cumulative Impacts – Water quality impacts from dewatering of excavations

Whole UWF Project Effect

Cumulative Impact Magnitude:
No significant excavation dewatering is expected for the UWF Grid Connection, UWF Related Works (Internal Windfarm Cabling) or the Upperchurch Windfarm. Effects associated with excavation dewatering will be rare, isolated within separate catchments and brief in duration if they occur and therefore the in-combination magnitude of effect is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- Location of the 110kV UGC within public roads, thereby reducing the potential for inflows into excavations;
- Significant in-combination effects from excavation dewatering is not expected to occur within the River Suir catchment as a result of the Consented UWF Turbine works, or the Internal Windfarm Cabling works as no significant groundwater pumping is expected; and,
- All pumped water from the works areas will be captured and treated prior to release away from local watercourses.

All Elements of the Whole UWF Project with Other Projects or Activities

- Please refer to Section 11.2.4.11 below for cumulative Impacts Evaluation: Surface Water Quality Effects from Suspended Sediments in the Killleengarrif_SC_010 and *Newport (Tipperary)_SC_010 sub-catchments.*

Topic **Water**

11.2.4.3 Impact Evaluation Table: Morphological impacts to watercourses due to in-stream works

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Watercourse crossing, in-stream works

Cumulative Impact Source: Watercourse crossing, in-stream works

Impact Pathway: Direct Excavations

Impact Description: Watercourse morphology relates to the shape of a watercourse channel, its bed and banks and how erosion, transportation of water, sedimentation and the composition of riparian vegetation changes this channel shape over time. Direct morphological impacts on watercourses will occur during in-stream works such as open trenching for the cable laying and/or culvert emplacement / replacement. These works will involve the excavation of the banks and the bed, along with the removal of some riparian vegetation. The banks and bed of the watercourse will be reinstated following any trenching or culvert works.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Morphological impacts to watercourses due to in-stream works

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude: Instream works relate to the 3 no. watercourses at the Mountphilips Substation site (W1, W2 and W3), and the culvert replacement works at up to 13 no. existing culverts along the route of the 110kV UGC.

The 3 watercourse crossings at the Mountphilips Substation site are located in agricultural lands. All 3 will require instream works for 2 new permanent crossings and 1 temporary crossing, these are part of the Ballyard_010 catchment which flows into the Newport River 6km downstream of the Mountphilips Substation site.

63 no. watercourse crossings occur along the public road network, and there are a mix of culverts (48 no.) and bridges (15 no.) in place. The public road section of the route goes through the following local surface water bodies from west to east: Newport (Tipperary)_040, Annagh_030, Annagh_020, Bilboa_010, Inch_(Bilboa)_010 and the Clodiagh_010.

Bridge structure works (road level works and works to parapet walls) will be required at the 3 main bridges along the 110kV UGC at the Rockvale Bridge (W7), Tooreenbrien Bridge (W36) and Anglesey Bridge (W53). However, these works will not involve instream works. No instream works will be required at the remaining 12 no. bridges or 35 no. of the culvert crossings along the route. However, due to the nature of upto 13 no. culverts (being old masonry box culverts), culvert replacement works may potentially[2] be required at these 13 no. culvert crossings.

The last 2 No. watercourse crossings (W67 and W68) are at the eastern extremity of UWF Grid Connection and occur under a private paved road with existing culverts are in place and no instream works are required. Both of these watercourse crossings are located in the Clodiagh_010 catchment.

Due to the relatively minor nature of the watercourses being crossed (75% are Class 4 drains or Class 3 low ecological importance), the fact that most are already culverted and the distributed nature of the works within several local surface water bodies over a large geographical area, the magnitude of impact is considered to be

[2] Based on site investigations, up to 13. No. existing culverts potentially may need to be replaced along the route of the 110kV UGC, this number is used in EIAR to facilitate the cumulative evaluation of the worst case scenario.

Local Surface Water Bodies

Sensitive Aspect

negligible (refer to Table 11-5).

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, negligible magnitude combined with the High Importance of the local surface water bodies;
- The vast majority of the watercourse crossing points are existing culverts along the public road network;
- The 13 no. watercourse crossings where culvert replacement works are potentially required are distributed within several local surface water bodies (i.e. impacts will not be concentrated within one surface water body) across a large geographical area (latitudinal distance of 23km);
- The 13 no. watercourse crossings where culvert replacement works are potentially required are mostly Class 3 or Class 4 watercourses (12 of the 13)
- 50 of the 68 watercourses have been in some way altered by the fact they are already culverted under roads;
- The effects will typically be brief to temporary in nature and reversible with reinstatement of the watercourse channel; and,
- The works will not negatively affect the overall WFD surface water body status as the magnitude of effects will be negligible.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects only relates to the Clodiagh (Tipperary)_010 local surface water bodies (within the River Suir regional catchment), where instream works for both UWF Grid Connection and UWF Related Works occur. In total UWF Grid Connection will potentially require the replacement of 1 No. existing culvert under the L2264-50 to be replaced and UWF Related Works will require 26 No. instream works in the Clodiagh (Tipperary)_010 catchment.

There is no potential for cumulative impacts in the Bilboa catchment, as there is no requirement for instream works for UWF Related Works.

The Upperchurch Windfarm and UWF Replacement Forestry will not require any instream works; therefore these projects have no potential to cause cumulative effects with UWF Grid Connection.

Due to the relatively minor nature of the watercourses being crossed (75% are Class 4 drains or Class 3 low ecological importance), the fact that most are already culverted the magnitude of impact is considered to be negligible (refer to Table 11-5).

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- No in-stream works are required for the Consented Upperchurch Windfarm or for UWF Replacement Forestry; and,
- Therefore, the overall potential for in-combination morphological effects with regard to in-stream works is negligible to none.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
There are 32 no. watercourse crossings required in total for the Internal Windfarm Cabling, Realigned Windfarm Roads and Haul Route Work. In-stream works will be required at 25 no. of these locations - 22 no. in

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the Clodiagh (Tipperary)_010 waterbody catchment and 3 in the Owenbeg_10 waterbody catchment.

The impacts will be localised to the watercourse bank and bed at the crossing location and will be temporary in nature with the exception of 9 no. of the 25.no crossings which will be permanent crossings.

Due to the relatively minor nature of the watercourses being crossed (most are drains or of low ecological importance) and the distributed nature of the works over a relatively large geographical area, the magnitude of impact is considered to be Small Adverse (refer to Table 11-5).

Significance of the Impact: Slight to Moderate

Rationale for Impact Evaluation:

- As per Table 11-7, Small Adverse magnitude combined with the High Importance of the local surface water bodies;
- 75% of the in-stream works areas are at Drains (Class 4) or marginal watercourses (Class 3);
- The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams;
- The majority of the watercourses have been in some way altered by the existing landuse (i.e. forestry or agriculture);
- The effects will be brief to temporary in nature and reversible (with the exception of the 9 no. permanent crossings); and,
- The works will not negatively affect the overall WFD surface water body status as the magnitude of effects will not be significant.

Element 3: UWF Replacement Forestry

Impact Magnitude: None

Significance of the Impact: No Potential for Impact

Rationale for Impact Evaluation:

- No requirement for instream works – the existing culvert crossing will be used to access the lands.

Element 4: Upperchurch Windfarm

Impact Magnitude:
There will be a requirement for 1 no. watercourse crossing along the Upperchurch Windfarm access roads and no in-stream works will be required as a clear span bridge is consented as part of the Upperchurch Windfarm. Due to the relatively small number of watercourses being crossed and the fact that in-stream works will only be carried out in drains, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- A clear-span bridge will be used where 1 no. natural stream (Class 1 Watercourse) will be crossed and therefore no in-stream works will be required.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Evaluation of Other Cumulative Impacts – Morphological impacts to watercourses due to in-stream works

Whole UWF Project Effect

Cumulative Impact Magnitude: The morphological effects will be distributed between two regional catchments (River Suir and River Shannon) and within several local surface water bodies which is on a scale that makes the magnitude impact Small.

Local Surface Water Bodies

Sensitive Aspect

Significance of the Cumulative Impact: Slight
Rationale for Cumulative Impact Evaluation: • As per Table 11-7, Small Adverse magnitude combined with the High Importance of the local surface water bodies; • 50 of the 68 watercourse crossings along the UWF Grid Connection are already culverted of which 13 no. may potentially require instream works. Of the 13 no, 12 no. are located at Class 3 and Class 4 watercourses; • The in-stream works areas required for the UWF Grid Connection are largely located within the River Shannon catchment while the watercourse crossings required for the UWF Related Works are largely located in the River Suir surface water catchment; • No in-stream works are required for the Consented Upperchurch Windfarm; and, • Therefore, the overall potential for in-combination morphological effects with regard to in-stream works is negligible to none.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 11.2.2.2.1).

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11.2.4.4 Impact Evaluation Table: Surface Water Quality Impacts due to Watercourse Crossing Works

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Watercourse crossing works
Cumulative Impact Source: Watercourse crossing works
Impact Pathway: Surface water flowpaths

Impact Description: Direct surface water quality impacts as a result of sediment release during watercourse crossing works such as instream works, or works at existing crossing structures, or works in close proximity. Indirect water quality impacts may also arise from nearby working area runoff, pumped water and dewatering works.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Surface Water Quality Impacts due to Watercourse Crossing Works

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
There are 68 no. watercourse crossings along the 110kV UGC- instream works will be required at 3 watercourses within the Ballyard_010 catchment at the Mountphilips Substation site; and works to replace existing culverts under the public road will be potentially required at up to 13 no. locations (W13, W14, W15, W17, W19, W20, W32, W34, W55, W57, W60, W61 and W64) along the route of the 110kV UGC. In addition works to raise the level of the road and raise the level of parapet walls will occur at 3 no. bridges. Trenching works will also take place at 12 no. other existing bridges and over or under 37 no. existing culverts. There is potential for surface water quality effects at each crossing over the duration of the works (generally 2-3 days per watercourse) and so Project Measures have been incorporated into the design in order to break the pathway between the works area (source) and the Receptor (water course).

Due to the fact that 65 of the 68 no. watercourse crossings along the UWF Grid Connection are existing culverts and bridges, and the distributed and transient nature of the works within several local surface water bodies over a relatively large geographical area, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- Culvert replacement works may potentially be required at 13 locations; of which 12 of the 13 no. are class 3 or class 4 watercourses
- The drains (Class 4) and marginal watercourses (Class 3) have typically low flows or no flows, and therefore the effectiveness of them acting as surface water flowpaths to more sensitive downstream surface watercourses are limited;
- Instream works at W1, W2 and W3 at the Mountphilips Substation site will be undertaken during dry weather within the IFI instream works window (July – September inclusive) (Project Design Measure), when flows are likely to be low;
- The instream works/culvert replacement works will not be undertaken without isolation of flow within the watercourse prior to the works commencing (Project Design Measure).
- There will be no direct discharge of pumped water into the watercourse during the works (Project Design Measure);
- Only between 1 and 5 watercourse crossings will be completed in any one day (5 construction crews will be working on the UWF Grid Connection route) over the entire length of the UWF Grid Connection (30.5km);

- The watercourse crossings required for the 110kV UGC are distributed across several local surface water bodies over a large geographical area (latitudinal distance of 23km);
- The works will not negatively affect the overall surface water body status; and,
- All potential effects will be localised, brief in nature and reversible.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: There is no potential for cumulative effects as a result of instream works in the River Shannon Catchment as none of the Other Elements will require watercourse crossing works in the Shannon catchment.
There is no potential for cumulative effects with Upperchurch Windfarm or UWF Replacement Forestry as neither of these projects require instream works.
The construction of UWF Grid Connection will potential require the replacement of 1 No. culvert in the Clodiagh (Tipperary)_010 waterbody in the Suir catchment. There will also be watercourse crossing works required at 22 No. watercourse crossing points in the Clodiagh (Tipperary)_10 required for the UWF Related Works. Water quality effects, which are likely to be localised, will have a magnitude of impact Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- No instream works for Upperchurch Windfarm or UWF Replacement Forestry;
- Small number of culverts (1) which may need replacing (and therefore instream works) for UWF Grid Connection in the Suir regional catchment;
- No potential for UWF Grid Connection to have a cumulative effect with the UWF Related Works in the River Shannon catchment because no instream watercrossing works required for UWF Related works in this catchment;
- The works will not negatively affect the overall surface water body status in the Suir catchment because most of the watercourse crossings are drains.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
There are 32 no. watercourse crossings required by the Internal Windfarm Cabling, Realigned Windfarm Roads and Haul Route Works, 26 no. of the total 32 no. crossings are located within the Clodiagh (Tipperary)_010, 5 no. in the Owenbeg (Tipperary)_010, and 1 no. in the Inch (Bilboa)_010. In-stream works will be required at 25 no. of these locations – 22 no. in the Clodiagh (Tipperary)_010and 3 in the Owenbeg (Tipperary)_010. There will be no instream works in the Inch (Bilboa)_010 catchment for UWF Related Works.

Due to the relatively minor nature of the watercourses being crossed (with most being only drains) and the distributed and transient nature of the works within the local surface water catchments, the magnitude of impact is considered to be Negligible to Small Adverse.

Significance of the Impact: Imperceptible to Slight

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible to Small Adverse magnitude combined with the High Importance of the local surface water bodies;
- 75% of the in-stream works areas are at drains (Class 4) or marginal watercourses (Class 3);
- The drains (Type 4) and marginal watercourses (Type 3) have typically no flows or very low flows, and therefore the effectiveness of them acting as a surface water flowpath to more important downstream surface water bodies are limited;
- The Class 1 and Class 2 watercourses where in-stream works are required only amount to 5 no. and these are

largely small headwater streams;
- In-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses (Project Design Measure) and therefore flows are likely to be very low;
- The in-stream works will not be undertaken without isolation of flow within the watercourse prior to the in-stream works commencing (Project Design Measure). This will be completed by over pumping, flume (pipe) or diversion methods;
- There will be no direct discharge of pumped water into the watercourse during the works (Project Design Measure);
- Only between 1 and 2 watercourse crossings will be completed in any one day (2 construction crews will be working on the UWF Related Works);
- The works will not negatively affect the overall surface water body status, and the magnitude of impact will not be significant; and,
- All effects will be localised, brief in nature and reversible.

Element 3: UWF Replacement Forestry

Impact Magnitude: None

Significance of the Impact: No Potential for Impact

Rationale for Impact Evaluation:
- No watercourse crossing works required.

Element 4: Upperchurch Windfarm

Impact Magnitude:
The water quality effects of watercourse crossing works with regard to the Upperchurch Windfarm were not assessed directly in 2013 EIS. However, the EIS concludes that overall water quality effects will not be significant. The potential impacts are further evaluated below for the purpose of assessing in-combination effects: There will be a requirement for 1 no. watercourse along the Upperchurch Windfarm access roads and in-stream works will not be required as a clear span bridge is consented. Due to the relatively small number of watercourses being crossed and the fact that watercourse crossing works will only be carried out in drains, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:
- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- A clear-span bridge will be used where a natural stream (Class 1 watercourse) will be crossed and therefore no in-stream works are required at this watercourse;
- watercourse crossing works will only be carried out in drains.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Consented Newport Town Park, Consented Castlewaller Windfarm, and *Potential* Bunkimalta Windfarm - *Please refer to Section 11.2.4.11 for cumulative information and evaluation*

Evaluation of Other Cumulative Impacts – Surface Water Quality Impacts due to Watercourse Crossing Works

Whole UWF Project Effect

Cumulative Impact Magnitude:
UWF Grid Connection will require instream works at 3 No. locations at the Mountphilips Substation site, and culvert replacement works at up to 13 No. watercourses along the 110kV UGC. The UWF Related Works will require instream works at 25. No watercourses. The Other Elements will not require any instream works. The

water quality effects, which are likely to be localised, will be dispersed between two regional catchments and within several local sub-catchments which is on a scale that makes the magnitude of impact Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The watercourse crossing works required for the UWF Grid Connection are largely located within the River Shannon catchment while the watercourse crossings required for the Upperchurch Windfarm and UWF Related Works are largely located in the River Suir surface water catchment;
- The potential for in-combination effects within the River Suir catchment as a result of Upperchurch Windfarm or UWF Related Works watercourse crossings is negligible as most of the crossings are at drains with no or low flows and therefore the effectiveness of them acting as a surface water flowpath to more important downstream surface water bodies to create in-combination effects is negligible;
- The watercourse crossings relating to the Upperchurch Windfarm and UWF Related Works will be completed over a period of 6 – 8 months; and,
- The works will not negatively affect the overall surface water body status, and the magnitude of impact will not be significant.

All Elements of the Whole UWF Project with Other Projects or Activities

- Please refer to Section 11.2.4.11 below for cumulative Impacts Evaluation: Surface Water Quality Effects from Suspended Sediments in the Killleengarrif_SC_010 and *Newport (Tipperary)_SC_010 sub-catchments.*

11.2.4.5 Impact Evaluation Table: Surface Water Impacts due to Contamination by Fuels, Oils and Chemicals

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Oils, Fuels and Chemicals
Cumulative Impact Source: Oils, Fuels and Chemicals
Impact Pathway: Runoff and surface water flowpaths

Impact Description: The plant and equipment that will be used during the construction phase will be run on fuels and oils. This creates the potential for spillage and leakage of hydrocarbons from plant during refuelling or storage of oils and fuels which can impact on downstream surface water bodies.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Surface Water Impacts due to Contamination by Fuels, Oils and Chemicals

Element 1: UWF Grid Connection - direct/indirect impact

Impact Magnitude: Plant and equipment, run on hydrocarbons, will be used at all UWF Grid Connection construction works areas and therefore surface water bodies along the whole route are a potential receptor. However, any spills or leaks are likely to be minor (worst case) and therefore indirect effects are assessed to be localised and temporary.
Given the transient and distributed nature of the works over several catchments along with the fact that only small volumes will be present on-site at one time, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- Only relatively small volumes of fuels / oils will be on-site at any one time and therefore no significant effects are expected;
- All fuels required for construction activities will be stored in a designated location, away from main traffic activity, within the Temporary Compound. All fuel will be stored in bunded, locked storage containers (Project Design Measure);
- Overnight parking of plant and machinery will only be permitted at the temporary compound at Mountphilips substation and at a distance greater than 50m from watercourses, and this reduces the risk posed by leaks (Project Design Measure);
- All chemical wastes will be stored in secure, bunded and covered storage containers, in a designated secure part of the Temporary Compound, and will be removed from site and transported to an approved licensed facilities (Project Design Measure);
- There will be no refuelling of plant or machinery permitted within 100m of a watercourse (Project Design Measure);
- Therefore, any incidents that do occur will largely be limited to small, isolated, low volume spills / leaks that may occur along the UWF Grid Connection construction works area; and,
- Any effects that do occur will be very localised to the soils and subsoils at the source / works activity area.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects relates to the following local waterbodies: Bilboa_010 and Inch (Bilboa)_010) in the Shannon catchment and the Clodiagh (Tipperary)_010 in the Suir Catchment, due to the use of hydrocarbons and machinery run on hydrocarbons for UWF Grid Connection, UWF Related Works, Upperchurch Windfarm and UWF Other Activities, in these catchments. UWF

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Replacement Forestry could also contribute to cumulative impacts in the Clodiagh (Tipperary)_010 catchment.

Any effects from oil and fuel usage are likely to occur rarely and be isolated incidents. Given the distributed nature of the works within several local surface water bodies and the fact that only small volumes of fuel/oil will be present on-site at any one time, the in-combination magnitude of effect is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- the distributed nature of the works within several local surface water bodies and the fact that only small volumes of fuel/oil will be present on-site at any one time;
- A Fuel and Oil Management Plan is proposed for the Upperchurch Windfarm which will include storage requirements and emergency procedures for dealing with any spills and leaks;
- The additional volumes of oils and fuels that will be present on the Upperchurch Windfarm site as a result of the UWF Related Works will be negligible;
- The UWF Replacement Forestry is not likely to contribute to in-combination effects with respect to impacts from oils and fuels due to the very low number of vehicles and use of fuel involved; and,
- Effects are likely to be due to small isolated localised spills (worst case) that are very unlikely to contribute to in-combination water quality effects within the local surface water catchments.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Plant and equipment will be used at all the works areas and therefore surface water bodies along the whole route are a potential receptor. However, any spills or leaks are likely to be minor (worst case) and therefore indirect effects are likely to be localised.
Given the transient and distributed nature of the works and the fact that only small volumes will be present on-site at one time, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- Only relatively small volumes of fuels / oils will be on-site at any one time and therefore no significant effects are expected;
- All fuels required for construction activities will be stored in a designated location, away from main traffic activity, within the Temporary Compound. All fuel will be stored in bunded, locked storage containers (Project Design Measure);
- There will be no refuelling of plant or machinery permitted within 100m of a Class 1 or Class 2 watercourse (Project Design Measure);
- All chemical wastes will be stored in secure, bunded and covered storage containers, in a designated secure part of the Temporary Compound, and will be removed from site and transported to an approved licensed facilities (Project Design Measure);
- Therefore, any incidents that do occur will largely be limited to small, isolated, low volume spills / leaks that may occur along UWF Related Works areas; and,
- Any effects that do occur will be very localised to the soils and subsoils at the source / works activity area.

Element 3: UWF Replacement Forestry

Impact Magnitude:
Plant and equipment used for the UWF Replacement Forestry works will be limited to 4 x 4 jeeps. Given the

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small-scale nature of the works and the fact that no refuelling or storage of fuels will be undertaken on site, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- Small scale of works
- No refuelling or storage of fuels
- Vehicles limited to 4 x 4 jeeps

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology Chapter, see Reference Documents Volume F8) the potential for water quality effects arises from the use and storage of oil and fuels which could result in spills and leaks. The effects were considered to be Not Significant.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- A Fuel and Oil Management Plan is proposed which will storage requirements and emergency procedures for dealing with any spills and leaks.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Evaluation of Other Cumulative Impacts – Surface Water Impacts due to Contamination by Fuels, Oils and Chemicals

Whole UWF Project Effect

Cumulative Impact Magnitude:
The Whole UWF Project has the potential has the potential to impact on surface water bodies in both the River Shannon and River Suir catchments from oil and fuel usage. Effects are likely to occur rarely and be isolated incidents.
Given the distributed nature of the works within two regional surface water catchments and over several local Surface Water Bodes and the fact that only small volumes of fuel/oil will be present on-site at any one time, the in-combination magnitude of effect is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The potential for in-combination effects with the 110kV UGC within the River Shannon surface water catchment are negligible as the vast majority of the Consented UWF Turbine, and the UWF Related Works are within the River Suir catchment;
- A Fuel and Oil Management Plan is proposed for the Upperchurch Windfarm which will include storage requirements and emergency procedures for dealing with any spills and leaks;
- The additional volumes of oils and fuels that will be present on the Upperchurch Windfarm site as a result of the UWF Related Works will be negligible;
- The UWF Replacement Forestry is not likely to contribute to in-combination effects with respect to impacts from oils and fuels; and,
- Effects are likely to be due to small isolated localised spills (worst case) that are very unlikely to contribute to in-combination water quality effects within the local surface water catchments.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 11.2.2.2.1).

11.2.4.6 Impact Evaluation Table: Water Quality Impacts from Cement Based Compounds

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Cement Based Compounds
Cumulative Impact Source: Cement Based Compounds
Impact Pathway: Runoff and surface water flowpaths
Impact Description: Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment.
Impact Quality: Negative

Evaluation of the Subject Development Impact – Water Quality Impacts from Cement Based Compounds

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Concrete will be used mainly at the Mountphilips Substation building foundations and in the 110kV UGC cable trench and therefore surface water bodies at the substation location and along the route of the 110kV UGC are potential receptors. However, any spills or leaks are likely to only occur occasionally (if at all) with incidents being small and isolated.

Given the transient and distributed nature of the works over several local surface water bodies, the fact that only relatively small volumes of cement will be placed at any particular time and that the cement inside the cable trench will be backfilled every 100m or so, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- No batching of wet cement is proposed on-site, and therefore significant volumes will not be present on-site at any one time (Project Design Measure);
- The most widespread use of cement will be in the 110kV UGC trench. Cement and possible runoff will be contained within the excavation by nature of a 1.25m deep trench, and therefore the risk to local surface water bodies is low;
- Lines of silt fencing and sandbags will be erected along the edge of the road so that surface water runoff from adjacent construction works areas is captured and directed to the excavated trench, where it can be pumped and treated before being released (Project Design Measure);
- All cement placed within the 110kV UGC trench will be backfilled before the next section of the trench commence and therefore is low risk of cement washout from the trench;
- Precast concrete structures will only be used at joint bays and at culvert watercourse crossing locations as required (Project Design Measure);
- Therefore, impacts that do arise (worst case) will largely be limited to small, isolated, low volume spills during emplacement of the cement within the cable trench; and,
- Any effects that do occur will be very localised to the source / works activity area.
- Concrete delivery chutes only will be washed out into the excavated trench, with the main washout of the concrete tank carried out at the supplier depot, concrete chute washouts within the SAC boundary will take place into designated bins for removal to the designated concrete wash settlement pond at the Mountphilips Substation site. (Project Design Measure).

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects relates to the following local waterbodies: Inch (Bilboa)_010 and Clodiagh (Tipperary)_010 for 110kV UGC trench works, the UWF Related works at the Telecom Relay Pole and the foundations for the Consented UWF Turbines and Consented UWF Substation. Any individual effects are likely to occur occasionally and be isolated incidents (if they occur at all). Given the relatively small volumes of cement will be present on-site at the UWF Grid Connection trench at any one time, the in-combination magnitude of effect is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The relatively small volumes of cement on-site at any one time with the potential to cause surface water quality impacts will be small;
- The use of concrete for UWF Grid Connection mainly relates to pouring of concrete in the cables trenches;
- The use of concrete for the UWF Related Works is negligible, and impacts on surface water quality are not expected; and,
- Concrete Control Procedures will be included in the Environmental Management Plan for the Upperchurch Windfarm, and therefore no significant in-combination effects with respect to the UWF Grid Connection are expected.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
The use of cement-based compounds will be limited to the Telecom Relay Pole foundation (c.4m^3) and to the 9 no. of public road crossings, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- Small scale of concrete use.

Element 3: UWF Replacement Forestry

Impact Magnitude: None

Significance of the Impact: No Potential for Impact

Rationale for Impact Evaluation:

- No requirement to use cement at the UWF Replacement Forestry site.

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013 EIS, there is a risk of spillage and runoff from cement during placing of concrete and also during washing out of chutes. Concrete will be used at the 22 no. turbine bases and also at the substation compound.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- During pouring containment measures will be put in place to keep cement within the foundation area and prevent it entering the local drainage routes; and,

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- Washing of trucks will be limited to the chutes, and a dedicated concrete washout area will be available on-site.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Evaluation of Other Cumulative Impacts – Water Quality Impacts from Cement Based Compounds

Whole UWF Project Effect

Cumulative Impact Magnitude:
The Whole UWF Project has the potential has the potential to impact on local surface water bodies in both the River Shannon and River Suir catchments from cement-based compounds. Effects are likely to occur occasionally and be isolated incidents (if they occur at all).
Given the distributed nature of the works within two regional surface water catchments, over two surface water bodies and the fact that only relatively small volumes of cement will be present on-site at any one time, the in-combination magnitude of effect is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The potential for in-combination effects with the 110kV UGC within the River Shannon surface water catchment are negligible as the vast majority of the Consented UWF Turbines, and the UWF Related Works are within the River Suir catchment;
- All cement placed within the 110kV UGC cabling trench will be backfilled with excavated material before the next section of the trench commence. Therefore, the volume of cement on-site at any one time with the potential to cause surface water quality impacts will be small;
- The use of concrete for the UWF Related Works is negligible, and impacts on surface water quality are not expected; and,
- Concrete Control Procedures will be included in the Environmental Management Plan for the Upperchurch Windfarm, and therefore no significant in-combination effects with respect to the UWF Grid Connection or the UWF Related Works are expected.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 11.2.2.2.1).

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11.2.4.7 Impact Evaluation Table: Surface Water Quality Impacts during Directional Drilling Works

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Groundworks
Cumulative Impact Source: None
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Surface water quality impacts on the local surface water bodies during ground-works associated with directional drilling under the watercourse bed at W8 and W9. Both these watercourse crossings are located in, and limited to, the Newport (Tipperary)_040 catchment. Directional drilling under the watercourse will prevent direct impacts on the watercourse. However, there is a risk of indirect impacts from sediment laden run-off during the launch pit, and reception pit excavation works. Frac-out during drilling has also the potential to impact on surface water quality.

The horizontal directional drilling works at W8 and W9 will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will advise the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized water tight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures; In the event of break-out occurring in the river bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures; In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point; and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the Environmental Management Plan for UWF Grid Connection (Project Design Measure);

There will be no requirements for drilling for any other element of the Whole UWF Project.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Surface Water Quality Impacts during Directional Drilling Works

Element 1: UWF Grid Connection

Impact Magnitude:
Indirect water quality impacts on the Newport (Tipperary)_040 during earthworks associated with the directional drilling. Effects could be continuous over the drilling works (c.1 week at each of the 2 locations).
Given that all runoff and pumped water will be treated and then discharged at a location away from W8 and W9 (Project Design Measure), the impact magnitude is likely to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- Negligible magnitude combined with the High Importance of the local surface water bodies;
- the launch pits and reception pits will be entirely located within the public road surface and therefore signifi-

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cant generation of sediment laden runoff is not expected;
- Excavation work will mainly only be required for the launch pit and reception pit;
- The drilling pits will not have to be kept free of water, and therefore no pumping will be required (no risk of discharge entering the watercourse);
- The ground on either side of both watercourses is relatively flat, and therefore there is a low risk of runoff from the works areas getting into the watercourse;
- Works carried out by experienced Drilling Contractor, under the supervision by a competent Mud Engineer;
- Potential effects will be brief in duration and reversible.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: There is no potential for cumulative impacts with either Other Elements or Other Projects, due to separation distances from the drilling locations associated with UWF Grid Connection (W8 and W9), and no drilling is required for any Other Element of the Whole UWF Project.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- no sources of impacts from other elements, Separation distances from other projects

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: None

Significance of the Impact: No Impact

Rationale for Impact Evaluation: No drilling works required.

Element 3: UWF Replacement Forestry

Impact Magnitude: None

Significance of the Impact: No Impact

Rationale for Impact Evaluation: No drilling works required.

Element 4: Upperchurch Windfarm

Impact Magnitude: None

Significance of the Impact: No Impact

Rationale for Impact Evaluation: No drilling works required.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Evaluation of Cumulative Impacts – Surface Water Quality Impacts during Directional Drilling Works

All Elements of the Whole UWF Project

Cumulative Impact Magnitude:
No potential for effects cumulatively with the Other Elements of the Whole UWF Project – drilling works are only associated with the UWF Grid Connection (110kV UGC).

Significance of the Cumulative Impact: No Cumulative Impact

Rationale for Cumulative Impact Evaluation:

- The UWF Grid Connection (110kV UGC route) is the only element which will result in impacts to Local Surface Water Bodies due to drilling works.

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11.2.4.8 Impact Evaluation Table: Surface water quality impacts during forestry felling

Evaluation of UWF Grid Connection Excluded: As there is no forestry felling associated with the UWF Grid Connection, there is no potential for UWF Grid Connection to cause water quality effects to Local Surface Water Bodies by itself, and consequently this project cannot have a cumulative effect.

However, the Other Elements must be considered because the UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluation for the Other Elements of the Whole UWF Project are included in this Impact Evaluation Table, in order to show the totality of the project.

Cumulative Impact Description for the Other Elements of the Whole UWF Project
Cumulative Impact Description for the Other Elements of the Whole UWF Project
Project Life Cycle Stage: Construction stage *(for Other Elements only)*
Other Element Impact Source: Tree felling activities Impact Pathway: Runoff and surface water flowpaths Impact Description: Surface water quality impacts from sediment release in surface water runoff during coniferous felling operations. Tree felling for the Whole UWF Project will only be required for UWF Related Works and the Upperchurch Windfarm Impact Quality: Negative
Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works
Impact Magnitude: 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 in these areas. In total, 0.3 hectares of forestry will be felled, and all this will be within the River Suir catchment. Surface water quality effects have the potential to occur locally. Due to the small scale of the overall felling and the fact that the felling areas are relatively remote from each other, the magnitude of impacts is considered to be Negligible.
Significance of the Impact: Imperceptible
Rationale for Impact Evaluation: • As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies; • Relatively small felling area proposed (0.3ha in total); • The total felling area will be required at two separate locations (0.2ha and 0.1ha) with the works being completed at different times; • All felling will be carried out under a tree felling license; • All tree felling will be undertaken using good working practices as outlined by the Forest Service in their "Forestry Harvesting and Environment Guidelines (Forest Service, 2000a) and "Forestry and Water Quality Guidelines" (Forestry Service, 2000b) Project Design Measure; and, • All effects will be localized, brief to temporary in duration and reversible
Element 3: UWF Replacement Forestry
Impact Magnitude: None
Significance of the Impact: No Potential for Impact
Rationale for Impact Evaluation: The UWF Replacement Forestry is currently agricultural land, and therefore no tree felling is required.

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The UWF Replacement Forestry will be a permanent woodland, therefore no harvesting will be required.

Element 4: Upperchurch Windfarm

Impact Magnitude:
A total of 4.35ha will be felled to facilitate the construction of the Upperchurch Windfarm infrastructure (2013 EIS). The majority of the felling will be undertaken in the Clodiagh_010 catchment (River Suir). The impact of tree felling on water quality was assessed in Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013 EIS. The overall effects are assessed to be Not Significant.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The Sediment and Erosion Control Plan for the Upperchurch Windfarm has measures in place for control of sediment during tree felling, and therefore no significant effects are expected; and,
- All tree felling will be undertaken using good working practices as outlined by the Forest Service in their "Forestry Harvesting and Environment Guidelines (Forest Service, 2000a) and "Forestry and Water Quality Guidelines" (Forestry Service, 2000b).

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Consented Newport Town Park, Consented Castlewaller Windfarm, and *Potential* Bunkimalta Windfarm - *Please refer to Section 11.2.4.11 for cumulative information and evaluation*

Evaluation of Other Cumulative Impacts – Surface water quality impacts during conifer plantation tree felling

Whole UWF Project Effect

Cumulative Impact Magnitude:
The Whole UWF Project has the potential to impact on surface water bodies in the River Suir catchment only. Felling areas are relatively small and located across several local surface water bodies, and therefore effects will be localised.

Given that there is no forestry felling areas associated with the UWF Grid Connection or UWF Replacement Forestry, and that the tree felling required for the UWF Related Works is relatively small compared to the Upperchurch Windfarm tree felling area, the overall magnitude of impact is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible to Small Adverse magnitude combined with the High Importance of the local surface water bodies;
- The areas required for felling relating to the UWF Related Works are small isolated areas that will be felled separate to the Upperchurch Windfarm felling, and therefore the potential for in-combination effects is negligible;
- The area to be felling for the UWF Related Works accounts for only 7% of the Upperchurch Windfarm felling area.
- No forestry felling required for UWF Grid Connection.

All Elements of the Whole UWF Project with Other Projects or Activities

- Please refer to Section 11.2.4.11 below for cumulative Impacts Evaluation: Surface Water Quality Effects from Suspended Sediments in the Killleengarrif_SC_010 and *Newport (Tipperary)_SC_010 sub-catchments.*

Topic: **Water**

11.2.4.9 Impact Evaluation Table: Increased flood risk

Impact Description	
Project Life Cycle Stage:	Operational Stage

Impact Source: Permanent Access Road and Hardstanding and new culverts
Cumulative Impact Source: Permanent Access Road and Hardstanding and new culverts
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Increased flood risk in local watercourses due to runoff from permanent hardstanding surfaces (which may result in increased flow in local watercourses) and restrictions/changes in surface water flow as a result of new permanent culvert crossings being potentially undersized and causing a backup of flow
Impact Quality: Negative

Evaluation of the Subject Development Impact – Increased flood risk

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Permanent infrastructure for UWF Grid Connection relates to the Mountphilips Substation compound area, and the associated new access road. Runoff from these surfaces may result in increased flow in local watercourses. There are 2 no. permanent watercourse crossings along the route of the new access road. In addition, there are potentially 13 no. existing culverts under the public road which may need to be replaced. Any new culverts installed will be sized to cope with a minimum 100-year flood event (Project Design Measure) and will be at least 900mm in diameter. Due to the distributed nature of the works over a large geographical area, the fact that all permanent hardstanding will have runoff control measures and that all permanent culverts will be sized for peak flood flows (Project Design Measure), the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- Negligible magnitude combined with the High Importance of the local surface water bodies;

Hardstanding Runoff:

- The permanent hardstanding areas are negligible in comparison to the area of the local surface water body;
- The permanent access road at Coole/Mountphilips will have permanent road side drains in place which will include check dams for reduction of runoff rates (Project Design Measure); and,
- The Mountphilips Substation will have a permanent surface water drainage network in place which will allow for surface water attenuation (Project Design Measure).

New Permanent Culvert Crossings:

- All permanent culverts and replaced culverts will be sized to cope with a minimum 100-year flood event (Project Design Measure);
- At a minimum, all pipe culverts will be 900mm in diameter regardless of the anticipated flood flow (i.e. minimum 900mm culvert will be used in drains regardless if flows are low)
- The new permanent cross structures at the Mountphilips Substation site (2 and W3) and the replacement culvert at W14 along the R503 will be bottomless or clear spanning (Project Design Measure); and,
- As agreed during a telephone consultation carried out by the EIA Coordinator with OPW, Limerick office, (February 2018), a Section 50 application will be submitted to the OPW for new crossings and upgrades following the receipt of planning permission for the UWF Grid Connection. The Section 50 applications will be accompanied by a hydraulic assessment of the new crossing structures to ensure they are adequate from a flood prevention perspective.

Local Surface Water Bodies

Sensitive Aspect

Element 1: UWF Grid Connection – cumulative impact
Cumulative Impact Magnitude: The potential for cumulative effects only relates to the Clodiagh (Tipperary)_010 (Suir catchment) where UWF Grid Connection works will potentially require 1 No. culvert to be replaced, and UWF Related Works will require the construction of 22 No. new culverts, and will also be associated with new hardstanding areas. New hardstanding areas will also be development for Upperchurch Windfarm in the Clodiagh (Tipperary)_010 catchment. The replaced culvert for UWF Grid Connection will be sized to cope with a minimum of a 100-year flood event. There are no new hardstanding areas or new watercourse crossing structures associated with any of the Other Elements in the Newport (Tipperary)_SC_010, Killeeengarriff_SC_010 and Bilboa_SC_010 EPA sub-catchments, and therefore the cumulative impact is considered to be Negligible. There is no potential for cumulative impacts due to new areas of hardstanding, as UWF Grid Connection will not require any new areas of hardstanding in the same catchments as any of the Other Elements.
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies; • All new watercourse crossing culverts will be adequately designed to accommodate any anticipated peak flood flows. • The UWF Grid Connection does not require any new permanent hardstanding areas within the local surface waterbodies associated with the Other Elements.
Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works
Impact Magnitude: Permanent infrastructure associated with the UWF Related Works will be limited to 0.6km of Realigned Windfarm Access Road. Runoff from these surfaces may result in increased flow in local watercourses. There are 9 no. permanent watercourse crossings required for the UWF Related Works, which potentially could cause localised flooding if undersized. Due to the fact that all permanent hardstanding will have runoff control measures and that all permanent culverts will be sized for peak flood flows (Project Design Measure), the magnitude of impact is considered to be Negligible.
Significance of the Impact: Imperceptible
Rationale for Impact Evaluation: • As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies; Hardstanding Runoff: • The footprint area of the Realigned Windfarm Roads is negligible compared to the area of the local surface water body. Therefore, runoff effects would be negligible; and, • Drainage from the Realigned Windfarm Roads will be within the capture zone of the Upperchurch Windfarm drainage system which will provide attenuation. New Permanent Culvert Crossings: • All permanent culverts will be sized to cope with a minimum 100-year flood event (Project Design Measure); • At a minimum, all pipe culverts will be 900mm in diameter regardless of the anticipated flood flow (i.e. minimum 900mm culvert will be used in drains regardless if flows are low), (Project Design Measure); • All the culverts on Class 1 and Class 2 type watercourses will be bottomless/clear spanning (Project Design Measure); and, • As agreed during a telephone consultation carried out by the EIA Coordinator with OPW, Limerick office,

Water

Topic

(February 2018), a Section 50 application will be submitted to the OPW for new crossings and upgrades following the receipt of planning permission for the UWF Grid Connection. The Section 50 applications will be accompanied by a hydraulic assessment of the new crossing structures to ensure they are adequate from a flood prevention perspective.

Element 3: UWF Replacement Forestry

Impact Magnitude: None

Significance of the Impact: No Potential for Impact

Rationale for Impact Evaluation:

- There are no new access roads, no permanent hardstanding areas or new culverts required for the UWF Replacement Forestry

Element 4: Upperchurch Windfarm

Impact Magnitude: Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013, there is a risk of increased runoff to downstream watercourses from impermeable surfaces. The effects were assessed to be Not Significant.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The total footprint of the permanent hardstanding and associated increase in runoff is negligible in the context of local surface water catchment area; and,
- A Sediment and Control Plan will be in place during the operational stage for runoff attenuation.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.2.2.2.1*

Evaluation of Other Cumulative Impacts – Increased flood risk

Whole UWF Project Effect

Cumulative Impact Magnitude:
Due to the distributed nature of the works within separate regional catchments and across several local surface water bodies and the fact that all permanent hardstanding will have runoff control measures and that all permanent culverts will be sized for peak flood flows, the magnitude of impact is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The permanent hardstanding areas associated with the 110kV UGC (Shannon) and the UWF Related Works (Suir) and Upperchurch Windfarm (mainly Suir) are in separate regional surface water catchments, and therefore there is no potential for in-combination effects;
- The additional access roads associated with the UWF Related Works Realigned Windfarm Roads more or less replace the stretches of access road that were already consented and therefore no significant in-combination effects are anticipated;
- Drainage from the Realigned Windfarm Roads will be within the capture zone of the Upperchurch Windfarm drainage system, and therefore attenuation will be provided; and,
- All new watercourse crossing culverts will be adequately designed to accommodate any anticipated peak flood flows.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 11.2.2.2.1).

Local Surface Water Bodies

Sensitive Aspect

11.2.4.10 Impact Evaluation Table: Surface Water Quality Impacts due to Runoff from Permanent Hardstanding Surfaces

Impact Description	
Project Life Cycle Stage:	Operational Stage

Impact Source: Permanent Access Roads and Hardstanding areas
Cumulative Impact Source: Permanent Access Roads and Hardstanding
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Surface water quality impacts from entrained suspended sediments in stormwater run-off as a result of the erosion of permanent hardstanding surfaces.
Impact Quality: Negative

Evaluation of the Subject Development Impact – Surface Water Quality Impacts due to Runoff from Permanent Hardstanding Surfaces

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Permanent infrastructure along the 110kV UGC will mainly include the access road to Mountphilips Substation and the Mountphilips Substation compound area. Runoff from these surfaces may generate sediments which could end up in local surface watercourses. The fact that silt control measures will be included at all permanent hardstanding areas (Project Design Measure), the magnitude of impact is considered to be Negligible. The Mountphilips Substation Site is located in the Ballyard_010 catchment which drains into the Newport River, c. 6km downstream south of Newport town.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The Mountphilips Substation and the new permanent access road at the Mountphilips Substation site will have a permanent surface water drainage network in place which will include check dams. These check dams will allow the settlement of suspended solids in water runoff while also slowing down the rate of water run-off from these areas. (Project Design Measure)

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Permanent infrastructure along the 110kV UGC will mainly include the access road to Mountphilips Substation and the Mountphilips Substation compound area, which is located in the Ballyard_010 local surface water body within the Killeengarriff_SC_010 sub-catchment of the Lower Shannon & Mulkear hydrometric area.

There is no potential for cumulative effects with any of the Other Elements of the Whole UWF Windfarm, as none of the Other Elements are located in the Killeengarriff_SC_010 sub catchment.

Significance of the Cumulative Impact: No Cumulative Impact

Rationale for Cumulative Impact Evaluation:

- No cumulative magnitude
- The UWF Grid Connection does not require any new permanent hardstanding areas within the local surface water bodies associated with the UWF Related Works and Upperchurch Windfarm.

Topic: **Water**

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Permanent infrastructure associated with the UWF Related Works will be limited to 0.6km of Realigned Windfarm Road and the Telecom Relay Pole. Runoff from these surfaces may generate sediments which could end up in local surface watercourses. Due to the fact that the permanent footprint associated with the UWF Related Works is negligible in comparison to the local catchment and that runoff from the works will be contained within the Upperchurch Windfarm Drainage, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The footprint area of the Realigned Windfarm Roads is negligible compared to the area of the local surface water body (<1%) therefore any water quality effects would be negligible; and,
- Drainage from the Realigned Windfarm Roads will be within the capture zone of the Upperchurch Windfarm drainage system, and therefore any surface water quality effects will be negligible.

Element 3: UWF Replacement Forestry

Impact Magnitude: None

Significance of the Impact: No Potential for Impact

Rationale for Impact Evaluation:

- There are no new permanent hardstanding areas at the UWF Replacement Forestry

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013 EIS, there is a risk of surface water quality impacts during the operational stage as a result of suspended sediments from road and hardstand drainage.

Significance of the Impact: Not Significant

- Rationale for Impact Evaluation:
- A Sediment and Control Plan will be in place during the operational stage, and this will include inspection and maintenance of drainage along with regular environmental water quality audits.

Element 5: UWF Other Activities– N/A, evaluated as excluded, see Section 11.2.2.2.1

Evaluation of Other Cumulative Impacts – Surface Water Quality Impacts due to Runoff from Permanent Hardstanding Surfaces

Whole UWF Project Effect

Cumulative Impact Magnitude:
Due to the distributed nature of the works within separate regional surface water catchments and across several surface water bodies over a large geographical area, the relatively small permanent footprint within individual catchments and the fact that silt control measures will be included at all permanent hardstanding areas, the magnitude of impact is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

Local Surface Water Bodies

Sensitive Aspect

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water bodies;
- The permanent hardstanding areas associated with the 110kV UGC (Shannon) and the UWF Related Works (Suir) are in separate regional surface water catchments, and therefore there is no potential for in-combination effects;
- The permanent hardstanding areas associated with Upperchurch Windfarm are mainly in the Suir catchment, and where permanent hardstanding will be located within the Shannon catchment, these new hardstanding areas will not be located within the same local surface waterbody as the Mountphilips Substation site.
- The additional access roads associated with the Realigned Windfarm Roads works more or less replace the stretches of access road that were already consented, and therefore no significant in-combination effects are anticipated;
- All new permanent hardstanding for UWF Grid Connection will have a permanent surface water drainage network in place; and
- Drainage from the Realigned Windfarm Roads and Telecoms Relay Pole will be within the capture zone of the Upperchurch Windfarm drainage system, and therefore any surface water quality effects will be negligible.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 11.2.2.2.1).

Topic

Water

11.2.4.11 Cumulative Impacts Evaluation : Surface Water Quality Effects from Suspended Sediments

Sensitive Aspect:	**Local Surface Water Bodies – Killleengarrif_SC_010 sub-catchment**
Cumulative Impact:	**Surface Water Quality Effects from Suspended Sediments**
Cumulative Impact Description	
Project Stage	Construction Stage of UWF Grid Connection

Source: Earthworks, overburden storage, instream works, culvert replacement works, bridge works, works near watercourses, works over watercourse crossing structures, excavation dewatering

Cumulative Source: Tree felling, Earthworks and Watercourse Crossing Works

Cumulative Impact Description:
Indirect surface water quality impacts on the Killleengarrif_SC_010 as a result of earthworks, overburden storage and instream works associated with the Mountphilips Substation site and excavations, culvert replacement works, bridge works and near and over watercourses associated with the UWF Grid Connection 110kV UGC, and forestry felling, earthworks and construction works associated with the potential Bunkimalta Windfarm and Castlewaller Windfarm (which are not expected to be built during the same period as UWF Grid Connection, but are nonetheless included for examination by application of the precautionary principle), and the excavations, groundworks and landscaping associated with a consented public park, Newport town park, which is downstream of the UWF Grid Connection. The potential for cumulative effects is likely to be greater in the main Clare River channel downstream of the works.

The UWF Grid Connection is the only Whole UWF Project element within the Killleengarrif_SC_010 sub-catchment.

Impact Quality: Negative

Individual Evaluation of the UWF Grid Connection and of the Other Projects

UWF Grid Connection Impact Magnitude:
The Mountphilips Substation site and approximately 13.5km of the 110kV UGC exists within the Killleengarrif_SC_010 sub-catchment.
The potential for effects on surface water quality mainly arise from 110kV UGC excavation works and Mountphilips Substation site works. There are 30 no. existing culvert watercourse crossings along the 110kV UGC within the Killleengarrif_SC_010 sub-catchment, 8 No. of which will potentially require replacement. 3 no. new watercourse crossing requiring instream works, 2 no. permanent, 1 no. temporary will also be required at the Mountphilips Substation site.

Due to the transient nature of the works and the fact that the 110kV UGC is mostly (c.12.7km of the 13.5km) within the carriageway of a public road, with the remaining 0.8km within the new site access road at Mountphilips Substation site, the impact magnitude is expected to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the High Importance of the local surface water body;
- Due to the relatively small footprint area of the works at Mountphilips Substation the potential to generate large volumes of sediment in runoff is low; At Mountphilips Substation site, all excavated material will be removed for temporary or permanent storage at designated berms, which will be located more than 25m away from the watercourses on Mountphilips Substation site. (Project Design Measure);
- Most of the 110kV UGC route (c.12.7km of the 13.5km) within the Killleengarrif_SC_010 sub-catchment is along a public road;
- Cable trenching works, joint bay chamber installation and culvert replacement works on the section of 110kV UGC between W13 and W20 (inclusive) and the culvert replacement works at W32 and W34 will only be completed during dry weather in the dryer months of the year – i.e. February to September included. This

will minimise/avoid the requirement for any excavation dewatering as a result of waterlogged soils or surface water runoff. (Project Design Measure);

- There is no in-stream works at the Clare River crossing itself as the 110kV UGC will be installed in the road surface over the bridge, works to raise the road level or height of parapet walls will be carried out from the bridge/road surface;
- It's likely only between 160 – 200m of the trench will be excavated in any day with only 1 – 2 watercourse crossings being completed in any one day (assumed 1 -2 work crews in the catchment);
- The transient nature of the works within the catchment; and,
- All effects will be brief to temporary in nature and reversible.

Other Project: Castlewaller Windfarm *(consented windfarm & potential grid connection)*

Impact Magnitude: While the Castlewaller Windfarm itself is not located within the Killeengarriff_SC_010 sub catchment, the potential route of the associated grid connection is likely to involve works along the public road network through the Kileengarriff_SC_010 subcatchment.

Significance of the Impact: Not significant

Rationale for Impact Evaluation:

- the potential route of the proposed grid connection would most likely be along the carriageway of public roads with minimal works required at watercourse crossing points.

Other Project: Bunkimalta Windfarm *(potential windfarm & consented grid connection)*

Impact Magnitude: It is assumed for the purpose of this cumulative evaluation that at least some of the potential Bunkimalta Windfarm turbines will be located within the Kileengariff_SC_010 sub-catchment upstream of the 110KV route.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The design of the windfarm is likely to follow best practice with construction activities located at least a minimum of 50m from watercourses where possible; and,
- It is assumed that a Sediment and Erosion Control Plan will be put in place during the construction phase to control runoff from the site.

Evaluation of Cumulative Impacts – Surface Water Quality Effects from Suspended Sediments

Cumulative Impact Magnitude: Due to the transient nature of the UWF Grid Connection works, the relatively small number of the Bunkimalta turbines potentially located within the catchment, the potential location of a route for Castlewaller Windfarm grid connection most likely within the public road network, and the relatively large catchment area of the Killleengarrif_SC_010 (122km^2), the magnitude of effects is likely to be Small Adverse.

Significance of the Cumulative Impact: Slight

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Small Adverse magnitude combined with the High Importance of the local surface water body;
- The relatively large surface water catchment area of the Kileengarrif_SC_010 sub-catchment – 122km^2; and,
- The transient nature of the 110kV works within the Kileengarrif_SC_010 sub-catchment.

Sensitive Aspect:	**Local Surface Water Bodies - Newport (Tipperary)_SC_010 sub-catchment**
Cumulative Impact:	**Surface Water Quality Effects from Suspended Sediments**
Cumulative Impact Description	
Project Stage	Construction Stage of UWF Grid Connection

Source: excavations, bridge works, works near watercourses, works over watercourse crossing structures, directional drilling works, excavation dewatering
Cumulative Source: Tree felling, Earthworks, Groundworks and Watercourse Crossing Works

Cumulative Impact Description:
Indirect surface water quality impacts on the Newport (Tipperary)_SC_010 as a result of watercourse crossings, and excavations associated with the UWF Grid Connection element of the Whole UWF Project, and the excavations, groundworks and watercourse crossing works associated with the upstream potential Bunkimalta Windfarm and consented Castlewaller Windfarm (which are not expected to be built during the same period as UWF Grid Connection, but are nonetheless included for examination by application of the precautionary principle), and the excavations, groundworks and landscaping associated with a consented public park, Newport town park, which is downstream of the UWF Grid Connection.

The UWF Grid Connection is the only Whole UWF Project element within the Newport (Tipperary)_SC_010 sub-catchment.
Impact Quality: Negative

Individual Evaluation of the UWF Grid Connection and of the Other Projects

Element 1: UWF Grid Connection

UWF Grid Connection Impact Magnitude:
Approximately 3.15km of the 110kV UGC exists within the Newport (Tipperary)_SC_010 sub-catchment. It should be noted that the Mountphilips Substation site in located in the Ballyard_010 waterbody in the Kileengarriff_SC_010 sub-catchment, the Ballyard_010 drains into the Newport River below Newport town.

The potential for effects on surface water mainly arise from 110kV UGC excavations and works adjacent to watercourse crossings. There are 5 no. watercourse crossings within the Newport (Tipperary)_SC_010 sub-catchment, none of which require instream works or culvert replacement works. Works within the catchment include crossing the watercourses within existing bridge structures (with minor works required to road level and bridge parapets at W7), and directional drilling at 2 other locations which will avoid works to the watercourses or structures at these two locations.

Due to the transient nature of the works and the fact that all 110kV UGC works (in the Newport (Tipperary)_SC_010) will be within the public road surface, the impact magnitude is expected to be Negligible Adverse.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible Adverse magnitude combined with the High Importance of the local surface water body;
- No instream works or culvert replacement works are required for UWF Grid Connection for any of the watercourses within the Newport (Tipperary)_SC_010 sub catchment;
- There is no in-stream works at the Newport River crossing at Rockvale Bridge (W7), the 110kV UGC will be installed within the bridge structure, some minor works may be required to the parapet walls;
- It's likely only between 80 – 100m of the trench will be excavated in any day with only 1 watercourse crossings being completed in any one day (assumed 1 work crew on local roads within this catchment); and,
- All effects will be brief to temporary in nature and reversible.

Local Surface Water Bodies

Sensitive Aspect

Other Project: Bunkimalta Windfarm *(potential windfarm & consented grid connection)*
Impact Magnitude: It is assumed for the purpose of this cumulative evaluation that at least some of the potential Bunkimalta Windfarm turbines will be located within the Newport (Tipperary)_SC_010, up-stream of the UWF Grid Connection (110KV UGC route).
Significance of the Impact: Not Significant
Rationale for Impact Evaluation: • The design of the windfarm is likely to follow best practice with construction activities located at least a minimum of 50m from watercourses where possible; and, • It is assumed that a Sediment and Erosion Control Plan will be put in place during the construction phase to control runoff from the site..
Other Project: Castlewaller Windfarm *(consented windfarm & potential grid connection)*
Impact Magnitude: The footprint of the Castlewaller Windfarm is entirely located within the Newport (Tipperary)_SC_010, up-stream of the UWF Grid Connection (110KV UGC route). At least part of its potential grid connection (not currently consented or proposed) is assumed to be located within the sub catchment (and likely to be located on forestry roads and public roads within the sub catchment)
Significance of the Impact: Not Significant for the windfarm, as reported in the Castlewaller Windfarm EIS (2011)
Rationale for Impact Evaluation: • A Sediment Control Plan will be put in place during the windfarm construction phase to control runoff from the site. • As per the EIS 2011, construction activities will be at least a minimum of 50m from watercourses where possible; • All tree felling will be completed by keyhole felling to reduce potential surface water quality effects; • The potential grid connection is along the carriageway of public roads with no instream works requirement.
Other Project: Newport Town Park
Impact Magnitude: The footprint of the consented Newport Town Park is entirely located within the Newport (Tipperary)_SC_010, downstream of the UWF Grid Connection (110KV UGC route), and located immediately adjacent to the Newport River. The footprint of the park overlaps the SAC boundary.
Significance of the Impact: Not Significant, as reported in the NIS (2018) for the project
Rationale for Impact Evaluation: • No groundworks within 50m of the river; • A Sediment Control Plan will be put in place during the construction phase to control runoff from the site.
Evaluation of Cumulative Impacts – Surface Water Quality Effects from Suspended Sediments
Cumulative Impact Magnitude: Due to the transient nature of the UWF Grid Connection works, the downstream location of Newport Town Park in the context of the location of the park within Newport town, the large upstream distance to the potential Bunkimalta Windfarm site (~10km), the upstream distance to Castlewaller Windfarm site (4km) and the relatively large combined catchment area of the Newport (Tipperary)_SC_010 (95km^2), the magnitude of effects is likely to be **Small Adverse**.
Significance of the Cumulative Impact: Slight
Rationale for Cumulative Impact Evaluation: • Small Adverse magnitude combined with the High Importance of the local surface water body; • The relatively small scale of the 110kV UGC works within the Newport (Tipperary)_SC_010 (3.5km); • The large combined surface water catchment area of the Newport (Tipperary)_SC_010 – 95km^2; • The transient nature of the 110kV UGC works within the Newport (Tipperary)_SC_010; • Sediment Control Plans will be/assumed to be in place at the Castlewaller Windfarm/ potential Bunkimalta

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- The Castlewaller Windfarm grid connection is likely to be routed are along public roads and therefore impacts on surface water quality are not expected;
- The Bunkimalta Windfarm grid connection is along public roads and therefore impacts on surface water quality are not expected; and,
- The relatively small scale and localized nature of the Newport Town Park.

11.2.4.12 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in the table below.

Table 11-21: Description and Rationale for Excluded Impacts to Local Surface Water Bodies

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Tree felling in Conifer Plantations Afforest-ation	2, 3	SW Runoff	Surface Water Quality Impacts due to Nutrient Input	Rationale for Excluding: Neutral effect. No forestry felling is required for UWF Grid Connection. The surface water quality effects on local surface water bodies from sedimentation as a result of tree felling for UWF Related Works were assessed to be imperceptible (refer to Section 11.2.4.8).This is due to the relatively small felling areas and the fact that the felling areas are distributed between several local catchments. Therefore, as a result of this negligible magnitude of sedimentation effects, the nutrient loading is assessed to be Neutral. The Upperchurch Windfarm will have a Sediment Control Plan, and therefore, the potential for nutrient loading to local watercourses is assessed to be Neutral as a result of the consented drainage design measures.
Decommissioning Stage Effects				
Rationale for Excluding: no potential for impacts/Neutral impacts The UWF Grid Connection will remain part of the National Grid and is not expected to be decommissioned. Therefore no hydrological impacts are expected. UWF Related Works: The cables will be pulled from the Internal Windfarm Cabling ducts at the turbines or at the substation; the ducting, Realigned Windfarm Roads and Haul Route Works will remain in-situ; therefore, no decommissioning works to lands are required. The Telecoms Relay Pole will be removed, and the compound area reinstated and returned to agricultural. Neutral effects to surface or groundwater are anticipated. The UWF Replacement Forestry will not be harvested or felled but will remain permanently in place. Therefore no hydrological impacts are expected. Upperchurch Windfarm: It is expected that the Consented UWF Substation will remain in-situ for use by ESBN, the UWF Access Roads will also remain in-situ for use by the landowner. Decommissioning works will be limited to the Consented UWF Turbines, Turbine Hardstanding areas, Meteorological Mast and associated drainage systems. All decommissioning works will take place from hard-core areas, with the majority of activity taking place on the turbine hardstands. Therefore, it is considered that decommissioning activities will have Neutral effects on surface water or groundwater.				

11.2.5 Mitigation Measures for Impacts to Local Surface Water Bodies

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Local Surface Water Bodies**.

11.2.6 Evaluation of Residual Impacts to Local Surface Water Bodies

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Local Surface Water Bodies above (Section 11.2.4) – i.e. **Imperceptible**.

11.2.7 Application of Best Practice and the EMP for Local Surface Water Bodies

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment.

The following Best Practice Measures have been developed, for the protection of Aquatic Habitats & Species, by the authors of this topic chapter, using industry best practice:

GC-BPM-01	Measures for Protection of Surface Water Quality and Watercourse Morphology during instream works at Mountphilips Substation site
GC-BPM-02	Measures for Protection of Surface Water Quality and Watercourse Morphology during replacement of existing culverts along the 110kV UGC outside Mountphilips Substation site
GC-BPM-03	Design of New Permanent Watercourse Crossing Structures and Existing Culvert Replacements to Prevent Flood Risk
GC-BPM-04	Surface Water Quality Protection Measures for Site Runoff During the Mountphilips Substation Site Construction Works
GC-BPM-05	Protection of Surface Water and Groundwater Quality during use of Cement Based Compounds
GC-BPM-06	Protection of Surface Water and Groundwater Quality During Storage and Handling of Fuels, Oils and Chemicals
GC-BPM-07	Surface Water Quality Protection Measures During Storage of Overburden at the Mountphilips Substation Site

These Best Practice Measure form part of the UWF Grid Connection Environmental Management Plan which is appended to this EIA Report as Volume D.

11.2.7.1 Surface Water Management Plan

The UWF Grid Connection Environmental Management Plan will include a bespoke Surface Water Management Plan. Water quality and the existing drainage regime will be managed under the Surface Water Management Plan (SWMP) which will be implemented by the appointed Contractor during the construction stage of the UWF Grid Connection. This Surface Water Management Plan (SWMP) provides the water management framework for the appointed Contractors and Sub-contractors and it incorporates the mitigating principles described in this EIAR (particularly in this Chapter 11 – Water) to ensure that construction works are carried out with minimal impact on the surface water environment and in accordance with the mitigation measures and project design commitments made in the EIAR.

The Surface Water Management Plan is part of the UWF Grid Connection Environmental Management Plan which is appended to this EIA Report as Volume D.

11.2.8 Summary of Impacts to Local Surface Water Bodies

A summary of the Impacts to Local Surface Water Bodies is presented in Table 11-23.

The greyed out boxes in the summary table below relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Table 11-22: Summary of the Impacts to Local Surface Water Bodies

Impact to Local Surface Water Bodies:	Morphological Impacts due to instream works	Surface water quality impacts						Water quality impacts from		Increased Flood Risk
		due to earthworks	from dewatering of excavations	from watercourse crossing works	due to forestry felling	during directional drilling works	Runoff from Permanent surfaces	fuels, oils and chemicals	from cement-based compounds	
Evaluation Impact Table	*Section 11.2.4.3*	*Section 11.2.4.1*	*Section 11.2.4.2*	*Section 11.2.4.4*	*Section 11.2.4.8*	*Section 11.2.4.7*	*Section 11.2.4.10*	*Section 11.2.4.5*	*Section 11.2.4.6*	*Section 11.2.4.9*
Project Life-Cycle Stage	Construction	Construction	Construction	Construction	Construction	Construction	Operational	Construction	Construction	Operational
UWF Grid Connection (direct effects)	Imperceptible	Imperceptible	Imperceptible	Imperceptible	No Potential for Impact	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
UWF Grid Connection (Cumulative effects)	Imperceptible	Imperceptible	Imperceptible	Imperceptible	No Potential for Impact	Imperceptible	No Cumulative Impact	Imperceptible	Imperceptible	Imperceptible
Element 2: UWF Related Works	Slight to Moderate	Slight to Moderate	Imperceptible	Imperceptible to Slight	Imperceptible	No impact	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Element 3: UWF Replace. Forestry	No potential for impacts	Imperceptible	No potential for impacts	No potential for impacts	No potential for impacts	No impact	No potential for impacts	Imperceptible	No potential for impacts	No potential for impacts
Element 4: Upperchurch WF	Imperceptible	Not Significant	Not Significant	Imperceptible	Not Significant	No impact	Not Significant	Not Significant	Not Significant	Not Significant
Element 5: UWF Other Activities	No Potential for Impacts - Evaluated as Excluded, see Section 11.2.2.2.1									
Cumulative Impact										
Whole UWF Project Effect	Slight	Slight	Imperceptible	Imperceptible	Imperceptible	No Cumulative Impact	Imperceptible	Imperceptible	Imperceptible	Imperceptible
All Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities	n/a	Slight – *See Section 11.2.4.11*					N/A - evaluated as excluded, See Section 11.2.2.2			

Local Surface Water Bodies

Sensitive Aspect

Water

Topic

REFERENCE DOCUMENTS

11.3 Sensitive Aspect No.2: Local Groundwater Bodies

This Section provides a description and evaluation of the Sensitive Aspect - Local Groundwater Bodies (inclusive of the groundwater that flows below the development).

11.3.1 BASELINE CHARACTERISTICS of Local Groundwater Bodies

11.3.1.1 STUDY AREA for Local Groundwater Bodies

The study area for Local Groundwater Bodies in relation to the UWF Grid Connection is described in Table 11-24 and illustrated on Figure GC 11.3: UWF Grid Connection Study Area for Local Ground Water Bodies (Volume C3 EIAR Figures).

Table 11-23: UWF Grid Connection Study Area for Local Groundwater Bodies

Study Area for Local Groundwater Bodies	Justification for the Study Area Extents
Local GWBs catchment divides as defined by GSI/WFD	Defined by bedrock lithology, local topography and groundwater flow.

11.3.1.2 Baseline Context & Character of Local Groundwater Bodies in the UWF Grid Connection Study Area

The UWF Grid Connection exists within two separate Groundwater Bodies (GWBs) which are called the Slieve Phelim GWB and the Templemore A GWB, which are made up of various local bedrock aquifer types.

The Mountphilips 110kV UGC and the majority of the 110kV UGC route exists (c 29km of the total 30.5km) within the Slieve Phelim Groundwater Body (GWB) with the far eastern section of the 110kV UGC route extending into the Te0.mplemore A GWB.

The Slieve Phelim GWB extends from Newport as far east as Milestone and contains the Mauherslieve Mountains, Slieve Felim Mountains and extends north as far as the Silvermine Mountains. The total area of the GWB is 520km^2. The regional groundwater flow direction at the location of the construction works areas within the Slieve Phelim GWB is to the south.

The Templemore A GWB extends from north of Templemore south towards Annacarthy and has a total area of 300km^2. The GWB contains the Silvermine Mountains, Kilduff Mountain and Devils bit Mountain. The land elevation drops off to the east of these mountains towards the River Suir valley. The regional groundwater flow direction at the location of the construction works areas within the Templemore A GWB is to the east/ southeast.

The location of the subject development in relation to Local Groundwater Bodies is illustrated on Figure GC 11.3: UWF Grid Connection Study Area for Local Ground Water Bodies.

Within the Slieve Phelim GWB, the construction works areas are underlain by both Poor Bedrock Aquifers and Locally Important Aquifers with the former being more dominant. Within the Templemore A GWB, the construction works areas are completely underlain by Poor Bedrock Aquifers.

In general, the groundwater flow regime of both bedrock types is typically poorly productive. These bedrock aquifers generally have no inter-granular permeability. Groundwater flows within fractures and faults are more likely to occur within the Locally Important Aquifers rather the Poor Aquifers.

The permeability of individual fractures and the degree of interconnection will be generally low, with fracturing confined to local zones. Permeability is highest in the upper few metres but generally decreases

rapidly with depth. In general, groundwater flow is concentrated in the upper 15m of the aquifer, although deeper inflows from along fault zones or connected fractures can be encountered. In these rocks, groundwater flowpaths are expected to be relatively short, typically from 30-300m, with groundwater discharging to small springs, or to the streams that traverse the aquifer. Flow directions are expected to approximately follow the local topography (GSI, 2004).

Baseflow contribution to streams tends to be low, particularly in summer as the groundwater regime cannot sustain summer baseflows due to low storativity with the aquifer. In winter, low permeabilities will lead to a high water table and potential water logging of soils which is consistent with the mapped soil type on the lower slopes of the site (i.e. poorly drained mineral). Local groundwater flow directions will mimic topography whereby flowpaths will be from topographic high points to lower elevated discharge areas at local streams.

Groundwater Quality: Both the Slieve Phelim GWB and the Templemore A GWB are assigned 'Good Status'[3] (www.catchments.ie). This applies to both quantitative status and chemical status. The objective for both GWBs is to protect the current 'Good Status' condition.

11.3.1.3 Importance of Local Groundwater Bodies

There is no existing data for groundwater quality in the area. However, both the Slieve Phelim GWB and the Templemore A GWB are assigned 'Good Status' (www.catchments.ie). This applies to both quantitative status and chemical status. The objective, under the Waterframe Directive is to protect the current 'Good Status' condition. Also, groundwater is used locally as a drinking water supply and therefore good groundwater quality is important from a human health perspective.

Within the Slieve Phelim GWB, the construction works areas are underlain by both Poor Bedrock Aquifers and Locally Important Aquifers with the former being more dominant. Within the Templemore A GWB, the construction works areas are completely underlain by Poor Bedrock Aquifers. Therefore the Importance of Local Groundwater Bodies in the study area is considered to be **Low to Medium** Importance.

11.3.1.4 Sensitivity of Local Groundwater Bodies

The primary sensitivities in respect of the subject development will be groundwater quality, which can be affected by oil/chemical spillages. Due to the nature of the local groundwater flow regime in the area (*i.e.* short groundwater flowpaths discharging locally to streams), there is expected to be a strong surface water – groundwater interaction in proximity to works areas. This means that any significant impact on groundwater quality locally is likely to result in indirect impacts on local surface water quality.

11.3.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Both the Slieve Phelim GWB and the Templemore A GWBs have been assigned 'Good Status' and the reported WFD risk result in respect of groundwater quality, and quantity is "Not at Risk". Therefore, no trends (*i.e.* reduction in groundwater quality or groundwater levels) have been reported.

11.3.1.6 Receiving Environment (the Baseline + Trends)

It is assumed that the groundwater body status within the study area will be at least Good during the construction stage. This is based on the assumption that groundwater bodies will have to achieve at least Good Status.

[3] 'Status' means the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 classes: High, Good, Moderate, Poor and Bad (WFD, 2010).

11.3.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

11.3.2.1 Cumulative Evaluation Study Areas

11.3.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Local Groundwater Bodies	Justification for the Study Area Extents
300m of construction works areas	Local GWBs catchment divides as defined by GSI/WFD within 300m of construction works areas. Within the underlying aquifer, groundwater flowpaths are expected to be relatively short, typically from 30-300m before groundwater discharges locally into streams. Therefore, for cumulative effects to occur on groundwater, Other Elements or Other Projects or Activities will have to be within 300m of UWF Grid Connection.

The study is illustrated on Figure CE 11.3 UWF Grid Connection Cumulative Evaluation Study Area for Local Groundwater Bodies (Volume C3 EIAR Figures).

11.3.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices. Scoping of these Other Elements is presented in Section 11.3.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 11-25 and illustrated on Figure WP 11.3: Whole Project Study Area for Local Groundwater Bodies.

Table 11-24: Whole Project Cumulative Evaluation Study Area for Local Groundwater Bodies

Cumulative Evaluation of all of the Elements of the Whole UWF Project		
Cumulative Project	**Cumulative Study Area Boundary**	**Justification for Study Area Extent**
Element 1: UWF Grid Connection	Local GWBs catchment divides as defined by GSI/WFD within 300m of construction works areas	Within the underlying aquifer, groundwater flowpaths are expected to be relatively short, typically from 30-300m before groundwater discharges locally into streams. Therefore, for cumulative effects to occur on groundwater, other elements will have to be within Other Elements will have to be within 300m of another Element.
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

11.3.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Local Groundwater Bodies also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Local Groundwater Bodies with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.19).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Local Groundwater Bodies.

11.3.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Local Groundwater Bodies

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Local Groundwater Bodies. The results of this evaluation are included in Table 11-26.

The location of, and study area boundary associated with the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 11.3. The baseline character of the areas around these Elements is described in Section 11.3.2.3.

Table 11-25: Results of the Evaluation of the Other Elements

Other Elements of the Whole UWF Project	
Element 1: UWF Grid Connection	Included for the evaluation of cumulative effects
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: No likely impacts/no potential for impacts due to: The UWF Replacement Forestry site is located entirely within the Templemore A GWB. Within the Templemore A GWB, the area within and around the UWF Replacement Forestry site is underlain by Poor Bedrock Aquifers. • No likely measurable impact to groundwater quality, due to the small scale nature of the works and the planting method to be employed - the new trees will be planted by hand using spades, • No likely measurable impact to groundwater quality, due to the small scale nature of the works as plant and equipment used for the UWF Replacement Forestry works will be limited to 4 x 4 jeeps, and there will be no refueling or storage of fuels will be undertaken on site, • No potential for impacts to groundwater quality as cement based compounds will not be used at the UWF Replacement Forestry site, • No potential for impacts to groundwater levels (quantity) as there will be no requirement for excavations or dewatering of excavations. • The UWF Replacement Forestry will not be harvested or felled but will remain permanently in place. Therefore no hydrological impacts are expected.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: No likely impacts/Neutral effects due to: • The Haul Route Activities are located entirely within the public road corridor.

	There will be no requirement for earthworks/groundworks and therefore no hydrological / water quality effects are likely. • Overhead Line Activities: These works involve upgrade works to the overhead existing lines such as cable wrapping which do not require any major excavations. Therefore no groundwater impacts are expected. • Monitoring Activities do not require any major construction activities. Therefore, groundwater impacts are expected. Once off activities will take place during the pre-construction stage, and comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will generally take place on the periphery of fields and are not expected to impact on water quality. • During the Operational Stage, farming practices under the Upperchurch Hen Harrier Scheme will, to a certain extent, cause lands to revert back to wet grassland. All associated potential hydrological effects are expected to be Neutral. During decommissioning of Upperchurch Windfarm, the Upperchurch Hen Harrier Scheme will finish, but no activities will be required, therefore there is no potential for effects to groundwater.

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11.3.2.3 Cumulative Information: Baseline Characteristics – Context & Character

11.3.2.3.1 Element 2: UWF Related Works & Element 4: Upperchurch Windfarm

The consented Upperchurch Windfarm and the UWF Related Works exist within two separate Groundwater Bodies (GWBs) which are called the Slieve Phelim GWB and the Templemore A GWB.

The majority of the Upperchurch Windfarm and the UWF Related Works are located in the Templemore A GWB with the western extents of the construction works areas extending into the Slieve Phelim GWB.

The Groundwater Bodies are made up of various local bedrock aquifer types. Within the Slieve Phelim GWB, the construction works areas are underlain by both Poor Bedrock Aquifers and Locally Important Aquifers with the former being more dominant. Within the Templemore A GWB, the construction works areas are completely underlain by Poor Bedrock Aquifers.

20 no. trial pits were undertaken in the area of the Upperchurch Windfarm, which are relevant to the UWF Related Works areas. Trial pits were up to 3m in depth (typically 2m), and no groundwater inflows were recorded in any of the trial pits.

Consideration of the Passage of Time: It is considered that there have been no material changes in the baseline environment of Upperchurch Windfarm and the descriptions in the 2013 and 2014 documents for Upperchurch Windfarm remain relevant to the cumulative evaluations in this EIAR.

11.3.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element 3 evaluated as excluded. See Section 11.3.2.2.1.

11.3.2.3.3 Element 5: UWF Other Activities

Not applicable – UWF Other Activities evaluated as excluded. See Section 11.3.2.2.1.

11.3.2.3.4 Other Projects or Activities:

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 11.3.2.2.

Topic **Water**

11.3.3 PROJECT DESIGN MEASURES for Local Groundwater Bodies

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 11-27 are relevant to the Environmental Factor, Water, and in particular to the sensitive aspect Local Groundwater Bodies.

Table 11-26: UWF Grid Connection Project Design Measures relevant to Local Groundwater Bodies

PD ID	Project Design Environmental Protection Measure (PD)
PD16	No refuelling of plant or equipment will be permitted within 100m of identified water supply wells
PD17	At Mountphilips Substation, water for operational stage welfare facilities will be obtained from a Rain Water Harvesting system. Waste water will be collected in tanks and removed from site by an appropriately licensed operator, for treatment in a licensed water treatment plant. These two measures will avoid the need for a new well or mains water connection and will avoid the need to treat waste water on-site.
PD24	Outside of the Mountphilips Substation site, where dewatering of trenches or excavations is required for the 110kV UGC, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated using a mobile water treatment train and then discharged via a silt bag to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD34	Only precast concrete culverts or structures will be used at the watercourse crossing locations at Mountphilips Substation site and for any culvert replacements along the 110kV UGC. Only precast concrete chambers will be used at Joint Bay locations. No batching of wet cement will take place on-site.
PD35	Concrete pours will be required for the 110kV UGC cables trench. Only chutes will be washed out at the works locations into the cable trench, with the washout of the tank taking place at the concrete supplier depot. Concrete chute washouts within the SAC boundary will take place into designated bins for removal to the designated concrete wash settlement pond at the Mountphilips Substation site.
PD42	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD43	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 at the Mountphilips Substation site. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored at the designated

	location in the temporary compound and all operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD44	Overnight parking of plant and machinery will only be permitted at the temporary compound at the Mountphilips Substation site and at a distance greater than 50m from watercourses.
PD46	All construction works will be monitored on a daily basis by the Environmental Clerk of Works and by members of the Environmental Clerk of Works team (for example Site Ecologist) as required, for compliance with the Environmental Commitments, which include the Project Design Measures, as per the UWF Grid Connection Environmental Management Plan (see Volume D).

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the fundamental design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3and 5.5**,** in Volume C4: EIAR Appendices.

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11.3.4 EVALUATION OF IMPACTS to Local Groundwater Bodies

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Local Groundwater Bodies.

As a result of the exercise, some impacts were included and some were excluded.

Table 11-27: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Groundwater quality impacts due to Contamination by Fuels, Oils and Chemicals (construction stage)	*Operational Stage Effects*
Groundwater quality impacts from cement-based compounds (construction stage)	*Decommissioning Stage Effects*
Groundwater level (quantity) impacts from dewatering of excavations (construction stage)	

The source-pathway-receptor links for included impacts are described in the Impact Evaluation Tables in the next sections. **The Impact Evaluation Tables are presented in the following sections 11.3.4.1 to 11.3.4.3.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections, in Section 11.3.4.4.

Topic: **Water**

11.3.4.1 Impact Evaluation Table: Groundwater quality impacts due to Contamination by Fuels, Oils and Chemicals

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Fuels, oils and hydrocarbons
Cumulative Impact Source: Fuels, oils and hydrocarbons
Impact Pathway: Soil / subsoil pore space and groundwater flowpaths

Impact Description: The plant and equipment that will be used during the construction phase will be run on fuels and oils. This creates the potential for spillage and leakage of hydrocarbons from plant during refuelling or storage of oils and fuels which can leach into groundwater underlying the works.

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Groundwater quality impacts due to Contamination by Fuels, Oils and Chemicals

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Plant and equipment will be used at all UWF Grid Connection construction works areas and therefore groundwater under the construction works areas is a potential receptor. However, any effects are only likely to be minor and localised.

Given the transient and distributed nature of the works within two groundwater bodies, the localised groundwater flow regime (short flowpaths to local streams and rivers) and the fact that only small volumes of fuels/oils will be present on-site at one time, the magnitude of impact is considered to be Negligible. The Project Design Measures, which are listed below, are also considered in the assessment of magnitude.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-6, Negligible magnitude combined with the Low to Medium Importance of the local aquifer (Poor – Locally Important Aquifer);
- All fuels required for construction activities will be stored in a designated location, away from main traffic activity, within the Temporary Compound at Mountphilips Substation. All fuel will be stored in bunded, locked storage containers (Project Design Measure);
- Overnight parking of plant and machinery will only be permitted at the temporary compound at the Mountphilips Substation site and at a distance greater than 50m from watercourses, and this reduces the risk to groundwater posed by leaks (Project Design Measure);
- All chemical wastes will be stored in secure, bunded and covered storage containers, in a designated secure part of the Temporary Compound, and will be removed from site and transported to approved licensed facilities (Project Design Measure);
- Therefore, any incidents that do occur will largely be limited to small, isolated, low volume spills / leaks that may occur along the UWF Grid Connection construction works area;
- Any accidental minor (low volume) spills on the ground surface will likely be absorbed by the underlying soils/subsoils and not be leached into the underlying groundwater;
- The majority of the 110kV route is along public roads which will reduced the potential for impacts on groundwater quality in the unlikely event of spills and leaks.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: There is potential for cumulative effects of the UWF Grid Connection with the

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UWF Related works to local groundwater to occur along the public road in Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons and along the private paved road in Knockcurraghbola Commons where both UWF Related Works and/or Upperchurch Windfarm works occur within 300m of UWF Grid Connection. All fuels required for Upperchurch Windfarm/UWF Related Works construction activities will be stored in a designated location, away from main traffic activity, within the windfarm Site Compound No.1 which is greater than 300m from UWF Grid Connection 110kV UGC works.
Given the transient and distributed nature of the works within the groundwater body, the localised groundwater flow regime (short flowpaths to local streams) and the fact that only small volumes will be present on-site at one time, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-6, Negligible magnitude combined with the Low Importance of the local aquifer (Poor Aquifer);
- Any incidents that do occur will largely be limited to small, isolated, low volume spills / leaks that may along the works area; and,
- Any accidental minor (low volume) spills on the ground surface will likely be absorbed by the underlying soils/subsoils and not be leached into the underlying groundwater.
- The location of the 110kV within public roads and paved private road will reduced the potential for impacts on groundwater quality in the unlikely event of spills and leaks.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Plant and equipment will be used at all the UWF Related Works areas and therefore groundwater under the construction works areas is a potential receptor. However, any effects are only likely to be minor and localised. Given the transient and distributed nature of the works within the groundwater body, the localised groundwater flow regime (short flowpaths to local streams) and the fact that only small volumes will be present on-site at one time, the magnitude of impact is considered to be Negligible. The Project Design Measures, which are listed below, are also considered in the assessment of magnitude.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-6, Negligible magnitude combined with the Low Importance of the local aquifer (Poor Aquifer);
- All fuels required for construction activities will be stored in a designated location, away from main traffic activity, within the windfarm Temporary Compounds. All fuel will be stored in bunded, locked storage containers (Project Design Measure);
- All chemical wastes will be stored in secure, bunded and covered storage containers, in a designated secure part of Site Compound No.1 (Upperchurch Windfarm), and will be removed from site and transported to an approved licensed facilities (Project Design Measure);
- Therefore, any incidents that do occur will largely be limited to small, isolated, low volume spills / leaks that may occur along the works area; and,
- Any accidental minor (low volume) spills on the ground surface will likely be absorbed by the underlying soils/subsoils and not be leached into the underlying groundwater.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 11.3.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013, the main risk to groundwater quality at the site will be from spills and leaks of hydrocarbons. The overall effects were assessed to be Not Significant.

Water

Topic

Significance of the Impact: Not Significant
Rationale for Impact Evaluation: • Implementation of a Fuel Management Plan which will require best practices to be carried out in respect of refuelling, handing and storage of fuels; and, • Procedures and contingency plans will be setup to deal with accidental spills and leaks.
Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.3.2.2.1*
Evaluation of Other Cumulative Impacts – Groundwater quality impacts due to Contamination by Fuels, Oils and Chemicals
Whole UWF Project Effect
Cumulative Impact Magnitude: Plant and equipment will be used at all the Whole UWF Project works areas, and therefore groundwater along the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm works areas are potential receptors. However, any effects are only likely to be minor and localised. Given the transient and distributed nature of the works within two separate groundwater bodies, the localised groundwater flow regime (short flowpaths to local streams) and the fact that only small volumes will be present on-site at one time, the in-combination magnitude of impact is considered to be **Negligible**.
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 11-6, **Negligible** magnitude combined with the **Low to Medium Importance** of the local aquifers; • The construction work areas associated with the UWF Grid Connection (91% within Slieve Phelim GWB) and the UWF Related Works and Upperchurch Windfarm (84% within Templemore A) are largely located in separate groundwater bodies, and therefore there is no potential for significant in-combination effects; and, • Groundwater flowpaths in the area of the Upperchurch Windfarm and UWF Related Works are expected to be localised (i.e. any recharge on the local hills will discharge into local streams) and therefore increased concentrations of hydrocarbons in groundwater locally as a result of isolated spills/leaks within the windfarm is not expected.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Local Groundwater Bodies with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.3.2.2).

11.3.4.2 Impact Evaluation Table: Groundwater quality impacts from cement-based compounds

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Cement based compounds
Cumulative Impact Source: Cement based compounds
Impact Pathway: Soil / subsoil pore space and groundwater flowpaths

Impact Description: Concrete and other cement-based products are highly alkaline and corrosive and can have negative impacts on local groundwater quality.

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Groundwater quality impacts from cement-based compounds

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The main use of cement-based compounds will be in the 110kV UGC cable trench and during the construction of foundations at the Mountphilips Substation / End Masts. Cement leachate has the potential to percolate into the underlying aquifer and contaminate groundwater locally.

Given the shallow nature of the works, the transient and distributed nature of the works within the groundwater body, the localised groundwater flow regime (short flowpaths to local streams) and the fact that relatively only small volumes of cement will be placed at one time, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-6, Negligible magnitude combined with the Low to Medium Importance of the local aquifers (Poor – Locally Important Aquifer);
- Due to the narrow, linear nature of the 110kV UGC trench and the small volumes of cement required per meter (~0.4m^3), the total volume of semi-dry lean-mix cement placed within local groundwater catchments along the route will be small, and the potential for groundwater quality effects will be negligible;
- A relatively small volume of wet cement will also be required at the Mountphilips Substation foundations (both within the Substation Compound and at the foundations for the 2 No. End Masts);
- It is not expected that cement will only come in direct contact with groundwater; and,
- Only a brief to temporary (and reversible) increase in the pH and alkalinity of the local groundwater is likely to occur. The effects will only persist until the cement mix has hardened and the high alkalinity leachate flushed out / diluted by rainfall or groundwater flow. The effects will be assimilated by the local groundwater flow.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: There is potential for cumulative effects to groundwater between the UWF Grid Connection and UWF Related Works, where the UWF Related Works Internal Windfarm Cable road crossing R6 comes within 300 meters of the UWF Grid Connection 110kV UGC works on the public road. 210m^3 and 20m^3 of concrete will be associated with the UWF Grid Connection and UWF Related Works, respectively, within the cumulative evaluation study area.
There is potential for cumulative effects to groundwater between the UWF Grid Connection and Consented Upperchurch Windfarm, where the Consented UWF Substation and the Consented UWF Turbine T22 come within 300 meters of the 110kV UGC. Given the volumes to be used on-site are negligible, the cumulative

magnitude of impact is considered to be negligible

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The volumes to be used on-site are negligible;
- It is not expected that cement will only come in direct contact with groundwater; and,
- Any groundwater effects will be temporary and localised

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: The use of cement-based compounds will be limited to the Telecom Relay Pole foundation (c.4m^3) and 9 No. of public road crossings (c.3-5m each). Therefore no impacts on surface water or groundwater quality are anticipated.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- The volumes to be used on-site are negligible, therefore no impacts on groundwater quality are expected.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 11.3.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude:

The primary use of cement at the Upperchurch Windfarm site will be at the 22 no. turbine locations and the substation site for foundation construction purposes. Given the spread out nature of the windfarm over a relatively large area, the localised groundwater flow regime (short flowpaths to local streams) and the fact that the works will be completed in stages, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-6, Negligible magnitude combined with the Low Importance of the local Aquifer (Poor Aquifer);
- The turbine bases and substation are distributed out over a large geographical area (1,154ha) comprising several local groundwater catchments (as define by topography),and therefore the total volume of cement within any one groundwater catchment will be negligible; and,
- At worst only a brief to temporary (and reversible) increase in the pH and alkalinity of the groundwater down-gradient of the works area is likely to occur. The effects will only persist until the cement mix has hardened and the high alkalinity leachate flushed out / diluted rainfall or by groundwater flow.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 11.3.2.2.1*

Evaluation of Other Cumulative Impacts – Groundwater quality impacts from cement-based compounds

Whole UWF Project Effect

Cumulative Impact Magnitude:

Localised and temporary change in groundwater quality at the footprint of the development areas.

Given the transient and distributed nature of the works within two separate groundwater bodies, the localised groundwater flow regime (short flowpaths to local streams) and the fact that only relatively small volumes will be present on-site at one time, the in-combination magnitude of impact is considered to be **Negligible**.

Local Groundwater Bodies

Sensitive Aspect

Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 11-6, **Negligible** magnitude combined with the **Low to Medium Importance** of the local aquifers; • The works areas associated with the 110kV UGC (Slieve Phelim GWB), the UWF Related Works and the Upperchurch Windfarm (Templemore A GWB) are largely located in separate groundwater bodies, and therefore there is no potential for significant in-combination effects

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Local Groundwater Bodies with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.3.2.2).

Topic **Water**

11.3.4.3 Impact Evaluation Table: Groundwater level (quantity) impacts from dewatering of excavations

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Excavation Dewatering
Cumulative Impact Source: Excavation Dewatering
Impact Pathway: Groundwater flowpaths

Impact Description: Impacts on local groundwater levels as a result of pumping of excavations such as the cable trench.

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Groundwater level (quantity) impacts from dewatering of excavations

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:

Significant dewatering is not expected at the Mountphilips Substation site. The majority (29.2km of 30.5km) of the UWG Grid Connection is along the carriageway of public roads or private paved road and therefore significant groundwater or surface water inflows into the cable trench are not anticipated. Existing road drainage is likely to limit any significant inflows into the trench. Due to the fact that the majority of the 110kV UGC is along the carriageway of public roads no dewatering of groundwater is likely. No effects on groundwater levels are likely.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- As per Table 11-6, Negligible magnitude combined with the Low to Medium Importance of the local aquifer (Poor to Locally Important) due to the shallow nature of the cable trench / joint bays, no effects on local groundwater levels and flows are likely; and,
- Location of the 110kV UGC on the public road network.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude:

Due to the upland nature of the eastern extent of the 110kV UGC location, no excavation dewatering is expected to occur. Similarly, due to the upland location and absence of groundwater inflows in trial pits investigations for Upperchurch Windfarm, excavation dewatering is not expected for UWF Related Works, with only minimal discontinuous dewatering potentially required for Upperchurch Windfarm in the UWF Grid Connection Cumulative Evaluation Study Area. Therefore, cumulative dewatering effects in this area are unlikely to occur.

Significance of the Impact: No Cumulative Impact

Rationale for Impact Evaluation:

- Due to the shallow nature of the works and the elevated nature of the works area, UWF Grid Connection is not likely to cause effects to groundwater level, either alone or cumulatively with Upperchurch Windfarm and/or UWF Related Works.

Topic: Water

Sensitive Aspect: Local Groundwater Bodies

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works
Impact Magnitude: Due to the elevated position of the windfarm site, the shallow nature of the excavation works and the fact that the groundwater table was not intercepted by any of the windfarm trial holes, no effects on the local groundwater levels are expected.
Significance of the Impact: No. Impact
Rationale for Impact Evaluation: • Due to the shallow nature of the works and the elevated nature of the works area, no impacts on groundwater levels are expected.
Element 3: UWF Replacement Forestry– *N/A, evaluated as excluded, see Section 11.3.2.2.1*
Element 4: Upperchurch Windfarm
Impact Magnitude: Impacts relating to groundwater levels and flows were not undertake in the 2013 EIS and therefore are evaluated below for the purpose of the cumulative impact assessment. Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013, limited and discontinuous seepage is expected from the sides of the turbine bases in sloping ground, and this is more likely to occur during wetter winter periods. This suggests that seepages will largely be as result of surface water runoff or minor groundwater seepages along the subsoil/bedrock interface. However, no seepages were reported during the trial pit investigation which was completed in October 2011. Therefore, the magnitude of impact is considered to be Negligible.
Significance of the Impact: Imperceptible
Rationale for Impact Evaluation: • As per Table 11-6, Negligible magnitude combined with the Low Importance of the aquifer(Poor aquifer); • Due to the elevated nature of the Upperchurch Windfarm site, significant interaction with the local groundwater table is not expected; and, • Groundwater flows (if present) will be limited to groundwater seepage at the subsoil / bedrock interface and therefore significant impacts on local groundwater levels are not expected.
Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.3.2.2.1*
Evaluation of Other Cumulative Impacts – Groundwater level (quantity) impacts from dewatering of excavations
Whole UWF Project Effect
Cumulative Impact Magnitude: No dewatering of groundwater is likely to be required for UWF Grid Connection or UWF Related Works, Minimal dewatering is likely to be required for Upperchurch Windfarm.
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 11-6, **Negligible** magnitude combined with the **Low to Medium Importance** of the local Aquifer; • The shallow nature of the works and the very limited interaction with the groundwater table; • The works areas associated with the 110kV UGC (Slieve Phelim GWB) and the turbine foundations associated with the Upperchurch Windfarm (Templemore A GWB) are in predominately in separate local groundwater

bodies, and therefore there is no potential for in-combination effects;
- Due to the elevated nature of the Upperchurch Windfarm, significant interaction with the local groundwater table is not expected; and,
- Groundwater flowpaths in the area of the Upperchurch Windfarm Works are expected to be localised (i.e. any recharge on the local hills will discharge into local streams) and therefore significant in-combination effects cannot occur.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Local Groundwater Bodies with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.3.2.2).

11.3.4.4 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in the table below.

Table 11-28: Description and Rationale for Excluded Impacts to Local Groundwater Bodies

Source(s) of Impacts	Project Element	Pathway(s)	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Operational Stage Effects				
There will be no excavation works required during the operational phase that would have an effect on groundwater levels. There are no discharges to ground (i.e. wastewater) and the volumes of oils and fuels present on-site at any one time (i.e. for maintenance purposes) will be negligible				
Decommissioning Stage Effects				
Rationale for Excluding: no potential for impacts/Neutral impacts UWF Grid Connection will remain part of the National Grid. Therefore no hydrological impacts are expected. UWF Related Works: The cables will be pulled from the Internal Windfarm Cabling ducts at the turbines or at the substation; the ducting, Realigned Windfarm Roads and Haul Route Works will remain in-situ; therefore, no decommissioning works to lands are required. The Telecoms Relay Pole will be removed, and the compound area reinstated and returned to agricultural. Neutral effects to groundwater are anticipated. Upperchurch Windfarm: It is likely that the Consented UWF Substation will remain in-situ for use by ESBN and that the Consented UWF Roads will also remain in-situ for use by the landowner. Decommissioning works will be limited to the Consented UWF Turbines, Turbine Hardstanding areas, Meteorological Mast and associated drainage systems. All decommissioning works will take place from hard-core areas, with the majority of activity taking place on the turbine hardstands. Therefore, it is considered that decommissioning activities will have Neutral effects on groundwater.				

11.3.5 Mitigation Measures for Impacts to Local Groundwater Bodies

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur Local Groundwater Bodies** as a consequence of the UWF Grid Connection.

11.3.6 Evaluation of Residual Impacts to Local Groundwater Bodies

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Local Groundwater Bodies above (Section 11.3.4) – i.e. **imperceptible**.

11.3.7 Application of Best Practice and the EMP for Local Groundwater Bodies

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment.

The following Best Practice Measures have been developed, for the protection of Aquatic Habitats & Species, by the authors of this topic chapter, using industry best practice:

GC-BPM-05	Protection of Surface Water and Groundwater Quality during use of Cement Based Compounds
GC-BPM-06	Protection of Surface Water and Groundwater Quality During Storage and Handling of Fuels, Oils and Chemicals

These Best Practice Measure form part of the UWF Grid Connection Environmental Management Plan which is appended to this EIA Report as Volume D.

11.3.7.1 Surface Water Management Plan

The UWF Grid Connection Environmental Management Plan will include a bespoke Surface Water Management Plan. Water quality and the existing drainage regime will be managed under the Surface Water Management Plan (SWMP) which will be implemented by the appointed Contractor during the construction stage of the UWF Grid Connection. This Surface Water Management Plan (SWMP) provides the water management framework for the appointed Contractors and Sub-contractors and it incorporates the mitigating principles described in this EIAR (particularly in this Chapter 11 – Water) to ensure that construction works are carried out with minimal impact on the surface water environment and in accordance with the mitigation measures and project design commitments made in the EIAR.

The Surface Water Management Plan is part of the UWF Grid Connection Environmental Management Plan which is appended to this EIA Report as Volume D.

11.3.8 Summary of Impacts to Local Groundwater Bodies

A summary of the Impacts to Local Groundwater Bodies is presented in Table 11-30.

Table 11-29: Summary of Impacts to Local Groundwater Bodies

Impact to Local Groundwater Bodies:	**Groundwater quality impacts due to Contamination by Fuels, Oils and Chemicals**	**Groundwater quality impacts from cement-based compounds**	**Groundwater level (quantity) impacts from dewatering of excavations**
Evaluation Impact Table	*Section 11.3.4.1*	*Section 11.3.4.2*	*Section 11.3.4.3*
Project Life-Cycle Stage	Construction	Construction	Construction
UWF Grid Connection (direct effects)	**Imperceptible**	**Imperceptible**	**No Impact**
UWF Grid Connection (Cumulative effects)	**Imperceptible**	**Imperceptible**	**No Cumulative Impact**
Element 2: UWF Related Works	Imperceptible	No Impact	No Impact
Element 3: UWF Replacement Forestry	No Likely Impacts/No Potential for Impact Evaluated as Excluded – see Section 11.3.2.2.1		
Element 4: Upperchurch Windfarm	Not Significant	Imperceptible	Imperceptible
Element 5: UWF Other Activities	Neutral Impacts/No Potential for Impact Evaluated as Excluded – see Section 11.3.2.2.1		
Cumulative Impact			
Whole UWF Project Effect	**Imperceptible**	**Imperceptible**	**Imperceptible**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities are likely to cause cumulative effects to Local Groundwater Bodies with either the UWF Grid Connection of the Other Elements of the Whole UWF Project (see Section 11.3.2.2).

11.4 Sensitive Aspect No.3: Local Wells & Springs

This Section provides a description and evaluation of the Sensitive Aspect - Local Wells & Springs.

Wells and springs, fed by groundwater, are used locally as a potable supply for human consumption or for farm animals

11.4.1 BASELINE CHARACTERISTICS of Local Wells & Springs

11.4.1.1 STUDY AREA for Local Wells & Springs

The study area for Local Wells & Springs in relation to the UWF Grid Connection is described in Table 11-31 and illustrated on Figure GC 11.4: UWF Grid Connection Study Area for Local Wells and Springs (Volume C3 EIAR Figures).

Table 11-30: UWF Grid Connection Study Area for Local Wells & Springs

Study Area for Local Wells & Springs	Justification for the Study Area Extents
50m corridor, either side of the construction works area	Due to the shallow depth and temporary nature of the excavations associated with the construction works, the potential for impacts to local wells/springs is limited to physical contact with the well head/source or *localised* (15-20m) changes to surface water runoff/groundwater flow or *localised* contamination of the source by fuel/oil spills/cement-based compounds.

11.4.1.2 Baseline Context and Character of Local Wells & Springs in the UWF Grid Connection Study Area

As per Chapter 12: Air, there are c.317 No. residences and 17 No. community facilities within 100m of the UWF Grid Connection (primarily the 110kV UGC). Surveys of the 110kV UGC route undertaken as part of the studies for Chapter 14: Material Assets (Built Services) also identified public water mains along the entire length of the 110kV UGC.

As described below there are 11 wells within 100m, 10 No. of which are within 50m of construction works.

Source Protection Zones & Public Supply Wells: Based on the GSI well database, there are no mapped source protection zones (relating to group schemes or public supplies) mapped within ~3km of the UWF Grid Connection Study Area. However, there are public groundwater supply wells along the route of the 110kV UGC (referred here to as GW1 – GW3). No source protection zones have been completed to date for these wells but the 110kV UGC route is likely to be within the groundwater catchment to these wells. These 3 no. wells (GW1 – GW3), which are used as an augment supply for the Newport Regional Water Supply, are located in a compound adjacent to the local road in Castlewaller townland where the route of the 110kV UGC passes along the local public road (refer to Figure GC 11.4). The wells are located within 12m of the construction works area of the 110kV UGC. The authors (HES) previously completed an audit of this source for Irish Water (for a non-related project) and are therefore familiar with the wells and plant layout.

GSI Wells: A search of the GSI database for wells (50m mapped accuracy) found that there are 3 no. GSI wells within 50m downslope of UWF Grid Connection works (GSI Ref: 1715SEW030, 1715SEW033, 1715NEW064). The location of the GSI mapped wells is identified on Figure GC 11.4.

Other Private Wells: However, the GSI well database is not exhaustive in terms of the locations of all wells in the area as the database relies on the submission of data by drillers and the public etc. Consultation, in the form of door to door surveys, was untaken with local residents along the 110kV UGC route. The survey concluded that the vast majority of residents, public and community facilities are supplied by public mains. During the door to door survey, 1 No. private domestic well (GW4) was identified at 100m distance from the 110kV UGC on the Regional Road R503 and 3 No. private domestic wells and an old unused pump at the side of the road (GW5 – GW8), were identified within 50m of the 110kV UGC route. The location of the private wells identified during the door to door survey are identified on Figure GC 11.4. All of these 5 No. wells (including the old pump) are located downslope of the works.

11.4.1.3 Importance of Local Wells & Springs

The sources identified during house to house calls are all reported to be bored wells, and they are generally used as domestic supplies. The public groundwater supply wells are used as an augment supply for the Newport Regional Water Supply.

11.4.1.4 Sensitivity of Local Wells & Springs

Due to the shallow nature of the cable trenches and foundation works, significant impacts on groundwater levels and groundwater flows are not expected to occur. Wells are sensitive to groundwater quality impacts from potential spills and leaks (e.g. fuels/oils).

11.4.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

No trends are known in respect of water quality or quantity of the sources identified. The raw water quality of the sources is expected to reflect the groundwater quality in the local aquifer.

11.4.1.6 Receiving Environment (the Baseline + Trends)

It is assumed that the existing sources identified will be the receiving environment during the time of the development works.

11.4.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

11.4.2.1 Cumulative Evaluation Study Areas

11.4.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Local Wells & Springs	Justification for the Study Area Extents
100m corridor, either side of construction works area	The study area for cumulative effects with UWF Grid Connection is doubled to include any Other Elements or Other Projects or Activities which could contribute to cumulative effects with UWF Grid Connection.

The study is illustrated on Figure CE 11.4 UWF Grid Connection Cumulative Evaluation Study Area for Local Wells and Springs.

11.4.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 11.4.2.2.1 below.

The Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 11-32 and illustrated on Figure WP 11.4 Whole Project Study Area for Local Wells and Springs.

Table 11-31: Whole Project Cumulative Evaluation Study Area for Local Wells & Springs

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	100m corridor, either side of construction works area from construction work area boundaries for Other Elements.	A conservative 100m study area is used to identify houses and buildings which may have local private well/spring water supplies
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

11.4.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Local Wells & Springs also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Local Wells & Springs with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.20).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Local Wells & Springs.

11.4.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Local Wells & Springs

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Local Wells & Springs. The results of this evaluation are included in Table 11-33. The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 11.4. The baseline character of the areas around these Elements is described in Section 11.4.2.3.

Table 11-32: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Elements of the Whole UWF Project	
Element 1: UWF Grid Connection	Included for the evaluation of cumulative effects
Element 2: UWF Related Works	Evaluated as excluded: No potential for effects due to the absence of any wells within 50m downslope of works areas. Based on the GSI well database, there are no source protection zones (relating to group schemes or public supplies) mapped in the study areas. A search of the GSI database for wells (50m mapped accuracy) within 100m of the UWF Related Works identified only 4 no. wells • mapped well 1715NEW064 (GSI Ref) at Knockcurraghbola Commons, • mapped well 1715NEW063 (GSI Ref) at Knockcurraghbola Commons, • mapped well 1715NEW065 (GSI Ref) at Foilnaman townland, and • mapped well 1715NEW108 (GSI Ref) at Knockcurraghbola Commons These 4 no. bored wells are located up-gradient of the construction works areas and therefore cannot be impacted. As the GSI well database is not exhaustive in terms of the locations of all wells in the area (as the database relies on the submission of data by drillers and the public etc.) consultation was undertaken with landowners regarding the nature of their water supply and its location. There are 5 wells within 100m of the UWF Related Works, however, only 3 No. of these wells are within 50m of the UWF Related Works and all are located upslope of the works area and therefore no impacts are anticipated. The location of these wells is identified on Figure WP 11.4.
Element 3: UWF Replacement Forestry	Evaluated as excluded: No potential for effects due to the absence of any wells within 50m of the afforestation lands.
Element 4: Upperchurch Windfarm (UWF)	Evaluated as excluded: No potential for effects due to the absence of any wells within 50m of construction works. The closest well is GSI mapped well 1715NEW108, which is located up-gradient of Site Entrance No.6, in Knockcurraghbola Commons townland, therefore this well will not be affected

	by the works. The location of the well is identified on Figure WP 11.4.
Element 5: UWF Other Activities	Evaluated as excluded: No likely effect/Neutral effect/No potential for effects due to: • The Haul Route Activities are located entirely within the public road corridor. There will be no requirement for earthworks/groundworks and therefore no water quantity or quality effects to Local Wells & Springs are likely. • Overhead Line Activities: These works involve upgrade works to the overhead existing lines such as cable wrapping which do not require any major excavations. Therefore no water quantity or quality effects to Local Wells & Springs are expected. • Monitoring Activities do not require any major construction activities. Therefore, no surface water or groundwater impacts are expected. Once off activities will take place during the pre-construction stage, and comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will generally take place on the periphery of fields and are not expected to impact on water quality. • During the Operational Stage, farming practices under the Upperchurch Hen Harrier Scheme will, to a certain extent, cause lands to revert back to wet grassland. All associated potential hydrological effects are expected to be Neutral. During decommissioning of UWF, the Upperchurch Hen Harrier Scheme will finish, but no activities will be required, therefore there is no potential for impacts to Local Wells & Springs.

11.4.2.3 Cumulative Information: Baseline Characteristics – Context & Character

11.4.2.3.1 Element 2: UWF Related Works

Not applicable – Element evaluated as excluded. See Section 11.4.2.2.1.

11.4.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 11.4.2.2.1.

11.4.2.3.3 Element 4: Upperchurch Windfarm

Not applicable – Element evaluated as excluded. See Section 11.4.2.2.1.

11.4.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 11.4.2.2.1.

11.4.2.3.5 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 11.4.2.2

11.4.3 PROJECT DESIGN MEASURES for Local Wells & Springs

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 11-35 are relevant to the Environmental Factor, Water, and in particular to the sensitive aspect **Local Wells & Springs**.

Table 11-33: UWF Grid Connection Project Design Measures relevant to Local Wells & Springs

PD ID	Project Design Environmental Protection Measure (PD)
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD16	No refuelling of plant or equipment will be permitted within 100m of identified water supply wells
PD17	At Mountphilips Substation, water for operational stage welfare facilities will be obtained from a Rain Water Harvesting system. Waste water will be collected in tanks and removed from site by an appropriately licensed operator, for treatment in a licensed water treatment plant. These two measures will avoid the need for a new well or mains water connection and will avoid the need to treat waste water on-site.
PD23	All Joint Bays for the 110kV UGC will be located at least 50m from a Class 1 or Class 2 watercourse and at least 25m from Class 3 or Class 4 watercourses.
PD24	Outside of the Mountphilips Substation site, where dewatering of trenches or excavations is required for the 110kV UGC, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated using a mobile water treatment train and then discharged via a silt bag to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD34	Only precast concrete culverts or structures will be used at the watercourse crossing locations at Mountphilips Substation site and for any culvert replacements along the 110kV UGC. Only precast concrete chambers will be used at Joint Bay locations. No batching of wet cement will take place on-site.
PD35	Concrete pours will be required for the 110kV UGC cables trench. Only chutes will be washed out at the works locations into the cable trench, with the washout of the tank taking place at the concrete supplier depot. Concrete chute washouts within the SAC boundary will take place into designated bins for removal to the designated concrete wash settlement pond at the Mountphilips Substation site.
PD42	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment. The Environmental

	Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD43	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 at the Mountphilips Substation site. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored at the designated location in the temporary compound and all operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD44	Overnight parking of plant and machinery will only be permitted at the temporary compound at the Mountphilips Substation site and at a distance greater than 50m from watercourses.

11.4.4 EVALUATION OF IMPACTS to Local Wells & Springs

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Local Wells & Springs.

As a result of the exercise, **no impacts were included for further evaluation**.

Table 11-34: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
No impacts included for evaluation	*Surface water and groundwater Contamination from Oils, Fuels and Chemicals (construction stage)*
	Surface water and groundwater Contamination from Cement Based Compounds (construction stage)
	Groundwater level and flow impacts (construction stage)
	Operational Stage Effects
	Operational Stage Effects

The source-pathway-receptor links and the rationale for excluded impacts are described in the section below.

11.4.4.1 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in the table below.

Table 11-35: Description and Rationale for Excluded Impacts to Local Wells & Springs

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Storage and handling of fuels / chemicals	1	SW Runoff GW Flowpaths	Surface water and groundwater Contamination from Oils, Fuels and Chemicals	Rationale for Excluding: no likely impact Potential for impacts relates to UWF Grid Connection only, as there are no wells within 50m downslope of UWF Related Works or Upperchurch Windfarm works. No likely impact of UWF Grid Connection, due to the fact that all plant and machinery will be working on an impermeable road surface, any minor spills or leaks are unlikely to percolate down into the underlying aquifer and flow towards these wells or springs (surface water more at risk). In addition, confirmatory house to house calls will be conducted prior to the commencement of UWF Grid Connection works to confirm the location of any possible new wells that might be installed in the intervening period. No refuelling of plant or equipment will be permitted within 100m of known/confirmed wells (Project Design Measure).
Use of Cement Based Compounds	1	SW Runoff GW Flowpaths	Surface water and groundwater Contamination from Cement Based Compounds	Rationale for Excluding: no likely impact The use of cement for the UWF Grid Connection works within 50m of 10 no. downslope wells (including the 3 no. Newport RWS wells) will be limited to the trench and due to the small volumes required and the fact that no contact with the underlying groundwater is expected (i.e. dry trenches within the carriageway of road) groundwater quality effects on the downstream wells are not expected. Potential for impacts relates to UWF Grid Connection only, as there are no wells within 50m downslope of UWF Related Works or within 100m of Upperchurch Windfarm works.
Excavation Dewatering (i.e. cable trench de-watering)	1	GW Flowpaths	Groundwater level and flow impacts	Rationale for Excluding: no likely impact Due to the shallow nature of the excavation works (1.25m) it is not expected that the excavation of a shallow trench along the carriageway of a public road will impact on groundwater flows/levels in the groundwater catchment to these wells as inflows to the well are most likely from deeper bedrock.
Operational Stage Effects				
Rationale for Excluding: no likely impact due to the absence of excavations and the minimal volumes of oils which will be present on site during maintenance works.				

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Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Decommissioning Stage				
Rationale for Excluding: no likely impact due to the absence of excavations and the minimal volumes of oils which will be present on site during decommissioning works at the Upperchurch Windfarm and UWF Related Works. UWF Grid Connection will not be decommissioned; therefore there is no potential for impacts.				

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11.4.5 Mitigation Measures for Impacts to Local Wells & Springs

Mitigation measures were incorporated into the UWF Grid Connection project design. No additional mitigation measures are required as the topic authors conclude that **no impacts are likely to occur to Local Wells & Springs** as a consequence of the development of the UWF Grid Connection.

11.4.6 Evaluation of Residual Impacts to Local Wells & Springs

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in the Evaluation of UWF Grid Connection (Section 11.4.4), i.e. **no impacts are likely to occur.**

11.4.7 UWF Grid Connection Environmental Management Plan

No impacts are likely to occur to Local Wells & Springs.

However, the Best Practice Measures and Surface Water Management Plan which will be implemented during the construction works for the protection of Local Surface Water Bodies (Section 11.2.7) and Local Groundwater Bodies (Section 11.3.7) will also provide further protection to Local Wells & Springs.

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resouced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and a Invasive Species Specialist.

11.4.7.1 Surface Water Management Plan

The UWF Grid Connection Environmental Management Plan will include a bespoke Surface Water Management Plan. Water quality and the existing drainage regime will be managed under the Surface Water Management Plan (SWMP) which will be implemented by the appointed Contractor during the construction stage of the UWF Grid Connection. This Surface Water Management Plan (SWMP) provides the water management framework for the appointed Contractors and Sub-contractors and it incorporates the mitigating principles described in this EIAR (particularly in this Chapter 11 – Water) to ensure that construction works are carried out with minimal impact on the surface water environment and in accordance with the mitigation measures and project design commitments made in the EIAR.

11.4.8 Summary of Impacts to Local Wells & Springs

The topic authors conclude that UWF Grid Connection is not likely to cause impacts to Local Wells & Springs.

Table 11-36: Summary of the impacts to Local Wells & Springs

Impact to Local Wells & Springs	**No Likely Impact** **Evaluated as Excluded**
Evaluation Section	*Section 11.4.4.1*
Project Life-Cycle Stage	n/a
UWF Grid Connection	**No likely Impacts**
Element 2: UWF Related Works	No potential for impacts Evaluated as Excluded, see Section 11.4.2.2.1
Element 3: UWF Replacement Forestry	No potential for impacts Evaluated as Excluded, see Section 11.4.2.2.1
Element 4: Upperchurch Windfarm	No potential for impacts Evaluated as Excluded, see Section 11.4.2.2.1
Element 5: UWF Other Activities	No potential for impacts Evaluated as Excluded, see Section 11.4.2.2.1
Cumulative Impact	
Whole UWF Project Effect	No Potential for Cumulative Impacts

The greyed out boxes in the summary table below relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities are likely to cause cumulative effects to Local Wells & Springs with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.4.2.2).

11.5 Sensitive Aspect No.4: Lower River Shannon SAC

This Section provides a description and evaluation of the Sensitive Aspect - Lower River Shannon SAC.

11.5.1 BASELINE CHARACTERISTICS of Lower River Shannon SAC

11.5.1.1 STUDY AREA for Lower River Shannon SAC

The study area for Lower River Shannon SAC in relation to the UWF Grid Connection is described in Table 11-39 and illustrated on Figure GC 11.5: UWF Grid Connection Study Area for Lower River Shannon SAC (Volume C3 EIAR Figures).

Table 11-37: UWF Grid Connection Study Area for Lower River Shannon SAC

Study Area for Lower River Shannon SAC	Justification for the Study Area Extents
The EPA sub-catchments of the Newport [Tipperary]_SC_010, Kileengarrif_SC_010, and Bilboa_SC_010 within the regional Mulkear River catchment • Newport[Tipperary]_SC_010, • Dead_SC_010, • Kileengarrif_SC_010, • Bilboa_SC_010, • Mulkear_SC_010, • Mulkear_SC_020, • Shannon[Lower]_SC_090	Defined by regional topography and drainage towards the SAC. Note: The Mulkear River catchment is the Lower Shannon & Mulkear Catchment Hydrometric Area HA25D excluding Shannon [Lower] _SC_100 sub-catchment and Shannon [Lower] _SC_080 sub-catchment. It is referred to as the Mulkear River Catchment throughout this sensitive aspect Section 11.5

11.5.1.2 Baseline Context & Character of Lower River Shannon SAC in the UWF Grid Connection Study Area

The Lower River Shannon SAC encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments, and the marine area between Loop Head and Kerry Head.

The Lower River Shannon is a designated SAC and contains protected Annex l habitats and Annex II species. Some of these plant habitats and animal species depend on the quality of the water within the SAC, and therefore in order to facilitate the evaluation of effects on protected habitats and species, the existing quality and characteristics of the waterbodies within the SAC and the potential for UWF Grid Connection to affect the quality of water within the SAC is evaluated in this Water chapter section. The potential for impacts to the protected species of plants and animals is evaluated in Chapter 8: Biodiversity (see Section 8.2: European Sites and Section 8.4: Aquatic Habitats & Species).

Overlap with the SAC Boundary

The Mountphilips Substation site and the majority of the 110kV UGC (29km of the total 30.5km) are located within the Mulkear River catchment of the Lower River Shannon SAC catchment area. The UWF Grid Connection (110kV UGC) is located within the boundary of the Lower River Shannon SAC at six locations, over a total distance of 1025m, as follows;

- 190m along a section of the local public road L6013-0 to the north of Newport;
- 230m along a section of local public roads L2156-0 and L2157-0 on either side of, and over Rockvale Bridge. Rockvale Bridge crosses the Newport River, to the north of Newport town, at Watercourse Crossing W7;
- 100m, 80m and 390m sections along the Regional Limerick to Thurles Road R503 to the east of Rear Cross; and
- 35m along a section of the Regional Road R503 at Anglesey Bridge, near Kilcommon. Anglesey Bridge crosses over the Bilboa River, to the south of Kilcommon village, at Watercourse Crossing W53.

All trenching works at the Rockvale Bridge and Anglesey Bridge will be carried out in the bridge structure. No instream works and no works on the lands below the bridges will be required. All works will be carried out from the bridge structures.

All construction works on the public road, including where works overlap the SAC boundary, will be carried out in the public road pavement and no instream works, and no works in the verges or adjacent lands will occur.

Water Sub-Catchments within the UWF Grid Connection Study Area

The UWF Grid Connection Study Area comprises the following sub-catchments within the Lower Shannon & Mulkear Catchment Hydrometric Area HA25D - Newport [Tipperary]_SC_010, Kileengarrif_SC_010, Bilboa_SC_010, Dead_SC_010, Mulkear_SC_010, Mulkear_SC_020, and the Shannon [Lower]_SC_090. This area is referred to as the Mulkear River Catchment throughout this Section 11.5.

The UWF Grid Connection is located within the Newport [Tipperary]_SC_010, Kileengarrif_SC_010, and Bilboa_SC_010 Sub-Catchments.

Watercourse Crossings within the UWF Grid Connection Study Area

In total, within the River Shannon catchment, there are 63 no. watercourse crossings along the 110kV UGC route. 3 no. of the watercourse crossings are located at the Mountphilips Substation site, while the remaining 60 no. watercourse crossings are existing bridges and culverts along the route of the 110kV UGC, which is entirely along the public road, where the 110kV UGC is located in the Mulkear River Catchment.

All 3 no. watercourse crossings at the Mountphilips Substation site will require instream works, 2 no. of these watercourses (W1 and W3) are streams and evaluated as being Class 2 watercourses with fisheries value. The remaining watercourse, W2, is a drain and evaluated as being Class 3 sub-optimal fisheries value.

The 60 no. watercourses along the 110kV UGC comprise 15 no. bridges and 45 no. culverts under the public road. No instream works are required at the bridges or at 32 no. of the culverts. At the remaining 12 no. watercourse crossings, the existing culverts may require replacement during construction works. 11 of these 12 no. culverts are evaluated at being either Class 3 or Class 4 with sub-optimal or no fisheries value.

Existing Water Quality Monitoring Data and WFD Waterbody Status

Based on the EPA mapping (www.catchments.ie), the main watercourses within the Newport[Tipperary]_SC_010, Kileengarrif_SC_010 and Bilboa_SC_010 sub catchments are the Newport River (in the Newport_040 local surface water body), Clare River (in the Annagh_030 local surface water body) and the Bilboa River (in the Bilboa_020 local surface water body), which have a Good to High Status in terms of EPA Q-Values with a *Not at Risk* risk rating. The exception to this is the Inch (Bilboa)_010 which is reported to be At Risk of not meeting the Water Framework Directive objectives due to agriculture and forestry related effects.

Flood Risk

A site-specific flood risk assessment was undertaken (in accordance with the guidance document 'The Planning System and Flood Risk Management Guidelines for Planning Authorities - DoEHLG, 2009) for the UWF Grid Connection and this report is attached as Appendix 11.3 Flood Risk Assessment. A summary of the flood risk assessment within the Mulkear River Catchment is provided below.

The majority of the works areas are not located within any mapped fluvial or pluvial flood extent zones and are considered to be areas at low risk to flooding (located within fluvial Flood Zone C (Low Risk). In addition, there are no significant mapped pluvial flood zones at the UWF Grid Connection areas. Due to elevated and hilly nature of the topography in the area of the development, no significant pluvial flooding would be anticipated.

Interaction with mapped fluvial flooding zones, which are associated with 100-year flooding events or greater, is generally limited to the crossing locations of larger watercourses. It is considered that the locations of the UWF Grid Connection are, for the most part, not susceptible to significant flooding. The Mountphilips Substation site is also not located within a mapped fluvial flood zone.

The OPW Preliminary Flood Risk Assessment (PFRA) mapping for the study area indicates that fluvial flooding along the 110kV UGC route is relatively localised to the larger stream and river crossing locations, namely; crossing locations W5, W7 (Newport River), W8, W9 (Small River), W33, W36 (Clare River), W39, W49 and W53 (Bilboa River). Access to these crossing locations will only be required during the construction stage (no new permanent infrastructure is required at these watercourses crossing locations). The Mountphilips Substation site is also not located within a mapped fluvial flood zone.

11.5.1.3 Importance of Lower River Shannon SAC

The Lower River Shannon SAC is a Natura 2000 as established under the Habitats Directive and therefore it has am **extremely high** importance.

11.5.1.4 Sensitivity of Lower River Shannon SAC

The primary sensitivities are surface water quality and its water dependant ecosystems.

11.5.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Based on the EPA database, with the exception of the Inch (Bilboa)_010, the Shannon Regional catchment waterbodies in the study areas, are reported to be 'Not at Risk' from water quality impacts (diffuse and point source) or morphological impacts. This suggests that there are no significant negative rising trends relating to water quality or morphology to the majority of the River Shannon catchment in the study areas.

11.5.1.6 Receiving Environment (the Baseline + Trends)

Due to the slow rate of change, it is expected that the status of waterbodies will be the same at the time of construction (2020/2021). However, it is assumed that the status of the surface water bodies within the study area will be at least Good during the lifetime of the UWF Grid Connection. This is based on the assumption that surface waterbodies will have to achieve at least Good Status.

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11.5.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

11.5.2.1 Cumulative Evaluation Study Areas

11.5.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Lower River Shannon SAC	Justification for the Study Area Extents
The regional Mulkear River catchment, comprising the following EPA Sub-Catchments: • Newport[Tipperary]_SC_010, • Kileengarrif_SC_010, • Bilboa_SC_010, • Dead_SC_010, • Mulkear_SC_010, • Mulkear_SC_020, • Shannon[Lower]_SC_090	Defined by regional topography and drainage towards the SAC.

The study is illustrated on Figure CE 11.5: UWF Grid Connection Cumulative Evaluation Study Area for Lower River Shannon SAC (Volume C3 EIAR Figures).

11.5.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 11.5.2.2.1 below.

The Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements and Other Projects or Activities which are described in Table 11-40 and Figure WP 11.5: Whole Project Study Area for Lower River Shannon SAC (Volume C3 EIAR Figures).

Table 11-38: Whole Project Cumulative Evaluation Study Area for Lower River Shannon SAC

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	The regional Mulkear River catchment, comprising the following EPA Sub-Catchments: • Newport[Tipperary]_SC_010, • Kileengarrif_SC_010, • Bilboa_SC_010, • Dead_SC_010, • Mulkear_SC_010, • Mulkear_SC_020, • Shannon[Lower]_SC_090	The Mulkear River is one of the regional catchments in which all of Elements of the Whole UWF Project are located. The Mulkear River catchment drains to the Lower River Shannon SAC. Extending the scoping area beyond the Mulkear River catchment would mean that the whole of the River Shannon catchment would be included and therefore at this vast scale, the Whole UWF Project would likely have a Neutral effect in relation to cumulative impacts.
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5:		

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Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	The regional Mulkear River catchment, comprising the	The Mulkear River is one of the regional catchments in which all of Elements of
UWF Other Activities		

11.5.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Lower River Shannon SAC also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Lower River Shannon SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.21).

The results of this scoping exercise are that: Newport Town Park (consented), Castlewaller Windfarm (consented) and Bunkimalta Windfarm (potential) have been scoped in for evaluation of cumulative effects to Lower River Shannon SAC.

11.5.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Lower River Shannon SAC

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Lower River Shannon SAC. The results of this evaluation are included in Table 11-41.

The location of, and study area boundary associated with, the Other Elements and Other Projects or Activities which are included for cumulative evaluation is illustrated on Figure CE 11.5. The baseline character of the areas around these Elements is described in Section 11.5.2.3.

Table 11-39: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Elements of the Whole UWF Project	
Element 1: UWF Grid Connection	Included for the evaluation of cumulative effects
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: No potential for effects due to the location of the UWF Replacement Forestry outside of the regional Mulkear River catchment.
Element 4: Upperchurch Windfarm	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effect/No potential for effects due to: • The Haul Route Activities are located entirely within the public road corridor. There will be no requirement for earthworks/groundworks and therefore no hydrological / water quality effects are likely. • Overhead Line Activities: These works involve upgrade works to the overhead existing lines such as cable wrapping which do not require any major excavations. Therefore no surface water or groundwater impacts are expected. • Monitoring Activities do not require any major construction activities. Therefore, no surface water or groundwater impacts are expected. Once

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	off activities will take place during the pre-construction stage, and comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will generally take place on the periphery of fields and are not expected to impact on water quality. • During the Operational Stage, farming practices under the Upperchurch Hen Harrier Scheme will, to a certain extent, cause lands to revert back to wet grassland. All associated potential hydrological effects are expected to be Neutral. During decommissioning of Upperchurch Windfarm, the Upperchurch Hen Harrier Scheme will finish, but no activities will be required, therefore no water quality effects are expected.
Other Projects or Activities	
Bunkimalta Windfarm Castlewaller Windfarm Newport Town Park	Yes, included for the evaluation of cumulative sedimentation effects. Evaluated as excluded: Neutral cumulative water quality effects from oils/cement contamination, increased flood risk or runoff from permanent surfaces, due to the separation distances, the implementation of best practice oil, fuel and cement measures as stated in the Newport Town Park NIS, Castlewaller Windfarm EIS, and assumed to form part of any future Castlewaller Windfarm grid connection or Bunkimalta Windfarm EIAR, and due to No potential for cumulative morphological effects due to separation distance, no increased flood risk associated with the Other Projects due to location of UWF Grid Connection, and implementation of surface water drainage system.

11.5.2.3 Cumulative Information: Baseline Characteristics – Context & Character

11.5.2.3.1 Element 2: UWF Related Works

A minority of the UWF Related Works are located within the River Shannon catchment - 1.7km of the total 17.9km of the Internal Windfarm Cabling and some of the Haul Route works (HW7, HW8, HW9, and HW10) located in the Bilboa_SC_010 sub catchment. There is only 1 no. watercourse crossing for the UWF Related Works, within the River Shannon catchment.

11.5.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – element evaluated as excluded. See Section 11.5.2.2.1.

11.5.2.3.3 Element 4: Upperchurch Windfarm

In relation to the Upperchurch Windfarm, similar to the UWF Related Works, only a small portion of the Upperchurch Windfarm is located in the River Shannon catchment with only 2 no. of the 22 no. Consented UWF turbines and associated UWF Access Roads located in the Bilboa_SC_010 sub catchment.

Consideration of the Passage of Time: It is considered that there have been no material changes in the baseline environment and the descriptions in the 2013 and 2014 documents for Upperchurch Windfarm remain relevant to the cumulative evaluations in this EIAR.

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11.5.2.3.4 Element 5: UWF Other Activities

Not applicable – element evaluated as excluded. See Section 11.5.2.2.1.

11.5.2.3.5 Other Projects or Activities

Newport Town Park (consented): A public park in Newport town is consented by Tipperary County Council, which is also located in the Newport (Tipperary)_SC_010 sub-catchment in the Mulkear River catchment,, and downstream of the UWF Grid Connection development. The park includes excavations, groundworks. Landscaping and car-parking facilities on lands immediately adjacent to the Newport River and overlaps the boundary of the Lower River Shannon SAC. No instream works associated with the Newport Town Park project.

Castlewaller Windfarm (consented): The 16 no. turbines and 1 no. substation of this consented windfarm development are all located within the Newport (Tipperary)_SC_010 sub-catchment in the Mulkear River catchment, all upstream of the UWF Grid Connection development. The route of the associated potential grid connection is assumed in this report to be predominately within the public road corridor to Killonan Station and is also within the River Shannon Catchment, The potential grid connection route may overlap with the UWF Grid Connection along the public road L6009-0. Although it is not likely that Castlewaller Windfarm or its grid connection will be constructed during the same period as UWF Grid Connection, this Other Project is nonetheless included in the cumulative evaluation on a precautionary basis and the potential for windfarm construction works taking place during the same period as UWF Grid Connection works is evaluated. The construction of the consented windfarm will involve both instream works and works in close proximity to watercourses.

Bunkimalta Windfarm (potential): Although it is not expected that the Bunkimalta Windfarm will be constructed at the same time as Upperchurch Windfarm or UWF Grid Connection (due to the recent annulment of the Bunkimalta Windfarm planning permission following the European Court of Justice ruling C-164/17), this project and its associated gird connection are nonetheless included in the cumulative evaluation on a precautionary basis. The potential Bunkimalta Windfarm is expected to be located in the same general area (as previously proposed), upstream of the UWF Grid Connection only. The Bunkimalta Windfarm is assumed in this report to be similar to the previous application for 16 no. turbines and a substation compound. The turbines are assumed to be located within both the Kileengarrif_SC_010 sub-catchment and the Newport (Tipperary)_SC_010 sub-catchment in the Mulkear River catchment. The construction of the windfarm is assumed to involve both instream works and works in close proximity to watercourses. The grid connection (consented) associated with the potential Bunkimalta is predominately within the public road corridor to Nenagh town and is also within the River Shannon Catchment, though does is not located close to the UWF Grid Connection.

11.5.3 PROJECT DESIGN MEASURES for Lower River Shannon SAC

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures PD15 to PD33 and PD40 to PD46 set out for Local Surface Water Bodies in Section 11.2.3 are also relevant to the River Shannon SAC.

The Project Design Measures outlined in Table 11-42 were developed for the sensitive aspect **Lower River Shannon SAC**.

Table 11-40: UWF Grid Connection Project Design Measures relevant to Lower River Shannon SAC

PD ID	Project Design Environmental Protection Measure (PD)
PD20	At Mountphilips Substation site, all excavated material will be removed for temporary or permanent storage at designated berms, which will be located more than 25m away from the watercourses on Mountphilips Substation site. All storage berms will be graded and sealed following emplacement. The berms will be covered if there is a risk of erosion. Temporary silt control methods such as silt fencing will be placed around all overburden storage areas. The existing vegetative buffer between the berms and the nearest watercourses will be maintained and no works will occur in the buffer zone.
PD21	At Mountphilips Substation site, the permanent storage berms will be along the new access road and around the substation compound will be planted with local provenance native fruiting hedge species, with grasses and native flower species common to the surrounding vegetation sown along the sides of the berms. Local provenance native wildflower seed of flowering plants like clovers, vetches and knapweed will be included. Revegetation works will take place at the soonest practicable opportunity after emplacement.
PD22	Outside of the Mountphilips Substation site, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the UWF Grid Connection Waste Management Plan. Loads of excavated material will be covered during transportation to prevent spillages of excavated material.
PD23	All Joint Bays for the 110kV UGC will be located at least 50m from a Class 1 or Class 2 watercourse and at least 25m from Class 3 or Class 4 watercourses.
PD24	Outside of the Mountphilips Substation site, where dewatering of trenches or excavations is required for the 110kV UGC, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated using a mobile water treatment train and then discharged via a silt bag to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD25	Construction works along the 110kV UGC route will cease during heavy or prolonged rainfall events, and any open trenches or excavations will be covered. Use of weathering forecasting will be undertaken in advance of works.
PD26	A phased approach will be undertaken in relation to excavations, excavation dewatering and any culvert replacement works, where these works occur within 50m of a watercourse. The phased approach will only permit one of main potential sediment producing activities (i.e. excavations, excavation dewatering or culvert replacement works), to be carried out within 50m of a watercourse, at any one

	time.
PD28	Along the 110kV UGC on the public road, where works will take place within 50m of a watercourse, additional mitigation measures will be implemented which include silt fencing and placement of sandbag arrangements along preferential surface water flowpaths on the road pavement. Following works on any particular section, any works debris will be removed from the road before the sandbags and silt fences are removed.
PD29	Cable trenching works, joint bay chamber installation and culvert replacement works on the section of 110kV UGC between W13 and W20 (inclusive) and the culvert replacement works at W32 and W34 will only be completed during dry weather in the dryer months of the year – i.e. February to September included. This will minimise/avoid the requirement for any excavation dewatering as a result of waterlogged soils or surface water runoff. None of these 110kV UGC sections are within the Lower River Shannon SAC.
PD30	Lines of silt fencing and sandbags will be erected along the edge of the road so that surface water runoff from adjacent construction works areas is captured and directed to the excavated trench, where it can be pumped and treated before being released, as per PD24.
PD31	Works to bridge parapet walls at watercourse crossings W7, W36, W53 will be carried out during dry weather, and debris netting will be fixed to the outside of the walls in order to prevent any debris falling into the watercourse below.
PD33	All new permanent watercourse culverts at the Mountphilips Substation site and any replacement culverts along the public road for the 110kV UGC will be sized to cope with a minimum 100-year flood event.
PD34	Only precast concrete culverts or structures will be used at the watercourse crossing locations at Mountphilips Substation site and for any culvert replacements along the 110kV UGC. Only precast concrete chambers will be used at Joint Bay locations. No batching of wet cement will take place on-site.
PD35	Concrete pours will be required for the 110kV UGC cables trench. Only chutes will be washed out at the works locations into the cable trench, with the washout of the tank taking place at the concrete supplier depot. Concrete chute washouts within the SAC boundary will take place into designated bins for removal to the designated concrete wash settlement pond at the Mountphilips Substation site.
PD36	The sections of 110kV UGC trenches that overlap the Lower River Shannon SAC will be lined with an impermeable geotextile material to prevent potential migration of cement from the trench base or sides into the SAC.
PD37	In addition to PD22, there will be no storage of overburden within the Lower River Shannon SAC.
PD38	110kV UGC works outside of Mountphilips Substation site will be carried out entirely on paved roads and where the 110kV UGC crosses watercourses, the works will be carried out over the existing bridges and over/under existing culverts. No in-streams works are proposed at any watercourse crossing points (including the Newport River and Bilboa River crossings) within the boundary of the Lower River Shannon SAC and therefore there will be no placement of cement or other materials within the river channels or on the river banks within the SAC.
PD39	In addition to PD42, there will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within 100m of the boundary of the Lower River Shannon SAC.
PD40	In addition to PD29, all 110kV UGC works within the boundary of the Lower River Shannon SAC will only be completed during dry weather in the dryer months of the year – i.e. February to September included.
PD41	The instream works at W1, W2 and W3 at Mountphilips Substation site, and the culvert replacement works at the 13 existing culverts on the public road, and all works (including concrete placement) within the boundary of the Lower River Shannon SAC, will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice Measures are followed.
PD42	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.

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PD43	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 at the Mountphilips Substation site. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored at the designated location in the temporary compound and all operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD44	Overnight parking of plant and machinery will only be permitted at the temporary compound at the Mountphilips Substation site and at a distance greater than 50m from watercourses.
PD45	The horizontal directional drilling works at W8 and W9 will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will advise the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized water tight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures; In the event of break-out occurring in the river bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures; In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point; and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the UWF Grid Connection Environmental Management Plan (see Volume D).
PD46	All construction works will be monitored on a daily basis by the Environmental Clerk of Works and by members of the Environmental Clerk of Works team (for example Site Ecologist) as required, for compliance with the Environmental Commitments, which include the Project Design Measures, as per the UWF Grid Connection Environmental Management Plan (see Volume D).
PD47	Surface water quality monitoring of the main watercourses downstream of the works will be carried out to ensure that the downstream water quality status in the receiving water is maintained and that there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009. Where non-compliance in water quality is measured or recorded, works will stop until the issue is resolved. The surface water monitoring locations and sampling programme are defined in the Surface Water Management Plan for UWF Grid Connection. The Surface Water Management Plan is part of the UWF Grid Connection Environmental Management Plan (see Volume D).
PD48	The new permanent cross structures at the Mountphilips Substation site and the replacement culvert at W14 along the R503 will be bottomless or clear spanning.
PD49	In-stream works at Mountphilips Substation site and culvert replacement works at W14 along the R503 Regional Road will only be undertaken during the IFI specified period (July, August and September) and will be carried out to best practice (IFI, 2016).
PD50	Culvert replacement works along the 110kV UGC will not be undertaken without isolation of flow within the watercourse. Isolation of flow will be achieved through the use of sandbags filled with clean, washed sand. Any fish within the isolated section will be removed prior to works commencing. This will require the engagement of licensed fisheries personnel to deplete the works area 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 using a flume

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	(pipe), with deflector plates used on the downstream side of the flume to reduce the hydraulic power of the water. Construction works at the crossing will be followed by site-specific reinstatement measures to ensure the equilibrated restoration of flow character and morphology within the affected reach to achieve baseline character and avoid any deterioration in morphology as required under the Water Framework Directive (WFD). Measures will include: bank stabilization measures, reinstatement of bank slope and character; and reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and the use of deflector plates during the restoration of flow. As per PD41, culvert replacement works will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice are followed. These measures will ensure that the baseline character is maintained and will ensure that a deterioration in morphology is avoided, as required under the Water Framework Directive. This in turn will protect Aquatic Ecology.

Cumulative Information:

Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the fundamental design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5 in Volume C4: EIAR Appendices.

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11.5.4 EVALUATION OF IMPACTS to Lower River Shannon SAC

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Lower River Shannon SAC.

As a result of the exercise, some impacts were included and some were excluded.

Table 11-41: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Surface water quality impacts due to earthworks (excavations and overburden storage)	*Surface water quality impacts due to tree felling (in conifer plantations – Other Elements only), (Construction Stage)*
Surface water quality impacts from dewatering of excavations (Construction Stage)	*Increased flood risk (Operational Stage)*
Surface water quality impacts from watercourse crossing works (Construction Stage)	*Surface Water Quality Impacts due to suspended solid input from permanent hardstanding surfaces (Operational Stage)*
Surface water quality impacts during directional drilling works (Construction Stage)	*Decommissioning Stage Effects*
Water quality impacts from fuels, oils and chemicals, (Construction Stage)	
Water quality impacts from cement-based compounds, (Construction Stage)	
Cumulative Impact Evaluation (with Other Projects): Surface Water Quality Effects from Suspended Solids	

The source-pathway-receptor links for included impacts are described in the Impact Evaluation Tables in the next sections. **The Impact Evaluation Tables are presented in the following sections 11.5.4.1 to 11.5.4.6.**

Cumulative evaluation with Other Projects is presented in Section 11.5.4.7.

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections in Section 11.5.4.8.

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11.5.4.1 Impact Evaluation Table: Surface water quality impacts due to earthworks (excavations and overburden storage)

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Earthworks and groundwork
Cumulative Impact Source: Earthworks and groundwork in relation to Other Elements
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Indirect surface water quality impacts on the SAC from entrained sediment in surface water runoff arsing during excavations and groundwork associated with construction works. There will also be a requirement for temporary and permanent overburden storage areas along the construction works area and these storage areas also have the potential to create entrained sediment in runoff as a result of their erosion.
Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Surface water quality impacts due to earthworks (excavations and overburden storage

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The potential for water quality effects will arising during earthworks required for the Mountphilips Substation and End Masts, new permanent access road, widened entrance, drainage system and the temporary compound at the Mountphilips Substation site and the cable trench and joint bays for the 110kV UGC (29 km of 30.5km are within the catchment area of the Lower River Shannon SAC),

In total, up to 5,000m^3 of overburden from excavations at Coole and Mountphilips (for Mountphilips Substation, End Masts, access road, entrance, and drainage system at the Mountphilips Substation site and also 110kV UGC between the Site Entrance in Coole to the Mountphilips Substation) will be permanently stored within the construction works area at the Mountphilips Substation site as linear berms alongside the new access road and around the substation compound. Erosion of these storage areas potentially could result in surface water quality impacts on the downstream SAC.

There will be no storage of overburden material required for the 110kV UGC where it occurs on public road outside of the Mountphilips Substation site, as all material excavated from the 110kV UGC trench will be removed to a licensed waste facility.

The potential for effects is considerably reduced by the carrying out of trenching works and construction of joint bay chambers during dry weather in the dryer months of the year – i.e. February to September included (when ground conditions are typically dryer) along the sections of the 110kV UGC route along the public road where there are numerous smaller watercourses being crossed that drain directly into the main watercourses. Particular areas to note include Clare River (W13 – W20, and W32 and W34) and works within the boundary of the SAC (Project Design Measure).

Due to the scheduling of works and the fact that there will be no storage of excavated material within, or in close proximity (6km upstream) to, the SAC boundary, the assimilative capacity provided by local watercourses along with the distributed and transient nature of the works upstream of the SAC, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- The working footprint will be spread out over a large geographical area (latitudinal distance of 22km) within

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the Mulkear River catchment;

- All excavated material from public roads as a result of the UWF Grid Connection will be removed to landfill, therefore there will be no overburden of material arising from excavation in the public road.
- Approx. 5,000m^3 (from excavations at Coole/Mountphilips) will be stored at Mountphilips Substation in the form of a linear berm around the substation and along new access road. Berms will be seeded at the soonest practicable opportunity (Project Design Measure). Mountphilips Substation excavation works are located c. 6km upstream of the Lower River Shannon SAC
- The majority of the watercourses intercepted by the works area (74%) are drains or marginal headwater watercourses with low flows, and therefore the effectiveness of them acting as a surface water flowpath to the downstream Lower River Shannon SAC is limited;
- The transient nature of the works within local surface water bodies upstream of the SAC;
- As discussed in Section 11.2.4, impacts on local surface water bodies are expected to be Imperceptible, and therefore effects on the Lower River Shannon SAC are expected to be of lower significance due to the larger downstream distance and dilution capacity of local surface water bodies;
- All works within the SAC will be confined to public road surface, and where works traversing the Rockvale Bridge and Anglesey Bridge, will be confined to the bridge;
- All effects will be brief to temporary in duration and reversible.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects with the Other Elements in the catchment of the Lower River Shannon SAC relates to the Inch (Bilboa)_010 local surface water body which form part of the Bilboa_SC_010 sub-catchment. In the Bilboa_SC_010 sub-catchment, works involving excavations will be required for UWF Grid Connection, UWF Related Works and Upperchurch Windfarm. No storage of overburden material will be required for UWF Grid Connection in the Bilboa_SC_010 sub-catchment as all material excavated from the 110kV UGC trench will be removed to a licensed waste facility.

Temporary and permanent storage of excavated material (overburden) will be required for UWF Related Works and Upperchurch Windfarm where total overburden storage within the Bilboa_SC_010 sub-catchment will be: up to 9,080m^3 of permanently stored overburden and up to 11,400m^3 temporarily stored overburden. It is possible that erosion of these storage areas could result in surface water quality impacts locally. Due to the transient and spread out nature of the UWF Grid Connection, Upperchurch Windfarm and UWF Related Works and the fact that most of the local watercourses, in the Bilboa_SC_010 sub-catchment, are drains or marginal watercourses (Class 3 or Class 4), the magnitude of impact is considered to be Negligible.

The potential for Bunkimalta Windfarm, Castlewaller Windfarm and Newport Town Park to cause cumulative effects with UWF Grid Connection, is evaluated in Section 11.5.4.7 Cumulative Impacts Evaluation.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- In-combination effects on surface water quality within Bilboa_SC_010 sub-catchment, within the catchment of the Lower River Shannon SAC, are likely to be negligible due to the small extent of in-combination works in this catchment – i.e. the majority of UWF Related Works, Upperchurch Windfarm and UWF Replacement Forestry are located in the Suir catchment, which limits the potential for cumulative impacts.
- Temporary nature of the works

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Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: UWF Related Works within the Mulkear River catchment will include 1.7km of Internal Windfarm Cabling (of the total 17.9km) and Haul Route works (HW7 - HW10) at 3 no. locations which mainly involves public road widening.

Temporary storage of overburden relating to excess material excavated from the Internal Windfarm Cabling within the Whole Project Cumulative Study Area (Mulkear River catchment) will amount to approximately

498m^3 of material. No permanent storage of overburden is proposed within the Mulkear River catchment.
Due to the relatively small scale of the UWF Related Works within the River Shannon catchment, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- The small footprint area of the construction works within the regional Mulkear River catchment;
- The majority of the 1.7km of the cabling will be installed within the consented UWF Access roads, and therefore this reduces overall excavation requirements;
- The majority of the UWF Related Works within the Whole Project Cumulative Study Area (Mulkear River catchment) are more than 50m from a watercourse (there is only 1 no. watercourse crossing in the River Shannon catchment); and,
- The effects are likely to be brief to temporary in duration and reversible in nature

Element 3: UWF Replacement Forestry– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude:
Temporary and permanent storage of excavated material (overburden) within the Bilboa_SC_010 sub-catchment will be: up to 9,080m^3 of permanently stored overburden and up to 10,902m^3 temporarily stored overburden. Based on Chapter 15 (Hydrology Chapter, see Reference Documents Volume F8) and the Sediment and Erosion and Control Plan from the 2013 EIS, release of sediment during the construction phase is likely to have a negative effect on the River Shannon and its tributaries.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- A process of mitigation by design was adopted by the Upperchurch Windfarm design team whereby all the windfarm infrastructure including overburden storage areas are located more than 50m from a stream and 20m from a drain (with the exception of the 1 no. watercourse crossing); and,
- The measures outlined in the EIS and within the Sediment and Erosion and Control Plan will ensure the development of the wind farm will not have a significant negative impact on the surface water quality.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Newport Town Park, Castlewaller Windfarm and potential Bunkimalta Windfarm
- Please refer to Section 11.5.4.7 for cumulative information

Evaluation of Other Cumulative Impacts – Surface water quality impacts due to earthworks (excavations and overburden storage)

Whole UWF Project Effect

Cumulative Impact Magnitude:
Excavations for UWF Grid Connection, UWF Related Works and Upperchurch Windfarm will take place with the catchment area of the Lower River Shannon SAC. The majority of these works will relate to the UWF Grid Connection works. However, any effects will be brief to temporary, and the UWF Grid Connection works in the catchment generally comprise trenching works in public road pavements and in bridge structures. Any material arising from 110kV UGC trenching and excavations in the public road will be sent to licensed waste facilities.
UWF Related Works and Upperchurch Windfarm will not contribute significantly to works in the Mulkear River catchment, due to the fact that the majority of the UWF Related Works and Upperchurch Windfarm are located in the River Suir catchment, the cumulative magnitude of impact is expected to remain at **Negligible.**

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Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 11-7, **Negligible** magnitude combined with the **Extremely High Importance** of the SAC; • The majority of UWF Grid Connection construction works areas are contained within the Mulkear River catchment while the majority of the Upperchurch Windfarm and UWF Related Works are located in the River Suir catchment; • The majority of the UWF Related Works within the Whole Project Cumulative Study Area (Mulkear River catchment) are more than 50m from a watercourse (there is only 1 no. watercourse crossing in the River Shannon catchment and no instream works at this crossing); • The Upperchurch Windfarm will have a Sediment and Erosion and Control Plan, and therefore no significant effects on the Lower River Shannon SAC are anticipated; and, • Therefore, the in-combination effects on surface water quality at the downstream Lower River Shannon SAC will be negligible.
All Elements of the Whole UWF Project with Other Projects or Activities - *Please refer to Section 11.5.4.7 for cumulative evaluation*

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11.5.4.2 Impact Evaluation Table: Surface water quality impacts from dewatering of excavations

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Excavation Dewatering
Cumulative Impact Source: Excavation Dewatering in relation to Other Elements
Impact Pathway: Runoff and surface water flowpaths

Impact Description: There will be a requirement to have the cable trenches relatively dry prior to the adding of the concrete. Any pumped water (from surface water inflows or from groundwater inflows) will likely have high levels of sediments and therefore has the potential to impact on local surface water quality.

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Surface water quality impacts from dewatering of excavations

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The River Shannon SAC extends as far upstream as the Newport River (at Rockvale Bridge) and Bilboa River (at Anglesey Bridge) watercourse crossing locations and is also mapped along the public road at 6 locations (local roads on either side of Rockvale bridge north of Newport, a local road L6013-0 to the north of Newport, the regional road R503 at Anglesey Bridge and 3 short sections of the R503 regional road to the east of Rear Cross village).

No significant excavation dewatering is expected for the UWF Grid Connection as the route (outside of the Mountphilips Substation site) is entirely along the carriageway of public roads which has road drainage in place. The potential for effects is considerably reduced by the carrying out of trenching works and construction of joint bay chambers during the spring/summer months (when ground conditions are typically dryer) along the sections of the 110kV UGC route along the public road where there are numerous smaller watercourses being crossed that drain directly into the main watercourses. Particular areas to note include Clare River (W13 – W20) and W32 and W34 and works within the boundary of the SAC (Project Design Measure);

Regardless all pumped water, outside the Mountphilips Substation site, will be treated using a mobile water treatment train and then discharged via a silt bag (Project Design Measure), the effects are likely to be Negligible.

At Mountphilips Substation site, no significant dewatering requirement is anticipated and any pumped water will be treated and then discharged at a location away from any local watercourses (Project Design), the effects are likely to be Negligible

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- There will be no direct discharge of pumped water into any watercourse or drain (Project Design Measure).
- At Mountphilips Substation site, any pumped water will be treated and then discharged at a location away from any local watercourses (Project Design)
- No significant dewatering requirement is expected during the construction of the Mountphilips Substation itself;

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- At the 110kV UGC works locations on the public road network, all pumped water will be treated using a mobile water treatment train and then discharged via a silt bag (Project Design);
- The route of the 110kV outside of the Mountphilips Substation site (within the Mulkear River catchment) is entirely along the carriageway of public roads and therefore significant trench dewatering is not anticipated;
- Cable trenching works, joint bay chamber installation and culvert replacement works on the section of 110kV UGC between W13 and W20 (inclusive) and the culvert replacement works at W32 and W34 will only be completed during dry weather in the dryer months of the year – i.e. February to September included. This will minimise/avoid the requirement for any excavation dewatering as a result of waterlogged soils or surface water runoff. None of these 110kV UGC sections are within the Lower River Shannon SAC. (Project Design Measure);
- Lines of silt fencing and sandbags will be erected along the edge of the road so that surface water runoff from adjacent construction works areas is captured and directed to the excavated trench, where it can be pumped and treated before being released (Project Design Measure);
- Works will not be completed during extreme or prolonged rainfall events in order reduce the risk of surface water inflows into the trench; and,
- All effects will be localised, brief to temporary in duration and reversible

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects with the Other Elements of the Whole UWF Project relates to the following local waterbodies: Inch (Bilboa)_010 local surface water body which is within the Bilboa_SC_010 sub-catchment of the larger Mulkear River catchment.

No significant excavation dewatering is expected for the UWF Grid Connection as the route is entirely located along the carriageway of public roads. Any effects are likely to be negligible. No excavation dewatering is expected for Internal Windfarm Cabling or the Upperchurch Windfarm due to the upland location of the works and based on the results of trial pit investigations at the windfarm site which had no groundwater inflows.

The potential for Bunkimalta Windfarm, Castlewaller Windfarm and Newport Town Park to cause cumulative effects with UWF Grid Connection, is evaluated in Section 11.5.4.7 Cumulative Impacts Evaluation.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC; and,
- No significant dewatering requirements are likely.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Only 1.7km of the Internal Windfarm Cabling is located within the Mulkear River catchment, and no dewatering is expected based on the trial pits undertaken at the windfarm site which were dry.

Significance of the Impact: No Likely Impact

Rationale for Impact Evaluation:

- No dewatering with respect to the UWF Related Works is anticipated.

Element 3: UWF Replacement Forestry– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013, limited and discontinuous seepage is expected from the sides of the turbine bases in sloping ground, and this is more likely to occur wetter winter periods. No significant effects on surface water quality were identified as a result of excavation

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dewatering.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- Only 2 no. turbines are located within the Mulkear River catchment;
- Use of interceptor drainage to prevent runoff entering excavations;
- All pumped water must be captured and treated; and,
- There will be direct discharge of treated pumped water into the existing drainage network

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Newport Town Park, Castlewaller Windfarm and potential Bunkimalta Windfarm

- Please refer to Section 11.5.4.7 for cumulative information

Evaluation of Other Cumulative Impacts – Surface water quality impacts from dewatering of excavations

Whole UWF Project Effect

Cumulative Impact Magnitude:

Given that any pumped water from UWF Grid Connection will be treated and then discharged at a location away from any local watercourses (at Mountphilips Substation site), and will be treated using a mobile water treatment train and then discharged via a silt bag, and taking into account the location of the majority of the development on the public road network, with no excavation dewatering expected from the Other Elements, significant dewatering is not expected for any element of the project, and therefore the impact magnitude will be **Negligible**

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- No significant excavation dewatering is likely for any of the project elements within the Mulkear River catchment;
- All pumped water will be treated using a mobile water treatment train and then discharged via a silt bag (Project Design Measure),
- Cable trenching works, joint bay chamber installation and culvert replacement works on the section of 110kV UGC between W13 and W20 (inclusive) and the culvert replacement works at W32 and W34 will only be completed during dry weather in the dryer months of the year – i.e. February to September included. This will minimise/avoid the requirement for any excavation dewatering as a result of waterlogged soils or surface water runoff. None of these 110kV UGC sections are within the Lower River Shannon SAC. (Project Design Measure); and,
- All effects will be localized and brief to temporary in nature.

All Elements of the Whole UWF Project with Other Projects or Activities

- *Please refer to Section 11.5.4.7 for cumulative evaluation*

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11.5.4.3 Impact Evaluation Table: Surface water quality impacts from watercourse crossing works

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Watercourse Crossing Works
Cumulative Impact Source: Watercourse Crossing Works in relation to Other Elements
Impact Pathway: Surface water downstream of the works area

Impact Description: Indirect surface water quality impacts as a result of sediment release during in-stream works such as open trenching for the cabling and culvert replacement /emplacement works within watercourses upstream of the Lower River Shannon SAC within the Mulkear River catchment.

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Surface water quality impacts from watercourse crossing works

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Instream works will be required at the 3 watercourses at the Mountphilips Substation site. Outside of the Mountphilips Site, there are 58 no. existing watercourse crossing structures along the road network. The 110kV UGC will potentially involve the replacement of 13 no. of these culverts within the Mulkear River catchment, where instream works will relate to the replacement of existing culverts in the road. Water quality effects can potentially occur downstream during the crossing works.

The potential for effects is considerably reduced by the carrying out of trenching works and construction of joint bay chambers during the spring/summer months (when ground conditions are typically dryer) along the sections of the 110kV UGC route along the public road where there are numerous smaller watercourses being crossed that drain directly into the main watercourses. Particular areas to note include Clare River (W13 – W20) and W32 and W34 and works within the boundary of the SAC (Project Design Measure);
Due to the fact that instream works largely involve culvert replacement, the assimilative capacity provided by local watercourses, the location of instream works in two separate sub-catchments, along with the distributed and transient nature of the works upstream of the SAC, the magnitude of impact is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7**,** Negligible magnitude combined with the Extremely High Importance of the SAC; The majority of the watercourses (74%) intercepted by the UWF Grid Connection upstream of the SAC are drains or marginal watercourses which have typically low flows, and therefore the effectiveness of them acting as surface water flowpaths to the downstream SAC is limited;
- As assessed in Section 11.2.4, all impacts on local surface water bodies (immediately downstream of the crossings works) are only expected to be Imperceptible to Slight and therefore effects on the downstream Lower River Shannon SAC are expected to be of much lower significance because (1) the large geographical distribution of the watercourse crossings within several local surface water bodies upstream of the SAC and (2) high assimilative capacity of the rivers within the SAC downstream of the works (i.e. Newport River, Clare River and Bilboa River);
- The transient nature of the watercourse crossing works within local surface water bodies upstream of the SAC; and,
- All effects will be brief to temporary in nature and reversible.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Due to the fact that there are no instream works required for UWF Related

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Works site within the Mulkear River catchment, and no instream works required for Upperchurch Windfarm, UWF Replacement Forestry or UWF Other Activities, it is considered that there is no potential for in-combination effects with the Other Elements of the Whole UWF Project.

The potential for Bunkimalta Windfarm, Castlewaller Windfarm and Newport Town Park to cause cumulative effects with UWF Grid Connection, is evaluated in Section 11.5.4.7 Cumulative Impacts Evaluation.

Significance of the Cumulative Impact: No cumulative impact

Rationale for Cumulative Impact Evaluation:

- No instream works for the Other Elements required in the Mulkear River catchment.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: There is only 1 no. watercourse crossing within the Mulkear River catchment for the UWF Related Works, however no in-stream works are required for this crossing and therefore no effects on the SAC are expected.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- There is only 1 no. watercourse crossing for the UWF Related Works in the River Mulkear River catchment, no instream works are required.

Element 3: UWF Replacement Forestry– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude: There is no watercourse crossing relating to Upperchurch Windfarm in the Mulkear River catchment. Therefore, there is no potential for impact.

Impact Evaluation: No Impact

Rationale for Impact Evaluation:

- There is no watercourse crossing relating to Upperchurch Windfarm in the Mulkear River catchment.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Newport Town Park, Castlewaller Windfarm and potential Bunkimalta Windfarm
- Please refer to Section 11.5.4.7 for cumulative information

Evaluation of Other Cumulative Impacts – Surface water quality impacts from watercourse crossing works

Whole UWF Project Effect

Watercourse crossing works in the Regional Mulkear River catchment are only associated with the UWF Grid Connection element of the Whole UWF Project. No Instream works required for any Other Elements in the Regional Mulkear River catchment. The whole project impact magnitude will be as per UWF Grid Connection impact magnitude above – i.e. Imperceptible.
The cumulative magnitude of impact will be **Negligible**.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

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- As per Table 11-7, **Negligible** magnitude combined with the **Extremely High Importance** of the SAC,
- Watercourse crossings works within the Mulkear River catchment are exclusively associated with the UWF Grid Connection.

All Elements of the Whole UWF Project with Other Projects or Activities

- *Please refer to Section 11.5.4.7 for cumulative evaluation*

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11.5.4.4 Impact Evaluation Table: Surface water quality impacts during directional drilling works

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Groundworks for directional drilling
Cumulative Impact Source: None – no drilling required for Other Elements
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Surface water quality impacts on the Lower River Shannon SAC as a result of the directional drilling works under the bed of the watercourse (and under the existing crossing structure) at the W8 and W9 watercourse crossings, in the Newport[Tipperary]_SC_010 sub-catchment of the Mulkear River catchment. There is a risk of indirect impacts from sediment laden runoff during the launch pit and reception pit excavation works, and from any frac-out occurrence (should it occur). The drilling locations at W8 and W9 are not located within the boundary of the Lower River Shannon SAC, which is approximately 2km downstream at its closest point.

The horizontal directional drilling works at W8 and W9 will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will advise the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized water tight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures; In the event of break-out occurring in the river bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures; In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point; and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the Environmental Management Plan for UWF Grid Connection (Project Design Measure);

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Surface water quality impacts during directional drilling works

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Given that all work will take place from the paved surface of the public road and generation of poor quality runoff is not anticipated, the impact magnitude is considered to be **Negligible**.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, **Negligible** magnitude combined with the **Extremely High** Importance of the SAC;
- The drilling locations are not located within the boundary of the Lower River Shannon SAC, which is approximately 2km downstream at its closest point;
- All work within the mapped SAC boundary will take place from the paved surface of the public road, and therefore the generation of sediment laden runoff is not expected;

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- Excavation work will only be required for the launch pit and reception pit, and will only take place in paved surfaces;
- The launch pit and reception pit will not have to be kept free of water, and therefore no pumping will be required (no risk of discharge entering the watercourse);
- All runoff from the works area will be collected and will be treated using a mobile water treatment train and then discharged via a silt bag. **(**Project Design Measure**);**
- There will be no direct discharge of any treated water to local watercourses;
- The application of environmental protection project design measures during drilling activities;
- Effects will be temporary in duration and reversible.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Due to the fact that there are no drilling works required for any of the Other Elements within the Mulkear River catchment, and no Other Element occurs within the Newport[Tipperary]_SC_010 sub catchment, and the fact that the Other Elements are mainly located in the River Suir catchment, it is considered that there is no potential for in-combination effects with the Other Elements of the Whole UWF Project.

Significance of the Cumulative Impact: No cumulative impact

Rationale for Cumulative Impact Evaluation:

- No Other Elements require directional drilling works or instream works in the Mulkear River catchment.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: None

Significance of the Impact: No impact

Rationale for Impact Evaluation:

- No instream works or drilling works within the Mulkear River catchment.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude: None

Significance of the Impact: No impact

Rationale for Impact Evaluation:

- No instream works or drilling works within the Mulkear River catchment.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Newport Town Park, Castlewaller Windfarm and potential Bunkimalta Windfarm

- Please refer to Section 11.5.4.7 for cumulative information

Evaluation of Cumulative Impacts – Surface water quality impacts during directional drilling works

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All Elements of the Whole UWF Project

Cumulative Impact Magnitude: No potential for effects cumulatively with the Other Elements of the Whole UWF Project – drilling works within the River Shannon catchment is only required for the UWF Grid Connection, and

none of the Other Elements are located in the Newport[Tipperary]_SC_010 sub catchment, where drilling for UWF Grid Connection will take place.
Significance of the Cumulative Impact: No Cumulative Impact
Rationale for Cumulative Impact Evaluation: • There will be no requirement to undertaken drilling for any other element of the Whole UWF Project, and none of the Other Elements are located within the Mulkear River catchment
All Elements of the Whole UWF Project with Other Projects or Activities - *Please refer to Section 11.5.4.7 for cumulative evaluation*

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11.5.4.5 Impact Evaluation Table: Water quality impacts from fuels, oils and chemicals

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Fuel, oils and chemicals
Cumulative Impact Source: Fuel, oils and chemicals
Impact Pathway: Runoff and surface water flowpaths

Impact Description: The plant and equipment that will be used during the construction phase will be run on fuels and oils. This creates the potential for spillage and leakage of hydrocarbons from plant during refuelling or storage of oils and fuels which can impact on downstream SAC.

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Water quality impacts from fuels, oils and chemicals

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:

Plant and equipment will be used at all UWF Grid Connection construction works areas, including 6 locations within the boundary of the Lower River Shannon SAC. However, any spills or leaks are likely to be minor (worst case), isolated and occur rarely. Given that the worst-case effects on local surface water bodies has been assessed to be Imperceptible (see Section 11.2.4.5) and the fact that the majority of the UWF Grid Connection construction works areas are upstream of the SAC, the worst-case effect on the SAC is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- Only relatively small volumes of fuels / oils will be on-site at any one time and therefore no significant effects on local surface water bodies are expected (Refer to Section 11.2.4.5);
- Refueling or overnight parking will not be permitted within 100m of the boundary of the SAC (Project Design Measure);
- Any spills along the 110kV UGC are likely to be small isolated incidents and comprise very small amounts, and the actual residual volumes that might reach the downstream Lower River Shannon SAC are likely to be negligible if any.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects in the UWF Grid Connection Cumulative Study Area (regional Mulkear River catchment) relates to the Bilboa_SC_010 sub-catchment, where UWF Grid Connection, Upperchurch Windfarm and UWF Related Works construction works will also take place. Contamination effects from oil/fuel leakages from construction machinery or from storage areas are unlikely to occur but there is potential for isolated incidents.

Given the distributed nature of the works within several local sub-catchments and the fact that only small volumes of fuel/oil will be present on-site at any one time, the in-combination magnitude of effect is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible.

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Rationale for Cumulative Impact Evaluation:

As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;

- The majority of the UWF Related Works and Upperchurch Windfarm are not located in the regional Mulkear River catchment
- the distributed nature of the works within several local sub-catchments and the fact that only small volumes of fuel/oil will be present on-site at any one time;
- A Fuel and Oil Management Plan is proposed for the Upperchurch Windfarm which will include storage requirements and emergency procedures for dealing with any spills and leaks;
- The additional volumes of oils and fuels that will be present on the Upperchurch Windfarm site as a result of the UWF Related Works will be negligible;
- Effects are likely to be due to small isolated localised spills (worst case) that are very unlikely to contribute to in-combination water quality effects within the local surface water catchments.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Only 1.7km of the Internal Windfarm Cabling is located within the Mulkear River catchment and effects on the downstream SAC are unlikely due to the small volumes that will be present on-site at any one time, and the transient nature of the works.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- The volumes on-site will be very small, and therefore no effects are expected.

Element 3: UWF Replacement Forestry– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology Chapter, see Reference Documents Volume F8) the potential for water quality effects arises from the use and storage of oil and fuels and surface waters downslope of the site can be affected. The effects were considered to be Not Significant for tributaries of the River Shannon.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- A Fuel and Oil Management Plan will be implemented which will detail storage requirements and emergency procedures for dealing with any spills and leaks; and,
- In addition, it should be noted that only 2 no. of the 22 no. Consented UWF turbines are located within the River Shannon catchment.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Evaluation of Other Cumulative Impacts – Water quality impacts from fuels, oils and chemicals

Whole UWF Project Effect

Cumulative Impact Magnitude:
Fuels and oils will be required for construction machinery and equipment used for UWF Grid Connection, UWF Related Works and Upperchurch Windfarm works which will take place with the catchment area of the Lower River Shannon SAC. Given that the majority of the UWF Grid Connection is located within the Mulkear River catchment and the majority of the UWF Related Works and the Upperchurch Windfarm is located within the River Suir catchment, the in-combination magnitude of effect will be as per the UWF Grid Connection which is Negligible.

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Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, **Negligible** magnitude combined with the **Extremely High** Importance of the SAC;
- The use of fuels, oils and chemicals within the Mulkear River catchment will comprises minor volumes over a large geographical area within several local surface water bodies;
- The volumes of oils, fuels and chemicals present within the Mulkear River catchment in relation to the UWF Related Works and Upperchurch Windfarm will also be very small; and,
- Any spills and leaks that do occur (if any) are likely to be small isolated incidents and therefore the potential for cumulative effects on the Lower River Shannon SAC is negligible.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 11.5.2.2.1).

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11.5.4.6 Impact Evaluation Table: Water quality impacts from cement-based compounds

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Cement based compounds
Cumulative Impact Source: Cement based compounds
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the protected species and habitats within the SAC.

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Water quality impacts from cement-based compounds

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
Given that the worst-case effects on local surface water bodies has been assessed to be Imperceptible (see Section 11.2.4.6) and the fact that the majority of the UWF Grid Connection construction works area are upstream of the SAC (with the exception of c. 1090m of the 110kV UGC which overlaps the SAC boundary at the Rockvale Bridge and Anglesey Bridge crossing and 4 no. short stretches along the public roads, but no in-stream works or joint bays are proposed within the SAC boundary), and the lining of the sections of trenches that overlap the SAC with an impermeable geotextile to prevent any potential migration of cement from the trench base/sides, the worst-case effect on the SAC is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- Only relatively small volumes of cement-based compounds will be on-site at any one time, and therefore no significant effects on local surface water bodies are expected (Refer to Section 11.2.4.6);
- The volume of cement that will be used within the SAC boundary will be small (c.250m^3), and in the context of the location of the trench in the public road pavement;
- Any spills along the 110kV UGC are likely to be small isolated incidents and comprise very small amounts, and the actual residual volumes that might reach the downstream Lower River Shannon SAC are likely to be negligible;
- The sections of trenches that overlap the SAC along the R503 will be lined with an impermeable geotextile to prevent potential migration of cement from the trench base/sides (Project Design Measure);
- Concrete chute washouts within the SAC boundary will take place into designated bins for removal to the designated concrete wash settlement pond at the Mountphilips Substation site;
- No in-streams works are proposed at any watercourse crossing points (including the Newport River and Bilboa River crossings) within the boundary of the Lower River Shannon SAC and therefore there will be no placement of cement or other materials within the river channels or on the river banks within the SAC.
- All 110kV UGC works within the boundary of the Lower River Shannon SAC will only be completed during dry weather in the dryer months of the year – i.e. February to September included.
- A member of CIEEM and the Institute of Fisheries Management will be present for all concrete pours within the SAC overlapping Sections (Project Design Measure);
- The Mountphilips Substation is set back more than 25m from local watercourses, and 6km from the downstream SAC and therefore no impacts on water quality from cement based compounds is anticipated.

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Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects is limited to the Bilboa_SC_010 sub-catchment in which cement is being used for each Element. Concrete will be used for the UWF Grid Connection 110kV UGC trench and also for 2 no. Consented UWF Turbines within the Bilboa_SC_010 sub-catchment. Given the relatively small volumes of concrete which will be present on-site at the UWF Gird Connection trench at any one time, the in-combination magnitude of effect is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC:
- The relatively small volumes of cement on-site at the UWF Grid Connection trench at any one time with the potential to cause surface water quality impacts will be small;
- Application of project design measures for UWF Grid Connection;
- Concrete Control Procedures will be included in the Environmental Management Plan for the Upperchurch Windfarm, and therefore no significant in-combination effects with respect to the UWF Grid Connection are expected.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
The use of cement-based compounds will be limited to the Telecom Relay Pole foundation (c.4m^3) and 9 no. road crossings, all of which are within the River Suir catchment area. Therefore, there is no potential for impacts to the Lower River Shannon SAC.

Significance of the Impact: No Impact

Rationale for Impact Evaluation: No cement based compounds will be required for UWF Related Works where it overlaps the catchment area of the Lower River Shannon SAC.

Element 3: UWF Replacement Forestry– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013 EIS, there is a risk of spillage and runoff from cement during placing of concrete and also during washing out of chutes. The use of cement will mainly be used for turbine base construction. In addition, only 2 no. turbines of the 22 no. permitted are located within the River Shannon catchment. The effects on tributaries within the River Shannon were assessed to be Not Significant.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- During pouring containment measures will be put in place to keep cement within the foundation area and prevent it entering the local drainage routes;
- Washing of truck will be limited to the chutes, and a dedicated concrete washout area will be available on-site; and,
- In addition, please note only 2 no. of the 22 no. permitted turbines are located within the River Shannon catchment.

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Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.5.2.2.1*

Evaluation of Other Cumulative Impacts – Water quality impacts from cement-based compounds
Whole UWF Project Effect
Cumulative Impact Magnitude: Cumulative effects from cement-based compounds for the Whole UWF Project within the Mulkear River catchment area relates to concrete used in 2 no. Consented UWF Turbine foundations along with concrete used for the UWF Grid Connection 110kV UGC and for foundations at Mountphilips Substation. Given that the majority of the UWF Grid Connection is located within the Mulkear River catchment and the majority of the Upperchurch Windfarm is located within the River Suir catchment, the in-combination magnitude of effect will be as per the UWF Grid Connection which is **Negligible**.
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 11-7, **Negligible** magnitude combined with the **Extremely High** Importance of the SAC; • The use of cement-based compounds within the Mulkear River catchment will comprises minor volumes over a large geographical area within several local surface water bodies; • The volumes of cement-based compounds present within the River Shannon catchment in relation to the Upperchurch Windfarm will also be small (only 2 No. Consented UWF Turbines will be constructed within the catchment area of the Lower River Shannon SAC); and, • Any spills that do occur are likely to be small isolated incidents and therefore the potential for cumulative effects is negligible.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 11.5.2.2.1).

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11.5.4.7 Cumulative Impacts Evaluation : Surface Water Quality Effects from Suspended Sediments

Cumulative Impact Description	
Project Stage	Construction Stage

Source: Earthworks, Dewatering, Watercourse Crossing Works including directional drilling works, Storage of Overburden

Cumulative Source: Forestry felling, Earthworks, storage of overburden, Dewatering and Watercourse Crossing Works

Cumulative Impact Description:
Indirect surface water quality impacts as a result of watercourse crossings, earthworks, groundworks and storage of overburden within the Mulkear River catchment is associated mainly with the UWF Grid Connection element of the Whole UWF Project, sources of impacts could also be associated with construction works for the consented Newport Town Park, Castlewaller Windfarm and the potential Bunkimalta Windfarm, should these projects be constructed during the same period as UWF Grid Connection.

Impact Quality: Negative

Individual Evaluation of the UWF Grid Connection and Other Elements and Other Projects

Element 1: UWF Grid Connection – direct/indirect impact

UWF Grid Connection Impact Magnitude:
Mountphilips Substation and 29km (of 30.5km) of the 110kV UGC are located within the Mulkear River catchment, with the majority of works upstream of the Lower River Shannon SAC
Due to the large geographical spread and transient nature of the works within the Mulkear River catchment the fact that the majority of the grid route is along public roads, the localized nature of the Mountphilips Substation works and the Project Design Measures which will protect water quality in the SAC, the magnitude of impact is likely to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, negligible magnitude combined with the Extremely High Importance of the SAC;
- The working footprint is spread out over a large geographical area (29km) within the Mulkear River catchment; The majority (74%) of the watercourses along the 110kV UGC are drains or marginal headwater watercourses with low flows, and therefore the effectiveness of them acting as a surface water flowpaths to the down-stream Lower River Shannon SAC is limited;
- The relatively small footprint and localized nature of the Mountphilips Substation;
- The transient nature of the works within local surface water bodies upstream of the SAC;
- The potential for effects is considerably reduced by the carrying out of trenching works and construction of joint bay chambers during the spring/summer months (when ground conditions are typically dryer) along the sections of the 110kV UGC route along the public road where there are numerous smaller watercourses being crossed that drain directly into the main watercourses. Particular areas to note include Clare River (W13 – W20) and W32 and W34 and works within the boundary of the SAC (Project Design Measure);
- As summarised in Section 11.2.4.10, impacts on local surface water bodies are only expected to be Imperceptible, and therefore effects on the downstream Lower River Shannon SAC are expected to be of lower significance; and,
- All effects will be brief to temporary in duration and reversible

Element 2: UWF Related Works

UWF Related Works Impact Magnitude:
UWF Related Works within the Mulkear River catchment will include 1.7km of Internal Windfarm Cabling (of the total 17.9km), and Haul Route works at 3 no. locations which mainly involves public road widening. Any effects

on the SAC are likely to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Imperceptible magnitude combined with the Extremely High Importance of the SAC;
- The small footprint area of the works within the Mulkear River catchment;
- The majority of the 1.7km of the cabling will be installed within the Consented UWF access roads, and therefore this reduces overall excavation requirements;
- The majority of the UWF Related Works within the Mulkear River catchment are more than 50m from a watercourse (there is only 1 no. watercourse crossing in the Mulkear River catchment); and,
- The effects are likely to be brief to temporary in duration and reversible in nature.

Element 4: Upperchurch Windfarm

UWF Impact Magnitude:
Based on Chapter 15 (Hydrology Chapter, see Reference Documents Volume F8) and the Sediment and Erosion and Control Plan from the 2013 EIS, release of sediment during the construction phase is likely to have a negative effect on the River Shannon and its tributaries..

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- Firstly, only 2 no. of the 22 no. consented UWF turbines are located within the Mulkear River catchment;
- A process of mitigation by design was adopted by the Consented Upperchurch Windfarm design team whereby all the windfarm infrastructure is located more than 50m from a stream and 20m from a drain (with the exception of watercourse crossings); and,
- The measures outlined in the EIS and within the Sediment and Erosion and Control Plan will ensure the development of the wind farm will not have a significant negative impact on the surface water quality.

Other Project: Newport Town Park

Impact Magnitude: The footprint of the consented Newport Town Park is entirely located within the Mulkear River catchment, downstream of the UWF Grid Connection (110KV UGC route), and located immediately adjacent to the Newport River and overlaps the Lower River Shannon SAC.

Significance of the Impact: Will not be Significant, as reported in the NIS (2018) for the project

Rationale for Impact Evaluation:

- No groundworks within 5m of the river;
- A Sediment Control Plan will be put in place during the construction phase to control runoff from the site.

Other Project: Castlewaller Windfarm

Impact Magnitude: The footprint of the consented windfarm is entirely located within the Mulkear River catchment, up-stream of the UWF Grid Connection (110KV UGC route). The potential Castlewaller Windfarm grid connection (not currently consented or proposed) is assumed to be located within the catchment (where it is likely to be located predominantly on public roads)

Significance of the Impact: Will not be Significant for the windfarm, as reported in the Castlewaller Windfarm EIS (2011), not significant for the grid connection.

Rationale for Impact Evaluation:

- A Sediment Control Plan will be put in place during the windfarm construction phase to control runoff from the site.
- Although the route of the grid connection is currently not know, it is assumed that the majority of the grid connection within the Castlewaller Windfarm site will be along windfarm roads and along public roads outside of the site.

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Other Project: Bunkimalta Windfarm
Impact Magnitude: The Bunkimalta Windfarm grid connection is also located in the regional Mulkear catchment. It is assumed for the purpose of this cumulative evaluation that at least some of the potential Bunkimalta Windfarm turbines will be located within the Kileengariff_SC_010 and Newport[Tipperary]_SC_010 sub-catchments upstream of the 110KV route. Temporary effects are likely at the downstream SAC. The consented grid connection is partially located within the Mulkear River catchment.
Significance of the Impact: Will not be Significant (will not be consented unless it can be proven that there will be no significant impacts to European Sites)
Rationale for Impact Evaluation: • The design of the windfarm is likely to follow best practice with construction activities located at least a minimum of 50m from watercourses where possible; and, • It is assumed that a Sediment and Erosion Control Plan will be put in place during the construction phase to control runoff from the site.
Evaluation of Other Cumulative Impacts – Surface Water Quality Effects from Suspended Sediments
Cumulative Impact Magnitude: The cumulative magnitude of surface water quality effects due to suspended solids from construction works associated with the Whole UWF Project (UWF Grid Connection, UWF Related Works and Upperchurch Windfarm) and from Newport Town Park, Castlewaller Windfarm and Bunkimalta Windfarm (should these projects be constructed during the same period) is considered to be **Negligible**
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • The transient nature of the 110kV UGC works upstream of the SAC; • The small scale of the UWF Related Works and the Upperchurch Windfarm within the River Shannon catchment; • The Sediment Control Plans that are proposed for the Bunkimalta Windfarm which will prevent significant surface water quality impacts; • The large area of the Mulkear River catchment (~735km^2) catchment and the inherent high assimilative capacity of the Lower Shannon & Mulkear Hydrometric area; and, • The grid connections for both Castlewaller Windfarm and Bunkimalta Windfarm (should they be built) is expected to be predominantly along public roads and therefore impacts on surface water quality are not expected.

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11.5.4.8 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 11-43 below.

Table 11-42: Description and Rationale for Excluded Impacts to Lower River Shannon SAC

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Surface water quality impacts due to tree felling	1,2,4	SW Runoff	Surface Water Quality Impacts due to felling activities	Rationale for Excluding: Neutral effect. No forestry felling required for UWF Grid Connection. No felling required for UWF Related Works or Upperchurch Windfarm within the Mulkear River catchment
Operational Stage				
Runoff form Permanent hardstanding and flood risk from permanent watercourse crossing culverts	1, 2, 4	SW Flowpaths	Increased flood risk	Rationale for Excluding: Neutral effect. There are no new watercourse crossing structures within the Lower River Shannon SAC. All new permanent watercourse crossing structures are on small headwater watercourses which are upstream of the SAC. Effects on local surface water bodies with respect to permanent crossings has being assessed to be imperceptible because any new or replaced culverts will be sized to cope with a 100-year flood flow as per the Project Design Measure (see Section 11.2.4.9) and therefore effects on the downstream SACs is considered to be Neutral. The effects of runoff on local surface water bodies was also assessed to be imperceptible due to the distributed nature of the permanent hardstanding infrastructure within several catchments over a large geographical area and the relatively small permanent footprint within individual local catchments (refer to Section 11.2.4.10). As such, effects on the downstream SACs will be Neutral.
Surface water quality impacts from runoff from permanent hardstanding surfaces	1,2, 4	SW Flowpaths	Surface Water Quality Impacts due to suspended solid input from permanent hardstanding surfaces	Rationale for Excluding: Neutral effect. Due to the distributed nature of the permanent hardstanding infrastructure within several catchments over a large geographical area, the relatively small permanent footprint within individual local catchments and the fact that silt control measures will be included at all permanent hardstanding areas (Project Design Measure), the impact on local surface water bodies is considered to be imperceptible (see Section 11.2.4.10), therefore effects on the downstream SACs are considered to be Neutral.

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Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Decommissioning Stage Effects				
Rationale for Excluding: Scoped Out, no potential for impacts/Neutral impacts The UWF Grid Connection will remain part of the National Grid. Therefore no hydrological impacts are expected. UWF Related Works: The cables will be pulled from the Internal Windfarm Cabling ducts at the turbines or at the substation; the ducting, Realigned Windfarm Roads and Haul Route Works will remain in-situ; therefore, no decommissioning works to lands are required. The Telecoms Relay Pole will be removed, and the compound area reinstated and returned to agricultural. Therefore, it is considered that decommissioning activities will have Neutral effects on downstream SACs. Upperchurch Windfarm: It is likely that the Consented UWF Substation will remain in-situ for use by ESBN and that the Consented UWF Roads will also remain in-situ for use by the landowner. Decommissioning works will be limited to the Consented UWF Turbines, Turbine Hardstanding areas, Meteorological Mast and associated drainage systems. All decommissioning works will take place from hard-core areas, with the majority of activity taking place on the turbine hardstands. Therefore, it is considered that decommissioning activities will have Neutral effects on downstream SACs.				

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11.5.5 Mitigation Measures for Impacts to Lower River Shannon SAC

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Lower River Shannon SAC** as a consequence of the UWF Grid Connection.

11.5.6 Evaluation of Residual Impacts to Lower River Shannon SAC

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Lower River Shannon SAC above (Section 11.5.4) – i.e. **imperceptible**.

11.5.7 Application of Best Practice and the EMP for Lower River Shannon SAC

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment.

The following Best Practice Measures have been developed, for the protection of **Aquatic Habitats & Species,** by the authors of this topic chapter, using industry best practice:

GC-BPM-01	Measures for Protection of Surface Water Quality and Watercourse Morphology during instream works at Mountphilips Substation site
GC-BPM-02	Measures for Protection of Surface Water Quality and Watercourse Morphology during replacement of existing culverts along the 110kV UGC outside Mountphilips Substation site
GC-BPM-03	Design of New Permanent Watercourse Crossing Structures and Existing Culvert Replacements to Prevent Flood Risk
GC-BPM-04	Surface Water Quality Protection Measures for Site Runoff During the Mountphilips Substation Site Construction Works
GC-BPM-05	Protection of Surface Water and Groundwater Quality during use of Cement Based Compounds
GC-BPM-06	Protection of Surface Water and Groundwater Quality During Storage and Handling of Fuels, Oils and Chemicals
GC-BPM-07	Surface Water Quality Protection Measures During Storage of Overburden at the Mountphilips Substation Site

These Best Practice Measure form part of the UWF Grid Connection Environmental Management Plan which is appended to this EIA Report as Volume D.

11.5.7.1 Surface Water Management Plan

The UWF Grid Connection Environmental Management Plan will include a bespoke Surface Water Management Plan. Water quality and the existing drainage regime will be managed under the Surface Water Management Plan (SWMP) which will be implemented by the appointed Contractor during the construction stage of the UWF Grid Connection. This Surface Water Management Plan (SWMP) provides the water management framework for the appointed Contractors and Sub-contractors and it incorporates the mitigating principles described in this EIAR (particularly in Chapter 11 – Water) to ensure that construction works are carried out with minimal impact on the surface water environment and in accordance with the mitigation measures and project design commitments made in the EIAR. The Surface Water Management Plan is part of the UWF Grid Connection Environmental Management Plan which is appended to this EIA Report as Volume D.

11.5.8 Summary of Impacts to the Lower River Shannon SAC

A summary of the Impacts to the Lower River Shannon SAC is presented in Table 11-44.

Table 11-43: Summary of the impacts to the Lower River Shannon SAC

	Surface water quality impacts				Water quality impacts from	
Impact to the Lower River Shannon SAC:	**due to earthworks**	**from dewatering of excavations**	**from watercourse crossing works**	**during directional drilling works**	**fuels, oils and chemicals**	**from cement-based compounds**
Evaluation Impact Table	*Section 11.5.4.1*	*Section 11.5.4.2*	*Section 11.5.4.3*	*Section 11.5.4.4*	*Section 11.5.4.5*	*Section 11.5.4.6*
Project Life-Cycle Stage	Construction	Construction	Construction	Construction	Construction	Construction
UWF Grid Connection (direct)	**Imperceptible**	**Imperceptible**	**Imperceptible**	**Imperceptible**	**Imperceptible**	**Imperceptible**
UWF Grid Connection (cumulative)	**Imperceptible**	**Imperceptible**	**No Cumulative**	**No Cumulative**	**Imperceptible**	**Imperceptible**
Element 2: UWF Related Works	Imperceptible	No Likely Impact	No Impact	No Impact	No Impact	No Impact
Element 3: UWF Replacement Forestry	No Potential for Impacts - Evaluated as Excluded, see Section 11.5.2.2.1					
Element 4: Upperchurch Windfarm	Not Significant	Not Significant	No Impact	No Impact	Not Significant	Not Significant
Element 5: UWF Other Activities	No Potential for Impacts - Evaluated as Excluded, see Section 11.5.2.2.1					
Cumulative Impact:						
Whole UWF Project Effect	**Imperceptible**	**Imperceptible**	**Imperceptible**	**No Cumulative Impact**	**Imperceptible**	**Imperceptible**
All Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities Bunkimalta Windfarm Castlewaller Windfarm Newport Town Park	Imperceptible– *See Section 11.5.4.7*				N/A - evaluated as excluded, see Section 11.5.2.2.1	

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

11.6 Sensitive Aspect No.5: Lower River Suir SAC

This Section provides a description and evaluation of the Sensitive Aspect - Lower River Suir SAC.

11.6.1 BASELINE CHARACTERISTICS of Lower River Suir SAC

11.6.1.1 STUDY AREA for Lower River Suir SAC

The study area for Lower River Suir SAC in relation to the UWF Grid Connection is described in Table 11-46 and illustrated on Figure GC 11.6: UWF Grid Connection Study Area for Lower River Suir SAC (Volume C3 EIAR Figures).

Table 11-44: UWF Grid Connection Study Area for Lower River Suir SAC

Study Area for Lower River Suir SAC	Justification for the Study Area Extents
Suir_SC_030 sub-catchment within the Regional River Suir Hydrometric are HA16	Defined by local topography and regional drainage

11.6.1.2 Baseline Context and Character of Lower River Suir SAC in the UWF Grid Connection Study Area

The Lower River Suir SAC consists of all of the freshwater stretches of the Suir immediately south of Thurles, and the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford, and many of the tributaries including the Clodiagh, the Lingaun, Anner, Nier, Tar, Aherlow and Multeen. With respect to the Whole UWF Project, the Clodaigh[4] River, Multeen River and Owenbeg River downstream of the development are within the Lower River Suir SAC.

Within the River Suir catchment, the last c.1.5km of the UWF Grid Connection 110kV UGC route is located in the Clodiagh (Tipperary)_010 local surface water body (sub-basin) which exists within the Suir_SC_030 sub-catchment. The UWF Grid Connection construction works are located c.12km upstream of the River Suir SAC.

Within the Suir_SC_030 sub-catchment of the River Suir, there are a total of 5 no. watercourses within the construction works area boundary associated with the UWF Grid Connection (W64 – W68). The 110kV UGC will cross all 5 watercourses at existing crossing points (culverts) along the public road network – 3 no. (W64, W65, W66) are located L2264-50 and L6188-0 public roads, while the remaining 2 no. (W67 and W68) are located along the private paved road to the Consented UWF Substation. Due to the primarily upland nature of the study area, all of the watercourses intercepted by the UWF Grid Connection within the River Suir catchment are either drains or minor headwater (1st - 2nd order) streams.

Existing Water Quality Monitoring Data and WFD Waterbody Status

Biological water quality monitoring and rating refers to the EPA Q-Value system of ranges and is calculated on the in-stream macro-invertebrate community present in a river or stream. A Q-value of 5 indicates very high-water quality while a Q-value of 1 indicates poor water quality. Q-Values are available for the Clodiagh River downstream of the works area. The Q-Value for the Clodiagh River within the Clodiagh (Tipperary)_010 local surface water body is Good to High. The EPA and Water Framework Directive "Status"

[4]It should be noted that **there are two Clodiagh Rivers within the catchment of the Lower River Suir SAC**; the Clodiagh River which rises in the eastern extent of the UWF Grid Connection and flows through the Upperchurch/Holycross area of County Tipperary, and c.60km to the southeast another Clodiagh River which rises in the Comeragh Mountains and flows through the Rathgormack/Clonea/Portlaw area of County Waterford. There is no interaction between the water catchment areas of these two rivers.

and "Risk Result" for surface water bodies in the area of the UWF Grid Connection are shown in Table 11.10 and Table 11-11. The status of the Clodiagh (Tipperary)_010 is reported to be At Risk of morphological and forestry related effects such as suspended sediment and eutrophication.

Classification of Watercourses at Crossing Locations

Detailed hydrological and aquatic surveys were undertaken along the works area in order to characterise and categorise watercourses where crossings are required as part of the works. All of the watercourse crossings in the Clodiagh (Tipperary)_010 of the River Suir are existing culverts. Based on the field surveys, the watercourses are categorised Class 2 (fisheries value) and Class 4 (drains, no fisheries value). Within the River Suir catchment, 4 no. of the 5 watercourses are classed as Class 4 – Drain and considered to have no fisheries value. The remaining watercourse at crossing point W65 is a Class 2 watercourse (stream) which does have fisheries value.

Watercourse crossing works

No works are required to 4 of the 5 existing culverts, with the 110kV UGC installed either under or over the culverts. The remaining culvert relates the existing culvert at W63 (Class 4 drain) which potentially may need to be replaced during construction works.

Flood Risk: A site-specific flood risk assessment was undertaken (in accordance with the guidance document 'The Planning System and Flood Risk Management Guidelines for Planning Authorities - DoEHLG, 2009) for the UWF Grid Connection. In summary, the area of the UWF Grid Connection within the River Suir catchment is considered to have low risk of flooding, due to the elevated nature of the construction works areas, and due to the location of the majority of the works areas outside of any mapped fluvial or pluvial flood extent zones, being located in fluvial Flood Zone C (Low Risk).

11.6.1.3 Importance of Lower River Suir SAC

The Lower River Suir SAC is a Natura 2000 as established under the Habitats Directive and is therefore of **Extremely High** importance.

11.6.1.4 Sensitivity of Lower River Suir SAC

One of the primary sensitivities of the SAC is surface water quality. As stated above, the majority of the watercourses (4 out of 5) at the works areas are drains with no fisheries value, and there are typically, themselves, not sensitive to impact but are potential pathways.

11.6.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Based on the EPA database, exception of the Clodiagh (Tipperary)_010, based on the WFD surface waterbody reports (www.wfdireland.ie), the surface water bodies wthin the Lower River Suir catchment in the study area are reported to be **Not at Risk** from water quality impacts (diffuse and point source) or morphological impacts. The Clodiagh (Tipperary)_010 catchment is **At Risk** from morphological impacts (channelization) and forestry related impacts, and it is therefore considered that there are potential negative rising trends relating to water quality or morphology.

11.6.1.6 Receiving Environment (the Baseline + Trends)

Due to the slow rate of change, it is expected that the status of waterbodies will be the same at the time of construction (2020/2021). However, it is assumed that the status of the surface water bodies within the study area will be at least Good during the lifetime of the UWF Grid Connection. This is based on the assumption that surface waterbodies will have to achieve at least Good Status.

11.6.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

11.6.2.1 Cumulative Evaluation Study Areas

11.6.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Lower River Suir SAC	Justification for the Study Area Extents
Suir_SC_030 sub-catchment within the Regional River Suir Hydrometric are HA16	Suir_SC_030 sub-catchment is one of the main catchments in which the UWF Grid Connection is located. Suir_SC_030 sub-catchment drains to the Lower River Suir SAC.

The study is illustrated on Figure CE 11.6: UWF Grid Connection Cumulative Evaluation Study Area for Lower River Suir SAC.

11.6.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 11.6.2.2.1 below.

The Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 11-47 and illustrated on Whole Project Study Area for Lower River Suir SAC.

Table 11-45: Whole Project Cumulative Evaluation Study Area for Lower River Suir SAC

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Suir_SC_030 sub-catchment and Multeen (East) SC_010 within the Regional River Suir Hydrometric area HA16 *(the UWF Related Works and Upperchurch Windfarm are also located in the Multeen (East) SC_010).*	The Whole UWF Project elements are located in the Suir_SC_030 and Multeen (East) SC_010. Both catchments drain to the Lower River Suir SAC. Extending the scoping area beyond the Suir_SC_030 and Multeen (East) SC_010 would mean that a much larger proportion of the River Suir catchment would be included and therefore at this scale, the Whole UWF Project would likely have a Neutral effect in relation to cumulative impacts.
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

11.6.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Lower River Suir SAC also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Lower River Suir SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.22).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Lower River Suir SAC.

11.6.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Lower River Suir SAC

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Lower River Suir SAC. The results of this evaluation are included in Table 11-48.

The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 11.6. The baseline character of the areas around these Elements is described in Section 11.6.2.3.

Table 11-46: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Elements of the Whole UWF Project	
Element 1: UWF Grid Connection	Included for the evaluation of cumulative effects
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Included for the evaluation of cumulative effects
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effect/No potential for effects due to: • The Haul Route Activities are located entirely within the public road corridor. There will be no requirement for earthworks/groundworks and therefore no hydrological / water quality effects are likely. • Overhead Line Activities: These works involve upgrade works to the overhead existing lines such as cable wrapping which do not require any major excavations. Therefore no surface water or groundwater impacts are expected. • Monitoring Activities do not require any major construction activities. Therefore, no surface water or groundwater impacts are expected. Once off activities will take place during the pre-construction stage, and comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will generally take place on the periphery of fields and are not expected to impact on water quality. • During the Operational Stage, farming practices under the Upperchurch Hen Harrier Scheme will, to a certain extent, cause lands to revert back to wet grassland. All associated potential hydrological effects are expected to be Neutral. During decommissioning of UWF, the Upperchurch Hen Harrier Scheme will finish, but no activities will be required, therefore no water quality effects are expected.

11.6.2.3 Cumulative Information: Baseline Characteristics – Context & Character

11.6.2.3.1 Element 2: UWF Related Works

The majority of the UWF Related Works construction works areas are located within the River Suir catchment. The majority of the construction works areas within the River Suir catchment are located locally within the Suir_SC_030 sub-catchment of the Clodiagh River catchment. Some of the works also extend into the Multeen (East) SC_010 sub-catchment.

In terms of the watercourse crossings associated with the UWF Related Works, 31 no. of the total 32 no. are located within the River Suir catchment. Of these 31. no watercourses, 25 no. will require instream works for UWF Related Works.

Of the 31 no. watercourse crossings within the River Suir catchment, 26 no. are at least 12km upstream (Clodiagh River catchment) of the Lower River Suir SAC and the remaining 5 no. are at least 3km upstream of the SAC.

11.6.2.3.2 Element 3: UWF Replacement Forestry

The entire UWF Replacement Forestry site is located within the River Suir catchment, in the Suir_SC_030 sub-catchment of the Clodiagh River catchment. The UWF Replacement Forestry is located at least 12km upstream of the SAC.

11.6.2.3.3 Element 4: Upperchurch Windfarm

The majority of the Upperchurch Windfarm construction works areas are located within the River Suir catchment. The majority of the construction works areas within the River Suir catchment are located locally within the Suir_SC_030 sub-catchment with some also in the Multeen (East) SC_010 sub-catchment. There is only one crossing of a natural stream associated with the Upperchurch Windfarm, a new crossing structure, comprising a clear span bridge, will be constructed at this crossing point, which is at least 12km upstream (Suir_SC_030 sub-catchment) of the Lower River Suir SAC.

Consideration of the Passage of Time: It is considered that there have been no material changes in the baseline environment and the descriptions in the 2013 and 2014 documents for Upperchurch Windfarm remain relevant to the cumulative evaluations in this EIAR.

11.6.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 11.6.2.2.1

11.6.2.3.5 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 11.6.2.2

11.6.3 PROJECT DESIGN MEASURES for Lower River Suir SAC

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

There are no Project Design Measures developed specifically for the Lower River Suir SAC. **The Project Design Measures developed for Local Surface Water Bodies in Section 11.2.3 are also relevant to the River Suir SAC.** These project design measures are presented again below.

Please Note: The Project Design Measures will be implemented through the Environmental Management Plan for UWF Grid Connection, which includes a Surface Water Management Plan (See Volume D appended to this EIA Report)

Table 11-47: UWF Grid Connection Project Design Measures relevant to the Lower River Suir SAC

PD ID	Project Design Environmental Protection Measure (PD)
PD17	At Mountphilips Substation, water for operational stage welfare facilities will be obtained from a Rain Water Harvesting system. Waste water will be collected in tanks and removed from site by an appropriately licensed operator, for treatment in a licensed water treatment plant. These two measures will avoid the need for a new well or mains water connection and will avoid the need to treat waste water on-site.
PD18	The new substation compound and the new permanent access road at the Mountphilips Substation site will have a permanent surface water drainage network in place which will include check dams. These check dams will allow the settlement of suspended solids in water runoff while also slowing down the rate of water run-off from these areas.
PD19	At Mountphilips Substation location, where dewatering of trenches or excavations is required, there will be no direct discharge of untreated 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 to the volume of water requiring treatment (if any) to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD20	At Mountphilips Substation site, all excavated material will be removed for temporary or permanent storage at designated berms, which will be located more than 25m away from the watercourses on Mountphilips Substation site. All storage berms will be graded and sealed following emplacement. The berms will be covered if there is a risk of erosion. Temporary silt control methods such as silt fencing will be placed around all overburden storage areas. The existing vegetative buffer between the berms and the nearest watercourses will be maintained and no works will occur in the buffer zone.
PD21	At Mountphilips Substation site, the permanent storage berms will be along the new access road and around the substation compound will be planted with local provenance native fruiting hedge species, with grasses and native flower species common to the surrounding vegetation sown along the sides of the berms. Local provenance native wildflower seed of flowering plants like clovers, vetches and knapweed will be included. Revegetation works will take place at the

	soonest practicable opportunity after emplacement.
PD22	Outside of the Mountphilips Substation site, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the UWF Grid Connection Waste Management Plan. Loads of excavated material will be covered during transportation to prevent spillages of excavated material.
PD23	All Joint Bays for the 110kV UGC will be located at least 50m from a Class 1 or Class 2 watercourse and at least 25m from Class 3 or Class 4 watercourses.
PD24	Outside of the Mountphilips Substation site, where dewatering of trenches or excavations is required for the 110kV UGC, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated using a mobile water treatment train and then discharged via a silt bag to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD25	Construction works along the 110kV UGC route will cease during heavy or prolonged rainfall events, and any open trenches or excavations will be covered. Use of weathering forecasting will be undertaken in advance of works.
PD26	A phased approach will be undertaken in relation to excavations, excavation dewatering and any culvert replacement works, where these works occur within 50m of a watercourse. The phased approach will only permit one of main potential sediment producing activities (i.e. excavations, excavation dewatering or culvert replacement works), to be carried out within 50m of a watercourse, at any one time.
PD27	At Mountphilips Substation site, works within 50m of watercourses, 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.
PD28	Along the 110kV UGC on the public road, where works will take place within 50m of a watercourse, additional mitigation measures will be implemented which include silt fencing and placement of sandbag arrangements along preferential surface water flowpaths on the road pavement. Following works on any particular section, any works debris will be removed from the road before the sandbags and silt fences are removed.
PD29	Cable trenching works, joint bay chamber installation and culvert replacement works on the section of 110kV UGC between W13 and W20 (inclusive) and the culvert replacement works at W32 and W34 will only be completed during dry weather in the dryer months of the year – i.e. February to September included. This will minimise/avoid the requirement for any excavation dewatering as a result of waterlogged soils or surface water runoff. None of these 110kV UGC sections are within the Lower River Shannon SAC.
PD30	Lines of silt fencing and sandbags will be erected along the edge of the road so that surface water runoff from adjacent construction works areas is captured and directed to the excavated trench, where it can be pumped and treated before being released, as per PD24.
PD31	Works to bridge parapet walls at watercourse crossings W7, W36, W53 will be carried out during dry weather, and debris netting will be fixed to the outside of the walls in order to prevent any debris falling into the watercourse below.
PD32	At Mountphilips Substation site, instream construction works at the watercourse crossings W1, W2 and W3 will be followed by site-specific reinstatement measures to ensure the equilibrated restoration of flow character and morphology within the affected reach to achieve baseline character and avoid any deterioration in morphology as required under the Water Framework Directive (WFD). Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and 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 margins to stabilise banks, add flood protection and provide riparian buffer; and the use of deflector plates during the restoration of flow. Instream works at W1, W2 and W3 at the Mountphilips Substation site will be undertaken during dry weather within the IFI instream works window (July – September inclusive). As per PD41, instream works at W1, W2 and W3 will be supervised by a member of

	CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice are followed. Although intended for the purpose of the WFD, this measure will also indirectly contribute to downstream water quality protection in the SAC.
PD33	All new permanent watercourse culverts at the Mountphilips Substation site and any replacement culverts along the public road for the 110kV UGC will be sized to cope with a minimum 100-year flood event.
PD34	Only precast concrete culverts or structures will be used at the watercourse crossing locations at Mountphilips Substation site and for any culvert replacements along the 110kV UGC. Only precast concrete chambers will be used at Joint Bay locations. No batching of wet cement will take place on-site.
PD35	Concrete pours will be required for the 110kV UGC cables trench. Only chutes will be washed out at the works locations into the cable trench, with the washout of the tank taking place at the concrete supplier depot. Concrete chute washouts within the SAC boundary will take place into designated bins for removal to the designated concrete wash settlement pond at the Mountphilips Substation site.
PD36	The sections of 110kV UGC trenches that overlap the Lower River Shannon SAC will be lined with an impermeable geotextile material to prevent potential migration of cement from the trench base or sides into the SAC.
PD37	In addition to PD22, there will be no storage of overburden within the Lower River Shannon SAC.
PD38	110kV UGC works outside of Mountphilips Substation site will be carried out entirely on paved roads and where the 110kV UGC crosses watercourses, the works will be carried out over the existing bridges and over/under existing culverts. No in-streams works are proposed at any watercourse crossing points (including the Newport River and Bilboa River crossings) within the boundary of the Lower River Shannon SAC and therefore there will be no placement of cement or other materials within the river channels or on the river banks within the SAC.
PD39	In addition to PD42, there will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within 100m of the boundary of the Lower River Shannon SAC.
PD40	In addition to PD29, all 110kV UGC works within the boundary of the Lower River Shannon SAC will only be completed during dry weather in the dryer months of the year – i.e. February to September included.
PD41	The instream works at W1, W2 and W3 at Mountphilips Substation site, and the culvert replacement works at the 13 existing culverts on the public road, and all works (including concrete placement) within the boundary of the Lower River Shannon SAC, will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice Measures are followed.
PD42	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD43	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 at the Mountphilips Substation site. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored at the designated location in the temporary compound and all operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD44	Overnight parking of plant and machinery will only be permitted at the temporary compound at the Mountphilips Substation site and at a distance greater than 50m from watercourses.
PD45	The horizontal directional drilling works at W8 and W9 will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer

	who understands the technicalities and challenges of drilling works. The Mud Engineer will advise the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized water tight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures; In the event of break-out occurring in the river bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures; In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point; and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the UWF Grid Connection Environmental Management Plan (see Volume D).
PD46	All construction works will be monitored on a daily basis by the Environmental Clerk of Works and by members of the Environmental Clerk of Works team (for example Site Ecologist) as required, for compliance with the Environmental Commitments, which include the Project Design Measures, as per the UWF Grid Connection Environmental Management Plan (see Volume D).
PD47	Surface water quality monitoring of the main watercourses downstream of the works will be carried out to ensure that the downstream water quality status in the receiving water is maintained and that there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009. Where non-compliance in water quality is measured or recorded, works will stop until the issue is resolved. The surface water monitoring locations and sampling programme are defined in the Surface Water Management Plan for UWF Grid Connection. The Surface Water Management Plan is part of the UWF Grid Connection Environmental Management Plan (see Volume D).
PD48	The new permanent cross structures at the Mountphilips Substation site and the replacement culvert at W14 along the R503 will be bottomless or clear spanning.
PD49	In-stream works at Mountphilips Substation site and culvert replacement works at W14 along the R503 Regional Road will only be undertaken during the IFI specified period (July, August and September) and will be carried out to best practice (IFI, 2016).
PD50	Culvert replacement works along the 110kV UGC will not be undertaken without isolation of flow within the watercourse. Isolation of flow will be achieved through the use of sandbags filled with clean, washed sand. Any fish within the isolated section will be removed prior to works commencing. This will require the engagement of licensed fisheries personnel to deplete the works area 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 using a flume (pipe), with deflector plates used on the downstream side of the flume to reduce the hydraulic power of the water. Construction works at the crossing will be followed by site-specific reinstatement measures to ensure the equilibrated restoration of flow character and morphology within the affected reach to achieve baseline character and avoid any deterioration in morphology as required under the Water Framework Directive (WFD). Measures will include: bank stabilization measures, reinstatement of bank slope and character; and reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and the use of deflector plates during the restoration of flow. As per PD41, culvert replacement works will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice are followed. These measures will ensure that the baseline character

	is maintained and will ensure that a deterioration in morphology is avoided, as required under the Water Framework Directive. This in turn will protect Aquatic Ecology.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the fundamental design of the UWF Related Works, UWF Replacement Forestry and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3, 5.4 and 5.5in Volume C4: EIAR Appendices.

11.6.4 EVALUATION OF IMPACTS to Lower River Suir SAC

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Lower River Suir SAC.

As a result of the exercise, some impacts were included and some were excluded.

Table 11-48: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Surface water quality impacts due to earthworks (excavations and overburden storage), (construction stage)	*Surface Water Quality Impacts due to Excavation Dewatering (construction stage)*
Surface water quality impacts from watercourse crossing works, (construction stage)	*Nutrient input due to tree felling(construction stage)*
Water quality impacts from fuels, oils and chemicals, (construction stage)	*Increased Flood Risk (operational stage)*
Water quality impacts from cement-based compounds, (construction stage)	*Surface Water Quality Impacts due to Suspended Sediment Input (operational stage)*
Surface water quality impacts due to forestry felling of conifer plantation (*Other Elements only*) (construction stage)	*Decommissioning Stage Effects*

The source-pathway-receptor links for included impacts are described in the Impact Evaluation Tables in the next sections. **The Impact Evaluation Tables are presented in the following sections 11.6.4.1 to 11.6.4.5.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections, in Section 11.6.4.6.

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11.6.4.1 Impact Evaluation Table: Surface water quality impacts due to earthworks

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Earthworks and groundwork

Cumulative Impact Source: Earthworks and groundwork

Impact Pathway: Runoff and surface water flowpaths

Impact Description: Surface water quality impacts from entrained sediment in surface water runoff arising during earthworks and groundwork associated with construction works within the River Suir catchment.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Surface water quality impacts due to earthworks

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:

Only approximately 1.5km (of the total 30.5km), of the UWF Grid Connection, is located within the Suir_SC_030 sub-catchment and is at least 11.5km upstream of the Lower River Suir SAC. UWF Grid Connection works within the Lower River Suir SAC are limited to trenching works, including the construction of c. 2 Joint Bays, within public road pavements. Also, there are no temporary or permanent overburden storage areas required for the UWF Grid Connection within the River Suir catchment, as all excavations from the public road will be removed to licensed waste facilities, and therefore the potential for effects on the SAC is considered to be unlikely.

Significance of the Impact: No likely impacts

Rationale for Impact Evaluation:

- Small scale of the works in the River Suir catchment and the large downstream distance to the SAC.
- No requirement to store UWF Grid Connection related excavations within the River Suir catchment.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: UWF Grid Connection, UWF Related Works, Upperchurch Windfarm and UWF Replacement Forestry works will take place in the Clodiagh River catchment.

The UWF Grid Connection is located within paved road surfaces within the River Suir catchment. In relation to storage of excavated materials (overburden), no storage is associated with UWF Grid Connection in the River Suir catchment as all excavations will be removed to licensed waste facilities (all loads will be covered during transit to prevent escape of material, as per Project Design).

UWF Replacement Forestry will require negligible groundworks, and the potential for cumulatively impacts mainly relates to the groundworks and excavations associated with the UWF Grid Connection, UWF Related Works and the Upperchurch Windfarm.

Cumulative overburden storage relates to UWF Related Works with Upperchurch Windfarm, where overburden will be permanently stored and will be temporarily stored for later reinstatement in the Suir regional catchment. It is possible that erosion of these storage areas could result in surface water quality impacts locally.

Due to the transient and spread out nature of the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm and the fact that three-quarters of the local watercourses, are drains or marginal watercourses, the magnitude of impact is considered to be Negligible.

Significance of the Cumulative Impact: Imperceptible

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Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, negligible magnitude combined with the Extremely High Importance of the SAC;
- While the majority of the UWF Related Works, the majority of Upperchurch Windfarm works, and all of the UWF Replacement Forestry, are located within the River Suir catchment, in-combination effects to local surface water bodies will be no greater than Slight (see Section 11.2.4.3) due to: the location of 62% of the Internal Windfarm Cabling within Consented UWF Roads which will reduce excavation requirements;
- the localised nature of effects from Haul Route Works and Realigned Windfarm Roads due to the scale of these works;
- imperceptible effects associated with UWF Replacement Forestry;
- the implementation of the Sediment & Erosion Control Plan for the consented Upperchurch Windfarm;
- low or marginal ecological value of the majority of watercourses.
- Temporary nature of the works

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
The majority of the works associated with UWF Related Works are located with the River Suir catchment (Clodiagh and Multeen catchments). Of the total 17.9km of internal windfarm cabling, 16.2km is located within the River Suir catchment.
The potential for water quality effects will arising during earthworks required for the Internal Windfarm Cable trench (16.2km), temporary access roads (5.3km), Haul Route Works (refer to Table 11-14), Realigned Windfarm Roads and the Telecom Relay Pole works.

Up to 930m^3 of overburden will be permanently stored along the internal cabling route as linear berms and up to 10,850m^3 will be temporarily be stored for later reinstatement along the works area. Erosion of these storage areas potentially could result is surface water quality impacts locally.

Given the transient and distributed nature of the works within the local catchments over a large geographical area and the large downstream distance (>12km) to the SAC from the majority of the works areas, the impacts magnitude is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, **Negligible** magnitude combined with the **Extremely High** Importance of the SAC;
- The majority of the watercourses intercepted by the works are drains (Class 4 watercourse) with low flows or no flows, and therefore the effectiveness of them acting as a surface water flowpath to the downstream SAC is limited;
- The vast majority of the works area (with the exception of watercourse crossings) are located more than 50m from a watercourse;
- All temporary and permanent overburden storage area will be located more than 50m from a Class 1 and Class 2 Watercourse;
- There is a substantial overlap of works - approximately 62% of the Internal Windfarm Cabling will be installed within the consented UWF access roads, thereby reducing the need for additional excavations; and,
- The majority of the works areas are located at least 12km upstream of the Lower River Suir SAC.

Element 3: UWF Replacement Forestry

Impact Magnitude:
The potential surface water quality effects on local surface water bodies from sedimentation as a result of the replacement forestry works are considered to be negligible.
This is due to the relatively small replanting area, and the fact that tree planting will be completed by hand. Therefore, there will be no requirement for rill ploughing or any earthworks, and the potential for the planting works to generate sediments in runoff is negligible. As such, nutrient loading to local watercourses is likely to

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be negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- The small scale planting and the non-intrusive nature of the works.

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on Chapter 15 (Hydrology Chapter, see Reference Documents Volume F8) and the Sediment and Erosion and Control Plan from the 2013 EIS, release of sediment during the construction phase is likely to have a minor negative effect on the River Suir and its tributaries.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The upland nature of the site (remote from the main local streams and rivers) and the small number of drainage features within the site; and,
- The measures outlined in the EIS and within the Sediment and Erosion and Control Plan will ensure the development of the wind farm will not have a significant impact on the surface water quality in the River and its tributaries.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.6.2.2.1*

Evaluation of Other Cumulative Impacts – Surface water quality impacts due to earthworks

Whole UWF Project Effect

Earthworks and storage/movement of excavated material will occur in the Suir_SC_030 sub-catchment and Multeen (East)_SC_10 sub-catchment within the Lower River Suir SAC catchment area.

The cumulative minor water quality effects, which are likely to be brief to temporary, are more likely to occur to the SAC within the Suir_SC_030 sub-catchment, as the majority of the UWF Related Works and the Upperchurch Windfarm are within this catchment.

The UWF Grid Connection is located within paved road surfaces within the River Suir catchment with no storage of overburden in the catchment.

Due to the transient and distributed nature of the construction works associated with both UWF Related Works and Upperchurch Windfarm and that the majority (62%) of the internal windfarm cabling will be located within the Upperchurch Windfarm (and therefore within the capture zone of the windfarm drainage), the impact magnitude on the SAC which is at least 11.5km downstream from works areas, the impact magnitude is considered to be **Negligible**.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, **Negligible** magnitude combined with the **Extremely High** Importance of the SAC;
- The majority of the 110kV UGC is contained within the River Shannon catchment and therefore its potential to contribute to in-combinations effects on the Lower River Suir SAC is less than negligible; works for UWF Grid Connection are located entirely within paved road surfaces, with no requirement for overburden storage;
- The circa 1.5km of UWF Grid Connection works are located at 12km upstream of the River Sur SAC.
- The majority of the Upperchurch Windfarm and UWF Related Works, including all of the UWF Replacement

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Forestry, are located within the River Suir. However, as a large proportion (62%) of the Internal Windfarm Cabling is within Consented UWF Roads (i.e. reduced excavation requirements), the negligible effects of the UWF Replacement Forestry and that the effects of the Haul Route works and Realigned Windfarm Roads are likely to be localised, no significant in-combination effects are expected on the River Suir SAC which exists at least 11.5km downstream from Whole UWF Project works; and,

- The Sediment and Erosion Control Plan for the Upperchurch Windfarm has measures in place for controlling runoff during excavation work, and therefore no significant effects are expected on the Lower River Suir SAC;

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Lower River Suir SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.6.2.2).

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11.6.4.2 Impact Evaluation Table: Surface water quality impacts from watercourse crossing works

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Watercourse Crossing Works
Cumulative Impact Source: Watercourse Crossing Works
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Indirect surface water quality impacts as a result of sediment release during stream crossing works such as open trenching for the 110kV UGC cabling and Internal Windfarm Cabling along with culvert emplacement / replacement within watercourses upstream of the SAC within the River Suir catchment.

Impact Quality: Negative

Evaluation of the Subject Development Impact– Surface water quality impacts from watercourse crossing works

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude: Only Approximately 1.5km of the 110kV UGC is located within the River Suir catchment, where 110kV UGC works will occur across 5 no. Watercourses, all of these watercourses will be crossed at the existing culvert crossing point along the public road network. 1 no. culvert may require replacement during construction works, this watercourse is a drain with no fisheries value. Due to the small scale of works, the downstream distance to the SAC (12km), and crossing structure works limited to 1 out of 5 of the existing crossings, the magnitude of any effects on the downstream SAC will be negligible.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- The small scale of the works
- the downstream distance to the SAC
- the fact that 4 out of the 5 no. watercourses are drains with no fisheries value, and no works required to the watercourse crossing on the Class 2 stream,
- culvert replacement works are for an existing drain culvert under the public road.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects relates to UWF Grid Connection. 1 no. small existing culvert which may require replacement for UWF Grid Connection in the Suir_SC_030 sub-catchment in the Suir catchment, no works are required to the other 4 no. culverts for UWF Grid Connection; additionally within the UWF Grid Connection Cumulative Evaluation Study Area, instream works will occur at 26 no. watercourses within the Suir_SC_030 sub-catchment for UWF Related Works.

There is no potential for Upperchurch Windfarm or UWF Replacement Forestry to cause cumulative effects with UWF Grid Connection as these projects do not require instream works.

No Other Projects or Activities are likely to cause cumulative impacts with UWF Grid Connection to water quality in the downstream Lower River Suir SAC.

Water quality effects, which are likely to be localised, will have a negligible magnitude of impact to the SAC.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- no instream works for Upperchurch Windfarm or UWF Replacement Forestry
- 1 no. culvert which may need replacing for UWF Grid Connection in the Suir_SC_030 sub-catchment.

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Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
There are 31 no. (of 32 no.) watercourse crossings related to the UWF Related Works within the River Suir catchment. In-stream works will be required at 25 no. of these locations.
Given the fact that the majority (75%) of the crossing are drains (Class 4 Watercourse), the distributed and transient nature of the watercourse crossing works and that the SAC is at least 12km downstream of the majority of the crossing locations, the impact magnitude is considered to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- 75% of the in-stream works areas are at drains (Class 4) or marginal watercourses (Class 3) which typically have no flows or very flows and therefore the effectiveness of them acting as a surface water flowpath to the downstream Lower River Suir SAC is limited;
- 31 no. watercourse crossings for UWF Related Works are located in the Suir_SC_030 sub-catchment , with 26 no. at least 11.5km upstream of the SAC and the remaining 5 no. being at least 3km upstream of the SAC;
- Only between 1 and 2 watercourse crossings will be completed in any one day (2 construction crews will be working on Internal Windfarm Cabling works);
- Significant effects are not expected to the local surface water bodies in the area of the works, therefore, significant effects are not expected on the further downstream SAC (refer to Section 11.2.4.4); and,
- The effects will be brief to temporary in nature and reversible.

Element 3: UWF Replacement Forestry

Impact Magnitude:
There is no new watercourse crossing works required for the UWF Replacement Forestry, and therefore there will be no impacts.

Significance of the Impact: No Potential for Impact

Rationale for Impact Evaluation:

- There is no new watercourse crossing works required for the UWF Replacement Forestry.

Element 4: Upperchurch Windfarm

Impact Magnitude:
The water quality effects of stream crossing work with regard to the Upperchurch Windfarm were not assessed directly in 2013 EIS. However, the EIS concludes that overall water quality effects on the River Suir and its tributaries would not be significant. The potential impacts are further evaluated below for the purpose of assessing in-combination effects. Within the River Suir catchment, there will be a requirement for 1 no. crossing of a natural stream along the Upperchurch Windfarm access roads and in-stream works will not be required as a clear-span bridge is proposed. All other crossings relate to small drains.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- A clear-span bridge will be used where a natural stream (Class 1 watercourse) will be crossed and therefore no in-stream works are required.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.6.2.2.1*

Evaluation of Other Cumulative Impacts–Surface water quality impacts from crossing works

Whole UWF Project Effect

Cumulative Impact Magnitude: Effects of the Whole UWF Project mainly relate to UWF Related Works.

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Watercourse crossing works are also required for UWF Grid Connection and Upperchurch Windfarm.

Cumulatively these projects will require instream works in the River Suir catchment, where 1 no. existing culverts may potentially need to be replaced during UWF Grid Connection works, instream works will occur at 25 no. separate watercourse crossing points for UWF Related Works, with a new crossing structure over 1 No. natural stream for Upperchurch Windfarm. There is no potential for cumulative effects in relation to this stream crossing at Upperchurch Windfarm, as this will involve the construction of a clear span bridge with no instream works. The Internal Cables for UWF Related Works will be installed in the bridge structure.

The magnitude of impacts will be as per the UWF Related Works which is N**egligible**

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, **Negligible** magnitude combined with the **Extremely High** Importance of the SAC;
- 31 no. watercourse crossings associated with the UWF Related Works in the Suir_SC_030 sub-catchment, 25 no. of which will require instream works;
- Only 5 no. of watercourse crossings associated with the UWF Grid Connection (110kV UGC) are located within the Suir_SC_030 sub-catchment, only 1 no. of which (drain) may require culvert replacement;
- The watercourses crossings required for the 110kV UGC, UWF Related Works and Upperchurch Windfarm will not be completed at the same and therefore the potential for significant in-combination effects are negligible; and,
- The majority of the crossing locations are at least 12km upstream of the Lower River Suir SAC.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Lower River Suir SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.6.2.2).

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11.6.4.3 Impact Evaluation Table: Water quality impacts from fuels, oils and chemicals

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Fuel, oils and chemicals
Cumulative Impact Source: Fuel, oils and chemicals
Impact Pathway: Runoff and surface water flowpaths

Impact Description: The plant and equipment that will be used during the construction phase will be run on fuels and oils. This creates the potential for spillage and leakage of hydrocarbons from plant during refuelling or storage of oils and fuels which can impact on downstream SAC.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Water quality impacts from fuels, oils and chemicals

Element 1: UWF Grid Connection– direct/indirect impact

Impact Magnitude:
Only 1.5km of the UWF Grid Connection is located within the River Suir catchment, where 110kV UGC works are located within the public road pavement, and no effects on the downstream SAC are likely due to the small scale, the downstream distance to the SAC (>12km), the transient nature of the works, and the small volumes of fuels/chemicals that will be present on-site.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- The small scale nature of the works, the small volumes of oils and fuels that will be present and the large downstream distance to the SAC.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects relates to the Suir_SC_030 sub-catchment relates to the use of machinery and vehicles, refueling activities and storage of fuels for UWF Grid Connection, Upperchurch Windfarm, UWF Related Works and UWF Replacement Forestry. Effects from oil and fuel usage are likely to occur rarely and be isolated incidents.

Given the distributed nature of the works within several local sub-catchments, the downstream distance to the River Suir SAC (at least 12km) and the fact that only small volumes of fuel/oil will be present on-site at any one time, the in-combination magnitude of effect is considered to be negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation: As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the local surface water bodies;

- Downstream distance to the River Suir SAC from works within the Suir_SC_030 sub-catchment is at least 12km.
- the distributed nature of the works
- the fact that only small volumes of fuel/oil will be present on-site at any one time;
- The additional volumes of oils and fuels that will be present on site for the UWF Grid Connection and the UWF Related Works will be negligible;
- A Fuel and Oil Management Plan is proposed for the Upperchurch Windfarm which will include storage requirements and emergency procedures for dealing with any spills and leaks;
- Due to the small scale and nature of the works, UWF Replacement Forestry is not likely to contribute to in-

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combination effects with respect to impacts from oils and fuels; and,
- Effects are likely to be due to small isolated localised spills (worst case) that are very unlikely to contribute to in-combination water quality effects within the local surface water catchments.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Approximately 16.2km of the total 17.9km Internal Windfarm Cabling is located within the River Suir catchment (Suir_SC_030 and Multeen (East) SC_010 sub-catchments) including all of the Realigned Windfarm Road works and the majority of the Haul Route Works (see Table 11-14).
Any spills or leaks of oils and fuels relating to the works are likely to be minor (worst case), isolated and occur rarely and therefore the magnitude of effects on the SAC are likely to be Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:
- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- Only relatively small volumes of fuels / oils will be on-site at any one time and therefore no significant effects on local surface water bodies are expected;
- The River Suir SAC is located more than 12km downstream from the majority of the works areas; and,
- Any spills along the along the UWF Related Works areas are likely to be small isolated incidents and comprise very small amounts, and the actual residual volumes that might reach the downstream Lower River Suir SAC are likely to be negligible if any

Element 3: UWF Replacement Forestry

Impact Magnitude:
Plant and equipment used for the UWF Replacement Forestry works will be limited to 4 x 4 jeeps. Given the small scale nature of the works and the fact that no refuelling or storage of fuels will be undertaken on site, no impacts are expected.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:
- The small scale and nature of the works, the small volumes of oils and fuels that will be present and the large downstream distance to the SAC.

Element 4: Upperchurch Windfarm

Impact Magnitude:
Based on the 2013 RFI Chapter 15 (Hydrology Chapter, see Reference Documents Volume F8) the potential for water quality effects arises from the use and storage of oil and fuels. The overall effects were assessed to be not significant.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:
- A Fuel and Oil Management Plan will be implemented during the construction of the Upperchurch Windfarm which will storage requirements and emergency procedures for dealing with any spills and leaks.

Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.6.2.2.1*

Evaluation of Other Cumulative Impacts – Water quality impacts from fuels, oils and chemicals

Whole UWF Project Effect

Cumulative Impact Magnitude:
Machinery run on hydrocarbons, and use of fuels for the Whole UWF Project will be required for all Elements

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of the Whole UWF Project, which are all located to some extent within the catchment area of the Lower River Suir, and therefore there is potential for the Whole UWF Project to impact on the Lower River Suir SAC from oil and fuel usage. However, any effects are likely to occur rarely and be isolated incidents, and the magnitude of effects is likely to be **negligible**.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 11-7, **Negligible** magnitude combined with the **Extremely High** Importance of the SAC;
- The location of the majority of the UWF Grid Connection outside of the River Suir catchment, therefore no impacts on the River Suir SAC are expected due to the negligible volumes of fuels and oils associated with UWF Grid Connection that will be present within the catchment.
- Any spills and leaks that do occur (if any) are likely to be small isolated incidents and therefore the potential for cumulative effects is negligible;
- A Fuel and Oil Management Plan will be implemented which will include storage requirements and emergency procedures for dealing with any spills and leaks; and,
- The large downstream distance from the majority of the works area to the Lower River Suir which is at least 12km.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Lower River Suir SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.6.2.2).

11.6.4.4 Impact Evaluation Table: Water quality impacts from cement-based compounds

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Cement based compounds
Cumulative Impact Source: Cement based compounds
Impact Pathway: Runoff and surface water flowpaths

Impact Description: Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment within the SAC.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Water quality impacts from cement-based compounds

Element 1: UWF Grid Connection- direct/indirect impact

Impact Magnitude:
522m^3 of concrete will be used in the last 1.5km of the 110kV UGC in the Suir_SC_030 sub-catchment.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- Small scale nature of the works and the downstream distance to SAC (<12km)

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Cement use in the Suir_SC_030 sub-catchment will include concrete in the UWF Grid Connection 110kV UGC, Consented UWF Turbine foundations and Consented UWF Substation and the UWF Related Works (Telecom Relay Pole and at the 9 no. public road crossings of Internal Windfarm Cabling).

Given the relatively small volumes of cement will be present on-site at any one time, the in-combination magnitude of effect is considered to be negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC;
- The relatively small volumes of cement on-site at any one time with the potential to cause surface water quality impacts will be small;
- The use of concrete for the UWF Grid Connection will be small, and impacts on surface water quality are not expected; and,
- Concrete Control Procedures will be included in the environmental Management Plan for the Upperchurch Windfarm, and therefore no significant in-combination effects with respect to the UWF Grid Connection are expected.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works
Impact Magnitude: Limited to the Telecom Relay Pole foundation (c.4m3) and the 9 no. road crossings. Therefore, no impacts on surface water quality or the downstream SAC are anticipated.
Significance of the Impact: No Impact
Rationale for Impact Evaluation: • Small scale nature of the works and the downstream distance to SAC (<12km)
Element 3: UWF Replacement Forestry
Impact Magnitude: None
Significance of the Impact: No Potential for Impact
Rationale for Impact Evaluation: • No requirement to use cement at the UWF Replacement Forestry site
Element 4: Upperchurch Windfarm
Impact Magnitude: Based on Chapter 15 (Hydrology, see Reference Documents Volume F8) of the 2013 EIS, there is a risk of spillage and runoff from cement during placing of concrete and also during washing out of chutes. The use of cement will mainly be for turbine base construction and the substation foundation. 20 no. turbines of the 22 no. permitted are located within the River Suir catchment and upstream of the SAC. However, the effects on the River Suir and its tributaries were assessed to be Not Significant.
Significance of the Impact: Not Significant
Rationale for Impact Evaluation: • During pouring containment measures will be put in place to keep cement within the foundation area and prevent it entering the local drainage routes; and, • Washing of truck will be limited to the chutes, and a dedicated concrete washout area will be available on-site.
Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.6.2.2.1*
Evaluation of Other Cumulative Impacts – Water quality impacts from cement-based compounds
Whole UWF Project Effect
Cumulative Impact Magnitude: The use of cement based compounds within the catchment area of the Lower River Suir SAC mainly relates to Upperchurch Windfarm, with only very small volumes of concrete required for UWF Grid Connection or UWF Related Works in the catchment. Effects are not likely to occur, but there is potential for isolated incidents, which will be managed under the Upperchurch Windfarm Environmental Management Plan and the magnitude of effects is likely to be **negligible**.
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 11-7, **Negligible** magnitude combined with the **Extremely High** Importance of the SAC; • The majority of the UWF Grid Connection is located within the River Shannon catchment, and therefore no impacts on the River Suir SAC are expected; • The very small volumes of cement required for the UWF Related Works;

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• The use of cement-based compounds within the River Suir catchment will comprises small volumes over a large geographical area within several local surface water bodies; • The transient nature of the works over a 6 -8 month work period; • The Upperchurch Windfarm will have measures in place to prevent release of cement into drainage routes during pouring of cement; and, • Any spills that do occur are likely to be small isolated incidents and therefore the potential for cumulative effects is negligible.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Lower River Suir SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.6.2.2).

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11.6.4.5 Impact Evaluation Table: Surface water quality impacts due to forestry felling

Evaluation of UWF Grid Connection Excluded: As there is no tree felling in the River Suir catchment associated with the UWF Grid Connection, there is no potential for UWF Grid Connection to cause water quality effects to Lower River Suir SAC by itself, and consequently this project cannot have a cumulative effect.

However, the Other Elements must be considered because the UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluation for the Other Elements of the Whole UWF Project are included in this Impact Evaluation Table, in order to show the totality of the project.

Cumulative Impact Description for the Other Elements of the Whole UWF Project	
Project Life Cycle Stage: *(for Other Elements only)*	Construction stage
Other Element Impact Source: Tree felling activities Impact Pathway: Runoff and surface water flowpaths Impact Description: Surface water quality impacts from sediment release in surface water runoff during coniferous felling operations within the River Suir Catchment. Tree felling within the River Suir catchment will only be required for UWF Related Works and the Upperchurch Windfarm Impact Quality: Negative	
Whole Project Information: Individual Evaluations of Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	
Impact Magnitude: In total, 0.3 hectares of forestry will be felled for the realigned windfarm roads and the Internal Windfarm Cable works, and all of this will be within the River Suir catchment. Surface water quality effects have the potential to occur locally, but impacts on the downstream SAC are likely to be Negligible due to the small felling area and the downstream distance to the SAC (>12km).	
Significance of the Impact: Imperceptible	
Rationale for Impact Evaluation: • As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC; • Relatively small felling area (0.3ha in total); • The total felling area relates to two separate locations (0.2ha and 0.1ha) with the works being completed one after the other, but not at the same time (Project Design Measure); • The two felling areas are at least 12km upstream of the Lower River Suir SAC; and, • This felling will be carried under a felling license from the Forest Service.	
Element 3: UWF Replacement Forestry	
Impact Magnitude: None	
Significance of the Impact: No Potential for Impact	
Rationale for Impact Evaluation: No tree felling associated with the UWF Replacement Forestry	
Element 4: Upperchurch Windfarm	
Impact Magnitude: A total of 4.35ha will be felled to facilitate the construction of the Upperchurch Windfarm	

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infrastructure (2013 EIS). All of the felling will be undertaken in the River Suir catchment. No significant effects on the River Suir and its tributaries was the outcome of the assessment in the 2013 EIS.
Significance of the Impact: Not Significant
Rationale for Impact Evaluation: The Sediment and Erosion Control Plan for the Upperchurch Windfarm has measures in place for control of sediment during tree felling, and therefore no significant effects are expected; and, All tree felling will be undertaken using good working practices as outlined by the Forest Service in their "Forestry Harvesting and Environment Guidelines (Forest Service, 2000a) and "Forestry and Water Quality Guidelines" (Forestry Service, 2000b).
Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.6.2.2.1*
Evaluation of Cumulative Impacts – Surface water quality impacts due to tree felling
All Elements of the Whole UWF Project
Cumulative Impact Magnitude: Cumulative effects relate to the UWF Related Works and the Upperchurch Windfarm. Due to the small felling area associated with the UWF Related Works, the in-combination magnitude of impacts is considered to be **Negligible.**
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 11-7, Negligible magnitude combined with the Extremely High Importance of the SAC; • The areas required for felling relating to the UWF Related Works are small isolated areas that will be felled separate to the Upperchurch Windfarm felling, and therefore the potential for in-combination effects is negligible; • The area to be felling for the UWF Related Works accounts for only 7% of the Upperchurch Windfarm felling area.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Lower River Suir SAC with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.6.2.2).

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11.6.4.6 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 11-50 below.

Table 11-49: Description and Rationale for Excluded Impacts to Lower River Suir SAC

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Excavation Dewatering (i.e. cable trench dewatering)	1,2,3,4	Runoff & SW Flowpaths	Surface Water Quality Impacts due to Excavation Dewatering	Rationale for Excluding: no likely impact Based on trial pits undertaken at the windfarm site (which were found to be dry), no groundwater inflows into the cable trench for the UWF Grid Connection or Internal Windfarm Cabling are anticipated within the River Suir catchment. No excavations required for the UWF Replacement Forestry, therefore no potential for impact. Therefore, surface water quality impacts, arising from dewatering of trenches, on the SAC is not expected.
Tree felling in Conifer Plantations Afforestation	2,3,4	SW Runoff	Nutrient input due to tree felling	Rationale for Excluding: Neutral Impact No tree felling/harvesting required for the UWF Grid Connection, therefore no potential for impact. No tree felling/harvesting required for the UWF Replacement Forestry, therefore no potential for impact. The surface water quality effects on local surface water bodies from sedimentation as a result of tree felling for UWF Related Works or Upperchurch Windfarm were assessed to be Imperceptible and not significant (refer to Section 11.2.4.8). This is due to the relatively small felling areas and the fact that the felling areas are distributed between several local catchments. Therefore, as a result of this minor impact from sediment, the nutrient loading is assessed to be Neutral.
Operational Stage				
Runoff form Permanent hardstanding and flood risk from permanent watercourse crossing culverts	1,2,3,4	SW Flowpaths	Increased flood risk	Rationale for Excluding: Neutral Impact There are no watercourse crossing structures proposed within the SAC. The 1 no. existing culvert which may need to be replaced for UWF Grid Connection is on a small drain. All new permanent watercourse crossing structures for UWF Related Works are on small headwater watercourses which are upstream of the SAC. Effects on local surface water bodies with respect to permanent crossings has being assessed to be imperceptible because culverts

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Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
				will be sized to cope with a 100-year flood flow as per the Project Design Measure (see Section 11.2.4.9) and therefore effects on the downstream SACs is considered to be Neutral. The effects of runoff on local surface water bodies was also assessed to be imperceptible due to the distributed nature of the permanent hardstanding infrastructure within several catchments over a large geographical area and the relatively small permanent footprint within individual local catchments (refer to Section 11.2.4.10). As such, effects on the downstream SACs will be Neutral. There are no new or upgraded watercourse crossings structures or hardstanding areas required for the UWF Replacement Forestry, therefore no potential for impacts.
Surface water quality impacts from runoff from permanent hardstanding surfaces	1,2,3,4	SW Flowpaths	Surface Water Quality Impacts due to Suspended solid input	Rationale for Excluding: Neutral Impact Due to the distributed nature of the permanent hardstanding infrastructure within several catchments over a large geographical area, the relatively small permanent footprint within individual local catchments and the fact that check dam measures will be included at all permanent hardstanding areas (Project Design Measure), the impact on local surface water bodies is considered to be imperceptible (see Section 11.2.4.10), therefore effects on the downstream SAC are considered to be Neutral. No groundworks or excavations required for the UWF Replacement Forestry, therefore no potential for impact.
Decommissioning Stage				
Rationale for Excluding: Neutral Impact, or no potential for impact to occur UWF Grid Connection will remain part of the National Grid. Therefore no hydrological impacts are expected. UWF Related Works: The cables will be pulled from the Internal Windfarm Cabling ducts at the turbines or at the substation; the ducting, Realigned Windfarm Roads and Haul Route Works will remain in-situ; therefore no decommissioning works to lands are required. The Telecom Relay Pole will be removed, and the compound area reinstated and returned to agricultural. Neutral effects to surface or groundwater are anticipated, and therefore neutral effects to the downstream SAC expected. The UWF Replacement Forestry will not be harvested or felled but will remain permanently in place. Therefore no hydrological impacts are expected. Upperchurch Windfarm: It is likely that the Consented UWF Substation will remain in-situ for use by ESBN and that the Consented UWF Roads will also remain in-situ for use by the landowner. Decommissioning works will be limited to the Consented UWF Turbines, Turbine Hardstanding areas, Meteorological Mast and associated drainage systems. All decommissioning works will take place from hard-core areas, with the majority of activity taking place on the turbine hardstands. Therefore, it is considered that decommissioning activities will have neutral effects to surface or groundwater, and therefore neutral effects to the downstream SAC expected.				

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11.6.5 Mitigation Measures for Impacts to Lower River Suir SAC

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Lower River Suir SAC**.

11.6.6 Evaluation of Residual Impacts to Lower River Suir SAC

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Lower River Suir SAC above (Section 11.6.4) – i.e. **imperceptible**.

11.6.7 Application of Best Practice and the EMP for Lower River Suir SAC

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment. The following Best Practice Measures have been developed, for the protection of **Aquatic Habitats & Species,** by the authors of this topic chapter, using industry best practice:

GC-BPM-01	Measures for Protection of Surface Water Quality and Watercourse Morphology during instream works at Mountphilips Substation site
GC-BPM-02	Measures for Protection of Surface Water Quality and Watercourse Morphology during replacement of existing culverts along the 110kV UGC outside Mountphilips Substation site
GC-BPM-03	Design of New Permanent Watercourse Crossing Structures and Existing Culvert Replacements to Prevent Flood Risk
GC-BPM-04	Surface Water Quality Protection Measures for Site Runoff During the Mountphilips Substation Site Construction Works
GC-BPM-05	Protection of Surface Water and Groundwater Quality during use of Cement Based Compounds
GC-BPM-06	Protection of Surface Water and Groundwater Quality During Storage and Handling of Fuels, Oils and Chemicals
GC-BPM-07	Surface Water Quality Protection Measures During Storage of Overburden at the Mountphilips Substation Site

These Best Practice Measure form part of the UWF Grid Connection Environmental Management Plan which is appended to this EIA Report as Volume D.

11.6.7.1 Surface Water Management Plan

The UWF Grid Connection Environmental Management Plan will include a bespoke Surface Water Management Plan. Water quality and the existing drainage regime will be managed under the Surface Water Management Plan (SWMP) which will be implemented by the appointed Contractor during the construction stage of the UWF Grid Connection. This Surface Water Management Plan (SWMP) provides the water management framework for the appointed Contractors and Sub-contractors and it incorporates the mitigating principles described in this EIAR (particularly in this Chapter 11 – Water) to ensure that construction works are carried out with minimal impact on the surface water environment and in accordance with the mitigation measures and project design commitments made in the EIAR. The Surface Water Management Plan is part of the UWF Grid Connection Environmental Management Plan which is appended to this EIA Report as Volume D.

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11.6.8 Summary of Impacts to the Lower River Suir SAC

A summary of the Impacts to the Lower River Suir SAC is presented in Table 11-51.

Table 11-50: Summary of Impacts to the Lower River Suir SAC

Impact to Lower River Suir SAC:	**Surface water quality impacts due to earthworks**	**Surface water quality impacts from watercourse crossing work**	**Water quality impacts from fuels, oils and chemicals**	**Water quality impacts from cement-based compounds**	**Surface water quality impacts due to forestry felling**
Evaluation Impact Table	*Section 11.6.4.2*	*Section 11.6.4.3*	*Section 11.6.4.4*	*Section 11.6.4.5*	*Section 11.6.4.1*
Project Life-Cycle Stage	Construction	Construction	Construction	Construction	Construction
UWF Grid Connection *Direct Impact*	**No Likely Impact**	**No Impact**	**No Impact**	**No Impact**	**No potential for impacts** **Evaluated as Excluded,** see Section 11.6.1
UWF Grid Connection *Cumulative Impact*	**Imperceptible**	**Imperceptible**	**Imperceptible**	**Imperceptible**	
Element 2: UWF Related Works	Imperceptible	Imperceptible	Imperceptible	No Impact	Imperceptible
Element 3: UWF Replacement Forestry	Imperceptible	No potential for impacts	No Impact	No potential for impacts	No potential for impacts
Element 4: Upperchurch Windfarm	Not Significant	No Impact	Not Significant	Not Significant	Not Significant
Element 5: UWF Other Activities	No Potential for Impacts - Evaluated as Excluded, see Section 11.6.2.2.1				
Cumulative Impact:					
Whole UWF Project Effect	**Imperceptible**	**Imperceptible**	**Imperceptible**	**Imperceptible**	**Imperceptible**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Lower River Suir with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.6.2.2).

Water

Topic

11.7 Sensitive Aspect No.6: Local Water Dependent Habitats

This Section provides a description and evaluation of the Sensitive Aspect - Local Water Dependent Habitats. In this EIA Report, Local Water Dependent Habitats relate to areas of wet grassland and wet heath which supports Devils Bit Scabious (plant) habitat for the Marsh Fritillary butterfly.

11.7.1 UWF Grid Connection – EVALATED AS EXCLUDED

11.7.1.1 Baseline Characteristics of Local Water Dependent Habitats in relation to UWF Grid Connection

While there is a small area of wet grassland within 50m of the new access road at the Mountphilips Substation site, there is no Marsh Fritillary habitat in this area.

The 110kV UGC outside of the Mountphilips Substation site is located entirely on public road pavements, with the last section of the route along a private paved road and in the future Upperchurch Windfarm Substation compound. While the location of the already consented Upperchurch Windfarm Substation is in a grassland field, this is in an improved grassland field and does not support Marsh Fritillary habitat.

11.7.1.2 Evaluation of UWF Grid Connection

UWF Grid Connection was evaluated for its potential to cause impacts to Local Water Dependent Habitats.

It was evaluated by the topic authors that UWF Grid Connection is not likely to cause impacts to **Local Water Dependent Habitats,** for the following reasons

- No likely effects due to the absence of suitable marsh fritillary habitat on or adjacent to construction works areas.

11.7.1.3 Cumulative Evaluation for the Other Elements *(grey background)*

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

UWF Grid Connection is not likely to cause impacts to Local Water Dependent Habitats by itself, and therefore is not likely to have a cumulative effect. However, the Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in Section 11.7.2 to 11.7.4 and included in the summary table in Section 11.7.8 in order to present the totality of the project.

11.7.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

11.7.2.1 Cumulative Evaluation Study Areas

11.7.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection has been excluded as a source of impacts to Local Water Dependent Habitats due to the absence of Marsh Fritillary habitat at or in close proximity (50m) of UWF Grid Connection construction works areas.

11.7.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

UWF Grid Connection is not likely to cause impacts to Local Water Dependent Habitats by itself, and therefore is not likely to have a cumulative effect. However, the Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6, in Volume C4 EIAR Appendices. Scoping of these Other Elements is presented in Section 11.7.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area for the evaluation of whole project effects is described in Table 11-52, and illustrated on Figure WP 11.7: Whole Project Study Area for Local Water Dependent Habitats.

Table 11-51: Cumulative Evaluation Study Area for Local Water Dependent Habitats

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 2: UWF Related Works	50m corridor, either side of Element works/ planting/ activity areas	Due to the shallow depth and temporary nature of the excavations associated with the construction works, the potential for impacts to local Water Dependent Habitats is limited to localised (<50m) changes to surface water runoff/groundwater flow.
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

11.7.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Local Water Dependent Habitats also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Local Water Dependent Habitats with the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.23).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Local Water Dependent Habitats.

11.7.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Local Water Dependent Habitats

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Local Water Dependent Habitats. The results of this evaluation are included in Table 11-53.

Table 11-52: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Element of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: No potential for effects due to the absence of suitable marsh fritillary habitat on or adjacent to the afforestation lands.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: No potential for effects to Local Water Dependent Habitats due to no requirement for construction excavation work sand the absence of Marsh Fritillary habitat at activity locations.

11.7.2.3 Cumulative Information: Baseline Characteristics – Context & Character

11.7.2.3.1 Element 2: UWF Related Works & Element 4 Upperchurch Windfarm

In the Upperchurch Windfarm/ UWF Related Works Study Area, Marsh Fritillary butterfly has been mapped in wet grassland and wet heath habitat, close to Consented UWF Rooads and the Internal Windfarm Cabling at Section SW13/SW14. The Internal Windfarm Cabling will be installed within the Upperchurch Windfarm access roads at this location.

The habitats at the locations identified above are relatively small and fragmented.

The wet grassland and wet heath habitat close to Consented UWF Roads/Internal Windfarm Cabling locations exists upslope of the construction works area, and therefore the natural drainage is unlikely to be impeded by the construction works.

Consideration of the Passage of Time: It is considered that there have been no material changes in the baseline environment (including drainage patterns) at the site and the descriptions in the 2013 and 2014 documents for Upperchurch Windfarm remain relevant to the cumulative evaluations in this EIAR.

11.7.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 11.7.2.2.1.

11.7.2.3.3 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 11.7.2.2.1.

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11.7.2.3.4 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 11.7.2.2.

11.7.2.4 Cumulative Information: Baseline Characteristics – Importance

The wet grassland and wet heath habitat supports populations of Marsh Fritillary (Annex II) and therefore has **High** importance.

11.7.2.5 Cumulative Information: Baseline Characteristics – Sensitivity

Wet grassland and wet heath habitats are sensitive to certain land use practices and specifically where drainage is being carried out.

11.7.2.6 Cumulative Information: Baseline Characteristics – Receiving Environment

It is assumed that the habitats identified will be the receiving environment during the time of the development works.

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11.7.3 PROJECT DESIGN MEASURES for Local Water Dependent Habitats

As UWF Grid Connection is not likely to cause effects to Water Dependent Habitats, no Project Design Measures have been developed.

11.7.4 EVALUATION OF IMPACTS to Local Water Dependent Habitats

It is evaluated that UWF Grid Connection is not likely to cause impacts to Local Water Dependent Habitats, see Section 11.7.1.

This Section evaluates the likely cumulative effects of Other Elements of the Whole UWF Project (in particular the Upperchurch Windfarm and UWF Related Works) and Other Projects or Activities.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Local Water Dependent Habitats.

As a result of the exercise, some impacts were included and some were excluded.

Table 11-53: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Drainage of Marsh Fritillary habitat (construction/operational stage)	**No other impacts were *excluded* from the evaluation**

The source-pathway-receptor links for the impact included are described in the **Impact Evaluation Table, which is presented in the next section 11.7.4.1.**

Note: No other impacts were excluded from the evaluation.

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11.7.4.1 Impact Evaluation Table: Drainage of Marsh Fritillary habitat

Evaluation of UWF Grid Connection Excluded: As there is no suitable Marsh Fritillary habitat within the construction works boundary (or within 50m of the construction works boundary) of the UWF Grid Connection, there is no potential for UWF Grid Connection to cause negative effect to Local Water Dependent Habitats by itself, and consequently this project cannot have a cumulative effect.

However, the Other Elements must be considered because the UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluation for the Other Elements of the Whole UWF Project are included in this Impact Evaluation Table, in order to show the totality of the project.

Cumulative Impact Description for the Other Elements of the Whole UWF Project	
Project Life Cycle Stage: *(for Other Elements only)*	Construction / Operational stage
Other Element Impact Source: Excavations and permanent infrastructure Impact Pathway: Surface water and groundwater flowpaths Impact Description: Alteration of wet habitat drainage/hydrology within the works area as a result of temporary excavation works and permanent infrastructure and drainage. Impact Quality: Negative	
Whole Project Information: Individual Evaluations of Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	
Impact Magnitude: Wet Grassland / Wet Heath has been mapped along the Internal Windfarm Cabling at Section SW13/SW14 (for 170m). The wet habitat mainly exists upslope of the works, and therefore effects are likely to be negligible.	
Significance of the Impact: Imperceptible	
Rationale for Impact Evaluation: • As per Table 11-7, Negligible magnitude combined with the High Importance of the habitat; • The works at route Sections SW13/SW14 will only comprises a temporary trench, and therefore any minor effects will be temporary; • The works are downslope of the wet habitat; • The shallow and temporary nature of the cable trench; • The cable will be installed within the permitted windfarm access road; • All effects will be brief to temporary and reversible.	
Element 3: UWF Replacement Forestry– *N/A, evaluated as excluded, see Section 11.7.2.2.1*	
Element 4: Upperchurch Windfarm	
Impact Magnitude: The Consented UWF Roads will be constructed through the same area of marsh fritillary habitat as the UWF Related Works above. The habitat is mainly on the upslope side of the works.	
Significance of the Impact: Not Significant	
Rationale for Impact Evaluation: • The works are mainly downslope of the wet habitat; and, • The natural surface water / groundwater drainage regime in the area is to be maintained by the windfarm drainage.	
Element 5: UWF Other Activities– *N/A, evaluated as excluded, see Section 11.7.2.2.1*	

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Evaluation of Other Cumulative Impacts – Drainage of Marsh Fritillary habitat
Whole UWF Project Effect
There is potential for cumulative Impacts of the UWF Related Works and the Upperchurch Windfarm, where the Internal Windfarm Cabling at SW13/SW14 will be installed within the Consented UWF Roads, and therefore in-combination effects are likely to be **Small Adverse**. The natural surface water / groundwater drainage regime in the area is to be maintained by the windfarm drainage. There is no potential for in-combination effects on the wet habitats due to the UWF Grid Connection.
Significance of the Cumulative Impact: Slight
Rationale for Cumulative Impact Evaluation: • As per Table 11-7, Small Adverse magnitude combined with the High Importance of the habitat; • The Internal Windfarm Cabling at SW13/SW14 will be installed within the Consented UWF access roads. • The consented windfarm drainage design will maintain the existing drainage regime.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to the Local Water Dependent Habitats with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.7.2.2).

11.7.5 Mitigation Measures for Impacts to Local Water Dependent Habitats

Mitigation measures are not relevant as no impacts are likely to occur to Local Water Dependent Habitats as a consequence of the UWF Grid Connection.

11.7.6 Evaluation of Residual Impacts to Local Water Dependent Habitats

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. Mitigation measures are not relevant and thus the Residual Impact is the same as the Impact set out in the Evaluation of UWF Grid Connection (Section 11.7.1), i.e. No likely impacts.

11.7.7 UWF Grd Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resouced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

11.7.8 Summary of Impacts to Local Water Dependent Habitats

A summary of the Impacts to Local Water Dependent Habitats is presented in Table 11-55.

Table 11-54: Summary of the impacts on Local Water Dependent Habitats

Impact to Local Water Dependent Habitats:	**Drainage of Marsh Fritillary habitat**
Evaluation Impact Table	*Section 11.7.1*
Project Life-Cycle Stage	Construction/ Operation
UWF Grid Connection *Direct Impact*	**No Likely Impact Evaluated as Excluded, see Section 11.7.1**
UWF Grid Connection *Cumulative Impact*	
Element 2: UWF Related Works	Imperceptible
Element 3: UWF Replacement Forestry	No Potential for Impacts Evaluated as Excluded, see Section 11.7.2.2.1
Element 4: Upperchurch Windfarm	Not Significant
Element 5: UWF Other Activities	No Potential for Impacts Evaluated as Excluded, see Section 11.7.2.2.1
Cumulative Impact	
All Elements of the Whole UWF Project (only relates to Upperchurch Windfarm and UWF Related Works)	**Slight**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Local Water Dependent Habitats with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 11.7.2.2)

Local Water Dependant Habitats

Sensitive Aspect

Water

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11.8 Reference List

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Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements.

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Reference List

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Contents

Topic Air

List of Figures

Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

List of Appendices

Appendices referenced in this topic chapter can be found in **Volume C4 EIAR Appendices.**

List of Abbreviations

Abbreviation	Full Term
AIMD	Active Implantable Medical Devices, such as Pacemakers
BPM	Ecopower Best Practice Measure developed by members of the EIAR Team
dB	Decibel - The unit of sound pressure level
EMF	Electromagnetic Fields, Comprising of Electric and Magnetic Field.
HDV	Heavy Duty Vehicle with a gross weight greater than 3.5 tonnes
IAQM	Institute of Air Quality Management
ICNIRP	International Commission on Non-Ionising Radiation Protection
NHA	National Heritage Area
OHL	Overhead Power Line, mounted on wooden poles or pylons

Abbreviation	Full Term
PD	Ecopower Project Design Environmental Protection Measure
PM	Abbreviation for particulate matter suspended in the air. PM10 is airborne particulate matter with an aerodynamic diameter less than 10 microns (µm); PM2.5 is less than 2.5µm
SAC	Special Area of Conservation
SPA	Special Protection Area
TII	Transport Infrastructure Ireland
V/m, or kV/m	Electric Field is measured in Volts per metre, V/m, or kV/m (1000 V/m)
µT	Magnetic Field is measured in micro Tesla , µT
UGC	Underground Cables
UWF	Upperchurch Windfarm

Glossary of Terms

Term	Definition
Ambient Sound	The total amount of all noise present at a particular place and time in the environment at the point of investigation
Attenuation	The reduction of sound energy by a variety of means such as air, humidity, porous materials, distance etc.
Average Noise Level (LAeq, Leq)	This is the energy average noise level considered as a notional steady level that contains the same amount of noise as the actual fluctuating noise level during a specified period of time (based on equal energy principal) expressed as LAeq sometimes as Leq
Decibel or dB	The unit of sound pressure level usually abbreviated to the dB. Any noise quantity that is expressed as a level is measured and quoted in decibels
EMF Immunity	The robustness of an electrical/electronic device to EMF interference and maintain correct operation.
Equipment Interference	Electrical/electronic device failing to maintain correct operation due to EMF levels
Noise Level	For sound transmitted primarily through the air it is usually taken to be the A weighted sound pressure level
Maximum Noise Level	This is the highest instantaneous sound pressure level in decibels with a specified frequency weighting and time weighting, expressed as LAFMax and sometimes referred to as the LMax
Project Design Measure	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.
Substation	Part of the Electrical Grid system, transform Voltage to higher or lower and perform several other functions
Trackout	The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site

Term	Definition
V/m, or kV/m	Electric Field is measured in Volts per metre, V/m, or kV/m (1000 V/m)
µT	Magnetic Field is measured in micro Tesla , µT

Topic
Air

Executive Summary to the Air Chapter

In this EIA Report, Air relates to air quality, ambient noise and vibration and Electromagnetic Fields (EMF).

Baseline Environment: The area is predominantly rural and away from major urban areas. There is a high level of air quality in the area, as it is located away from busy, congested roads and industrial sources of air pollutants. Sources of EMF in the existing environment are limited to electric equipment in homes, businesses, farms and community facilities; existing overhead and underground electricity lines; and overhead telephone lines and signals from existing telecommunications masts. The existing noise sources are typical for such a rural/ agricultural setting, with natural and man-made noise including farm machinery and traffic on the public road network and in Newport town.

Baseline Noise Measurements: A baseline environmental noise survey was undertaken in 2017 (which included weekend and weekday periods, both day and night) close to the Mountphilips Substation site. The results show, when averaged for each of the day, evening and night time periods that the noise monitoring location can be considered an area of low background noise, during calm weather at least. Noise levels along the 110kV UGC are expected to be higher, normal levels of rural noise due to the location of the works on public roads.

Survey Results for Sensitive Aspects in the Baseline Environment: The study area for Construction Dust, Noise and Vibration is 350m from the construction works area (391 No. residences and 19 No. public places and facilities) and 50m from the main transport routes (312 No. residences and 33 No. public places and facilities); the study area for Operational Noise is 400m from Mountphilips Substation (6 No. residences); and for Operational EMF is 100m from Mountphilips Substation and 110kV UGC (none within 100m of Mountphilips Substation and 317 No. residences and 17 No. public places and facilities along the 110kV UGC).

The majority of the residential dwellings are along the local road network to the north of Newport town and along the Regional Road R503 particularly in the Lackamore area and in the vicinity of Rear Cross village. The majority of public places and facilities are located in the village of Rear Cross, with facilities also available in the nearby town of Newport, and to a lesser extent in the nearby villages of Klicommon and Upperchurch.

Transient people in the area relate to road users, including walkers and cyclists, farm and forestry works in adjacent lands, and walkers on waymarked trails in the area.

Summary of the likely Impacts to Local Residents & Community of the Development:

Dust from construction works and vehicles: The impact to Local Residents & Community is evaluated as **Slight** because background levels of pollution are very low, however the works will be of temporary duration, the impact is reversible and the works will be transitory and predominantly linear in nature.

Noise from construction works and vehicles: The Impact to Local Residents & Community is evaluated as **Moderate** because the NRA threshold limits are likely to be exceeded, at some locations; not all receptors will be impact simultaneously, with only small numbers of receptors impacted at any one time due to the progressive linear nature of the works; the relatively short exposure during normal working hours with works within 350m of a receptor typically completed within 10 days, and works within 60m of a receptor generally completed within 1 to 2 days; the temporary duration of potential exceedance of the guidelines limits (generally less than 1 week); the compliance with the guideline limits at all properties which are located farther 60m (realistic case) from works areas on the public road network; the reversibility of the effect with the completion of works; the carrying out of works during daytime hours.

Noise during operation of Mountphilips Substation: There will be **No Impact** because of separation distance to the nearest residence (385m) and therefore there will be no discernible change in the baseline conditions.

Increase in ambient EMF levels during operation of the Substation and 110kV UGC: (**local residents & community**). There are no residents or community facilities within 100m of Mountphilips Substation. There will be some increase in magnetic field levels at the 317 No. local residences and 17 No. community facilities (including 2 No. schools) which are within 100m of the 110kV UGC along the public road. The Impact of increased EMF levels due to the 110kV UGC is evaluated as **Imperceptible** because the worst case increase in levels of magnetic fields will be at local residences and community facilities within 30m of the 110kV UGC where there will be a small increase in EMF levels (4.45µT at 5m from the 110kV UGC to 0.13µT at 30m from the 110kV UGC) , these levels will rapidly reduce with distance from the cabling. All other properties, which includes the 2 local schools (Lackamore National School and Rear Cross National School) the levels of EMF will remain at a level similar to existing ambient levels. In all cases, all increases in EMF remain substantially under the ICNIRP guideline limits. A level of 4.45 µT at the very closest houses have a marginally higher significance for electronic devices, however Artificial Implanted Medical Devices s such as pacemakers, are tested to higher EMF Immunity levels to safeguard operation. A limit of 100 µT also applies to these devices. There will be no increase in electric fields due to the complete screening by both the metallic sheath surrounding the cables and by the concrete and backfill materials above the cables.

For Transient People the impact of EMF will be **Imperceptible to Slight** because the value will be 54µT directly above the 110kV UGC - which is still circa. half of the ICNIRP guideline limits of 100µT. Electric fields from the 110kV UGC will be screened by metallic sheath. The electric fields at Mountphilips Substation will be 40V/m which is less than 1/100th of the ICNIRP limit of 5000V/m. In any case transient people will only experience brief and occasional exposure.

Summary of the Likely Cumulative Impact: Where the UWF Grid Connection construction works interact with UWF Related Works and Upperchurch Windfarm particularly in the Knocknabansha / Knockmaroe / Knockcurraghbola Crownlands / Knockcurraghbola Commons area, the cumulative impact to Local Residents & Community will be Slight (construction Dust); and Moderate (construction Noise). The Whole UWF Project cumulative impacts range from Slight (construction Dust) to Moderate (construction Noise). Where the operational UWF Grid Connection interacts with UWF Related Works and with the *potential* Castlewaller Windfarm grid connection along the Local Road L6009-0 at Castlewaller / Carrowkeale / Derryleigh; and with the existing 110kV OHL and 220kV OHL in Mountphilips and Coole townlands, the cumulative impact will be No Impact (operational noise); Imperceptible (operational EMF local residents); Imperceptible to Slight (operational EMF transient people). The Whole UWF Project cumulative impact will be in the order of UWF Grid Connection due to the separation distance between the Other Elements of the Whole UWF Project and the potential Castlewaller Windfarm grid connection and existing 110kV and 220kV OHLs.

Conclusion: The UWF Grid Connection will not cause significant adverse effects to Air.

12 Environmental Factor: Air

12.1 Introduction to the Air Chapter

12.1.1 What is Air?

In this EIAR, Air relates to air quality, ambient noise and vibration and electromagnetic Fields.

Air quality relates to the quality of air in our environment, and can be adversely affected by emissions of various pollutants. In terms of this chapter, nitrogen oxides (NO + NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) are the two main air pollutants of concern. Poor air quality can impact human health, vegetation and ecosystems. Ireland in general has a good standard of air quality compared with other European countries.

Airborne noise is energy propagated through the air via pressure fluctuations which are detected by the ear. Vibration relates to energy propagated through either the air or the ground.

Electromagnetic Fields (EMF) comprise an electric field and a magnetic field, and are emitted from both natural and unnatural sources in the environment.

12.1.2 Overview of Air in the Local Environment

In general terms the project is located in predominantly rural areas and away from major urban areas or large centres of population. The surrounding landscape is predominantly rural, agricultural grassland and forestry. Nearby settlements include the town of Newport, and the villages of Upperchurch, Kilcommon, while the 110kV UGC is routed through the village of Rear Cross. With the exception of the Newport area, the area is sparsely populated with individual dwellings and farmsteads scattered throughout this rural area.

There are a number of Designated Sites in the area including the Slievefelim to Silvermines SPA and the Lower River Shannon SAC. There are also a number of waymarked trails in the area – including the Slievefelim Way and the Ormond Way cycle route.

There is a high level of air quality in this upland area, as it is located away from busy, congested roads and industrial sources of air pollutants.

The existing noise sources are typical for such a rural/ agricultural setting, dominated by natural noise sources, mainly wind borne noise, but also running water and birdsong. There are also man-made noise sources in rural areas including farm machinery when in operation, and from traffic in and around Newport town and from traffic on the public road network, including the R503 road which is a regional road connecting Thurles to Newport and Limerick City.

Sources of EMF in the existing environment include electric equipment, and low, medium and high voltage overhead electricity lines, overhead telephone lines, signals from existing telecommunications masts and underground communication cables which run along road boundaries and across agricultural lands.

The location of the UWF Grid Connection is illustrated on OSI Mapping on Figure GC 12.1: Location of the UWF Grid Connection.

Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

12.1.3 Sensitive Aspects of the Air Environment included for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspects **are included in this topic chapter** as they could be potentially impacted:

Sensitive Aspect No. 1	Local Residents & Community	Section 12.2
Sensitive Aspect No. 2	Transient People	Section 12.3

Each of the above listed Sensitive Aspects are evaluated individually in Sections 12.2 to 12.3 of this Chapter.

To help readers navigate to individual sensitive aspect sections, the colour codes for each Sensitive Aspect used above are also used in the Sensitive Aspect sections Section 12.2 to 12.3. The colour-codes have been applied to section headings, tables and on side-tabs on the edge of the pages.

12.1.4 Sensitive Aspects excluded from further evaluation

The following Sensitive Aspects **are excluded from this topic chapter**:

Telecommunications Infrastructure *(Telecommunication equipment on local masts and local signal paths between tele-communication masts)*	Evaluated as excluded in this Air chapter: Evaluated in Chapter 14: Built Services. The levels of EMF associated with the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm and the potential for EMF to effect local communication networks have been a subject of discussion between Kevin Hayes of Ai Bridges, one of the authors of Ch.14 Material Assets (Built Services) and Lewis Brien, one of the authors of this topic chapter Air, where it was decided that in order to avoid duplication of information in this EIA Report, that the this type of impact pathway would be evaluated in Chapter 14: Material Assets (Built Services). The results of the evaluation in Chapter 14, is that the development is not likely to adversely affect local communication networks.
Sensitive Ecological Receptors	Evaluated as excluded in this Air chapter: Evaluated in Chapter 8: Biodiversity. To avoid duplication of information in this EIA Report, information on the emission of dust, noise, vibration and EMF was provided by the authors of this chapter Air to the authors of the Biodiversity Chapter. The authors of the Biodiversity chapter have taken these emissions into account in their evaluations of impacts to ecological receptors.

12.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of a current application to An Bord Pleanála. The main parts of the UWF Grid Connection are identified in Table 12-1 below.

Table 12-1: Subject Development – UWF Grid Connection

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Ancillary works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 EIAR Main Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

12.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.
- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. ***Note***: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

12.1.6 The Authors of the Air Chapter

This report on the Environmental Factor Air, was written by a number of authors.

The Air Quality sections have been written by Ciara Nolan, BSc (Hons) in Energy Systems Engineering and Master in Applied Environmental Science, of AWN Consulting Ltd. She is an Associate Member of the Institute of Air Quality Management and specialises in the fields of ambient and indoor air quality monitoring and EIA. AWN Consulting is a multidisciplinary environmental consultancy specialising in Acoustics, Air Quality, Climate, Waste, Water and Soil Quality, Flora and Fauna and Seveso II Major Accident Hazard Land Use Assessments.

The noise and vibration sections have been written by Peter Barry (BAgr Sc. MSc) of Enovi. Peter is an Environmental Scientist, Environmental Noise Specialist and Environmental Impact Assessment practitioner. Peter has 20 years-experience in the measurement, prediction, assessment and control of environmental noise. Peter is a member of the Institute of Acoustics (IOA) and has undertaken numerous wind farm and associated infrastructure noise impact assessments across the country.

The Electromagnetic Fields sections have been written by John McAuley (MSc (Hons) in Engineering) and Lewis Brien (B (Hons) in Electronics) of Compliance Engineering Ireland (CEI). CEI has carried out over 500 radiofrequency site surveys throughout Ireland and worldwide and is recognised by Comreg as one of the foremost independent authorities on the radio frequency spectrum in Ireland.

12.1.7 Sources of Baseline Information

The information sources outlined in Table 12-2 were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 12-2: Sources of Baseline Information for Air

Type	Source
Consultation	Feedback was received from • Health Service Executive • Members of the public during the Public Consultation and Information Day See Chapter 3: The Scoping Consultations, Chapter 3 Appendices for further details.
Legislation, Regulation & Policy	• EU Directive 2008/50/EC - Air quality standards were established under which sets limit values for certain air pollutants in order to protect against human health impacts. • Environmental Noise Directive (END), EC 2002/49/EC • European Commission (EC) "Electromagnetic Compatibility Directive 2014/30/EU" • European Commission (EC) "Radio and Telecommunications Equipment Directive 1999/5/EC" • S. I. No. 109 of 2007, European Communities (Electromagnetic Compatibility) Regulations 2007. • S. I. No. 240 of 2001, European Communities (Radio and Telecommunications Terminal Equipment) Regulations 2001.
Industry Guidance	• Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII, 2011) • Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014) • Environmental Protection Agency – Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), 2016. • NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004) • Transport Infrastructure Ireland "Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, March 2014" • Institute of Environmental Management and Assessment (IEMA) - Guidelines for Environmental Noise Impact Assessment, 2014. • British Standard 5228 Parts 1 & 2, Code of Practice for Noise and Vibration Control on Construction and Open Sites + A1 2014. • ISO 9613-2-1996- Acoustics – Attenuation of sound during propagation outdoors –Part 2: General method of calculation, • ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric And Magnetic Fields (1Hz – 100 kHz) (2010) • EU EMF recommendation 1999/519/EC. • European Committee for Electrotechnical Standardization (CENELEC), "EN 45502-2-1:2003 Active implantable medical devices. Particular requirements for active implantable medical devices intended to treat bradyarrhythmia (cardiac pacemakers)
Desktop	• EPA "Air Quality Monitoring Report 2017" (EPA, 2018), • EPA Annual Air Quality Monitoring Reports (2010 - 2016) • Review of aerial photography, and OSI and other online mapping to identify local residential properties, local community facilities and walking routes and to identify other activities in close proximity to these properties and routes • AC Field Modelling of the fields from the works • Comreg, ESB and Radiological Protection Institute of Ireland online Information • Review of the following EIA Report chapters: Chapter 10: Soils, Chapter 15: Material Assets: Roads • Review of planning/ environmental information documents for the Other Elements of the Whole UWF Project as contained in Volume F of the planning application

Type	Source
Fieldwork	• Site visits to establish the proximity of nearby sensitive receptors to the works areas. • Representative noise measurement undertaken at a similar substation to the Mountphilips Sub-station for the purposes of the evaluation. • Baseline Noise Measurements at the nearest noise sensitive receptor to the Mountphilips substation location

12.1.8 Methodology used to Describe the Baseline Environment and to Evaluate Impacts

UWF Grid Connection can impact local air through a number of mechanisms: traffic based air pollutants, construction dust emissions, noise or vibration emissions, and electromagnetic fields. The methodology for evaluating the effects of traffic, dust noise, vibration and EMF emissions is provided in the Sections below.

12.1.8.1 Methodology for Evaluating Effects to Air Quality

12.1.8.1.1 Air Quality Standards

Air quality is evaluated against the Air Quality Standards set out by the EU. Air Quality Standards were established under EU Directive 2008/50/EC which sets limit values for certain air pollutants in order to protect against human health and ecological impacts. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors, such as natural background levels, environmental conditions and socio-economic factors, may be considered. The limit values are presented in the table below.

Table 12-3: EU Air Quality Standards Regulations

Pollutant	Regulation[1]	Limit Type	Value
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	40 µg/m^3 PM_{10}
$PM_{2.5}$	2008/50/EC	Annual limit for protection of human health	25 µg/m^3 $PM_{2.5}$
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3 NO_2
		Annual limit for protection of human health	40 µg/m^3 NO_2
		Critical Load for protection of vegetation	30 µg/m^3 NO + NO_2

12.1.8.1.2 Transport Infrastructure Ireland Guidance on Traffic based air pollutants

The UK DMRB guidance, on which Transport Infrastructure Ireland (TII) guidance document '*Guidelines on the Treatment of Air Quality During the Planning and Construction of National Road Schemes*' was based, states that road links[2] meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment.

Neither the subject development nor the whole project meet any of the criteria listed in Table 12-4, and as a result a local air quality assessment was not required.

[1] Based on EU Directive 2008/50/EC

[2] A road link is where the existing road network is broken up into sections of road with similar traffic conditions (traffic composition, speed and flow).

Table 12-4: UK DMRB Criteria for Air Quality Assessment

TII Criteria	Criteria met?
Road alignment change of 5 meters or more	No, no change in road alignments
Daily traffic flow changes by 1,000 Annual Average Daily Traffic (AADT) or more	No, changes to daily traffic substantially below 1000 Annual Average Daily Traffic (AADT)
HGVs flows change by 200 vehicles per day or more	No, HGV flow changes substantially below 200 vehicles/day
Daily average speed changes by 10 km/h or more	No, no change in average speed
Peak hour speed changes by 20 km/h or more	No, no change in peak hour speed

12.1.8.1.3 IAQM Guidance on Construction Dust Emissions

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' outlines an assessment method for predicting the impact of dust emissions from earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase in order to predict the likely magnitude of the dust impacts on sensitive receptors.

12.1.8.1.4 IAQM Guidance on identifying Sensitive Receptors

The IAQM Guidance states that an assessment of dust impacts will be required where there is a 'human receptor' within 350 m of the boundary of the works or within 50 m of routes used by construction vehicles. According to the IAQM Guidance **a 'human receptor'** refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling[3], or exposure to PM_{10} over a time period relevant to the air quality objectives. The criteria for determining the sensitivity of a receptor to effects from dust is outlined in the Table below.

Table 12-5: IAQM Criteria for determining the sensitivity of a receptor to dust impacts

Sensitivity of a Human Receptor to Dust soiling	
High	locations where users can expect enjoyment of a high level of amenity
	appearance, aesthetics, value of property diminished by soiling
	people or property present either continuously or for extended periods of time
Medium	locations where users expect to enjoy a reasonable level of amenity
	appearance, aesthetics, value of property diminished by soiling
	people or property not present continuously or regularly for extended periods of time
Low	locations where enjoyment of amenity is not reasonably expected
	property not expected to be diminished in appearance, aesthetics, value by soiling
	areas of transient exposure where people or property are passing through or by an area
Sensitivity of a Human Receptor to health impacts from PM_{10}	
High	Areas where people are exposed over a time period relevant to the air quality objective for PM_{10} (Air Quality Standards established under Directive 2008/50/EC are reproduced in Table 1 of Appendix 12.1: Air Quality Monitoring & Standards.)
Medium	locations where the people exposed are workers
Low	locations where human exposure is transient

[3] As Per IAQM guidance 2014: Occupational settings are relevant in terms of annoyance effects.

12.1.8.1.5 IAQM Guidance on Evaluating the Sensitivity of the Area

According to IAQM Guidance (2014), the sensitivity of an area to construction dust impacts from either dust soiling or health impacts from PM_{10} is assessed using the criteria outlined in Table 12-6 to Table 12-7. This is based on the sensitivity of the receptor, the number of receptors and their distance from the dust source.

With regards to the sensitivity of the area a 'worst-case' approach has been taken in this assessment whereby the area with the majority of sensitive receptors within the closest distance to the works area have been assessed. This will establish the highest possible level of risk associated with any element of the project for either dust soiling or health impacts from PM_{10}; then the appropriate level of mitigation or best practice measures can be established if necessary, based on a high, medium or low level of risk.

Table 12-6: Sensitivity of an area to dust soiling effects on people and property (in bold)

Receptor Sensitivity	**Number of Receptors**	**Distance from the Source (m)**			
		less than 20	**less than 50**	**less than 100**	**less than 350**
High	greater than 100	High	High	Medium	Low
	10 - 100	High	**Medium**	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	1 or more	Medium	Low	Low	Low
Low	1 or more	Low	Low	Low	Low

(Note: The sensitivity of the area to dust soils effects are identified in bold text with yellow background)

Table 12-7: Sensitivity of an area to human health impacts

Receptor Sensitivity	**Annual Mean PM_{10} concentration**	**Number of Receptors**	**Distance from the Source (m)**				
			less than 20	**less than 50**	**less than 100**	**less than 200**	**less than 350**
High	less than 24 µg/m^3	greater than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	**Low**	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	less than 24 µg/m^3	greater than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	less than 24 µg/m^3	1 or more	Low	Low	Low	Low	Low

(Note: The sensitivity of the area to dust soils effects are identified in bold text with yellow background)

12.1.8.1.6 IAQM Guidance on Evaluating the Magnitude of Dust Emissions

Earthworks will primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- Large: Total site area > 10,000 m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved >100,000 tonnes;
- Medium: Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8 m in height, total material moved 20,000 – 100,000 tonnes;
- Small: Total site area < 2,500 m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 20,000 tonnes, earth-works during wetter months.

The worst case classification for dust emission magnitude (earthworks) can be classified as large as worst case for UWF Grid Connection.

Construction Material: Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- Large: Total building volume > 100,000 m^3, on-site concrete batching, sandblasting;
- Medium: Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. con-crete), on-site concrete batching;
- Small: Total building volume < 25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The worst case classification for dust emission magnitude (construction material) can be classified as medium for UWF Grid Connection.

Trackout: In relation to trackout, factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- Large: > 50 HGV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;
- Medium: 10 - 50 HGV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;
- Small: < 10 HGV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

The worst case classification for dust emission magnitude (trackout) can be classified as medium for UWF Grid Connection.

12.1.8.1.7 IAQM Guidance on Evaluating the Risk of Dust Impacts

The sensitivity of the area is combined with the dust emission magnitude to define the risk of dust impacts in the absence of mitigation, as outlined in Table 12-8.

Table 12-8: Risk of Dust Impacts in relation to earthworks, construction works and trackout

Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk – earthworks/construction *or* Low Risk - trackout	Low Risk – earthworks/construction *or* Negligible - trackout
Low	Low Risk	Low Risk	Negligible

The worst case risks of dust impacts in relation to earthworks, construction materials and trackout can be classified as medium in relation to the UWF Grid Connection construction works.

Relevant Appendix: Volume EIAR C4: EIAR Appendices
Appendix 12.1: Air Quality Monitoring & Standards

12.1.8.2 Methodology for Evaluating Noise & Vibration Effects

12.1.8.2.1 Identifying Noise Sensitive Receptors

A noise sensitive receptor is defined by the Environmental Protection Agency as, *any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.*

12.1.8.2.2 Construction Stage Noise Predictions

The potential for construction stage noise impacts mainly relates to the construction of the 110kV UGC. There are no extraordinary sources of noise amongst the equipment to be used, and the works will generally proceed linearly and during normal working hours.

The main item of plant which will be used for the excavation of the 110kV UGC trench and Joint Bay locations will be an excavator. This is a piece of machinery with similar noise emissions to an agricultural tractor, which are commonplace in the area. Noise emissions for a 30 to 50 tonne tracked excavator is 79dB at 10m. This data is sourced from the British Standard 5228, Code of Practice for noise and vibration control on construction and open sites. Plant and machinery typically involved in substation and underground construction activities is listed in the table below. Noise levels, sourced from BS5228 Noise Database for Noise and Vibration Control on Construction and Open Site 1& 2: 2014+A1, are also included in the table.

Table 12-9: Typical Construction Plant and Machinery which will be used during the Construction Stage

Plant and Machinery	Octave Banding (Hz)								Sound Power Level dB(A)	Sound Pressure Level @10mdB(A)
	63	125	250	500	1k	2k	4k	8k		
Telescopic Handler	86.8	86.9	85.4	92.8	98	96.2	88	78.9	102	71
Mobile Crane	84.8	90.9	93.4	90.8	95.0	95.2	88.0	79.9	101	70
30-50T Excavator	89.8	92.9	99.4	104.8	104	103.2	100	92.9	110	79
15-30T Excavator	99.8	98.9	104.1	100.8	101	100.2	96	86.9	109	78
12T Roller	94.8	98.9	99.4	108.8	104	100.2	97	90.9	111	80
Rigid truck	89.8	94.9	99.4	98.8	105	102.2	97	87.9	109	78
Tractor & Trailer	97.8	100.9	98.4	103.8	104	104.2	96	88.9	110	79
15-20T Rubber Tired Excavator	78.8	80.9	86.4	91.8	94	92.2	91	79.9	99	68
3-10T mini digger	85.8	86.9	90.4	90	95.0	90	92	84.9	100	69
Diesel Generator	84.8	88.9	79.4	81.8	84	80.2	77	66.9	92	61

The decibel sum of all of the items of plant listed above totals 86 dBA at 10 metres.

The construction works will be sequenced and all the noise sources presented in Table 12-9 will not be in operation continuously for the duration of the construction phase, and likely noise levels will be in the order of the excavator, i.e. 79dB at 10m.

Calculating the Spatial Extent of Noise

Using the inverse square law rule (In decibel terms a doubling (or halving) of sound intensity corresponds to an increase (or reduction) of 6dB), the sound pressure level, or magnitude of noise impact for both the Worst Case Noise levels (all plant in operation in the same location at the same time) and the Realistic Noise Levels, can be determined. The results are presented in Table 3, at increasing distances from the works. The

appropriate construction noise threshold levels (as per NRA *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (2004), are also included in Table 3.

Table 1 Determining Worst-Case and Realistic-Case Noise Levels

Distance from noise source	Worst Case Scenario	Realistic Scenario	NRA Guidance Levels
10m	86 dB	79 dB	65 dB
20m	80 dB	73 dB	65 dB
40m	74 dB	67 dB	65 dB
80m	68 dB	61 dB	65 dB
160m	62 dB	55 dB	65 dB
320m	56 dB	49 dB	65 dB

It is expected that the 65dB threshold will not be exceeded at distances of 120m under worst case scenario and 60m under realistic scenario.

12.1.8.2.3 NRA Guidelines on Construction Noise

There is no statutory guidance in Ireland relating to the maximum noise levels permitted during construction works, and in the absence of statutory guidance or other specific limits prescribed by local authorities, the thresholds outlined in Table 1 of the NRA *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (2004) has been adopted in this appraisal. The Authority (NRA) considered that the noise levels, included in Table 12-10 below, are typically deemed acceptable, with the comment that more stringent levels might be appropriate in areas where pre-existing noise levels are low.

Table 12-10: Construction Stage Noise Level Thresholds at the façade of dwellings

Period	Working Hours	$L_{Aeq(1\ hour)}$ dB[4]	$L_{pA(Max)slow}$[5] dB
Monday to Friday	07:00 to 19:00hrs	70	80
Monday to Friday	19.00 to 22.00hrs[6]	60*	65*
Saturday	08:00 to 16:30hrs	65	75

The results of background noise monitoring at Coole/Mountphilips (see Appendix 12.2: Background Noise Measuring & Operational Noise Modelling) show that when averaged for each of the day, evening and night time periods that the noise monitoring location can be considered an area of low background noise, during calm weather at least. Background noise surveys undertaken in 2012 in the vicinity of the Upperchurch Windfarm (see **2013 RFI**) demonstrated that this area is also an area of low background noise. As a result it is considered that background noise levels are generally low throughout the study area with higher levels of background noise along the Regional Road and in the vicinity of Newport town, and therefore the threshold

[4] L_{Aeq}): An indication of the average level of noise heard
[5] $L_{pA(Max)}$: An indication of the maximum sound level heard
[6] As stated in both the NRA Guidelines (2004) construction at these times or outside the times indicated in the table, except for emergency work, will require the explicit permission of the relevant local authority.

level of 65dB applies. It should be noted that the 60dB level is not applied because works will not take place beyond 7pm.

12.1.8.2.4 TII Guidelines for Evaluating Construction Stage Vibration Effects

Vibration emissions are limited to the construction phase.

According to TII's 2014 Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, *'the NRA's Guidelines point out that there are two separate considerations for vibration during the construction phase: that which affects human comfort and that which affects cosmetic or structural damage to buildings. There is a third category: that which affects sensitive equipment or processes, which could include installations concerning gas, water, electricity and telecommunications.*

The Guidelines suggest that human tolerance for daytime blasting and piling, two of the primary sources of construction vibration, limits vibration levels to a peak particle velocity (ppv) of 12mm/s and 2.5mm/s respectively.

To avoid the risk of even cosmetic damage to buildings, the Guidelines suggest that vibration levels should be limited to 8mm/s at frequencies of less than 10Hz, to 12.5mm/s for frequencies of 10 to 50Hz, and to 20mm/s at frequencies of 50Hz and above'.

No blasting or piling will be required for UWF Grid Connection.

12.1.8.2.5 Operational Phase Noise from the proposed Mountphilips Substation

Operational Stage noise is limited to the Mountphilips Substation for UWF Grid Connection.

Quiet Area Screening: As the Mountphilips Substation will be a permanent fixture with noise emissions a Quite Area screening was carried out for the location of the substation. The Screening is included in Appendix 12.2: Background Noise Measuring & Operational Noise Modelling. In summary the area is not classed as a 'Quiet Area'.

Low Background Noise Area Screening: As all of the criteria for Quiet Area classification are not met, then screening was carried out to see if the area met the criteria for a low background noise area. The Screening is included in Appendix 12.2. In summary, the Mountphilips/Coole area can be considered an area of low background noise, during calm weather at least.

IEMA Guidelines for Environmental Noise Impact Assessment

The Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment, November 2014, were used to evaluate the magnitude of impacts, the sensitivity of receptors and the level of significance of any effects during operation of the Mountphilips Substation. The criteria outlined in Tables 12-11 to 12-13 have been sourced from these Guidelines.

Table 12-11: IEMA (2014) Guidelines for Evaluating the Magnitude of Noise Impact

EPA Terminology	Description	Receptor Perception of Effects
Negligible	No discernible change in the baseline environmental conditions, within margins of error of measurement	Not Noticeable
Small	Impact resulting in a discernible change in baseline environmental conditions with undesirable/desirable conditions that can be tolerated	Noticeable and not intrusive

Medium	Impact resulting in a discernible change in baseline environmental conditions predicted either to cause statutory objectives to be marginally exceeded or to result in undesirable/desirable consequences on the receiving environment.	Noticeable and intrusive
Large	Impact resulting in a considerable change in baseline environmental conditions predicted either to cause statutory objectives to be significantly exceeded or to result in severe undesirable/desirable consequences on the receiving environment.	Noticeable and disruptive

Table 12-12: IEMA (2014) Guidelines for Evaluating the Sensitivity of Receptor

EPA Terminology	**Description**
Negligible	Receptor/ resource is not sensitive to noise.
Low	Receptor/resource is tolerant of change without detriment to its character or is of low or local importance. For example industrial estates
Medium/ Moderate	Receptors/resource has moderate capacity to absorb change without significantly altering its present character. For example residential dwellings, offices, schools, and play areas. Locally designated nature conservation sites which are also known to contain noise sensitive species (i.e. noise may change breeding habits or threaten species in some other way).
High	Receptor/resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance. For example hospitals, residential care homes, and internationally and nationally designated nature conservation sites which are also known to contain noise sensitive species (i.e. noise may change breeding habits or threaten species in some other way).

Table 12-13: IEMA (2014) Guidelines for Evaluating the Impact Significance Matrix

Magnitude	**Sensitivity of Receptor**			
	Negligible	Low	Medium/ Moderate	High
Negligible	None	None	None	None
Small	None	Slight	Moderate	Moderate
Medium	None	Moderate	Substantial	Substantial
Large	None	Moderate	Substantial	Very Substantial

12.1.8.2.6 Operational Phase Noise from the Upperchurch Windfarm

The consented UWF Turbines and the Consented UWF Substation will be required to meet strict noise limits as described in the Conditions of Planning. These noise limits, which are set out in Condition 11 of the Grant of Permission (2014), which apply at the nearest relevant receptors, are considered by the consenting authorities to be acceptable in terms of the protection of residential amenity, without unduly restricting wind farm development.

Condition 11: *Wind Turbine Noise arising from the proposed development by itself or in combination with other existing or permitted wind energy development in the vicinity shall not exceed the greater of (a) 5 dB(A) above background noise levels or (b) 43 dB(A) L90 10 min, when measured externally at dwellings of other sensitive receptors. (Ref: ABP 22.243040)*

12.1.8.3 Methodology for Evaluating Electromagnetic Fields Effects

12.1.8.3.1 Treatment of the Existing Electricity and Communication Networks

The contribution to EMF levels from existing 110kV or 220kV overhead lines is considered in the cumulative impact of the Impact Evaluation Tables for EMF. The local electricity (10kV, 20kV, 38kV) networks and communications (eir) networks, on the other hand, are considered as part of the existing environment.

12.1.8.3.2 Treatment of Naturally Occurring Electric and Magnetic Fields

Naturally occurring electric and magnetic fields differ from the electromagnetic Fields (EMF) which are produced by the power system as naturally occurring EMF do not change direction and are, therefore, referred to as static or direct current (DC) fields, whereas EMF from power systems fluctuates at a fixed frequency and are referred to as alternating current (AC) fields.

As EMF from the two sources (natural, power systems) differ from each other, naturally occurring electric and magnetic fields are not included in the baseline environment. Further details on electromagnetic fields is provided in Appendix 12.3: Explanation and Modelling of Electromagnetic Fields.

12.1.8.3.3 Authors Methodology for Modelling Theoretical Worst-Case Effects

In order to categorically demonstrate that the maximum possible power load of the electric cables and equipment associated with the whole UWF project, will comply with the EU EMF Exposure Recommendations and the International Commission on Non-Ionising Radiation Protection (ICNIRP) limits, the theoretical worst-case contribution of the operational Whole UWF Project, to EMF levels in the environment is evaluated in this report. The criteria for modelling the worst-case levels of EMF are outlined in Appendix 12.3: Explanation and Modelling of Electromagnetic Fields.

12.1.8.3.4 ICNIRP General Public Reference levels

In this EIA Report chapter, the compliance of the various electrical and radio communications elements of the whole windfarm has been evaluated against the directives and legislation listed in Section 12.1.7 above, and against the 1998 guidelines on limiting exposures to electromagnetic fields as published by the ICNIRP. The European Union and the Irish Government have adopted the ICNIRP 1998 guidelines, which are outlined in Table 12-14 below. The Irish Government Department of Communications, Marine and Natural Resources, have stated “No adverse health effects have been established below the limits suggested by international guidelines”.

Table 12-14: ICNIRP 1998 EMF Limits

Exposure Characteristics ICNIRP	Electric Field Strength V/m	Magnetic Field Strength µT
1998 General Public Refere7nce Level	5000	100
2010 General Public Reference Level	5000	200

A conservative approach has been adopted in this EIAR, in that the lower 1998 levels have been used to evaluate the significance of any increases in EMF.

12.1.8.4 Authors Methodology for Evaluating the Magnitude and Significance of Impacts

The significance of the impact for each identified sensitive receptor will be assessed according to the impact magnitude according to Table 12-15 and Table 12-16.

Table 12-15: Determining magnitude and significance of effects in relation to Electric Fields

Magnitude		Significance of Effects		
Magnitude Rating	Field Strength	Local Residents & Community	Transient People	Electronic Equipment
Very Low (1)	< 1 V/m	**Imperceptible** Similar to existing ambient levels	**Imperceptible** Similar to existing ambient levels	**Imperceptible** Similar to existing ambient levels
Low (2)	1V/m - 1000 V/m	**Slight** Similar to existing ambient levels from residential electric equipment	**Imperceptible** Higher than existing ambient levels	**Imperceptible** Similar to existing ambient levels from Electric Equipment
Medium (3)	1000 V/m-5000 V/m	**Slight** Under EU EMF limits Under HSA Low Action limit	**Slight** Significantly higher than existing ambient levels but length of exposure is momentary or brief	**Slight to moderate** Above existing ambient levels from Electric Equipment
High (4)	5000 V/m -10000 V/m	**Moderate** Above EU EMF limits Above HSA Low Action limit	**Moderate** Above EMF limits although not applicable	**Significant** Above EU AIMD[7] Device Immunity Test levels
Very High (5)	>10000 V/m	**Profound** Above EU EMF limits Above HSA High Action limit	**Significant to Profound** Significantly above AIMD Immunity Test Level	**Profound** Significantly above electrical device test levels

[7] AIMD is the abbreviation for 'Artificial Implantable Medical Devices' such as pacemakers and defibrillators

Table 12-16: Determining magnitude and significance of effects in relation to Magnetic Fields

Magnitude		Significance of Effects		
Magnitude Rating	**Field Strength**	**Local Residents & Community**	**Transient People**	**Electronic Equipment**
Very Low (1)	< 0.1 to 1.26 µT (micro Tesla)	**Imperceptible** Similar levels to existing ambient levels	Imperceptible Similar to existing ambient levels	**Imperceptible** Similar to existing ambient levels Below EU Residential and Light Industrial Electronic device Immunity limit (1.26 µT)
Low (2)	1.26-38 µT	**Imperceptible** Higher than existing ambient levels Under EU EMF limits Under HSA public limit	**Imperceptible** Higher than existing ambient levels	**Imperceptible to Slight** Above EU Residential and Light Industrial Electronic device Immunity limit (1.26 µT)
Medium (3)	38-100 µT	**Slight** Under EU EMF limits Under HSA public limit	**Imperceptible to Slight** Significantly Higher than existing ambient levels but exposure not long term	**Slight** Above EU Industrial Electronic device Immunity limit (38 µT)
High (4)	100-1000 µT	**Moderate** EU EMF limits exceeded HSA Low Action Level reached	**Moderate** Above EU EMF limits although not applicable	**Moderate to Significant** Above EU AIMD Device test levels
Very High (5)	>1000 µT	**Significant** EU EMF and HSA levels breached **Profound** > 6000 µT HSA High Action Level reached	**Significant to Profound** EU EMF and HSA levels breached but not applicable to transient people Above Test Levels for AIMD Devices	**Profound** Significantly above All Electrical Device test levels

12.1.9 Certainty and Sufficiency of Evaluation/Information

Air Quality: The information used to compile the air quality sections of this chapter is collated from reports and documents generated by local authorities and statutory agencies, including the Environmental Protection Agency, Transport Infrastructure Ireland, The UK Institute of Air Quality Management[8] and The UK Department for Environment, Food and Rural Affairs. The most recent publications have been relied upon, with references detailed as footnotes throughout the chapter. The UK guidance has been used in the absence of equivalent Irish guidance as is considered best practice. The most recent monitoring data provided by the EPA was used to inform the baseline conditions. See Appendix 12.1: Air Quality Monitoring & Standards.

Noise: The information used to compile the noise and vibration sections of this chapter was based on best practice and guidance as described throughout this document. The baseline information used for the purpose of this assessment has been acquired through a combination of site visits, visual observations, mapping and noise measurements. Background noise measures were carried out in the vicinity of the proposed Mountphilips Substation, and a proxy noise measurement (using calibrated and certified equipment) of an existing 110kV substation was undertaken and applied to the proposed Mountphilips Substation. The use of this proxy measurement is considered sufficient and acceptable as method of determining any potential noise impacts of the Mountphilips Substation. Noise levels documented in industry standard best practice and guidance documentation, BS 5228 Noise and Vibration from Open and Construction Sites, 2014, has been used in determining the potential impact of the UWF Grid Connection construction works. Calculations undertaken err on the side of caution and overestimation. See Appendix 12.2: Background Noise Measuring & Operational Noise Modelling.

EMF: The information used to compile the Electromagnetic Fields sections of this chapter is collated from reports and documents generated by national and international authorities and statutory agencies, including the Commission for Communication Regulation (Comreg), International Commission for Non-Ionizing Radiation Protection (ICNIRP), Health and Safety Authority (HSA), Eirgrid in Ireland, National Grid in the United Kingdom and a selection of published and accessible scientific studies. Where possible the most recent publications are relied upon, with references detailed as footnotes throughout the chapter.

In respect of Air no significant limitations or difficulties were encountered.

[8] IAQM (2014) Guidance on the Assessment of Dust from Demolition and Construction

12.2 Sensitive Aspect No.1: Local Residents & Community

This Section provides a description and evaluation of the Sensitive Aspect - Local Residents & Community.

12.2.1 BASELINE CHARACTERISTICS of Local Residents & Community

12.2.1.1 STUDY AREA for Local Residents & Community

The study area for Local Residents & Community in relation to the UWF Grid Connection is described in Table 12-17 and illustrated on

Figure GC 12.2.1: UWF Grid Connection Study Area for Local Residents & Community (Dust & Noise) Figure GC 12.2.2: UWF Grid Connection Study Area for Local Residents & Community (Haulage Routes) and Figure GC 12.2.3: UWF Grid Connection Study Area for Local Residents & Community (EMF)

Table 12-17: UWF Grid Connection Study Area for Local Residents & Community

Study Area for Local Residents & Community	Justification for the Study Area Extents
Construction Dust: Dwellings and community facilities within 350m of construction works areas - See Figure GC 12.2.1 and Dwellings and community facilities within 50m of main transport routes used by construction vehicles – See Figure GC 12.2.2.	Based on Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, and the Guidance on the Assessment of Dust from Demolition and Construction.
Construction Noise and Vibration: 350m from construction work areas. – See Figure GC 12.2.1.	Based on the Guidelines for the Treatment of Noise and Vibration in National Road Schemes, the Guidelines recommend that receptors within 300m of a route be identified, however in the interest of simplicity, the wider Air Quality study area of 350m from construction works is used in the appraisal.
Operational Noise: 400m from Mountphilips Substation. – See Figure GC 12.2.1.	Beyond this distance, there is no potential for any increases in ambient noise levels.
Operational EMF: 100m from Mountphilips Substation and 110kV UGC– See Figure GC 12.2.3.	Based on professional judgement, EMF Field emissions can extend to this distance. At distances greater than 100m from the Mountphilips Substation and 110kV UGC, the contribution of the UWF Grid Connection to ambient EMF levels will be extremely low or none, with effects being considered neutral or none.

12.2.1.2 Baseline Context and Character of Local Residents & Community in the UWF Grid Connection Study Area

The number of local residences and community facilities within the study area are outlined on Table 12-18 and included on Figures GC 12.2 (Figure GC 12.2.1, Figure GC 12.2.2 and Figure GC 12.2.3).

As illustrated on Figures GC 12.2, the majority of the residential dwellings are along the local road network to the north of Newport town (L2166-10, L2157-0, and L6009-0 on the outskirts of Newport town), and along the Regional Road R503 particularly in the Lackamore area and particularly in the vicinity of Rear Cross village. The majority of community facilities are located in the village of Rear Cross, with community facilities also

available in the nearby town of Newport, and to a lesser extent in the nearby villages of Klicommon and Upperchurch.

Table 12-18: Number of Local Residences and Community within the UWF Grid Connection Study Area

Study Area for Local Residents & Community	Number of Local Residences and Community Facilities
Construction Dust: **350m of construction works areas**	391 No. residences 19 No. community facilities **Total = 410**
Construction Dust: **50m of main transport routes**	312 No. residences, and 33 No. community facilities **Total = 346**
Construction Noise and Vibration: **350m from construction work areas**	391 No. residences 19 No. community facilities **Total = 410**
Operational Noise: **400m from Mountphilips Substation**	6 No. residences **Total = 6**
Operational EMF: **100m from Mountphilips Substation and 110kV UGC**	None within 100m of the Mountphilips Substation. 317 No. local residences along 110kV UGC 17 No. community facilities along 110kV UGC **Total = 334**

Air Quality: All residential properties and community facilities, within the UWF Grid Connection Study Area, are located within EPA Air Quality Monitoring Zone D. Overall, there is a good air quality baseline for the area. Background concentrations of air pollutants (NO_2, PM_{10} and $PM_{2.5}$) are very low in this area and are substantially below the EU limit values.

Further details on the limit values and on baseline air quality are included in Appendix 12.1: Air Quality Monitoring & Standards.

Noise: The majority of construction works areas can be characterised as a quiet rural location with no major existing or dominating noise or vibration sources. Baseline noise monitoring undertaken at the Mountphilips Substation location confirms that the area surrounding the substation is an area of low background noise (See Appendix 12.2: Background Noise Measuring & Operational Noise Modelling). Considering the location of the 110kV UGC along the public road network, the route of the 110kV UGC is not considered to be located in an area of low background noise.

Vibration: There are no significant sources of vibration in the area.

EMF: Electrical objects and anything connected to them produce two types of fields - electric fields and magnetic fields. Electric and magnetic fields are produced in all residential and working environments as a result of nearby electrical wiring, appliances, power lines and telecommunication masts, among other things. Electric fields are measured in volts per meter (V/m), and magnetic fields measured in microtesla (µT). The ICNIRP guideline levels (See Section 12.1.8.3.4) in relation to the general public for exposure to frequency EMF associated with electrical power systems, is 5000V/m for electric fields exposure and 100µT for magnetic field exposure. It is assumed in this report that the existing electric field and magnetic field levels, at local residential dwellings and community facilities, are 10V/m and 0.2 µT respectively, which is substantially under the ICNIRP guideline levels. Further details on electric and magnetic fields and typical levels from common household appliances and from 110kV electrical power system infrastructure is included in Appendix 12.3: Explanation and Modelling of Electromagnetic Fields.

EMF – Electronic Equipment: Two types of electronic equipment are evaluated in this section; electronic equipment or appliances which are assumed to be used in all local residences, businesses and community facilities and Artificial Implantable Medical Devices (AIMDs) such as pacemakers which could be worn by local residents or members of the community within 100m of the 110kV UGC. Currently, the EMF levels to which electronic equipment is being exposed to is likely to be in the region of 10V/m and 0.2 µT.

12.2.1.3 Importance of Air (Local Residents & Community)

Air Quality: The low number of residential properties is common in rural, upland areas of Ireland, as is their distribution with the majority of properties and community facilities within the UWF Grid Connection Study Area centred around Rear Cross village, and in ribbon development along the regional and local roads. In general there is a reasonable expectation for a good quality of air in these upland areas which are remote from busy, congested roads and industrial sources of air pollutants.

Noise: Rural environments are generally regarded as quiet areas, in contrast to urban areas. Areas with low background noise levels are recognised as having a greater amenity and quality of life value.

EMF: The ICNIRP guidelines form the basis of the EU guidelines for human exposure to EMF (EC Council Recommendation 1999/519/EC[9]). These exposure guidelines apply only where members of the public could be expected to spend significant periods of time (EC, 1999). In this report, these members of the public relate to local residents and users of local community facilities including businesses.

Electronic equipment such as washing machines and other electrical appliances in local residences, business premises or community facilities are required, under EU legislation (EMC Directive 2013/30/EU), to have an immunity level of at least 1.26 µT for a 50 Hz magnetic field, to safeguard the normal operation of the electronic device from interruption or degradation caused by EMF.

Artificial Implantable Medical Devices (AIMDs) which may be worn by local residents or members of the community, such as pacemakers are tested to higher EMF Immunity levels to safeguard operation according to EU regulations (CENELEC 50527-1:2010). A limit of 100 µT applies to 50 Hz magnetic fields and 5000 V/m to 50 Hz electric fields. It should be noted that these are the same limits as the ICNIRP limits adopted by the EU for the general public and used in this chapter of the EIA Report.

12.2.1.4 Sensitivity of Local Residents & Community

Air Quality: Local residents and people using community facilities could be sensitive to health effects such as respiratory illnesses as a result of breathing polluted air. All local residences and community facilities are considered 'high-sensitivity' locations (see Table 12-5).

Receptor sensitivity to dust impacts is considered to be **medium** because local residents and community can expect to enjoy a reasonable level of amenity at their residents or community facilities (which are generally in towns/villages or along the road network.

Receptor sensitivity to health impacts is considered to be **low** based on EPA monitoring that annual mean background level of PM_{10} are well below the objective limit and substantially less than 24 µg/m^3, as per the IAQM assessment guidance.

Noise & vibration: Local residents and communities are considered as **medium** sensitive receptors, as per Table 12-12, 'Receptors/resource has moderate capacity to absorb change without significantly altering its present character. For example residential dwellings, offices, schools, and play areas'.

[9] https://ec.europa.eu/health/sites/health/files/electromagnetic_fields/docs/emf_rec519_en.pdf

EMF: Local Residents and members of the community could raise health concerns if the levels of EMF Exposure within their residences and premises are deemed to breech the 1998 ICNIRP limits. A substantial increase in EMF levels above EU electric and electronic equipment Immunity test levels could cause the malfunction of equipment. Neither of these scenarios will occur, and high voltage substations and underground cables in Ireland do not exceed either the 1998 or 2010 EMF limits.

Note: Electronic Equipment in machinery and vehicles are not commonly susceptible to 50 Hz magnetic fields, and are excluded from further consideration in this EIA Report.

12.2.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Air Quality: There are no specific future trends in relation to air quality. In Ireland the primary sources of Particulate Matter (PM_{10} and $PM_{2.5}$) are vehicular emissions and burning of solid fuels for heating. In general, air quality is likely to improve in future years with a reduction in the use of diesel and petrol vehicles and increased usage of renewable sources of electricity. However, due to the nature of the area (remotely populated with no congested roads) PM emissions are unlikely to change dramatically in future years.

Operational Noise & EMF: There has been a trend of renewable energy development in the eastern extent of the 110kV UGC, with Milestone Windfarm becoming operational in 2018. The addition of further wind energy development, for example the consented Upperchurch Windfarm will mean an additional noise and EMF sources in the area and an increase in ambient noise levels within the bounds of the noise limits as imposed by conditions of planning. Electrical and Users of Electronic Equipment and radio frequency technology will increasingly become more present in everyday life; the expansion of the power infrastructure in the country is also expected albeit at a much slower rate; however government regulations will ensure EMF levels remain significantly lower than the ICNIRP standard limits.

12.2.1.6 Receiving Environment (the Baseline + Trends)

Air Quality: There are no specific future trends for construction dust emissions in the UWF Grid Connection Study Area. It is assumed that in relation to dust, the receiving environment will be similar to the baseline environment.

Noise: The receiving environment at the time of construction will include the noise sources in the current baseline environment, but will not include operational Consented UWF Turbines.

EMF: A continued adoption of electrical and electronic infrastructure and equipment, will increase the background level of EMF at a very slow rate over time. It is not expected for EMF levels to increase significantly above existing average levels of 10V/m or 0.2µT in local residents and the receiving environment during the operational stage is assumed to be similar to the baseline environment identified above.

12.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

12.2.2.1 Cumulative Evaluation Study Areas

12.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Local Residents & Community	Justification for the Study Area Extents
Construction Dust, Noise & Vibration: Air Quality, Noise & Vibration: 700m from UWF Grid Connection construction works. 50m from main transport routes. Operational noise: 800m from Mountphilips Substation Operational EMF: 200m from Mountphilips Substation and 110kV UGC	Local Residents & Community could potential be effected by dust, noise, vibration and EMF sources from different directions either at the same time or sequentially and therefore the distance from the source was doubled from that used for the UWF Grid Connection (the exception being noise along haulage routes, which remains the same, as cumulative impacts related to any additional traffic on the haul routes).

The study area is illustrated on Figure CE 12.2.1: UWF Grid Connection Cumulative Evaluation Study Area for Local Residents & Community (Dust & Noise), Figure CE 12.2.2: UWF Grid Connection Cumulative Evaluation Study Area for Local Residents & Community (Haulage Routes), Figure CE 12.2.3: UWF Grid Connection Cumulative Evaluation Study Area for Local Residents & Community (EMF)

12.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 12.2.2.2.1 below.

The location of, and study area boundary associated with, the Other Elements and Other Projects or Activities which are included for cumulative evaluation is illustrated on

Figure WP 12.2.1: Whole Project Study Area for Local Residents & Community (Dust & Noise) Figure WP 12.2.2: Whole Project Study Area for Local Residents & Community (Haulage Routes) (Volume C3 EIAR Figures) and Figure WP 12.2.3: Whole Project Study Area for Local Residents & Community (EMF)

Table 12-19: Cumulative Evaluation Study Area for Local Residents & Community

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Construction Dust, Noise & Vibration: Air Quality, Noise & Vibration: 700m from construction works, 50m from main transport routes,	Local Residents & Community could potential be effected by dust, noise, vibration and EMF sources from different directions either at the same time or sequentially and therefore the distance
Element 2: UWF Related Works		
Element 3:		

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
UWF Replacement Forestry Element 4: Upperchurch Windfarm (UWF) Element 5: UWF Other Activities	Operational Noise: 800m from both the Mountphilips Substation and Consented UWF Substation Operational EMF: 200m from 110kV UGC, Internal Windfarm Cabling, Consented UWF Turbines and Consented UWF Substation.	from the source was doubled from that used for the UWF Grid Connection.

12.2.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Local Residents & Community also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Local Residents & Community with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.24).

The results of this scoping exercise are that: the existing Shannonbridge – Killonan 220 kV OHL and the Castlewaller Windfarm (consented windfarm and potential grid connection) has been scoped in for evaluation of cumulative effects to Local Residents & Community.

The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 12.2.1 to Figure WP 12.2.3.

12.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Local Residents & Community

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Local Residents & Community. The results of this evaluation are included in Table 12-20. The baseline character of the areas around these projects is described in Section 12.2.2.3.

Table 12-20: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: Neutral Impacts or No Impacts due to • The planting of the new woodland will have a neutral impact on air quality as works will be carried out by hand using spades, with use of vehicles limited to personnel vehicles and negligible traffic volumes associated with the planting stage. • No potential for adverse air quality impacts during the growth stage, due to the absence of dust creating activities and negligible traffic volumes. • There is no potential for noise or vibration effects, as there will be no sources of mechanical noise or vibration because planting will be carried out by hand (Project Design Measure) in grassland fields.

	• During the growth stage, chainsaws may be used during thinning activities, however this type of activity will be infrequent, brief in nature and at a distance from local residents, therefore it is considered that noise related impacts will be neutral during any thinning activities during the growth stage. • There is no potential for impacts due to EMF emissions as there are no electrical or radio-communication parts associated with the UWF Replacement Forestry.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral Impacts or No Impacts due to: • Neutral effect on Air Quality - any activities will be of a very short duration, minimal extent and will involve minimal use of vehicles or equipment. • Neutral effect on ambient noise or vibration levels due to the momentary to brief duration of activities at any one location, and the generally low-medium noise levels of the equipment used. Equipment which will be used includes a hedge cutter, tractor, vans, and cable-pullers and hand tools. Activities will take between 15 minutes and 2 days to complete at the various locations Specifically in relation to Haul Route Activities, any noise or vibration emitted by machinery or vehicles used will be in the context of background noise and vibration from regional or national roads, or will not be noticeable in the context of local traffic and farming activity. . • No potential for increases in ambient EMF levels, as there are no electrical or radio-communication parts associated with the Overhead Line Activities.
Other Projects or Activities	
Shannonbridge – Killonan 220kV OHL (existing)	Yes, included for the evaluation of cumulative effects in relation to EMF effects. Evaluated as excluded in relation to dust, noise or vibration effects, as there is no potential for cumulative effects because the 220kV OHL already exists and therefore no construction works are associated with this line and no upgrade works are expected to occur during the construction stage of the UWF Grid Connection. No potential for cumulative operational noise effects due to separation distances to nearby houses and in addition noise from the existing overhead lines at Coole and Mountphilips are considered part of the baseline noise levels measured in the area.
Castlewaller Windfarm (consented windfarm and potential grid connection)	Yes, included for the evaluation of cumulative effects in relation to EMF effects. Evaluated as excluded in relation to dust, noise or vibration effects, as The potential for cumulative impacts only relates to the potential grid connection and R503 site entrance works. No potential for cumulative impacts with the windfarm, due to separation distance. In relation to the potential grid connection and site entrance works, cumulative construction impacts are not expected as works will either take place at separate times, or should works be carried out at the same time, then works on the grid connection for both projects are likely to be carried out by one crew, with no material cumulative increase in noise or dust at local residents, and although a longer construction periods is possible on the local road L6009-0, this will not cause significant effects to residential amenity, as the works are still temporary and of short duration, during daylight hours. Works at the R503 entrance will not cause cumulative significant impacts to local residents due the very short duration of both 110kV UGC works and the entrance works.

Local Residents & Community

Sensitive Aspect

12.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

12.2.2.3.1 Element 2: UWF Related Works, Element 4: Upperchurch Windfarm

The number of local residences and community facilities within the Cumulative Evaluation Study Area are outlined on Table 12-21 and included on Figures WP 12.2 (Figure WP 12.2.1 to Figure WP 12.2.3).

Table 12-21: Number of Local Residences and Community within the Cumulative Evaluation Study Area

Individual Project Element	Local Residents & Community within 350m of Construction Works Areas (Air Quality, Noise, Vibration)	Local Residents & Community within 50m of Materials Haulage Routes (Air Quality only)	Local Residents & Community within 100m Of Electrical Parts (EMF only)
UWF Related Works	41 No. residences (9 no. within 50m) No community facilities	33 No. residences along Material Haulage Routes No community facilities.	9 No. local residences within 100m of the Internal Windfarm Cabling No community facilities
Upperchurch Windfarm	29 No. local residences within 350m, 3 No. within 50 of site entrances, None within 200m of a Consented UWF Turbine. No community facilities	33 No. residences along Material Haulage Routes No community facilities	No local residences or community facilities within 100m of the Consented UWF Turbines or Consented UWF Substation.

Air Quality: All residential properties and community facilities, within the Cumulative Evaluation Study Area, are located within EPA Air Quality Monitoring Zone D. Overall, there is a good air quality baseline for the area. Background concentrations of air pollutants (NO_2, PM_{10} and $PM_{2.5}$) are very low in this area and are substantially below the EU limit values. Further details on the limit values and on baseline air quality are included in Appendix 12.1: Air Quality Monitoring & Standards.

Noise: The majority of the Cumulative Evaluation Study Area can be characterised as a quiet rural location with no major existing or dominating noise or vibration sources. Background noise surveys undertaken in 2012 in the vicinity of the Upperchurch Windfarm (see 2013 RFI) demonstrated that this area is also an area of low background noise. See Appendix 12.2: Background Noise Measuring & Operational Noise Modelling.

Vibration: There are no significant sources of vibration in the area.

Consideration of the Passage of Time: There have been no new houses built within 350m of the Upperchurch Windfarm since 2013, and while the Milestone Windfarm was built in 2018, and is now operational, this windfarm was considered cumulatively in the 2013 and 2014 assessments for the consented Upperchurch Windfarm. Therefore it is considered that the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this EIAR

Air

Topic

12.2.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 12.2.2.2.1

12.2.2.3.3 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 12.2.2.2.1

12.2.2.3.4 Other Projects or Activities

Shannonbridge – Killonan 220kV OHL: There is 1 No. local residence (no community facilities) within 100m of both the 110kV UGC (95m distance) and the existing 220kV OHL (53m distance). This residence is located in Coole townland on the L2166-0.

Castlewaller Windfarm: There are 33 No. local residence (no community facilities) within 100m of the potential Castlewaller Windfarm grid connection along the local road L6009-0 at Castlewaller / Carrowkeale / Derryleigh.

12.2.3 PROJECT DESIGN MEASURES for Local Residents & Community

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 12-22 are relevant to the Environmental Factor, Air, and in particular to the sensitive aspect **Local Residents & Community**.

Table 12-22: UWF Grid Connection Project Design Measures relevant to Local Residents & Community

PD ID	Project Design Environmental Protection Measure (PD)
PD04	All construction works will be carried out during daylight hours.
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD06	Construction works will not be carried out within 150m of Rearcross National School or Lackamore National School, during school hours. In addition, the project Community Liaison Officer will keep each school informed of construction timetables and scheduling.
PD07	110kV UGC construction works along the local roads L2264-50 and L6188-0, will not take place at the same time as the UWF Related Works Haul Route Works on these roads. The 110kV UGC construction works will also be scheduled so that the works do not occur on the same days as concrete deliveries for Consented UWF Turbines along these local roads.
PD11	Construction works for the 110kV UGC in Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons townlands, which are within 350m of local residences, will not take place at the same time as either the UWF Related Works or Upperchurch Windfarm where those works also occur within 350m.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5, in Volume C4: EIAR Appendices.

12.2.4 EVALUATION OF IMPACTS to Local Residents & Community

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Local Residents & Community.

As a result of the exercise, some impacts were included and some were excluded.

Table 12-23: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Increase in Airborne Dust (construction stage)	*Increase in ambient electromagnetic fields (EMF) levels (construction stage)*
Increase in ambient noise levels (construction stage)	*Vibration damage to buildings or internal nuisance to residents (construction stage)*
Increase in ambient noise levels (operational stage)	*Decrease in ambient air quality as a result of traffic derived pollutants (NO_2, PM_{10}, $PM_{2.5}$, CO, Benzene (construction stage)*
Increase in ambient EMF levels (operational stage)	*Vibration emissions during the operational stage*
	Decommissioning Effects

The source-pathway-receptor links for included impacts are described in the Impact Evaluation Tables in the next sections. **The Impact Evaluation Tables are presented in the following sections 12.2.4.1 to 12.2.4.4**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections, in Section 12.2.4.5

12.2.4.1 Impact Evaluation Table: Increase in Airborne Dust

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Delivery of construction materials to works area, excavation and storage of materials.
Cumulative Impact Source: Delivery of construction materials to works area, excavation and storage of materials
Impact Pathway: Air/Wind

Impact Description: During dry and windy weather conditions, construction dust emissions will arise from construction activities such as excavations, earth moving and backfilling which may generate quantities of dust. Vehicles transporting potentially dusty material to and from the site also have the potential to cause dust generation along the concentrated haul routes from the construction areas. Dust deposition rates will be greatest within 50 m of the source. An increase in airborne dust can cause dust soiling effects at property and increase the risk of respiratory illness to local residents and members of the local community.

Impact Quality: Negative

Evaluation the Subject Development Impact – Increase in Airborne Dust

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude: The emission of dust from excavation and backfilling of 28,680m^3 of potentially dusty materials (rocks, soils etc.), the storage and handling of 5,000m^3 of this material at the Mountphilips Substation site, and the delivery of 1,350 loads of potentially dusty materials to site (aggregate). The potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.

There are no local residences or community facilities within 350m of the Mountphilips Substation - the closest residence is 385m to the east. There are 312 No. local residences and 33 No. of community facilities in total within 50m of haulage routes along public roads (R503, L2166-0, L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, L2264-50, L6188 and the L5337-1).

There are 391 No. local residences and 19 No. of community facilities within 350m of the UWF Grid Connection construction works areas, however dust from the 110kV UGC trenches and joint bay excavations will be minimal, and will take place in stages rather than all at once.

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- Medium sensitivity of local residents and community to dust impacts
- the medium magnitude of dust soiling as a result of earthworks, construction and trackout, as per Section 12.1.8.1.7; in the context of the
- temporary duration of works;
- the reversibility of the impact,
- transitory and predominantly linear nature of the works
- background levels of particulate matter are substantially below the relevant EU limit values

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative in-combination effects relates to construction stage dust from UWF Grid Connection and UWF Related Works and Upperchurch Windfarm as a result of earthworks, construction works and construction related haulage. Construction works for all 3 projects will occur in the Knocknabansha / Knockmaroe / Knockcurraghbola Crownlands / Knockcurraghbola Commons area, where 20 No. residences, located along the L2164-50 and L6188 local roads, are within 350m of UWF Grid Connection and

Upperchurch Windfarm works and UWF Related Works, while a further 9 No. houses are within 350m of UWF Grid Connection and UWF Related Works only.

17 No. residences will be within 50m of the haul routes for the projects which are routed along the L2164-50 and L6188 roads.

To protect Residential Amenity of residents along these roads, the sequential timing of construction works which is part of the UWF Grid Connection project design (See Section 12.2.3), will ensure that local residences are not effected by multiple construction works being carried out at the same time. Therefore, there is no potential for in-combination effects, and any cumulative effects relate to a slightly longer duration of effects (sequential effects) rather than a larger magnitude of effects.

Significance of the Cumulative Impact: Slight

Rationale for Cumulative Impact Evaluation:

- Medium sensitivity of local residents and community to dust impacts
- the medium magnitude of dust soiling as a result of earthworks, construction and trackout, as per Section 12.1.8.1.7; in the context of the
- relatively low number of receptors;
- the implementation of timing/scheduling restrictions in the Knocknabansha / Knockmaroe / Knockcurraghbola Crownlands / Knockcurraghbola Commons area;
- temporary duration of works, even when considered sequentially,
- the reversibility of the impact,
- transitory and predominantly linear nature of the works;
- background levels of particulate matter are substantially below the relevant EU limit values

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
The emission of dust from excavation and backfilling of 11,830m^3 of potentially dusty materials (rocks, soils etc.), the storage and handling of 930m^3 of this material on site, and the delivery of 292 loads of potentially dusty materials to site (aggregate). The potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.
There are 41 No. local residences but no community facilities within 350m of the UWF Related Works construction works areas.

There are 33 No. local residences are within 50m of haulage routes along local roads between the Upperchurch Windfarm site entrance No.1 and other various site entrances along local roads.

There are 51 No. residents in total within 50m of haulage routes and within 350m of the UWF Related Works construction works areas.

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- low risk of human health or dust soiling impacts as a result of earthworks, construction and trackout, as per Table 12-5;
- temporary duration of works,
- the reversibility of the impact,
- transitory and predominantly linear nature of the works;
- background levels of particulate matter are substantially below the relevant EU limit values

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 12.2.2.2.1*

Local Residents & Community

Sensitive Aspect

Element 4: Consented Upperchurch Windfarm
Impact Magnitude: As per the 2013 EIS, approximately 108,000m^3 of material will be excavated as part of the construction phase of the Upperchurch Windfarm; Six borrow pits will be constructed to quarry stone; 4.4ha of forestry will be felled; delivery of 4,960 loads of materials will be brought to site to construct 22 No. turbines and the associated concrete bases.
Significance of the Impact: No significant Impact
Rationale for Impact Evaluation: • The ABP Inspectors Report 2014 found that there were no significant impacts to Air Quality and any dust impacts are considered 'temporary in nature and confined to the immediate area'.
Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 12.2.2.2.1*
Evaluation of Other Cumulative Impacts – Increase in Airborne Dust
Whole UWF Project Effect
Magnitude: The extent of impacts from the whole project relates to 407 no. of local residences and 19 No. community facilities/businesses which are within 350m of construction works associated with UWF Grid Connection, Upperchurch Windfarm and UWF Related Works, and 326 No. local residences and 33. no community facilities/business which are within 50m of construction material haul routes. The potential for cumulative in-combination effects of all of the elements of the Whole UWF Project is limited to local residences located along the L2264-50 and L6188-0 local roads in the Knockmaroe / Knockcurraghbola Crownlands / Knockcurraghbola Commons area, which construction works associated with the UWF Grid Connection, Upperchurch Windfarm and UWF Related Works are located within 350m of 20 No. of local residences. To protect Residential Amenity of residents along these roads, the sequential timing of construction works is built into the project design (See Section 12.2.3), to ensure that local residences are not effected by multiple construction works being carried out at the same time. Therefore, there is no potential for in-combination effects, and any cumulative effects relate to a slightly longer duration of effects rather than larger magnitude of effects.
Significance of the Whole Project Effect : Slight
Rationale for Impact Evaluation: • low risk of human health or dust soiling impacts as a result of earthworks, construction and trackout, as per Table 12-5, • temporary duration of works, even when considered sequentially, • the reversibility of the impact, • transitory and predominantly linear nature of the works; • background levels of particulate matter are substantially below the relevant EU limit values

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 12.2.2.2.1).

Air

Topic

12.2.4.2 Impact Evaluation Table: Increase in Ambient Noise Levels

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Substation and UGC Construction - Working plant and moving machinery involved in construction and excavation activities
Cumulative Impact Source: Working plant and moving machinery and excavation activities
Impact Pathway: Air

Impact Description: Noise emissions from working plant or machinery, moving vehicles and the physical excavation of the ground will increase the levels of outdoor noise during works in any particular area. Construction of the 110kV UGC will predominately be linear and will progress quickly, and will be carried out during regular working hours. The main item of plant to be used will be an excavator, which will emit 79dB of noise at a separation distance of 10m. This is a piece of machinery with similar noise emissions to an agricultural tractor, which are commonplace in the area.

The NRA Guideline thresholds for construction noise emissions in an area of low background noise is 65dB (A), otherwise the threshold level is 70dB (A). As detailed in Appendix 12.2: Background Noise Measuring & Operational Noise Modelling, modelling of the worst case effect was carried out, and demonstrates that maximum worst case noise emissions from the machinery involved in the construction of the substation would be 86dB at 10m distance from works, reducing to 56dB at 350m from works. However, this modelling is very conservative and only attenuates noise based on distance and assumes that all machinery, listed in Ch.5, is working at the same location at the same time. Realistically construction noise will not exceed the 65dB (A) construction threshold beyond 60m, and will not exceed the 70dB (A) threshold at approximately 30m.

Impact Quality: Negative

Evaluation the Subject Development Impact – Increase in Ambient Noise Levels

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude: Construction works will be taking place at up to 5 different locations along UWF Grid Connection works areas at any one time – i.e. 1 crew working at the Mountphilips Substation, and up to 4 crews working at other UWF Grid Connection locations along the 30.5 km long 110kV UGC route.

There are no local residences or community facilities within 350m of the Mountphilips Substation - the closest residence is 385m to the east.

There are 394 No. local residences and 19 No. community facilities (mainly along the R503 and including 2 primary schools) within 350m of the 110kV UGC construction works areas. These receptors are located along the public road network, where the normal construction threshold of 70dB(A) applies. 278 No. of the 394 No. residences are within 60m of the construction works areas. Realistically construction noise will not exceed the 65dB(A) construction guideline noise threshold beyond 60m.

Significance of the Impact: Moderate

Rationale for Impact Evaluation:

- The small magnitude of works combined with medium sensitivity of receptors (see Tables 12-11, 12-12 & 12-13)
- The NRA threshold limits are likely to be exceeded, at some locations
- Not all receptors will be impact simultaneously, with only small numbers of receptors impacted at any one time due to the progressive linear nature of the works.

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Sensitive Aspect

- The relatively short exposure during normal working hours with works within 350m of a receptor typically completed within 10 days, and works within 60m of a receptor generally completed within 1 to 2 days
- The temporary duration of potential exceedance of the guidelines limits (generally less than 1 week)
- The compliance with the guideline limits at all properties which are located farther 60m (realistic case) from works areas on the public road network
- The reversibility of the effect with the completion of works
- The carrying out of works during daytime hours

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative in-combination effects relates to additional construction stage noise from Upperchurch Windfarm and UWF Related Works where their construction works occur within the UWF Grid Connection Cumulative Evaluation Study Area. The potential for cumulative effects is concentrated in the Knocknabansha / Knockmaroe / Knockcurraghbola Crownlands / Knockcurraghbola Commons area. The study area is 350m, however realistically construction noise will not exceed the 65dB (A) construction threshold beyond 60m, and will not exceed the 70dB (A) threshold at approximately 30m.

Cumulative impacts within 350m of UWF Grid Connection works could occur at

- 29. No local residences which will be within 350m of both UWF Grid Connection and UWF Related Works construction works areas – 4 no. of these residences are within 60m of construction works areas; and
- 20. No local residences (20 No. of the 29 No. identified above) which will be within 350m of UWF Grid Connection and UWF Related Works and Upperchurch Windfarm construction works areas – 2 no. of these residences are within 60m of construction works areas from all three projects.

To protect Residential Amenity of residents in the Knocknabansha / Knockmaroe / Knockcurraghbola Crownlands / Knockcurraghbola Commons area, the sequential timing of construction works is built into the UWF Grid Connection project design (See Section 12.2.3), to ensure that local residences are not effected by multiple construction works being carried out at the same time. Therefore, there is no potential for in-combination effects, and any cumulative effects relate to a slightly longer duration of effects (sequential effects) rather than larger magnitude of effects.

Significance of the Cumulative Impact: Moderate

Rationale for Cumulative Impact Evaluation:

- The small magnitude of works combined with medium sensitivity of receptors (see Tables 12-11, 12-12 & 12-13)
- the NRA threshold limits are likely to be exceeded, at some locations; in the context of
- The relatively low number (20 No.) of houses which could be affected by sequential effects,
- The temporary total duration of exceedance of the guidelines thresholds (1 to 2 days within 60m of a local resident for UWF Grid Connection works),
- The compliance with the guideline limits at all properties which are located farther than 60m (realistic case) from works areas
- The reversibility of the effect with the completion of works
- The carrying out of works during daytime hours.

Air

Topic

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: Construction works will be taking place at several distinct locations at any one time. There are 41 No. local residences, but no community facilities, within 350m of UWF Related Works construction works areas. These receptors are located along the public road network close to the public road crossing points

of Internal Windfarm Cables or close to Haul Route Works. 10 No. of the 41 No. residences are within 60m of the construction works areas. Realistically construction noise will not exceed the construction limit beyond 60m.

Significance of the Impact: Moderate

Rationale for Impact Evaluation:

- the NRA threshold limits are likely to be exceeded, at some locations
- The low number of receptors (41 No.) within 350m of the works in the context of the spread of construction works over a large area, with works within 350m of a receptor typically completed within 10 days
- The very low number of houses at which the guideline thresholds will be exceeded – there are only 10 No. dwellings within 60m.
- The temporary duration of exceedance of the guidelines thresholds (generally less than 1 week)
- The compliance with the guideline limits at all properties which are located farther than 60m (realistic case) from works areas
- The reversibility of the effect with the completion of works
- The carrying out of works during daytime hours
- The small magnitude of works combined with medium sensitivity of receptors (see Tables 12-11, 12-12 & 12-13).

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 12.2.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude: There are 29 No. residences within 350m of the Upperchurch Windfarm works areas – specifically Site Entrances. However, there are no dwellings within 350m of the turbine hardstands which will be the main locations of noise emissions. As per the RFI 2013, the results of the construction noise predictive modelling indicate that the appropriate threshold of significance (65dB(A)) as outlined in BS5228-1:2009 will not be exceeded beyond 200m. There are no dwellings within this distance from turbine hardstand areas. As per the 2013 ABP Inspectors Report – 'The construction phase will be significant as there will be some level of disturbance arising in particular in relation to increased noise, air emissions and traffic but the overall range of impacts in the construction phase will be of a short term duration'

Significance of the Impact: Not be significant

Rationale for Impact Evaluation:
As per the 2013 Inspectors Report:

- The short term duration of works.
- The appropriate construction noise threshold (65dB (A)) as outlined in the RFI will not be exceeded beyond 200m, under conservative worst-case modelling scenario

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 12.2.2.2.1*

Evaluation of Other Cumulative Impacts – Increase in Ambient Noise Levels

Whole UWF Project Effect

Magnitude:
The extent of impacts from the whole project relates to 407 no. of local residences and 19 No. community facilities/businesses which are within 350m of construction works associated with the Whole UWF Project. The vast majority of these properties are located along the public road network on the UWF Grid Connection 110kV UGC route.

The potential for cumulative in-combination effects of all of the elements of the Whole UWF Project is limited to the 29 No. local residences located along the L2264-50 and L6188-0 in the Knockmaroe / Knockcurraghbola Crownlands / Knockcurraghbola Commons area, which are within 350m of construction works associated with UWF Related Works; Upperchurch Windfarm; and UWF Grid Connection;. To protect

Local Residents & Community

Sensitive Aspect

Residential Amenity of residents along these roads, the sequential timing of construction works is built into the project design (See Project Information, Section 12.2.3), to ensure that local residences are not effected by multiple construction works being carried out at the same time. Therefore, there is no potential for in-combination effects, and any cumulative effects relate to a slightly longer duration of effects rather than larger magnitude of effects.
Significance of the Whole Project Effect: Moderate
Rationale for Impact Evaluation: • the NRA threshold limits are likely to be exceeded, at some locations • The low number (29 No.) of houses which could be affected by sequential effects, • The temporary total duration of exceedance of the guidelines thresholds, • The compliance with the guideline limits at all properties which are located farther than 60m (realistic case) from works areas • The reversibility of the effect with the completion of works • The carrying out of works during daytime hours • The small magnitude of works combined with medium sensitivity of receptors (see Tables 12-11, 12-12 & 12-13)

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 12.2.2.2.1).

Topic Air

12.2.4.3 Impact Evaluation Table: Increase in Ambient Noise Levels

Impact Description	
Project Life Cycle Stage:	Operational Stage

Impact Source: Operational Mountphilips Substation,
Cumulative Impact Source: Operational Consented UWF Turbines, Consented UWF Substation
Impact Pathway: Air

Impact Description: Noise emissions from operational plant such as the operational Mountphilips Substation, or operational Consented UWF Turbines and Consented UWF Substation will increase the levels of outdoor noise in the vicinity of these structures.

Impact Quality: Negative

Evaluation the Subject Development Impact – Increase in Ambient Noise Levels

Element 1: UWF Grid Connection – direct/indirect effect

Impact Magnitude: There are 6 No. local residences (no community facilities) within 400m of the Mountphilips Substation. The nearest residence is 385m to the east of the substation along the L2166-0 local road. The Mountphilips/Coole area is not classed as a Quiet Area, however background noise measures undertaken in the area demonstrate that it is an area with Low background noise, and therefore EPA daytime/evening/night-time noise limited of 45dB, 40dB and 35dB apply.

For the purpose of this assessment a noise measurement was taken from a representative substation at a wind farm in County Kerry. A noise level of 60 dB(A) was measured at a distance of 5m from the representative substation. Noise modelling of the operational noise from Mountphilips Substation demonstrated that based on a noise level of 60 dB(A) at 5m, worse-case noise levels would be 22dB at 385m from the Mountphilips Substation. This is well below the lowest background noise threshold of 35dBA (night-time noise limit) for low background noise locations. See Appendix 12.2: Background Noise Measuring & Operational Noise Modelling for further details on modelling of operational noise emissions. The magnitude of increases in ambient noise levels cause by the Mountphilips Substation will be negligible and will have no discernible effect on local residents.

Significance of the Impact: No Impact

Rationale for Impact Evaluation:

- Negligible magnitude - there will be no discernible change in the baseline environmental conditions.

Element 1: UWF Grid Connection – cumulative effect

Impact Magnitude: The Mountphilips Substation is the only part of the UWF Grid Connection project that has potential to increase ambient noise levels – the 110kV UGC will not emit noise. Due to the separation distance between UWF Grid Connection and the Other Elements of the Whole UWF Project, there is no potential for cumulative effects.

Significance of the Impact: No Impact

Rationale for Impact Evaluation: No potential due to the separation distances (c.22km) between the Mountphilips Substation and the Other Elements of the Whole UWF Project.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Local Residents & Community

Sensitive Aspect

Impact Magnitude: None,
Significance of the Impact: No Potential for Impact
Rationale for Impact Evaluation: • no sources of operational stage noise from any parts of the UWF Related Works.
Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 12.2.2.2.1*
Element 4: Consented Upperchurch Windfarm
Impact Magnitude: As per the ABP Inspectors Report 2013, 'What can be concluded from the noise assessment is that the development will impact in relation to noise as there will be a rise in noise levels from the current ambient noise levels associated with a rural area for many of the houses and sensitive receptors in the general and study area. The level of increase will however be within permitted levels for the most part even in a worst case scenario'. The Consented UWF Substation, will both emit similar levels of noise as the Mountphilips Substation, and the nearest house to the substation is similarly just under 400m (360m) from the Consented UWF Substation and will have no discernible effect on local residents.
Significance of the Impact: Moderate (turbines), No impact (substation)
Rationale for Impact Evaluation: • due to the small magnitude combined with medium sensitivity of receptors according to see Tables 12-11, 12-12 & 12-13 • The very low number of receptors (1) within 400m of the substation, and noise emissions from the operation of the Consented UWF Substation will not be audible above the existing background noise levels. • As per the ABP Inspectors Report (2013): 'What can be concluded from the noise assessment is that the development will impact in relation to noise as there will be a rise in noise levels from the current ambient noise levels associated with a rural area for many of the houses and sensitive receptors in the general and study area. The level of increase will however be within permitted levels for the most part even in a worst case scenario.
Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 12.2.2.2.1*
Evaluation of Other Cumulative Impacts – Increase in Ambient Noise Levels
Whole UWF Project Effect
Magnitude: None.
Significance of the Whole Project Effect : No Potential for Cumulative Impact
Rationale for Impact Evaluation: • No potential due to the separation distance between the operational Mountphilips Substation and the Consented UWF Turbines and Consented UWF Substation

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because all of the Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 12.2.2.2.1).

Air

Topic

12.2.4.4 Impact Evaluation Table: Increase in Ambient EMF Levels

Impact Description	
Project Life Cycle Stage:	Operational Stage

Impact Source: Mountphilips Substation, 110kV UGC
Cumulative Impact Source: UWF Related Works Internal Windfarm Cabling, Consented UWF Turbines, Consented UWF Substation, 220kV Overhead line, Castlewaller Windfarm
Impact Pathway: Air/Ground

Impact Description: There will be some increase in electromagnetic field levels at local residences and community facilities which are within 100m of electrical or communication parts. Electrical or electron equipment or AIMDs worn by people also has potential to be affected by increased EMF. Details of the modelling of worst case EMF emissions are included in Appendix 12.3: Explanation and Modelling of Electromagnetic Fields.

Impact Quality: Negative

Evaluation the Subject Development Impact – Increase in ambient EMF levels

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:

There are no residents or local community facilities within 100m of the Mountphilips Substation. The nearest residential property is 385m distance from the substation - there will no increase in ambient EMF levels at this property.
There will be some increase in magnetic field levels at the 317 No. local residences and 17 No. community facilities which are within 100m of the 110kV UGC. Electrical/electron equipment in these properties or facilities or AIMD worn by residents/community will also be exposed to increased magnetic field levels.

The increase will be highest at properties/facilities closest to the underground cables and will rapidly reduce with distance from the cabling. The nearest residence is 5m from the 110kV UGC. The nearest community facility (pub) is 15m from the 110kV UGC.

The worst case increase in levels of magnetic fields at local residences and community facilities will range from:
- 4.45µT to 0.13µT for residences/community/businesses between 5m and 30m from the 110kV UGC;
- 0.12µT to 0.05µT for residences/community/businesses between 31m and 50m from the 110kV UGC;
- 0.05µT to 0.01µT for residences/community/businesses between 51m and 100m from the 110kV UGC;

The levels of 4.45 µT at the very closest houses are have a marginally higher significance for electronic devices (EU Residential and Light Industrial Electronic device Immunity limit 1.26 µT). AIMDs such as pacemakers, which may be worn by local residents or members of the community, are tested to higher EMF Immunity levels to safeguard operation. A limit of 100 µT applies to these devices, which is the same limit as the ICNIRP limits adopted by the EU for the general public.

There will be no increase in electric fields will occur due to the complete screening of these fields by both the metallic sheath surrounding the cables and the concrete and backfill materials above the cables.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- the Very Low magnitude of the increased magnetic fields level in local residences
- the new levels will be similar to existing ambient levels of 1.26 µT
- The new levels remain substantially under the EU EMF Limits 100µT for magnetic field exposure.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Cumulative impacts only relate to 6 No. local residences which are within 100m of both the 110kV UGC and the Internal Windfarm Cabling for UWF Related Works, where the Internal Windfarm Cabling crosses the L2264-50 public road (and therefore crosses the 110kV UGC) in the Knockmaroe and Knockcurraghbola Crownlands area. Electrical/electron equipment and AIMDs may also be used/worn at these residences. The cumulative, worst case increase in magnetic fields will be 0.046 µT, which will increase ambient magnetic fields at the closest local residences to 0.246µT(i.e. 0.04+ + 0.2). No in combination effects with UWF Grid Connection will occur at any other residence or community facility.

There is no potential for cumulative impacts with Upperchurch Windfarm as there are no Consented UWF Turbines (nor the Consented UWF Substation) located within 100m of a residence or community facility.

Cumulative impacts with Other Projects relates to the combined impact of the 110kV UGC and the existing 220kV OHL. There is 1 No. residence in Coole on the L2166-0 which is within 100m of both projects. The 110kV UGC will increase magnetic fields at the 1 No. local residence by 0.01 µT. The worst case in-combination ambient magnetic field levels at the 1 No. local residence would be 0.99µT (i.e. 0.01 + 0.98). There is no potential for increased electric fields, as the electric fields from the 110kV UGC will be completely screened.

Cumulative impacts with Other Projects also relates to 33 No. local residences which are within 100m of both the of the 110kV UGC and the potential Castlewaller Windfarm grid connection, where the 110kV UGC (Upperchurch Windfarm) may be routed parallel to the potential Castlewaller Windfarm grid connection along the local road L6009-0 at Castlewaller / Carrowkeale / Derryleigh. Electrical/electronical equipment and AIMDs may also be used/worn at these residences. Should Castlewaller Windfarm grid connection be routed along this road, the maximum worst case cumulative EMF levels at the closest residence (9m from 110kV UGC) will be 1.64µT.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- the Very Low magnitude of cumulative magnetic fields level in local residences
- the new levels will be similar to existing ambient levels at the closest local residences.
- The new levels remain substantially under the EU EMF Limits 100µT for magnetic field exposure.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: There will be some increase in magnetic field levels at the 9 No. of local residences which are within 100m of the Internal Windfarm Cabling. Electrical/electronical equipment in these properties or AIMD worn by residents will also be exposed to increased magnetic field levels. The worst case increased levels of magnetic fields at local residences within 100m ranged from 0.001µT to 1.17µT.
No increase in electric fields will occur due to the complete screening of these fields by both the metallic sheath surrounding the cables and the earth (backfill) materials above the cables.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:
In relation to the 110kV UGC:

- the Very Low magnitude of the increased magnetic fields level in local residences
- the new levels will be similar to existing ambient levels
- The new levels remain substantially under the EU EMF Limits 100µT for magnetic field exposure.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 12.2.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude: None

Significance of the Impact: No impact

Rationale for Impact Evaluation:

- No local residents or community within 100m of the Consented UWF Windfarm Substation, or the Consented UWF Turbines.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 12.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Shannonbridge – Killonan 220 kV Overhead Line (existing)

Impact Magnitude: There is 1 No. residence which is within 100m of the 220kV OHL (53m distant). Electrical/electronical equipment and AIMDs may also be used/worn at this residence. The 220kV OHL is currently increasing electric and magnetic field levels, under the worst case scenario, by 300 V/m and 0.98µT.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- the Low magnitude of the electric fields level in accordance with Table 12-15
- the Very Low magnitude of the magnetic fields level in accordance with Table 12-16

Other Project: Castlewaller Windfarm (consented windfarm and potential grid connection)

Impact Magnitude: There will be some increase in magnetic field levels at the 33 No. of local residences which are within 100m of the potential Castlewaller Windfarm grid connection on the L6009-0. Electrical/electronical equipment in these properties or AIMD worn by residents will also be exposed to increased magnetic field levels. The worst case increased levels of magnetic fields at local residences within 100m ranged from 13.5µT (directly above Castlewaller Windfarm cables only) to 0.003µT at 100m distance.
No increase in electric fields will occur due to the complete screening of these fields by both the metallic sheath surrounding the cables and the earth (backfill) materials above the cables.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- the Low magnitude of the electric fields level in accordance with Table 12-15
- the Very Low magnitude of the magnetic fields level in accordance with Table 12-16

Evaluation of Other Cumulative Impacts – Increase in ambient EMF levels

Whole UWF Project Effect

Cumulative Impact Magnitude:
In total there are 361 No. local residents or community facilities within 100m of electrical parts associated with the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm Elements of the Whole UWF Project. Electrical/electronical equipment and AIMDs may also be used/worn at these residences, business or community facilities. Worst case increases in magnetic fields will range from 0.01µT to 4.45µT.

There is potential for in-combination effects in Knockmaroe/Knockcurraghbola Crownlands and Knockcurraghbola Commons as outlined at UWF Grid Connection Cumulative Evaluation above. At these residences the cumulative, worst case increase in magnetic fields will be 0.046µT, which will increase ambient magnetic fields at the closest local residences to 0.246µT.

Significance of the Cumulative Impact: Imperceptible to Slight

Rationale for Cumulative Impact Evaluation:

- the Very Low to Low magnitude of the new magnetic fields level in local residences– the new worst case level of magnetic fields will range from 0.13µT to 4.45µT (this value includes the existing ambient level)
- The new levels remain substantially under the EU EMF Limits 100µT for magnetic field exposure.

All Elements of the Whole UWF Project with Other Projects or Activities

Local Residents & Community

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Cumulative Impact Magnitude:
UWF Related Works and Upperchurch Windfarm cannot have cumulative effects with either Shannonbridge – Killonan 220 kV Overhead Line or with Castlewaller Windfarm, due to the separation distance to these projects.

The potential for cumulative impacts of the Whole UWF Project with Other Projects relates to the combined impact of the UWF Grid Connection 110kV UGC and the existing 220kV OHL and the potential grid connection for the consented Castlewaller Windfarm. The cumulative impact will be in the order to the UWF Grid Connection cumulative impact above – i.e.
The cumulative, worst case increase in magnetic fields when the 110kV UGC is considered with the 220kV OHL will be 0.99µT (i.e. 0.01 + 0.98) at 1 No. residence. The cumulative, worst case increase in magnetic fields when the 110kV UGC is considered with the potential Castlewaller Windfarm grid connection will be 1.64µT at the nearest residents (9m from the 110kV UGC).

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- the Very Low magnitude of the cumulative magnetic fields level – the cumulative level of magnetic fields will remain under 1.64µT under the worst case scenario (maximum possible power loads) at the closest local residences.
- the cumulative level will be similar to the existing contribution from the 220kV OHL and the potential Castlewaller Windfarm grid connection.
- The new levels remain substantially under the EU EMF Limits 100µT for magnetic field exposure.

Topic Air

12.2.4.5 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 12-24 below.

Table 12-24: Description and Rationale for Excluded Impacts to Local Residents & Community

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
All construction works, personnel and activities	1,2,4	Air, Ground	Increase in ambient electromagnetic fields (EMF) levels	Rationale for Excluding: No Potential for Impacts, The Internal Windfarm Cables, Consented UWF Turbines and Consented UWF Substation, Mountphilips Substation, 110kV UGC, will only create electromagnetic fields during the operation of these parts. No EMF will be emitted during the construction stage.
Road opening, rock breaking, earthmoving, operation of machinery and movement of construction traffic along access roads	1, 2, 4	Air, Ground	Vibration damage to buildings or internal nuisance to residents	Rationale for Excluding: Neutral effects, there will be no sources of significant vibration during the construction stage of the UWF Grid Connection or the UWF Related Works, due to any absence of piling and blasting on site. There will be some vibration emissions from road opening, rock breaking and earthmoving activities, though these vibrations will be at a very low level with expected levels of between 0 and 1 mm/s at 10m distance, this is substantially less than the vibration levels of '8mm/s at frequencies of less than 10Hz, to 12.5mm/s for frequencies of 10 to 50Hz, and to 20mm/s at frequencies of 50Hz and above' below which even cosmetic damage to buildings can be avoided, and below the lower limit for human tolerance of piling of 2.5mm/s.
Construction Traffic	1,2,4	Wind	Decrease in ambient air quality as a result of traffic derived pollutants (NO2, PM10, PM2.5, CO, Benzene	Rationale for Excluding – Neutral impact: The traffic levels associated with Elements 1, 2, 4 do not reach the criteria outlined in Table 12-4 for carrying out an air modelling assessment for traffic based pollutants as the increase in traffic levels will be less than 1,000 AADT. According to Table 12-7, any small increases in traffic derived pollutants will have a negligible effect in the context of the baseline air quality level of c. 5µg/m^3 (NO2) or 10µg/m^3 (PM10) which is substantially below the objective/limit value of 40µg/m^3 for NO2 and PM10.
Operational Stage				
Operational UWF Grid Connection, UWF Related Works and Upperchurch Windfarm	1, 2, 4	Ground	Vibration emissions during the operational stage	Rationale for Excluding: No potential for impacts, there will be no sources of significant vibration during the operational stage of the UWF Grid Connection or the UWF Related Works, due to any absence of piling, blasting, road opening, rock breaking or earthmoving activities. Vibration from operational plant or from operational vehicles using site access roads will be almost impossible to detect, and will not cause damage to buildings or internal nuisance to residents.

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
				In relation to the Upperchurch Windfarm, according to the UWF RFI 2013: "The level of vibration from wind turbines is so small that only the most sophisticated instrumentation and data processing can reveal their presence, and they are almost impossible to detect "The level of vibration from wind turbines is so small that only the most sophisticated instrumentation and data processing can reveal their presence, and they are almost impossible to detect".

Decommissioning Stage

Rationale for Excluding: No potential for effects/Neutral effects, as per

UWF Grid Connection: No potential for effects to Air the UWF Grid Connection will not be decommissioned.

UWF Related Works: Decommissioning of the UWF Related Works is limited to the removal of the Telecom Relay Pole and pulling of cables from ducts (Internal Windfarm Cabling) which will take place either from the Consented UWF Turbines or the Consented UWF Substation. **Neutral effect on air quality**, due to the small extent of decommissioning activities with any dust associated occurring within the immediate vicinity of the works areas and limited use of vehicles. **Neutral effect on ambient noise or vibration levels,** due to the distance (greater than 100m) to any local resident or community facility. There will be **Neutral vibration effects**, as the decommissioning activities will not involve any major sources of vibration. There will be **no potential for ambient EMF level increases** as the cables and electrical plant will have been powered down at the start of the Decommissioning Stage and no EMF will be emitted.

Upperchurch Windfarm: It is likely that the Consented UWF Substation will remain in-situ for use by ESBN and that the Consented UWF Roads will also remain in-situ for use by the landowner. Decommissioning works will be mainly limited to the Consented UWF Turbines, Turbine Hardstanding areas, meteorological masts and associated drainage systems, where the turbines will be removed and the remaining hardstanding areas and associated drainage will be reinstated using the soils in the adjacent storage permanent overburden storage berms, this soil will be reseeded and will re-vegetate quickly, Neutral effects to soils are expected due to the small extent of the hardstands in the context of the abundance of soils in the surrounding area. Upperchurch Windfarm decommissioning works and activities are predominately from turbine hardstands, with works at any one turbine hardstand taking place over c.2 weeks. **Neutral effect on air quality,** due to the small extent of decommissioning activities with any dust associated occurring within the immediate vicinity of the works areas and limited use of vehicles. **Neutral effect on ambient noise or vibration levels,** due to the distance (greater than 100m) to any local resident or community facility. There will be Neutral vibration effects, as the decommissioning activities will not involve any major sources of vibration. There will be **no potential for ambient EMF level increases** as the cables and electrical plant will have been powered down at the start of the Decommissioning Stage and no EMF will be emitted.

12.2.5 Mitigation Measures for Impacts to Local Residents & Community

Mitigation measures were incorporated into the UWF Grid Connection project design including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur** to Local Residents & Community.

12.2.6 Evaluation of Residual Impacts to Local Residents & Community

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures were required, and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Local Residents & Community above (Section 12.2.4) – i.e. **no significant adverse impacts**.

12.2.7 Application of Best Practice and the EMP for Local Residents & Community

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment.

The following Best Practice Measures have been developed, for the protection of **Local Residents & Community,** by the authors of this topic chapter, using industry best practice:

GC-BPM-08	Minimising Dust Emissions from Site Activities
GC-BPM-10	Measuring Operational EMF Emissions

These Best Practice Measures form part of the UWF Grid Connection Environmental Management Plan, which is appended to the EIA Report as Volume D.

12.2.8 Summary of Impacts to Local Residents & Community

A summary of the Impact to Local Residents & Community is presented in Table 12-25.

Table 12-25: Summary of the impacts to Local Residents & Community

Impact to Local Residents & Community:	**Increase in Airborne Dust**	**Increase in Ambient Noise Levels**	**Increase in Ambient Noise Levels**	**Increase in Ambient EMF Levels**
Evaluation Impact Table	*Section 12.2.4.1*	*Section 12.2.4.2*	*Section 12.2.4.3*	*Section 12.2.4.4*
Project Life-Cycle Stage	Construction	Construction	Operational Stage	Operational Stage
UWF Grid Connection *direct/indirect impact*	**Slight**	**Moderate**	**No Impact**	**Imperceptible**
UWF Grid Connection *Cumulative Impacts*	**Slight**	**Moderate**	**No Impact**	**Imperceptible**
Element 2: UWF Related Works	Slight	Moderate	No Potential for Impact	Imperceptible
Element 3: UWF Replacement Forestry	Neutral Impacts or No Impacts - Evaluated as Excluded, see Section 12.2.2.2.1			
Element 4: Upperchurch Windfarm	No significant Impact	Not be Significant	Moderate (Turbines) No Impact (Substation)	No Impact
Element 5: UWF Other Activities	Neutral Impacts or No Impacts - Evaluated as Excluded, see Section 12.2.2.2.1			
Cumulative Impact:				
All Elements of the Whole UWF Project	**Slight**	**Moderate**	**No Potential for Cumulative Impact**	**Imperceptible to Slight**
All Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities Shannonbridge – Killonan 220kV OHL Castlewaller Windfarm	**No Potential for Impact** - Evaluated as Excluded, see Section 12.2.2.2.1			**Imperceptible**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

12.3 Sensitive Aspect No.2: Transient People

This Section provides a description and evaluation of the Sensitive Aspect - Transient People.

12.3.1 BASELINE CHARACTERISTICS of Transient People

12.3.1.1 STUDY AREA for Transient People

The study area for Transient People in relation to the UWF Grid Connection is described in Table 12-26 and illustrated on Figure GC 12.3: UWF Grid Connection Study Area for Transient People (Volume C3 EIAR Figures).

Table 12-26: UWF Grid Connection Study Area for Transient People

Study Area for Transient People	Justification for the Study Area Extents
Construction Stage Air Quality, Noise and Vibration: Lands, roads and waymarked walking trails within 350m of construction works areas & within 50m of main transport routes used by construction vehicles	Based on Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, and the Guidance on the Assessment of Dust from Demolition and Construction. Based on the Guidelines for the Treatment of Noise and Vibration in National Road Schemes, the Guidelines recommend that receptors within 300m of a route be identified, however in the interest of simplicity, the wider Air Quality study area of 350m from construction works is used in the appraisal.
Operational Stage Noise: Lands, roads and waymarked walking trails within 400m from Mountphilips Substation.	Beyond this distance, there is no potential for any increases in ambient noise levels.
Operational Stage EMF: Lands, roads and waymarked walking trails within 100m from Mountphilips Substation and the 110kV UGC	Based on professional judgement, EMF Field emissions can extend to this distance. At distances greater than 100m, the contribution of the UWF Grid Connection to ambient EMF levels will be extremely low or none, with effects being considered neutral or none

12.3.1.2 Baseline Context and Character of Transient People in the UWF Grid Connection Study Area

Transient People relate to farm/forestry workers and walkers/cyclists who may pass by or momentarily/briefly come within 350m of construction works areas or within 50m of haul routes associated with the project, or within 100m of operational electrical plant, such as underground cables and substations.

Air Quality: Any transient people present within the UWF Grid Connection Study Area, will be within an EPA Air Quality Monitoring Zone D area. Overall, there is a good air quality baseline for the area. Background levels of air pollutants (NO_2, PM_{10} and $PM_{2.5}$) in this area are substantially below the EU limit values.

Noise & Vibration: The study area is considered to be an area with low background noise, with no significant sources of noise. There are no significant sources of vibration in the area either.

Note: Drivers of motorised vehicles are not considered sensitive to either noise or air quality, due to the emission of noise and air pollutants by vehicles and the enclosure of the driver and passengers inside the vehicle.

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EMF: Along walking trails and roads, and in fields and forestry, the existing levels of Magnetic field are likely to be less than 0.2 µT at a distance of 30 m away from existing electric infrastructure such as a 38kV line and up to 4µT directly underneath medium voltage overhead lines.

EMF – Electronic Equipment: Artificial Implantable Medical Devices (AIMDs) such as pacemakers which could be worn by transient people on roads, lands and walking routes. Electronic equipment in machinery and vehicles on farmland, forestry and public roads are excluded from further evaluation as they are not commonly susceptible to 50 Hz magnetic fields.

The location of transient people within the UWF Grid Connection Study Area identified in Table 12-27.

Table 12-27: Transient People within the UWF Grid Connection Study Areas

Project	Transient People within 350m of Construction Works Areas (Air Quality, Noise, Vibration)	Transient People within 50m of Materials Haulage Routes (Air Quality)	Transient People within 100m Of Electrical Parts (EMF)
UWF Grid Connection	• Walkers/cyclists on roads along the 110kV UGC or on those parts of the Slievefelim Way and Ormond Way Cycle Route within 350m of the 110kV UGC • Farm and forestry workers on lands within 350m of construction works areas,	• Walkers/cyclists on material haulage routes on the following roads R503, L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, L2264-50, L6188 and the L5337-1.	• All road users on R503, L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, L2264-50 and L6188-within 100m of the 110kV UGC Walkers/cyclists on those parts of the Slievefelim Way and Ormond Way Cycle Route within 100m of the 110kV UGC • Farm and forestry workers on lands within 100m of the Mountphilips Substation and/or the 110kV UGC.

12.3.1.3 Importance of Air (Transient People)

Users of the walking trails in the area expect a high level of amenity and enjoyment. Farm and forestry workers spend the majority of their working day outdoors.

There is a reasonable expectation from all types of transient people for a good level of air quality, and low ambient noise and EMF levels in rural upland areas of Ireland which are remote from busy, congested roads and industrial sources of air pollutants, noise and vibration.

Artificial Implantable Medical Devices (AIMDs) which may be worn by Transient People, such as pacemakers are tested to higher EMF Immunity levels to safeguard operation according to EU regulations (CENELEC 50527-1:2010). A limit of 100 µT applies to 50 Hz magnetic fields and 5000 V/m to 50 Hz electric fields. It should be noted that these are the same limits as the ICNIRP limits adopted by the EU for the general public and used in this chapter of the EIA Report.

Air

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12.3.1.4 Sensitivity of Transient People

Air Quality: As per the methodology outlined in Section 12.1.8.1, areas of transient human exposure are considered to be of **low** sensitivity, based on the receptor sensitivity (**low**), the number of receptors (assessed as **'1 or more'** and their distance from the source (**less than 50 m** in worst-case locations), and the assumption based on EPA monitoring that annual mean background level of PM_{10}, are well below the objective limit and

substantially less than 24 µg/m^3, it is considered that sensitivity of transient people to dust soiling or human health effects is considered '**Low**' under the IAQM assessment guidance.

Noise & Vibration: Road users and farm/forestry workers are not considered noise sensitive receptors given their proximity to vehicle, machinery and animals. Construction workers are not sensitive receptors. According to the IEMA 2014 Guidelines, other transient people – walkers and cyclists on waymarked trails - are considered to have a low sensitivity to noise effects.

EMF: Transient People such as farm workers, walkers or road users do not fall under the ICNIRP guideline exposure limits as their time spent in close proximity to the operational Whole UWF Project will typically be limited to momentary or brief periods of time. However, in this EIA Report chapter, any increases in EMF levels, to which Transient People will be exposed, are also evaluated against the 1998 ICNIRP limits. A substantial increase in EMF levels above EU electric and electronic equipment Immunity test levels could cause the malfunction of equipment.

12.3.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Air Quality: If the works do not proceed, the baseline levels of dust including PM_{10} and $PM_{2.5}$ are likely to remain at existing levels. In Ireland the primary sources of Particulate Matter (PM_{10} and $PM_{2.5}$) are vehicular emissions and burning of solid fuels for heating. Due to the nature of the area (remotely populated with no congested roads) PM emissions are unlikely to change dramatically in future years. Small fluctuations are likely in line with previous trends.

Noise: the baseline noise environment at the eastern end of the 110kV UGC has changed in recent years with the commissioning, in 2018, of the Milestone Windfarm, and this trend of wind energy development in the eastern side of the upland area will continue with the construction of the Consented Upperchurch Windfarm. At other locations in the study area there have been no increases or decreases in sources of background noise in the local area.

EMF: Electrical and electronic equipment and radio frequency technology will increasingly become more present in everyday life; the expansion of the power infrastructure in the country is also expected albeit at a much slower rate; however government regulations will ensure EMF levels remain significantly lower than the ICNIRP standard limits.

12.3.1.6 Receiving Environment (the Baseline + Trends)

Air Quality: There are no specific future trends for construction dust emissions in the area of the Whole UWF Project. It is assumed that in relation to dust, the receiving environment will be similar to the baseline environment.

Noise: The baseline environment described above will be the receiving at the time of construction of UWF Grid Connection. The Consented UWF Turbines will not be operational until after the commissioning of both the UWF Grid Connection and Upperchurch Windfarm.

EMF: A continued adoption of electrical and electronic infrastructure and equipment, will increase the background level of EMF at a very slow rate over time. It is not expected for EMF levels to increase significantly above existing average levels of 10V/m or 0.2µT and the receiving environment during the operational stage is assumed to be similar to the baseline environment identified above.

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12.3.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

12.3.2.1 Cumulative Evaluation Study Area

12.3.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Transient People	Justification for the Study Area Extents
Air Quality, Noise & Vibration: Lands, roads and waymarked walking trails within 700m from UWF Grid Connection construction works areas and within 50m from UWF Grid Connection main transport routes, and Operational noise: Lands, roads and waymarked walking trails within 800m of Mountphilips Substation. EMF: Lands, roads and waymarked walking trails within 200m of UWF Grid Connection electrical and communication equipment.	Transient People could potential be effected by dust, noise, vibration and EMF sources from different directions either at the same time or sequentially and therefore the distance from the source was doubled from that used for the UWF Grid Connection (the exception being noise along haulage routes, which remains the same, as cumulative impacts related to any additional traffic on the haul routes).

The study is illustrated on Figure CE 12.3: UWF Grid Connection Cumulative Evaluation Study Area for Transient People

12.3.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 12.3.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements as described in Table 12-28 and illustrated on Figure WP 12.3: Whole Project Study Area for Transient People (Volume C3 EIAR Figures).

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Table 12-28: Cumulative Evaluation Study Area for Transient People

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Air Quality, Noise & Vibration: Lands, roads and waymarked walking trails within 700m from construction works areas and within 100m from main transport routes, and EMF: Lands, roads and waymarked walking trails within 200m of Whole UWF Project electrical and communication equipment.	Transient People could potential be effected by dust, noise, vibration and EMF sources from different directions either at the same time or sequentially and therefore the distance from the source (Whole UWF Project) was doubled from that used for the UWF Grid Connection (alone) (the exception being noise along haulage routes, which remains the same, as cumulative impacts related to any additional traffic on the haul routes).
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm		
Element 5: UWF Other Activities		

12.3.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Transient People also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Transient People with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.25).

The results of this scoping exercise are that: the existing Shannonbridge – Killonan 220 kV OHL, and Killonan – Nenagh 110kV OHL and Castlewaller Windfarm (consented windfarm and potential grid connection); have been scoped in for evaluation of cumulative effects to Transient People.

The location of the Other Projects or Activities which are included for cumulative evaluation is illustrated on Figure WP 12.3.

12.3.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Transient People

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Transient People. The results of this evaluation are included in Table 12-29. The baseline character of the areas around these projects is described in Section 12.3.2.3.

Table 12-29: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Elements of the Whole UWF Project	
Element 1: UWF Grid Connection	Included for the evaluation of cumulative effects
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: No measureable effect/No potential for effects due to • The planting of the new woodland will have a neutral impact on air quality as works will be carried out by hand using spades, with use of vehicles limited to personnel vehicles and negligible traffic volumes associated with the planting stage. • No potential for adverse air quality impacts during the growth stage, due to the absence of dust creating activities and negligible traffic volumes.

	• There is no potential for noise or vibration effects, as there will be no sources of mechanical noise or vibration because planting will be carried out by hand (Project Design Measure) in grassland fields. • During the growth stage, chainsaws may be used during thinning activities, however this type of activity will be infrequent, brief in nature and at a distance from local residents, therefore it is considered that noise related impacts will be neutral during any thinning activities during the growth stage. • There is no potential for impacts due to EMF emissions as there are no electrical or radio-communication parts associated with the UWF Replacement Forestry.
Element 4: Upperchurch Windfarm	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral Impacts or No Impacts due to: • Neutral effect on Air Quality - any activities will be of a very short duration, minimal extent and will involve minimal use of vehicles or equipment. • Neutral effect on ambient noise or vibration levels due to the momentary to brief duration of activities at any one location, and the generally low-medium noise levels of the equipment used. Equipment which will be used includes a hedge cutter, tractor, vans, and cable-pullers and hand tools. Activities will take between 15 minutes and 2 days to complete at the various locations Specifically in relation to Haul Route Activities, any noise or vibration emitted by machinery or vehicles used will be in the context of background noise and vibration from regional or national roads or will not be noticeable in the context of local traffic and farming activity. • No potential for increases in ambient EMF levels, as there are no electrical or radio-communication parts associated with the Overhead Line Activities.
Other Projects or Activities	
Shannonbridge – Killonan 220 kV OHL; Killonan – Nenagh 110kV OHL; Castlewaller Windfarm (consented windfarm and potential grid connection);	Yes, included for the evaluation of cumulative effects in relation to EMF effects. Evaluated as excluded in relation to dust, noise or vibration effects, as The potential for cumulative impacts only relates to the potential grid connection and R503 site entrance works. No potential for cumulative impacts with the windfarm, due to separation distance. In relation to the potential grid connection and site entrance works, cumulative construction impacts are not expected as works will either take place at separate times, or should works be carried out at the same time, then works on the grid connection for both projects are likely to be carried out by one crew, with no material cumulative increase in noise or dust, and although a longer construction periods is possible on the local road L6009-0, this will not cause significant effects to road users or workers on adjacent lands, as the works are still temporary and of short duration, during daylight hours. Works at the R503 entrance will not cause cumulative significant impacts to transient people due the very short duration of both 110kV UGC works and the entrance works at the entrance location.

12.3.2.3 Cumulative Information: Baseline Characteristics – Context & Character

Transient People relate to farm/forestry workers and walkers/cyclists who may pass by or momentarily/briefly come within 350m of construction works areas or within 50m of haul routes, or within 100m of operational electrical plant, such as underground cables, substations and wind turbines. Electronic equipment such as Artificial Implanted Medical Devices (AIMDs) may also be worn by Transient People.

Note: Drivers of motorised vehicles are not considered sensitive to either noise or air quality, due to the emission of noise and air pollutants by vehicles and the enclosure of the driver and passengers inside the vehicle.

The potential locations where Transient People may be present within the Whole Project Cumulative Evaluation Study Area are identified in Table 12-28 and illustrated on Figure WP 12.3.

Air Quality: Any transient people present within the Cumulative Evaluation Study Area, will be within an EPA Air Quality Monitoring Zone D area. Overall, there is a good air quality baseline for the area. Background levels of air pollutants (NO_2, PM_{10} and $PM_{2.5}$) in this area are substantially below the EU limit values.

Noise & Vibration: The study area is considered to be an area with low background noise, with no significant sources of noise. There are no significant sources of vibration in the area either.

EMF: Along walking trails and roads, and in fields and forestry, the existing levels of Magnetic field are likely to be less than 0.2 µT at a distance of 30 m away from existing electric infrastructure such as a 38kV line and up to 4µT directly underneath medium voltage overhead lines.

12.3.2.3.1 Element 2: UWF Related Works, Element 4: Upperchurch Windfarm

The potential for Transient People to be within the Whole Project study area for UWF Related Works and Upperchurch Windfarm is outlined in the table below.

Table 12-30: Transient People within the UWF Grid Connection Study Areas

Project	Transient People within 350m of Construction Works Areas (Air Quality, Noise, Vibration)	Transient People within 50m of Materials Haulage Routes (Air Quality)	Transient People within 100m Of Electrical Parts (EMF)
UWF Related Works	• Farm and forestry workers on lands within 350m of construction works areas, • Walkers/cyclists on roads within 350m of the 9 No. road crossing locations • Walkers/cyclists on those parts of the Eamonn a Chnoic Loop or Ormond Way Walking Route, or Ormond Way Cycle Route, within 350m of construction works areas	• Walkers/cyclists on material haulage routes on the following local roads: L-4139-0, L-4138-12, L-2264-50, L-6188-0, L-61881-0 and L-6185-13.	• Farm and forestry workers on lands within 100m of the Internal Windfarm Cabling. • Road users within 100m of the 9 No. Internal Windfarm Cabling crossing locations • Walkers/cyclists on those parts of the Eamonn a Chnoic Loop or Ormond Way Walking Route, or Ormond Way Cycle Route, which are within 100m of the Internal Windfarm Cabling.

Project	Transient People within 350m of Construction Works Areas (Air Quality, Noise, Vibration)	Transient People within 50m of Materials Haulage Routes (Air Quality)	Transient People within 100m Of Electrical Parts (EMF)
Upperchurch Windfarm	• Farm and forestry workers on lands within 350m of construction works areas, • Walkers/cyclists on roads within 350m of the 11 no. site entrances, • Walkers/cyclists on those parts of the Eamonn a Chnoic Loop or Ormond Way Walking Route, within 350m of construction works areas	• Walkers/cyclists on material haulage routes on the following local roads: L-4139-0, L-4138-16, L-2264-50, L2264-34, L-6188-0, L-61881-0 and L-6185-13.	• Farm and forestry workers and walkers on lands within 100m of the Consented UWF Substation and Consented UWF Turbines.

Consideration of the Passage of Time: The Ormond Way Cycle Route has been developed since the 2013 Upperchurch Windfarm planning application, and the Ormond Way Walking Route is currently under development. The cycle route passes construction works areas in Knockmaroe. The preliminary route of the Ormond Way Walking similar to the Eamonn a Chnoic is partially routed through the windfarm. The evaluations in this EIAR take account of these additional waymarked trails.

12.3.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 12.3.2.2.1

12.3.2.3.3 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 12.3.2.2.1

12.3.2.3.4 Other Projects or Activities

Farm or forestry workers or road users may be present within 100m of both the UWF Grid Connection and the Shannonbridge – Killonan 220kV OHL:, or the Killonan – Nenagh 110kV OHL.

Farm or forestry workers or road users may be present within 100m of the potential Castlewaller Windfarm grid connection works on the L6009-0.

12.3.3 PROJECT DESIGN MEASURES for Transient People

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 12-22 are relevant to the Environmental Factor, Air, and in particular to the sensitive aspect **Transient People**.

Table 12-31: UWF Grid Connection Project Design Measures relevant to Transient People

PD ID	Project Design Environmental Protection Measure (PD)
PD04	All construction works will be carried out during daylight hours.
PD07	110kV UGC construction works along the local roads L2264-50 and L6188-0, will not take place at the same time as the UWF Related Works Haul Route Works on these roads. The 110kV UGC construction works will also be scheduled so that the works do not occur on the same days as concrete deliveries for Consented UWF Turbines along these local roads.

12.3.4 EVALUATION OF IMPACTS to Transient People

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

As a result of the exercise, some impacts were included and some were excluded.

Table 12-32: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Increase in ambient EMF levels (Operational Stage)	*Increase in ambient electromagnetic fields (EMF) levels (construction stage)*
	Vibration nuisance (construction stage)
	Decrease in ambient air quality as a result of traffic derived pollutants (NO_2, PM_{10}, $PM_{2.5}$, CO, Benzene) (construction stage)
	Increase in Airborne Dust (construction stage)
	Increase in ambient noise levels (construction stage)
	Increase in ambient noise levels (operational stage)
	Vibration emissions during the operational stage (operational stage)
	Decommissioning Effects

The source-pathway-receptor links for included impacts are described in the Impact Evaluation Tables in the next sections. **The Impact Evaluation Tables are presented in the following section 12.3.4.1.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections, in Section 12.3.4.2.

12.3.4.1 Impact Evaluation Table: Increase in Ambient EMF Levels

Impact Description	
Project Life Cycle Stage:	Operational stage

Impact Source: Mountphilips Substation, 110kV UGC,
Cumulative Impact Source: Internal Windfarm Cabling (UWF Related Works), 110kV Overhead line, 220kV Overhead line, Castlewaller Windfarm potential grid connection.
Impact Pathway: Air/Ground

Impact Description: There will be some increase in electromagnetic field levels in locations which are within 100m of electrical or communication parts. AIMDs worn by people also has potential to be affected by increased EMF. Details of the modelling of worst case EMF emissions are included in Appendix 12.3: Explanation and Modelling of Electromagnetic Fields**.**

Impact Quality: Negative

Evaluation the Subject Development Impact – Increase in ambient EMF levels

Element 1: UWF Grid Connection - direct/indirect impact

Impact Magnitude:
Mountphilips Substation: Any farm or forestry workers present within 100m of the Mountphilips Substation will be exposed to increased ambient electric and magnetic fields levels within 100m of the substation, which were modelled as 40V/m and 1µT under worst case scenario conditions at the substation fence. AIMD worn by Transient People will also be exposed to increased magnetic field levels.

110kV UGC: Any farm or forestry works, walkers, cyclists on/users of waymarked trails (Slievefelim Way and Ormond Way Cycle), or road users on public roads within 100m of the 110kV UGC will be exposed to increased magnetic field levels. AIMD worn by Transient People will also be exposed to increased magnetic field levels. The worst case levels of 54µT magnetic field will be directly over the 110kV. Levels of EMF drop off quickly with distance and at 5m, 10m, 25m and 50m from the 110kV UGC, the worst case magnetic field levels will be 4.45µT, 1.16 µT ,0.19µT and 0.05µT, respectively.

110kV UGC: No increase in electric fields will occur due to the complete screening of these fields by both the metallic sheath surrounding the cables and the concrete and earth (backfill) materials above the cables.

Magnitude Result: Low & Very Low in relation to electric fields, Medium in relation to magnetic fields.

Significance of the Impact: Imperceptible to Slight

Rationale for Impact Evaluation:

- The Low magnitude of the worst-case increased electric fields of 40V/m at the Mountphilips Substation
- the Very Low magnitude of the increased magnetic fields of 1µT at the Mountphilips Substation
- the Medium magnitude of the increased magnetic fields above the 110kV UGC, of 54µT.
- the momentary to brief exposure of any transient people present
- the occasional nature of any exposure
- the reversibility of the exposure as the person moves away from the location of the underground cables
- The new levels will remain substantially under the EU EMF Limits

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Cumulative impacts only relate to public roads, waymarked cycle routes, waymarked walking routes, and agricultural and forestry lands (where farm and forestry workers may be present). AIMD worn by Transient People will also be exposed to increased magnetic field levels.

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In relation to cumulative effects with Other Elements of the Whole UWF Project, Transient People could be:

- within 100m of both the UWF Grid Connection 110kV UGC and the UWF Related Works Internal Windfarm Cabling and in Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons, where the worst case levels will be 55.8 µT directly over the two trenches; or
- within 100m of the UWF Grid Connection 110kV UGC and the UWF Related Works Internal Windfarm Cabling and Consented UWF Substation, in Knockcurraghbola Commons, where worst case cumulative increases in ambient magnetic fields will be 1µT in close proximity to both underground cables and near the substation fence.

In relation to cumulative effects with Other Projects:

- The worst case combination ambient magnetic field levels for transient people which are within 100m of both the 110kV UGC and the potential Castlewaller Windfarm grid connection **or** within 100m of both the 110kV UGC and the 110kV OHL **or** within 100m of both the 110kV UGC and the 220kV OHL would be 56.7µT, 69µT and 79.7µT respectively, at the points directly above the potential Castlewaller Windfarm grid connection, directly above the 110kV UGC and directly under the OHLs.
- On the local road, which is passes under the 220kV OHL, the worst case levels are 25.7µT magnetic field and 3.5 kV/m electric field, but this point is greater than 100m from the 110kV UGC, and the 110kV UGC will not contribute to increased magnetic fields at this location.
- There are no cumulative electric field levels as the 110 kV UGC does not contribute to the ambient Electric field. There is also no cumulative associated with the electrical equipment in the Mountphilips Substation compound, as the compound is greater than 100m from either the 110kV or 220kV OHLs, and from the potential Castlewaller Windfarm grid connection.

Magnitude Result: Low in relation to electric fields, Medium in relation to magnetic fields.

Significance of the Cumulative Impact: ranging from Imperceptible to Slight

Rationale for Cumulative Impact Evaluation:

- the Medium magnitude of the increased magnetic fields which will be greatest above the 110kV UGC and Internal Windfarm Cable, of 55.8µT.
- the Medium cumulative magnitude of magnetic fields at Mountphilips of 69 µT and 79.7 µT over the 110kV UGC and under the 110kV OHL and the 220kV OHL, respectively
- the Medium cumulative magnitude of magnetic fields along the L6009-0 of 56.7 µT above both the 110kV UGC and potential Castlewaller Windfarm grid connection;
- the momentary to brief exposure of any transient people present
- the occasional nature of any exposure,
- the reversibility of the exposure as the person moves away from the location of the underground cables, turbines or substation.
- The new levels remain substantially under the EU EMF Limits.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: Any farm or forestry works, walkers and cyclists, or road users on public roads within 100m of the operational Internal Windfarm Cables will be exposed to increased magnetic field levels. AIMD worn by Transient People will also be exposed to increased magnetic field levels. The worst case levels of magnetic field will be directly over the Internal Windfarm Cables and will be 7.6 µT. Levels of EMF drop off quickly with distance and at 30m of the Internal Windfarm Cable, the worst case magnetic field levels will be 0.03 µT.

No increase in electric fields will occur due to the complete screening of these fields by both the metallic sheath surrounding the cables and the earth (backfill) materials above the cables.
Magnitude Result: Very Low

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

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• the Very Low magnitude of the increased magnetic fields of 7.6µT • No increase in electric fields • the momentary to brief exposure of any transient people present • the occasional nature of any exposure • the reversibility of the exposure as the person moves away from the location of the underground cables • The new levels remain substantially under the EU EMF Limits.
Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 12.3.2.2.1*
Element 4: Consented Upperchurch Windfarm
Impact Magnitude: Consented UWF Substation: Any farm or forestry workers present within 100m of the Consented UWF Substation will be exposed to increased ambient electric and magnetic fields levels, which were modelled as 40V/m and 1µT under worst case scenario conditions. AIMD worn by Transient People will also be exposed to increased magnetic field levels. Consented UWF Turbines: Any farm or forestry workers, walkers on/users of waymarked trails (Ormond Way Walking trail and Eamonn a Chnoic Loop) present within 5m of the Consented UWF Turbines will be exposed to increased ambient magnetic fields levels, which were researched and calculated as 0.2 µT under worst case scenario conditions. Magnitude Result: Very Low, Low
Significance of the Impact: Imperceptible
Rationale for Impact Evaluation: • The Low magnitude of the worst-case increased electric fields of 40V/m at the Consented UWF Substation, • the Very Low magnitude of the increased magnetic fields of 1µT at the Consented UWF Substation • the Very Low magnitude of the increased magnetic fields beside the Consented UWF Turbines of 0.2µT • the momentary to brief exposure of any transient people present • the reversibility of the exposure as the person moves away from the location of the underground cable
Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 12.3.2.2.1*
Cumulative Information: Individual Evaluations of Other Projects or Activities
Other Project: Shannonbridge – Killonan 220 kV OHL
Impact Magnitude: Any farm workers, walkers, cyclists or other road users within 100m of the existing overhead lines will be exposed to increased magnetic and electric field levels. The worst case levels associated with this OHL will be directly underneath the 220kV lines, with worst case magnetic fields of 25.7 µT and electric fields of 3.5 kV/m in relation to the 220kV OHL. Magnitude Result: Medium
Significance of the Impact: Imperceptible to Slight
Rationale for Impact Evaluation: • the Medium magnitude of the existing magnetic and electric fields of 25.7 µT and 3.5 kV/m • the momentary to brief exposure of any transient people present • the occasional nature of any exposure • The new levels remain substantially under the EU EMF Limits.
Other Project: Killonan – Nenagh 110kV OHL
Impact Magnitude: Any farm workers within 100m of the existing overhead lines will be exposed to increased magnetic and electric field levels. The worst case levels associated with this OHL will be directly underneath the 110kV lines, with worst case magnetic fields of 15 µT and electric fields of 1.3 kV/m. Magnitude Result: Medium
Significance of the Impact: Imperceptible to Slight

Transient People

Sensitive Aspect

Rationale for Impact Evaluation:
- the Medium magnitude of the existing magnetic and electric fields of 15 µT and 1.3 kV/m
- the momentary to brief exposure of any transient people present
- the occasional nature of any exposure

The new levels remain substantially under the EU EMF Limits.

Other Project: Castlewaller Windfarm (potential grid connection)

Impact Magnitude: Any farm or forestry works, walkers and cyclists, or road users on public roads within 100m of the Potential Castlewaller Windfarm Grid Connection will be exposed to increased magnetic field levels. AIMD worn by Transient People will also be exposed to increased magnetic field levels. The worst case levels of magnetic field will be directly over the UWF Grid Connection 110kV UGC and the potential Castlewaller Windfarm grid connection, which will be 56.7 µT. Levels of EMF drop off quickly with distance and at 30m the worst case magnetic field levels will be 0.19 µT.

No increase in electric fields will occur due to the complete screening of these fields by both the metallic sheath surrounding the cables and the earth (backfill) materials above the cables.
Magnitude Result: Very Low

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:
- the Very Low magnitude of the increased magnetic fields of 56.7µT
- No increase in electric fields
- the momentary to brief exposure of any transient people present
- the occasional nature of any exposure
- the reversibility of the exposure as the person moves away from the location of the underground cables

The new levels remain substantially under the EU EMF Limits.

Evaluation of Other Cumulative Impacts – Increase in ambient EMF levels

Whole UWF Project Effect

Cumulative Impact Magnitude:
The extent of the whole project impact is the increase in ambient EMF at both substations, over/close to 110kV underground cables, Internal windfarm cables, and also at Consent UWF Turbine locations. Any farm or forestry works, or walkers or cyclists on waymarked trails will be exposed to increased levels of EMF. AIMD worn by Transient People will also be exposed to increased magnetic field levels.

The worst case possible increases in ambient electric and magnetic fields levels of 40V/m and 1µT under worst case scenario conditions at the substation fences, increases of 54µT in magnetic fields directly over the 110kV UGC, 7.6 µT increases in magnetic fields directly over the Internal Windfarm Cabling, and 0.2 µT increases in magnetic fields right beside the turbine bases.

The worst case in-combination effect will be directly over the 110kV UGC and Internal Windfarm Cabling trenches, which are located in the same area in Knockmaroe (on the L2264-50), and on the private paved road in Knockcurraghbola Crownlands near the Consented UWF Substation, where worst case levels will be 55.8 µT. No in combination effects of Elements of the Whole UWF Project will occur at any other location and any increases in electric or magnetic fields will be as described above.

Magnitude Result: Very Low, Low, Medium

Significance of the Cumulative Impact: ranging from **Imperceptible to Slight** for people**, Slight** for AIMDs

Rationale for Cumulative Impact Evaluation:
- The Low magnitude of the worst-case increased electric fields of 40V/m at the 110kV substations
- the Very Low magnitude of the increased magnetic fields of 1µT at the 110kV substations

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- the Medium magnitude of the increased magnetic fields above the 110kV UGC and Internal Windfarm Cable, of 55.8µT.
- the Low magnitude of the increased magnetic fields beside the Consented UWF Turbines and over an internal windfarm cable of 7.8 µT
- the momentary to brief exposure of any transient people present
- the occasional nature of any exposure,
- the reversibility of the exposure as the person moves away from the location of the underground cables
- The new levels remain substantially under the EU EMF Limits.

All Elements of the Whole UWF Project with Other Projects or Activities

Cumulative Impact Magnitude: Cumulative impacts with Other Projects only relates to UWF Grid Connection, as described above (UWF Grid Connection – cumulative impacts), and copied hereunder:

110kV UGC and 220kV OHL or 110kV OHL:
The worst case combination ambient magnetic field levels for transient people which are within 100m of both the 110kV UGC and the 110kV OHL **or** within 100m of both the 110kV UGC and the 220kV OHL would be 69µT and 79.7µT respectively, at the points directly above the 110kV UGC and directly under the OHLs.

On the local road, which is passes under the 220kV OHL, the worst case levels are 25.7µT magnetic field and 3.5 kV/m electric field, but this point is greater than 100m from the 110kV UGC, and the 110kV UGC will not contribute to increased magnetic fields at this location.

110kV UGC and potential Castlewaller Windfarm grid connection:
The worst case combination ambient magnetic field levels for transient people which are within 100m of both the 110kV UGC and the potential Castlewaller Windfarm grid connection would be 56.7µT, at the points directly above both grid connections on the L6009-0.

There are no cumulative electric field levels as the 110 kV UGC does not contribute to the ambient Electric field. There is also no cumulative associated with the electrical equipment in the Mountphilips Substation compound, as the compound is greater than 100m from either the 110kVs or 220kV OHL.

Significance of the Cumulative Impact: Imperceptible to Slight

Rationale for Cumulative Impact Evaluation:

- the Medium cumulative magnitude of magnetic fields at Mountphilips of 56.7 µT, 69 µT and 79.7 µT above the 110kV UGC, under the 110kV OHL and the 220kV OHL, respectively
- the momentary to brief exposure of any transient people present
- the occasional nature of any exposure
- the reversibility of the exposure as the person moves away from the location of substations and the underground cables or overhead lines.
- The new levels remain substantially under the EU EMF Limits.

Transient People

Sensitive Aspect

12.3.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 12-32 below.

Table 12-33: Description and Rationale for Excluded Impacts to Transient People

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
All construction works, personnel and activities	1,2,4	Air, Ground	Increase in ambient electromagnetic fields (EMF) levels	Rationale for Excluding: No Potential for Impacts, the Mountphilips Substation, 110kV UGC, Internal Windfarm Cables, Consented UWF Turbines and Consented UWF Substation will only create electromagnetic fields during the operation of these parts. No EMF will be emitted during the construction stage.
Road opening, rock breaking, earthmoving, operation of machinery and movement of construction traffic along access roads	1, 2, 4	Air, Ground	Vibration nuisance	Rationale for Excluding: No Potential for Impacts, ttransient people are not considered sensitive to vibration emissions at the levels which could be emitted during construction works and by construction machinery.
Construction Traffic	1,2,4	Wind	Decrease in ambient air quality as a result of traffic derived pollutants (NO_2, PM_{10}, $PM_{2.5}$, CO, Benzene	Rationale for Excluding: Neutral impact, the traffic levels associated with the UWF Grid Connection or the Other Elements of the Whole UWF Project do not reach the criteria outlined in Table 12-4 for carrying out an air modelling assessment for traffic based pollutants as the neither the individual nor in-combination increase in traffic levels will be less than 1,000 AADT. According to Table 12-7, any small increases in traffic derived pollutants will have a negligible effect in the context of the baseline air quality level of c. 5µg/m^3 (NO_2) or 10µg/m^3 (PM_{10}) which is substantially below the objective/limit value of 40µg/m^3 for NO_2 and PM_{10}.
Delivery of construction materials Excavation and storage of materials	1, 2, 4	Wind	Increase in airborne dust	Rationale for Excluding: Neutral impact, due to a Low receptor sensitivity, a Low sensitivity of the area (of walking routes, public roads or agricultural/forestry lands), combined with the medium magnitude of construction activities, it is considered that the risk of dust effects to Transient People is Low, furthermore the duration of any effects will be momentary to brief in duration.

Air

Topic

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Delivery of construction materials Excavation and storage of materials	1, 2, 4	Wind	Increase in ambient noise levels	Rationale for Excluding: Neutral impact, as per the IEMA 2014 transient people are considered to have a Low sensitivity to noise effect, any walkers or cyclists will only momentarily encounter construction works at four locations where waymarked trails come into close proximity with construction works areas. In addition, there will be no unauthorized access by transient people to construction works areas.
Operational Stage				
Operational substations, operational turbines	1,4	Air	Increase in ambient noise levels	Rationale for Excluding: no potential for impacts/Neutral impacts: once constructed, noise emissions from the operational Mountphilips Substation or the Consented UWF Substation will not be audible at distances beyond 200m. As there are no waymarked trails within this distance, there is no potential for impacts to Transient People (Road users and farm/forestry workers are not considered noise sensitive receptors given their proximity to vehicle, machinery and animals). In relation to Other Elements, the Eamonn a Chnoic Loop is routed in close proximity to turbines in Knocknamena, however it is considered that while the noise emitted by the turbines will be heard in close proximity, this noise will not be intrusive – the levels will not cause any change in behaviour, such as having to speak more loudly as a conversation can be carried out normally while standing underneath a turbine. In the context of the momentary/brief duration of any effects, it is considered that the noise emitted by the Consented Upperchurch Turbines will have a neutral effect on any walkers that may be on this looped walk.
Operational UWF Grid Connection, UWF Related Works and Upperchurch Windfarm	1, 2, 4	Ground	Vibration emissions during the operational stage	Rationale for Excluding**:** No potential for impacts, there will be no sources of significant vibration during the operational stage of the UWF Grid Connection or the UWF Related Works, due to any absence of piling, blasting, road opening, rock breaking or earthmoving activities. Vibration from operational plant or from operational vehicles using site access roads will be almost impossible to detect. In relation to the Upperchurch Windfarm, according to the UWF RFI 2013: "The level of vibration from wind turbines is so small that only the most sophisticated instrumentation and data processing can reveal their presence, and they are almost impossible to detect
Decommissioning Stage				

Transient People

Sensitive Aspect

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)

Rationale for Excluding: No potential for effects/Neutral effects:

UWF Grid Connection: No potential for effects to Air: The UWF Grid Connection will not be decommissioned and therefore there is no potential for effects to air quality or to ambient noise, vibration or EMF levels.

UWF Related Works: Decommissioning of the UWF Related Works is limited to the removal of the Telecom Relay Pole and pulling of cables from ducts (Internal Windfarm Cabling) which will take place either from the Consented UWF Turbines or the Consented UWF Substation. Neutral effect on air quality, due to the small extent of decommissioning activities with any dust associated occurring within the immediate vicinity of the works areas and limited use of vehicles. Neutral effect on ambient noise or vibration levels, due to momentary to brief duration of any increase in ambient noise experience by any walkers that may be presented on the Eamonn a Chnoic Loop or Ormond Way (if developed) where they comes in close proximity to the Upperchurch Windfarm. There will be Neutral vibration effects, as the decommissioning activities will not involve any major sources of vibration. No potential for impact ambient EMF levels: no EMF will be emitted as the cables and electrical plant will have been powered down at the start of the Decommissioning Stage.

Upperchurch Windfarm; Neutral impact –It is likely that the Consented UWF Substation will remain in-situ for use by ESBN, decommissioning works will be limited to the Consented UWF Turbines, turbine hardstanding areas, meteorological masts and associated drainage systems, where the turbines and will be removed and the remaining hardstanding areas and associated drainage will be reinstated using the soils in the adjacent storage permanent overburden storage berms, this soil will be reseeded and will re-vegetate, Neutral effects to soils are expected due to the small extent of the hardstands in the context of the large extent of soils in the surrounding area. Upperchurch Windfarm decommissioning works and activities are predominately from turbine hardstands, with works at any one turbine hardstand taking place over c.2 weeks. Neutral effect on Air Quality, due to the small extent of decommissioning activities with any dust associated occurring within the immediate vicinity of the works areas and limited use of vehicles. Neutral effect on ambient noise or vibration levels**,** due to the momentary to brief duration of any increase in ambient noise experience by any walkers that may be presented on the Eamonn a Chnoic Loop or Ormond Way where they comes in close proximity to the Upperchurch Windfarm. There will be Neutral vibration effects, as the decommissioning activities will not involve any major sources of vibration. No potential for impact ambient EMF levels: no EMF will be emitted as the cables and electrical plant will have been powered down at the start of the Decommissioning Stage.

Air

Topic

12.3.5 Mitigation Measures for Impacts to Transient People

Mitigation measures were incorporated into the UWF Grid Connection project design including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur** to Transient People.

12.3.6 Evaluation of Residual Impacts to Transient People

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures were required, and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Transient People above (Section 12.3.4) – i.e. **Neutral Impacts/No Likely Impacts**.

12.3.7 Application of Best Practice and the EMP for Transient People

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment.

The following Best Practice Measures have been developed, for the protection of **Transient People,** by the authors of this topic chapter, using industry best practice:

GC-BPM-08	Minimising Dust Emissions from Site Activities
GC-BPM-10	Measuring Operational EMF Emissions

These Best Practice Measures form part of the UWF Grid Connection Environmental Management Plan, which is appended to the EIA Report as Volume D.

Transient People

Sensitive Aspect

12.3.8 Summary of Impacts to Transient People

A summary of the Impact to Transient People is presented in Table 12-33.

Table 12-34: Summary of the impacts to Transient People

Impact to Transient People:	**Increase in Ambient EMF Levels**
Evaluation Impact Table	*Section 12.3.4.1*
Project Life-Cycle Stage	Operational Stage
UWF Grid Connection *direct/indirect impact*	**Imperceptible to Slight**
UWF Grid Connection *cumulative impact*	**Imperceptible to Slight**
Element 2: UWF Related Works	Imperceptible
Element 3: UWF Replacement Forestry	Neutral Impacts or No Impacts - Evaluated as Excluded, see Section 12.3.2.2.1
Element 4: Upperchurch Windfarm	Imperceptible
Element 5: UWF Other Activities	Neutral Impacts or No Impacts Evaluated as Excluded, see Section 12.3.2.2.1
Cumulative Impact:	
All Elements of the Whole UWF Project	**Imperceptible to Slight (for people) Slight (for AIMDS)**
All Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities Shannonbridge – Killonan 220 kV OHL; Killonan – Nenagh 110kV OHL; Castlewaller Windfarm (potential grid connection)	**Imperceptible to Slight**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Air

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12.4 Reference List

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World Health Organisation (EMF) http://www.who.int/peh-emf/en/

Reference List

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Air

UWF Grid Connection EIA Report (2019)

Volume C2: EIAR Main Report

Chapter 13: Climate

October 2019

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Glossary of Terms

Term	Definition
Embodied emissions / embodied energy	These are defined as the energy consumed by all of the processes associated with the production of a development, from the mining and processing of natural resources to manufacturing, transport and product delivery
CO_2eq	This is defined as the 'carbon dioxide equivalent'. It is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2eq signifies the amount of CO_2 which would have the equivalent global warming impact
Capacity Factor	Is how much electricity a power plant actually produces compared to how much it would produce if it operated at full nameplate capacity 100% of the time. Expressed as a % of full nameplate capacity.
EU ETS	The EU Emissions Trading System which is part of the EU's policy to combat climate change and its key tool for reducing greenhouse gas emissions cost-effectively. It is the world's first major carbon market and remains the biggest one
Mt	Mt refers to Megatonne values. 1 Mt = 1 Million Tonnes
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.
Project Design Measure	Measures for environmental protection, incorporated into the design of the project.

List of Abbreviations

Abbreviation	Description
IPCC	Intergovernmental Panel on Climate Change is the United Nations body for assessing the science related to climate change.
EPA	The Irish Environmental Protection Agency which produces national greenhouse gas emission projections on an annual basis. The EPA has been designated by Government with the responsibility to develop, prepare and publish periodic projections of greenhouse gas emissions for Ireland, and acts as the national entity with overall responsibility for the preparation and reporting of emissions projections.

Executive Summary of the Climate Chapter

Baseline Environment:

Climate change is now recognised as the biggest threat to life on earth, and it is now urgent that we take immediate action to reduce anthropogenic emissions of greenhouse gases to limit its damaging effects.

Addressing climate change requires two types of responses: mitigation and adaptation. As part of Ireland's mitigation response, the Irish government is committed to several emissions targets, including a 20% reduction by 2020 of non-ETS emissions (i.e. agriculture, transport, residential, commercial, non-energy intensive industry, and waste) on 2005 levels; with annual binding limits set for each year over the period 2013-2020; 30% reduction of emissions by 2030 compared to 2005 levels, with a longer term policy position of at least 80% reduction of emissions by 2050 (compared to 1990 levels).

Targets have also been set for electricity from renewable sources: the National Renewable Energy Action Plan sets a target of 40% electricity generation to come from renewable sources by 2020, and the White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015 – 2030' which aims to transform Ireland to a low carbon economy, sets a target of 70% electricity generation to come from renewable sources by 2030.

The latest published figures (2019) from the EPA in relation to Ireland's mitigation response, indicate that Ireland will breach its annual obligations up to 2020 (based on projected figures). EPA also project that this breach of obligations will continue into the future from 2021 to 2030. Ireland needs to reduce its use of fossil fuels considerably and urgently in order to influence these EPA projections.

To avoid the risk of long-lasting or irreversible changes to the climate system, it is clear that we must make rapid, far-reaching and unprecedented changes across all aspects of society. The transition to clean energy is an essential part of this.

Windfarms help in achieving Ireland's targets by supplying renewable energy to the national electricity system thus reducing the harmful emission content of electricity production. For example in 2018 wind energy met 29% of Ireland's electricity demand. This set a record, for Ireland in relation to the highest % in Europe of electricity demand being supplied by on-shore wind, thus impacting Ireland's mitigation response to Climate Change in a positive way. In addition to this for the first time ever recorded, wind energy provided more electricity than gas over a full month in January 2018.

The Development: While the UWF Grid Connection development will not directly impact Climate, it will cause positive indirect impacts through enabling the supply of electricity to the National Grid that is generated from renewable sources (wind generation at Upperchurch Windfarm).

Potential effects on Climate through Change remediation: Windfarms will help in achieving Ireland's targets by supplying renewable electricity to the national electricity system and indirectly reducing the use of fossil fuels for electricity production. Increased deployment of Renewable Energy electricity generation avoids CO^2 emissions from fossil fuel generated electricity, and contributes towards meeting Irelands Climate targets.

Summary of the Significance of the indirect Impact: The UWF Grid Connection itself will not generate renewable electricity and therefore will not contribute *in itself* to Climate Change mitigation action. However, UWF Grid Connection will **indirectly cause positive effects** to climate as the purpose of UWF Grid Connection is to transport the renewable electricity produced by Upperchurch Windfarm to the National Grid. An indirect **Significant Positive Impact is evaluated** by the authors for the development because Upperchurch Windfarm will generate approximately 220million kWh of renewable energy per annum, which will avoid the emission of 106,216 tonnes of greenhouse gases per annum which would have

resulted from generating the same amount of electricity by fossil fuel plant. 220 million kWh is enough to supply 52,381 houses (equivalent to 40% of the houses in Counties Tipperary and Limerick combined) with green, emission free electricity.

Cumulative Impact: According to the SEAI Energy in Ireland Report (2018), the average generating capacity factor of Irish windfarms was 28% in 2017. Based on this capacity factor, and the total generating capacity of 3,700MW, windfarms in Ireland avoid the emission of 4.38 million tonnes of CO^2 eq or 7.2% of Ireland's 2017 total national emissions. Therefore the cumulative impact of Upperchurch Windfarm in addition to **all other operational windfarms in the Irish State** will also be a **Significant Positive Impact**.

Conclusion: The UWF Grid Connection will cause indirect significant positive effects to Climate

It should be noted that this **Significant Positive Impact on Climate is the only significant impact (positive or negative) from the development**, as assessed by the topic experts in this EIA Report.

Topic **Climate**

13 Environmental Factor: Climate

13.1 Introduction to the Climate Chapter

13.1.1 What is Climate?

Climate is defined as the average weather over a period of time.

Climate change means a significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period – decades or longer. The Earth's climate has changed many times during the planet's history, with events ranging from ice ages to long periods of warmth. What's different about this period of the earth's history is that human activities are significantly contributing to natural climate change through our emissions of greenhouse gases. This interference is resulting in increased air and ocean temperatures, drought, melting ice and snow, rising sea levels, increased rainfall, flooding and other influences.

Climate Action is taking urgent action to tackle climate change and its impacts; this includes Climate Mitigation which is about reducing our emissions of greenhouse gases to limit the amount of warming that happens over the coming decades. Ultimately, mitigation means reducing our dependence on fossil fuels in all aspects of our lives[1].

13.1.2 Overview of Climate in the Environment

The scientific community and governments across the world are in agreement - the climate is changing.

Climate change is now recognised as the biggest threat to life on earth, and it is now urgent that we take immediate action to reduce anthropogenic emissions of greenhouse gases to limit its damaging effects[2].

Addressing climate change requires two types of responses: mitigation and adaptation. As part of Ireland's mitigation response, the Irish government is committed to several emissions targets:

- **Ireland's 2020 target is to achieve a 20% reduction of non-ETS emissions** (i.e. agriculture, transport, residential, commercial, non-energy intensive industry, and waste) on 2005 levels; with annual binding limits set for each year over the period 2013-2020;
- National Renewable Energy Action Plan (NREAP) which sets **a target of 40% electricity generation to come from renewable sources by 2020**. The Irish Governments strategy document 'Strategy for Renewable Energy 2012 – 2020' aims to achieve Ireland's 2020 targets at a minimum.
- **Irelands 2030 target** under the European Council Effort Sharing Regulation is a **30% reduction of emissions compared to 2005 levels by 2030**;
- The White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015 – 2030' aims to transform Ireland to a low carbon economy, with **a target of 70% electricity generation to come from renewable sources by 2030**.
- The Government of Ireland's Climate Action Plan 2019: Over the longer-term Ireland's National Policy Position on Climate change has set a target of an aggregate r**eduction in carbon dioxide (CO^2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built**

[1] EPA (2019) Research Report *Irish Climate Futures: Data for Decision-making*
[2] https://www.seai.ie/publications/2019-04_SEAI2019ProjectionsReport_Final.pdf

environment and transport sectors. The long-term vision of low-carbon transition is also based on, in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

In order to meet these emission targets, Ireland needs to reduce its use of fossil fuels considerably.

Irelands Compliance with Climate Obligations: In the latest published figures from the EPA on Ireland's mitigation response, projections show that **Ireland will breach the annual obligations up to 2020, and over the period 2021 to 2030**, and therefore reduction measures are required in all sectors.

13.1.3 Sensitive Aspects of the Climate Environment included for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspect is **included in this topic chapter** as it could be potentially impacted:

Sensitive Aspect No. 1	Climate Change	Section 13.2

The above listed Sensitive Aspect is evaluated in Section 13.2 of this Chapter.

To help readers navigate, the colour code for the Sensitive Aspect used above is also used in the Sensitive Aspect Section 13.2. The colour-code has been applied to the section headings, tables and on side-tabs on the edge of the pages.

13.1.4 Sensitive Aspects excluded from further evaluation

No Sensitive Aspects were excluded from this topic chapter.

13.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of a current application to An Bord Pleanála. The main parts of the UWF Grid Connection are identified in Table 13-1 below.

Table 13-1: Subject Development – UWF Grid Connection

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Ancillary Works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 EIAR Main Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

13.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.
- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. ***Note***: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

13.1.6 The Author of the Climate Chapter

This report was written by Ciara Nolan, BSc (Hons) in Energy Systems Engineering and Master in Applied Environmental Science, of AWN Consulting Ltd. She is an Associate Member of the Institute of Air Quality Management and specialises in the fields of ambient and indoor air quality monitoring and EIA. AWN Consulting is a multidisciplinary environmental consultancy specialising in Acoustics, Air Quality, Climate, Waste, Water and Soil Quality, Flora and Fauna and Seveso II Major Accident Hazard Land Use Assessments.

13.1.7 Sources of Baseline Information

The information sources outlined in Table 13-2 were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 13-2: Sources of Baseline Information for Climate

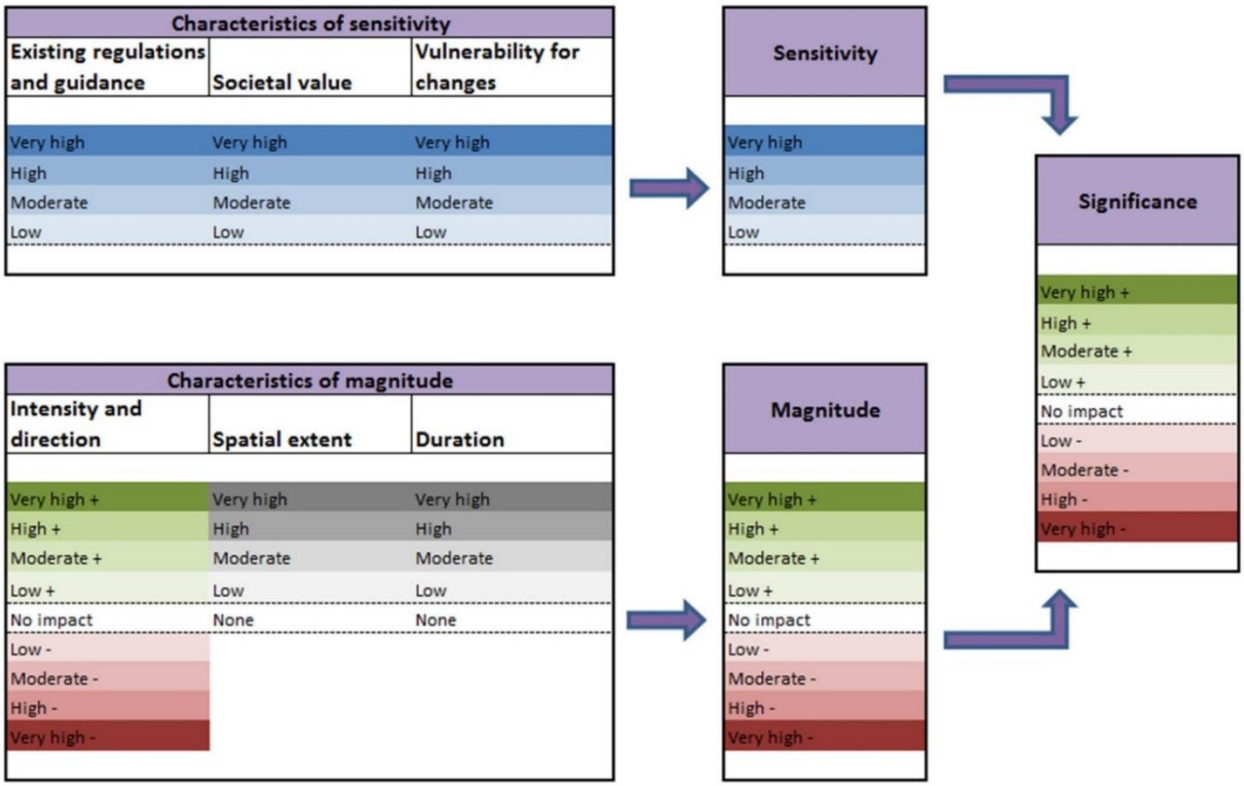
Type	Source
Consultation	No feedback was received from consultees • See Chapter 3: The Scoping Consultations, and Appendices for further details.
Legislation, Regulation, Policy	• EU Renewable Energy Directive 2009/28/EC • National Climate Policy Position (Government of Ireland 01/01/2013) • EU Effort Sharing Decision (Decision No 406/2009/EC) • National Renewable Energy Action Plan (NREAP) 2010 • NREAP Ireland's Fourth Progress Report submitted under Article 22 of Directive 2009/28/EC (December 2017) • The White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015 – 2030' • Government of Ireland's Climate Action Plan 2019 • Mid-West Regional Planning Guidelines 2010-2022 • North Tipperary County Development Plan 2010 (as varied)
Guidelines	• UK Environment Agency carbon calculator for construction sites (Version 3.6, 2014)
Desktop	• EPA (2019) GHG Emissions Projections Report • EPA (2019) Research Report *Irish Climate Futures: Data for Decision-making* • SEAI (2019) National Energy Projections 2019 • SEAI (2019) National Projections Report • SEAI (2018) Energy Related Emissions In Ireland 2005 – 2016 • IPCC (2019) Special Report on the Ocean and Cryosphere in a Changing Climate In co-ordination with and by review of the other EIA Report Chapters as follows: • Chapter 9: Land • Chapter 10: Soils • Chapter 15: Material Assets – Roads • Review of planning/ environmental information documents for the Other Elements of the Whole UWF Project as contained in Volume F of the planning application
Fieldwork	• No fieldwork was required

13.1.8 Methodology used to Describe the Baseline and to Evaluating Effects

There are no specific guidelines on the evaluation of effects to Climate for an EIA Report. The methodology for evaluating impacts to the environmental factor Climate is based on a standard methodology – using the IMPERIA methodology. The IMPERIA methodology is described below.

13.1.8.1 Overview of the IMPERIA Methodology

In the framework developed under the EC LIFE project - IMPERIA, the evaluation of impact significance uses a replicable, multi-criteria decision analysis, where the sensitivity of the receptor (i.e. the sensitivity of a Sensitive Aspect of the environment) and the magnitude of the change caused by a project are rated using sub-criteria or scales, and then the overall significance is evaluated using a matrix.



The criteria for determining the overall sensitivity of a receptor and magnitude of the change (impact) to the receptor, is provided in the tables below. The matrix for determining the significance of the impact to the receptor is provided after these tables.

13.1.8.1.1 Criteria for Evaluating the Sensitivity of a Receptor

Sensitivity of the receptor is a description of the characteristics of the receptor or aspect of the environment which will be affected by the development. It is a measure of 1) existing regulations and guidance, 2) societal value and 3) vulnerability for the change. The sensitivity of a receptor is estimated in its current state prior to any change implied by the project.

Existing regulations and guidance describes whether there are any such objects in the impact area, which have some level of protection by law or other regulations (e.g. prohibition against polluting groundwater and Natura areas), or whose conservation value is increased by programs or recommendations (e.g. landscapes designated as nationally valuable).

Societal value describes the value of the receptor to the society and depending on the type of impact may be related to economic values (e.g. water supply), social values (e.g. landscape or recreation) or environmental values (e.g. natural habitat). Societal value measures general appreciation from the point of view of the society. When relevant, the number of people impacted is taken into account.

Vulnerability for the change describes how liable the receptor is to be influenced or harmed by changes to its environment.

Sensitivity	Criteria Existing regulations/guidance	Criteria Societal value	Criteria Vulnerability to change
Low	Few or no recommendations which add to the conservation value of the impact area, and no regulations restricting use of the area (e.g. zoning plans).	The receptor is of small value or uniqueness. The number of people impacted is small.	Even a large external change would not have substantial impact on the status of the receptor. There are only few or none vulnerable receptors in the area.
Moderate	Regulation sets recommendations or reference values for an object in the impact area, or the project may impact an area conserved by a national or an international program.	The receptor is valuable and locally significant but not very unique. The number of people impacted is moderate.	At least moderate changes are needed to substantially change the status of the receptor. There are some vulnerable receptors in the area.
High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is unique and valuable to society. It may be deemed nationally significant and valuable. The number of people impacted is large.	Even a small external change could substantially change the status of the receptor. There are many vulnerable receptors in the area.
Very High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is highly unique, very valuable to society and possibly irreplaceable. It may be deemed internationally significant and valuable. The number of people affected is very large.	Even a very small external change could substantially change the status of the receptor. There are very many vulnerable receptors in the area.

The **overall sensitivity of a receptor** is assessed by the competent expert on the basis on his/her assessment of the components of sensitivity. A general guide for deriving the overall sensitivity is to pick the maximum of existing regulations and guidance and societal value and then adjust that value depending on the level of vulnerability.

Determining the Overall Sensitivity of a Receptor	
Low	The receptor has minor social value, low vulnerability for the change and no existing regulations and guidance. Even a receptor which has major or moderate social value may have low sensitivity if it's not liable to be influenced by the development.
Moderate	The receptor has moderate value to society, its vulnerability for the change is moderate, regulation may set reference values or recommendations, and it may be in a conservation program. Even a receptor which has major social value may have moderate sensitivity if it has low vulnerability, and vice versa.
High	Legislation strictly conserves the receptor, or it is very valuable to society, or very liable to be harmed by the development.
Very High	Legislation strictly conserves the receptor, or it is irreplaceable to society, or extremely liable to be harmed by the development. Even minor influence by the proposed development is likely to make the development unfeasible.

13.1.8.1.2 Criteria for Evaluating the Magnitude of an Impact

Magnitude of the impact describes the characteristics of the changes or effects that the planned project is likely to cause. Magnitude is a combination of 1) intensity and direction, 2) spatial extent, and 3) duration. Assessment of magnitude evaluates the likely changes affecting the receptor *without* taking into account the receptors sensitivity to those changes.

Intensity describes the physical dimension of a development. The direction of the change/effect is either positive (green) or negative (red).

Magnitude	Criteria – Intensity & Direction
Very High	The proposal has an extremely beneficial effect on nature or environmental load. A social change benefits substantially people's daily lives.
High	The proposal has a large beneficial effect on nature or environmental load. A social change clearly benefits people's daily lives.
Moderate	The proposal has a clearly observable positive effect on nature or environmental load. A social change has an observable effect on people's daily lives.
Low	An effect is **positive** and observable, but the change to environmental conditions or on people is small.
No impact	An effect so small that it has no practical implication. Any benefit or harm is negligible.
Low	An effect is **negative** and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has a clearly observable negative effect on nature or environmental load. A social change has an observable effect on people's daily lives and may impact daily routines.
High	The proposal has a large detrimental effect on nature or environmental load. A social change clearly hinders people's daily lives.
Very High	The proposal has an extremely harmful effect on nature or environmental load. A social change substantially hinders people's daily lives.

Spatial extent describes the geographical reach of, or the range within which, an effect is observable.

Duration describes the length of time during which an impact is observable and it also takes other related issues such as timing and periodicity into account. These are relevant for impacts which aren't observable all the time such as periodic impacts.

Magnitude	Criteria Spatial Extent	Criteria Duration
Low	Impact extends only to the immediate vicinity of a source. Typical range is < 1 km.	An impact whose duration is at most one year, for instance during construction and not operation. A moderate-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
Moderate	Impact extends over one municipality. Typical range is 1-10 km.	An impact lasts from one to a number of years. A long-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
High	Impact extends over one region. Typical range is 10-100 km.	An impact lasts several years. The impact area will recover after the project is decommissioned.
Very High	Impact extends over several regions and may cross national borders. Typical range is > 100 km.	An impact is permanent. The impact area won't recover even after the project is decommissioned.

Deriving the overall magnitude of the change from components of magnitude

Magnitude of the change is a comprehensive synthesis of its component factors. In a case, where intensity, spatial case and duration all get the same value, the magnitude would also be given this value. In other cases, intensity should be taken as a starting point, and the assessment should be adjusted based on spatial extent and duration to obtain an overall estimate. The aim is that the overall assessment should capture the characteristics of an effect. The table below describes some example descriptions of different categories for the magnitude of the change.

Determining the Overall Magnitude of the Change/Effect	
Very High	The proposal has beneficial effects of very high intensity and the extent and the duration of the effects are at least high.
High	The proposal has beneficial effects of high intensity and the extent and the duration of the effects are high.
Moderate	The proposal has clearly observable positive effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
Low	An effect is positive and observable, but the change to environmental conditions or on people is small.
No impact	No change is noticeable in practice. Any benefit or harm is negligible.
Low	An effect is negative and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has clearly observable negative effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
High	The proposal has harmful effects of high intensity and the extent and the duration of the effects are high.
Very High	The proposal has harmful effects of very high intensity and the extent and the duration of the effects are at least high.

13.1.8.2 Assessing the significance of an impact

The **assessment of the overall significance uses the matrix below,** where positive impacts are in green and negative in red. The matrix is based on the **magnitude of the change** affecting a receptor and on the **sensitivity of the receptor** to those changes.

The values obtained from the table are indicative because the most relevant dimensions for characterising an impact are dependent on the type of impact. Thus, some discretion from the expert is required, in particular in cases, where the one component is low and the other one high or very high.

Determining the Overall Significance of an Impact

Impact Significance		Magnitude of change								
		Very High	High	Moderate	Low	No Change	Low	Moderate	High	Very High
Receptor Sensitivity	Low	Significant*	Moderate*	Slight	Imperceptible	Neutral	Imperceptible	Slight	Moderate*	Significant*
	Moderate	Significant	Significant	Moderate	Slight	Neutral	Slight	Moderate	Significant	Significant
	High	Profound	Significant	Significant	Moderate*	Neutral	Moderate*	Significant	Significant	Profound
	Very High	Profound	Profound	Significant	Significant*	Neutral	Significant*	Significant	Profound	Profound

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

Note on Terms used in 'Determining the Overall Significance of an Impact' Table: *The Significance rating ascribed in the Table above have been refined from the ARVI tool, to provide a more nuanced understanding of the significance and also to be compatible with the terms used throughout this EIA Report, which have been informed by the EPA Guidelines on Information to be contained in EIAR (2017) for description of effects.*

In the above Table - Low has been refined as Slight or Imperceptible depending on context; High has been renamed as Significant; Very High has been renamed as Profound; No Impact is understood to also mean Neutral effect, which is defined in the EPA Guidelines as 'no effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error'.

13.1.9 Certainty and Sufficiency of the Evaluation/Information

Information on the Baseline Environment has been complied based on available information from the EPA. Data on Ireland's GHG emissions from 1990 to 2017 have been reviewed in order to identify the projected trends in the baseline and receiving environments. The EPA has published finalised data for Ireland's GHG emissions up to 2017 and provisional data for 2018 levels of GHG emissions.

In relation to Climate, there were no limitations or difficulties encountered in compiling the details of the baseline environment or evaluating the impacts of the UWF Grid Connection and of the Whole UWF Project.

13.2 Sensitive Aspect No.1: Climate Change

This Section 13.2 provides a description of the baseline environment and an evaluation of the likely impacts of UWF Grid Connection, both alone and cumulatively, on **Climate Change**.

13.2.1 BASELINE CHARACTERISTICS for Climate Change

This Section 13.2.1 comprises the identification of the Study Area for direct or indirect effects and a description of the context, character, importance and sensitivity of the Climate Change in the area. Trends or changes in the baseline environment are also identified.

13.2.1.1 STUDY AREA for Climate Change

The study area for Climate Change in relation to the UWF Grid Connection is described in Table 13-3.

Table 13-3: UWF Grid Connection Study Area for Climate Change

Study Area for Climate Change	Justification for the Study Area Extents
Irish State	While climate change is global, the study area for this report relates to the Irish State, as any emissions or emission offsets of the project, if significant, have the potential to impact Ireland's commitments and targets under various EU Climate Agreements and other international agreements

13.2.1.2 Baseline Context & Character of Climate Change in the UWF Grid Connection Study Area

Context

According to the SEAI 2019 National Projections Report[3], 'Climate change is now recognised as the biggest threat to life on earth, and it is now urgent that we take immediate action to reduce anthropogenic emissions of greenhouse gases to limit its damaging effects. In September 2018 the G7 noted that "*Today the effects of climate change are no longer a distant threat – they are real and present*". Four of the hottest years on record occurred post-2010. At the United Nation Framework Convention on Climate Change (UNFCCC) Conference of Parties (COP) 24, held in December 2018, it was highlighted that "*there is no doubt about the urgency of the situation, and the priority that tackling climate change needs to have for the international community*", that "*the reality is proving to be worse than scientists had foreseen*" and "*climate change is running faster than we are*".

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change. According to the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate[4] (September 2019): 'global warming has already reached 1°C above the pre-industrial level, due to past and current greenhouse gas emissions. There is overwhelming evidence that this is resulting in profound consequences for ecosystems and people. The ocean is warmer, more acidic and less productive. Melting glaciers and ice sheets are causing sea level rise, and coastal extreme events are becoming more severe'.

According to the United Nations, without action, the world's average surface temperature is likely to surpass 3°C this century. The poorest and most vulnerable people are being affected the most.

[3] https://www.seai.ie/publications/2019-04_SEAI2019ProjectionsReport_Final.pdf
[4] https://www.ipcc.ch/srocc/home/

Climate Change Mitigation

Addressing climate change requires two types of responses: mitigation (defined as an anthropogenic intervention to reduce anthropogenic forcing of the climate system) and adaptation (defined as: the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects that moderates harm or exploits beneficial opportunities".

As part of Ireland's mitigation response, the Irish government is committed to several emissions targets:

- Ireland's **2020 target** is to achieve a **20% reduction of non-ETS emissions** (i.e. agriculture, transport, residential, commercial, non-energy intensive industry, and waste) on 2005 levels; with annual binding limits set for each year over the period 2013-2020;
- National Renewable Energy Action Plan (NREAP) which sets a target of **40% electricity generation to come from renewable sources by 2020**. The Irish Governments strategy document 'Strategy for Renewable Energy 2012 – 2020' aims to achieve Ireland's 2020 targets at a minimum.
- Irelands **2030 target** under the European Council Effort Sharing Regulation is a **30% reduction of emissions** compared to 2005 levels by 2030;
- The White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015 – 2030' aims to transform Ireland to a low carbon economy, with a target of **70% electricity generation to come from renewable sources by 2030;**
- Over the longer-term Ireland's National Policy Position on Climate change has set a target of an aggregate **reduction in** carbon dioxide (CO2) **emissions** of **at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors**. The long-term vision of low-carbon transition is also based on, in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

Mitigation is about reducing our emissions of greenhouse gases to limit the amount of warming that happens over the coming decades. Ultimately, mitigation means reducing our dependence on fossil fuels in all aspects of our lives. All actors, from individuals, households, businesses and governments to the international community and international corporations, have an important role to play in mitigation[5].

The IPCC Report (2019) outlines the benefits of limiting global warming to the lowest possible level, in line with the goal that governments set themselves in the Paris Agreement[6] - urgently reducing greenhouse gas emissions limits the scale of ocean and cryosphere changes; the ecosystems and the livelihoods that depend on them can be preserved.

To avoid the risk of long-lasting or irreversible changes to the climate system, it is clear that we must make rapid, far-reaching and unprecedented changes across all aspects of society. The transition to clean energy is an essential part of this. In 2018 wind energy met a record 29% of Ireland's electricity demand – the highest % in Europe of electricity demand supplied by on-shore wind. In January 2018, for the first time, wind energy provided more electricity than gas over a full month.

[5] EPA (2019) Research Report *Irish Climate Futures: Data for Decision-making*
[6] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

13.2.1.3 IMPORTANCE of Climate Change

According to the SEAI 2019 National Projections Report[7], 'Climate change is now recognised as the biggest threat to life on earth, and it is now urgent that we take immediate action to reduce anthropogenic emissions of greenhouse gases to limit its damaging effects.'

Using the IMPERIA methodology set out in Section 13.1.8, Climate Change is considered to have a **Very High Sensitivity** due to the national and international regulations and targets, and a **Very High value for biodiversity and human wellbeing**.

13.2.1.4 SENSITIVITY of Climate Change

Climate change is a result of increased levels of carbon dioxide and other greenhouse gases in the atmosphere causing the heat trapping potential of the atmosphere to increase. The release of carbon dioxide from the burning of fossil fuels is a major cause of climate change. Greenhouse gases can be emitted from vehicles and embodied energy (or embodied emissions) associated with materials used in the construction of a development. Greenhouse gases can be offset by the generation of electricity from renewable sources rather than from fossil fuel sources.

According to the 2019 EPA Research Report *Irish Climate Futures: Data for Decision-making*: 'That the world has warmed since the 19th century is unequivocal. Evidence for warming includes changes in surface, atmospheric and oceanic temperatures; glaciers; snow cover; sea ice; and sea level and atmospheric water vapour. We know that humans have been the main cause of this warming through emissions of greenhouse gases. We also know that continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system, and at all scales from local to global. **How much warming will be experienced over the course of this century depends on future emissions of greenhouse gases**. If we continue on a business as-usual course, Earth's average temperature is likely to increase by between 2.6°C and 4.8°C above today's levels, with associated increases in extreme events and sea level rise. For Ireland, such changes would probably mean more frequent wet winters, dry summers and hot summers, which would pose challenges for water and flood risk management, agriculture and tourism. Recent national-scale extreme events, from the winter storms of 2013/14 to the flooding of the Shannon and other catchments associated with Storm Desmond, serve to highlight Ireland's vulnerability to extreme events. Much work has been completed by different research groups from Irish universities and Met Éireann on exploring future impacts. These works show that we are likely to experience wetter winters, drier summers and more frequent extreme weather events, with associated implications across multiple sectors.

[7] https://www.seai.ie/publications/2019-04_SEAI2019ProjectionsReport_Final.pdf

13.2.1.5 TRENDS for Climate Change in the Baseline Environment

SEAI National Projections Report 2019

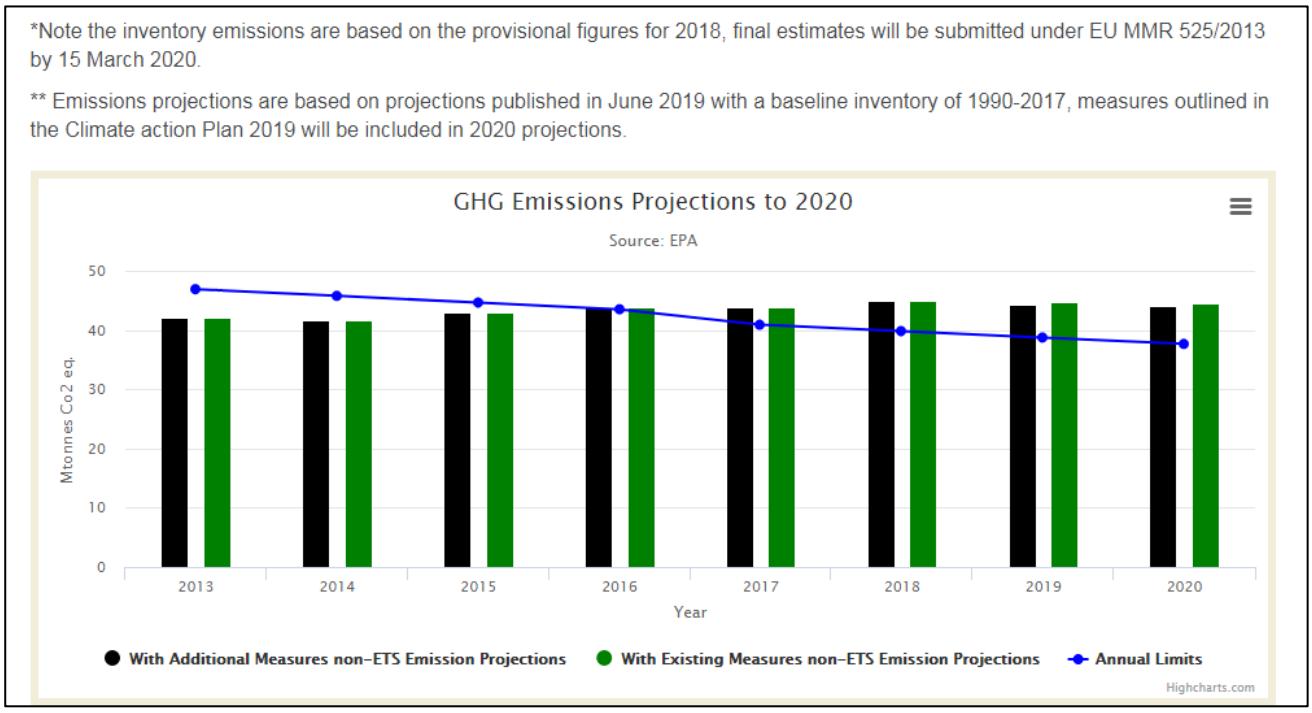
Different levels of achievement are anticipated by 2020 for renewable energy targets for transport, electricity and heat:

- The transport sector will likely meet the EU mandated 2020 target of 10% (but only when multipliers for sustainable biofuels are included as permissible under the renewable energy directive).
- A small gap of less than three percentage points is anticipated for the electricity target of 40% by 2020.
- The gap for the heat target is larger and could be three to four percentage points short of the 2020 target of 12%.

When these are taken together, **it is expected that Ireland will fall short of its mandatory European target for an overall 16% renewable energy share by 2020**, with overall achievement approximately 13% (see Figure 13.2.1). This shortfall will require Ireland to purchase statistical transfers, as per the Renewable Energy Directive 2009/28/EU.

On the current trajectory, **Ireland's energy efficiency achievement in 2020 is likely to be 16%, compared to the binding 20% energy savings target**. **Non-ETS emissions are anticipated to be between 0% and 1% below 2005 levels by 2020 compared to the target of 20% below**, which was mandated in the European Council Effort Sharing Decision (Decision No 406/2009/EC). The emissions target shortfall will also require compliance purchasing.

Figure 13.2.1: Extract from EPA GHG Emissions Projections to 2020[8]



[8] http://www.epa.ie/irelandsenvironment/environmentalindicators/#climate

13.2.1.5.1 Trends in the move towards electricity

We are heading towards an increasingly electrified world 'the deployment of electric cars and electric heating in buildings will drive power demand growth in the short term, while some segments of heavy-duty transport and heavy industry could also switch to electricity by mid-century'[9]. The recently published Climate Action Plan[10] envisages the installation of 400,000 domestic heat pumps and almost a million electric cars on our roads by 2030. Demand for electricity will therefore increase substantially during a period of time when Ireland is committed to reducing its non-ETs emissions. To address this demand, the Climate Action Plan also sets a target of 70 per cent of electricity coming from renewable sources by 2030, up from around 30 per cent today.

13.2.1.5.2 The 'Do Nothing Scenario' (the Environment if the Development is not carried out)

Climate change represents a serious threat to the environment. The very high impact of Climate Change to biodiversity and to our human wellbeing, is reflected in the Irish Oireachtas declaring a climate and biodiversity emergency on the 9th May 2019.

If the UWF Grid Connection does not proceed, the renewable generation for Upperchurch Windfarm will not be transported to the National Grid and the subsequent benefits of GHG offsets will not occur. In the 'do-nothing' alternative, **not developing the Upperchurch Windfarm project means that** there will be a consequential loss of the carbon offset potential and **the emission of 106,216 tonnes of greenhouse gases every year from the generation of electricity by fossil fuel plant would not be avoided**.

13.2.1.6 Description of the RECEIVING ENVIRONMENT for Climate Change

The receiving environment is the likely state of the baseline environment at the time of construction/operation/decommissioning as relevant i.e. baseline + trends.

According to the Government of Ireland's Climate Action Plan 2019 Ireland will miss the target set for the period 2013 to 2020 for renewables by about one eighth and for cumulative emissions by a little under 5%. However, more worrying is the expectation that recent growth in emissions, particularly from Industry, Agriculture, and Transport will put us on a trajectory to be over 25% above the 2030 targets.

[9] https://newclimateeconomy.report/2018/energy/
[10] https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf

13.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

13.2.2.1 Cumulative Evaluation Study Areas

13.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Climate Change	Justification for the Study Area Extents
Irish State	While climate change is global, the study area for this report relates to the Irish State, as any emissions or emission offsets of the project, if significant, have the potential to impact Ireland's commitments and targets under various EU Climate Agreements and other international agreements

13.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to show the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6, in Volume C4 EIAR Appendices. Scoping of these Other Elements is presented in Section 13.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements and Other Projects or Activities which are described in Table 13-5.

Table 13-4: Whole Project Cumulative Evaluation Study Area for Local Soils, Subsoils & Bedrock

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Irish State	While climate change is global, the study area for this report relates to the Irish State, as any emissions or emission offsets of the project, if significant, have the potential to impact Ireland's commitments and targets under various EU Climate Agreements and other international agreements
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

13.2.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Climate Change also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Climate Change with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.26).

The results of this scoping exercise are that: operational Windfarms in the Republic of Ireland and Bunkimalta Windfarm (potential future windfarm) and Castlewaller Windfarm (consented future windfarm) have been scoped in for evaluation of cumulative effects.

13.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Climate Change

An evaluation was carried out by the topic author of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects to cause cumulative effects to the Sensitive Aspect Climate Change. The results of this evaluation are included in Table 13-6.

Table 13-5: Results of the Evaluation of the Other Elements and Other Projects

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Evaluated as excluded: No potential for effects/Neutral effects due to • No potential to positively *directly* impact Climate Change through increasing renewable energy production - the UWF Related Works will not themselves generate renewable electricity, though their purpose is to support the construction of the renewable generator, the consented Upperchurch Windfarm • Neutral impacts to Climate Change due to increases in GHG emissions as the volume of embodied emissions from construction materials and from excavated or hardstand areas and emissions from vehicles, machinery or equipment such as mobile generators, as the emissions have been calculated at substantially less than 1% of Ireland's 2020 national emission ceiling for CO2, • Neutral impacts to Climate Change due to forestry felling, as the loss of forested land results in the loss of an area capable of uptaking 6.5 tonnes of CO2/yr which is equivalent to substantially less than 1% of Ireland's 2020 national emission ceiling for CO2. • Neutral impacts to Climate Change due to increased GHG emissions during the operational stage, due to the infrequent nature and very small scale of any maintenance works required the increase in GHG emissions from maintenance vehicles can be considered negligible, • There will be a Neutral impact to Climate Change as a result of decommissioning activities due to the low volume of machinery and vehicles required.
Element 3: UWF Replacement Forestry	Evaluated as excluded: No potential for effects/Neutral effects due to • No potential to positively *directly* impact Climate Change through increasing renewable energy production - the UWF Replacement Forestry will not produce renewable electricity • Neutral impact to Climate Change as a result of the planting of trees, as the new native woodland will result in an area capable of uptaking 9.2 tonnes CO2/yr which would offset substantially less than 1% of Ireland's 2017 national GHG emissions and will have a Neutral impact on Climate Change.

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	• Neutral impact to Climate Change due to the use of vehicles or equipment during planting or maintenance works at the afforestation lands, as any GHG emissions from vehicles or equipment associated with the UWF Replacement Forestry will be of a very low magnitude due to the relatively small scale of the works and the avoidance of the use of large machinery during planting works.
Element 4: Upperchurch Windfarm (UWF)	**Included for the evaluation** of cumulative effects in relation to **Increasing Renewable Energy Production** Evaluated as excluded in relation to adverse effects from increases in GHG emissions and reductions in the carbon sink potential of the UWF lands due to: • Neutral impacts to Climate Change due to increases in GHG emissions as the volume of embodied emissions from construction materials and from excavated or hardstand areas and emissions from vehicles, machinery or equipment such as mobile generators, as the emissions have been calculated at substantially less than 1% of Ireland's 2020 national emission ceiling for CO2, • Neutral impacts to Climate Change due to forestry felling, as the loss of forested land results in the loss of an area capable of uptaking 95 tonnes of CO2/yr which is equivalent to substantially less than 1% of Ireland's 2020 national emission ceiling for CO2. • Neutral impacts to Climate Change due to increased GHG emissions during the operational stage, due to the infrequent nature and very small scale of any maintenance works required the increase in GHG emissions from maintenance vehicles can be considered negligible, • There will be a Neutral impact to Climate Change as a result of decommissioning activities due to the low volume of machinery and vehicles required.
Element 5: UWF Other Activities	Evaluated as excluded: No potential for effects/No measureable effects due to: • No potential to positively *directly* impact Climate Change through increasing renewable energy production - the UWF Other Activities will not produce renewable electricity • Neutral impact to Climate Change as a result of the planting of trees, as new hedgerows and trees will result in an area capable of uptaking 3.4 tonnes CO2/yr which would offset substantially less than 1% of Ireland's 2017 national GHG emissions and will have a Neutral impact on Climate Change. • Neutral impact to Climate Change due to the use of vehicles or equipment as activities will be very small scale, with minor volumes of equipment and machinery required.
Other Projects or Activities	
Operational Windfarms in the Republic of Ireland Potential future Bunkimalta Windfarm Consented future Castlewaller Windfarm	Yes, included for the evaluation of cumulative effects Please Note: Other Projects or Activities only relate to the cumulative evaluation of Other Elements of the Whole UWF Project (in particular Upperchurch Windfarm). There is no potential for cumulative effects with the UWF Grid Connection.

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Topic

13.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

13.2.2.3.1 Element 2: UWF Related Works

Not applicable – Element evaluated as excluded. See Section 13.2.2.2.1

13.2.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 13.2.2.2.1

13.2.2.3.3 Element 4: Already Consented Upperchurch Windfarm

Every unit (kWh) of electricity generated by clean renewable sources replaces a unit of electricity generated by fossil fuel sources and thereby offsets the pollution (expressed in CO_2e) that would be emitted by fossil fuel generation. Upperchurch Windfarm will generate electricity from the clean renewable wind resource, and replace generation from fossil fuel sources, as outlined in Table 13-7.

Table 13-6: Upperchurch Windfarm contribution to Climate Change mitigation

Value	Unit	Source
220,000,000 kWh	Kilowatt hours of electricity per annum which will be generated by Upperchurch Windfarm	Predicted production from the 22 Wind Turbines at Upperchurch Windfarm
52,381 houses	houses/per annum that will be supplied with electricity from Upperchurch Windfarm	Based on CRU Figures of 4,200 kilowatt hours of average use per annum per household in Ireland (August 2017). *Review of Typical Domestic Consumption Values for Electricity and Gas Customers (CER 17/003)*
40%	% of all Households in County Tipperary and County Limerick combined, that could be supplied with all of their electricity consumption from Upperchurch Windfarm	
CO_2e offsets: Upperchurch Windfarm will generate 220,000,000 kWh every year without emitting greenhouse gases (GHG) or ash pollution and this will avoid an equal amount of electricity being generated from gas, coal or oil, which do emit GHG. The gases in a GHG bundle (carbon dioxide, methane, nitrous oxide and ozone) are represented by the term CO_2e (Carbon Dioxide equivalent) when discussing offsets. The following section sets out the CO_2e that is emitted by cars and dairy cows and compares those emissions to the savings or offsets in CO_2e from Upperchurch Windfarm (CO_2e offsets) production. It also sets out the amount of forestry that would be required (forestry sequestration or CO_2e absorption) for the same CO_2e offsets contribution, as Upperchurch Windfarm.		
106,216 tonnes CO_2e offset	(Greenhouse Gases) CO_2e tonnes per annum that would otherwise be emitted if the 220,000,000 kWh to be generated by Upperchurch Windfarm, was instead generated by gas, coal and oil.	Based on the energy intensity of the Irish electricity generation mix *of 482.8g CO_2e/kWh (Source: Energy-related CO_2 Emissions in Ireland 2005-2016 (SEAI, 2018))*

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Value	Unit	Source
44,629 cars	Number of cars that would emit the equivalent amount of CO_2e (106,216 tonnes) per annum	Based on Irish Motor Industry June 2018 (2.38 tonnes/per annum CO_2e per car) and Cartell.ie March 2018 (average per car in Ireland 21,025 km/per annum)
2,079,345 cars	Number of cars in Ireland	CSO 2017
2.15%	% of the cars in Ireland that can be offset by Upperchurch Windfarm production	
5 tonnes	tonnes of CO_2e emitted per cow per annum	Average annual production from a cow (6,000 litre milk) on grass based diet in Ireland results in 5 tonnes of CO_2e emissions per annum. Teagasc (Environment Knowledge Transfer Department 2019)
21,243 cows	Number of cows that would emit the equivalent amount of CO_2e (34,037 tonnes) that can be offsets from Upperchurch Windfarm production	
164,245 cows	Dairy cows in Tipperary	Irish Cattle Breeding Federation numbers for 2017 *(https://www.icbf.com/wp/?p=10601)*
13%	% of the Tipperary dairy cow herd that can be offset by Upperchurch Windfarm production	
8,614 hectares forestry	Equivalent hectares of forestry that would be required if the same amount of CO_2 that Upperchurch Windfarm would avoid, was to be absorbed by growing forest (forestry sequestration)	COFORD estimate that Irish forests on average sequester 3.36 tonnes of carbon per hectare per annum. (Carbon Sequestration in Irish Forests (COFORD 2009). 1 tonne of Carbon = 3.67 tonnes of CO_2. Therefore 1 hectare of Irish forest sequesters 12.33 tonnes per annum of CO_2 The COFORD Council is a body appointed by the Minister for Agriculture, Food and the Marine to advise the Minister and his Department on issues related to the development of the forest sector in Ireland.

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Consideration of the Passage of Time: The passage of time was considered during a review of the sources of information. There have been changes in the baseline environment since 2013, these changes involve commitments made by Ireland to reduce greenhouse gas emissions, and also include the compliance and projected compliance with these targets out to 2050. In summary Ireland is not currently on track to achieve its emissions targets, and reductions in the use of fossil fuel are required in all sectors. These changes have been considered, where relevant, in the cumulative evaluations in this EIAR.

13.2.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 13.2.2.2.1

13.2.2.3.5 Other Projects or Activities

There are currently over 250 windfarms in the Republic of Ireland which have an installed capacity of 3,700MW[11]. Together, these windfarms have the ability to off-set approximately 4.38 million tonnes of CO_2 generated annually by fossil fuels (assuming a typical CO_2 emission factor of 482.8 gCO_2/kWh (2016 data)[12]) assuming an average capacity factor of 28%.

There is some possibility that the potential future Bunkimalta Windfarm and potential future Castlewaller Windfarm could be operational during the same period as UWF Grid Connection and Upperchurch Windfarm. Bunkimalta is a potential 34MW wind farm and Castlewaller Windfarm would be of similar size.

[11] IWEA (2019) Facts & Stats (https://www.iwea.com/about-wind/facts-stats)
[12] SEAI (2018) Energy Related Emissions In Ireland 2005 - 2016

13.2.3 PROJECT DESIGN MEASURES for Climate Change

There are no Project Design Environmental Protection Measures specific to Climate Change

13.2.4 EVALUATION OF IMPACTS to Climate Change

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Climate Change.

As a result of the exercise, some impacts were included and some were excluded.

Table 13-7: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Increase in Renewable Energy Production (operational stage)	*Increases in GHG emissions (construction stage)*
	Increases in GHG emissions (operational stage)
	Decommissioning Effects

The source-pathway-receptor links for the impact included are described in the Impact Evaluation Table in the next section – Section 13.2.4.1.

The impacts which were excluded are evaluated in Section 13.2.4.2.

13.2.4.1 Impact Evaluation Table: Increase in Renewable Energy Production

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: None for UWF Grid Connection
Cumulative Impact Source: Renewable energy production by Upperchurch Windfarm
Impact Pathway: Air/National and European Policy

Impact Description: UWF Grid Connection does not have the potential to directly impact Climate Change through increasing renewable energy production - the UWF Grid Connection itself will not generate renewable electricity, however its purpose is to transport renewable electricity from the consented Upperchurch Windfarm to the National Grid. **This impact is evaluated at the end of this table as the whole project impact**.

Impact Quality: Positive

Evaluation of the Subject Development Impact – Excavation & Relocation of soils, subsoil and bedrock

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude: No direct impact. The indirect impact of UWF Grid Connection – i.e. facilitating the development of Upperchurch Windfarm is examined as the 'whole project' impact below.

Significance of the Impact: No Direct Impact

Rationale for Impact Evaluation:

- The UWF Grid Connection itself will not generate renewable electricity and therefore will not positively contribute in itself to Climate Change mitigation.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: No direct impact. The indirect impact of UWF Grid Connection – i.e. facilitating the development of Upperchurch Windfarm is examined as the 'whole project' impact below.

Significance of the Cumulative Impact: No Cumulative Impact

Rationale for Cumulative Impact Evaluation:

- The UWF Grid Connection itself will not generate renewable electricity and therefore will not positively contribute in itself, or cumulatively, to Climate Change mitigation.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works – *N/A, evaluated as excluded, see Section 13.2.2.2.1*

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 13.2.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude:
The 22 No. turbines of the consented Upperchurch Windfarm will avoid the emission of 106,216 tonnes of greenhouse gases per annum which would have resulted from generating the same amount of electricity by fossil fuel plant. 220 million kWh is enough to supply 52,381 houses (equivalent to 40% of the houses in County Tipperary and County Limerick combined) with green, emission free electricity.

Significance of the Impact: **Significant (positive)**

Climate Change

Sensitive Aspect

Rationale for Impact Evaluation:

- The increased availability of renewable electricity sources will reduce GHG emissions from fossil fuel burning for energy production every year for the lifetime of the Upperchurch Windfarm.
- Climate change is considered to have a **Very High Sensitivity** due to the national and international regulations and targets, and a **Very High value for biodiversity and human wellbeing**.
- The renewable energy produced by Upperchurch Windfarm is considered to be Low Magnitude in the context of the total amount of energy required in the Irish State.
- The impact of Upperchurch Windfarm will therefore be a **positive and significant Impact** due to the Very High sensitivity of Climate Change, combined with a Low Magnitude of impact (calculated using the IMPERIA methodology outlined in Section 13.1.8).
- Upperchurch Windfarm will support Ireland's renewable energy target of 40% electricity production from renewables by 2020, and 70% by 2030.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 13.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Operational Windfarms in the Republic of Ireland and the potential future Castlewaller Windfarm and potential future Bunkimalta Windfarm

Impact Magnitude: According to the Irish Wind Energy Association there are currently over 250 wind farms in the Republic of Ireland, with a total generating capacity of 3,700MW[13]. According to the SEAI Energy in Ireland Report (2018)[14], the average generating capacity factor of Irish windfarms was 28% in 2017. Based on this capacity factor, and the total generating capacity of 3,700MW, windfarm in Ireland avoid the emission of 4.38 million tonnes of CO_2 eq or 7.2% of Ireland's 2017 total national emissions.

There is some possibility that potential future Bunkimalta Windfarm and potential future Castlewaller Windfarm could be operational during the same period as UWF Grid Connection and Upperchurch Windfarm. Together these two windfarm could produce enough electricity for c.32% of the houses in County Tipperary and County Limerick combined, and would avoid the emission of c.90,000 tonnes of greenhouse gasses per annum.

Significance of the Impact: **Significant (positive)**

Rationale for Impact Evaluation:

- The increased availability of renewable electricity sources will reduce GHG emissions from fossil fuel burning for energy production every year for the lifetime of the Upperchurch Windfarm.
- Climate Change is considered to have a **Very High Sensitivity** due to the national and international regulations and targets, and a **Very High value for biodiversity and human wellbeing**.
- Ireland is more likely to meet its renewable energy target of 40% electricity production from renewables by 2020, and 70% by 2030.

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Evaluation of Other Cumulative Impacts – Increase in Renewable Energy Production

Whole UWF Project Effect

Magnitude: While UWF Grid Connection, UWF Related Works, UWF Replacement Forestry and UWF Other Activities will not individually produce renewable electricity, they will facilitate the construction and/or operation of the Upperchurch Windfarm, and therefore will indirectly cause positive effects to Climate

[13] https://www.iwea.com/about-wind/facts-stats, accessed 14th June 2019

[14] https://www.seai.ie/resources/publications/Energy-in-Ireland-2018.pdf

Change.

The 22 No. turbines of the **consented Upperchurch Windfarm will generate approximately 220 million kilowatt hours of renewable energy per annum** which will **avoid the emission of 106,216 tonnes of greenhouse gases per annum** which would have resulted from generating the same amount of electricity by fossil fuel plant. 220 million kWh is enough to supply **52,381 houses** (equivalent to 40% of the houses in County Tipperary and County Limerick) with green, emission free electricity.

The inclusion of the Upperchurch Windfarm project will increase Ireland's overall emissions saving to 4.5 million tonnes of CO_2 eq, or 7.5% of Ireland's 2017 total national emissions.

Significance of the Whole Project Effect: Significant (positive)

Rationale for Impact Evaluation:

- The increased availability of renewable electricity sources will reduce GHG emissions from fossil fuel burning for energy production every year for the lifetime of the Upperchurch Windfarm.
- Climate Change is considered to have a **Very High Sensitivity** due to the national and international regulations and targets, and a **Very High societal value for human wellbeing**.
- The renewable energy produced by Upperchurch Windfarm is considered to be Low Magnitude in the context of the total amount of energy required in the Irish State.
- The impact will be **positive and significant** due to the Very High sensitivity of Climate Change, combined with a Low Magnitude of impact (calculated using the IMPERIA methodology outlined in Section 13.1.8).
- Upperchurch Windfarm and the proposed facilitating UWF Grid Connection, and facilitating Other Elements will support Ireland's renewable energy target of 40% electricity production from renewables by 2020, and 70% by 2030.

All Elements of the Whole UWF Project with Other Projects or Activities

Cumulative Impact Magnitude: The operational windfarms in Ireland, together with the Upperchurch Windfarm, and potential future Bunkimalta Windfarm and Castlewaller Windfarm can constribute overall emissions saving to 4.6 million tonnes of CO_2 eq per annum.

Significance of the Cumulative Impact: Significant (positive)

Rationale for Cumulative Impact Evaluation:

- The increased availability of renewable electricity sources will reduce GHG emissions from fossil fuel burning for energy production every year for the lifetime of the Upperchurch Windfarm.
- Climate Change is considered to have a **Very High Sensitivity** due to the national and international regulations and targets, and a **Very High societal value for human wellbeing**.
- Windfarms support Ireland's renewable energy target of 40% electricity production from renewables by 2020, and 70% by 2030.

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Sensitive Aspect
Climate
Topic

13.2.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 13-9 below.

Table 13-8: Description and Rationale for Excluded Impacts to Climate Change

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Trench and Foundation excavations, use of machinery and vehicles	1 *(all Other Elements have been excluded)*	Air, policy	Increases in GHG emissions	Rationale for Excluding: Neutral impact, The volume of embodied emissions from UWF Grid Connection construction materials and from excavated or hardstand areas and emissions from vehicles, machinery or equipment such as mobile generators, (either for UWF Grid Connection alone or cumulatively) will be substantially less than 1% of Ireland's 2020 national emission ceiling for CO_2.
Operational/Growth Stage				
Use of vehicles, machinery	1	Air, policy	Increased GHG emissions	Rationale for Excluding: Neutral impact, Due to the infrequent nature and very small scale of any potential maintenance/repair works required for UWF Grid Connection the increase in GHG emissions from maintenance vehicles can be considered negligible.
Decommissioning Stage				
Rationale for Excluding: No potential for impacts: UWF Grid Connection will remain part of the National Grid, therefore no impacts can occur.				

13.2.5 Mitigation Measures for Impacts to Climate Change

Mitigation measures are not relevant as **UWF Grid Connection will not cause adverse impacts** to Climate Change. UWF Grid Connection will support the development of Upperchurch Windfarm, and therefore will cause an indirect **significant positive impact on Climate Change**.

13.2.6 Evaluation of Residual Impacts to Climate Change

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. Mitigation measures are not relevant and thus the Residual Impact is the same as the Impact set out in the Evaluation of UWF Grid Connection (Section 13.2.4), i.e. **indirect Significant Positive impact.**

13.2.7 Application of Best Practice and the EMP for Climate Change

The UWF Grid Connection Environmental Management Plan also includes Best Practice Measures (BPM), which although not part of the Project Design for the UWF Grid Connection, will be employed to afford further protection to the Environment.

The following Best Practice Measure has been developed, for the protection of **Climate Change,** by the authors of this topic chapter, using industry best practice. The production of the Upperchurch Windfarm element will be recorded during the operational stage to monitor the actual levels of production against the levels in this EIA Report:

GC-BPM-11	Measuring Operational Electricity Production

This Best Practice Measure forms part of the UWF Grid Connection Environmental Management Plan, which is appended to this EIA Report as Volume D.

13.2.8 Summary of Impacts to Climate Change

A summary of the Impact to Climate Change is presented in Table 13-10.

Table 13-9: Summary of the impacts to Climate Change

Impact to Climate Change:	**Increase in Renewable Energy Production**
Evaluation Impact Table	*Section 13.2.4.1*
Project Life-Cycle Stage	Operational Stage
UWF Grid Connection *(direct/indirect impact)*	**No Direct Impact** *(indirect impact is the whole project impact)*
UWF Grid Connection *(cumulative Impact)*	**No Cumulative Impact**
Element 2: UWF Related Works	No Direct Impact
Element 3: UWF Replacement Forestry	No Direct Impact
Element 4: Upperchurch Windfarm	**Significant (positive)**
Element 5: UWF Other Activities	No Direct Impact
Cumulative Impact: *(for Other Elements only)*	
Whole UWF Project Effect *(due to Upperchurch Windfarm)*	**Significant (positive)**
All Other Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities: Operational Windfarms in the Republic of Ireland potential future Bunkimalta Windfarm potential future Castlewaller Windfarm	**Significant (positive)**

13.3 Reference List

EU Effort Sharing Decision (Decision No 406/2009/EC) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009D0406&from=EN Last Accessed: October 2019

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National Climate Policy Position (Government of Ireland 01/01/2013) https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/National-Policy-Position.aspx

Government of Ireland's Climate Action Plan 2019 https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf Last Accessed: October 2019

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UWF Grid Connection EIA Report (2019)

Volume C2: EIAR Main Report

Chapter 14: Material Assets (Built Services)

October 2019

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Figure WP 14.2	Whole Project Study Area for Local Residents & Community (Built Services)
Figure GC 14.3	UWF Grid Connection Study Area for Electricity Transmission System
Figure CE 14.3	UWF Grid Connection Cumulative Evaluation Study Area for Electricity Transmission System
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Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

List of Appendices

Appendix No.	Appendix Title
There are no appendices associated with this topic chapter.	

Appendices referenced in this topic chapter can be found in **Volume C4 EIAR Appendices.**

Glossary of Terms

Term	Definition
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.
Project Design Measure	Measures for environmental protection, incorporated into the design of the project.

List of Abbreviations

Abbreviation	Full Term
PD	Ecopower Project Design Environmental Protection Measure developed by members of the EIAR Team
AMM	Ecopower Additional Mitigation Measure developed by members of the EIAR Team
Electrical grid	An interconnected network for delivering electricity from producers (generators such as windfarms) to consumers (industrial, business and residential electricity users).
LV	Low Voltage
MV	Medium Voltage – i.e. 10kV – 20kV (10,000 -20,000 Volts)
HV	High voltage – i.e. 38kV, 110kV and 220kV (38,000, 110,000 volts and 220,000 volts re-spectively)
UGC	Underground Cables
UWF	Upperchurch Windfarm

Topic **Material Assets (Built Services)**

Executive Summary of the Material Assets (Built Services) Chapter

Baseline Environment: The Built Services in the area are mainly made up of underground water supply pipes, and overhead telephone and medium to high voltage electricity lines.

UWF Grid Connection will involve the connection of a new substation onto the Killonan – Nenagh 110kV overhead line (OHL) which originates in the Killonan 220kV Station and ends in the Nenagh 110kV Substation. The Killonan Station is the main bulk supply point for the Mid-West region using numerous regional networks at all voltages (110kV, 38kV and 20kV). One of these regional networks is the Killonan to Nenagh 110kV OHL.

Survey Results for Local Built Services in the Baseline Environment: A GPS survey of all existing Irish Water/Eir/ESBN Networks services within 20m of UWF Grid Connection works areas was conducted. Driven surveys of the 110kV UGC route were carried out with Irish Water Newport Regional Water Supply and Kilcommon supply Area Managers. There are Irish Water mains under all of the Regional Road 110kV route and also along the Local Roads between Irish Water wells in Carrowkeale townland and the Newport Regional Water Treatment plant in New Ross townland (L6009-0 and L2157-0). Project Design Measure PD09 to ensure protection of Irish Water assets, was developed as a result of these meetings.

Summary of the likely Impact on Local Residents & Community - Water Supply: During excavation works for cables trenches and joint bays for the 110kV UGC, existing water pipes under the road could be damaged and supply interrupted. The likely impact is evaluated as **Neutral** due to the implementation of project design environmental protection measures such as confirmatory consultations with Irish Water, Eir and ESB; review of all relevant infrastructure mapping before works; confirmatory ground surveys at service locations to be carried out ahead of works; excavations will be hand dug within 500mm of pipes; a banksman will accompany each excavator to oversee all excavation works and close contact with the local Newport Regional Supply office at Newross will be maintained by the Environmental Clerk of Works throughout the construction of the 110kV UGC. **Likely Cumulative effects will also be Neutral** due to project design measures including timing of works so that they don't coincide with Other Elements of the Whole UWF Project in the Knockmaroe/ Knockcurraghbola Crownlands area.

Summary of the Likely Impact on the Transmission System: it was evaluated that any interruptions to power supplies will be Neutral, with no potential for cumulative impacts due to the planning of supply outages on the system. While the addition of a control point on the existing Killonan – Nenagh Overhead Line will be a positive impact, it is in the context of the large extent of the national transmission system network. Other Projects (such as the consented Castlewaller Windfarm or potential Bunkimalta Windfarm) will not cause cumulative impacts as these projects are not expected to involve the construction of new substation assets on this OHL.

Conclusion: The UWF Grid Connection will not cause significant adverse effects to Material Assets (Built Services).

Topic **Material Assets (Built Services)**

14 Environmental Factor: Material Assets (Built Services)

14.1 Introduction to the Material Assets (Built Services) Chapter

14.1.1 What is Material Assets (Built Services)?

Built Services relate to the pipes, overhead lines, underground cables and wireless signals which supply drinking water, electricity, telephone and broadband services to houses, businesses and community facilities.

Water supply relates to the network of water mains and pipes which are part of the public Irish Water network. Pipes and mains related to private water supply (in the form of group schemes) are also considered, however the sources of water supply (i.e. wells, springs etc) are evaluated in Chapter 11: Water.

Electricity supply relates to both the local Low Voltage (LV), Medium Voltage (MV) such as the 20kV networks which supply local houses and businesses; and high voltage 38kV, 110kV and 220kV lines which form part of the electricity system.

Communications supply relates to the overhead lines and underground telecommunication cables, which form part of the Eir network. Communications supply also relates to privately owned telecommunication masts and associated wireless signals.

14.1.2 Overview of Built Services in the Local Environment

The Built Services in the area are mainly made up of overhead telephone and electricity lines, and underground water supply pipes.

The overhead telephone lines which are located along roadside boundaries, and overhead electricity lines are generally located in fields close to the local roads, both of these services are connected to local residences and well as community facilities and local businesses. Local electricity supply in the upland area is fed from a number of 38kV substations, including at Birdhill, Silvermines and Cappamore. Other above-ground built services include a telecommunications mast, known as the Foilnaman Mast, at Knockmaroe, along with other small masts in the wider area. There is a small Eir exchange building in Rear Cross village.

There are two high voltage lines near Newport, in the Mountphilips/Coole area - a 110kV overhead line and a 220kV overhead line, which are both connected to the Killonan Station, near Limerick City. The 220kV OHL is routed through the Mountphilips Substation site, and the Mountphilips Substation will be looped onto the 110kV OHL via the new End Masts.

There is one water treatment plant owned and operated by Irish Water in the area – the Newport Regional Water Supply, which supplies the towns of Newport and Ballina and the village of Birdhill. These water supplies are via underground water mains, which are located in and along public roads. Some of the water pipes in the Carrowkeale/Castlewaller area connect one of the sources of the Newport Regional Water Supply to the Irish Water treatment plant in Newross. There is also an Irish Water reservoir in Knocknabansha which supplies the villages of Kilcommon and Rear Cross.

The Newport Regional Water Supply sources comprise surface water abstractions and groundwater wells, sources include surface water abstractions from the Newport River upstream of Rockvale Bridge, close to the water treatment plant, and a small group (3 no.) of groundwater borehole wells in the townland of Castlewaller, ~0.7km to south of the Newport RWS plant. The water from the wells in Castlewaller is piped

to the Newport Regional Water Supply via mains placed in the public road, including pipes affixed to the outside of parapet walls at existing bridge crossings over 110kV UGC watercourse crossing points W8 and W9.

The location of the UWF Grid Connection is illustrated on OSI Mapping on Figure GC 14.1: Location of the UWF Grid Connection, which can be found in **Volume C3 EIAR Figures.**

14.1.3 Sensitive Aspects of the Material Assets (Built Services) Environment included for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspects **are included in this topic chapter** as they could be potentially impacted:

Sensitive Aspect No. 1	Local Residents & Community	Section 14.2
Sensitive Aspect No. 2	Electricity Transmission System	Section 14.3

Each of the above listed Sensitive Aspects are evaluated individually in Sections 14.2 to 14.3 of this Chapter.

To help readers navigate to individual sensitive aspect sections, the colour codes for each Sensitive Aspect used above are also used in the Sensitive Aspect sections Section 14.2 to 14.3. The colour-codes have been applied to section headings, tables and on side-tabs on the edge of the pages.

14.1.4 Sensitive Aspects excluded from further evaluation

The following Sensitive Aspects **are excluded from this topic chapter**:

Built Services Infrastructure & the Owners & Operators of Built Services Infrastructure *(Owners/Operators of Public Water Mains and Pipes, Electricity Lines, Telephone Lines and Communication Cables, Telecommunication Masts, Gas Mains and Pipes, Waste Water pipes and treatment plants, private water supply pipes)*	Evaluated as excluded, no likely effects/ Neutral effects No likely impact during construction works due to the implementation of project design measures, including confirmatory surveys, consultation with the service owners and operators, and the use of goal posts and supervision. Notwithstanding the above, Neutral impact (worst case impact) due to the very small extent (62 km of underground water pipes, 73km of overhead electricity lines, 58km of overhead telephone line, 3km of underground electricity cables and 3km of underground communication cables) which could be affected by the UWF Grid Connection in the context of the size of the networks nationally. Each service equates to less than 0.1% of the owner/operators national networks – 63,000km of water mains, 150,000km of electricity lines[1], and overhead telephone lines and underground Eir communication cables supplying c.2 million customers in Ireland[2].
Newport Regional Water Supply	Evaluated as excluded: no likely effects/Neutral Effects There is one water treatment plant owned and operated by Irish Water in the area – the Newport Regional Water Supply, which supplies the towns of Newport and Ballina and the village of Birdhill. There is a groundwater source for the Newport RWS comprising borehole wells in the townland of Castlewaller. The water from the wells in Castlewaller is piped to the New-port Regional Water Supply via mains placed in the public road, including

[1] https://www.esbnetworks.ie/who-we-are/our-networks
[2] https://www.eir.ie/pressroom/

	pipes affixed to the outside of parapet walls at existing bridge crossings over 110kV UGC watercourse crossing points W8 and W9. Damage to these supply mains are not likely to occur with the implementation of Project Design Measures (see Section 14.2.3) and the design of the watercourse crossing works at W8 and W9 which will involve directional drilling under the watercourse rather than works over the bridge structures. In the unlikely event of damage to these mains, effects will have no practical implication on the regional supply due to the alternative sources available (abstraction from the Newport River) and the brief duration of any loss of supply due to the stocking of repair materials at works locations and the ongoing communication with the regional supply office during works.
Shannonbridge – Killonan 220kV Overhead Line	Evaluated as excluded, no likely effects Both the 110kV UGC and new access road to Mountphilips Substation pass under the 220kV overhead lines, which will result in construction works being carried out, and construction traffic passing, under the lines. It is evaluated that there is no likelihood of these lines being damaged during construction works – due to the implementation of UWF Grid Connection project design measures, including confirmatory surveys, consultation with EirGrid, the use of goal posts and supervision of the works. Additionally, the Code of Practice for Avoiding Danger from Overhead Electricity Lines 2019 will be implemented as part of standard construction practices for the project.

14.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of a current application to An Bord Pleanála. The main parts of the UWF Grid Connection are identified in Table 14-1 below.

Table 14-1: Subject Development – UWF Grid Connection

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Ancillary Works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 EIAR Main Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

14.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.

- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. ***Note***: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

14.1.6 The Authors of the Material Assets (Built Services) Chapter

This report on the Environmental Factor Material Assets - Built Services, was written by a number of authors.

The Water supply sections have been written by David Tarrant and Daithí Barrett both with project experience relating to the proposed type of works. David Tarrant is a Chartered Engineer with TLI Group with over 12 years' experience in the Irish construction sector and currently a lead civil design engineer with TLI Group. Daithí Barrett is a Lead Environmental Scientist within TLI Group and has over 6 years' experience dealing specifically with environmental issues relating to the utility sector. TLI Group is a utility infrastructure consultancy and construction company, operating extensively within the utilities sector both in Ireland and internationally.

The Water supply sections have been reviewed by David Broderick (BSc, H. Dip Env Eng, MSc): Hydrogeologist and Michael Gill (B.A., B.A.I., M.Sc., Dip. Geol, MIEI): Environmental Engineer of Hydro-Environmental Services (HES). HES specialise in surface water and groundwater management including water supply development and protection.

The Electricity supply and Transmission System sections have been written by Ruairí Geary, Chartered Engineer, who is a design team leader within TLI Group. Ruairí has over 10 years' experience in a wide range of Electrical/Mechanical engineering projects, specialising in the area of distribution and transmission network design, and in particular working on the ESBN/Eirgrid systems.

The Communications supply sections have been written by Kevin Hayes (Masters in Electronic Engineering and a Software Design Engineer) of Ai Bridges. Kevin has in excess of 15 years of experience in telecommunications network design, analysis and troubleshooting of radio frequency issues and development of telecommunication projects. Services provided by Ai Bridges include; Electromagnet Interference (EMI) Impact studies, TV interference Remediation, Aviation & Radar Studies, Hot Zone Studies and also expert witness reporting for planning and post-planning application requirements.

14.1.7 Sources of Baseline Information

The information sources outlined in Table 14-2 were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 14-2: Sources of Baseline Information for Material Assets (Built Services)

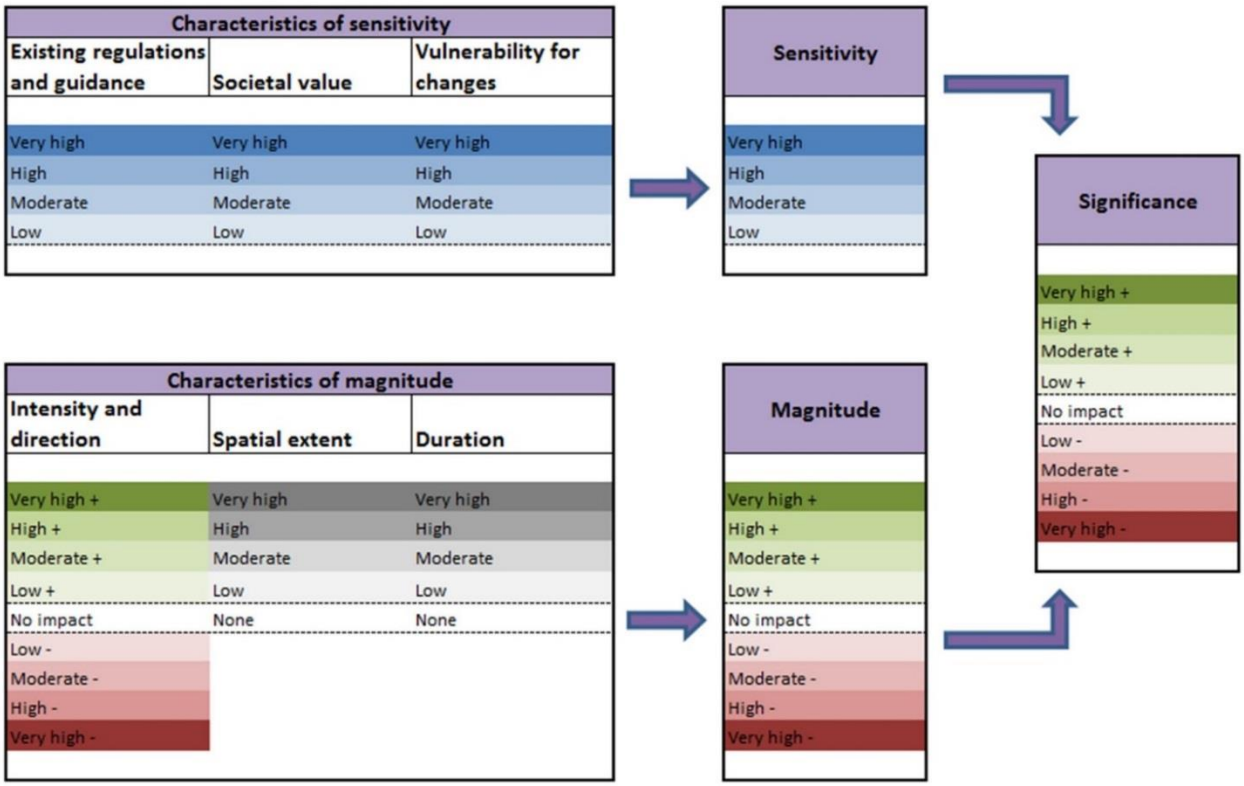
Type	Source
Consultation	Feedback was received from: • Infrastructure owners; ESB Networks, EirGrid, Eir, Irish Water, Airspeed, Three Ireland, and Gas Networks Ireland, • House calls to a number of local residents and local landowners regarding water supply • National Federation of Group Water Schemes • Irish Water Area Managers – Newport Area, Kilcommon Area See Chapter 3: The Scoping Consultations, Chapter 3 Appendices for further details.
Guidelines	• Irish Water (2016): Connections and Developer Services – Code of Practice for Water Supply Infrastructure (A Design and Construction Guide for Developers); and, • Health and Safety Authority (2016): Code of Practice for Avoiding Danger from Underground Services, • Health and Safety Authority (2019): Code of Practice for Avoiding Danger from Overhead Electricity Lines.
Desktop	• Review of Irish Water Services Mapping • Review of Eir Mapping • Review of ESBN Existing Asset Database • Review of Eirgrid 110kV Functional Specifications • Review of ESB Networks Functional Specifications • Review of Gas Networks Ireland Mapping • Review of ComReg Quarterly Key Data Report Q1 2017 • Modelling of microwave radio link paths to/from Foilnaman Telecommunications Mast • Review of Chapter 11: Water • Review of the existing EIS and planning documents for the Other Elements of the Whole UWF Project (i.e. the consented Upperchurch Windfarm, consented UWF Replacement Forestry, proposed UWF Related Works (currently under appeal to An Bord Pleanála)), contained in Volume F.
Fieldwork	• Survey of all construction works areas for UWF Grid Connection • GPS survey of all existing Irish Water/Eir/ESBN networks within 20m of UWF Grid Connection works areas • Route Survey with Matthew O'Leary Newport Area Manager Irish Water and Donal Ryan Kilcommon Area Manager Irish Water in August 2019.

14.1.8 Methodology used to Describe the Baseline Environment and to Evaluate Impacts

There are no specific guidelines on the evaluation of effects to Material Assets for an EIA Report. In this chapter, the methodology for evaluating impacts to the Material Asset – Built Services, uses a standard methodology – the IMPERIA methodology. The IMPERIA methodology is described in Section 14.1.8.1 below.

14.1.8.1 Overview of the IMPERIA Methodology

In the framework developed under the EC LIFE project - IMPERIA, the evaluation of impact significance uses a replicable, multi-criteria decision analysis, where the sensitivity of the receptor (i.e. the sensitivity of a Sensitive Aspect of the environment) and the magnitude of the change caused by a project are rated using sub-criteria or scales, and then the overall significance is evaluated using a matrix.



The criteria for determining the overall sensitivity of a receptor and magnitude of the change (impact) to the receptor, is provided in the tables below. The matrix for determining the significance of the impact to the receptor is provided after these tables.

14.1.8.1.1 Criteria for Evaluating the Sensitivity of a Receptor

Sensitivity of the receptor is a description of the characteristics of the receptor or aspect of the environment which will be affected by the development. It is a measure of 1) existing regulations and guidance, 2) societal value and 3) vulnerability for the change. The sensitivity of a receptor is estimated in its current state prior to any change implied by the project.

Existing regulations and guidance describes whether there are any such objects in the impact area, which have some level of protection by law or other regulations (e.g. prohibition against polluting groundwater and Natura areas), or whose conservation value is increased by programs or recommendations (e.g. landscapes designated as nationally valuable).

Societal value describes the value of the receptor to the society and depending on the type of impact may be related to economic values (e.g. water supply), social values (e.g. landscape or recreation) or

environmental values (e.g. natural habitat). Societal value measures general appreciation from the point of view of the society. When relevant, the number of people impacted is taken into account.

Vulnerability for the change describes how liable the receptor is to be influenced or harmed by changes to its environment.

Sensitivity	Criteria Existing regulations/guidance	Criteria Societal value	Criteria Vulnerability to change
Low	Few or no recommendations which add to the conservation value of the impact area, and no regulations restricting use of the area (e.g. zoning plans).	The receptor is of small value or uniqueness. The number of people impacted is small.	Even a large external change would not have substantial impact on the status of the receptor. There are only few or none vulnerable receptors in the area.
Moderate	Regulation sets recommendations or reference values for an object in the impact area, or the project may impact an area conserved by a national or an international program.	The receptor is valuable and locally significant but not very unique. The number of people impacted is moderate.	At least moderate changes are needed to substantially change the status of the receptor. There are some vulnerable receptors in the area.
High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is unique and valuable to society. It may be deemed nationally significant and valuable. The number of people impacted is large.	Even a small external change could substantially change the status of the receptor. There are many vulnerable receptors in the area.
Very High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is highly unique, very valuable to society and possibly irreplaceable. It may be deemed internationally significant and valuable. The number of people affected is very large.	Even a very small external change could substantially change the status of the receptor. There are very many vulnerable receptors in the area.

The **overall sensitivity of a receptor** is assessed by the competent expert on the basis on his/her assessment of the components of sensitivity. A general guide for deriving the overall sensitivity is to pick the maximum of existing regulations and guidance and societal value and then adjust that value depending on the level of vulnerability.

Determining the Overall Sensitivity of a Receptor	
Low	The receptor has minor social value, low vulnerability for the change and no existing regulations and guidance. Even a receptor which has major or moderate social value may have low sensitivity if it's not liable to be influenced by the development.
Moderate	The receptor has moderate value to society, its vulnerability for the change is moderate, regulation may set reference values or recommendations, and it may be in a conservation program. Even a receptor which has major social value may have moderate sensitivity if it has low vulnerability, and vice versa.
High	Legislation strictly conserves the receptor, or it is very valuable to society, or very liable to be harmed by the development.
Very High	Legislation strictly conserves the receptor, or it is irreplaceable to society, or extremely liable to be harmed by the development. Even minor influence by the proposed development is likely to make the development unfeasible.

14.1.8.1.2 Criteria for Evaluating the Magnitude of an Impact

Magnitude of the impact describes the characteristics of the changes or effects that the planned project is likely to cause. Magnitude is a combination of 1) intensity and direction, 2) spatial extent, and 3) duration. Assessment of magnitude evaluates the likely changes affecting the receptor *without* taking into account the receptors sensitivity to those changes.

Intensity describes the physical dimension of a development. The direction of the change/effect is either positive (green) or negative (red).

Magnitude	Criteria – Intensity & Direction
Very High	The proposal has an extremely beneficial effect on nature or environmental load. A social change benefits substantially people's daily lives.
High	The proposal has a large beneficial effect on nature or environmental load. A social change clearly benefits people's daily lives.
Moderate	The proposal has a clearly observable positive effect on nature or environmental load. A social change has an observable effect on people's daily lives.
Low	An effect is **positive** and observable, but the change to environmental conditions or on people is small.
No impact	An effect so small that it has no practical implication. Any benefit or harm is negligible.
Low	An effect is **negative** and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has a clearly observable negative effect on nature or environmental load. A social change has an observable effect on people's daily lives and may impact daily routines.
High	The proposal has a large detrimental effect on nature or environmental load. A social change clearly hinders people's daily lives.
Very High	The proposal has an extremely harmful effect on nature or environmental load. A social change substantially hinders people's daily lives.

Spatial extent describes the geographical reach of, or the range within which, an effect is observable.

Duration describes the length of time during which an impact is observable and it also takes other related issues such as timing and periodicity into account. These are relevant for impacts which aren't observable all the time such as periodic impacts.

Magnitude	Criteria Spatial Extent	Criteria Duration
Low	Impact extends only to the immediate vicinity of a source. Typical range is < 1 km.	An impact whose duration is at most one year, for instance during construction and not operation. A moderate-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
Moderate	Impact extends over one municipality. Typical range is 1-10 km.	An impact lasts from one to a number of years. A long-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
High	Impact extends over one region. Typical range is 10-100 km.	An impact lasts several years. The impact area will recover after the project is decommissioned.
Very High	Impact extends over several regions and may cross national borders. Typical range is > 100 km.	An impact is permanent. The impact area won't recover even after the project is decommissioned.

Deriving the overall magnitude of the change from components of magnitude

Magnitude of the change is a comprehensive synthesis of its component factors. In a case, where intensity, spatial case and duration all get the same value, the magnitude would also be given this value. In other cases, intensity should be taken as a starting point, and the assessment should be adjusted based on spatial extent and duration to obtain an overall estimate. The aim is that the overall assessment should capture the characteristics of an effect. The table below describes some example descriptions of different categories for the magnitude of the change.

Determining the Overall Magnitude of the Change/Effect	
Very High	The proposal has beneficial effects of very high intensity and the extent and the duration of the effects are at least high.
High	The proposal has beneficial effects of high intensity and the extent and the duration of the effects are high.
Moderate	The proposal has clearly observable positive effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
Low	An effect is positive and observable, but the change to environmental conditions or on people is small.
No impact	No change is noticeable in practice. Any benefit or harm is negligible.
Low	An effect is negative and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has clearly observable negative effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
High	The proposal has harmful effects of high intensity and the extent and the duration of the effects are high.
Very High	The proposal has harmful effects of very high intensity and the extent and the duration of the effects are at least high.

14.1.8.2 Assessing the significance of an impact

The **assessment of the overall significance uses the matrix below,** where positive impacts are in green and negative in red. The matrix is based on the **magnitude of the change** affecting a receptor and on the **sensitivity of the receptor** to those changes.

The values obtained from the table are indicative because the most relevant dimensions for characterising an impact are dependent on the type of impact. Thus, some discretion from the expert is required, in particular in cases, where the one component is low and the other one high or very high.

Determining the Overall Significance of an Impact

Impact Significance		Magnitude of change								
		Very High	**High**	**Moderate**	**Low**	**No Change**	**Low**	**Moderate**	**High**	**Very High**
Receptor Sensitivity	**Low**	Significant*	Moderate*	Slight	Imperceptible	Neutral	Imperceptible	Slight	Moderate*	Significant*
	Moderate	Significant	Significant	Moderate	Slight	Neutral	Slight	Moderate	Significant	Significant
	High	Profound	Significant	Significant	Moderate*	Neutral	Moderate*	Significant	Significant	Profound
	Very High	Profound	Profound	Significant	Significant*	Neutral	Significant*	Significant	Profound	Profound

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

Note on Terms used in 'Determining the Overall Significance of an Impact' Table: *The Significance rating ascribed in the Table above have been refined from the ARVI tool, to provide a more nuanced understanding of the significance and also to be compatible with the terms used throughout this EIA Report, which have been informed by the EPA Guidelines on Information to be contained in EIAR (2017) for description of effects.*

In the above Table - Low has been refined as Slight or Imperceptible depending on context; High has been renamed as Significant; Very High has been renamed as Profound; No Impact is understood to also mean Neutral effect, which is defined in the EPA Guidelines as 'no effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error'.

14.1.9 Certainty and Sufficiency of the Evaluation/Information

The information which informed the baseline descriptions and impact evaluations was collated from data and maps (mapped water mains, overhead lines and underground etc) which were obtained through consultation with the service owners, i.e. Eir, ESBN, Irish Water etc. In all cases the most recent data and publications are relied upon. The location of services identified on the Eir, ESBN and Irish Water mapping were confirmed through surveys of the entire 110kV UGC route along the public road network.

In respect of Built Services, no significant limitations or difficulties were encountered.

14.2 Sensitive Aspect No.1: Local Residents & Community

This Section provides a description and evaluation of the Sensitive Aspect - Local Residents & Community.

Local Residents & Community relates to the local residences, businesses and community facilities that are connected to Built Services.

14.2.1 BASELINE CHARACTERISTICS of Local Residents & Community

14.2.1.1 STUDY AREA for Local Residents & Community

The study area for Local Residents & Community in relation to the UWF Grid Connection is described in Table 14-3 and illustrated on Figure GC 14.2: UWF Grid Connection Study Area for Local Residents & Community (Built Services) (Volume C3 EIAR Figures).

Table 14-3: UWF Grid Connection Study Area for Local Residents & Community

Study Area for Local Residents & Community	Justification for the Study Area Extents
Local residences, businesses and community facilities connected to: - underground pipes or cables within the UWF Grid Connection construction works area boundary, - overhead lines within 7m of the UWF Grid Connection construction works area boundary to allow for machinery movement. The extent of the study area is from the fault point to the nearest valve/transformer/cabinet.	Effects are limited to direct physical damage to the lines, pipes or cables during construction works. The extent of the study area is limited to those local residents/businesses/facilities using Irish Water/Eir/ESB services who could be affected by an outage and whose service cannot be re-directed through another part of the Irish Water/Eir/ESB networks.

14.2.1.2 Baseline Context and Character of Local Residents & Community in the UWF Grid Connection Study Area

The majority of Built Service users in the UWF Grid Connection Study Area comprise local residences. The number of businesses in the locality is few, and while most people commute to work, there may be a small number of people who use their house to work from home or as a home-office. Farming is an important enterprise in the study area, with farmsteads and farmyards scattered throughout the locale. There are also community facilities in the area, particularly in Newport town and Rear Cross village and along the regional R503 road.

During consultations with Irish Water, ESBN and Eir, a number of overhead and underground services were identified and mapped, and verified by the various authors of this chapter during site investigations. The properties in the area which could be connected to these Built Services were also identified through desktop and field surveys. The location of these services and the associated Local Residents & Community are outlined on Table 14-4 and illustrated on Figure GC 14.2.

Table 14-4: Summary of Local Residents & Community connected to Irish Water, ESB and Eir networks in the UWF Grid Connection Study Area

Project Element	Local Residents & Community connected to Irish Water Mains	Local Residents & Community connected to Local ESB Network	Local Residents & Community connected to the Local Eir Network
UWF Grid Connection	C.543 No. properties connected to 14 No. lengths of Irish Water Mains A water mains run parallel to the 110kV UGC in the L2166-0, L6013-0, L2156-0, L2157-0, L6009-0, R503 and L2264-50	C.716 No. properties connected to 65 No. overhead electricity lines and 1 No. underground electricity cable. These overhead lines and underground cable are generally located in fields beside the road network.	C.490 No. properties connected to 32 No. overhead lines telephone lines and 7 No. underground telephone lines These overhead lines are generally located in roadside boundaries.

14.2.1.3 Importance of Local Residents & Community

It is considered that public water supply is highly valued, as it is likely to be the sole source of water for most Irish Water customers.

Electricity supply is also considered to be of high value as the sole source of electricity for most local residents and businesses.

Fixed line telephone and broadband services, on the other hand, have less of an importance locally due to the availability and widespread use of mobile phones and wireless signals.

14.2.1.4 Sensitivity of Local Residents & Community

Local Residents & Community are sensitive to any temporary loss of built services due to damage to pipes, cables or overhead lines or due to planned outages. Based on the IMPERIA criteria (outlined in Section 14.1.8), the Sensitivity of Local Residents & Community is evaluated as **Moderate**.

14.2.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Irish Water are currently undertaking a national programme of works on their networks to reduce leakage and improve water supply nationally. As part of their Capital Investment Programme, the water treatment plant and network associated with the Newport Regional Water Supply Scheme was upgraded in 2017[3]. Discussions with Irish Water (pers. comms Newport Regional Water Supply, September 2019) did not identify any upcoming plans to upgrade or reduce leakage on the local networks within the study area.

The electricity network is being continuously upgraded through refurbishment programs and expanded through new connections, though this is happening slowly, particularly in rural areas such as the study area.

In recent years the popularity and adoption of mobile telephones and mobile broadband has grown significantly and the dependence on fixed line telephone service using traditional overhead lines or underground cables is decreasing. This trend is likely to continue especially in rural areas where the use of fixed line telephone services are expected to continue decreasing, albeit at a slow rate.

[3] https://www.water.ie/projects-plans/national-projects/leakage-reduction-programme/, Pers.Comms Newport Regional Water Supply, September 2019

The number of residences, businesses and community facilities in the area is likely to increase slowly in line with increases in the population of the area. According to Chapter 6 Population (Section 6.2.1.5 and Section 6.2.1.6) of this EIAR, '*data from the past 10 years of Censuses suggests that population growth peaked in the decade to 2016, with a notable slowdown in population growth in the last five years recorded in Census 2016. Within the study area, Newport town has experienced rapid population growth, doubling in population between 1996 and 2016…… Under moderate assumptions, the CSO projects that the State population will increase by 19% from 4.7 million people in 2016 to 5.6 million by 2046.*[4] *Should local populations grow in tandem; the population of the UWF Grid Connection Study Area will grow by from 7,966 to c.9,480 persons by 2046'*.

It is expected that most new residences, business and community facilities will be located in or close to Newport town, Rear Cross village, and other villages in the surrounding area in line with the North Tipperary County Development Plan, (Section 2.3.1) which states 'it is planned that future population growth in the county will be accommodated in existing towns and villages in line with a county settlement hierarchy, and also through sensitive development in rural areas with infrastructure delivered in a timely fashion to ensure sustainable and inclusive communities'.

14.2.1.6 Receiving Environment (the Baseline + Trends)

As population trends and network upgrades are happening slowly, it is assumed that the existing baseline environment for Local Residents & Community, described above, will be the receiving environment during the construction stage of the subject development.

[4] http://www.cso.ie/en/media/csoie/releasespublications/documents/population/2013/poplabfor2016_2046.pdf

Local Residents & Community

Sensitive Aspect

14.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

14.2.2.1 Cumulative Evaluation Study Area

14.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Local Residents & Community	Justification for the Study Area Extents
Local residences, businesses and community facilities connected to: - underground pipes or cables within the UWF Grid Connection construction works area boundary, - overhead lines within 7m of the UWF Grid Connection construction works area boundary to allow for machinery movement. The extent of the study area is from the fault point to the nearest valve/transformer/cabinet.	The potential for cumulative effects are limited to those local residents, businesses and community facilities that can be directly affected by UWF Grid Connection in the first instance.

The study is illustrated on Figure CE 14.2: UWF Grid Connection Cumulative Evaluation Study Area for Local Residents & Community (Built Services).

14.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 14.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 14-5 and illustrated on Figure WP 14.2: Whole Project Study Area for Local Residents & Community (Built Services) (Volume C3 EIAR Figures).

Table 14-5: Cumulative Evaluation Study Area for Local Residents & Community

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Local residences, businesses and community facilities connected to: - underground pipes or cables within construction works area boundaries, - overhead lines within 7m of the construction works area	Effects to Local Residents & Community are limited to direct physical damage to the lines, pipes or cables which supply their properties during construction works. The extent of the study area is limited to those local residents using Irish Water/Eir/ESB services who could be affected by an
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		

Material Assets (Built Services)

Topic

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 4: Upperchurch Windfarm	boundaries to allow for machinery movement. The extent of the study area is from the fault point to the nearest valve/transformer/cabinet.	outage and whose service cannot be re-directed through another part of the Irish Water/Eir/ESB networks.
Element 5: UWF Other Activities		

14.2.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Local Residents & Community also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Local Residents & Community with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.27).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Local Residents & Community.

14.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Local Residents & Community

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Local Residents & Community. The results of this evaluation are included in Table 14-6.

The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 14.2. The baseline character of the areas around these projects is described in Section 14.2.2.3.

Table 14-6: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: No potential for effects due to • No potential to cause loss of supply of water, telephone or electricity services to Local Residences & Community, due to the absence of excavation works and large machinery - all planting and maintenance activities will be carried out by hand, any vehicles used will be standard vans or four-wheel drive vehicles and trailers.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: No potential for effects due to: • The absence of any structures, and the absence of excavation works and large machinery associated with the Haul Route Activities, Overhead Line Activities, Monitoring Activities and the Upperchurch Hen Harrier Scheme.

Local Residents & Community

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14.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

14.2.2.3.1 Element 2: UWF Related Works / Element 4: Upperchurch Windfarm

In relation to the Other Elements of the Whole UWF Project, the location of services and associated Local Residents & Community are outlined on Table 14-7 and illustrated on Figure WP 14.2.

Table 14-7: Summary of Local Residents & Community connected to Irish Water, ESB and Eir networks in the Whole Project Cumulative Evaluation Study Area

Cumulative Project	Local Residents & Community connected to Irish Water Mains	Local Residents & Community connected to Local ESB Network	Local Residents & Community connected to the Local Eir Network
UWF Related Works	C. 25 No. properties connected to 2 No. length of Irish Water Mains These water mains run parallel to construction works in the road (L-2264-50, L6188-0).	c.92 No. properties connected to 8 No. electricity lines and 2 No. underground electricity cables. These overhead lines and underground cables are generally located in fields beside the local road network.	C.57 No. properties connected to 9 No. telephone lines These overhead lines are generally located in roadside boundaries.
Upperchurch Windfarm	C. 25 No. properties connected to 2 No. length of Irish Water Mains These water mains run across the site entrances along the road (L-2264-50, L6188-0).	c.1 No. properties connected to 1 No. electricity line across a field at Knockmaroe.	C.40 No. properties connected to 3 No. telephone lines, these overhead lines are generally located in roadside boundaries.

UWF Grid Connection Cumulative Evaluation Study Area: Properties located off the L-2264-50 in the Knockmaroe/Knockcurraghbola area are located in the study area for the UWF Grid Connection and the UWF Related Works and the Consented Upperchurch Windfarm. These properties, identified on Figure CE 14.2 are supplied by:

- 1 No. Irish Water main on the L2264-50 (19 No. properties),
- 3 No. overhead electricity line (29 No. properties), and
- 1 no. overhead telephone line (21 No. properties).

Consideration of the Passage of Time in relation to Upperchurch Windfarm: There have been no new built services installed on stretches of road at Upperchurch Windfarm site entrances, and no new services built across lands under which Consented Upperchurch Windfarm construction works or construction machinery will pass. While the effects to local residents of an interruption of built service supplies was not specifically evaluated in the 2013 EIS, it is now considered in the evaluations in this EIAR for UWF Grid Connection.

Material Assets (Built Services)

14.2.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 14.2.2.2.1

14.2.2.3.3 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 14.2.2.2.1

Topic

14.2.2.3.4 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 14.2.2.2.

14.2.3 PROJECT DESIGN MEASURES for Local Residents & Community

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 14-8 are relevant to the Environmental Factor, Material Assets (Built Services), and in particular to the sensitive aspect **Local Residents & Community**.

Table 14-8: UWF Grid Connection Project Design Measures relevant to Local Residents & Community

PD ID	Project Design Environmental Protection Measure (PD)
PD04	All construction works will be carried out during daylight hours.
PD07	110kV UGC construction works along the local roads L2264-50 and L6188-0, will not take place at the same time as the UWF Related Works Haul Route Works on these roads. The 110kV UGC construction works will also be scheduled so that the works do not occur on the same days as concrete deliveries for Consented UWF Turbines along these local roads.
PD08	Confirmatory consultations with Irish Water, Eir and ESB and review of all relevant infrastructure mapping before works, along with 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 banksman will accompany each excavator to oversee all excavation works.
PD09	Close contact with the local Newport Regional Supply office at Newross will be maintained by the Environmental Clerk of Works throughout the construction of the 110kV UGC. The Environmental Clerk of Works will keep the Newport Regional Water Supply office up-to-date with the location and schedule of works. To reduce risk of damaging water mains; pre-construction confirmatory surveys will be carried out, and excavations will be hand dug within 500mm of pipes. So that any damage (should it occur) can be fixed immediately, a supply of water mains repair materials will be kept at the Mountphilips Substation compound and at each works location on the public road network.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 (Volume C4: EIAR Appendices).

14.2.4 EVALUATION OF IMPACTS to Local Residents & Community

In this Section, the likely direct and indirect effects of the UWF Grid Connection and the likely cumulative effects of the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Local Residents & Community.

As a result of the exercise, some impacts were included and some were excluded.

Table 14-9: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included	***Impacts Excluded*** *(Justification in next section)*
Loss of public water supply (construction stage)	*Loss of electricity/ communications service(s) due to accidental damage (construction stage)*
	Loss of electricity/ communications service(s) due to planned outages (UWF Related Works only) (construction stage)
	Damage to communication services due to electromagnetic interference (operational stage)
	Damage to overhead lines or underground cables during any operational maintenance or repair works
	Decommissioning Effects

The source-pathway-receptor links for the impact included are described in the Impact Evaluation Table in the next section - **Section 14.2.4.1**.

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table in Section 14.2.4.2.

14.2.4.1 Impact Evaluation Table: Loss of Public Water Supply

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: excavations of public road pavements
Cumulative Impact Source: excavations of public road pavements
Impact Pathway: Physical contact

Impact Description: should damage occur, a brief (c.1 day) loss of water supply to local residences, businesses or community facilities due to direct damage to underground water mains which provide local supply during excavation works for cables trenches, joint bays and culvert replacement works.

The potential for impacts is reduced to 'unlikely' through the implementation of Project Design Measures including; the supervision of works, consultation with Irish Water and confirmatory surveys of works locations ahead of works and stocking of repair materials at works locations.

Impact Quality: **Negative**

Evaluation of the Subject Development Impact – Loss of Public Water Supply

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
There are 543 No. properties connected to 14 No. Irish Water main lines. As per IMPERIA methodology, the magnitude is evaluated as Negligible as a potential c.1 day supply disruption would have no practical implication, should a mains line be damaged during construction works.

While this would equate to an Imperceptible impact (given the Moderate Sensitivity and the Negligible magnitude, as per the IMPERIA methodology outlined in Section 14.1.8), the implementation of Project Design Measures (see Section 14.2.3) reduces the likelihood of the impact to 'unlikely'.

Significance of the Impact: Neutral impact

Rationale for Impact Evaluation:

- the Moderate sensitivity of Local Residents & Community using public water supply in the locality,
- this impact unlikely to occur with the implementation of project design, notwithstanding
- the Negligible magnitude of impacts in the unlikely event that they do occur, and the reversal of any impacts with the repair of damaged Irish Water pipes.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: There are 19 No. properties connected to 1 No. Irish Water main lines along the L2264-50 (Borrisoleigh Road) and L6188-0 in the Knockmaroe/Knockcurraghbola Crownlands area which has potential to be damaged by UWF Grid Connection works and by UWF Related Works, and/or by Upperchurch Windfarm works. Due to the small number of properties, the Sensitivity is reduced to Low. While works for the three projects will not occur during the same period (as per Project Design measure PD07), there is potential for damage to this water pipe to occur more than once due to works for the various projects. As per IMPERIA methodology, the magnitude is slightly larger than for the UWF Grid Connection on its own, and is evaluated as Low as there is potential for short supply disruptions due to each of the projects, should a mains line be accidently damaged during construction works.

While this would equate to an Imperceptible impact (given the Low Sensitivity and the Low magnitude, as per the IMPERIA methodology outlined in Section 14.1.8), the implementation of Project Design Measures (see Section 14.2.3) reduces the likelihood of the impact to 'unlikely'.

Local Residents & Community

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Significance of the Cumulative Impact: Neutral Cumulative Impact

Rationale for Cumulative Impact Evaluation:

- the Low sensitivity of Local Residents & Community using public water supply in the locality,
- this impact unlikely to occur with the implementation of project design, notwithstanding
- the Low magnitude of impacts in the unlikely event that they do occur, the potential for the impact to occur more than once, and the reversal of any impacts with the repair of damaged Irish Water pipes.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
There are 25 No. properties connected to 2 No. Irish Water main lines which have potential to be affected by excavations for the UWF Related Works.

As per IMPERIA methodology, the magnitude is evaluated as Negligible due to the low number of users connected to the lines. Properties will experience a c.1 day disruption of water supply should a mains line be damaged during construction works. While this would equate to an Imperceptible impact (given the Low Sensitivity and the Low Magnitude, as per the IMPERIA methodology outlined in Section 14.1.8), the implementation of Project Design Measures (see Section 14.2.3) reduces the likelihood of the impact to 'unlikely'.

Significance of the Impact: Neutral Impact

Rationale for Impact Evaluation:

- the Low sensitivity of Local Residents & Community using public water supply in the locality,
- this impact unlikely to occur with the implementation of project design, notwithstanding
- the Negligible magnitude of impacts in the unlikely event that they do occur, and
- the reversal of any impacts with the repair of damaged Irish Water pipes.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 14.2.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude:
There are 25 No. properties connected to 2 No. Irish Water main lines which have potential to be affected by excavations for Upperchurch Windfarm.

As per IMPERIA methodology, the magnitude is evaluated as Negligible due to the low number of users connected to the lines. Properties will experience a c.1 day disruption of water supply should a mains line be damaged during construction works. While this would equate to an Imperceptible impact (given the Low Sensitivity and the Low Magnitude, as per the IMPERIA methodology outlined in Section 14.1.8), the implementation of Project Design Measures (see Section 14.2.3) reduces the likelihood of the impact to 'unlikely'.

Significance of the Impact: Neutral Impact

Rationale for Impact Evaluation:

- the Low sensitivity of Local Residents & Community using public water supply in the locality,
- this impact unlikely to occur with the implementation of project design, notwithstanding
- the Negligible magnitude of impacts in the unlikely event that they do occur, and
- the reversal of any impacts with the repair of damaged Irish Water pipes.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 14.2.2.2.1*

Material Assets (Built Services)

Topic

Evaluation of Other Cumulative Impacts – Loss of Public Water Supply
Whole UWF Project Effect
Impact Magnitude: In total there are 555 No. properties connected to 15 No. Irish Water main lines which have potential to be affected by excavations for the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm. As per IMPERIA methodology, the magnitude is evaluated as Negligible for each project individually, and Low in the Knockmaroe/Knockcurraghbola Crownlands area as any accidental damage would result in c.1 day supply disruption which would have no practical implication, should a mains line be damaged during construction works. While this would equate to an Imperceptible impact (given the Moderate/Low Sensitivity and the Negligible/Low magnitude, as per the IMPERIA methodology outlined in Section 14.1.8), the implementation of Project Design Measures (see Section 14.2.3) reduces the likelihood of the impact to 'unlikely'.
Significance of the Impact: Neutral Impact
Rationale for Impact Evaluation: • the Low to Moderate sensitivity of Local Residents & Community using public water supply in the locality, • this impact unlikely to occur with the implementation of project design, notwithstanding • the Negligible impact magnitude of the projects individually, and Low impact magnitude of projects cumulatively, in the unlikely event that they do occur, and the reversal of any impacts with the repair of damaged Irish Water pipes.

Local Residents & Community

Sensitive Aspect

Material Assets (Built Services)

Topic

14.2.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from evaluation are described in Table 14-10 below.

Table 14-10: Description and Rationale for Excluded Impacts to Local Residents & Community

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Public road opening excavations Excavations associated with groundwork Movement of large machinery	1, 2, 4	Physical contact with overhead lines and underground cables	Loss of electricity/ communications service(s) due to accidently damage	Rationale for Excluding: No likely effect/Neutral Impact: No likely effect to underground services due to the very short length (c.20m) of underground electricity cables along the route of the 110kV UGC, and the absence of underground communication cables, in addition to the application of protection measures included as part of the project design (See Section 14.2.3), including direct supervision during construction; confirmatory pre-construction consultations with Eir and ESB; and pre-construction confirmatory surveys at service locations ahead of works. No likely effect to overhead lines due to the implementation of standard construction best practice as part of project design, including the preconstruction confirmatory surveys of overhead services, the use of goalposts, and the supervision of works. Additionally, the Code of Practice for Avoiding Danger from Overhead Electricity Lines 2019 will be implemented as part of standard construction practices for the project. In any case, should accidently damage occur, any effects will be Neutral, due to the short duration of any loss of service likely to be for c.1 day while damaged lines or cables are being repaired, the reversibility of the loss of service and in the context of the provision for a 3 day (ESB) or 5 day (Eir) repair/service restoration as standard, in service level agreements with these companies.
Relocation of telephone or electricity poles/lines	2	Planned outage	Loss of electricity/ communications service(s) due to a planned outage	Rationale for Excluding: No planned outages for UWF Grid Connection or Upperchurch Windfarm. Planned outages only relate to UWF Related Works, where any impacts will be Neutral, due to the notification of local residents or business of the outage ahead of works, which will allow them to plan for the outage; the alternative means of communication available, and the completion of works in one day in the context of the provision for 3 day (ESB) or 5 day (Eir)

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
				repair/service restoration as standard in service level agreements.
Operational Stage				
Operation of UWF Grid Connection	1	Air	Damage to communication services due to electromagnetic interference	Rationale for Excluding: Neutral Impacts;
Public road opening excavations, and movement of large machinery during planned maintenance or unplanned repairs along the 110kV UGC.	1	Physical contact with overhead lines and underground cables	Loss of electricity/ communications service(s)/water mains due to accidently damage during any operational maintenance or repair works	Rationale for Excluding: No likely effect/Neutral Impact: No likely effect as any planned maintenance or unplanned repairs along the 110kV UGC will involve excavating road surfaces at joint bay locations, rather than involving new excavation works in the public road. No services will be located over joint bays. No likely effect to overhead lines due to the implementation of standard best practice as part of project design, including the use of goalposts, and the supervision of works. Additionally, the Code of Practice for Avoiding Danger from Overhead Electricity Lines 2019 will be implemented as part of standard practices for the project. In any case, should accidently damage occur, any effects will be Neutral, due to the short duration of any loss of service likely to be for c.1 day while damaged lines or cables are being repaired, the reversibility of the loss of service and in the context of the provision for a 3 day (ESB) or 5 day (Eir) repair/service restoration as standard, in service level agreements with these companies. No road works or excavation of new ground expected for any of the Other Elements.
Decommissioning Stage				
Rationale for Excluding: No potential for impacts/no likely impacts UWF Grid Connection will not be decommissioned, therefore no potential for impacts to occur. Decommissioning works and activities related to UWF Related Works or Upperchurch Windfarm will mainly take place from turbine hardstands on the Upperchurch Windfarm, at locations away from local Built Services, therefore there effects to Built Services are not likely to occur.				

Local Residents & Community

Sensitive Aspect

14.2.5 Mitigation Measures for Impacts to Local Residents & Community

Mitigation measures were incorporated into the UWF Grid Connection project design including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Local Residents & Community**.

14.2.6 Evaluation of Residual Impacts to Local Residents & Community

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures were required, and thus the Residual Impact is the same as the Impact set out in Section 14.2.4.1 – i.e. **Neutral Impacts/no likely impact**.

14.2.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

Material Assets (Built Services)

Topic

14.2.8 Summary of Impacts to Local Residents & Community

A summary of the Impact to Local Residents & Community is presented in Table 14-11.

Table 14-11: Summary of the impacts to Local Residents & Community

Impact to Local Residents & Community:	**Loss of Public Water Supply**
Evaluation	*Section 14.2.4.1*
Project Life-Cycle Stage	Construction
UWF Grid Connection *direct/indirect impact*	**Neutral**
UWF Grid Connection *cumulative impact*	**Neutral**
Element 2: UWF Related Works	Neutral impact
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 14.2.2.2.1
Element 4: Upperchurch Windfarm	Neutral impact
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 14.2.2.2.1
Cumulative Impact:	
Whole UWF Project Effect	**Neutral**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Local Residents & Community with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 14.2.2.2).

Local Residents & Community

Sensitive Aspect

Material Assets (Built Services)

Topic

14.3 Sensitive Aspect No.2: Electricity Transmission System

This Section provides a description and evaluation of the Sensitive Aspect - Electricity Transmission System.

In this EIA Report, the Electricity Transmission System relates to the Killonan – Nenagh 110kV Overhead Line. The consented Upperchurch Windfarm will connect to this line through the UWF Grid Connection.

14.3.1 BASELINE CHARACTERISTICS of Electricity Transmission System

14.3.1.1 STUDY AREA for Electricity Transmission System

The study area for Electricity Transmission System in relation to the UWF Grid Connection is described in Table 14-12 and illustrated on Figure GC 14.3: UWF Grid Connection Study Area for Electricity Transmission System (Volume C3 EIAR Figures).

Table 14-12: UWF Grid Connection Study Area for Electricity Transmission System

Study Area for Electricity Transmission System	Justification for the Study Area Extents
Existing Killonan to Nenagh 110kV overhead line	The new Mountphilips Substation will be connected to this tail fed line which is controlled from Killonan 220kV Station and ends in Nenagh 110kV Substation.

14.3.1.2 Baseline Context and Character of Electricity Transmission System in the UWF Grid Connection Study Area

The UWF Grid Connection is the only part of the Whole UWF Project which is relevant to the Electricity Transmission System, as it will involve the connection of a new substation onto the Killonan – Nenagh 110kV overhead line (OHL).

The Killonan – Nenagh 110kV OHL is controlled and fed from the Killonan 220kV/110kV Station, which is located to the southeast of Limerick City. The Killonan Station is one of the main transmission system stations in the country with 3 No. 220kV lines feeding into it - from Tarbert, Knockraha and Shannonbridge. This power is then distributed through the Killonan Station to the mid-west region using numerous regional networks at all voltages (110kV, 38kV and 20kV). One of these regional networks is the Killonan to Nenagh 110kV OHL, which is c.41km long, originating in the Killonan 220kV Station and ending in the Nenagh 110kV Substation.

The Killonan – Nenagh 110kV OHL is c.41km long and comprises 110kV overhead lines mounted on a mixture of double wooden poles and lattice steel towers. The middle section of the line between Ahane and Silvermines is relatively new, being built in 2012/2013. The other sections, between Killonan and Ahane, and Nenagh and Silvermines are older and were built in the 1970's and 1990's respectively.

The UWF Grid Connection will connect onto the Killonan – Nenagh 110kV OHL just to the north of Poleset No.79, approximately one third of the way along the line between Killonan and Nenagh.

The UWF Grid Connection will cross under the existing Shannonbridge – Killonan 220kV OHL in Coole town-land, close to the site entrance for Mountphilips Substation, however, no effects are likely to occur to the OHL, and as outlined in Section 14.1.4, this overhead line has been scoped out from further evaluation.

Electricity Transmission System

Sensitive Aspect

14.3.1.3 Importance of Electricity Transmission System

The nationwide electricity transmission system allows for the transport of large volumes of electricity from generation stations, including wind farms, to bulk supply points near the main population centres where it interconnects with the distribution system[5]. According to the Eirgrid Transmission Development Plan 2012 to 2022, the Killonan Station is the main bulk supply point for the Mid-West region. The Killonan – Nenagh 110kV OHL is one of the main electricity supplies into Nenagh town. The Killonan – Nenagh 110kV OHL is considered to have **High** societal value.

14.3.1.4 Sensitivity of Electricity Transmission System

The Killonan – Nenagh 110kV OHL can be affected by damage to the lines due to adverse weather conditions such as high wind and ice, or faults at the Killonan Station. However, the network protection and control systems would allow Nenagh to be fed from the 38kV network which is also connected to the Nenagh Substation.

14.3.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Due to the condition and age of the transmission equipment in Killonan 220/110 kV station, a major project involving the replacement of the whole station is planned under Eirgrid's Transmission Development Plan 2012 to 2022, *CP0624: Reinforcement of the Transmission Network in Limerick City Project*. There are currently no plans for the 110kV part of the Nenagh Substation. Once lines or stations are built or upgraded, they generally do not need further upgrading works for c.40 years.

14.3.1.6 Receiving Environment (the Baseline + Trends)

It is assumed that the existing Killonan – Nenagh 110kV OHL will be the receiving environment at the commencement of the operational stage.

Material Assets (Built Services)

Topic

[5] https://www.esbnetworks.ie/who-we-are/our-networks

14.3.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

14.3.2.1 Cumulative Evaluation Study Area

14.3.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Electricity Transmission System	**Justification for the Study Area Extents**
Existing Killonan to Nenagh 110kV overhead line	Transmission system asset to which the Upperchurch Windfarm will be connected.

The study is illustrated on Figure CE 14.3: UWF Grid Connection Cumulative Evaluation Study Area for Electricity Transmission System.

14.3.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 14.3.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 14-13 and illustrated on Figure WP 14.3: Whole Project Study Area for the Electricity Transmission System (Volume C3 EIAR Figures).

Table 14-13: Cumulative Evaluation Study Area for Electricity Transmission System

Cumulative Project	**Cumulative Study Area Boundary**	**Justification for Study Area Extent**
Element 1: UWF Grid Connection	Existing Killonan to Nenagh 110kV overhead line	Transmission system asset to which the Upperchurch Windfarm will be connected.
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

14.3.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Electricity Transmission System also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Electricity Transmission System with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.28).

The results of this scoping exercise are that: Bunkimalta Windfarm (potential windfarm and consent grid connection) and Castlewaller Windfarm (consented windfarm and potential grid connection) have been scoped in for evaluation of potential cumulative effects to Electricity Transmission System.

14.3.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Electricity Transmission System

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Electricity Transmission System. The results of this evaluation are included in Table 14-14.

The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 14.3. The baseline character of the areas around these projects is described in Section 14.3.2.3.

Table 14-14: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Evaluated as excluded: No potential for effects due to • the absence of any Electricity Transmission System Assets in the area. • Does not involve any direct connections onto the OHL
Element 3: UWF Replacement Forestry	Evaluated as excluded: No potential for effects due to • the absence of any Electricity Transmission System Assets in the area. • Does not involve any direct connections onto the OHL
Element 4: Upperchurch Windfarm (UWF)	Evaluated as excluded: No potential for effects due to • the absence of any Electricity Transmission System Assets in the area, • Does not involve any direct connections onto the OHL – while electricity generated by Upperchurch Windfarm will be transported on the Killonan-Nenagh 110kV OHL, this electricity will be carried via the UWF Grid Connection Element, and therefore any potential for effects have been evaluated as part of the UWF Grid Connection element.
Element 5: UWF Other Activities	Evaluated as excluded: Neutral impact or No potential for impacts due to: • Neutral effect to the Electricity Transmission System during the wrapping and re-sagging (Overhead Line Activities) due to the line between Killonan and Nenagh being de-energised and switched out. This will have no effect on Killonan as this station is the feed point, i.e. all power flows from Killonan to Nenagh. There will also be no interruption to the distribution of electricity from the Nenagh Substation as electricity supply to Nenagh will be sourced from the existing 38kV grid network at the Nenagh 110kV Substation,

	• No potential for effects caused by the remaining UWF Other Activities (Haul Route Activities, Monitoring Activities or Upperchurch Hen • Harrier Scheme) as these activities do not interact with the Electricity Transmission System.
Other Projects or Activities	
Castlewaller Windfarm Bunkimalta Windfarm (potential windfarm)	Included for the evaluation of cumulative effects

14.3.2.3 Cumulative Information: Baseline Characteristics – Context & Character

The UWF Grid Connection is the only part of the Whole UWF Project which is relevant to the Electricity Transmission System, as it will involve the connection of a new substation onto the Killonan – Nenagh 110kV overhead line (OHL).

14.3.2.3.1 Element 2: UWF Related Works

Not applicable – Element evaluated as excluded. See Section 14.3.2.2.1

14.3.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 14.3.2.2.1

14.3.2.3.3 Element 4: Already Consented Upperchurch Windfarm

Not applicable – Element evaluated as excluded. See Section 14.3.2.2.1

14.3.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 14.3.2.2.1

14.3.2.3.5 Other Projects or Activities

Bunkimalta Windfarm - it is likely that any future Bunkimalta Windfarm will connect to Nenagh Substation via the consented grid connection.

Castlewaller Windfarm – the windfarm element of this project is already consented, and a potential route for the underground grid connection was the subject of an SID pre-application consultation process with An Bord Pleanála. The potential route for the grid connection was directly to Killonan, this route is not the subject of any current connection offer.

14.3.3 PROJECT DESIGN MEASURES for Electricity Transmission System

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

There are no Project Design Measures specific to the Electricity Transmission System.

14.3.4 EVALUATION OF IMPACTS to Electricity Transmission System

In this Section, the likely direct and indirect effects of the UWF Grid Connection and the likely cumulative effects with Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Electricity Transmission System.

As a result of the exercise, **no impacts were included for evaluation** – all were excluded.

Table 14-15: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included	***Impacts Excluded*** *(Justification in next section)*
No Impacts included for Evaluation	*Interruption of power supply on the electricity system (construction stage)*
	Adding a control point to the Killonan to Nenagh 110kV OHL (operational stage)
	Decommissioning Effects

The source-pathway-receptor links and the rationale for excluded impacts are described in Section 14.3.4.1.

14.3.4.1 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 14-16 below.

Table 14-16: Description and Rationale for Excluded Impacts to Electricity Transmission System

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Commissioning of the Mountphilips Substation	1	Planned outage	Interruption of power supply on the electricity system	Rationale for Excluding: Neutral Impact During the commissioning of the new Mountphilips Substation, the line between Killonan and Nenagh will be de-energised and switched out. This will have no effect on Killonan as this station is the feed point, i.e. all power flows from Killonan to Nenagh. There will also be no interruption to the distribution of electricity from the Nenagh Station as electricity supply to Nenagh will be sourced from the existing 38kV grid network at the Nenagh 110kV Station. Potential cumulative impacts with a potential Bunkimalta Windfarm are not likely as the two connections will be planned by EirGrid/ESBN in a manner that avoids power supply interruptions on the system. Similarly, any potential connection for Castlewaller Windfarm will be planned to avoid power supply interruptions by EirGrid/ESBN.
Operational Stage				
Addition of new substation onto the Killonan - Nenagh 110kV OHL	1	Killonan to Nenagh 110kV overhead line	Adding a control point to the Killonan to Nenagh 110kV OHL	Rationale for Excluding: The addition of the Mountphilips Substation will add an operational control point for ESBN on this tail fed line. The main function of the new substation will be to transport electricity from the Upperchurch Windfarm onto the line, and although the addition of a new control point will be of benefit to ESB Networks in the form of a new asset and will strengthen the network into Nenagh, it will not cause significant positive effects to the transmission system due to the size of the overall Irish transmission system. There is no likely cumulative impacts with a potential Bunkimalta Windfarm as that project is not likely to involve a new substation on the line. Similarly a potential connection of Castlewaller Windfarm is not expected to involve a new substation on the line.
Decommissioning Stage				
Rationale for Excluding: No potential for impacts to Electricity Transmission System as the UWF Grid Connection will form part of the National Grid on a permanent basis and will not be decommissioned.				

14.3.5 Mitigation Measures for Impacts to Electricity Transmission System

Mitigation measures are not relevant as the UWF Grid Connection as the topic authors conclude that **significant impacts are not likely to occur** to the Electricity Transmission System.

14.3.6 Evaluation of Residual Impacts to Electricity Transmission System

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No mitigation measures were required, and thus the Residual Impact is the same as the Impact set out in Section 14.3.4.1 – i.e. **Neutral Impacts/no likely impacts/ no significant adverse impacts are likely to occur**.

14.3.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

14.3.8 Summary of Impacts to Electricity Transmission System

A summary of the Impact to Electricity Transmission System is presented in Table 14-17.

Table 14-17: Summary of the impacts to Electricity Transmission System

Impact to Electricity Transmission System:	**No Impact** - All impacts are evaluated as excluded
Evaluation Impact Table	*Section 14.3.4.1*
Project Life-Cycle Stage	Construction/Operation
UWF Grid Connection	**No potential for Impact**
Element 2: UWF Related Works	No Potential for Impact - Evaluated as Excluded, see Section 14.3.2.2.1
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 14.3.2.2.1
Element 4: Upperchurch Windfarm	No Potential for Impact - Evaluated as Excluded, see Section 14.3.2.2.1
Element 5: UWF Other Activities	Neutral Impact/No Potential for Impact - Evaluated as Excluded, see Section 14.3.2.2.1
Cumulative Impact:	
All Elements of the Whole UWF Project	**No potential for Cumulative Impacts**
All Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities Castlewaller Windfarm (consented windfarm, potential grid connection) Bunkimalta Windfarm (potential windfarm and consented grid connection)	**No potential for/No Likely Cumulative Impacts**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Electricity Transmission System

Sensitive Aspect

Material Assets (Built Services)

Topic

14.4 Reference List

ESB Networks, Who We Are, https://www.esbnetworks.ie/who-we-are/our-networks

Eir, Pressroom, https://www.eir.ie/pressroom

Irish Water, Leakage Reduction Programme https://www.water.ie/projects-plans/national-projects/leakage-reduction-programme/

Reference List

Topic: Material Assets (Built Services)

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Chapter 15: Material Assets - Roads

October 2019

Topic: Material Assets (Roads)

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List of Figures

Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

List of Appendices

Appendices referenced in this topic chapter can be found in **Volume C4 EIAR Appendices.**

Glossary of Terms

Term	Definition
Congested	A junction or link is considered to be congested when traffic flows are at 85% of the estimated capacity of the junction or link
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.
Project Design Measure	Measures for environmental protection, incorporated into the design of the project.
Traffic Growth	The normal expected growth in traffic over time
Trip	One movement, in or out of the study area by foot, cycle or vehicle
FWD Analysis	A load pulse is produced by dropping a known mass, and is transmitted to the road pavement through a loading plate. The load cell measures the load imparted to the pavement surface and the geophones measure the pavement deflection in response to the load.

List of Abbreviations

Abbreviation	Full Term
TII	Transport Infrastructure Ireland
PD	Ecopower Project Design Environmental Protection Measure developed by members of the EIAR Team
AMM	Ecopower Additional Mitigation Measure developed by members of the EIAR Team
FWD	Falling Weight Deflectometer
UGC	Underground Cables
UWF	Upperchurch Windfarm

Executive Summary of the Material Assets: Roads Chapter

Baseline Environment: Most of the UWF Grid Connection 110kV UGC involves cabling in lightly trafficked sections of the R503 Regional Road, with less works planned for local roads which are generally rural in nature and also lightly trafficked. The R503 runs generally in an E-W orientation and links Thurles town in the east with Newport town and Limerick city to the west and is identified as Strategic Roads in the North Tipperary County Development Plan 2010 (as amended).

The public roads affected are the Regional Road R503, along with the Local Roads "L" Roads – the L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, L5337-1, L2264-50, L6188-0, with the exception of the L5337-1 at Tullow Newport (L5337-1 won't be affected - construction material haul route only). All of these roads are 2-way roads, with the trafficked pavement varying in width from 3.5 to 5m, with narrow verges, and are generally bounded by low level earthen embankments or hedgerows along either side, with road surface water drained to open drains, generally running along each of the roadsides.

There are no vehicle weight restrictions in place along any of the roads affected by the works. Road Boundaries consist of a mix of hedgerows and simple mounded embankments, which are aligned beyond drainage channels that occur in most roadside verges.

Road Users include local traffic and commuters on the R503 between Limerick and Thurles. Tourists may also be present on the walking/cycling routes that interact with these roads.

Survey Results for Sensitive Aspects in the Baseline Environment: Surveys of the existing road and traffic conditions were carried out including Passing Traffic Volume Data collection (ATC Tube Counts); Buried Structures Survey; Pavement video survey and Pavement Condition Index (vPCI) survey; and Peat Probe Surveys (R503 only). A Road Safety Audit and a Traffic & Transport Impact Assessment were also conducted.

Passing Traffic Volume Data surveys demonstrated that the roads in the study area are very lightly trafficked. Traffic counts (7-day classified 'ATC Tube Counts') were carried out in January 2019 at 5 locations and in May 2019 at 6 locations, to measures vehicles over a 24-hour period and the results show that traffic volumes on the roads are very low. Traffic speeds are generally maintained well within the posted speed limits.

Buried Structure surveys established that the 63 no. watercourse crossings along the public road comprise a mix of bridges (15) and plastic/concrete/masonry culverts (48). TLI Group engineers surveyed the structures and were satisfied that the road structures above the bridges (where trenching in the bridge deck is required) were in good condition and will be capable of supporting the 110kV UGC infrastructure and the increased traffic loading associated with the construction works. No works will be required to the bridge structures themselves. At two bridges (W8 and W9) the bridges are not considered to have sufficient road depth over the bridge arch/deck to accommodate the cable ducting and therefore the cabling will cross via Horizontally Drilling (HDD) under the existing bridge and watercourse. Also, the existing road level and parapet wall heights at Rockvale Bridge (W7), Tooreenbrien Bridge (W36) and Anglesey Bridge (W53) will need to be increased to accommodate the 110kV UGC. A Road Safety Audit was carried out, by Malachy Walsh & Partners, who considered that the project will not affect road safety along the route.

Pavement condition surveys show that the pavement condition on the R503 was rated as Good; with conditions on the local "L" roads found to be 'good' to 'fair' on most local roads. Surveys of the public roads along the route, particularly where the 110kV UGC route pass through mapped peat soils in the central part of the route on sections of the Regional Road R503, found that sections of the R503 road through mapped peat soils are substantially of 'excavate and fill' construction, though not all sections of road may be built on competent ground and would be considered to be of 'floating road' construction. A total of 20 peat probe sampling was also carried out to determine the depth of peat in these areas. In general the ground on both

sides of the regional road was firm ground. The design of the 110kV UGC cables trench includes the application of floating road trench design where competent ground is not encountered, this will avoid any effects to the structural integrity of any 'floating' sections of the Regional Road R503.

Road Works affecting the Public Roads including buried structures: The 110kV is almost wholly planned for the pubic road network, with trenching and cabling required in the R503 and on some Local Roads. The construction of the 110kV UGC will involve the excavation of a trench c.1.25m deep and 0.6m wide within public road pavements. In total there will be 29.2km of cables trench within the road pavements. The construction of the Joint Bays will require the excavation of the road pavement to install pre-cast concrete chambers for the 40 No. Joint Bays along the route of the 110kV UGC on the public road. Of the 48 No. culverts, no works will be required to 35 No. of these, with the 110kV UGC installed either under or over the culverts. At the remaining 13 No. culverts, the existing masonry box culvert may need to be replaced (12 No. of which are under the R503, and 1 No. under the L-2265-50). The 110kV UGC will then be installed under the existing/replaced culvert.

Works to road verges and boundaries will only occur at Mountphilips Substation site entrance. All works outside of the Mountphilips Substation site will take place within road pavements/built surfaces.

Road works affecting Road Users: It is expected that works on the public road will last approximately 8 to 9 months on the R503 and for periods of between 1 to 3 weeks at various points on the Local Roads. There will be 4 construction works crews working on the roads at the same time, with 1 crew dedicated to construction works on the local roads, and 3 crews working at separate locations along the Regional R503 Road. There will be approximately 80m – 100m of trenching completed in a single day. At the Joint Bay locations, initial construction works will take 2 days, cable pulling works will take 3 days and cable jointing works 5 days, per Joint Bay. 31 of the 40 Joint Bays are on the Regional R503 Road.

Works will result in one-lane closures on the Regional R503 Road and will result in some road closures and one-lane closures on the Local Roads. The Local Roads that will be closed for periods between 1 week and 1 month are; the two local roads north of Newport and one local road near the consented Upperchurch Windfarm substation. There are diversion options adding 5 minutes to the journey time, available around the Newport local road closures and a diversion adding 10 minutes to the journey time around the local road closure near the Upperchurch Windfarm substation. At the one-lane closure locations, traffic flow at these locations will be managed around the works, using a stop-go system and flagmen to minimise delays and disruption to road users.

A Traffic Management Plan (TMP) will implemented, the objective of which will be to control and minimise the traffic impacts of construction insofar as it may affect the road network, local residents and the travelling public on the public roads close to and adjacent to the UWF Grid Connection construction site, through measures to maximise road safety while keeping traffic flowing as freely as possible. As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the Promoter will fund the costs of Tipperary County Council engaging a chartered Civil Engineer to oversee quality control and compliance with drawings, specifications and road opening conditions for the duration of the works

Summary of the Likely Impact to Public Roads: **The impact on public road pavements is evaluated as Moderate**, due to the moderate magnitude of the works but works will be temporary; traffic on the roads is light and the road will be reinstated in accordance with the Department of Transport, Tourism & Sport Guidelines for Managing Openings in Public Roads (April 2017). **The impact on bridges and culverts is evaluated as Neutral** because the majority of buried structures require no works and also any works required will contribute to safer roads and improved infrastructure because any culverts replaced, will be replaced with higher specification culverts. **The impact to roadside boundaries is evaluated as Imperceptible** because boundary removal is limited to the widening of the existing field entrance for the Mountphilips Substation

site and the reinstatement of the road boundary behind sightlines at the widened entrance. **Cumulative impacts** with UWF Related Works, Upperchurch Windfarm and *potential* Castlewaller Windfarm (grid connection works on the local road in Castlewaller) are the same, ranging from **Neutral to Imperceptible to Moderate**.

Summary of the Likely Impacts to Road Users: The effect of delays to be expected by Road Users due to road works, is evaluated as Slight due to the lightly trafficked nature and extent of available capacity on all roads; the availability of acceptable diversions around road closures; the maintenance of local access to properties on the roads, including the roads subject to closures; the temporary duration and the application of traffic management measures and use of flagmen to minimise traffic delays. **The Cumulative Impact** with UWF Related Works, Upperchurch Windfarm and *potential* Castlewaller Windfarm (grid connection works on the local road in Castlewaller) are the same, ranging from **Imperceptible to Slight**.

Conclusion: The UWF Grid Connection will not cause significant adverse effects to Material Assets (Roads).

Topic
Material Assets (Roads)

15 Environmental Factor: Material Assets (Roads)

15.1 Introduction to the Material Assets (Roads) Chapter

15.1.1 What are Material Assets (Roads)?

The Material Asset - Roads, relates to the local, Regional and National roads which are part of the public road network. In this chapter, Road Users relate to pedestrians, cyclists, and drivers of motor vehicles using the public road network.

15.1.2 Overview of Material Assets (Roads) in the Local Environment

The existing roads environment consists for the most part of lightly trafficked sections of the R503 Regional Road, along with local roads which are generally rural in nature and also lightly trafficked. All of these roads are 2-way roads, with the trafficked pavement varying in width from 3.5 to 5m, with narrow verges, and are generally bounded by low level earthen embankments or hedgerows along either side. The road pavements consist of traditional surface-dressed flexible pavement ('tar and chippings'), with road surface water drained to open drains, generally running along each of the roadsides.

Road Users are mainly people driving cars or vans to and from work/school. The R503 connects Thurles with Limerick and is also designated as a scenic route. The number of road users was low in general, with very low numbers of walkers or cyclists recorded during traffic counts.

The location of the UWF Grid Connection in relation to the local road network is illustrated on OSI Mapping on Figure GC 15.1: Location of the UWF Grid Connection.

Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

15.1.3 Sensitive Aspects of the Material Assets (Roads) Environment <u>included</u> for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspects **<u>are included in this topic chapter</u>** as they could be potentially impacted:

Sensitive Aspect No. 1	Public Roads	Section 15.2
Sensitive Aspect No. 2	Road Users	Section 15.3

<u>Each of the above listed Sensitive Aspects are evaluated individually in Sections 15.2 to 15.3 of this Chapter</u>.

To help readers navigate to individual sensitive aspect sections, the colour codes for each Sensitive Aspect used above are also used in the Sensitive Aspect sections Section 15.2 to 15.3. The colour-codes have been applied to section headings, tables and on side-tabs on the edge of the pages.

15.1.4 Sensitive Aspects excluded from further evaluation

The following Sensitive Aspects **are excluded from this topic chapter**:

Public Roads & Road Users on national and regional roads along delivery routes for concrete and aggregate deliveries, other materials deliveries, personnel and turbine component transportation on national and regional roads and local roads, as far as the R503 at Newport from the west, and at Ballycahill from the east, and the UWF Other Activities Haul Route Activity Locations: N69, N18, M7, R498, and the R503 from R498 junction as far as the consented Upperchurch Windfarm Site Entrance No.1.	Evaluated as excluded, due to Neutral impacts: It is considered that National and Regional Road pavements or buried structures are not likely to be affected by the delivery of the construction materials or the larger turbine components, due to the high capacity and good condition of these roads, the commonality of HGVs on these roads, and the absence of any requirement to carry out works to the road surface or to road structures in order to deliver turbine components or construction or operational materials or personnel.
Public Roads & Road Users along the route of any diversions temporarily put in place due to road closures on local roads.	Evaluated as excluded, due to Neutral impacts: It is considered that impacts to local roads or local road users due to any diversions will be Neutral, due to the brief or very short temporary duration of any diversion put in place along with the ability of these local roads to accommodate the additional traffic volumes and the lightly trafficked nature of the roads in this upland area.

15.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of a current application to An Bord Pleanála. The main parts of the UWF Grid Connection are identified in Table 15-1 below.

Table 15-1: Subject Development – UWF Grid Connection

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Ancillary Works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 EIAR Main Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

15.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.

- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. ***Note***: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

15.1.6 The Authors of the Material Assets (Roads) Chapter

The Material Assets chapter has been written by David Tarrant, Ruairí Geary and Daithí Barrett, all with project experience relating to the proposed type of works, with TLI Group.

David Tarrant is a Chartered Engineer and has over 12 years' experience in the Irish construction sector is currently a lead civil design engineer with TLI Group. David has worked on numerous HV Cable designs within the road network including national roads, TII Infrastructure crossings and also in designing new proposed roadways. Daithí Barrett is a Lead Environmental Scientist within TLI Group and has over 6 years' experience dealing specifically with environmental issues relating to the utility sector. Ruairi Geary is a Chartered Engineer and is a design team leader within TLI Group. Ruairí has over 14 years' experience in a wide range of Electrical/Mechanical/Civil engineering projects, specialising in the area of distribution and transmission network design, and in particular working on the ESB and Eirgrid Networks.

TLI Group is a utility infrastructure consultancy and construction company, operating extensively within the utilities sector both in Ireland and internationally. Designing and building overhead power lines and underground cables with associated structures are the company's core expertise.

15.1.7 Sources of Baseline Information

The information sources outlined in Table 15-2 were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 15-2: Sources of Baseline Information for Material Assets (Roads)

Type	Source
Consultation	Feedback was received from • Transport Infrastructure Ireland • Roads Department, Tipperary County Council • Members of the public during the Public Consultation and Information Day See Chapter 3: The Scoping Consultations, Chapter 3 Appendices for further details.
Guidelines	• The TII Traffic and Transport Assessment Guidelines (2014) • The TII Design Manual for Roads and Bridges (2013, as amended), • The Department for Transport Traffic Signs Manual (2010), • The TII Specification for the Reinstatement of Openings in National Roads (2013)
Desktop	• North Tipperary County Development Plan 2010 (as varied in 2016). • POWSCAR 2016, CSO Database • RSA Collision Statistics Database • EPA Mapping Database • Review of planning/ environmental information documents for the Other Elements of the Whole UWF Project as contained in Volume F of the planning application • Compilation of Appendix 15.1: Traffic and Transportation Assessment Report • Review of Pavement Management Systems' Appendix 15.2: Pavement Condition Survey • Review of Road Safety Audit by Malachy Walsh & Partners. Appendix 15.4: Stage 1 Road Safety Audit and Review
Fieldwork	• Passing Traffic Volume Data collection and assessment (ATC Tube Counts) • Buried Structures Survey (part of Appendix 5.2: Inventory and Survey of Watercourse Crossings) • A pavement video survey and pavement condition index (vPCI) survey for the whole road network involved in the development, by Pavement Management Services (PMS). Appendix 15.2: Pavement Condition Survey • Site Visits & Observation of road pavement and boundary conditions. Appendix 15.3: Site Photographs of UWF Grid Connection Roads, Bridges & Culverts. • Stage 1 Road Safety Audit and Review, by Malachy Walsh & Partners – see Appendix 15.4 • Peat Probe Survey on the R503. Appendix 15.5: Peat Probe Survey and illustrated on Figure GC 15.2. • Inventory and Survey of Watercourse Crossings. Appendix 15.6.

15.1.8 Methodology used to Describe the Baseline Environment and to Evaluate Impacts

The methodology used to describe the baseline environment and evaluate impacts was based on TII's Traffic and Transportation Assessment Guidelines (2014), and on the IMPERIA methodology, described in Section 15.1.8.2 below.

15.1.8.1 Transport Infrastructure Ireland - Traffic and Transportation Assessment Guidelines

15.1.8.1.1 TII Threshold Analysis

The TII guidelines recommend that a threshold assessment & analysis is undertaken. The threshold levels are included in the 1st column of Table 15-3 below. Whether or not the UWF Grid Connection project meets the criteria is detailed in the 2nd column.

Table 15-3: TII Threshold Analysis

Traffic Management Guidelines Thresholds for Transport Assessments	**Criteria met? Yes/No?**
Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road.	**Yes**, due to the extremely low existing traffic volumes on some of the local roads in the study area.
Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists or the location is sensitive	No - There are no roads classed as 'congested' – all roads are between 1% and 2% of their estimated capacity (as per the TII Guidelines, a junction or link is considered to be congested when traffic flows are at 85% of the estimated capacity of the junction or link)
Residential development in excess of 200 dwellings.	No - Not applicable
Retail and leisure development in excess of 1,000m^2.	No - Not applicable
Office, education and hospital development in excess of 2,500m^2.	No - Not applicable
Industrial development in excess of 5,000m^2.	No - Not applicable
Distribution and warehousing in excess of 10,000m^2	No - Not applicable

As one of the criteria in Table 15-3 will be met, a detailed Traffic & Transportation Assessment has been undertaken and has been incorporated into Section 15.2 and Section 15.3 of this chapter. The full Traffic and Transportation Assessment is included with the EIA Report as Appendix 15.1.

15.1.8.1.2 Methodology for Calculating Traffic Volumes

The construction traffic associated with the UWF Grid Connection and the Other Elements (UWF Related Works and Upperchurch Windfarm) has been quantified and the cumulative volumes have been calculated in order to evaluate the whole project impact on any roads which are affected by more than one element of the whole project.

The modelling of trip generation, assignment and distribution to the road network has been based on information in Chapter 5 of the EIAR Main Report.

In order to quantify the impact on traffic and transport, the construction traffic volumes and movements to and from the site compounds (the Temporary Compound at the Mountphilips Substation for UWF Grid Connection, and Site Compound No. 1 in Graniera for Upperchurch Windfarm and UWF Related Works) and the various site entrances and to and from quarries and the various construction works areas was calculated, and the daily and peak hour construction traffic movements associated with each site entrance or road works location was then calculated for the relevant local road. This was undertaken for a typical 24 Hour Annual Average Daily Traffic volume, and for the traditional weekday AM and PM peak hours.

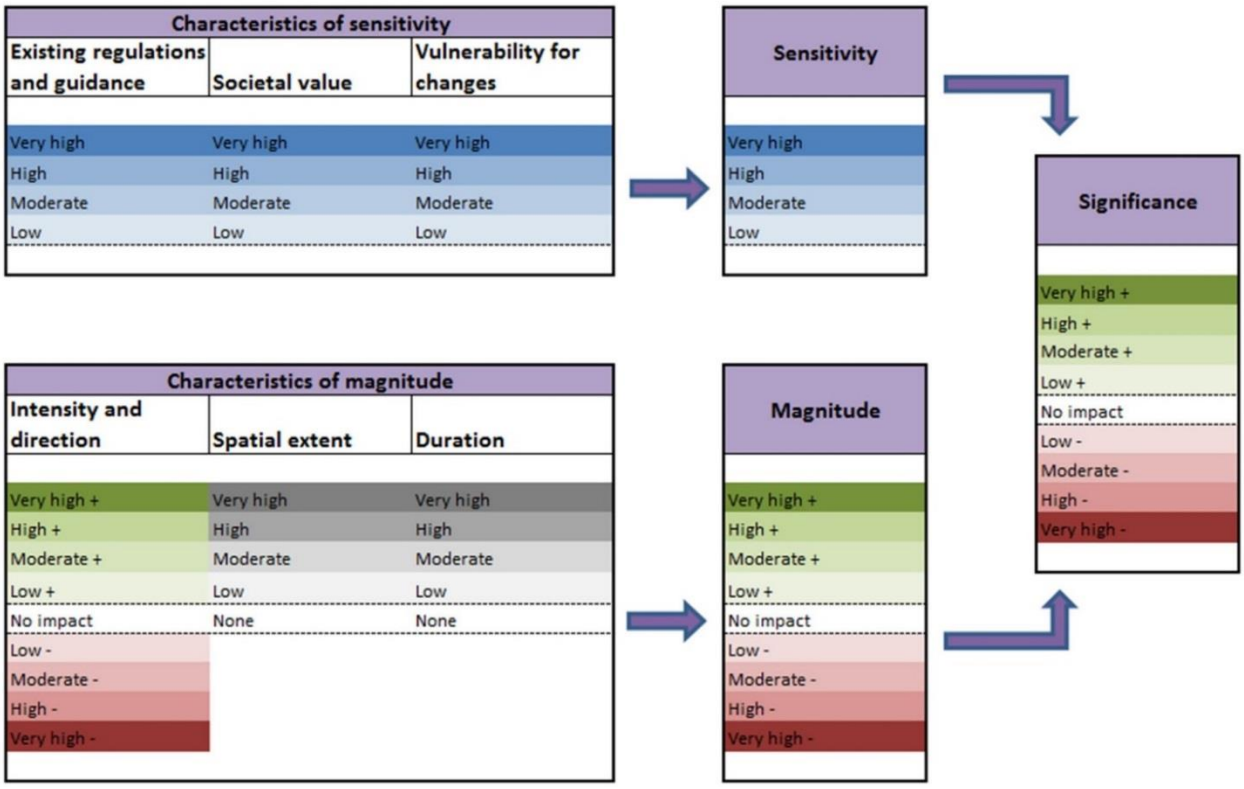
The Annual Average Daily Traffic volumes in PCUs without the works, for each of the affected roads has been measured through traffic counts, which were carried out on each affected road. Passing Traffic Volume Data collection and assessment (ATC Tube Counts) can be found in Appendix 15.1: Traffic and Transportation Assessment Report.

The transport impact of the additional construction traffic has been evaluated against the existing volumes and the future volumes, together with the quantified road link capacity based on the existing pavement width and conditions, using industry standard methods (TD76/99 Link Capacity Assessment) of link capacity assessment traffic volumes and link capacity details for each affected road. See Appendix 15.4: Stage 1 Road Safety Audit and Review.

15.1.8.2 Overview of the IMPERIA Methodology

The IMPERIA methodology is also used to evaluate the significance of impacts, together with the TII Guidance.

In the framework developed under the EC LIFE project - IMPERIA, the evaluation of impact significance uses a replicable, multi-criteria decision analysis, where the sensitivity of the receptor (i.e. the sensitivity of a Sensitive Aspect of the environment) and the magnitude of the change caused by a project are rated using sub-criteria or scales, and then the overall significance is evaluated using a matrix.



The criteria for determining the overall sensitivity of a receptor and magnitude of the change (impact) to the receptor, is provided in the tables below. The matrix for determining the significance of the impact to the receptor is provided after these tables.

15.1.8.2.1 Criteria for Evaluating the Sensitivity of a Receptor

Sensitivity of the receptor is a description of the characteristics of the receptor or aspect of the environment which will be affected by the development. It is a measure of 1) existing regulations and guidance, 2) societal value and 3) vulnerability for the change. The sensitivity of a receptor is estimated in its current state prior to any change implied by the project.

Existing regulations and guidance describes whether there are any such objects in the impact area, which have some level of protection by law or other regulations (e.g. prohibition against polluting groundwater and Natura areas), or whose conservation value is increased by programs or recommendations (e.g. landscapes designated as nationally valuable).

Societal value describes the value of the receptor to the society and depending on the type of impact may be related to economic values (e.g. water supply), social values (e.g. landscape or recreation) or environmental values (e.g. natural habitat). Societal value measures general appreciation from the point of view of the society. When relevant, the number of people impacted is taken into account.

Vulnerability for the change describes how liable the receptor is to be influenced or harmed by changes to its environment.

Sensitivity	Criteria Existing regulations/guidance	Criteria Societal value	Criteria Vulnerability to change
Low	Few or no recommendations which add to the conservation value of the impact area, and no regulations restricting use of the area (e.g. zoning plans).	The receptor is of small value or uniqueness. The number of people impacted is small.	Even a large external change would not have substantial impact on the status of the receptor. There are only few or none vulnerable receptors in the area.
Moderate	Regulation sets recommendations or reference values for an object in the impact area, or the project may impact an area conserved by a national or an international program.	The receptor is valuable and locally significant but not very unique. The number of people impacted is moderate.	At least moderate changes are needed to substantially change the status of the receptor. There are some vulnerable receptors in the area.
High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is unique and valuable to society. It may be deemed nationally significant and valuable. The number of people impacted is large.	Even a small external change could substantially change the status of the receptor. There are many vulnerable receptors in the area.
Very High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is highly unique, very valuable to society and possibly irreplaceable. It may be deemed internationally significant and valuable. The number of people affected is very large.	Even a very small external change could substantially change the status of the receptor. There are very many vulnerable receptors in the area.

The **overall sensitivity of a receptor** is assessed by the competent expert on the basis on his/her assessment of the components of sensitivity. A general guide for deriving the overall sensitivity is to pick the maximum of existing regulations and guidance and societal value and then adjust that value depending on the level of vulnerability.

Determining the Overall Sensitivity of a Receptor	
Low	The receptor has minor social value, low vulnerability for the change and no existing regulations and guidance. Even a receptor which has major or moderate social value may have low sensitivity if it's not liable to be influenced by the development.
Moderate	The receptor has moderate value to society, its vulnerability for the change is moderate, regulation may set reference values or recommendations, and it may be in a conservation program. Even a receptor which has major social value may have moderate sensitivity if it has low vulnerability, and vice versa.
High	Legislation strictly conserves the receptor, or it is very valuable to society, or very liable to be harmed by the development.
Very High	Legislation strictly conserves the receptor, or it is irreplaceable to society, or extremely liable to be harmed by the development. Even minor influence by the proposed development is likely to make the development unfeasible.

15.1.8.2.2 Criteria for Evaluating the Magnitude of an Impact

Magnitude of the impact describes the characteristics of the changes or effects that the planned project is likely to cause. Magnitude is a combination of 1) intensity and direction, 2) spatial extent, and 3) duration. Assessment of magnitude evaluates the likely changes affecting the receptor *without* taking into account the receptors sensitivity to those changes.

Intensity describes the physical dimension of a development. The direction of the change/effect is either positive (green) or negative (red).

Magnitude	**Criteria – Intensity & Direction**
Very High	The proposal has an extremely beneficial effect on nature or environmental load. A social change benefits substantially people's daily lives.
High	The proposal has a large beneficial effect on nature or environmental load. A social change clearly benefits people's daily lives.
Moderate	The proposal has a clearly observable positive effect on nature or environmental load. A social change has an observable effect on people's daily lives.
Low	An effect is **positive** and observable, but the change to environmental conditions or on people is small.
No impact	An effect so small that it has no practical implication. Any benefit or harm is negligible.
Low	An effect is **negative** and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has a clearly observable negative effect on nature or environmental load. A social change has an observable effect on people's daily lives and may impact daily routines.
High	The proposal has a large detrimental effect on nature or environmental load. A social change clearly hinders people's daily lives.
Very High	The proposal has an extremely harmful effect on nature or environmental load. A social change substantially hinders people's daily lives.

Spatial extent describes the geographical reach of, or the range within which, an effect is observable.

Duration describes the length of time during which an impact is observable and it also takes other related issues such as timing and periodicity into account. These are relevant for impacts which aren't observable all the time such as periodic impacts.

Magnitude	Criteria Spatial Extent	Criteria Duration
Low	Impact extends only to the immediate vicinity of a source. Typical range is < 1 km.	An impact whose duration is at most one year, for instance during construction and not operation. A moderate-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
Moderate	Impact extends over one municipality. Typical range is 1-10 km.	An impact lasts from one to a number of years. A long-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
High	Impact extends over one region. Typical range is 10-100 km.	An impact lasts several years. The impact area will recover after the project is decommissioned.
Very High	Impact extends over several regions and may cross national borders. Typical range is > 100 km.	An impact is permanent. The impact area won't recover even after the project is decommissioned.

Deriving the overall magnitude of the change from components of magnitude

Magnitude of the change is a comprehensive synthesis of its component factors. In a case, where intensity, spatial case and duration all get the same value, the magnitude would also be given this value. In other cases, intensity should be taken as a starting point, and the assessment should be adjusted based on spatial extent and duration to obtain an overall estimate. The aim is that the overall assessment should capture the characteristics of an effect. The table below describes some example descriptions of different categories for the magnitude of the change.

Determining the Overall Magnitude of the Change/Effect	
Very High	The proposal has beneficial effects of very high intensity and the extent and the duration of the effects are at least high.
High	The proposal has beneficial effects of high intensity and the extent and the duration of the effects are high.
Moderate	The proposal has clearly observable positive effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
Low	An effect is positive and observable, but the change to environmental conditions or on people is small.
No impact	No change is noticeable in practice. Any benefit or harm is negligible.
Low	An effect is negative and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has clearly observable negative effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
High	The proposal has harmful effects of high intensity and the extent and the duration of the effects are high.
Very High	The proposal has harmful effects of very high intensity and the extent and the duration of the effects are at least high.

15.1.8.3 Assessing the significance of an impact

The **assessment of the overall significance uses the matrix below,** where positive impacts are in green and negative in red. The matrix is based on the **magnitude of the change** affecting a receptor and on the **sensitivity of the receptor** to those changes.

The values obtained from the table are indicative because the most relevant dimensions for characterising an impact are dependent on the type of impact. Thus, some discretion from the expert is required, in particular in cases, where the one component is low and the other one high or very high.

Determining the Overall Significance of an Impact

Impact Significance		Magnitude of change								
		Very High	**High**	**Moderate**	**Low**	**No Change**	**Low**	**Moderate**	**High**	**Very High**
Receptor Sensitivity	**Low**	Significant*	Moderate*	Slight	Imperceptible	Neutral	Imperceptible	Slight	Moderate*	Significant*
	Moderate	Significant	Significant	Moderate	Slight	Neutral	Slight	Moderate	Significant	Significant
	High	Profound	Significant	Significant	Moderate*	Neutral	Moderate*	Significant	Significant	Profound
	Very High	Profound	Profound	Significant	Significant*	Neutral	Significant*	Significant	Profound	Profound

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

Note on Terms used in 'Determining the Overall Significance of an Impact' Table: *The Significance rating ascribed in the Table above have been refined from the ARVI tool, to provide a more nuanced understanding of the significance and also to be compatible with the terms used throughout this EIA Report, which have been informed by the EPA Guidelines on Information to be contained in EIAR (2017) for description of effects.*

In the above Table - Low has been refined as Slight or Imperceptible depending on context; High has been renamed as Significant; Very High has been renamed as Profound; No Impact is understood to also mean Neutral effect, which is defined in the EPA Guidelines as 'no effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error'.

15.1.9 Certainty and Sufficiency of the Evaluation/Information

The assessment follows industry-standard procedures, guidelines and best practices for the Assessment of Traffic and Transportation impacts.

The information which informed the baseline descriptions and impact evaluations was collated from site visits and surveys of the local and regional road network and surveys of bridge and culvert crossing structures, carried out in January and June 2019, and through consultation with the Roads Department of Tipperary County Council.

In respect of Roads, no significant limitations or difficulties were encountered.

15.2 Sensitive Aspect No.1: Public Roads

This Section provides a description and evaluation of the Sensitive Aspect - Public Roads.

15.2.1 BASELINE CHARACTERISTICS of Public Roads

15.2.1.1 STUDY AREA for Public Roads

The study area for Public Roads in relation to the UWF Grid Connection is described in Table 15-4 and illustrated on Figure GC 15.2: UWF Grid Connection Study Area for Public Roads (Volume C3 EIAR Figures).

Table 15-4: UWF Grid Connection Study Area for Public Roads

Study Area for Public Roads	Justification for the Study Area Extents
Construction works areas on the public road network; route of concentrated UWF Grid Connection construction traffic; roadwork locations on local roads; at site access points and the R503 regional road between Newport and Ballycahill.	Public Roads at road works locations or along routes of concentrated construction traffic or at the site access point may be affected by road works and construction traffic movement associated with UWF Grid Connection. Roads remote from the area are not likely to be affected.

15.2.1.2 Baseline Context and Character of Public Roads in the UWF Grid Connection Study Area

The roads which could be potentially affected by the UWF Grid Connection works and associated haulage are the **Regional Road** R503, along with the **Local Roads** (designated as "L" Roads); L2166-10, L6013-0, L2156-0, L2157-0, L6009-0, L5337-1, L2264-50, L6188-0. With the exception of the L5337-1 at Tullow Newport, all of these roads will be subject to trenching and joint bay excavation works for the 110kV UGC.

The L6013-0 will not be used as a haulage route from the Mountphilips Substation Site (location of the temporary construction compound) to the L2156-0, L2157-0 and L6009-0 when installing the 110kV UGC along these roads. Rather traffic from the temporary construction compound at Mountphilips Substation site will use the L2166-10, through Newport town and then the L5337-1 at Tullow to access the L2156-0, L2157-0 and L6009-0 works, thus avoiding the L6013-0 entirely.

15.2.1.2.1 Road Pavements

The roads are 2-way roads, with the trafficked pavement varying in width from 3.5 to 5m. The road pavements generally consist of traditional surface-dressed flexible pavement ('tar and chippings'), with narrow verges and road surface water drained to open drains, generally running along each of the roadsides.

15.2.1.2.2 Pavement Condition

A Pavement Condition Survey was carried out to evaluate the type, severity and quantity of pavement distress for each 100 metre length of pavement along the route of the survey. These distresses include defects such as bleeding, ravelling, patching, rutting, depressions, alligator cracking, potholes, edge break-up and road disintegration. The Pavement Condition Index (PCI) rating, the structural index and the surface index based on distress type, are calculated for each 100 metres from the distress data collected. The data and detailed survey results are included in Appendix 15.2: Pavement Condition Survey and summarised below. Photographs of each road are included in Appendix 15.3: Site Photographs of UWF Grid Connection Roads, Bridges & Culverts. The survey found that, in general, the road condition is good to fair throughout the study area.

Table 15-5: PCI Rating System (index between 0 and 100).

PCI Range	Pavement Condition Rating
85 to 100	Very Good
65 to 85	Good
50 to 65	Fair
40 to 50	Poor
20 to 40	Very Poor
< 20	Fail

Table 15-6: Pavement Condition Ratings (roads listed from west to east)

Road No.	Pavement Condition Index	Rating	Length of UWF Grid Connection 110kV UGC (km)
L-2166-10	57/46	Fair / Poor	0.8 km
L-6013-0	62	Fair	1.2 km
L-2156-0	50	Fair	0.3 km
L-2157-0	57/36	Fair / Very Poor	0.8 km
L-6009-0	81	Good	1.7 km
R-503	81	Good	22.2 km
L-2264-50	71	Good	1.9 km
L-6188-0	73	Good	0.3 km

15.2.1.2.3 R503 Road Stability through areas of mapped peat soils

Sections of the 110kV UGC route pass through mapped peat soils (as per EPA Corine 2018 mapping) in the central part of the route on sections of the Regional Road R503. Peat probe sampling was carried out to determine the depth of peat in these areas (see Appendix 15.5: Peat Probe Survey). A total of 20 peat probe test samples were completed, with peat identified in 5 no. of these locations in Reardnogy More and Knocknabansha townlands. Peaty topsoil only (i.e. no deep peat) was recorded at the other 15 no. locations. At the 5 no. locations where peat depths were recorded, the peat depth ranged between 1m and 4m. At four of the five locations it was found that the high side of the road comprised of firm dry ground, and that the lower (southern) side of the road also comprised dry ground close to the road with wetter boggier ground further away from the road. Boggy ground was noted on both sides of the road at one location at Reardnogy Beg. The locations of the 20 no. peat probes are identified on Figure GC 15.2.

A visual survey of the R503 Regional Road was carried out by the topic authors in August 2019. During this survey, recent repair works to the road to correct differential (uneven) settlement of the road were identified. Overall, based on these surveys, it is expected that the sections of the R503 road through mapped peat soils are substantially of 'excavate and fill' construction, though not all sections of road may be built on competent ground and would be considered to be of 'floating road' construction.

The design of the 110kV UGC cables trench includes the application of floating road trench design where competent ground is not encountered – i.e. on sections where the road is not sitting on solid ground. This essentially involves installing geogrid material around the cable trench and lapped 1m over the existing road at both sides of the trench in order to secure the cable trench into the road build up. An additional geotextile layer is installed at the bottom of the trench, if the bottom of the trench is sitting on peat, this will provide additional stability for the installation of the cable trench. During reinstatement of these sections of 110kV UGC a minimum width of 2.6m of roadway will be reinstated to mitigate against differential (uneven) settlement through spreading loads and creating a more even distribution of pressures across the peat

surface[1]. It is considered that the application of floating road trench design and the minimum 2.6m reinstatement of the road above will improve the performance of these sections of road.

15.2.1.2.4 Buried structures (bridges and culverts)

There are 63 No. buried structures located on the route of the 110kV UGC, comprising a mix of bridges, plastic or concrete pipe culverts and small masonry stone culverts. The number of each type of structure for each road along the route of the 110kV UGC is detailed in Table 15-7 and illustrated on Figure GC 15.2: UWF Grid Connection Study Area for Public Roads. Photographs of these structures are included in Appendix 15.3: Site Photographs of UWF Grid Connection Roads, Bridges & Culverts and an inventory is included in Appendix 15.6: Inventory and Survey of Watercourse Crossings.

Table 15-7: Buried Structures in Public Roads (roads listed from west to east)

Road No.	No. of bridges	No. of culverts	Length of UWF Grid Connection 110kV UGC (km)
L-2166-10	0	1	0.8 km
L-6013-0	1	1	1.2 km
L2156-0	1	0	0.3 km
L2157-0	0	0	0.8 km
L6009-0	2	0	1.7 km
R-503	11	41	22.2 km
L-2264-50	0	3	1.9 km
L-6188-0	0	2	0.3 km

The buried structures listed above area were inspected by Chartered Engineers from TLI Group during site investigations in January and June 2019.

15.2.1.2.5 Road stability in the vicinity of old masonry culverts

13 no. culverts along the 110kV UGC route are old masonry culverts which potentially will require replacement during construction works. Some of these culverts have already partially collapsed. A visual inspection was carried out by the topic authors in August 2019 of the stability of the road above these culverts. The survey found no evidence of road instability at any of the culvert locations.

15.2.1.2.6 Structural Condition of Bridges

All bridges along the route of the 110kV UGC were visually assessed by David Tarrant, structural engineer with TLI Group, as part of bridge crossing design. At the 15 No. bridges, the visual condition of the structures is as expected for the construction type and age of structures. There were no visual cracks or depressions in the road surfaces above the bridges/culverts at the time of inspection. It is considered that the road structures above the bridges (where trenching in the bridge deck is required) were in good condition and will be capable of supporting the 110kV UGC infrastructure and the increased traffic loading associated with the construction works.

[1] Scottish National Heritage & Forestry Commission Scotland, *Floating Roads on Peat* (2010)

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15.2.1.2.7	Cable Trench design for Bridge crossings

For over half of all bridge crossings, sufficient depth/cover is provided in the bridge deck to allow the installation of the ducting in standard trefoil formation. Where the bridge deck has insufficient dimensions/cover to accommodate the standard trefoil detail (<1250mm depth), a flat cable formation will be utilised. Ducts laid in flat formation will be laid in C25/30 concrete, ensuring protection for the ducts and providing localised strengthening of the bridge arch beneath the ducting.

15.2.1.2.8	Works at Bridges

No works will be required to the bridge structures themselves, however at Rockvale Bridge (W7), Tooreenbrien Bridge (W36) and Anglesey Bridge (W53), the road level will be raised to provide sufficient cover over the cables and this raising of the road will require that the height of the bridge parapet walls are increased to meet current Tii requirements/standards. These bridges are identified on Figure GC 15.2: UWF Grid Connection Study Area for Public Roads.

15.2.1.2.9	Directional Drilling under bridges

2 No. Bridges along the proposed route of the 110kV UGC (Watercourse crossing W8 and W9) are not considered to have sufficient road depth over the bridge arch/deck to accommodate the cable ducting and therefore are proposed to be crossed via a method of Horizontal Directional Drilling (HDD) under the existing bridge. At W8 and W9, where the bridge is drilled under, the bridge will remain unchanged as a result of the proposed works.

Relevant EIAR Figures:

Figure GC 15.2.1: Remedial Works to Bridges at W7, W36 and W53. Detailed drawings of all 15 No. bridges are included in the Drawings Pack Volume B of the Planning Application.

15.2.1.2.10	Culvert Crossing Design

The 48 No. culverts (under the public road) are comprised of both concrete/plastic pipes and masonry box culverts, **no works will be required to 35 No. of these culverts**, with the 110kV UGC installed either under or over these culverts.

At the remaining 13 No. culverts, the existing old masonry box culvert may need to be replaced (12 No. of which are under the R503, and 1 No. under the L-2265-50), and the 110kV UGC will be installed under the existing/replaced culvert. These culverts are identified on Figure GC 15.2: UWF Grid Connection Study Area for Public Roads.

Material Assets (Roads)

Relevant EIAR Figures:

Figure GC 15.2.2: Cross Sections of 110kV UGC over and under existing culverts

Figure GC 15.2.3: Cross Sections of Replaced Culvert along the 110kV UGC

Detailed drawings of the culvert crossings are included in the Drawings Pack Volume B of the Planning Application.

15.2.1.2.11	Buried Structures along Construction material Haulage Routes

Topic

There is 1 No. additional buried structure (bridge) along the construction material haulage route on the L5337-1 at Tullow. The buried structure is currently in good condition and will be capable of supporting the increased traffic loading associated with the construction works. No works will be required to this structure, and it scoped out from further evaluation in this report.

15.2.1.2.12 Weight Restrictions

There are **no vehicle weight restrictions in place** along any of the roads affected by the works. This provides a useful guide to the acceptability of the roads and buried structures and their adequacy to facilitate the movement of HGV vehicle types, subject to the normal legally allowable axle loading on Irish Roads.

15.2.1.2.13 Road Boundaries

Road Boundaries consist of a mix of hedgerows and simple mounded embankments, which are aligned beyond drainage channels that occur in most roadside verges. The road boundary at Coole (where the site entrance for Mountphilips Substation will be located) consists of earthen banks and hedgerow with some immature trees alongside the road).

15.2.1.2.14 Traffic Volumes

Observation based on site visits, and a review of the traffic survey information, confirms that all of the roads within the study area, including the Regional Roads, are very lightly trafficked, and have on average 98.8% spare capacity during peak traffic periods. Traffic volumes are described in further detail in Section 15.3.1.2 of this Chapter, with data from the traffic count surveys included in Appendix 15.1: Traffic and Transportation Assessment Report.

15.2.1.3 Importance of Public Roads

According to the Department of Transport, Tourism and Sport[2], 'the regional and local roads programme is important from economic, social and political perspectives. These roads serve an important economic role in the Irish context and also have valuable social and community functions. These roads are often the sole means of access for local economic activity and play a very important role in Ireland due to

- the dispersed nature of the population and industrial development;
- the importance of tourism and agriculture as generators of wealth and employment; and
- the increasing attention being given to rural development and urban regeneration'.

The R503 runs generally in an E-W orientation and links Thurles town to the east with Newport town and Limerick City to the west and is identified as Strategic Roads in the North Tipperary County Development Plan 2010 (as amended).

The local roads generally serve as access to local residential traffic and are used for farming and rural operations and activities. The R503 is also designated scenic route in Tipperary North County Development Plan.

With the exception of Rockvale Bridge at W7, Tooreenbrien Bridge at W36 and Anglesey Bridge at W53, the buried structures, listed above, are not considered to be structurally important, and they serve solely as a route to carry storm water run-off and water in small watercourse under the road. The Anglesey Bridge at W53 is historically important, being listed under the National Inventory of Architectural Heritage. The potential for effects to the cultural heritage or architectural heritage of the Anglesey Bridge are evaluated in Chapter 16: Cultural Heritage, Section 16.3.4.1 and Appendix 16.2: Architectural Heritage Impact Assessment of Anglesey Bridge.

[2] http://www.dttas.ie/roads/english/regional-and-local-roads

15.2.1.4 Sensitivity of Public Roads

Road pavements and buried structures can be affected by road works involving the excavation of the pavement, works at bridges, and by increases in traffic, particularly HGV traffic. Road boundaries can be affected by new or widened accesses from the public road network onto the lands beyond.

Based on the IMPERIA methodology, outlined in Section 15.1.8, Public Roads (including road pavements, bridges and culverts) are evaluated as having **Moderate** Sensitivity due to their value to society which is locally and regionally significant but taking into account the low usage of the roads in the study area which have 99% available capacity. As described in Section 15.2.1.3 above, one bridge, Anglesey Bridge, is listed on the National Inventory of Architectural Heritage and is evaluated as having 'High' sensitivity.

15.2.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

The current condition of the public road pavements and the current good condition of the buried structures is likely to continue with very slow increases in annual traffic volumes, in the region of 1-2% per annum.

15.2.1.6 Receiving Environment (the Baseline + Trends)

The condition of road pavements and buried structures are assumed to be the same as the current condition by the start of the construction stage. Published annual national traffic growth rates of 1-2% per annum have been applied to the measured 2019 volumes on the affect roads for the years 2020/2021[3], to allow for worst case traffic volumes during a 2020/2021 construction stage.

[3] Whilst a 2020/2021 opening year has been selected for the works, in light of the anticipated slow change in the baseline conditions, it should be noted that any required change (of say 2-3 years) in the selection of opening year will have no implications whatsoever for the conclusions of the study due to the very lightly trafficked nature of the affected roads.

15.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

15.2.2.1 Cumulative Evaluation Study Area

15.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Public Roads	Justification for the Study Area Extents
Route of concentrated UWF Grid Connection construction traffic; roadwork locations on local roads; at site access points and the R503 regional road between Newport and Ballycahill.	Public Roads at road works locations or along routes of concentrated construction traffic or at the site access point may be affected by road works and construction traffic movement associated with both UWF Grid Connection *and* Other Elements of the Whole UWF Project or Other Projects. The study area has been extended out to Ballycahill in order to take account of traffic to UWF Related Works and Upperchurch Windfarm from the quarry in Holycross, which will join the R503 Regional Road at Ballycahill. Roads remote from the area are not likely to be affected. The local roads between the Holycross quarry and the junction with the R503 at Ballycahill are not likely to be affected due to the existing daily use of these roads by quarry traffic, in the context of the daily output capacity of the quarry.

The study area is illustrated on Figure CE 15.2: UWF Grid Connection Cumulative Evaluation Study Area for Public Roads.

15.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 15.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 15-8 and illustrated on Figure WP 15.2: Whole Project Study Area for Public Roads (Volume C3 EIAR Figures).

Table 15-8: Cumulative Evaluation Study Area for Public Roads

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Route of concentrated UWF Grid Connection construction traffic; roadwork locations on local roads; at site access points and the R503 regional road between Newport and Ballycahill.	Public Roads along routes of concentrated construction traffic or at road works or site access points may be affected by construction traffic movements and road works.
Element 2: UWF Related Works		
Element 3:		

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
UWF Replacement Forestry		Roads remote from the area are not likely to be affected.
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

15.2.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Public Roads also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Public Roads with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.29).

The results of this scoping exercise are that: Castlewaller Windfarm (consented windfarm, potential grid connection and potential widened forestry entrance on the R503) have been scoped in for evaluation of cumulative effects to Public Roads.

The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 15.2.

15.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Public Roads

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Public Roads. The results of this evaluation are included in Table 15-9.

The location of, and study area boundary associated with, the Other Elements and Other Projects which are included for cumulative evaluation is illustrated on Figure WP 15.2. The baseline character of the areas around these projects is described in Section 15.2.2.3.

Table 15-9: Results of the Evaluation of the Other Elements and Other Projects & Activities

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3:UWF Replacement Forestry	Evaluated as excluded: No impacts due to: The road which could be potentially affected by the UWF Replacement Forestry is the **Local Road** L2264-34, from which access will be gained through an existing farm entrance to the afforestation lands. This road is a 2-way road made of traditional surface-dressed flexible pavement ('tar and chippings'), with narrow verges and road surface water drained to open drains, generally running along one/both of the roadside. The road is very lightly trafficked with 99.6% spare capacity, and is not subject to any vehicular weight restrictions. Road boundaries consist of a mix of hedgerows and simple mounded embankments, which are aligned beyond drainage channels that occur in many roadside verges.

	• No noticeable increase in traffic volumes on the public road network due to the extremely low traffic volumes associated with the UWF Replacement Forestry - the planting stage will generate 1-2 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 2 to 4 vehicle movements per year. • No requirement for roadworks or works to roadside boundaries or buried structures. In relation to the entrance to the UWF Replacement Forestry from the public road; the existing farm entrance will be used. This entrance (labelled EW10 on the drawings and mapping included with the UWF Related Works application to Tipperary County Council) currently has sufficient sightlines and set back distances. No changes to the geometry of the existing entrance will be required to accommodate the new native woodland. The only change relates to a change of use from agricultural to agriculture and forestry, which will have no effect on Public Roads.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral Impact/No Impact due to: • Notwithstanding the National and Regional Road network along the turbine component and materials haul routes are scoped out in Section 15.1.4, in relation to the Haul Route Activities, none of the Tii Guideline thresholds (see Table 15-3) are met, and therefore further analysis is not required - the traffic increases as a result of the Haul Route Activities (tree trimming, laying of matting, street furniture removal), will be in all cases considerably less than 1% of the current traffic volumes on these roads and as a result will be neutral, given that the normal day-to-day variation in traffic conditions can be as much as 10%. In addition, tree trimming is regularly carried out to roadside boundaries and is a commonplace occurrence on the public road network, and specifically in relation to the Clarina junction on the N69 outside Limerick, the turbine component delivery route across the side of the roundabout at Clarina Junction will be provided through the use of a 'geogrid' material, which will be used to facilitate the use of the roundabout without disturbing the soil or causing damage to the roundabout.. • Upperchurch Hen Harrier Scheme & Monitoring Activities & Overhead Line Activities: no works to the road network or road boundaries form part of these activities, and taking into consideration the extremely low volumes of traffic associated with these activities, and the brief duration of any public road use, no effects to Public Roads are likely to occur.
Castlewaller Windfarm (consented windfarm, potential grid connection, including potential site entrance works off the R503)	Yes, included for the evaluation of potential cumulative effects to Road Pavements. Excluded in relation to cumulative effects to bridges and culverts as the potential for cumulative impacts only relates to the 110kV UGC on the L6009-0 road, where 110kV UGC will be directionally drilled under the two watercourse crossings structures on this road – thereby avoiding direct impacts to these

	bridges, and consequently there is no potential for cumulative impacts to these bridges. Excluded in relation to roadside boundaries, as the 110kV UGC works will be within road pavements with no works in verges or boundaries along the L6009-0 or R503 roads, therefore no interaction with any potential Castlewaller Windfarm grid connection or site entrance works.

15.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

15.2.2.3.1 Element 2: UWF Related Works

The roads which could be potentially affected by the UWF Related Works and associated haulage are the Regional Road R503 (between Newport and Ballycahill) along with the Local Roads (designated as "L" Roads); L6185-13, L2264-50, L6188-0, L61881-0, L2264-34, L4139-16, L4138-12 and L4139-0.

Buried Structures: There are 3 No. buried structures under affected roads; concrete culverts routing storm water under the L6188-0 at WW31 and under the L4139-0 at WW12 and a square masonry culvert routing a small stream under the L6185-13 road at WW32.

Road Boundaries**:** consist of a mix of hedgerows and simple mounded embankments, which are aligned beyond drainage channels that occur in many roadside verges.

Traffic Volumes: Observation based on site visits, and a review of the traffic survey information, confirms that all of the roads within the study area, including the Regional Roads, are very lightly trafficked, and have on average 99% spare capacity during peak traffic periods.

15.2.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 15.2.2.2.1

15.2.2.3.3 Element 4: Already Consented Upperchurch Windfarm

The regional and local roads associated with the UWF Related Works will also be used for access to the Upperchurch Windfarm.

Consideration of the Passage of Time: The makeup and number of road users of the public road network in the vicinity of Upperchurch Windfarm has not materially changed since the preparation of the 2013/2014 planning documents and assessments. It is considered therefore that the information in the 2013 EIS, is relevant to the cumulative evaluations in this EIAR for UWF Grid Connection.

15.2.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 15.2.2.2.1

15.2.2.3.5 Other Projects or Activities

Castlewaller Windfarm: Although Castlewaller grid connection is not likely to be constructed during the same period as UWF Grid Connection (because the Castlewaller Windfarm has not yet been offered a grid connection from EirGrid) in the event that the 2 No. projects are built at the same time, there could be cumulative impacts to road surfaces/boundaries and any culverts present at the point of interaction on the L6009-0 (potential grid connection cabling) and the R503 (potential widening works at an existing forestry entrance at Fanit) and therefore this project is scoped in for consideration. The potential grid connection for Castlewaller, could overlap the 110kV UGC route on the L6009-0 road.

15.2.3 PROJECT DESIGN MEASURES for Public Roads

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 15-10 are relevant to the Environmental Factor, Material Assets (Roads), and in particular to the sensitive aspect **Public Roads**.

Table 15-10: UWF Grid Connection Project Design Measures relevant to Public Roads

PD ID	Project Design Environmental Protection Measure (PD)
PD04	All construction works will be carried out during daylight hours.
PD07	110kV UGC construction works along the local roads L2264-50 and L6188-0, will not take place at the same time as the UWF Related Works Haul Route Works on these roads. The 110kV UGC construction works will also be scheduled so that the works do not occur on the same days as concrete deliveries for Consented UWF Turbines along these local roads.
PD13	As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the Promoter will fund the costs of Tipperary County Council engaging a chartered Civil Engineer to oversee quality control and compliance with drawings, specifications and road opening conditions for the duration of the works

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5**,** in Volume C4: EIAR Appendices.

15.2.4 EVALUATION OF IMPACTS to Public Roads

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Public Roads.

As a result of the exercise, some impacts were included and some were excluded.

Table 15-11: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Damage to road pavements (construction stage)	*Decrease in structure integrity of roads (construction stage)*
Damage to Bridges & Culverts (construction stage)	*Operational Stage Impacts*
Damage to road boundaries (construction stage)	*Decommissioning Stage Impacts*

The source-pathway-receptor links for included impacts are described in the Impact Evaluation Tables in the next sections. **The Impact Evaluation Tables are presented in the following sections 15.2.4.1 to 15.2.4.3.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections, in Section 15.2.4.

15.2.4.1 Impact Evaluation Table: Damage to Road Pavements

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Excavations for cable trenches and joint bays, construction/delivery traffic
Cumulative Impact Source: Trenching works, site access, construction/delivery traffic
Impact Pathway: Roads

Impact Description: Road pavements comprise the hard surfacing of the road, along with the supporting subgrade underneath. The roadside verge and drainage influences the quality of road edges and road condition. Road pavements can be damaged by excavations of the surface and also by large volumes of additional traffic. The use, widening, or opening of site access points can also lead to deterioration of the road edge.

The methodology employed to evaluate the effect on road pavements is based on the Transport Infrastructure Ireland's Traffic and Transportation Assessment Guidelines, using the methodology as outlined in Section 15.1.8. See Appendix 15.1: Traffic and Transportation Assessment Report, and also Appendix 15.2: Pavement Condition Survey, and Appendix 15.5: Peat Probe Survey, which informed this evaluation.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Damage to Road Pavements

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude: The impact to public road pavements relates to the widening of the existing field entrance at Coole for the Mountphilips Substation, and the construction of the 110kV Underground Cables (UGC) along 29.2km of the public road network between the Mountphilips Substation site entrance at Coole and the private paved road in Knockcurraghbola Commons (in the vicinity of the Consented UWF Substation).
The 110kV UGC is routed along the L2166-10 (0.8km), L6013-0 (1.2km), L2156-0 (0.3km), L2157-0 (0.8km), L6009-0 (1.7km), R503 (22.2km), L2264-50 (1.9km), L6188-0 (0.3km).

Verge Works: Works to road verges will only occur at Mountphilips Substation site entrance at Coole townland where the existing field entrance will be permanently widened – with 6m of verge removed and overlaid with hardcore.

Excavation of road surfaces for cable trenches: The construction of the 110kV UGC will involve the excavation of a trench c.1.3m deep and 0.6m wide within public road pavements. In total there will be 29.2km of cable trench within the road pavements. The construction works will proceed in a linear manner with on average 100m of cable trench completed each day. At the end of each day, the completed sections of cables trench will be reinstated with a temporary surface for road safety and trench integrity purposes. See Figure GC 15.2.2: Cross Sections of 110kV UGC over and under existing culverts. A floating road design will be used at any locations where competent ground is not encountered during trench excavations. This is expected to be limited to short lengths of the R503 in Reardnogy More and Knocknabansha townlands. A detailed drawing of the cable trench is included in the drawings pack in Volume B: Planning Drawings with the planning application.

Excavation of road surfaces for Joint Bays: The construction of the 110kV UGC will require the excavation of an area, c. 2.5m wide and 6m long and 2.3m deep, to install pre-cast concrete chambers for the 40 No. Joint Bays under the public road pavements. All Joint Bays will include comprise a joint bay chamber and 2 ancillary chambers (Earth Link Chamber & Communications Chamber). Following excavations, the precast joint bay, link box and communications chambers will be placed in-situ and the surrounding road pavement reinstated. The joint bay chambers will be temporarily filled with sand, fitted with precast concrete covers, and the road surface above temporarily reinstated. The joint bay will be temporarily reopened to pull through the cables, being temporarily reinstated once more, until the cable jointing is carried out. Following jointing the joint bay chamber will be temporarily reinstated, ready for final permanent reinstatement following commissioning. The

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road surface over joint bay chambers will be fully reinstated with no access chambers. The Earth Link Chamber and Communications Chamber will have surface access chambers and a man-hole type cover at road surface level. See Figure 15.2.4: Views of 110kV UGC Joint Bays.

Reinstatement of Road Surfaces: Full permanent reinstatement will take place at the end of construction works, or otherwise in accordance with the conditions of the Road Opening Licence. All sections of roads subject to trenching works in the road pavement will be permanently reinstated with surface dressing, to the specification of the Road Opening Licence(s) and in accordance with Department of Transport, Tourism & Sport Guidelines for Managing Openings in Public Roads (April 2017); and will be subject to the Traffic Management Plan. This road reinstatement will ameliorate any impacts to road pavements, and therefore it is considered that no permanent impacts to road pavements are likely to occur.

Additional Construction Traffic: All of the roads within the UWF Grid Connection Study Area are in good condition (see Appendix 15.2: Pavement Condition Survey) with an average excess of c.98% of the capacity of each road remaining available during construction works (see Appendix 15.1: Traffic and Transportation Assessment Report). Therefore, the deterioration of the road edges or reduction in the integrity of road pavements, due to the additional construction traffic, is not expected to occur. Nonetheless, the project Promoter is committed to carrying out Pavement Condition Surveys both before and after the construction period, and any pavements which are inadvertently damaged by construction traffic will be repaired to the satisfaction of Tipperary County Council.

Overall the magnitude of the impact to road pavements is **Moderate** due to the moderate intensity (observable effect on people's daily lives and may impact daily routines), high spatial extent (more than 10km), and low duration (impacts will be less than 1 year in any road with permanent reinstatement) as per the IMPERIA methodology, see Section 15.1.8.2.2.

Significance of the Impact: Moderate

Rationale for Impact Evaluation:

- the Moderate Sensitivity and the Moderate Magnitude, as per IMPERIA methodology outlined in Section 15.1.8.1.3
- the temporary duration of the works, with temporary reinstatement, and permanent reinstatement at the completion of works
- The lightly trafficked nature and extent of available capacity on all roads (in excess of 98% on average)
- As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the Promoter will fund the costs of Tipperary County Council engaging a chartered Civil Engineer to oversee quality control and compliance with drawings, specifications and road opening conditions for the duration of the works.
- The reinstatement of trenching locations within road pavements in accordance with the Department of Transport, Tourism & Sport Guidelines for Managing Openings in Public Roads (April 2017).

Material Assets (Roads)

Topic

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude:
There is no potential for cumulative effects with Upperchurch Windfarm, as Upperchurch Windfarm will not involve any works to road pavement surfaces or verges.
There is potential for cumulative effects with UWF Related Works on the R503 at Knocknabansha, and along the local roads L2264-50 and L6188-0 at Knockmaroe and Knockcurraghbola Crownlands where excavations for the 110kV UGC will occur along with verge/boundary works for UWF Related Works Haul Route Works and a 5m section of the cable trenches in each of the local roads for the UWF Related Works Internal Windfarm Cabling. The magnitude of cumulative impacts will be reduced by the avoidance of road works for UWF Grid Connection being carried out at the same time as road works for UWF Related Works on the L2264-50 or L6188-0 local roads (Project Design Measure), with the 110kV UGC trench being reinstated with a temporary surface on a daily basis. All sections of roads subject to trenching works in the road pavement will be permanently reinstated with surface dressing, to the specification of the Road Opening Licence(s) and in accordance with Department of Transport, Tourism & Sport Guidelines for Managing Openings in Public Roads (April 2017); and

will be subject to the Traffic Management Plan. This road reinstatement will ameliorate any impacts to road pavements, and therefore it is considered that no permanent impacts to road pavements are likely to occur.

Cumulative impacts also related to combined construction traffic on the R503, the L2264-50 and L6188-0 roads associated with UWF Grid Connection and UWF Related Works and the Consented Upperchurch Windfarm. Pavement Condition Surveys (see Appendix 15.2: Pavement Condition Survey) undertaken on these roads show that the roads are in good condition, while Transport Modelling (see Appendix 15.1: Traffic and Transportation Assessment Report) of the combined worst case construction traffic demonstrates that, while the volume of traffic on the L6188-0 will double in volume, an average excess of c.95% of the capacity of each road will remaining available during construction works. Therefore, the deterioration of the road edges or reduction in the integrity of road pavements, due to the additional construction traffic, is not expected to occur. Nonetheless, the project Promoter is committed to carrying out Pavement Condition Surveys both before and after the construction period, and any pavements which are inadvertently damaged by construction traffic will be repaired to the satisfaction of Tipperary County Council.

While the spatial extent of roads affected cumulative is low, there are works for three projects ongoing on the L2264-50 and therefore it is considered that the magnitude of effects on the **L2264-50 is Moderate**, while the magnitude on the **L6188-0 in Knockcurraghbola Commons is Low.**

There is potential for cumulative impacts with the potential Castlewaller grid connection trenching works along the **L6009-0** at Castlewaller / Carrowkeale / Derryleigh townlands and at the R503 (Castlewaller Site Entrance) at Fanit townlands over a 1 month period. The cumulative impact magnitude is evaluated as **Low** for the public road as significant cumulative construction impacts are not expected as works will either take place at separate times, or should works be carried out at the same time, then works for both projects are likely to be carried out by one crew, with no significant cumulative damage to the road pavement with road reinstatement, subject to road opening licenses, and although a longer construction periods is possible on the local road L6009-0, this will not cause significant effects to residential amenity, as the works are still temporary and of short duration, during daylight hours. Works at the R503 entrance will not cause cumulative significant impacts to the public road due the very short duration of both 110kV UGC works and the entrance works.

Significance of the Cumulative Impact: **ranges from Moderate** (on L2264-50) **to Slight** (on L6188-0, L6009-0 and R503 site entrance)

Rationale for Impact Evaluation:

- the Moderate Sensitivity and the Low to Moderate Magnitude, as per IMPERIA methodology outlined in Section 15.1.8.2.2.
- The temporary duration of the works, with temporary reinstatement, and permanent reinstatement at the completion of works;
- The lightly trafficked nature and extent of available capacity (average in excess of 95%) on all roads
- The reinstatement of trenching locations within road pavements in accordance with the Department of Transport, Tourism & Sport Guidelines for Managing Openings in Public Roads (April 2017)
- The scheduling of works to avoid roadworks from both UWF Grid Connection and UWF Related Works occurring at the same time, on the L2264-50 and L6188-0.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: Haul Route Works will involve the removal of a total of 1710m of verges on the R503, L4139-0, L4138-12, L2264-50, L6188-0, L6185-13 roads, hardcore will be laid and compacted on these verge areas, and following construction, soil will be laid over the hardcore during reinstatement of the verge.
Internal Windfarm Cables will involve a total of 45m of trench excavations in the road pavement on the L4139-0, L4139-16, L6188-0, L61881-0, L6185-13, L2264-34, L2264-50. Small sections of verge will be also being removed and overlaid with hardcore at the 9 No. temporary entrances for the Internal Windfarm Cabling and Haul Route Works. The additional construction traffic associated with the UWF Related Works will have a negligible effect on the network capacity and operation of the roads within the study area, as 99.6%, on average, of the capacity of each of the roads will remain available during the construction stage.

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Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The temporary duration of the works,
- The lightly trafficked nature and extent of available capacity on all roads
- The reinstatement of trenching locations within road pavements in accordance with the Tii Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads
- The repair of any damage to road pavements along concentrated construction traffic haul routes.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 15.2.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude: There are no works planned to the public road surfaces. Works involving the laying of hardcore on road verges will occur at the main Site Entrance on the R503 and to a lesser extent at the 11 no. smaller existing entrances off the local road network in the area.
Any damage to the network due to the passage of construction traffic will be repaired in accordance with Condition 23 of the Grant of Permission 2014.

Significance of the Impact: Neutral

Rationale for Impact Evaluation:

- Planning Conditions requiring all roads to be reinstated to the satisfaction of Tipperary County Council,
- FWD Testing that will ensure that the strength and stability of the roads is maintained and reinstated.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 15.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Castlewaller Windfarm (potential grid connection and R503 site entrance works)

Magnitude: A *potential* (i.e. not permitted and not currently proposed) underground grid connection to Killonan, including a section along the L6009-0 at Castlewaller / Carrowkeale / Derryleigh townlands. Any works will be subject to a road opening license. Potential widening of an existing forestry entrance off the R503 for the Castlewaller project at Fanit townland. Works likely to take c.1 month period.
Magnitude is evaluated as Low on L6009-0, Very Low on R503

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The Low Sensitivity and Low /Very Low Magnitude;
- The lightly trafficked nature and extent of available capacity on the L6009-0 and R503;
- The temporary duration and the reversibility of the impact with the completion of construction works;
- The application of traffic management measures and use of flagmen

Evaluation of Other Cumulative Impacts – Damage to Road Pavements

Whole UWF Project Effect

Cumulative Impact Magnitude: UWF Grid Connection will involve permanent laying of hardcore on 6m of road verge at Mountphilips Substation entrance, and trench excavations along 29.2km of road pavement and 40 No. joint bay excavations within the public road surfaces between the Mountphilips Substation entrance in Coole and the Consented UWF Substation in Knockcurraghbola Commons. In the Upperchurch Windfarm area, the UWF Related Works will involve trench excavations along 45m of road pavement and temporary laying of hardcore on 1,755m of road verge. Upperchurch Windfarm will involve the laying of hardcore on the verge area at the main Site Entrance on the R503 and to a lesser extent at the 11 no. existing smaller entrances off the local road network in the area.

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The road pavements affected by the UWF Grid Connection works along local roads and along the R503 Regional Road are for the most part located away from UWF Related Works or Upperchurch Windfarm traffic. There are only two local roads which will be subject to construction traffic relating to the three elements, – the L2264-50 and L6188-0. In addition, two local roads, L4138-12 and L4139-0, will experience a noticeable (albeit still very low) increase in traffic with works for both the UWF Related Works and Upperchurch Windfarm in Shevry.

While the spatial extent of roads affected cumulative is moderate, effects are spread over a large longitudinal area, avoiding Newport town, and overall the magnitude is considered to be **Low.**

Significance of the Cumulative Impact: Slight

Rationale for Cumulative Impact Evaluation:

- the Moderate Sensitivity and the Low Magnitude, as per IMPERIA methodology outlined in Section 15.1.8.2.2.
- The good condition but weak pavement strength of most of the local roads including the L2264-50, L6188-0, L4138-12 and the L4139-0 local roads, with the repair of any damage to these four roads with full width reinstatement on any damaged sections.
- The temporary duration of the works, with temporary reinstatement, and permanent reinstatement at the completion of works
- The lightly trafficked nature and extent of available capacity on all roads
- The reinstatement of trenching locations within road pavements in accordance with the Department of Transport, Tourism & Sport Guidelines for Managing Openings in Public Roads (April 2017)
- The repair of any damage to other road pavements along concentrated construction traffic haul routes for the UWF Grid Connection.

All Elements of the Whole UWF Project with Other Projects or Activities

Cumulative Impact Magnitude: Cumulative impacts with Other Projects only relates to UWF Grid Connection, as described above (UWF Grid Connection – cumulative impacts), and copied hereunder:

110kV UGC and Potential Castlewaller Windfarm grid connection :
There is potential for cumulative impacts with the potential Castlewaller grid connection trenching works along the **L6009-0** at Castlewaller / Carrowkeale / Derryleigh townlands and at the R503 (Castlewaller Site Entrance) at Fanit townlands over a 1 month period. The cumulative impact magnitude is evaluated as **Low** for the public road as significant cumulative construction impacts are not expected as works will either take place at separate times, or should works be carried out at the same time, then works for both projects are likely to be carried out by one crew, with no significant cumulative damage to the road pavement with road reinstatement, and although a longer construction periods is possible on the local road L6009-0, this will not cause significant effects to residential amenity, as the works are still temporary and of short duration, during daylight hours. Works at the R503 entrance will not cause cumulative significant impacts to the public road due the very short duration of both 110kV UGC works and the entrance works. The magnitude of cumulative impacts is evaluated as **Low** on this road due to the lightly trafficked nature of this road, the temporary duration of works with full road reinstatement following works.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- The Low Sensitivity and Low Magnitude;
- The lightly trafficked nature and extent of available capacity on the L6009-0 and R503;
- The temporary duration and the reversibility of the impact with the completion of construction works;
- The application of traffic management measures and use of flagmen

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15.2.4.2 Impact Evaluation Table: Damage to Bridges and Culverts

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Trenching works
Cumulative Impact Source: road widening works (UWF Related Works)
Impact Pathway: Roads

Impact Description: Bridges and culverts within UWF Grid Connection construction works areas relate to bridges and culverts along the 110kV UGC route which provide crossing structures over watercourses. These structures are important from a transport and travel perspective and are important for road safety.

The 110kV UGC will be installed in the road surface over the bridges or by horizontal directional drilling under the bridge itself. Culverts will be crossing by installing ducts in concrete over or under the existing culvert. Impacts relate to excavation works at these crossing structures, and not to additional construction traffic, as the structures were found to be in good condition during surveys of the structures, and are considered capable of carrying any extra traffic or machinery associated with the works.

The potential for a reduction in the integrity of the structures due to trenching works (for UWF Grid Connection) or road widening works (for UWF Related Works), is examined in this impact table. The effect of raising the road level on the safety of bridges and parapet walls is also examined.

Impact Quality: positive

Evaluation of the Subject Development Impact – Damage to Bridges and Culverts

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude: There are 63 No. buried structures under the public roads along the route of the 110kV UGC – 15 No. bridges and 48 no. culverts. The potential for impacts only relates to the 110kV UGC cable trench as there will be no Joint Bays within 25m of any bridge or culvert structure.

To minimize the impact on the bridge structure, all ducting installed with the bridge deck will be encased in concrete, this will ensure distribution of the cable weight and provide a bond between sides of the trench excavation. In additional, the bridge arch/structural deck will not be affected by the proposed works. The ducting will be installed in the roadway build-up only. It is expected that 3 No. Bridges along the cable route will require the road level to be raised (W7, W36 and W53) to provide a minimum construction depth to the top of ducts, the adjacent parapet wall will be increased to meet minimum TII standards. This will make the bridge safer for both traffic and pedestrians. Raising the height of parapet walls will be a positive impact, contributing to road safety along the route. Detailed drawings of the 3 No. bridges where road and parapet level build-up is required are included in the drawings pack, included in Volume B Planning Drawings of the planning application.

At the 48 No. culverts along the route, the 110kV UGC cables trench will be constructed either under or over 35 No. of these culverts with no impact on the culvert. Impacts to culvert structures relate to 13 no. masonry box culverts which potentially will need to be replaced during works. It is considered that because any culverts replaced during construction works, will be replaced with higher specification culverts, that the impact to the public road network will be positive.

Overall, the impact magnitude will be Negligible due to the small number of bridges which require works to parapet walls, and the small number of culverts which potentially will be replaced, in the context of the large number of crossing structures along the road network within the study area and under the wider county roads.

Significance of the Impact: Neutral Impact

Material Assets (Roads)

Topic

Rationale for Impact Evaluation:

- The Moderate Sensitivity and Negligible Magnitude, as per IMPERIA methodology – see Section 15.1.8.2.2.
- The majority of crossings will require no works to buried structures,
- Impacts will be positive – contributing to safer roads and improved infrastructure.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative impacts only relates to the 1 No. culvert (W64) along the L2264-50 which potentially will need to be replaced during 110kV UGC trenching works. However, no works will be carried out on or in close proximity to this structure for any of the Other Elements of the Whole UWF Project. In addition this culvert is structurally capable of carrying the additional construction traffic associated with the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm along this road.

Significance of the Impact: No Cumulative Impact

Rationale for Impact Evaluation:

- Only 1 No. culvert, which may require replacement, within the area of UWF Related Works and Upperchurch Windfarm, and no works will be carried out on or in close proximity to this structure for any of the Other Elements of the Whole UWF Project.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: There are 3 No. buried structures at UWF Related Works Haul Route Works locations - WW12 and WW31 (both culverts) and WW32 (small stone arch structure). WW32 does not require any works, therefore there no potential for effects to this structure. Both WW12 and WW31 will require a 1m extension of the culvert on one side, this work will be carried out with minimal interference to the existing structure in accordance with Tii Specification for Roadworks.

All three structures (WW12, WW31 and WW32, were inspected by Wind Prospect Ireland *(now Ionic Consulting)* in 2017 who found that the structures are in good condition and are not subject to vehicular weight restrictions, therefore it is considered that these structures will not be affected by the additional construction traffic associated with the UWF Related Works and the Upperchurch Windfarm.

The magnitude of impact will be negligible due to the very small number of culverts involved.

Significance of the Impact: Neutral Impact

Rationale for Impact Evaluation:

- The extension of the 2 No. culverts will not affect the existing structure.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 15.2.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude: No works to crossing structures under public roads are associated with the Upperchurch Windfarm.

Significance of the Impact: No Potential for Impact

Rationale for Impact Evaluation:

- No works to crossing structures under public roads are associated with the Upperchurch Windfarm.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 15.2.2.2.1*

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Evaluation of Other Cumulative Impacts – Damage to Bridges and Culverts
Whole UWF Project Effect
Cumulative Impact Magnitude: The cumulative whole project effect relates to trenching works over or under 63 no. watercourse strucutres, increase in road level and height of parapet walls on 3 No. of bridges, and the replacement of up to 13 No. small masonry box culverts, mainly under the R503, along the 110kV UGC route, and the extension by 1m of 2 no. culverts on local roads for UWF Related Works (Haul Route Works).
Significance of the Cumulative Impact: **Neutral**
Rationale for Cumulative Impact Evaluation: • The Moderate Sensitivity and the negligible magnitude • The majority of crossings will require no works, • Impacts will be positive – contributing to safer roads and improved infrastructure.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Public Roads with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 15.2.2.2).

Material Assets (Roads)

Topic

15.2.4.3 Impact Evaluation Table: Damage to Road Boundaries

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Site access to Mountphilips Substation
Cumulative Impact Source: Trenching works, site access
Impact Pathway: Road Boundary

Impact Description: Road boundaries consist of existing hedges and roadside embankments and walls, and are important for road safety and contribute to the character of an area.

Part of the road boundary will be removed at site access points (for both UWF Grid Connection and UWF Related Works) and, in addition, works for UWF Related Works Internal Windfarm Cabling are through roadside boundaries and trenching works will be involve the removal of a 5m section of the boundary at each of these locations. At the Mountphilips Substation site entrance, the roadside boundary will be reinstated adjacent to its original alignment behind the site entrance sight lines.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Damage to Road Boundaries

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude: the potential for impacts to roadside boundaries relates to the widening of the existing field entrance for the Mountphilips Substation site. No damage to roadside boundaries will occur at any location along the 110kV UGC on public roads outside of the Mountphilips Substation site. No works will be required (and therefore no potential to damage road boundaries) at the access point onto the private paved road in Knockcurraghbola Commons.

A new permanent site entrance will be provided through an existing farm entrance off the L2166-10, for the Mountphilips Substation and Temporary Compound. The existing farm entrance will be widened to 6m, with a visibility splay of 160m provided. The sightlines are based on the 85th percentile ambient traffic speed on the Local Road serving the access, as recorded during traffic count surveys. These sightlines will be provided through the partial removal of the roadside boundary and the pruning of any hedgerow or trees within the visibility splay. Any hedges or trees that are removed will be replaced with an equivalent length of hedge and/or number of trees which will be replanted behind the sight lines. Each entrance will be fenced with post and rail and an entrance gate will be installed set back 4.8m from the road edge. The Mountphilips Substation site entrance is illustrated on Figure GC 15.2.5: Plan View of Permanent Site Entrance at Coole (Mountphilips Substation Site Entrance).

Due to the very small extent of boundary removal, with reinstatement, impact magnitude is evaluated as Negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The Moderate Sensitivity and Negligible Magnitude, as per IMPERIA methodology – see Section 15.1.8.2.2.
- Impacts to road boundaries is limited to the widening of 1 existing field entrance at Coole;
- The reinstatement of road boundaries behind sightlines at the widened entrance.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: There is no potential for cumulative impacts with UWF Grid Connection, as the 110kV UGC will not require any temporary or permanent removal of roadside boundaries for the 110kV

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Material Assets (Roads)	Public Roads

UGC, with the only road boundary affected by UWF Grid connection at a substantial separation distance (c.22km) from the Other Elements.

Significance of the Impact: No Cumulative Impact

Rationale for Impact Evaluation:

- UWF Grid Connection effects to road boundaries will only occur in Coole townland at the Mountphilips Substation site;
- Separation distance (c.22km) to Other Elements.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: No works to road boundaries are required for Realigned Windfarm Roads, Telecoms Relay Pole or UWF Related Works Ancillary Works.
14 No. temporary entrances off the public road for the Internal Windfarm Cabling trenching works, 10 No. of which will be newly opened, and 4 No. will comprise widening of existing farm gateways.
5 No. temporary entrances off the public road will be opened or widened to accommodate the UWF Related Works Haul Route Works, 2 No. of which are through existing farm gates. The Haul Route Works will involve the temporary removal of 1035m and the permanent removal of 25m of road boundaries.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The temporary loss of road boundaries at temporary site access points,
- The reinstatement of all temporary entrances and opening of roadside boundaries to the satisfaction of Tipperary County Council
- The reinstatement of all verges and roadside drainage following the completion of construction works in an area.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 15.2.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude: The widening of 11 no. permanent site entrances through existing farm gates along the R503, L4139-0, L4138-12, L6188-0, L2264-50 and L6185-13 roads. As per the EIS 2013: All construction entrances have been designed having regard to the North Tipperary County Development Plan and the National Roads Authority Geometric Design of Major/Minor Priority Junctions and Vehicular Access to National Roads. Widening works at these locations will be managed under the Traffic Management Plan for the Upperchurch Windfarm set out in the RFI 2013.

Significance of the Impact: Not be Significant

Rationale for Impact Evaluation: As per the Grant of Permission 2014: it is considered that, subject to compliance with the conditions set out below, the development would not seriously injure the amenities of the area or of property in the vicinity, and would be acceptable in terms of traffic safety and convenience.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 15.2.2.2.1*

Evaluation of Other Cumulative Impacts – Damage to Road Boundaries

Whole UWF Project Effect

Cumulative Impact Magnitude:
The roadside boundaries affected by the UWF Grid Connection (1 of 1), UWF Related Works (18 of 19) and Upperchurch Windfarm (10 of 11) are for the most part on local roads. The 2 boundaries on Regional Roads

related to Haul Route Works for UWF Related Works at HW7 (locally known as the Christmas tree yard) on the R503, and for the main entrance into Upperchurch Windfarm, also on the R503 at Shevry.

The roadside boundary for UWF Grid Connection at the Mountphilips Substation entrance will be permanent, while for the Upperchurch Windfarm/UWF Related Works approximately half of the roadside boundary removal will be temporary and the boundaries will be reinstated along the original alignment following completion of construction works. The remaining entrances for Upperchurch Windfarm will be permanently widened, where the extent of widening is small at all but one of these entrances – where longer sections of public road boundary will be removed to provide sightlines at the main Upperchurch Windfarm site entrance (at UWF Site Entrance No.1 in Shevry).

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- Temporary loss or permanent loss/change to road boundaries will have a negative and observable effect, particularly in the Upperchurch area, however the implications to the public road network will be small given the very low volumes of traffic on the local roads.
- The opening of roadside boundaries, reinstatement of all temporary entrances, verges and roadside drainage for UWF Related Works to the satisfaction of Tipperary County Council;
- The separation distance between the Upperchurch Windfarm/UWF Related Works area and the Mountphilips Substation for UWF Grid Connection.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Public Roads with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 15.2.2.2).

15.2.4.4 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 15-12 below.

Table 15-12: Description and Rationale for Excluded Impacts to Public Roads

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Excavations, installation of cables trench	1,2	Roads	Decrease in structure integrity of roads	Rationale for Excluding: No likely effect in relation to UWF Grid Connection due to the stable nature of roads within the construction works areas being predominantly of 'excavate and fill' construction and their location on firm ground. At the sections of road along the 110kV UGC on the R503 where it occurs through mapped peat areas will use a floating road cable trench detail and 2.6m reinstatement of the road surface following works, this will improve the strength of the road in these locations. In all other locations, the public road is located on competent ground. In relation to UWF Related Works, trenching or works in road pavements, verges or boundaries will be carried out in locations underlain by competent ground, with reinstatement of pavements/verges/boundaries to the satisfaction of Tipperary County Council. Therefore effects to the integrity of roads is not expected to occur.
Operational Stage				
Rationale for Excluding: Neutral effect: With regard to the UWF Grid Connection: The Mountphilips Substation, will be remotely monitored and secured, and will be inspected on a monthly basis. The 110kV UGC will be tested (via the manhole cover over link box chambers at the Joint Bay locations) every 1 to 2 years. In total, it is expected that access to the Mountphilips Substation/110kV UGC will occur over a total c.13 per year, most likely using vans, will be associated with the routine operation of the UWF Grid Connection. Any infrequent maintenance or unplanned repairs (if they occur at all) are expected to involve reopening Joint Bays requiring the use of larger machinery and plant for very short periods of time (1 to 2 weeks). Any road works will be subject to Road Opening Licence, and the Joint Bay area will be reinstated to the satisfaction of Tipperary County Council, and any impacts are expected to be Neutral. With regard to the UWF Related Works: The Telecoms Relay Pole and the ground above the Internal Windfarm Cables will have one inspection per year, the Realigned Windfarm Roads will be visually inspected on a monthly basis during windfarm site inspections. Each inspection will ordinarily be by way of a normal car or small works van. However, it may require the use of larger machinery and plant for brief durations (c.1 day) to maintain the Realigned Windfarm Roads periodically during the operational stage. As these traffic volumes associated with the operational stage are negligible, no damage to road pavements are likely to occur. No works to road pavements or buried structures will be required during the operation of the UWF Related Works. With the exception of Haul Route Works, no works to road boundaries will be required. At Haul Route Works locations, the roads boundaries may need to be adjusted temporarily at some stage in the future in order to accommodate the transport of turbine components to and from the windfarm. It is considered that this will occur very infrequently during the operational stage. It is intended that the hard-core surface, which was installed during the construction works, will be left in-situ under the reinstated verges and boundaries and can be uncovered in the event of requiring its reuse. The resulting duration of any works at Haul Route Works locations will be				

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
brief, reversible with reinstatement, and are typical of commonly occurring road works on Irish roads, therefore any impacts to road boundaries will be Neutral. With regard to the Upperchurch Windfarm: 1-2 small vehicle movements (van or four wheel drive) per day associated with the maintenance of the windfarm, and few if any larger vehicle movements. The only larger vehicles would be those associated with the windfarm are the replacement of turbine parts, which may be required infrequently during the operational stage. In any case the use of larger vehicles will involve very small numbers of larger vehicle movements, all of which will comply with axle loadings, and vehicle movements associated with large turbine components will take place outside of peak hours. Due to the very low traffic volumes associated with Upperchurch Windfarm, which are less than those associated with a residential dwelling and the absence of roadworks or works to roadside boundaries or buried structures, the effects to Public Roads will be Neutral.				
Decommissioning Stage				
Rationale for Excluding: No potential for effects/Neutral effects. The UWF Grid Connection will not be decommissioned, therefore there is no potential for effects. The traffic volumes associated with those parts of the UWF Related Works which will be decommissioned (Telecoms Relay Pole, cables from the Internal Windfarm Cables) will result in minimal traffic condition changes which will not be noticeable on the local roads. Haul Route Works: It is not known at this time whether the turbine components will be broken up and transported off-site in smaller parts for recycling, or if some or all of the turbine components will be transported offsite for reuse. Should turbine components be transported offsite, then the road verges/boundaries at Haul Route Works locations will be widened once more, similar to infrequent widening during the operational stage, to facilitate the transport of turbine components (if needed). These works will not have any effect on road pavements, and any boundaries removed will be reinstated immediately afterwards. Therefore, it is considered that the decommissioning works and activities associated with the UWF Related Works will have a neutral effect on Public Roads. In relation to the Upperchurch Windfarm, no works or damage to public road pavements or to public road boundaries are expected during any decommissioning activities, therefore there is no potential for impacts to Public Roads from this Element.				

15.2.5 Mitigation Measures for Impacts to Public Roads

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur** to Public Roads.

15.2.6 Evaluation of Residual Impacts to Public Roads

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures were required, and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Public Roads above (Section 15.2.4)

– i.e. **no significant adverse impacts**.

15.2.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

15.2.8 Summary of Impacts to Public Roads

A summary of the Impact to Public Roads is presented in Table 15-13.

Table 15-13: Summary of the impacts to Public Roads

Impact to Public Roads:	**Damage to Road Pavements**	**Damage to Bridges and Culverts**	**Damage to Road Boundaries**
Evaluation Impact Table	*Section 15.2.4.1*	*Section 15.2.4.2*	*Section 15.2.4.3*
Project Life-Cycle Stage	Construction	Construction	Construction
UWF Grid Connection (direct/indirect impact)	**Moderate**	**Neutral**	**Imperceptible**
UWF Grid Connection (cumulative impact)	**Moderate** (L2264-50) to **Slight** (L6188-0, L6009-0 and R503 site entrance)	**No Cumulative Impact**	**No Cumulative Impact**
Element 2: UWF Related Works	Imperceptible	Neutral	Imperceptible
Element 3: UWF Replacement Forestry	No Impact - Evaluated as Excluded, see Section 15.2.2.2.1		
Element 4: Upperchurch Windfarm	Neutral	No potential for Impact	Not be Significant
Element 5: UWF Other Activities	Neutral Impact/No Impact - Evaluated as Excluded, see Section 15.2.2.2.1		
Cumulative Impact:			
All Elements of the Whole UWF Project	**Slight**	**Neutral**	**Imperceptible**
Other Projects & Activities: Castlewaller Windfarm (potential grid connection on the L6009-0 and potential site entrance works off the R503)	**Imperceptible**	**No potential for cumulative impact**	

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Public Roads with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 15.2.2.2).

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Public Roads

Sensitive Aspect

Material Assets (Roads)

Topic

15.3 Sensitive Aspect No.2: Road Users

This Section provides a description and evaluation of the Sensitive Aspect - Road Users.

15.3.1 BASELINE CHARACTERISTICS of Road Users

15.3.1.1 STUDY AREA for Road Users

The study area for Road Users in relation to the UWF Grid Connection is described in Table 15-14 and illustrated on Figure GC 15.3: UWF Grid Connection Study Area for Road Users (Volume C3 EIAR Figures).

Table 15-14: UWF Grid Connection Study Area for Road Users

Study Area for Road Users	Justification for the Study Area Extents
Construction works area boundary on the public road network; and the route of concentrated construction traffic on the R503 between Newport and Knockmaroe, and on the local roads north of Newport town to the Mountphilips Substation site entrance at the western end of the 110kV UGC route, and the local roads north of the R503 between the junction at Knockmaroe and the private paved road to the Consented UWF Substation location at the eastern end of the 110kV UGC route.	Road Users on public roads at road works locations or along routes of concentrated construction traffic or at the site access point may be affected by road works and construction traffic movement associated with UWF Grid Connection. Road Users, who have acceptable alternative routes are not likely to be affected.

15.3.1.2 Baseline Context and Character of Road Users in the UWF Grid Connection Study Area

Road Users relate to local road users, vehicular through traffic (road users commuting or passing through the area), tourists and pedestrians/cyclists. These road users use the roads for commuting to work or school, for agricultural/forestry access, for local and regional business or leisure purposes.

15.3.1.2.1 Composition of Road Users

In relation to commuting to work or school, data from the Central Statistics Office (POWSCAR 2016) indicates that the majority of road users in upland area, travel to work in a car, van or lorry, whereas a small minority of people use public transport (mainly buses), walk or cycle. Detailed POWSCAR data is included in Appendix 15.1: Traffic and Transportation Assessment Report. The POWSCAR 2016 Census, outlined in Table 15-15, shows a high usage of cars and a very low usage of bicycles and walking as modes of transport in the Electoral Districts (Kilcomenty, Kilnarath, Killoscully, Newport, Abington and Foilnaman) associated with the UWF Grid Connection. The CSO data shows that the majority of people drive or are driven to work or school/college.

Based on the CSO data, outlined in Table 15-15 below, it is assumed that road users along the regional road in the area (R503) mainly comprise people travelling to work or school/college, or travelling to shops and businesses along the R503, as this road is identified as a commuter route linking Thurles with Limerick.

It is also assumed that tourists use the R503 regional road to travel between Thurles and Limerick, and potentially, are present on the walking/cycling routes that exist in the study area.

The R503 is also designated scenic route in Tipperary North County Development Plan.

Table 15-15: Extract from CSO 2016 POWSCAR data

POWSCAR 2016 - Theme 11 Commuting	Kilcomenty	Killoscully	Kilnarath	Newport	Abington	Foilnaman
Commuting to Work						
On foot - Work	3	1	1	39	2	2
Bicycle - Work	0	0	0	7	0	0
Bus, minibus or coach - Work	2	2	0	11	4	0
Train, DART or LUAS - Work	0	1	0	1	1	1
Motorcycle or scooter - Work	0	0	1	2	0	1
Car driver - Work	232	158	113	868	158	88
Car passenger - Work	7	5	1	61	4	4
Van - Work	30	16	17	86	26	16
Other (incl. lorry) - Work	3	0	2	7	7	4
Work mainly at or from home - Work	22	19	12	42	26	21
Not stated - Work	5	8	6	30	6	4
Total – Commuting to Work	**304**	**210**	**153**	**1154**	**234**	**141**
Commuting to School or College						
On foot - School or college	15	0	2	189	14	5
Bicycle - School or college	0	0	1	3	0	0
Bus, minibus or coach - School or college	19	57	23	36	47	31
Train, DART or LUAS - School or college	1	0	0	0	0	0
Motorcycle or scooter - School or college	0	0	0	0	0	0
Car driver - School or college	14	7	5	39	9	2
Car passenger - School or college	150	53	41	473	61	39
Van - School or college	2	0	1	3	0	0
Other (incl. lorry) - School or college	0	0	0	0	0	0
Work mainly at or from home - School or college	4	0	0	0	0	0
Not stated - School or college	3	4	4	22	4	3
Total – Commuting to School or College	**208**	**121**	**77**	**765**	**135**	**80**
Total per Mode of Transport						
On foot - Total	18	1	3	228	16	7
Bicycle - Total	0	0	1	10	0	0
Bus, minibus or coach - Total	21	59	23	47	51	31
Train, DART or LUAS - Total	1	1	0	1	1	1
Motorcycle or scooter - Total	0	0	1	2	0	1
Car driver - Total	246	165	118	907	167	90
Car passenger - Total	157	58	42	534	65	43
Van - Total	32	16	18	89	26	16
Other (incl. lorry) - Total	3	0	2	7	7	4

POWSCAR 2016 - Theme 11 Commuting	Kilcomenty	Killoscully	Kilnarath	Newport	Abington	Foilnaman
Work mainly at or from home - Total	26	19	12	42	26	21
Not stated - Total	8	12	10	52	10	7
Total per ED	**512**	**331**	**230**	**1919**	**369**	**221**

15.3.1.2.2 Traffic Volumes

7-day classified 'ATC Tube Counts' surveys were carried out at on each of the affected roads in order to establish background traffic conditions, in terms of volume and ambient speed. All vehicles recorded during the traffic survey are expressed in terms of "Passenger Car Units" (PCUs), sometimes referred to as "Car Equivalents". This is the methodology which has been employed here (with for example specific industry standard conversion factors to convert HGVs, Skip Lorries, Cars/Trailers and Bin Lorries to PCUs). The conversion factors used are in accordance with industry-standard recommendations.

The existing traffic conditions of the affected roads, as recorded during the surveys, are presented in Table 15-16 and Table 15-17. The Electoral Districts in which each of the affected roads are located, are also identified in the Table, for ease of reference to the CSO data in Table 15-15 above. In summary, the surveys confirm that the roads in the area are generally very lightly trafficked, reflecting the rural nature of the study area.

Table 15-16: Summary of Traffic Volumes recorded during traffic count surveys

Traffic Count Locations	Road ID	Electoral District	24Hr 2-Way AADT (PCUs)	% HGVs	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)
T1	L-2166-0	Kilcomenty	721	0.5%	94	66
T2	L6013-0	Kilcomenty	301	0.4%	35	27
T3	L2156-0	Kilnarath	1016	0.3%	97	108
T4	L2157-0	Kilnarath	967	0.7%	85	95
T5	L6009 at Castlewaller	Kilnarath	217	0.2%	31	21
T6	L6009 at Cooldrisla	Newport	407	0.7%	38	37
T7	R503 at Derryleigh	Newport	2046	0.9%	176	229
T8	R503 at Rear Cross	Abington	950	1.6%	80	110
T9	R503 at Knockmaroe	Foilnaman	709	1.9%	66	87
T10	L2264-50	Foilnaman	183	0.8%	19	23
T11	L6188-0	Foilnaman	76	0.6%	7	7

The traffic count data demonstrates that on average the vast majority (98.5%) of traffic on the roads within the UWF Grid Connection Study Area comprised cars or vans, with 1% comprises heavy vehicles (such as buses, articulated and rigid trucks), and 0.5% comprises bicycles or motorcycles.

The traffic count survey, in addition to observations during site visits and surveys, confirms that the roads within the UWF Grid Connection Study Area have low traffic volumes and are not congested roads.

Road Users

Sensitive Aspect

15.3.1.2.3 Traffic Speeds

The traffic data collected confirmed that the traffic speeds are generally maintained well within the posted speed limits (i.e. less than 80kph which is generally the speed limit on the local roads).

Table 15-17: Summary of 85th percentile speeds recorded during traffic count surveys

Road ID	85th percentile Traffic Design Speed Km/Hr
L-2166-10**	84
L6013-0	58.9
L2156-0	59.6
L2157-0	72.5
L6009 at Castlewaller	67.5
L6009 at Cooldrisla	52.4
R503 at Derryleigh	83.4
R503 at Rear Cross	69.5
R503 at Knockmaroe	61.7
L2264-50	70.4
L6188-0	54

*** The site entrance for the Mountphilips Substation is off the L2166-10 local road at Coole townland.*

15.3.1.2.4 Road Safety Record

A review of the Road Safety Authority (RSA) online collision database (http://rsa.ie/en/RSA/Road-Safety/RSA-Statistics/Collision-Statistics/Ireland-Road-Collisions/), which is available for the eleven year period during the years 2005 to 2015 inclusive, recorded no fatal collisions, 2 no. serious collisions and 3 no. minor collisions along the route of the 110kV UGC on the R503 between 2005-2015 inclusive. No collisions were recorded on the local roads within the study area during this period. The roads in the study area are considered to have a good record of road safety.

15.3.1.2.5 Public Transport

A rural transport bus service provides services between Upperchurch, Klicommon and Rear Cross to the larger towns in in Tipperary. Rear Cross is also along the Bus Éireann Limerick to Dundrum service route.

15.3.1.2.6 Tourist/Walking/Cycling Routes

The R503 is a designated scenic route in Tipperary North County Development Plan. The waymarked walking routes Slievefelim Way, is routed along the R503 for c.1.3km just outside Rear Cross village. There is also a waymarked cycle route, the Ormond Way Cycle, part of which is routed along the L2264-50 (locally called the Borrisoleigh Road) through Knockmaroe townland. These walks and cycle route are identified on Figure GC 15.3 UWF Grid Connection Study Area for Road Users.

Material Assets (Roads)

Topic

Both the CSO data and the traffic count surveys show a very low usage of the road network by cyclists.

15.3.1.3 Importance of Road Users

Road Users are of importance as members of local communities, farmers and forestry workers, other workers, commuters to and between urban areas and visitors. Road Users are required to adhere to the Rules of the Road and to use the roads in accordance with the Road Traffic Act (as amended).

15.3.1.4 Sensitivity of Road Users

Road Users could be sensitive to changes in road use conditions such as substantial increases in traffic volumes, particularly HGVs; presence of roadworks and traffic management measures, such as stop-go systems; and a reduction in road pavement quality which could either increase journey times or reduce road safety.

Cyclists or walkers are considered to be vulnerable road users, and could be intimidated by the presence of heavy goods vehicles, particularly on narrow roads. There are also two primary schools located along the route of the 110kV UGC on the R503 – Lackamore National School and Rear Cross National School, children being dropped off or collected at school opening/closing times are more vulnerable to increased traffic and road works in close proximity.

Based on the IMPERIA methodology, outlined in Section 15.1.8.2.1, Road Users are evaluated as having **Low** Sensitivity due to the low number of users on the roads, and due to the temporary and linear nature of the works there will not be substantial changes on the road network which could significant affect Road Users, and due to the low number of more vulnerable Road Users such as walkers and cyclists, or children attending local national schools in the area.

15.3.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

According to Transport Infrastructure Ireland[4], growth across the national road network was 3% in 2017.

Construction traffic volumes were assigned to the roads within the UWF Grid Connection Study Area. Traffic growth factors for 2020/2021 (start year for construction) were calculated from data obtained from Transport Infrastructure Ireland[5] which provides the recommended method of predicting future year traffic growth on public roads. A growth rate factor of 1.028 was applied to the current traffic volumes on the roads, and it is expected that there will be very slow increases in annual traffic volumes, in the region of 1-2% per annum.

In general, by the time of construction, the volume of traffic and make-up of road users is considered unlikely to change noticeably from baseline conditions.

15.3.1.6 Receiving Environment (the Baseline + Trends)

The evaluation of impacts to Road Users is based on the predicted traffic volumes for 2020/2021.

Whilst a 2020/2021 opening year has been selected for the works, in light of the anticipated slow change in the baseline conditions, it should be noted that any required change (of say 2 - 3 years) in the selection of opening year will have no implications whatsoever for the conclusions of the study due to the very lightly trafficked nature of the affected roads.

[4] Transport Infrastructure Ireland 'National Roads Network Indicators' (2017)
[5] PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 (Travel Demand Projections October 2016, Table 5.3.2: Link-Based Growth Rates: Annual Growth Factors)

Road Users

Sensitive Aspect

15.3.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

15.3.2.1 Cumulative Evaluation Study Area

15.3.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Road Users	Justification for the Study Area Extents
Construction works area boundary on the public road network; and The route of concentrated construction traffic on the R503 between Newport and Knockmaroe, and on the local roads north of Newport town to the Mountphilips Substation site entrance at the western end of the 110kV UGC route, and the local roads north of the R503 between the junction at Knockmaroe and the private paved road to the Consented UWF Substation location at the eastern end of the 110kV UGC route.	Road Users on public roads at road works locations or along routes of concentrated construction traffic or at the site access point may be affected by road works and construction traffic movement associated with both UWF Grid Connection *and* Other Elements of the Whole UWF Project or Other Projects. Road Users, who have acceptable alternative routes are not likely to be affected

The study is illustrated on Figure CE 15.3: UWF Grid Connection Cumulative Evaluation Study Area for Road Users.

15.3.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 15.3.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 15-18 and illustrated on Figure WP 15.3: Whole Project Study Area for Road Users (Volume C3 EIAR Figures).

Table 15-18: Cumulative Evaluation Study Area for Public Roads

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	Route of concentrated construction traffic or roadwork locations on regional roads and on local roads as far as the site access points	Road Users along routes of concentrated construction traffic or at road works or site access points may be affected by construction traffic movements and road works. Road Users, who have acceptable alternative routes are not likely to be affected
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		

Material Assets (Roads)

Topic

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 5: UWF Other Activities		

15.3.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Road Users also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Road Users with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.2 .4.30).

The results of this scoping exercise are that: Castlewaller Windfarm (potential grid connection and potential site entrance works off the R503) has been scoped in for evaluation of cumulative effects to Public Roads.

The location of, and study area boundary associated with, the Other Elements and Other Projects which are included for cumulative evaluation is illustrated on Figure WP 15.3.

15.3.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Road Users

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project or Other Projects to cause cumulative effects to the Sensitive Aspect Road Users. The results of this evaluation are included in Table 15-19.

The location of, and study area boundary associated with, the Other Elements and Other Projects which are included for cumulative evaluation is illustrated on Figure WP 15.3. The baseline character of the areas around these projects is described in Section 15.3.2.3.

Table 15-19: Results of the Evaluation of the Other Elements and Other Projects

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: No impacts are likely to occur due to Access into the UWF Replacement Forestry lands will be through an existing farm entrance on the Local Road L2264-34. This road is a 2-way road which is very lightly trafficked with 99.6% spare capacity. There are adequate sightlines at this existing entrance. Part of the Ormond Way cycle route is along the L2264-34. No increase in journey times due to the absence of any road works and the extremely low volumes of traffic associated with the UWF Replacement Forestry - the planting stage will generate 1-2 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 2 to 4 vehicle movements per year. No reduction in road safety due to the adequacy of sightlines at the existing access point.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral Impacts or No Impacts due to: Notwithstanding the National and Regional Road network along the turbine component and

Road Users

Sensitive Aspect

	materials haul routes are scoped out in Section 15.1.4, in relation to the Haul Route Activities, none of the Tii Guideline thresholds (see Table 15-3) are met, and therefore further analysis is not required - the traffic increases as a result of the Haul Route Activities (tree trimming, laying of matting, street furniture removal), will be in all cases considerably less than 1% of the current traffic volumes on these roads and as a result will have no effect on Road Users, given that the normal day-to-day variation in traffic conditions can be as much as 10%. In addition, tree trimming is a commonplace occurrence on the public road network. Although street furniture, including safety signs, will be removed as part of the Haul Route Activities, these signs will be removed immediately prior to turbine component transportation, during off peak hours, and replaced immediately after the convoy passes by and it is considered that the brief removal of street furniture will not affect the safe use of the roads by Road Users. Upperchurch Hen Harrier Scheme & Monitoring Activities & Overhead Line Activities: no works to the road network or road boundaries form part of these activities, and taking into consideration the extremely low volumes of traffic associated with these activities, and the brief duration of any public road use, no effects to Road Users are likely to occur.
Castlewaller Windfarm (potential grid connection);	Yes, included for the evaluation of cumulative effects in relation to potential grid connection works on the L6009-0 local road. Although Castlewaller Windfarm is not likely to be constructed during the same period as UWF Grid Connection (because the Castlewaller Windfarm has not yet been offered a grid connection from EirGrid, and has to obtain planning consent for its grid connection), there is *some possibility* that this windfarm could be built during the same period as UWF Grid Connection. In the event that the 2 No. projects are built at the same time, there could be cumulative increased journey times for Road Users at the points of potential co-location of the underground grid connections in the L6009-0, and therefore this project is scoped in for consideration. Excluded from the evaluation of cumulative effects in relation to the consented windfarm and the potential site entrance works off the R503, The indicate site entrance works on the R503 are not expected to cause any impacts to road users and are not scoped in. Similarly the windfarm works are not located on the public road, with traffic levels not of a quantity to cause significant cumulative impacts to road users, therefore the windfarm is scoped out.

15.3.2.3 Cumulative Information: Baseline Characteristics – Context & Character

15.3.2.3.1 Element 2: UWF Related Works

Material Assets (Roads)

Topic

The roads which could be potentially affected by the UWF Related Works and associated haulage are the Regional Road R503 along with the Local Roads (designated as "L" Roads); L6185-13, L2264-50, L6188-0, L61881-0, L2264-34, L4139-16, L4138-12 and L4139-0.

Traffic count surveys: were carried out for a 24-hour period at 9. No locations. The traffic count survey, in addition to observations during site investigations, confirms that the roads in the study area have low traffic volumes and are not congested roads. The vast majority of traffic counted comprised cars or vans. Both the traffic count surveys and the CSO POWSCAR data show a very low usage of the road network by cyclists.

Road Safety: The traffic data collected confirmed that the traffic speeds are generally maintained well within the posted speed limits (i.e. less than 80kph which is generally the speed limit on the local roads). A review of the Road Safety Authority on-line collision statistics demonstrates that the local and regional roads in the study area do not have a significant history of accidents. See Appendix 15.1: Traffic and Transportation Assessment Report for more details on safety statistics.

The waymarked walking routes that exist in the UWF Related Works Study Area consist of the Eamon a Chnoic Loop and the Ormond Way walking route (currently being developed). There is also a waymarked cycle route, the Ormond Way Cycle, part of which is routed along the L2264-50 and L2264-34 (locally called the Borrisoleigh Road) through Knockmaroe and Foilnaman. These walks and cycle route are identified on Figure WP 15.3: Whole Project Study Area for Road Users. Part of the Ormond Way walking route (currently under development) is along the L4139-0; and all of the Ormond Way Cycle route is along public roads.

15.3.2.3.2	Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 15.3.2.2.1

15.3.2.3.3	Element 4: Already Consented Upperchurch Windfarm

The baseline characteristics for Road Users described under UWF Related Works above, also applies to the road users which will be travelling on roads associated with Upperchurch Windfarm deliveries.

Consideration of the Passage of Time: Although road traffic increases at approximately 1 – 2% per annum, due to the very lightly nature of the roads and the extent of available capacity on all roads, it is considered that there is not a material change from traffic conditions at the time of the Upperchurch Windfarm 2013 EIS or 2014 assessment, and therefore the information in the 2013 EIS remains relevant to the cumulative evaluations in this EIAR for UWF Grid Connection

15.3.2.3.4	Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 15.3.2.2.1

15.3.2.3.5	Other Projects or Activities

Castlewaller Windfarm: Potential to cause increased journey times for Road Users on the L6009-0 (if the potential Castlewaller grid connection trenching works were to coincide with the UWF Grid Connection trenching works).

15.3.3 PROJECT DESIGN MEASURES for Road Users

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 15-20 are relevant to the Environmental Factor, Material Assets (Roads), and in particular to the sensitive aspect **Road Users**.

Table 15-20: UWF Grid Connection Project Design Measures relevant to Road Users

PD ID	Project Design Environmental Protection Measure (PD)
PD04	All construction works will be carried out during daylight hours.
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD06	Construction works will not be carried out within 150m of Rearcross National School or Lackamore National School, during school hours. In addition, the project Community Liaison Officer will keep each school informed of construction timetables and scheduling.
PD07	110kV UGC construction works along the local roads L2264-50 and L6188-0, will not take place at the same time as the UWF Related Works Haul Route Works on these roads. The 110kV UGC construction works will also be scheduled so that the works do not occur on the same days as concrete deliveries for Consented UWF Turbines along these local roads.
PD10	Flag-men will be used at 110kV UGC works locations on the public roads subject to one lane closures. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the public road network in a in a safe and efficient manner. The works will be carried out according to the Traffic Management Plan for UWF Grid Connection. The Traffic Management Plan forms part of the Environmental Management Plan.
PD11	Construction works for the 110kV UGC in Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons townlands, which are within 350m of local residences, will not take place at the same time as either the UWF Related Works or Upperchurch Windfarm where those works also occur within 350m.
PD12	As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the works along the public road network will be scheduled to minimise impacts on schools and local businesses. The works will be scheduled so that they do not disrupt or interfere with Tipperary County Council's road works programme on the R503 through Newport town.
PD13	As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the Promoter will fund the costs of Tipperary County Council engaging a chartered Civil Engineer to oversee quality control and compliance with drawings, specifications and road opening conditions for the duration of the works

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5 in Volume C4: EIAR Appendices.

15.3.4 EVALUATION OF IMPACTS to Road Users

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Road Users.

As a result of the exercise, some impacts were included and some were excluded.

Table 15-21: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Increased Journey Times (construction stage)	*Increased Risk of Road Accidents (construction stage)*
	Interrupted or disrupted access to property (construction stage)
	Operational Effects
	Decommissioning Effects

The source-pathway-receptor links for the impact included are described in the Impact Evaluation Table in the next section, **Section 15.3.4.1.**

The source-pathway-receptor links and the rationale for impacts excluded are described in the section directly after the Impact Evaluation Table, in Section 15.3.4.2.

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Sensitive Aspect

15.3.4.1 Impact Evaluation Table: Increased Journey Times

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Road works, construction traffic
Cumulative Impact Source: Road works, construction traffic
Impact Pathway: Roads

Impact Description: The presence of roadworks on local roads and the regional road R503, road closures and one-lane closures with stop-go systems, and increased traffic due to the use of the roads by construction delivery vehicles could result in delays and disruption to road users along roads in the study area.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Increased Journey Times

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:

Construction works for the UWF Grid Connection will involve the excavation of the road pavements for the cables trench and the Joint Bays.

The trenching works are conservatively expected to proceed at an average rate of 80m – 100m per day for the 110kV UGC:

- 0.7km on the L2166-10 which will be completed over a 2 week period,
- 1.2km on the L6013-0 which will be completed over a 3 week period;
- 0.4km on the L2156-0 which will be completed over a 1 week period,
- 0.8km on the L2157-0 which will be completed over a 2 week period,
- 1.8km on the L6009-0 which will be completed over a 1 month period,
- 22.4k on the R503 for which will be completed over a 8 to 9 month period,
- 1.9km on the L2264-50 which will be completed over a 1 month period; and
- 0.3km on the L6188-0 which will be completed over a 1 week period.

In addition road works will be required at Joint Bay locations, during their initial construction (2 days per Joint Bay), and during cable pulling (3 days per Joint Bay), and during cable jointing works (5 days per Joint Bay). There are a total of 40 no. Joint Bays along the public road network:

- 2 No. on the Local Road L6013-0;
- 1 No. on the L5183-0
- 1 No. on the L2166-1
- 2 No. on the L6009-0,
- 31 No. on the R503,
- 2 No. on the L2264-50; and
- 1 No. on the L6188-0.

4 No. construction works crews will carry out 110kV UGC works concurrently, with 1 No. crew dedicated to construction works on the local roads, and 3 No. crews working at separate locations along the R503 Regional Road.

Traffic counts were carried out in January 2019 at 5 locations and in May 2019 at 6 locations, to measures Passenger Car Units (PCUs) over a 24-hour period, the results show that traffic volumes on the roads are very low, while Traffic Modelling (See Appendix 15.1: Traffic and Transportation Assessment Report) demonstrates that over 98% of the capacity of the roads will remain available during the construction period.

- 721 PCUs on the L2166-10,
- 301 PCUs on the L6013-0,
- 1016 PCUs on the L2156-0,
- 967 PCUs on the L2157-0,

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- 217 PCUs on the L6009-0 at Castlewaller,
- 407 PCUs on the L6009-0 at Cooldrisla,
- 2046 PCUs on the R503 at Derryleigh,
- 950 PCUs on the R503 at Rear Cross,
- 709 PCUs on the R503 at Knockmaroe,
- 183 PCUs on the L2264-50 and
- 76 PCUs on the L6188-0.

Road Closures: Due to the narrow road widths of the L6013-0, L6009-0, L6188-0 local roads, these roads will be closed during construction works. Acceptable alternative routes are available for all of these roads, and diversions will be signposted during road closures. Local access will be maintained on these roads at all times.

Diversion times are as follows:

- L-6013-0: Diversion through Newport town, circa 5 minutes. As detailed above this diversion will be in place for a period of 3 weeks
- L-6009-0: Diversion through Newport town, circa 5 minutes. As detailed above this diversion will be in place for a period of 1 month.
- L-6188-0: Diversion through townland of Shevry and on through Milestone, circa 10 minutes. As detailed above this diversion will be in place for a period of 1 week.

One-Lane Closures: The remaining roads – R503, L2166-10, L2156-0, L2157-0 and L2264-50 will be subject to one lane closures, with traffic flow managed around the works using a stop-go system and flagmen to minimise delays and disruption to road users. Traffic management measures will be put in place on the approach to works, advance warning signage has been designed in accordance with the Traffic Signs Manual.

One-lane closures for the local roads are detailed above, a further breakdown of the 8 to 9 month works on the Regional road R503 are as follows:

- 3 crews preforming trenching, joint bay installation and temporary road reinstatement. This will require 3 No. one lane closures along the R503 for 23 No. weeks. Wait time will be circa 3 minutes at each location. The wait time is short due to the low volume of traffic on the R503.
- Cable pulling will take 2-3 no. days per joint bay. This will include removal of temporary road reinstatement, pulling of cables and reinstatement of the road over the joint bay. There will be 3 No. crews for 7 No. weeks.
- Cable jointing works will take 5 days per joint bay. This will include the removal of temporary road reinstatement, jointing of cables and the final reinstatement of the road over the joint bay. There will be 3 No. crews for 11 No. weeks.

The magnitude of impact is evaluated as Moderate, due to the moderate intensity (observable effect on people's daily lives and may impact daily routines), low to moderate spatial extent, and low duration (impacts will be less than 1 year), as per the IMPERIA methodology, see Section 15.1.8.2.2

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- The lightly trafficked nature and extent of available capacity on all roads
- The availability of acceptable diversions around road closures on the L6013-0, L6009-0, L6188-0 local roads;
- The maintenance of local access to properties on the roads, including the roads subject to closures.
- The temporary duration (generally 1 to 3 weeks at any one point on local roads, and 8 to 9 months in total on the regional road)
- The reversibility of the impact with completion of roadworks;
- Application of traffic management measures and use of flagmen to minimise traffic delays.

Road Users

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Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative impacts with Other Elements relates to the L2264-50 and L6188-0 local roads and R503 Regional Road in the Upperchurch Windfarm/UWF Related Works area.

The potential for cumulative effects relates to additional construction related traffic on local roads within the UWF Grid Connection Cumulative Study Area for deliveries to Upperchurch Windfarm and UWF Related Works construction works areas, there will also be increased traffic on the regional road R503 for deliveries to the UWF Grid Connection, Upperchurch Windfarm and UWF Related Works sites.

There is no potential for in-combination travel delays due to road works for UWF Grid Connection and for UWF Related Works, as works for these two elements on the L2264-50 and L6188-0 local roads will not be carried out at the same time. Cumulative impacts relate to sequential impacts with works for UWF Grid Connection and UWF Related Works occurring over a total of 6 weeks on the L2264-50, and over a total of 2 weeks on the L6188-0.

The cumulative impact magnitude is evaluated as Low for road users along the L2264-50 local roads and R503 regional road, due to the very low number of Road Users in the context of the 98% available capacity on these roads, even when the cumulative traffic volumes are modelled (see Appendix 15.1: Traffic and Transportation Assessment Report).

The potential for cumulative impacts with the *potential* Castlewaller grid connection trenching works along the L6009-0 at Castlewaller / Carrowkeale / Derryleigh townlands over a 1 month period. The cumulative impact magnitude is evaluated as Low for road users as cumulative construction impacts are not expected as works will either take place at separate times, or should works be carried out at the same time, then works for both projects are likely to be carried out by one crew, and although a longer construction periods is possible on the local road L6009-0, this will not cause significant effects to journey times, as the works are still temporary and of short duration, with alternative routes available. Local access to properties will maintained during road works and road closures.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The Low Sensitivity and Low Magnitude;
- The lightly trafficked nature and extent of available capacity on the R503, L2264-50, L6188-0, and L6009-0;
- The temporary duration and the reversibility of the impact with the completion of construction works;
- The application of traffic management measures and use of flagmen
- Local access to properties maintained.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: The Internal Windfarm Cabling requires 9 No. separate cable crossing of public roads, which will each be completed within one day.
Haul Route Works will take place at 13 No. locations and will be completed within 1 to 3 days at any location. Flagmen will be used at these locations to minimise delays and disruption to local road users. Traffic management measures will be put in place on the approach to works, advance warning signage has been designed in accordance with the Traffic Signs Manual.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The lightly trafficked nature and extent of available capacity on all roads
- Brief to temporary (up to 3 days) duration of road works, with most trenching completed within one day at road crossing locations.
- The temporary duration of increased traffic associated with the delivery of construction materials;

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- Application of traffic management measures and use of flagmen

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 15.3.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude: There are no works to the public road associated with the Upperchurch Windfarm.
As per Appendix 15.1: Traffic and Transportation Assessment Report the additional construction traffic associated with the Upperchurch Windfarm not have a significant adverse effect on the network capacity and operation of the roads within the study area, with 98%, on average, of the capacity of the affected roads remaining available during the construction stage. The cumulative impact magnitude is evaluated as Low to Moderate.

Significance of the Impact: Imperceptible to Slight

Rationale for Impact Evaluation:

- As per the ABP Inspectors Report for Upperchurch Windfarm: I would therefore agree that the development will impact on the road network and cause disruption to road users but the overall impact will be confined to the time span of the construction period. Impacts can I consider be addressed and mitigated by the implementation of the construction management plan.
- As per the Grant of Permission 2014: it is considered that, subject to compliance with the conditions set out below, the development would not seriously injure the amenities of the area or of property in the vicinity, and would be acceptable in terms of traffic safety and convenience

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 15.3.2.2.1*

Other Project: Potential Castlewaller Windfarm Grid Connection

A potential underground grid connection to Killonan, including a section along the L6009-0 at Castlewaller / Carrowkeale / Derryleigh townlands. Any works will be subject to a road opening license and Traffic Management Plan. Works likely to take c.1 month period. Magnitude is evaluated as Low on L6009-0.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The Low Sensitivity and Low Magnitude;
- The lightly trafficked nature and extent of available capacity on the L6009-0;
- The temporary duration and the reversibility of the impact with the completion of construction works;
- The application of traffic management measures and use of flagmen
- Local access to properties maintained.

Evaluation of Other Cumulative Impacts – Increased Journey Times

Whole UWF Project Effect

Cumulative Impact Magnitude: The Whole UWF Project works requires road works various local public roads and on the Regional Road R503 across the Whole Project Cumulative Evaluation Study Area. Two roads – L2264-50 and L6188-0, will be subject to road works to both UWF Grid Connection 110kV UGC trenching and UWF Related Works Internal Windfarm Cabling Trenching and Haul Route Works, over a total period of 6 weeks on the L2264-50 and 2 weeks on the L6188-0, otherwise roadworks for the UWF Grid Connection and UWF Related Works will be on separate public roads. No road works are required for Upperchurch Windfarm.

The construction works associated with the Whole UWF Project will also cause an increase in traffic volumes on roads due to the construction traffic delivering construction materials, four roads will be subject to construction material haulage traffic from more than one element – the L2264-50, L6188-0, L4138-12 and

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L4139-0. These roads are very lightly trafficked, with 98% of the estimated available capacity of all roads remaining available during the peak traffic construction periods. A number of roads will be subject to road closures, with acceptable alternative routes available for each road, and with local access to properties maintained during road works and road closures.

The R503 will be subject to one lane closures as a result of UWF Grid Connection works, over a period of 8 to 9 months.3 no. crews preforming trenching, joint bays and temporary road reinstatement.

Significance of the Cumulative Impact: ranging from Imperceptible to Slight:
Slight significance for Road Users on the roads associated with UWF Grid Connection works, and the L4138-12 and the L4139-0 roads subject to cumulative traffic, and **Imperceptible** for Road Users on other Public Roads.

Rationale for Cumulative Impact Evaluation:

- The lightly trafficked nature and extent of available capacity on all roads
- Temporary duration of UWF Grid Connection road works and road closures, with reversibility of impacts with the completion of construction;
- Brief to temporary (up to 3 days) duration of UWF Related Works road works, with most trenching completed within one day at road crossing locations, and trenching along the length of a public road not lasting more than 3 days at any location,
- For the most part, the separation of UWF Grid Connection works from Upperchurch Windfarm/UWF Related Works construction sites; Application of traffic management measures and use of flagmen

All Elements of the Whole UWF Project with Other Projects or Activities

Cumulative Impact Magnitude: Cumulative impacts with Other Projects only relates to UWF Grid Connection, as described above (UWF Grid Connection – cumulative impacts), and copied hereunder:

110kV UGC and Potential Castlewaller Windfarm grid connection :
The potential for cumulative impacts with the *potential* Castlewaller grid connection trenching works along the L6009-0 at Castlewaller / Carrowkeale / Derryleigh townlands over a 1 month period. The cumulative impact magnitude is evaluated as Low for road users as cumulative construction impacts are not expected as works will either take place at separate times, or should works be carried out at the same time, then works for both projects are likely to be carried out by one crew, and although a longer construction periods is possible on the local road L6009-0, this will not cause significant effects to journey times, as the works are still temporary and of short duration, with alternative routes available. Local access to properties will maintained during road works and road closures.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- The Low Sensitivity and Low Magnitude;
- The lightly trafficked nature and extent of available capacity on the L6009-0, R503, L2264-50 and L6188-0;
- The temporary duration and the reversibility of the impact with the completion of construction works;
- The application of traffic management measures and use of flagmen
- Local access to properties maintained.

Material Assets (Roads)

Topic

15.3.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 15-22 below.

Table 15-22: Description and Rationale for Excluded Impacts to Road Users

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Traffic Management Road Works, Construction Traffic	1, 2, 4	Road	Increased Risk of Road Accidents	Rationale for Excluding: No likely effect due to the lightly trafficked nature of the roads, the brief to temporary duration of any road works, and the inclusion of road user protection measures in the project design (See Section 15.3.3); the application of advanced signage and traffic management measures, which have been designed in accordance with the Traffic Signs Manual, on the approach to any works or site access points; the provision of sightlines at permanent site entrances; and the application of speed restrictions on vehicles delivering construction materials along the local road network, these measures will ensure the continued safe passage of all road users.
Traffic Management Road Works	1, 2	Road	Interrupted or disrupted access to property	Rationale for Excluding: Neutral impact to road users: Roadworks for the 110kV UGC will take place along 29.2km of public road network, however best practice measures will be put in place to ensure that there is no loss of access to properties along the 110kV UGC route. A small number of roads will be closed for a short duration, however access will be provided at all times to 3rd party properties. In relation to UWF Related Works, road works will be carried out at 18 No. locations, there will be no road closures and access will be provided at all times to 3rd party properties. There are no road works associated with Element 4 Upperchurch Windfarm.
Operational Stage				
Rationale for Excluding: Neutral Impacts or No Impacts: With regard to the UWF Grid Connection: The Mountphilips Substation, will be remotely monitored and secured, and will be inspected on a monthly basis. Each of the cable joint bays along the 110kV UGC and the ground above the 110kV UGC will be inspected annually. In total, it is expected that access to the joint bays/substation will occur over a total c.13 days per year, most likely using vans, will be associated with the routine operation of the UWF Grid Connection. Any infrequent maintenance or repairs (if at all) are expected to be limited to Joint Bay locations and may require roadworks for very short periods of time (1 - 2 weeks). Impacts are expected to be Neutral given the very temporary duration and the implementation of traffic management measures during roadworks (if any). With regard to the UWF Related Works: The Telecoms Relay Pole and the ground above the Internal Windfarm Cables will have one inspection per year, the Realigned Windfarm Roads will be visually inspected on a monthly basis during windfarm site inspections. Each inspection will ordinarily be by way of a normal car or small works van. However, it may require the use of larger machinery and plant for brief durations (c.1 day) to maintain the Realigned Windfarm Roads periodically during the operational stage. At Haul Route Works locations, the roads boundaries may need to be adjusted temporarily at some stage in the future in order to accommodate				

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)

the transport of turbine components to and from the windfarm. It is considered that this will occur very infrequently during the operational stage. It is intended that the hard-core surface, which was installed during the construction works, will be left in-situ under the reinstated verges and boundaries and can be uncovered in the event of requiring its reuse. The resulting duration of any works at Haul Route Works locations will be brief, reversible with reinstatement and are typical of commonly occurring road works on Irish roads, therefore any impacts to Road Users, such as increased journey times, will be Neutral.

With regard to the Upperchurch Windfarm: 1-2 small vehicle movements (van or four-wheel drive) per day associated with the maintenance of the windfarm, and few if any larger vehicle movements. The only larger vehicles would be those associated with the windfarm are the replacement of turbine parts, which may be required infrequently during the operational stage. In any case the use of larger vehicles will involve very small numbers of larger vehicle movements, all of which will comply with axle loadings, and vehicle movements associated with large turbine components will take place outside of peak hours. Due to the very low traffic volumes associated with Upperchurch Windfarm, which are less than those associated with a residential dwelling and the absence of roadworks, the effects to Road Users will be Neutral.

Decommissioning Stage

Rationale for Excluding: Neutral Impacts/No Impacts.
The UWF Grid Connection will not be decommissioned, therefore there is no potential for effects.

The traffic volumes associated with those parts of the UWF Related Works which will be decommissioned (Telecoms Relay Pole, cables from the Internal Windfarm Cables) will result in minimal traffic condition changes which will not be noticeable on the local roads, and neutral effects to Road Users is expected. In relation to the Haul Route Works: It is not known at this time whether the turbine components will be broken up and transported off-site in smaller parts for recycling, or if some or all of the turbine components will be transported offsite for reuse. Should turbine components be transported offsite, then the road verges/boundaries at Haul Route Works locations will be widened once more, similar to infrequent widening during the operational stage, to facilitate the transport of turbine components (if needed). The duration of any works at Haul Route Works locations will be brief, reversible with reinstatement and are typical of commonly occurring road works on Irish roads, therefore any impacts to Road Users, such as increased journey times, will be Neutral.

In relation to the Upperchurch Windfarm, the traffic volumes associated with the decommissioning of the turbines will be low, and for the most part will consist of HGVs and vans transporting turbine parts off-site. Turbine component transportation off-site, if any, will be carried out during off-peak hours (typically during the early hours of the morning) when there are few, if any motorists on local and regional roads, it is considered that effects to Road Users, if any, will be neutral.

15.3.5 Mitigation Measures for Impacts to Road Users

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures, and it is this design that has been evaluated in this topic chapter. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur** to occur to Road Users.

15.3.6 Evaluation of Residual Impacts to Road Users

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Road Users above (Section 15.3.4) – i.e. **no significant adverse impacts**.

15.3.7 Traffic Management Plan

A Traffic Management Plan forms part of the UWF Grid Connection Environmental Management Plan, which is included as Volume D.

The Traffic Management Plan (TMP) for the public roads will be a key construction contract document, the implementation of which will reduce possible impacts which may occur due to the presence of construction traffic and works on the public roads, in particular the Local Roads in the vicinity. It is a particular objective of this plan to control and minimise the traffic impacts of construction insofar as it may affect the local environment, local residents and the travelling public on the public roads close to and adjacent to the construction site, through measures to maximise the safety while keeping traffic flowing as freely as possible. The TMP will be updated from time to time to include any relevant planning conditions in addition to any new information on 3rd party road works or events, which would impact on the construction traffic route and timing. The appointed Contractor will be responsible for carrying out and managing the construction activities in accordance with the TMP.

Best Practice through the implementation of a Traffic Management Plan, will be employed to afford further protection to the Environment.

Road Users

Sensitive Aspect

15.3.8 Summary of Impacts to Road Users

A summary of the Impact to Road Users is presented in Table 15-23.

Table 15-23: Summary of the impacts to Road Users

Impact to Road Users:	**Increased Journey Times**
Evaluation Impact Table	*Section 15.3.4.1*
Project Life-Cycle Stage	Construction
UWF Grid Connection Direct/indirect impact	**Slight**
UWF Grid Connection Cumulative impact	**Imperceptible**
Element 2: UWF Related Works	Imperceptible
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 15.3.2.2.1
Element 4: Upperchurch Windfarm	Imperceptible to Slight
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 15.3.2.2.1
Cumulative Impact:	
All Elements of the Whole UWF Project	**Ranges from Imperceptible to Slight**
Other Projects & Activities: Castlewaller Windfarm (potential grid connection on the L6009-0)	**Imperceptible**

Material Assets (Roads)

Topic

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

15.4 Reference List

Bus Eireann, Limerick – Newport – Cappamore – Dundrum 332. https://www.buseireann.ie/timetables/332-1516878888.pdf.

Central Statistics Office

https://www.cso.ie/en/media/csoie/census/census2016/powscar/Place_of_Work,_School_or_College_-_Census_of_Anonymised_Records_(POWSCAR)_User_Guide_2016_v4.pdf

Department of Transport, Tourism and Sport. Regional and Local Roads. https://www.gov.ie/en/policy-information/0eb589-road-safety/?referrer=/roads/english/road-safety/

North Tipperary Leader Partnership, Rural Transport Programme. http://www.ntdc.ie/programmes/rural-development-programme-leader-2014-2020/

Road Safety Authority, Online Map of Collisons in Ireland. https://www.rsa.ie/en/RSA/Road-Safety/RSA-Statistics/

EPA Maps, Corine 2018, https://gis.epa.ie/EPAMaps/

Reference

Topic: Material Assets (Roads)

UWF Grid Connection EIA Report (2019)

Volume C2: EIAR Main Report

Chapter 16: Cultural Heritage

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ECOPOWER

October 2019

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List of Figures

Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

List of Appendices

Appendices referenced in this topic chapter can be found in **Volume C4 EIAR Appendices.**

Glossary of Terms

Term	Definition
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.
Project Design Measure	Measures for environmental protection, incorporated into the design of the project.

List of Abbreviations

Abbreviation	Full Term
RMP	Record of Monuments & Places
NIAH	National Inventory of Architectural Heritage
PD	Ecopower Project Design Environmental Protection Measure developed by members of the EIAR Team
UGC	Underground Cables
UWF	Upperchurch Windfarm

Executive Summary of the Cultural Heritage Chapter

Baseline Environment: The Slievefelim to Silvermine Mountain uplands area, is a region with a rich and diverse history of human settlement going back to prehistoric times, which is reflected in the archaeological record. The cultural heritage assessment focuses on cultural heritage sites within the geographical study areas – i.e. within construction works areas (and in some cases, within 500m of construction works areas); and within 2km of the Mountphilips Substation.

Survey Results for Sensitive Aspects in the Baseline Environment: The full development area was examined through a review of the Sites and Monuments Record, topographical files of the National Museum of Ireland, published and unpublished sources, cartographic analysis, reviews of historical and aerial mapping and thorough field walking. A full list and description of the Sites recorded/identified within the UWF Grid Connection Study Areas is included in Appendix 16.1: Detailed Description of Cultural Heritage Sites. An Architectural Heritage Impact Assessment for Anglesey Bridge was also carried out, see Appendix 16.2 Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905.

Recorded Legally Protected Sites relate to heritage sites recorded on the Record of Monuments & Places – i.e. RMP sites. In total there are 39 No. Recorded Legally Protected Sites within the 500m UWF Grid Connection Study Area and a total of 14 No. sites within 2km of Mountphilips Substation.

Other Recorded Sites relate to heritage sites recorded on the National Inventory of Architectural Heritage or on the NIAH Garden Survey. In total, 12 No. Other Recorded sites were recorded - 8 No. within the 500m UWF Grid Connection study areas and 8 No. sites within 2km of Mountphilips substation. Seven Sites are identified on the National Inventory of Architectural Heritage (NIAH) and five are demesnes listed on the NIAH Garden Survey.

Previously Unrecorded Sites are sites identified on historic Ordnance Survey Maps and/or recorded during field walking or from reviews of aerial photography. A total of 51 No. sites were recorded within the UWF Grid Connection Study Area. These sites mainly comprised of Lime Kilns, Wells, Quarries and Townland Boundaries, some of which may not have ever had any structural elements associated with them or are no longer standing.

Unrecorded Subsurface Sites relates to structures or artefacts which are currently undiscovered but which may potentially exist under the ground surface.

Summary of the Significance of the Impacts to Recorded Legally Protected Sites: 39 No. sites are within 500m of UWF Grid Connection construction works areas. No Recorded Legally Protected Sites are likely to be affected by construction works due to the distance of these sites from the construction works areas, which are located outside the Zone of Notification for all but 3 No. sites. However, **no destruction impacts** are any expected to these 3 no. sites due to the location of the 110kV UGC in public road pavements. In any case, project design measures include the archaeological monitoring of groundworks and excavations within 500m of RMP sites. In relation to the Operational Stage, 4 No. sites (of the 14 No.) within 2km of the operational Mountphilips Substation will have *theoretical* visibility of the new Mountphilips Substation, however due to the low lying location, there will be **no visual impact** as the substation will be completely screened from view from all of these 4 No. sites. **Cumulative effects with Other Elements** of the Whole UWF Project are not likely during construction, and have no potential to occur during the operational stage. Overall, the **whole project effect** will be **Imperceptible**.

Summary of the Significance of the Impacts to Other Recorded Sites: 8 No. Other Recorded Sites are within 500m of UWF Grid Connection construction works areas. In relation to the Operational Stage, there is 1 No. site within 2km of the operational Mountphilips Substation which will have *theoretical* visibility of the new

Mountphilips Substation. There is **no potential for complete or partial destruction** of Other Recorded Sites from groundworks for the development, due to separation distance (6 of the 8 No. of the sites); and due to the fact that Mountphilips Demense site has no extant features and has been subsumed into the modern agricultural landscape in the area; and due to no interaction with the columns or supporting structures of Anglesey Bridge. There is **no potential for visual impact** from Mountphilips Substation as the only Site which would have visibility of the new substation is the Mountphilips Demense, which as stated above, has no extant features and has been subsumed into the modern agricultural landscape**.** There is **No potential for cumulative impacts** due to the absence of Other Recorded Sites in proximity to Other Elements of the Whole UWF Project**.**

Summary Impact on Previously Unrecorded Sites: Due to the location of the 110kV UGC on paved roads outside the Mountphilips Substation site, the separation distance to Previously Unrecorded Sites and the monitoring of groundworks within 500m of an RMP or NIAH site, the potential for damage to Previously Unrecorded Sites is limited to townland boundaries at the Mountphilips Substation site where a 160m section of the Coole/Freagh townland boundary will be removed to facilitate the widening of the entrance from the public road and a 10m section of the Mountphilips/Coole townland boundary will be removed for the new permanent access road to the Substation compound. This impact is evaluated as **Imperceptible**, mainly due to the small extent of change to these boundaries. **Visual impacts are not likely to occur**, as none of the 22 No. Previously Unrecorded Sites which occur within 2km of Mountphilips Substation, will have visibility of the Substation. There is **no potential for cumulative impacts** due to the separation distance to Other Elements of the Whole UWF Project**.** Overall the **whole project effect** is evaluated as **Slight.**

Summary Impact on Unrecorded Subsurface Sites: By their nature, the magnitude of the impact of the development on Unrecorded Subsurface Sites cannot be determined at this stage. It is possible that unknown archaeological materials could be impacted upon by the UWF Grid Connection works, particularly at the Mountphilips Substation site where works will take place to remove sections of townland boundaries and where groundworks occur in the Other Recorded Site *GR3 Mount Philips Demesne*, and along the Regional Road R503 where 110kV UGC works will occur within the Zone of Notification for Recorded Legally Protected Sites; *GL18 – Ringfort (rath)* in Derryleigh, *GL28 – Enclosure* in Scraggeen and *GL34 – Mine (copper)* in Lackamore. It is considered that Unrecorded Subsurface Sites exposed during the course of construction ground works are most likely to involve levelled earthworks, backfilled cuts, and areas of large scale burning or artefact scatters. It is unlikely that any fully intact remains of special archaeological significance will be uncovered. The potential for impacts is mitigated by the provision for archaeological monitoring of all ground works relating to the construction, within 500m of an RMP or NIAH site, and the location of works taking place in extensively improved lands at Mountphilips, and within road pavement outside the Mountphilips Substation site. It is evaluated that UWF Grid Connection may cause **Slight Impacts** to Unrecorded Subsurface Sites. Furthermore, it is considered that there is **no potential for cumulative effects**, as any Unrecorded Subsurface Sites if present, will only be affected by initial groundworks. Overall the **whole project effect** is in the order of UWF Grid Connection – i.e. **Slight.**

Conclusion: The UWF Grid Connection will not cause significant adverse effects to Cultural Heritage.

16 Environmental Factor: Cultural Heritage

16.1 Introduction to the Cultural Heritage Chapter

16.1.1 What is Cultural Heritage?

Cultural Heritage relates to sites of archaeological, historical or architectural significance within the receiving environment. The study of Cultural Heritage, or archaeology, is the study of past societies through the material remains left by those societies and the evidence of their environment. Cultural Heritage consists of such material remains (whether in the form of sites, monuments, and historic structures or artefacts in the sense of moveable objects) and environmental evidence.

The legal definition of a Monument is defined in section 2 of the National Monuments Act 1930 as any a) artificial structure or group of structures, b) any cave, stone or other natural product, that has been carved, sculpted or worked upon or appears to have been purposely arranged, c) any part of any prehistoric/ancient tomb, grave or burial deposit, ritual, industrial or habitation site, and d) any place comprising the remains or traces of any structure, erection, cave, stone or natural product of any tomb, grave, burial deposit or ritual, industrial or habitation sites situated on land or in the territorial waters of the state. This definition is very broad and overlaps with a number of the other categories of cultural heritage such as architecture.

Archaeological objects are defined in section 2 of the National Monuments Act 1930 as "any chattel whether in a manufactured or partly manufactured or unmanufactured state which by reason of the archaeological interest attaching thereto or of its association with any Irish historical event or person has a value substantially greater than its intrinsic (including artistic) value, and the said expression includes ancient human, animal or plant remains".

Architectural heritage is defined in the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 as "(a) structures and buildings together with their settings and attendant grounds, fixtures and fittings, (b) groups of such structures and buildings, and (c) sites".

Landscape comprises the visible features of an area of land, including physical elements such as landforms, living elements of flora and fauna, abstract elements like lighting and weather conditions, but from a cultural heritage viewpoint it is the human elements and the built environment that are most significant.

Cultural heritage can vary greatly in form and date. Sites may have no visible surface features; the surface features of an archaeological site may have decayed completely or been deliberately removed but archaeological deposits and features may survive beneath the surface. Such sites may sometimes be detected as crop-marks visible from the air or have their presence indicated by the occurrence of artefact scatters in ploughed land, but in other cases may remain invisible unless uncovered through ground disturbance.

16.1.2 Overview of Cultural Heritage in the Local Environment

The UWF Grid Connection is located in the Slievefelim to Silvermine Mountain uplands area, which is a region with a rich and diverse history of human settlement going back to prehistoric times. This extended period of occupation is reflected in the archaeological record. This report focuses on cultural heritage sites within the geographical study areas – i.e. within construction works areas and in some cases, within 500m of construction works areas; and within 2km of any above ground structures associated with the project.

Within 2km of the UWF Grid Connection, a total of 111 Cultural Heritage Sites were identified and described. These included 49 No. sites listed on the Record of Monuments and Places (RMP), 7 listed on the National Inventory of Architectural Heritage Building Survey, 5 on the National Inventory of Architectural Garden Survey, and 50 sites (wells, lime kilns, houses and fords etc) shown on various editions of the historic Ordnance Survey maps.

While the spread of these monuments date from the Neolithic through to post medieval and modern times, the upland region appears to have been most intensively settled in the late Neolithic, with populations dispersing to the lower slopes during later periods (Grogan 2005, 21).

The location of the UWF Grid Connection within the Slievefelim to Silvermine Mountain uplands area is illustrated on OSI Mapping on Figure GC 16.1: Location of the UWF Grid Connection on Historical Mapping.

Figures and mapping referenced in this topic chapter can be found in Volume C3 EIAR Figures.

Note: For ease of reading and mapping, Cultural Heritage sites within the study area have been numbered as follows;

- GL – Recorded Legally Recorded Sites within the UWF Grid Connection Study Area
- GR – Other Recorded Sites within the UWF Grid Connection Study Area
- GU – Other Previously unrecorded Sites within the UWF Grid Connection Study Area

These Sites are numbered from West to East. The location of these sites as well as the Archaeological Reference number are presented on the Figures which accompany this chapter (see Volume C3: EIAR Figures).

See also Appendix 16.1: Detailed Description of Cultural Heritage Sites **(Volume C4: EIAR Appendices).**

16.1.2.1 Archaeological Surveys in the General Area of the Development

The monuments of Tipperary were surveyed in the early 1980s by the Archaeological Survey of Ireland. A review of prehistoric archaeology in Tipperary undertaken by Richard Raleigh (1985) highlighted the prehistoric richness of this North Tipperary region, while between 1992 and 1995 the North Munster Project of the Discovery Programme sought to understand settlement patterns over a vast 7000km^2 area that centred on the lower Shannon catchment (Grogan 1996). An Archaeological Inventory for County Tipperary was published in 2002 (see Farrelly and O'Brien 2002).

In 1959, Michael O'Kelly from the Department of Archaeology, University College Cork, excavated one of the most visually impressive monuments in the region, the prehistoric Wedge tomb of Baurnadomeeny (RMP TN038-009), which is located c800m north of the proposed UWF Grid Connection on the southeast face of Moherslieve (O'Kelly 1959; 1961).

These works all formed the core of the desk study portion of this report

16.1.2.2 The Mesolithic Period (7000-4000BC)

While there are no sites within the study area which can be directly attributed to this period, some 20km to the south of the study area, in the townland of Rathjordan, a small group of Early Mesolithic microliths were identified among the finds from an excavation of a ring barrow carried out in the 1940s (Woodman 1986, 10). A precise date for this material is impossible to ascertain other than it was most likely earlier than 6000 BC (Woodman 1986, 10). This might indicate that the wider region, in particular lower slopes of the western Silvermine Mountains, may have been a location for some of the earliest human settlement in the country.

16.1.2.3 The Neolithic Period (4000-2400BC)

The Neolithic period sees the first concrete evidence of human settlement in the study area. While people in the Neolithic were predominantly farmers and lived in rectangular or circular/oval shaped wooden houses, it is their megalithic tombs and cairns which leave a lasting visual impression in the landscape. A court tomb at Shanballydesmond (RMP TN038-013), c510m south of the UWF Grid Connection, is the oldest known Neolithic monument in Tipperary (Raleigh 1985). Excavations by Kelly in 1958 inside the tomb yielded six unburnt or cremated human remains and tools of flint and chert. The tomb itself sits at high point in the landscape overlooking the Bilboa River. Several other Megalithic Tombs have been identified within the study area where not enough remains to accurately attribute them to a specific period. While they are most likely later Wedge Tombs (see below), the possibility remains that they are earlier Neolithic examples.

Another probable Neolithic monument class is a cairn, and one such monuments is c1.1km north of the study area (UWF Grid Connection). This cairn, located at Baurnadomeeny, (TN038-007001), is located on the southwest of Mauherslieve and contains a cist burial (TN038-007002)

Neolithic Period: Cairn and Cist at Baurnadomeeny

16.1.2.4 The Bronze Age (2400-500BC)

The Bronze Age period is represented in the region area by several main site types: wedge tombs, barrows, standing stones, stone circles/rows and fulachta fiadh. The tradition of megalithic tomb construction in the region continued through into this Early Bronze Age period with the construction of a number of wedge tombs. These tombs date to between 2300 and 2000 BC and are often associated with the Beaker pottery of the Early Bronze Age (Newman and Halpin 2000, 9). There are a total of four examples of wedge tombs

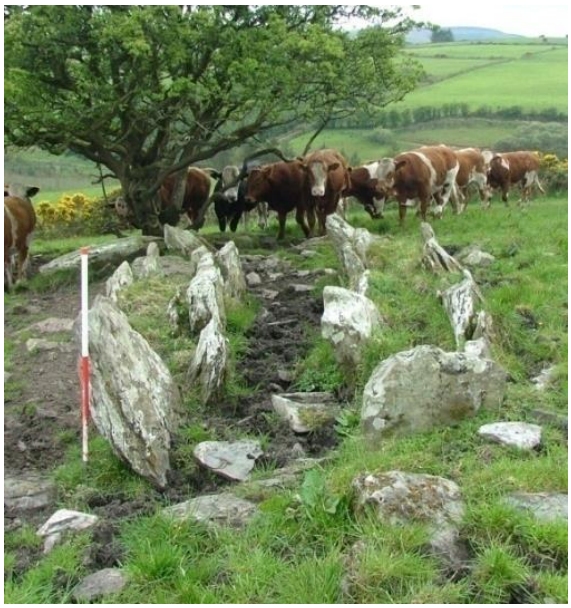
located in the area (GL47 *TN039-009*, *TN039-008*, *TN039-017* and *TN039-016*). There are also three additional megalithic tombs (TN039-050, TN039-045 and TN039-037) which have not been classified by the RMP, but most likely fall within this category. The most prominent and complete wedge tomb is located at Knockcurraghbola Commons and sits on the southern slopes of a small knoll. It is situated within the study area, 380m northwest of the UWF Grid Connection. The tomb is 7m long and decreases in height and width from southwest to northeast.

Another complex of four tombs – two of which are wedge tombs and two are possible wedge tombs – are located 1.5m southwest of the Knockcurraghbola Commons tomb are also in this townland. The first one is the most preserved of this group. These tombs were visited by the author as part of the field survey carried out for the archaeological assessment of the Upperchurch windfarm in 2012.

Elsewhere, excavations at the Baurnadomeeny Wedge tomb (c800m north of the proposed UWF Grid Connection) by O'Kelly yielded 21 burials and a range of flint tools (Raleigh 1985). A distribution analysis of the tombs of the study area and the immediate surroundings of the Silvermine Mountains revealed that these types of burial monuments were not on the summits of hills like in the Neolithic but were more generally on lower lying, sloping land. The Wedge tombs are associated with a series of rivers and streams that ultimately flow into the River Shannon, with the exception of the Knockcurraghbola Commons group, which are at the juncture where streams flow to both the Bilboa River (and on to the Shannon) and the Turraheen River, which connects with the Suir River.

Wedge Tomb in Knockcurraghbola Commons townland

Megalithic Tomb in Knockcurraghbola Commons townland



Megalithic Tomb in Knockcurraghbola Commons townland

Megalithic Tomb in Knockcurraghbola Commons townland

Megalithic Tomb in Knockcurraghbola Commons townland

Megalithic Tomb in Knockcurraghbola Commons townland

Wedge Tomb in Baurnadomeeny townland

The Middle Bronze Age period is represented in the study area by standing stones, stone rows and stone circles. There are at least 3 examples of standing stones (TN039-004002, TN039-043, and TN039-044), a stone circle (TN039-004001), and a stone row (TN039-052) from the area. Distribution and viewshed analyses (carried out in 2012 by the author) of the standing stones within and adjacent to the study area show a

striking pattern: they are overwhelmingly placed at positions which overlook the numerous rivers and streams.

Standing Stone in Knockcurraghbola Crownlands

Standing Stone in Knockcurraghbola Commons

Stone Row in Knockcurraghbola Commons

Test excavations were also carried out in the vicinity of the Stone *Row* in Knockcurraghbola Commons townland (shown in the photo directly above) by the author in 2017 as part of the EIAR studies for the UWF Related Works project. The investigation revealed nothing of archaeological significance.

A single fulacht fiadh, a type of Bronze Age site where water was heated for both domestic and ritual use, was identified within the development area (TN039-051) in Knockcurraghbola Commons townland. This was located to the south of –the Stone Row in an area completely covered by dense mature forestry.

16.1.2.5 The Iron Age (2400-500BC)

Later burial monuments come in the form of barrows. There are three examples of this monument type in the area (TN031-071, TN037-044 and TN039-035). These burial mounds are generally dated to the Late Bronze and Early Iron Age but may be earlier.

No work has been carried out on any of the examples from within the study area to more accurately date these monuments. As with the earlier megalithic examples there is a high concentration of these monuments evident in the wider landscape of the development area. One example, a well preserved bowl-barrow (Site GL13) is located *c.125*m from the UWF Grid Connection development area.

Site GL13 - Bowl Barrow from south

To make sense of the prehistoric site distribution patterns and the heavy concentration of prehistoric monuments in the upland region, Raleigh (1985) observed that mineral resources may have been an attraction for settlement. There is 1 no. mine recorded in the study area, a prehistoric copper mine 40m south of the study area in Lackamore (GL34 - TN038-020).

16.1.2.6 The Early Medieval Period (400-1100AD)

Occupation continued during the Early Medieval (c.400-1100 AD) period with a large concentration of ringforts to be found on the slopes of the Silvermine Mountains. Ringforts enclosed single farmsteads and are by far the most common medieval archaeological monument surviving in Ireland with over 47,000 examples having been identified across the island (Aalen et al. 2012, 45).

Although there are some examples dotted around the valleys in the Silvermine mountains, ringforts typically avoided upland areas. This monument type is more commonly found on flat ground and the lower slopes of river valleys. Within the study area there are a total of 9 ringforts. All bar one of these is located at the western extents of the development area.

There are also enclosures (Site GL23 TN-37-022, Site GL28 TN37-031, GL42 TN39-025001 and GL43 TN39-025002) within the study area which may be attributed to this period.

The Early Medieval period also saw the spread of Christianity across Ireland and many churches and monastic centres emerged during this period. The significance of holy wells and other sites of ritual significance, such as bullaun Stones, can be traced back to this period. While it is unclear that any of the four medieval churches from the study area have their origins in this period, within the environs of the proposed development there are three holy wells (Site GL5 TN031-010002 and Site-GL10 TN031-072) and two bullaun stones (Site GL1 TN031-009 and Site GL32 TN037-032002).

16.1.2.7 The Later Medieval Period (1179-1400AD)

The next significant archaeological period for the region followed the Anglo-Norman conquest in the late-12th century. During this period the western portion of the study area was part of the kingdom of Limerick (Empey 1985, 76). It was conquered by 1206 and the previous Gaelic order was replaced by a new feudal regime that was organised on entirely different principles (Empey 1985, 76). The Anglo-Norman conquest had a massive impact on the landscape of Ireland. With the conquest came a new architecture of power in the form of great stone castles, cathedrals and churches. These great buildings were designed and located to assert the new-found dominance of the Anglo-Normans over the landscape, the people and their traditions. Within the broader landscape of the proposed development area there are a wide array of examples of Anglo-Norman buildings, from early motte and baileys through to the subsequent masonry castles and churches.

The two churches within the study area (Site GL4 and Site GL12), possibly dating from the medieval period, provide evidence for the Anglo-Norman encroachment into the locality. Within the broader region of the Silvermine Mountains there is greater evidence of this conquest, specifically the military aspect. The castles are situated at the foothills of the mountains overlooking the Clodiagh and Owenbeg rivers but not in the upland regions, which would have remained out of Norman influence. These frontier castles (for example Site GL7, *tower house*) appear to defend a key routeway into the mountainous regions of North Tipperary.

16.1.2.8 The 'Age of Improvement' (17th-18th Century)

In the 17th-18th-centuries country estates known as demesnes emerged across the country. These had their origins in the "Age of Improvement". Demesnes consisted of designed landscapes which were usually enclosed by stone walls and were often entered through elaborate gate lodges and gateways. They often contained an area of managed woodland known as a wilderness; this included pathways for the gentry to stroll through. Trees were planted along the roads in the estate to create shelter belts and avenues along the approaches to the 'Big House'. The houses formed the centrepiece of every demesne and were generally constructed in the Palladian style which drew on aspects of Classical Roman and Greek architecture.

Within the study area, a total of five designed landscapes are shown on the first edition Ordnance Survey Maps. The Mountphilips 110kV Substation is located within the footprint of Mount Philips Demesne (GR3). Within the immediate vicinity of the substation site are two additional demesnes, Barna Demesne (GR4) and Rockvale Demesne (GU7). Practically all features associated with these sites within the vicinity of the development area are no longer extant.

16.1.2.9 Early Modern Period (1850-Present)

Agricultural farming and land improvement is evident across the majority of the study area. This is characterised by large scale land enclosure in upland areas and the presence of a significant number of smithys, lime kilns, gravel pit and quarries present in the study area.

In 1973, Ireland's accession to the E.E.C. (E.U.) and the subsequent effects of the Common Agricultural Policy (CAP) had far reaching consequences for the landscape. CAP promoted intensification and industrial-scale farming which was mainly responsible for the destruction of many of the field-boundaries marked on the first edition map of the development area. The land in the area is now a mix of improved agricultural grassland and wet grassland employed for pasture, though coniferous forest also makes up a sizeable proportion – c.30%.

16.1.3 Sensitive Aspects of the Cultural Heritage Environment included for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspects **are included in this topic chapter** as they could be potentially impacted:

Sensitive Aspect No. 1	Recorded Legally Protected Sites	Section 16.2
Sensitive Aspect No. 2	Other Recorded Sites	Section 16.3
Sensitive Aspect No. 3	Previously Unrecorded Sites	Section 16.4
Sensitive Aspect No.4	Unrecorded Subsurface Sites	Section 16.5

Each of the above listed Sensitive Aspects are evaluated individually in Sections 16.2 to 16.5 of this Chapter.

To help readers navigate to individual sensitive aspect sections, the colour codes for each Sensitive Aspect used above are also used in the Sensitive Aspect sections Section 16.2 to 16.5. The colour-codes have been applied to section headings, tables and on side-tabs on the edge of the pages.

16.1.4 Sensitive Aspects excluded from further evaluation

No Sensitive Aspects are excluded from this topic chapter.

16.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of a current application to An Bord Pleanála. The main parts of the UWF Grid Connection are identified in Table 16-1 below.

Table 16-1: Subject Development – UWF Grid Connection

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Ancillary Works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 EIAR Main Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

16.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.

- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. ***Note***: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

16.1.6 The Authors of the Cultural Heritage Chapter

This report was written by Barry Fitzgibbon (MA MIAI) and Cóilín O'Drisceoil (MA MIAI) of Kilkenny Archaeology. The report authors are members of the Irish Archaeological Institute, the professional body of archaeologists in Ireland and are also qualified as licence-eligible archaeologists under the criteria set out by the National Monuments Service and the National Museum of Ireland. Kilkenny Archaeology specializes in evaluating the impact of large-scale development on Cultural Heritage sites in the receiving environment.

A dedicated report on the conservation aspects of the Anglesey Bridge at Foildarragh, NIAH No. 22403905 was prepared by James Powell BSc MIEI CEng, built heritage consultant. James is a Chartered Engineer with a particular speciality in Applied Building Repair and Conservation.

16.1.7 Sources of Baseline Information

The information sources outlined in Table 16-2 were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 16-2: Sources of Baseline Information for Cultural Heritage

Type	Source
Consultation	No feedback was received from consultees See Chapter 3: The Scoping Consultations, Chapter 3 Appendices for further details.

Policy & Regulations	• National Monuments Acts 1930-1994 (as amended)
	• Heritage Act 2000
	• Planning and Development Act 2000 (as amended)
	• The Architectural Heritage and Historic Properties Act, 1999.
	• European Convention on the Protection of the Archaeological Heritage (*Valetta Convention*, ratified by Ireland 1997)
	• The European Convention on the Protection of the Architectural Heritage (*Granada Convention*, ratified by Ireland in 1997).
	• ICOMOS Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas, 2005
	• Mid-West Regional Planning Guidelines 2010-2022
	• North Tipperary County Development Plan 2010-2016 (as varied),
	  ○ Policy LH16: Archaeology and Cultural Heritage
	  ○ Section 7.5.3 Architectural Heritage of Local Interest
	  ○ Policy LH15: Architectural Heritage of Local Interest

Guidelines	• 'Framework and Principles for the Protection of the Archaeological Heritage' *issued by the Dept. of Arts, Heritage, Gaeltacht and the Islands (1999)* • The National Roads Authority's (NRA) Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (2005) • Architectural Heritage Protection Guidelines for Planning Authorities (DAHG 2011).
Desktop	Databases: • Record of Monuments and Places • Record of Protected Structures • National Inventory of Architectural Heritage • National Museum of Ireland Topographic Files All editions of the historic Ordnance Survey Maps: • First edition 1841 and the second edition 1898 1:10560 maps • Second edition 1900 Ordnance Survey map sheet • Other historic mapping, such as the Down Survey (1655) and the Griffith Valuation (1850). • Griffith's Valuation maps and valuation report • Records of Monuments and Places (RMP) constraints maps Review of Aerial Photography Mapping: • 2000 Ordnance Survey orthophotography • 2005 Ordnance Survey orthophotography • Google Earth • Bing maps aerial photos • Chapter 17: Landscape

Type	Source
	• Review of planning/ environmental information documents for the Other Elements of the Whole UWF Project as contained in Volume F of the planning application.
Fieldwork	• Field survey, walking of the works areas

16.1.8 Methodology used to Describe the Baseline Environment and to Evaluate Impacts

The methodology employed conforms to the recommendations in regard to archaeological assessments in the 'Framework and Principles for the Protection of the Archaeological Heritage' issued by the Dept. of Arts, Heritage, Gaeltacht and the Islands (1999), the *Architectural Heritage Protection Guidelines for Planning Authorities* (DAHG 2011), as well as the legislative frameworks of the *National Monuments Acts 1930-2012 (as amended)*, the *Heritage Act 2000*, The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 and the *European Convention on the Protection of the Archaeological Heritage (ratified by Ireland 1997)*.

This assessment comprised a site specific desk-based study and a field survey of the application area.

The criteria used to evaluate impacts for this cultural heritage appraisal has been derived from the National Roads Authority's (NRA) Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (2005). These criteria are set out in the tables below.

Table 16-3: NRA Criteria for Determining the Quality of Cultural Heritage Impacts

Quality of Impacts	Description
Negative	A change that will detract from or permanently remove an archaeological monument from the landscape.
Neutral	A change that does not affect the archaeological heritage
Positive	A change that improves or enhances the setting of an archaeological monument

Table 16-4: NRA Criteria for Determining the Significance of Impacts on Cultural Heritage

Significance of Impacts	Description
Profound	Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where an archaeological site is completely and irreversibly destroyed by a proposed development.
Significant	An impact which, by its magnitude, duration or intensity, alters an important aspect of the environment. An impact like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity and data about the archaeological feature/site.
Moderate	A moderate direct impact arises where a change to the site is proposed which though noticeable, is not such that the archaeological integrity of the site is compromised and which is reversible. This arises where an archaeological feature can be incorporated into a modern-day development without damage and that all procedures used to facilitate this are reversible.
Slight	An impact which causes changes in the character of the environment which are not significant or profound and do not directly impact or affect an archaeological feature or monument.
Imperceptible	An impact capable of measurement but without noticeable consequences in terms of the nature or character of the archaeological feature or monument.

16.1.9 Certainty and Sufficiency of Information Provided

The assessment of effects has a clear documentary trail of the analysis used to arrive at conclusions that demonstrably conform to peer-reviewed standards. The methodology complies with the recommendations in regard to archaeological assessments in the 'Framework and Principles for the Protection of the Archaeological Heritage' issued by the Dept. of Arts, Heritage, Gaeltacht and the Islands (1999), the *Architectural Heritage Protection Guidelines for Planning Authorities* (DAHG 2011), as well as the legislative frameworks of the *National Monuments Acts 1930-2012 (as amended)*, the *Heritage Act 2000*, The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 and the *European Convention on the Protection of the Archaeological Heritage (ratified by Ireland 1997)*.

The methods employed also complies with the requirement in section 7.5 – Built Heritage of the North Tipperary County Development Plan 2010 (as varied) to require archaeological assessment of developments in areas where previously recorded archaeological monuments are present.

In relation to this Cultural heritage evaluation, no limitations/difficulties were encountered.

16.2 Sensitive Aspect No.1: Recorded Legally Protected Sites

This Section provides a description and evaluation of Sensitive Aspect - Recorded Legally Protected Sites. Recorded Legally Protected Sites relates to sites listed on the Record of Monuments & Places (RMP) and on the Record of Protected Structures.

16.2.1 BASELINE CHARACTERISTICS of Recorded Legally Protected Sites

This Section 16.2.1 comprises the identification of the Study Area for direct or indirect effects, and a description of the context, character, importance and sensitivity of the Recorded Legally Protected Sites in the area. Trends or changes in the baseline environment are also identified.

16.2.1.1 STUDY AREA for Recorded Legally Protected Sites

The study area for Recorded Legally Protected Sites in relation to the UWF Grid Connection is described in Table 16-5 and illustrated on Figure GC 16.2: UWF Grid Connection Study Area for Recorded Legally Protected Sites (Volume C3 EIAR Figures).

Table 16-5: UWF Grid Connection Study Area for Recorded Legally Protected Sites

Study Area for Recorded Legally Protected Sites	Justification for the Study Area Extents
Construction Stage Effects; Within the footprint of the construction works area plus 500m radius surrounding the footprint of the construction works areas	Groundworks, and their potential to directly impact any Cultural Heritage Site, are restricted to the immediate footprint of the development area. The wider study area was adopted in order to ensure that the full extent of each identified Recorded Legally Protected Site, as well as any associated, or ancillary, features or structures, could be fully appraised. It is extremely unlikely that Cultural Heritage Sites beyond this area could be impacted.
Operational Stage Visual Effects: 2km zone around the location of the Mountphilips Substation	Because of the relatively low heights of the Mountphilips Substation (including the End Masts), any visibility beyond 2km would be barely perceptible to none. The remainder of the UWF Grid Connection will either be placed below ground (110kV UGC) or will comprise the new stone road and widened entrance at Coole, which are a common occurrence in the area and will not cause any visual impacts, and for this reason these parts are not included in the operational stage study area.

16.2.1.2 Baseline Context and Character of Recorded Legally Protected Sites in the UWF Grid Connection Study Area

There are a total of 39 No. archaeological sites recorded on the Record of Monuments and Places (RMP) within 500m of construction works area for UWF Grid Connection.

There are a total of 14 No. Recorded Legally Protected sites which will be located within 2km of the operational Mountphilips Substation, 4 No. of these Sites will have theoretical visibility of the Mountphilips Substation; *GL6 - Ringfort, GL8 – Bawn and GL7 - Castle - Tower House,* and *GL13 - Bowl Barrow.*

The environment within which these monuments occur is largely rural in nature across a mix of open farmland and cultivated forestry.

The Recorded Legally Protected Sites within the UWF Grid Connection Study Area are identified in Table 16-6 below, and Figure GC 16.2: UWF Grid Connection Study Area for Recorded Legally Protected Sites.

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Table 16-6: Recorded Legally Protected Sites within the UWF Grid Connection Study Area

Site ID	Record of Monuments & Places Code	Classification/Type	Townland	Separation Distance
GL1	TN031-009----	Bullaun stone	Ballyard	1.6km
GL2	TN031-010001-	Church	Ballyard	1.5km
GL3	TN031-010002-	Ritual site - holy well	Ballyard	1.5km
GL4	TN031-010003-	Graveyard	Ballyard	1.5km
GL5	TN031-010004-	Font	Ballyard	1.5km
GL6	TN031-011----	Ringfort - rath	Ballyard	1.3km
GL7	TN031-048001-	Castle - tower house	Cragg	1.5km
GL8	TN031-048002-	Bawn	Cragg	1.5km
GL9	TN031-061----	Ringfort - rath	Oakhampton	1.3km
GL10	TN031-072----	Ritual site - holy well	Foildarrig	500m
GL11	TN031-070002-	Children's burial ground	Foildarrig	190m
GL12	TN031-070001-	Church	Foildarrig	180m
GL13	TN031-071----	Barrow - bowl-barrow	Foildarrig	125m
GL14	TN031-073----	Earthwork	Clonbealy	165m
GL15	TN031-079----	Souterrain	Castlewaller	520m
GL16	TN037-007----	Earthwork	Castlewaller	315m
GL17	TN037-006----	Ringfort - rath	Carrowkeale	315m
GL18	TN037-005----	Ringfort - rath	Derryleigh	8m
GL19	TN037-009----	Castle - unclassified	Derryleigh	82m
GL20	TN037-023----	House - indeterminate date	Derryleigh	405m
GL21	TN037-044----	Barrow - ring-barrow	Kilnacappagh	174m
GL22	TN037-037----	Redundant record	Kilnacappagh	154m
GL23	TN037-022----	Enclosure	Kilnacappagh	180m
GL24	TN037-018----	Ringfort - cashel	Kilnacappagh	360m
GL25	TN037-019----	Ringfort - cashel	Carrowkeale (kilvellane par.)	450m
GL26	TN037-024----	Ringfort - cashel	Derryleigh,scraggeen	160m
GL27	TN037-030----	Ringfort - cashel	Kilnacappagh	125m
GL28	TN037-031----	Enclosure	Scraggeen	40m
GL29	TN037-039001-	Redundant record	Derrygareen	150m
GL30	TN037-039002-	Redundant record	Derrygareen	180m
GL31	TN037-032001-	Ringfort - rath	Derrygareen	250m

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Site ID	Record of Monuments & Places Code	Classification/Type	Townland	Separation Distance
GL32	TN037-032002-	Bullaun stone	Derrygareen	260m
GL33	TN037-033----	Fulacht fia	Knockancullenagh	130m
GL34	TN038-020----	Mine - copper	Lackamore (kilvellane par.)	40m
GL35	TN038-006----	Megalithic tomb - wedge tomb	Reardnogy more	300m
GL36	TN038-012----	Pit-burial	Reardnogy more	80m
GL37	TN039-013----	Redundant record	Coonmore	55m
GL38	TN039-012----	Children's burial ground	Coonmore	50m
GL39	TN039-012001-	Mound	Coonmore	55m
GL40	TN039-024----	Redundant record	Foildarragh	230m
GL41	TN039-030----	Ringfort - rath	Foildarragh	165m
GL42	TN039-025001-	Enclosure	Kilcommon (templebeg par.)	220m
GL43	TN039-025002-	Enclosure	Kilcommon (templebeg par.)	270m
GL44	TN039-026----	Redundant record	Kilcommon (templebeg par.)	140m
GL45	TN039-008----	Megalithic tomb - wedge tomb	Knockmaroe	145m
GL46	TN039-050----	Megalithic tomb - unclassified	Knockcurraghbola commons	400m
GL47	TN039-009----	Megalithic tomb - wedge tomb	Knockcurraghbola commons	320m
GL48	TN039-052----	Stone row	Knockcurraghbola commons	310m
GL49	TN039-051----	Fulacht fia	Knockcurraghbola commons	200m

The variety of site types, and periods from which they originate, are indicative of the rich history of human activity, both religious and secular, in the Study Area. The 49 sites can be broken down as follows; 6 Redundant record, 4 Enclosure, 4 Ringfort - cashel, 3 Megalithic tomb - wedge tomb, 2 bullaun stones, 2 Fulachta fia, 2 Ritual site – holy wells, 2 Children's burial ground, 2 Church, 2 Earthwork, 1 Bawn, 1 Castle – tower house, 1 Graveyard, 1 Barrow - bowl-barrow, 1 Font, 1 Souterrain, 6 Ringfort - rath, 1 Castle - unclassified, 1 House - indeterminate date, 1 Barrow - ring-barrow, 1 Mine - copper, 1 Pit-burial, 1 Mound, 1 Megalithic tomb - unclassified and 1 Stone row.

Further details on the above listed Recorded Legally Protected Sites within the study area are included in Appendix 16.1: Detailed Description of Cultural Heritage Sites **(Volume C4: EIAR Appendices).**

16.2.1.3 Importance of Recorded Legally Protected Sites

Sites listed on the Record of Monuments and Places are protected under the National Monuments Acts (1934-2014). None of the sites identified are classed as National Monuments.

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16.2.1.4 Sensitivity of Recorded Legally Protected Sites

Archaeological sites can be affected by any groundworks which would partially or wholly damage the site itself or features/objects associated with the site or which may damage any associated subsurface features or structures which are no longer visible.

Some archaeological sites or monuments were most likely purposefully constructed in specific locations, on specific alignments, to take advantage of views of the surrounding landscape, celestial events and other monuments. As such the views of and from these sites are an integral part of the monuments character and could be affected by the presence of new structures in the local area.

16.2.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Increased legal protections offered to Recorded Protected Sites under the National Monuments Acts 1930-2014 has resulted in a reduction of potential damage to said sites through typical human activity in the region (e.g. forestry and farming). The sites which survive in the study area tend to be earthworks or stone structures and barring any unforeseen catastrophic natural processes, it might take thousands of years before any significant damage occurs through processes such as weathering or erosion.

16.2.1.6 Receiving Environment (the Baseline + Trends)

No trends have been identified over the course of this report which would lead to changes to the Recorded Legally Protected Sites and it is therefore assumed in this report that the baseline environment identified above will be the receiving environment.

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16.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

16.2.2.1 Cumulative Evaluation Study Areas

16.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Recorded Legally Protected Sites	Justification for the Study Area Extents
Cumulative Construction Stage Impacts; footprint of the UWF Grid Connection construction works area plus 1000m radius surrounding the footprint of the construction works areas	Groundworks, and their potential to directly impact any Cultural Heritage Site, are restricted to the immediate footprint of the development area. The wider (doubled) study area was adopted in order to ensure that the full extent of each identified Recorded Legally Protected Site, as well as any associated, or ancillary, features or structures, could be fully evaluated for potential damage by UWF Grid Connection construction works within 500m and by works associated with either Other Elements or Other Projects or Activities which occur within the 1000m area.
Cumulative Operational Stage Visual Impacts: 2km zone around the location of the Mountphilips Substation, 4km to identify any Other Projects or Activities	Because of the relatively low heights of Mountphilips Substation, any visibility of the substation beyond 2km would be barely perceptible to none. The study area is doubled to 4km, to identify Other Projects or Activities which have potential to cause cumulative effects.

The study is illustrated on Figure CE 16.2: UWF Grid Connection Cumulative Evaluation Study Area for Recorded Legally Protected Sites.

16.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 16.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements and Other Projects or Activities which are described in Table 16-7 and illustrated on Figure WP 16.2: Whole Project Study Area for Recorded Legally Protected Sites (Volume C3 EIAR Figures).

Table 16-7: Whole Project Cumulative Evaluation Study Area for Recorded Legally Protected Sites

Cumulative Project	Whole Project Cumulative Study Area Boundary	Justification for Study Area Extent
Element 2: UWF Related Works		Cumulative impacts to Cultural Heritage Sites is limited to those sites which could potentially be

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Cumulative Project	Whole Project Cumulative Study Area Boundary	Justification for Study Area Extent
Element 3: UWF Replacement Forestry	500m corridor from works areas and activity locations for each Element 2km radius from above ground level structures, 4km to identify any Other Projects or Activities	affected by more than one Element of the Whole UWF Project. Because of the relatively low heights of the Telecoms Relay Pole and the Mountphilips Substation, any visibility of these structures beyond 2km would be barely perceptible to none. Any cumulative landscape character and visual amenity impacts beyond 2km will only relate to the presence of cumulative turbines in views containing the Consented UWF Turbines, the cumulative impacts of which have previously been assessed as acceptable by An Bord Pleanala. The study area is doubled to 4km, to identify Other Projects or Activities which have potential to cause cumulative effects.
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

16.2.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Recorded Legally Protected Sites also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Recorded Legally Protected Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.31).

The results of this scoping exercise are that: no other projects or activities will cause cumulative effects to Recorded Legally Protected Sites with UWF Grid Connection however in order to present the totality of the project – Milestone Windfarm, Foilnaman Mast, Cummermore Communications Pole have been scoped in for evaluation of cumulative effects relating to the Other Elements.

16.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Recorded Legally Protected Sites

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Recorded Legally Protected Sites. The results of this evaluation are included in Table 16-8.

The location of the Other Elements and Other Projects or Activities which are included for cumulative evaluation is illustrated on Figure WP 16.2.

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Table 16-8: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: No likely effect/Neutral effect due to: • There are no Recorded Legally Protected Sites on the UWF Replacement Forestry lands, or within 500m of the lands,

	• The planting works will involve the manual turning of sod, and due to the absence of Sites on the lands or within 500m of the lands, damage to Recorded Legally Protected Sites is not likely to occur, • As there are no Recorded Legally Protected Sites within 500m of the lands and due to the location of the UWF Replacement Forestry in a valley rather than the top of a hill, it is considered that the visual effect of the maturing wood will be Neutral.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	• Evaluated as excluded: Neutral effect/No potential for effects due to: No mechanical excavation of soils nor the erection of new structures is associated with the UWF Other Activities, therefore there is no potential for either physical or visual impacts on Recorded Legally Protected Sites.
Other Projects or Activities	
Milestone Windfarm Foilnaman Mast Cummermore Communications Pole	Yes, included for the evaluation of cumulative effects **Please Note:** Other Projects or Activities only relate to the cumulative evaluation of Other Elements of the Whole UWF Project. There is no potential for cumulative effects with the UWF Grid Connection.

16.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

16.2.2.3.1 Element 2: UWF Related Works

Within the 500m study area from UWF Related Works construction works areas, there are a total of 14 No. archaeological sites recorded on the Record of Monuments and Places (RMP). The 14 sites are identified on Figure WP 16.2, and can be broken down as follows: 4 Barrows, 1 Cist, 2 Enclosures, 1 Fulacht Fiadh, 1 Possible Field System, 4 Megalithic Tombs, and 1 Stone Row A description of, and further details for, these Recorded Legally Protected Sites can be found in the Cultural Heritage chapter of the Revised EIAR for UWF Related Works, which is included in V olume F: Reference Documents (see – Volume F2 Part 2 and F3 Part 3).

The UWF Related Works construction works area occurs within the zone of notification of one of these sites; *Site RL6*[1] *- Stone Row* (30m from a section of Internal Windfarm Cabling). Archaeological testing was carried out at this site; the test report is included as an appendix in the Revised EIAR for UWF Related Works (see – Volume F3 Part 3).

In relation to the Operational Stage, a further 10 No. of Recorded Legally Protected Sites occur between 500m and 2km, giving a total of 24 No. of Sites within the 2km study area. Of these 10 No. sites, there are 7 No. sites which will have theoretical visibility of the Telecoms Relay Pole - RL5 - Wedge Tomb, RL6 - Stone Row, RL7 - Fulacht Fiadh, RL8 - Megalithic Tomb, RL20 - Ring Barrow, RL21 - Ring Barrow and RL22 - Cist. See Figure WP 16.2.

16.2.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 16.2.2.2.1

16.2.2.3.3 Element 4: Already Consented Upperchurch Windfarm

The sites within 500m of the UWF are included in the description for the UWF Related Works above.

[1] RL6 is the same cultural heritage site as GL48

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In relation to visual effects, it is assumed that all 24 No. sites within the 2km study area will have theoretical visibility of the Consented UWF Turbines.

Consideration of the Passage of Time: There has been no changes to Recorded Legally Protected Sites in the Upperchurch Windfarm area, and the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this EIAR. Therefore it is considered that there has been no material changes in the baseline environment.

16.2.2.3.4 Other Projects or Activities

The existing Milestone Windfarm is located in Knockcurraghbola Crownlands, Knockcurraghbola Commons, Shevry, Graniera, Knockduff and Inchivara, and comprises of 4 no. wind turbines. The Milestone turbines will be viewed alongside the Consented UWF Turbines and across the valley from the Telecom Relay Pole.

The existing Foilnaman Mast is located on the Knockmaroe hill, c.200m from where the Telecoms Relay Pole (UWF Related Works) will be located. The existing Cummermore Communications Pole is located nearly 4km to the southwest of the Telecom Relay Pole location.

Please Note: Other Projects or Activities only relate to the cumulative evaluation of Other Elements of the Whole UWF Project. There is no potential for cumulative effects with the UWF Grid Connection.

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16.2.3 PROJECT DESIGN MEASURES for Recorded Legally Protected Sites

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measure outlined in Table 16-9 are relevant to the Environmental Factor, Cultural Heritage, and in particular to the sensitive aspect **Recorded Legally Protected Sites**.

Table 16-9: UWF Grid Connection Project Design Measures relevant to Recorded Legally Protected Sites

PD ID	Project Design Environmental Protection Measure (PD)
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD14	All initial groundworks within 500m of an RMP or NIAH site, 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.
PD15	Where excavations occur at culvert replacement locations along the 110kV UGC, and at the 3 No. new watercourse crossing at the Mountphilips Substation site, excavations will be monitored by an appropriately qualified archaeologist under license from the National Monuments Service, the excavated material will be examined for any evidence of archaeological material and metal detected as part of a finds retrieval strategy.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5, in Volume C4: EIAR Appendices.

16.2.4 EVALUATION OF IMPACTS to Recorded Legally Protected Sites

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Recorded Legally Protected Sites.

As a result of the exercise, some impacts were included and some were excluded.

Table 16-10: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded (Justification at the end of the Impact Evaluation Table sections)***
Visual Impact (operational stage)	*Complete or partial destruction (construction stage)*
	Decommissioning Effects

The source-pathway-receptor links for the included impact are described in the Impact Evaluation Table in the following section 16.2.4.1.

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table, in Section 16.2.4.2.

16.2.4.1 Impact Evaluation Table: Visual Impact

Impact Description	
Project Life Cycle Stage:	Operational Stage
Impact Source: Above ground structures, features and works Cumulative Impact Source: Above ground structures, features and works Impact Pathway: Visibility Impact Description: The close proximity of new above-ground structures to Recorded Legally Protected Sites, may cause visual impacts to these sites, reducing the quality of the visual amenity or character or setting of a monument or site. Impact Quality: Negative	
Evaluation of the Subject Development Impact – Visual Impact	
Element 1: UWF Grid Connection – direct/indirect impact	
Impact Magnitude: Although 4 No. Recorded Legally Protected Sites are theoretically visible from the Mountphilips Substation, (*GL6 - Ringfort, GL8 – Bawn and GL7 - Castle - Tower House,* and *GL13 - Bowl Barrow)* the results of drone surveys, carried out by the authors of Chapter 17: Landscape, demonstrates that the surrounding vegetation combined with the low lying location of the substation will completely screen the new substation completely from view from all of these 4 No. sites. See Landscape Figure 17.4 (Volume C3 EIAR Figures) for photomontages of the view of Mountphilips from the L2166-10 in Coole townland	
Significance of the Impact: No Impact	
Rationale for Impact Evaluation: • There will be no inter-visibility of Mountphilips Substation with these 4 No. sites	
Element 1: UWF Grid Connection – cumulative impact	
Cumulative Impact Magnitude: Due to the separation distance (c.20km) between Mountphilips Substation and the Other Elements of the Whole UWF Project, and the Other Projects, there will be no intervisibility of Mountphilips Substation with either Other Elements or Other Projects, therefore there is no potential for cumulative impacts.	
Significance of the Impact: No Cumulative Impact	
Rationale for Impact Evaluation: • absence of intervisibility due to separation distance and topography	
Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	
Impact Magnitude: There are 7 No. sites which will have theoretical visibility of the Telecoms Relay Pole; *RL5(GL47) - Wedge Tomb, RL6(GL48) - Stone Row, RL7(GL49) - Fulacht Fiadh, RL8(GL46) - Megalithic Tomb, RL20- Ring Barrow, RL21 - Ring Barrow and RL22 - Cist.* While there is theoretical intervisibility between the Telecoms Relay Pole and the sites listed above, the character of the relay pole – being an up to 18m high wooden pole with communication equipment in the form of 2 pairs of small dishes - will mean any visual impact is negligible to non-existent, and the Pole will be similar in appearance to wooden telephone and wooden electricity poles which are common in the area.	

Recorded Legally Protected Sites

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Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- the small scale of the Telecoms Relay Pole
- The distance to the sites, with the nearest being 1.53km
- In the context of other, more noticeable, structures in the vicinity which include telecommunication masts and wind turbines.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 16.2.2.2.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude: As per the EIS 2013, it was evaluated that 8 No. out of a total 101 No. Recorded Protected Sites within a 4km study area of the turbines, will have intervisibility with all 22 wind turbines

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The Board considered that, subject to compliance with the mitigation measures set out in the 2013 EIS, the development would not have a significant effect on the environment.
- The application of Condition No. 7 and Condition No.8 which protect visual amenity.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 16.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

(Note: Other Projects or Activities only relate to the cumulative evaluation of Other Elements of the Whole UWF Project. There is no potential for cumulative effects with the UWF Grid Connection.)

Other Project: Milestone Windfarm

Impact Magnitude:
As per Grant of Permission for the Milestone Windfarm, the planning authorised deemed that the windfarm would not adversely impact on the visual amenities or the landscape character of the area.

Significance of the Impact: Not significant

Rationale for Impact Evaluation:

- The Board considered that, subject to compliance with the mitigation measures set out in the Environmental Impact Statement, the development would not have a significant effect on the environment.
- The application of Conditions which protect visual amenity.

Other Project: Foilnaman Mast

Impact Magnitude: Based on the character of the existing mast and communication pole being c.20m in height and being viewed as part of the baseline environment, it is considered that the magnitude of any visual impact is negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- the small scale of the communication structures
- in the context of other, more noticeable, structures in the vicinity which include telecommunication masts and wind turbines.

Other Project: Cummermore Communication Pole

Impact Magnitude: Based on the character of the existing mast and communication pole being c.20m in height and being viewed as part of the baseline environment, it is considered that the magnitude of any visual impact is negligible.

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Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- the small scale of the communication structures
- in the context of other, more noticeable, structures in the vicinity which include telecommunication masts and wind turbines.

Evaluation of Other Cumulative Impacts – Visual Impact

All Elements of the Whole UWF Project

Cumulative Impact Magnitude:
Although 4 No. Recorded Legally Protected Sites are theoretically visible from the Mountphilips Substation, due to the low lying location, the substation will be completely screened from view from all of these 4 No. sites. There is no potential for cumulative visual impacts between the UWF Grid Connection and either the UWF Related Works or the Upperchurch Windfarm, given the separation distance and absence of intervisibility between the Mountphilips Substation and the Telecoms Relay Pole and the Upperchurch Windfarm.

In relation to the UWF Related Works, of the 7 No. Recorded Legally Protected Sites which will have a theoretical visibility of the Telecoms Relay Pole, all of these sites will also have theoretical visibility of the above ground structures associated with the Upperchurch Windfarm. It is considered that together the Telecoms Relay Pole and the Upperchurch Windfarm will not have a greater magnitude of impact than the Upperchurch Windfarm on its own, as the Telecoms Relay Pole will be barely noticeable in the context of the larger turbines in the area, and will be similar in appearance to wooden telephone and electricity poles which are common in the area.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- The screening of Mountphilips Substation and absence of intervisibility with other elements of the whole project.
- The barely noticeable character of the Telecoms Relay Pole
- The barely noticeable character of the Telecoms Relay Pole and the absence of inter-visibility with the Mountphilips Substation

All Elements of the Whole UWF Project with Other Projects or Activities

Cumulative Impact Magnitude:
There is no potential for cumulative visual effects of the UWF Grid Connection with Other Projects, as the Mountphilips Substation will not be inter-visible with the Milestone Windfarm or with Foilnaman Mast or Cummermore Communications Pole.

Cumulative visual effects in relation to the UWF Related Works are limited the Telecom Relay Pole and the Upperchurch Windfarm with the Milestone Windfarm. It is considered that due to its small scale, that the addition of the Telecoms Relay Pole to the viewsheds from cultural heritage sites will not cause any additional visual effect to that already evaluated (and considered acceptable) for the Upperchurch Windfarm - which included a cumulative evaluation of the visual impact of the Upperchurch Windfarm together with the Milestone Windfarm. It is also considered that due to their small scale, any views of the Telecoms Relay Pole together with the other existing communication structures will be cumulatively neutral.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- No inter-visibility between Mountphilips Substation and any Other Project or Activity.
- Small scale of the Telecom Relay Pole and of the existing communication structures at Foilnaman and Cummermore.

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- The Board considered that, subject to compliance with the mitigation measures set out in the Environmental Impact Statement, the consented Upperchurch Windfarm would not have a significant effect on the environment, either on its own or cumulatively with other windfarms in the area (which included Milestone Windfarm).

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16.2.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 16-11 below.

Table 16-11: Description and Rationale for Excluded Impacts to Recorded Legally Protected Sites

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway(s)	Impacts (Consequence)	Rationale for Excluding (Scoping Out)
Construction Stage				
Ground-works	1, 2, 4	Mechanical or manual excavation of soil.	Complete or partial de-struction	Rationale for Excluding: **no likely impact/Neutral impact** In relation to the UWF Grid Connection: No Recorded Legally Protected Sites are likely to be affected by construction works due to the distance of these sites from the construction works areas, which are located outside the Zone of Notification for all but 3 sites - GL8 – *Ringfort (rath) in Derryleigh,* GL18 – *Enclosure in Scraggeen,* GL24 – *Mine (copper) in Lackamore.* However, the location of the UWF Grid Connection in close proximity to these sites relates to the construction of the 110kV UGC in the regional public road pavement which will avoid impacts to GL8 – *Ringfort (rath) in Derryleigh,* GL18 – *Enclosure in Scraggeen,* GL24 – *Mine (copper) in Lackamore.* In relation to UWF Related Works: No Recorded Legally Protected Sites are likely to be affected by construction works due to the distance of these sites from the construction works areas, which are located outside the Zone of Notification for all sites, with the exception of and 1 No. site near the UWF Related Works - *RL6 – Stone Row* in Knockcurraghbola Commons. Test excavations at this site encountered no features or objects of archaeological significance. In relation to the Upperchurch Windfarm, as per the EIS 2013 (See Reference Documents Volume F8 UWF 2013 EIS Section 12.3.1), all Recorded Legally Protected Sites, are located away from works areas and will not be directly or indirectly impacted by the permitted development. Furthermore, damage to currently unknown subsurface archaeology associated with these sites is not likely to occur due to both the separation distance between known sites and works areas and as the design of the subject development (see Project Design Measures Section 16.2.3) and Condition No. 20 of the Grant of Planning 2014 in relation to the Upperchurch Windfarm (See Reference Documents Volume F10), includes for the archaeological monitoring of all ground works during the construction stage. This will allow for an onsite archaeologist, in consultation with the National Monuments Service and the National Museum of Ireland, to monitor groundworks and stop works in the affected area in the event of any archaeological features or objects being uncovered during excavation works, and will ensure that any features or objects uncovered will be preserved by record and/or preserved in situ, in consultation and under licence to the

Recorded Legally Protected Sites

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Source(s) of Impacts	Project Element	Pathway(s)	Impacts (Consequence)	Rationale for Excluding (Scoping Out)
				National Monuments Service and the National Museum of Ireland. It should be noted that 5 No. archaeological sites recorded on the Record of Monuments and Places (RMP) are located within 500m of construction works area associated with the UWF Grid Connection and the UWF Related Works and the Upperchurch Windfarm; RL9 - Wedge Tomb, RL8 - Megalithic Tomb, RL5 - Wedge Tomb, RL6- Stone Row and RL7 - Fulacht Fia, with the exception of RL6 – evaluated for UWF Related Works above, none of these sites are in close proximity to works areas, and the monitoring of all groundworks within 500m of an RMP or NIAH site, will ensure that any features or objects being uncovered during excavation works, and will ensure that any features or objects uncovered will be preserved by record and/or preserved in situ, in consultation with the National Monuments Service and the National Museum of Ireland.
Decommissioning Stage				
Rationale for Excluding: UWF Grid Connection will not be decommissioned. In relation to Upperchurch Windfarm/UWR Related Works, no new groundworks will be required for decommissioning, with any groundworks will be limited to those areas of ground which were previously excavated during the construction stage, therefore there is no potential for direct/indirect effects on Recorded Legally Protected Sites.				

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16.2.5 Mitigation Measures for Impacts to Recorded Legally Protected Sites

Mitigation measures were incorporated into the UWF Grid Connection project design including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Recorded Legally Protected Sites**.

16.2.6 Evaluation of Residual Impacts to Recorded Legally Protected Sites

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Recorded Legally Protected Sites above (Section 16.2.4) – i.e. **no significant adverse impacts**.

16.2.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

16.2.8 Summary of Impacts to Recorded Legally Protected Sites

A summary of the Impact to Recorded Legally Protected Sites is presented in Table 16-12.

Table 16-12: Summary of the impacts to Recorded Legally Protected Sites

Impact to Recorded Legally Protected Sites:	**Visual Impact**
Evaluation Impact Table	*Section 16.2.4.1*
Project Life-Cycle Stage	*Operational Stage*
UWF Grid Connection *Direct/indirect impact*	**No Impact**
UWF Grid Connection *Cumulative impact*	**No Cumulative Impact**
Element 2: UWF Related Works	Imperceptible
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 16.2.2.2.1
Element 4: Upperchurch Windfarm	Not Significant
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 16.2.2.2.1
Cumulative Impact:	
All Elements of the Whole UWF Project	**Imperceptible**
All Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities Milestone Windfarm Foilnaman Mast Cummermore Communications Pole	**Imperceptible**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Other Recorded Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 16.2.2.2).

16.3 Sensitive Aspect No.2: Other Recorded Sites

This Section provides a description and evaluation of the Sensitive Aspect - Other Recorded Sites. Other Recorded Sites relates to sites identified on the National Inventory of Architectural Heritage (NIAH) or on the NIAH Garden Survey

16.3.1 BASELINE CHARACTERISTICS of Other Recorded Sites

This Section 16.3.1 comprises the identification of the Study Area for direct or indirect effects, and a description of the context, character, importance and sensitivity of the Other Recorded Sites in the area. Trends or changes in the baseline environment are also identified.

16.3.1.1 STUDY AREA for Other Recorded Sites

The study area for Other Recorded Sites in relation to the UWF Grid Connection is described in Table 16-13 and illustrated on Figure GC 16.3: UWF Grid Connection Study Area for Other Recorded Sites (Volume C3 EIAR Figures).

Table 16-13: UWF Grid Connection Study Area for Other Recorded Sites

Study Area for Other Recorded Sites	Justification for the Study Area Extents
Construction Stage Effects; Within the footprint of the construction works area plus 500m radius surrounding the footprint of the construction works areas	Groundworks, and their potential to directly impact any Cultural Heritage Site, are restricted to the immediate footprint of the development area. The wider study area was adopted in order to assure that the full extent of each identified Other Recorded Site, as well as any associated, or ancillary, features or structures, could be fully appraised. It is extremely unlikely that Cultural Heritage Sites beyond this area could be impacted.
Operational Stage Visual Effects: 2km zone around the location of the Mountphilips Substation	Because of the relatively low heights of the Mountphilips Substation, any visibility beyond 2km would be barely perceptible to none. The remainder of the UWF Grid Connection will either be placed below ground or will comprise stone roads which are a common occurrence in the area and will not cause any visual impacts, and for this reason these parts are not included in the operational stage study area.

16.3.1.2 Baseline Context and Character of Other Recorded Sites in the UWF Grid Connection Study Area

The majority of sites on the NIAH date from the 18th and 19th century and form part an important part of the region's built heritage. In total there are 12 No. Other Recorded Sites within the study area.

7 of the 12 No. Other Recorded Stes are identified on the National Inventory of Architectural Heritage, the remaining five are demesnes listed on the NIAH Garden Survey.

As illustrated on Figure GC 16.3, 8 No. Other Recorded Sites occur within 500m of construction works areas for UWF Grid Connection, and 8 No. Other Recorded sites occur within 2km of the proposed Mountphilips Substation. Drone surveys by the authors of Ch.17 Landscape demonstrate that there will be no visibility of the Mountphilips Substation from 7 No. of these sites, with the potential for visual impacts only occurring at *GR3 – Mount Philips Demesne*.

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An overview of the Other Recorded Sites within the study area is provided in Table 16-14 below, and identified on Figure GC 16.3. Further details on the Other Recorded Sites within the study area are included in Appendix 16.1: Detailed Description of Cultural Heritage Sites (Section A16.1.2) **(Volume C4: EIAR Appendices).**

Table 16-14: Other Recorded Sites within the UWF Grid Connection Study Area

Site ID	Source	NIAH Code	Classification/Type	Townland	Separation Distance from Project
GR1	First Edition Ordnance Survey		Demesne	Cragg	1.6km
GR2	NIAH	22403113	Cragg House	Cragg	1.2
GR3	First Edition Ordnance Survey		Demesne	Mountphilips	0 within Demense
GR4	First Edition Ordnance Survey		Demesne	Barna	380m
GR5	NIAH	22403114	Oakhampton House	Oakhampton	1.1km
GR6	First Edition Ordnance Survey		Demesne	Oakhampton	850m
GR7	First Edition Ordnance Survey		Demesne	Rockvale	360m
GR8	NIAH	22311001	Charter School	Clonbealy	470m
GR9	NIAH	TN-59-R-736614	Derryleigh House	Derryleigh	100m
GR10	NIAH	22403801	Church of the Visitation	Reardnogy more	13m
GR11	NIAH	22403802	Rear Cross National School	Reardnogy more	18m
GR12	NIAH	22403905	Anglesey Bridge	Foildarragh	0m Crosses over Bridge

The five demesnes listed on the NIAH Garden Survey are likely to have their origins in the "Age of Improvement" in the 17th and 18th century. Large portions of these demesnes have been subsumed into the modern agricultural landscape and many of their characteristic features are unrecognisable.

Specifically in relation to the Mount Philips Demesne, in whose area the construction works will take place, *GR3 - Mount Philips Demesne* is described on the survey as having virtually no recognisable features visible. During field walking it was noted that this site has been subsumed into the modern agricultural landscape common to western extent of the UWF Grid Connection study area.

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GR6 - House forms part of Oakhampton Demesne. *GR2 – Cragg House* and *GR8 – Charter School* are isolated in rural settings.

GR 12 – Anglesey Bridge: Built c. 1800 - 1830 by the then lord lieutenant of Ireland Lord Anglesey, Anglesey Bridge crosses the Bilboa River in the townland of Foildarragh. The bridge is marked 'Anglesey Bridge' on the first edition OS map. It comprises U-plan cut-waters to its south elevation and has dressed stone voussoirs on its arches. A stone parapet has dressed stone capping.

An Architectural Heritage report covering the conservation related aspects of the proposed development relating to Anglesey Bridge can be found in Appendix 16.2: Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905. **(Volume C4: EIAR Appendices).**

16.3.1.3 Importance of Other Recorded Sites

While sites listed on the NIAH are currently not afforded any legal protection, they have been identified as being an important part of Irish architectural heritage. Sites on the NIAH may be afforded legal protection in the future and a number are afforded legal protection if included in the Record of Protected Structures.

16.3.1.4 Sensitivity of Other Recorded Sites

Other Recorded Sites may be affected by any works which would partially or wholly remove any part of the structure. In addition, demesne landscapes often incorporated views of the surrounding landscape into their design. In instances where these landscapes might survive, the views may be affected by new structures, which may potentially visually impact these sites.

16.3.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

There are five sites on the NIAH Building Survey (listed above), which are currently occupied or in use. As such they are well maintained and unlikely to suffer negative impact from natural processes. Changes to these structures may come by way of improvements carried out by the occupiers.

The five demesnes listed on the NIAH Garden Survey been subsumed into the modern agricultural landscape common to western extent of the development area. These have been subject to large scale intensive farming, with new farm yards, buildings and roads having been constructed. Many of the internal farm subdivisions, as shown on the historic editions of the Ordnance Survey, have been removed and landscaping features and woodland have been removed. It is probable that the NIAH Garden Survey sites identified will continue to be subsumed into the surrounding agricultural landscape and, as such, will get less and less recognisable.

16.3.1.6 Receiving Environment (the Baseline + Trends)

Any trends identified above which would lead to changes to the Other Recorded Sites is likely to only occur over a long period of time and it is therefore assumed in this report that the baseline environment identified above will be the receiving environment.

16.3.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

16.3.2.1 Cumulative Evaluation Study Areas

16.3.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Other Recorded Sites	Justification for the Study Area Extents
Cumulative Construction Stage Impacts; footprint of the UWF Grid Connection construction works area plus 1000m radius surrounding the footprint of the construction works areas	Groundworks, and their potential to directly impact any Cultural Heritage Site, are restricted to the immediate footprint of the development area. The wider (doubled) study area was adopted in order to assure that the full extent of each identified Other Recorded Site, as well as any associated, or ancillary, features or structures, could be fully evaluated for potential damage by UWF Grid Connection construction works within 500m and by works associated with either Other Elements or Other Projects or Activities which occur within the 1000m area.
Cumulative Operational Stage Visual Impacts: 2km zone around the location of the Mountphilips Substation, 4km to identify any Other Projects or Activities	Because of the relatively low heights of Mountphilips Substation, any visibility of the substation beyond 2km would be barely perceptible to none. The study area is doubled to 4km, to identify Other Projects or Activities which have potential to cause cumulative effects.

The study is illustrated on Figure CE 16.3 UWF Grid Connection Cumulative Evaluation Study Area for Other Recorded Sites.

16.3.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 16.3.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 16-15 and illustrated on Figure WP 16.3: Whole Project Study Area for Other Recorded Sites (Volume C3 EIAR Figures).

Table 16-15: Cumulative Evaluation Study Area for Other Recorded Sites

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 2: UWF Related Works	500m corridor from works areas and activity locations for each Element, 1000m to identify any Other Projects or Activities	Cumulative impacts to Cultural Heritage Sites is limited to those sites which could potentially be affected
Element 3: UWF Replacement Forestry		

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 4: Upperchurch Windfarm (UWF)	2km radius from above ground level structures, 4km to identify any Other Projects or Activities	by more than one Element of the Whole UWF Project. Because of the relatively low heights of the Telecoms Relay Pole and the Mountphilips Substation, any visibility of these structures beyond 2km would be barely perceptible to none. Any cumulative landscape character and visual amenity impacts beyond 2km will only relate to the presence of cumulative turbines in views containing the Consented UWF Turbines, the cumulative impacts of which have previously been assessed as acceptable by An Bord Pleanala. The study area is doubled to 1km and 4km, to identify Other Projects or Activities which have potential to cause cumulative effects.
Element 5: UWF Other Activities		

16.3.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Other Recorded Sites also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Other Recorded Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.32).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Other Recorded Sites.

16.3.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Other Recorded Sites

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Other Recorded Sites. The results of this evaluation are included in Table 16-16.

Table 16-16: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Evaluated as excluded: No potential for effects due to: • There are no Other Recorded Sites within 500m of the construction works areas associated with UWF Related Works, therefore construction works have no potential to cause physical effects such as partial or complete damage to this type of Cultural Heritage Site. • There are no Other Recorded Sites within 2km of the Telecom Relay Pole, therefore this new structure has no potential to cause any visual impacts to any Other Recorded Site

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Element 3: UWF Replacement Forestry	Evaluated as excluded: No potential for effects due to • There are no Other Recorded Sites within the lands or within 500m of the lands, therefore there is no potential for UWF Replacement Forestry to have either physical or visual effects to this type of Cultural Heritage Site.
Element 4: Upperchurch Windfarm (UWF)	Evaluated as excluded: No potential for effects due to • As per the 2013 EIS, there are no Other Recorded Sites located in close proximity to the consented Upperchurch Windfarm. • As per the EIS 2013 (See Reference Documents Volume F8 UWF 2013 EIS Section 12.3.1), no cultural heritage sites, (including Other Recorded Sites), will be directly or indirectly impacted by the permitted development.
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effect/No potential for effects due to: • No mechanical excavation of soils nor the erection of new structures is associated with the UWF Other Activities, therefore there is no potential for either physical or visual impacts to Other Recorded Sites.

16.3.2.3 Cumulative Information: Baseline Characteristics – Context & Character

16.3.2.3.1 Element 2: UWF Related Works

Not applicable – Element evaluated as excluded. See Section 16.3.2.2.1

16.3.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 16.3.2.2.1

16.3.2.3.3 Element 4: Already Consented Upperchurch Windfarm

Not applicable – Element evaluated as excluded. See Section 16.3.2.2.1

16.3.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 16.3.2.2.1

16.3.2.3.5 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 16.3.2.2.

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16.3.3 PROJECT DESIGN MEASURES for Other Recorded Sites

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 16-17 are relevant to the Environmental Factor, Cultural Heritage, and in particular to the sensitive aspect **Other Recorded Sites**.

Table 16-17: UWF Grid Connection Project Design Measures relevant to Other Recorded Sites

PD ID	Project Design Environmental Protection Measure (PD)
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD14	All initial groundworks within 500m of an RMP or NIAH site, 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.
PD15	Where excavations occur at culvert replacement locations along the 110kV UGC, and at the 3 No. new watercourse crossing at the Mountphilips Substation site, excavations will be monitored by an appropriately qualified archaeologist under license from the National Monuments Service, the excavated material will be examined for any evidence of archaeological material and metal detected as part of a finds retrieval strategy.

16.3.4 EVALUATION OF IMPACTS to Other Recorded Sites

In this Section, the likely direct and indirect effects of the UWF Grid Connection and the likely cumulative effects of the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Other Recorded Sites.

As a result of the exercise, no impacts were included – all impacts were excluded.

Table 16-18: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded (Justification at the end of the Impact Evaluation Table sections)***
No Impacts Included for Evaluation	*Complete or partial destruction (construction stage)*
	Visual Impact (operational stage)
	Decommissioning stage

The source-pathway-receptor links and the rationale for excluded impacts are described next in Section 16.3.4.1.

16.3.4.1 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 16-19 below.

Table 16-19: Description and Rationale for Excluded Impacts to Other Recorded Sites

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Ground-works	1	Mechanical or manual excavation of soil.	Complete or partial destruction	Rationale for Excluding: No potential for impacts/No likely impacts, In relation to the UWF Grid Connection, a total of 8 No. Other Recorded Sites within 500m of UWF Grid Connection construction works areas. The UWF Grid Connection works occur within the boundary of 2 sites- Demesne (GR3) and Bridge (GR12). *GR3 - Mount Philips Demesne*, is a designed landscape recorded on the NIAH Garden Survey and is described on the survey as having virtually no recognisable features visible. During field walking it was noted that this site has been subsumed into the modern agricultural landscape in the area. Therefore, it is considered that there is no potential for significant impacts to *GR3 - Mountphilips Demesne*. *In relation to GR12 – Anglesey Bridge*, this bridge is located on the Regional Road R503, the 110kV UGC will be installed in the road pavement over the bridge and there will be no interaction with the columns or supporting structures of the bridge. Some works may be required to the bridge parapets which are currently broken and cracked. This work will be carried out as per specifications drawn up by a suitably qualified conservation engineer, based on best practice standard construction methodologies for conservation works (*Architectural Heritage Protection Guidelines for Local Authorities (2011)* and confirmed by the Architectural Heritage Advisory Service of the Department of Culture, Heritage and the Gaeltacht under Part IV of the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001 (as amended). An Architectural Heritage Impact Assessment of Anglesey Bridge can be found in Appendix 16.2: Architectural Heritage Impact Assessment of Anglesey Bridge NIAH 22403905. 2 Other Recorded Sites are within 20m of the construction work, these Sites relate to *GR10 - Church of the Visitation*, *GR11 - Rear Cross National School*, based on site investigations, it is considered that UWF Grid Connection works in close proximity to these sites relates to the construction of the 110kV UGC in public road pavement and impacts to these 2 sites are not expected to occur.

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
				The remaining 4 No. Other Recorded Sites are located at distances greater than 100m from UWF Grid Connection construction works and there is no likelihood for impacts to occur. Furthermore, damage to currently unknown subsurface archaeology associated with the 6 Other Recorded Sites (which are located outside the construction works area boundaries) is not likely to occur due to both the separation distance between known sites and works areas and as the design of the UWF Grid Connection (see Project Design Measures - Section 16.3.3), includes for the archaeological monitoring of all ground works within 500m of an RMP or NIAH site, during the construction stage. This will allow for an on-site archaeologist, in consultation with the National Monuments Service and the National Museum of Ireland, to monitor groundworks and stop works in the affected area in the event of any archaeological features or objects being uncovered during excavation works, and will ensure that any features or objects uncovered will be preserved by record and/or preserved in situ, in consultation with the National Monuments Service and the National Museum of Ireland.
Operational Stage				
Above-ground structures	1	Visibility	Visual Impact	Rationale for Excluding: No potential for impact In relation to the UWF Grid Connection, only the Mountphilips Substation (control building up to 8m in height, with associated lattice towers extending to 18m) has the potential to cause visual effects, 8 No. sites occur within 2km of Mountphilips Substation- *GR1 – Cragg Demesne,* GR2 - *Cragg House, GR3 – Mountphilips Demesne, GR4 – Barna Demesne,* GR5 - *Oakhampton House, GR6 – Oakhampton Demesne, GR7 – Rockvale Demesne and* GR8 - *Charter School.* Drone surveys by the authors of Ch.17 Landscape demonstrate that there will be no visibility of the Mountphilips Substation from 7 No. of these sites, and the remaining site; *GR3 – Mount Philips Demesne* has been completely subsumed into the modern agricultural landscape and above surface features no longer exist, therefore it cannot be affected by visual impacts. See also Landscape Figure 17. 4 (Volume C3 EIAR Figures) for photomontages of the view of Mountphilips from the L2166-10 in Coole townland
Decommissioning Stage				
Rationale for Excluding: UWF Grid Connection will not be decommissioned.				

16.3.5 Mitigation Measures for Impacts to Other Recorded Sites

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **there no impacts are likely** to occur to Other Recorded Sites as a consequence of the UWF Grid Connection.

16.3.6 Evaluation of Residual Impacts to Other Recorded Sites

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Section 16.3.4.1 – i.e. **no impacts are likely to occur**.

16.3.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

16.3.8 Summary of Impacts to Other Recorded Sites

A summary of the Impact to Other Recorded Sites is presented in Table 16-20.

Table 16-20: Summary of the impacts to Other Recorded Sites

Impact to Other Recorded Sites:	**No impact**
Evaluation	*Section 16.3.4.1*
Project Life-Cycle Stage	*All*
UWF Grid Connection *Direct/indirect impact* *Cumulative Impact*	**No Potential for Impacts / No Likely Impacts**
Element 2: UWF Related Works	No Potential for Impacts - Evaluated as Excluded, see Section 16.3.2.2.1
Element 3: UWF Replacement Forestry	No Potential for Impacts - Evaluated as Excluded, see Section 16.3.2.2.1
Element 4: Upperchurch Windfarm	No Potential for Impacts - Evaluated as Excluded, see Section 16.3.2.2.1
Element 5: UWF Other Activities	No Potential for Impacts - Evaluated as Excluded, see Section 16.3.2.2.1
Cumulative Impact:	
Whole UWF Project Effect	**No Potential for Impacts / No Likely Impacts**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Other Recorded Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 16.3.2.2).

16.4 Sensitive Aspect No.3: Previously Unrecorded Sites

This Section provides a description and evaluation of the Sensitive Aspect - Previously Unrecorded Sites. Previously Unrecorded Sites are sites identified on historic Ordnance Survey Maps and/or recorded during field walking or from reviews of aerial photography.

16.4.1 BASELINE CHARACTERISTICS of Previously Unrecorded Sites

This Section 16.4.1 comprises the identification of the Study Area for direct or indirect effects, and a description of the context, character, importance and sensitivity of the Previously Unrecorded Sites in the area. Trends or changes in the baseline environment are also identified.

16.4.1.1 STUDY AREA for Previously Unrecorded Sites

The study area for Previously Unrecorded Sites in relation to the UWF Grid Connection is described in Table 16-21 and illustrated on Figure GC 16.4: UWF Grid Connection Study Area for Previously Unrecorded Sites (Volume C3 EIAR Figures).

Table 16-21: UWF Grid Connection Study Area for Previously Unrecorded Sites

Study Area for Previously Unrecorded Sites	Justification for the Study Area Extents
Construction Stage Effects; Within the footprint of construction works areas. The study area is extended to 100m at certain locations which have features of potentially significant interest or importance.	Groundworks, and their potential to directly impact any Cultural Heritage Site, are restricted to the immediate footprint of the development area. The wider study area was adopted in order to ensure that the full extent of each identified Cultural Heritage Site, as well as any associated, or ancillary, features or structures, could be fully appraised. It is extremely unlikely that Previously Unrecorded Cultural Heritage Sites beyond this area could be impacted.
Operational Stage Visual Effects: 2km zone around the location of the Mountphilips Substation	Because of the relatively low heights of the Mountphilips Substation, any visibility beyond 2km would be barely perceptible to none. The remainder of the UWF Grid Connection will either be placed below ground or will comprise a new stone roads which are a common occurrence in the area and will not cause any visual impacts, and for this reason these parts are not included in the operational stage study area.

16.4.1.2 Baseline Context and Character of Previously Unrecorded Sites in the UWF Grid Connection Study Area

The majority of the Previously Unrecorded Sites with the Slievefelim to Silvermines upland area date from the post medieval or early modern periods and reflect a wide variety of human rural activity. Examples include infrastructural, religious, agricultural and domestic sites. The sites mainly comprised of Lime Kilns, Wells, Quarries and Townland Boundaries, many of which may not have ever had any structural elements associated with them or are no longer standing.

Cartographic analysis, aerial photography and a thorough field survey identified a total of 165 No. additional Previously Unrecorded Sites within the study area relating to the UWF Grid Connection. While these were all mapped over the course of this report, only 51 No. Previously Unrecorded Sites were deemed to have potential significance, and are included for evaluation in this Section 16.4.4.

The 51. No. Previously Unrecorded Sites are identified on Table 16-22 below and on Figure 16.4: UWF Grid Connection Study Area for Previously Unrecorded Sites. A more detailed description is provided in Appendix 16.1: Detailed Description of Cultural Heritage Sites: **Volume C4 EIAR Appendices**.

Table 16-22: Previously Unrecorded Sites within the UWF Grid Connection Study Area

Site ID	Source	Classification/Type	Townland	Separation Distance from Project
GU1	First Edition Ordnance Survey	Pond	Mountphilips	654m
GU2	25 Inch Ordnance Survey	House	Mountphilips	259m
GU3	25 Inch Ordnance Survey	Ford	Oakhampton	10m
GU4	First Edition Ordnance Survey	Bridge	Mountphilips	955m
GU5	First Edition Ordnance Survey	House	Coole	358m
GU6	25 Inch Ordnance Survey	Stepping Stones	Barna	1.01km
GU7	First Edition Ordnance Survey	Demesne	Coole	215m
GU8	25 Inch Ordnance Survey	House	Killeen	1.53km
GU9	25 Inch Ordnance Survey	Lodge	Barna	699m
GU10	25 Inch Ordnance Survey	House	Barna	740m
GU11	First Edition Ordnance Survey	Gate Lodge	Foildarrig	593m
GU12	25 Inch Ordnance Survey	Stepping Stones	Foildarrig	784m
GU13	25 Inch Ordnance Survey	House	Foildarrig	956m
GU14	First Edition Ordnance Survey	Mill	Rockvale	1km
GU15	First Edition Ordnance Survey	Bridge	Rockvale	1km
GU16	First Edition Ordnance Survey	House	Mackney (Bourke)	1.45km
GU17	First Edition Ordnance Survey	School	Clonbealy	2km
GU18	First Edition Ordnance Survey	Demesne	Clonbealy	1.7km
GU19	First Edition Ordnance Survey	Demesne	Newport	1.9km
GU20	25 Inch Ordnance Survey	Smithy	Touknockane	2km
GU21	25 Inch Ordnance Survey (1905)	Ford	Castlewaller	0m
GU22	25 Inch Ordnance Survey (1905)	Foot Bridge	Castlewaller	10m
GU23	First Edition Ordnance Survey (1838)	Spring	Castlewaller	20m
GU24	First Edition Ordnance Survey (1838)	Spring	Castlewaller	60m
GU25	25 Inch Ordnance Survey (1905)	Ford	Castlewaller	0m
GU26	25 Inch Ordnance Survey (1905)	Foot Stick	Castlewaller	10m
GU27	25 Inch Ordnance Survey (1905)	Well	Cooldrisla	19m
GU28	25 Inch Ordnance Survey (1905)	Lime Kiln	Kilnacappagh	23m

Site ID	Source	Classification/Type	Townland	Separation Distance from Project
GU29	25 Inch Ordnance Survey (1905)	Lime Kiln	Derrygareen	18m
GU30	25 Inch Ordnance Survey (1905)	Well	Knockancullenagh	33m
GU31	25 Inch Ordnance Survey (1905)	Lime Kiln	Knockancullenagh	5m
GU32	25 Inch Ordnance Survey (1905).	Lime Kiln	Lackamore	55m
GU33	25 Inch Ordnance Survey (1905).	Lime Kiln	Lackamore	48m
GU34	First Edition Ordnance Survey (1838)	Shaft	Tooreenbrien Upper	25m
GU35	First Edition Ordnance Survey (1838)	Lackamore Lodge	Tooreenbrien Upper	70m
GU36	First Edition Ordnance Survey (1838)	Lackamore Post Office	Tooreenbrien Upper	10m
GU37	First Edition Ordnance Survey (1838)	Ford	Tooreenbrien Lower	22m
GU38	25 Inch Ordnance Survey (1905)	Well	Shanballyedmond	18m
GU39	First Edition Ordnance Survey (1838)	Creamery	Reardnogy More	10m
GU40	First Edition Ordnance Survey (1838)	Smithy	Reardnogy More	10m
GU41	25 Inch Ordnance Survey (1905).	Constabulary Barrack	Reardnogy More	30m
GU42	25 Inch Ordnance Survey (1905)	Well	Reardnogy More	48m
GU43	25 Inch Ordnance Survey (1905)	Well	Reardnogy More	86m
GU44	25 Inch Ordnance Survey (1905)	Well	Reardnogy More	12m
GU45	25 Inch Ordnance Survey (1905)	Lime Kiln	Baurnadomeeny	55m
GU46	25 Inch Ordnance Survey (1905)	Well	Baurnadomeeny	30m
GU47	First Edition Ordnance Survey (1838)	Smithy	Foildarragh	25m
GU48	First Edition Ordnance Survey (1838)	Kilcommon Creamery	Foildarragh	40m
GU49	First Edition Ordnance Survey (1838)	Constabulary Barrack	Kilcommon	25m
GU50	First Edition Ordnance Survey (1838)	Townland Boundary	Mountphilips/Coole	0m
GU51	First Edition Ordnance Survey (1838)	Townland Boundary	Coole/Freagh	0m

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Of the 51 No. Previously Unrecorded Sites, 29 no. are within the 100m study area. 22 No. are within the 2km study area around Mountphilips Substation, with 12 no. of the 22.no sites having theoretical visibility of the Mountphilips Substation. These 12 no. sites, which are evaluated for visual impacts caused by the new substation are: GU1 -Pond, GU2 - House, GU5- House, GU7 - Demesne, GU8 House, GU9 - Lodge, GU10 - House, GU11- Lodge, Site GU16 - House, Site GU17 – School, Site GU18 - Demesne and GU20 – Smithy. Drone surveys by the authors of Ch.17 Landscape demonstrate that there will be no visibility of the Mountphilips Substation from any of these sites.

The 110kV UGC is routed along the Anglesey Road (formerly known as the 'New Line Road'), which was constructed on behalf of the then Lord Lieutenant, Henry Paget 1st Marquis of Anglesey, in 1838 by the

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Commissioner of Valuation, surveyor and engineer Sir Richard John Griffith. The road, complete with milestones, was built to link Thurles with Newport. Previously Unrecorded Sites GU27 to GU49 are located alongside this road. Thirteen culverts have been also been identified along the Anglesey Road (R503), which may require replacement. These culverts have been documented but are not considered to be of archaeological importance.

16.4.1.3 Importance of Previously Unrecorded Sites

While none of these sites are subject to any legal protection, nor are they uncommon structures in the Irish landscape, they form an integral part of the cultural heritage landscape and are indicative of the long history of human activity within the study area.

16.4.1.4 Sensitivity of Previously Unrecorded Sites

Previously Unrecorded Sites may be affected by any groundworks which would partially or wholly remove any part of the structure. Because the majority of Previously Unrecorded Sites were not designed with specific views in mind, nor were they incorporated into a wider landscape of cultural heritage sites, they are unlikely to be sensitive to negative visual impacts arising from the construction of above ground structures.

An exception to this may relate to previously unrecorded demesne, house or lodge sites. These would only be sensitive in instances where the historic fabric is still largely intact and there are clear sightlines with said above-ground structures.

16.4.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Previously unrecorded sites are not subject to any legal protections and as such many have fallen out of use and into ruin, been demolished or subsumed into the modern agricultural and forestry landscapes. During field work it was found that many of the sites identified from the historic editions of the Ordnance Survey are no longer extant. It is considered that the gradual degradation or destruction of Unrecorded Upstanding Cultural Heritage sites will continue.

16.4.1.6 Receiving Environment (the Baseline + Trends)

Any trends identified above which would lead to changes to the Previously Unrecorded Sites is likely to only occur over a long period of time and it is therefore assumed in this report that the baseline environment identified above will be the receiving environment.

16.4.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

16.4.2.1 Cumulative Evaluation Study Areas

16.4.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Previously Unrecorded Sites	Justification for the Study Area Extents
Cumulative Construction Stage Impacts; footprint of the UWF Grid Connection construction works area plus 200m radius surrounding the footprint of the construction works areas Cumulative Operational Stage Visual Impacts: 2km zone around the location of the Mountphilips Substation, 4km to identify any Other Projects or Activities	Groundworks, and their potential to directly impact any Cultural Heritage Site, are restricted to the immediate footprint of the development area. The study area is doubled to 200m, to identify Other Elements or Other Projects or Activities which have potential to cause cumulative effects with UWF Grid Connection. Because of the relatively low heights of Mountphilips Substation, any visibility of the substation beyond 2km would be barely perceptible to none. The study area is doubled to 4km, to identify Other Projects or Activities which have potential to cause cumulative effects.

The study is illustrated on Figure CE 16.4 UWF Grid Connection Cumulative Evaluation Study Area for Previously Unrecorded Sites.

16.4.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 16.4.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 16-23 and illustrated on Figure WP 16.4: Whole Project Study Area for Previously Unrecorded Sites (Volume C3 EIAR Figures).

Table 16-23: Whole Project Cumulative Evaluation Study Area for Previously Unrecorded Sites

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 2: UWF Related Works	200m corridor from works areas and activity locations for each Element 2km radius from above ground level structures,	Cumulative impacts to Cultural Heritage Sites is limited to those sites which could potentially be affected by more than one Element of the Whole UWF Project. The study area is doubled to 200m, to identify Other Projects or Activities which have potential to cause cumulative effects.
Element 3: UWF Replacement Forestry		
Element 4:		

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Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Upperchurch Windfarm (UWF)	4km to identify any Other Projects or Activities	Because of the relatively low heights of the Telecoms Relay Pole and the Mountphilips Substation, any visibility of these structures beyond 2km would be barely perceptible to none. Any cumulative landscape character and visual amenity impacts beyond 2km will only relate to the presence of cumulative turbines in views containing the Consented UWF Turbines, the cumulative impacts of which have previously been assessed as acceptable by An Bord Pleanála. The study area is doubled to 4km, to identify Other Projects or Activities which have potential to cause cumulative effects.
Element 5: UWF Other Activities		

16.4.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Previously Unrecorded Sites also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Previously Unrecorded Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.33).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Previously Unrecorded Sites.

16.4.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Previously Unrecorded Sites

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Previously Unrecorded Sites. The results of this evaluation are included in Table 16-24.

The location of, and study area boundary associated with, the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 16.4.

Table 16-24: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3:UWF Replacement Forestry	Evaluated as excluded: Neutral effect/No potential for effects due to • There is no potential for damage to the Foilnaman/Knockcurraghbola Commons townland boundary, as no works are required to this boundary. • No other Previously Unrecorded Sites were mapped on the UWF Replacement Forestry lands during field surveys or desktop review, therefore there is no potential for any physical damage to any other Previously Unrecorded Sites. • In relation to visual effects from the maturing woodland; there are 3 Previously Unrecorded Sites (2 wells and a quarry) which will have theoretical visibility of

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	the new woodland, however as these sites lack archaeological, cultural or historical significance it is considered that the maturing wood will cause Neutral visual effects.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effect/No potential for effects due to: • No mechanical excavation of soils nor the erection of new structures is associated with the UWF Other Activities, therefore there is no potential for either physical or visual impacts to Previously Unrecorded Sites.

16.4.2.3 Cumulative Information: Baseline Characteristics – Context & Character

It should be noted that 18 No. Previously Unrecorded Sites are located within the study area associated with the UWF Grid Connection and the UWF Related Works and the Upperchurch Windfarm; all of these fall within the category of well, or lime kiln or townland boundary.

16.4.2.3.1 Element 2: UWF Related Works

Cartographic analysis, aerial photography and a thorough field survey identified a total of 41 No. Previously Unrecorded Sites within the study area relating to the UWF Related Works. While these were all mapped over the course of the preparation of the EIA Report for UWF Related Works, only 1 No. Previously Unrecorded Sites (RU1, House), was deemed to have potential significance, was numbered, listed and described in detail in the complete table of sites, which can be found in Appendix 16.1: Detailed Description of Cultural Heritage Sites. RU1 *House* is 1.7km from the UWF Grid Connection construction works boundary. The Internal Windfarm Cabling crossings townland boundaries at 19 No. locations.

In relation to the Operational Stage, there are 21 No. sites which will have theoretical visibility of the Telecoms Relay Pole; 1 No. of these is a lime kiln, 4 No. are gravel pits/quarries, 16 No. are springs/wells.

16.4.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 16.4.2.2.1

16.4.2.3.3 Element 4: Already Consented Upperchurch Windfarm

The 41 No. Previously Unrecorded Sites, identified for the UWF Related Works are also relevant to the Upperchurch Windfarm construction works areas and the Consented UWF Turbines.

Consideration of the Passage of Time: There has been no changes to Previously Unrecorded Sites in the Upperchurch Windfarm area, and the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this EIAR. Therefore it is considered that there has been no material changes in the baseline environment.

16.4.2.3.4 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 16.4.2.1.

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16.4.3 PROJECT DESIGN MEASURES for Previously Unrecorded Sites

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measure outlined in Table 16-25 is relevant to the Environmental Factor, Cultural Heritage, and in particular to the sensitive aspect **Previously Unrecorded Sites**.

Table 16-25: UWF Grid Connection Project Design Measures relevant to Previously Unrecorded Sites

PD ID	Project Design Environmental Protection Measure (PD)
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD14	All initial groundworks within 500m of an RMP or NIAH site, 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.
PD15	Where excavations occur at culvert replacement locations along the 110kV UGC, and at the 3 No. new watercourse crossing at the Mountphilips Substation site, excavations will be monitored by an appropriately qualified archaeologist under license from the National Monuments Service, the excavated material will be examined for any evidence of archaeological material and metal detected as part of a finds retrieval strategy.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5 in Volume C4: EIAR Appendices.

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16.4.4 EVALUATION OF IMPACTS to Previously Unrecorded Sites

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Previously Unrecorded Sites.

As a result of the exercise, some impacts were included and some were excluded.

Table 16-26: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded (Justification at the end of the Impact Evaluation Table sections)***
Damage to townland boundaries (construction stage)	*Complete or partial destruction on other Previously Unrecorded Sites (i.e. not townlands) (construction stage)*
	Visual Impact (operational stage)
	Decommissioning Effects

The source-pathway-receptor links for the impact included are described in the Impact Evaluation Table in the next section – Section 16.4.4.1.

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table, in Section 16.4.4.2.

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16.4.4.1 Impact Evaluation Table: Damage to townland boundaries

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Initial groundworks during the construction phase
Cumulative Impact Source: Initial groundworks during the construction phase
Impact Pathway: Excavation or removal of townland boundaries

Impact Description: Likely impacts to Previously Unrecorded Sites are limited to the mechanical or manual excavation of and temporary or permanent removal of small sections of townland boundaries at both site access points (UWF Grid Connection and UWF Related Works) and to install cables or roads along works areas (UWF Related Works). Often modern townland boundaries have origins going back to the medieval period or earlier, where they might have acted as extents for manors or ancient landholdings. Whilst there is no evidence to this effect for the townland boundaries in question, any associated structures or ditches may contain archaeologically significant material which may be damaged or removed during ground works.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Damage to Townland Boundaries

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The potential for damage to townland boundaries is limited to the Mountphilips Substation site.

The construction of the UWF Grid Connection will involve the removal of a 160m section of the Coole/Freagh townland boundary at the widened entrance to Mountphilips Substation site off the Local Road L2166-10. In addition a 10m section of the Mountphilips/Coole townland boundary will be removed for the new permanent access road to the Mountphilips Substation compound.

During field investigations, nothing of archaeological significance was found at any of these locations.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- Small scale and limited extent of damage to townland boundaries, limited to 2 boundaries
- Over the course of the field inspection there was no indication of any obvious features of archaeological significance associated with the affected townland boundaries.
- The townland boundaries in the area have been subject to continuous alterations, demolition and removal as a result of housing, agriculture and forestry in recent times.
- The design of the development (see section 16.4.3) includes a provision for archaeological monitoring of all ground works relating to the construction, within 500m of an RMP or NIAH site. This will allow for an onsite archaeologist, in consultation with the National Monuments Service and the National Museum of Ireland, 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.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: There is no potential for cumulative impacts, as UWF Grid Connection will not cause any damage to townland boundaries in the Upperchurch Windfarm/UWF Related Works area.

Significance of the Impact: No Cumulative Impact

Rationale for Impact Evaluation:

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- Separation distance from Other Elements of the Whole UWF Project

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
The construction of the UWF Related Works will involve the temporary removal of c.55m of boundary at 12 No. of townland boundaries and the permanent removal of c.15m at 3 No. townlands boundaries along the route of the Internal Windfarm Cabling, Haul Route Works and Realigned Windfarm Road locations.
3 no. of these points are through existing farm/forestry gates or farm/forestry roads, and 12 no. are new boundary crossing points.

During field investigations, nothing of archaeological significance was found at any of these locations.

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- Only a very small portion (up to 10m) of the total extent of any particular townland boundary is to be affected by the UWF Related Works.
- Over the course of the field inspection there was no indication of any obvious features of archaeological significance associated with the affected townland boundaries.
- The townland boundaries in the region have been subject to continuous alterations, demolition and removal as a result of development, agriculture and forestry in recent times.
- The design of the development (see section 16.4.3) includes a provision for archaeological monitoring of all ground works relating to the construction. This will allow for an onsite archaeologist, in consultation with the National Monuments Service and the National Museum of Ireland, 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.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 16.4.2.1.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude:
In total there will involve the permanent removal of c.60m at 7 No. townlands boundaries along the Upperchurch Windfarm roads. 3 no. of these points are through existing farm/forestry gates or farm/forestry roads. And 4 no. are new boundary crossing points

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The Board considered that, subject to compliance with the mitigation measures set out in the Environmental Impact Statement, the development would not have a significant effect on the environment.
- The application of Condition No. 20 which will protect unknown subsurface archaeology.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 16.4.2.1.1*

Evaluation of Other Cumulative Impacts – Damage to Townland Boundaries

Whole UWF Project Effect

Cumulative Impact Magnitude:
A total of 55m of boundary will be temporary removed at 12 No. townland boundaries and 235m of boundary will be permanently removed at 10 No. of townland boundaries (10m of which overlap at 2 No. boundaries between the Upperchurch Windfarm and the UWF Related Works) to accommodate the construction of the Whole UWF Project.

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None of these boundaries are of archaeological significance.
Significance of the Cumulative Impact: Slight
Rationale for Cumulative Impact Evaluation: • Only a very small portion of the total extent of any particular townland boundary is to be affected by construction works. • Over the course of the field inspection there was no indication of any obvious features of archaeological significance associated with the affected townland boundaries. • The townland boundaries in the region have been subject to continuous alterations, demolition and removal as a result of development, housing, agriculture and forestry in recent times. • The design of the development (see section 16.4.3) includes a provision for archaeological monitoring of all ground works relating to the construction, within 500m of an RMP or NIAH site. This will allow for an onsite archaeologist, in consultation with the National Monuments Service and the National Museum of Ireland, 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.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Previously Unrecorded Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 16.4.2.2).

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16.4.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 16-27 below.

Table 16-27: Description and Rationale for Excluded Impacts to Previously Unrecorded Sites

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway(s)	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Construction Stage				
Ground-works	1, 2, 4	Mechanical or manual excavation	Complete or partial destruction of other Previously Unrecorded Sites (i.e. not townland boundaries)	Rationale for Excluding: Neutral Impact, The 110kV UGC crosses two fords at GU21 and GU25 at W8 and W9, however the 110kV UGC will be drilled under the existing bridges at these locations and no impacts are likely to occur. 13 No. old masonry culverts along the Anglesey Road may require replacement during works, these culverts are not considered to be of archaeological importance. Damage to other Previously Unrecorded Sites are not likely to occur due to separation distance, and the monitoring of groundworks within 500m of an RMP or NIAH site, as part of project design for UWF Grid Connection. In relation to the Other Elements, archaeological monitoring of works form part of the project design measures for UWF Related Works and Condition No. 20 of the Grant of Planning 2014 in relation to the Upperchurch Windfarm. This will allow for an onsite archaeologist, in consultation with the National Monuments Service and the National Museum of Ireland, to monitor groundworks and stop works in the affected area in the event of any archaeological features or objects being uncovered during excavation works, and will ensure that any features or objects uncovered will be preserved by record and/or preserved in situ, in consultation with the National Monuments Service and the National Museum of Ireland.
Operational Stage				
Above-ground structures	1, 2, 4	Visibility	Visual Impact	Rationale for Excluding: No likely impact/No cumulative impacts: In relation to the UWF Grid Connection, only the Mountphilips Substation has the potential to cause visual effects and within 2km there are 12 No. sites which would have theoretical visibility of the Substation, however, drone surveys by the authors of Ch.17 Landscape demonstrate that realistically there will be no visibility of the Substation from any of these sites. There will be no intervisibility of the Mountphilips Substation with Upperchurch Windfarm or UWF Related Works. In relation to the UWF Related Works - only the Telecoms Relay Pole has the potential to cause visual effects and 21 No. Previously Unrecorded Sites have theoretical visibility of the relay pole, (1 No. of these is a lime kiln, 4 No. are gravel pits/quarries, 16 No. are

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Source(s) of Impacts	Project Element	Pathway(s)	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
				springs/wells), however these sites lack archaeological, cultural or historical significance and it is considered that they are not sensitive to visual effects.
Decommissioning Stage				
Rationale for Excluding: UWF Grid Connection will not be decommissioned. In relation to Upperchurch Windfarm/UWR Related Works, no new groundworks will be required for decommissioning, with any groundworks will be limited to those areas of ground which were previously excavated during the construction stage, therefore there is no potential for effects on Previously Unrecorded Sites.				

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16.4.5 Mitigation Measures for Impacts to Previously Unrecorded Sites

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as **no significant adverse impacts** are concluded by the topic authors as likely to occur to Previously Unrecorded Sites as a consequence of the UWF Grid Connection.

16.4.6 Evaluation of Residual Impacts to Previously Unrecorded Sites

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Previously Unrecorded Sites above (Section 16.4.4) – i.e. **no significant adverse impacts**.

16.4.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

16.4.8 Summary of Impacts to Previously Unrecorded Sites

A summary of the Impact to Previously Unrecorded Sites is presented in Table 16-28.

Table 16-28: Summary of the impacts to Previously Unrecorded Sites

Impact to Previously Unrecorded Sites:	**Damage to townland boundaries**
Evaluation Impact Table	*Section 16.4.4.1*
Project Life-Cycle Stage	*Construction Stage*
UWF Grid Connection *Direct/indirect impact*	**Imperceptible**
UWF Grid Connection *Cumulative impact*	**No Cumulative Impact**
Element 2: UWF Related Works	Slight
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 16.4.2.2.1
Element 4: Upperchurch Windfarm	Not Significant
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 16.4.2.2.1
Cumulative Impact:	
Whole UWF Project Effect	**Slight**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Previously Unrecorded Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 16.4.2.2).

16.5 Sensitive Aspect No.4: Unrecorded Subsurface Sites

This Section provides a description and evaluation of the Sensitive Aspect - Unrecorded Subsurface Sites. Unrecorded Subsurface Sites relates to structures or artefacts which are currently undiscovered but which may potentially exist under the ground surface.

16.5.1 BASELINE CHARACTERISTICS of Unrecorded Subsurface Sites

This Section 16.5.1 comprises the identification of the Study Area for direct or indirect effects and a description of the context, character, importance and sensitivity of the Unrecorded Subsurface Sites in the area. Trends or changes in the baseline environment are also identified.

16.5.1.1 STUDY AREA for Unrecorded Subsurface Sites

The study area for Unrecorded Subsurface Sites in relation to the UWF Grid Connection is described in Table 16-29 and illustrated on Figure GC 16.5: UWF Grid Connection Study Area for Unrecorded Subsurface Sites (Volume C3 EIAR Figures).

Table 16-29: UWF Grid Connection Study Area for Unrecorded Subsurface Sites

Study Area for Unrecorded Subsurface Sites	Justification for the Study Area Extents
Footprint of construction works areas where groundworks will take place.	Any previously Unrecorded Subsurface Sites beyond this area will remain unexposed and there cannot be evaluated.

16.5.1.2 Baseline Context and Character of Unrecorded Subsurface Sites in the UWF Grid Connection Study Area

As this type of sensitive cultural heritage receptor is currently undiscovered, neither the context nor the character of any Unrecorded Subsurface Sites, which may potentially exist under the ground surface, can be described in this report. The Slievefelim to Silvermine Mountains upland area is a region with a rich and diverse history of human settlement going back to prehistoric times, with c.680 known monuments, recorded on the Record of Monuments and Places within the broader upland area. While the spread of these monuments date from the Neolithic through to post medieval and modern times, the upland region appears to have been most intensively settled in the late Neolithic, with populations dispersing to the lower slopes during later periods (Grogan 2005, 21).

At Mountphilips Substation site, because the land has been subject to intensive agriculture, it is considered that Unrecorded Subsurface Sites exposed during the course of construction ground works are most likely to involve levelled earthworks, back filled ditches or slot trenches cut directly into the natural subsoil, or areas of large scale burning such as you might find at a Fulacht Fiadh site. There is also the possibility for other site types being exposed, including (but not limited to) artefact scatters, objects such as pottery, stone and bronze axes, foundations of buried structures, burials, and trackways.

Along the 110kV UGC route, outside of the Mountphilips Substation site, the potential for Unrecorded Subsurface Sites being exposed during construction works have more potential to occur along sections of the R503 Regional Road (Anglesey Road) where the 110kV UGC works will occur within the Zone of Notification for GL18 – *Ringfort (rath) in Derryleigh,* GL28 – *Enclosure in Scraggeen and* GL34 – *Mine (copper) in Lackamore*, than at other locations along the 110kV UGC route.

16.5.1.3 Importance of Unrecorded Subsurface Sites

Subsurface features or structures of archaeological significance are subject to protection under the National Monuments Acts (1930-2004).

16.5.1.4 Sensitivity of Unrecorded Subsurface Sites

Unrecorded Subsurface Sites may be completely or partially damaged or destroyed by the manual or mechanical excavation of soil. Because of the lack of upstanding, or above ground, remains these sites are unlikely to be sensitive to any visual impacts with proposed above ground structures.

16.5.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

It is considered that while it is unlikely that there would be any change to the Unrecorded Subsurface Cultural Heritage sites within the application site, the possibility exists that Unrecorded Subsurface Sites may be uncovered by further agricultural activity or afforestation in the area.

16.5.1.6 Receiving Environment (the Baseline + Trends)

No trends have been identified which are likely to lead to changes to the Unrecorded Subsurface Sites and it is therefore assumed in this report that the baseline environment identified above will be the receiving environment.

16.5.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

16.5.2.1 Cumulative Evaluation Study Areas

16.5.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Unrecorded Subsurface Sites	Justification for the Study Area Extents
Footprint of works areas where groundworks will take place.	Groundworks, and their potential to directly impact Unrecorded Subsurface Sites, are restricted to the immediate footprint of the development area. It is extremely unlikely that Sites beyond this area could be impacted.

The study is illustrated on Figure CE 16.5 UWF Grid Connection Cumulative Evaluation Study Area for Unrecorded Subsurface Sites.

16.5.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 16.5.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements which are described in Table 16-30 and is illustrated on Figure WP 16.5: Whole Project Study Area for Unrecorded Subsurface Sites (Volume C3 EIAR Figures).

Table 16-30: Cumulative Evaluation Study Area for Unrecorded Subsurface Sites

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 2: UWF Related Works	Footprint of works areas where groundworks will take place.	Groundworks, and their potential to directly impact Unrecorded Subsurface Sites, are restricted to the immediate footprint of the development area. It is extremely unlikely that Sites beyond this area could be impacted.
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5: UWF Other Activities		

16.5.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Unrecorded Subsurface Sites also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Unrecorded Subsurface Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.34).

The results of this scoping exercise are that: it is evaluated that no Other Projects or Activities are likely to cause cumulative effects with either the UWF Grid Connection or the Other Elements of the Whole UWF Project, and therefore no Other Projects or Activities are scoped in for evaluation of cumulative effects to Unrecorded Subsurface Sites.

16.5.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Unrecorded Subsurface Sites

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project to cause cumulative effects to the Sensitive Aspect Unrecorded Subsurface Sites. The results of this evaluation are included in Table 16-31.

The location of the Other Elements which are included for cumulative evaluation is illustrated on Figure WP 16.5.

Table 16-31: Results of the Evaluation of the Other Elements of the Whole UWF Project

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Evaluated as excluded: No likely effect due to: • The UWF Replacement Forestry will comprise the planting by hand of 6ha of agricultural lands to native woodland. Ground works during planting will involve minor, manual turning of the sod which are unlikely to expose any subsurface structures, features or objects of archaeological significance, therefore there is no likelihood of damage occurring to any Unrecorded Subsurface Sites. • In relation to visual effects from the maturing woodland; it is unlikely that a monument will be uncovered during planting works, rather that Unrecorded Subsurface Sites (if any) will are likely to be small artefacts, levelled earthworks or backfilled cuts. These types of archaeology are considered unlikely to be sensitive to visual effects.
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: No potential for effects due to: • No mechanical excavation of soils nor the erection of new structures is associated with the UWF Other Activities, therefore there is no potential for either physical or visual impacts to Unrecorded Subsurface Sites.

16.5.2.3 Cumulative Information: Baseline Characteristics – Context & Character

16.5.2.3.1 Element 2: UWF Related Works

Because of the increased likelihood of Unrecorded Subsurface Sites in the vicinity of known archaeological monuments, archaeological test excavations were carried out 1 No. location along the UWF Related Works construction works areas where construction works will pass within the Zone of Notification for Site 83 – Stone Row (17E173) in Knockcurraghbola Commons. Nothing of archaeological significance was encountered during these test excavations. The test report is included as an appendix in the Revised EIAR for UWF Related Works (see – Reference Documents - Volume F3 Part 3).

16.5.2.3.2 Element 3: UWF Replacement Forestry

Not applicable – Element evaluated as excluded. See Section 16.5.2.2.1

16.5.2.3.3 Element 4: Already Consented Upperchurch Windfarm

The consented Upperchurch Windfarm is not located within close proximity to any known archaeological monuments.

Consideration of the Passage of Time: There has been no changes to Unrecorded Subsurface Sites in the Upperchurch Windfarm area, and the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this EIAR. Therefore it is considered that there has been no material changes in the baseline environment.

16.5.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 16.5.2.2.1

16.5.2.3.5 Other Projects or Activities

Not applicable – No Other Projects or Activities were scoped in for evaluation of cumulative effects, see Section 16.5.2.2.

16.5.3 PROJECT DESIGN MEASURES for Unrecorded Subsurface Sites

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measure outlined in Table 16-32 are relevant to the Environmental Factor, Cultural Heritage, and in particular to the sensitive aspect **Unrecorded Subsurface Sites**.

Table 16-32: UWF Grid Connection Project Design Measures relevant to Unrecorded Subsurface Sites

PD ID	Project Design Environmental Protection Measure (PD)
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD14	All initial groundworks within 500m of an RMP or NIAH site, 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.
PD15	Where excavations occur at culvert replacement locations along the 110kV UGC, and at the 3 No. new watercourse crossing at the Mountphilips Substation site, excavations will be monitored by an appropriately qualified archaeologist under license from the National Monuments Service, the excavated material will be examined for any evidence of archaeological material and metal detected as part of a finds retrieval strategy.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3 and 5.5 in Volume C4: EIAR Appendices.

16.5.4 EVALUATION OF IMPACTS to Unrecorded Subsurface Sites

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Unrecorded Subsurface Sites.

As a result of the exercise, some impacts were included and some were excluded.

Table 16-33: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded (Justification at the end of the Impact Evaluation Table sections)***
Complete or partial destruction (construction stage)	*Visual Impact (operational stage)*
	Decommissioning Stage Effects

The source-pathway-receptor links for the impact included are described in the Impact Evaluation Table in the next section – Section 16.5.4.1.

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table, in Section 16.5.4.2.

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16.5.4.1 Impact Evaluation Table: Complete or partial destruction

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Initial groundworks during the construction phase.
Cumulative Impact Source: Initial groundworks during the construction phase.
Impact Pathway: excavation of soil

Impact Description: In the event of ground works for the development encountering Unrecorded Subsurface Cultural Heritage Sites, these works could result in the complete or partial destruction of said sites.

Impact Quality: Negative

Evaluation of the Impact of the Subject Development – Complete or partial destruction

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
By their nature, the magnitude of the impact of the development on Unrecorded Subsurface Sites cannot be determined at this stage. It is possible that previously unknown archaeological materials could be impacted upon by the UWF Grid Connection works, particularly at the Mountphilips Substation site due to the excavation of grassland and the overlap with Other Recorded Site *GR3 Mount Philips Demesne*; at the townland boundaries at the Mountphilips Substation site entrance (Coole/Freagh - GU51) and along the new access road to the substation (Mountphilips/Coole - GU50); and along the Regional Road R503 where 110kV UGC works will occur within the Zone of Notification for Recorded Legally Protected Sites; *GL18 – Ringfort (rath)* in Derryleigh, *GL28 – Enclosure* in Scraggeen and *GL34 – Mine (copper)* in Lackamore. Unrecorded Subsurface Sites are unlikely to be discovered during excavations for other sections of the 110kV UGC given the location of the 110kV within paved roadways.

Because much of the study area around Mountphilips Substation has been subject to intensive agriculture, it is considered that Unrecorded Subsurface Sites exposed during the course of construction ground works are most likely to involve levelled earthworks, backfilled cuts, and areas of large scale burning or artefact scatters. It is unlikely that any fully intact remains of special archaeological significance will be uncovered.

The design of the development (see Project Design Measures - section 16.5.3) includes a provision for archaeological monitoring of all ground works relating to the construction, within 500m of an RMP or NIAH site. This will allow for an onsite archaeologist, in consultation with the National Monuments Service and the National Museum of Ireland, 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.

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- The unknown extent of Unrecorded Subsurface Sites.
- The location of 110kV UGC predominately within public roads;
- The dominant land uses in the area, agriculture and forestry and public roads, which will mean that it will be unlikely that any fully intact remains of special archaeological significance will be uncovered.
- The monitoring of all initial groundworks within 500m of an RMP or NIAH site, by an on-site archaeologist, under license.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: There is potential for cumulative effects of UWF Grid Connection with UWF Related Works along the L2264-50 and 6188-0 where UWF Grid Connection 110kV UGC works overlap with the UWF Related Works Haul Route Works (H8-H12) along the above listed roads. However the UWF Grid Connection

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is within the pavement of the public road whereas UWF Related Works haul route works are in the public road verge or adjacent to the public road and therefore the footprint of the works do not overlap. There is also potential for cumulative effects where UWF Related Works Internal Windfarm Cabling will be constructed over the 110kV UGC (crosses over the 110kV UGC at 2 locations) on the public road, however this is in the context of works taking place in road pavement, and further it is considered that there is no potential for cumulative effects, as any previously Unrecorded Subsurface Sites if present, will only be affected by initial groundworks.

Significance of the Impact: No Cumulative Impact

Rationale for Impact Evaluation:

- Unrecorded subsurface sites can only be impacted upon by initial groundworks and not by subsequent ground-works.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:

By their nature, the magnitude of the impact of the development on Unrecorded Subsurface Sites cannot be determined at this stage. It is possible that previously unknown archaeological material could be impacted upon by the UWF Related Works, particularly given the high number of Cultural Heritage Sites in their environs. Because much of the study area has been subject to intensive agriculture and later forestry planting, it is considered that Unrecorded Subsurface Sites exposed during the course of construction ground works are most likely to involve levelled earthworks, backfilled cuts, and areas of large scale burning or artefact scatters. It is unlikely that any fully intact remains of special archaeological significance will be uncovered.

The design of the development (See UWF Related Works Project Design Measures, Reference Documents Volume F2 Part 2 Section 16.5.3) includes a provision for archaeological monitoring of all ground works relating to the construction. This will allow for an onsite archaeologist, in consultation with the National Monuments Service and the National Museum of Ireland, 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.

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- The unknown extent of Unrecorded Subsurface Sites, in the context of the extent of Cultural Heritage Sites in the surrounding area
- The dominant land uses in the area, agriculture and forestry, which will mean that it will be unlikely that any fully intact remains of special archaeological significance will be uncovered.
- The monitoring of all groundworks by an on-site archaeologist, under license.

Element 3: UWF Replacement Forestry – *N/A, evaluated as excluded, see Section 16.5.2.1.1*

Element 4: Consented Upperchurch Windfarm

Impact Magnitude: Over the course of the 2013 EIS, it was deemed that known Cultural Heritage Sites would not be directly or indirectly impacted by the permitted development. However, the possibility existed that previously unknown subsurface features associated with these sites it may result the complete or partial destruction of said sites.

Significance of the Impact: Slight

Rationale for Impact Evaluation:

- The Board considered that, subject to compliance with the mitigation measures set out in the Environmental Impact Statement, the development would not have a significant effect on the environment.
- The application of the 2014 Grant of Permission, Condition No. 20, which will protect unknown subsurface archaeology.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 16.5.2.1.1*

Unrecorded Subsurface Sites

Sensitive Aspect

Evaluation of Other Cumulative Impacts – Complete or partial destruction
Whole UWF Project Effect
Cumulative Impact Magnitude It is considered that there is no potential for cumulative effects, as any unrecorded subsurface sites if present, will only be affected by initial groundworks – i.e. by the UWF Grid Connection works or the UWF Related Works or the Upperchurch Windfarm only. The whole project effect will be in the order of the UWF Grid Connection in the Mountphilips Substation site and along the R503, and in the order of the UWF Related Works in the Upperchurch area.
Significance of the Cumulative Impact: Slight
Rationale for Cumulative Impact Evaluation: • Unrecorded subsurface sites can only be impacted upon by initial groundworks and not by subsequent ground-works.

Note: No cumulative evaluation of Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Unrecorded Subsurface Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 16.5.2.2).

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16.5.4.2 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 16-34 below.

Table 16-34: Description and Rationale for Excluded Impacts to Unrecorded Subsurface Sites

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway(s)	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Operational Stage				
Above-ground structures	1, 2, 4	Visibility	Visual Impact	Rationale for Excluding: No likely Impact. It is unlikely that a monument will be uncovered during construction works, rather that small artefacts, levelled earthworks or backfilled cuts are likely to be uncovered. These types of archaeology are considered unlikely to be sensitive to visual effects.
Decommissioning Stage				
Rationale for Excluding: UWF Grid Connection will not be decommissioned, therefore there is no potential for effects. In relation to Upperchurch Windfarm/UWR Related Works, no new groundworks will be required for decommissioning, with any groundworks will be limited to those areas of ground which were previously excavated during the construction stage, therefore there is no potential for effects on Unrecorded Subsurface Sites.				

16.5.5 Mitigation Measures for Impacts to Unrecorded Subsurface Sites

Mitigation measures were incorporated into the UWF Grid Connection project design, including the Project Design Measures. No additional mitigation measures are required as **no significant adverse impacts** are concluded by the topic authors as likely to occur to Unrecorded Subsurface Sites as a consequence of the UWF Grid Connection.

16.5.6 Evaluation of Residual Impacts to Unrecorded Subsurface Sites

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Unrecorded Subsurface Sites above (Section 16.5.4) – i.e. **Slight impacts**.

16.5.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

16.5.8 Summary of Impacts to Unrecorded Subsurface Sites

A summary of the Impact to Unrecorded Subsurface Sites is presented in Table 16-35.

Table 16-35: Summary of the impacts to Unrecorded Subsurface Sites

Impact to Unrecorded Subsurface Sites:	**Complete or partial destruction**
Evaluation Impact Table	*Section 16.5.4.1*
Project Life-Cycle Stage	*Construction*
UWF Grid Connection Impact	**Slight**
UWF Grid Connection *Cumulative impact*	**No Cumulative Impact**
Element 2: UWF Related Works	Slight
Element 3: UWF Replacement Forestry	No Potential for Impact - Evaluated as Excluded, see Section 16.5.2.2.1
Element 4: Upperchurch Windfarm	Slight
Element 5: UWF Other Activities	No Potential for Impact - Evaluated as Excluded, see Section 16.5.2.2.1
Cumulative Impact:	
Whole UWF Project Effect	**Slight**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Note: No cumulative information for Other Projects or Activities is included in the table above, because no Other Projects or Activities were evaluated as having potential to cause cumulative effects to Unrecorded Subsurface Sites with either the UWF Grid Connection or the Other Elements of the Whole UWF Project (see Section 16.5.2.2).

Unrecorded Subsurface Sites

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16.6 Reference List

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Reference List

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Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

List of Appendices

Appendices referenced in this topic chapter can be found in **Volume C4 EIAR Appendices.**

Glossary of Terms

Term	Definition
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.
Project Design Measure	Measures for environmental protection, incorporated into the design of the project.

List of Abbreviations

Abbreviation	Full Term
LVIA	Landscape and Visual Impact Assessment
LCA	Landscape Character Area
PD	Ecopower Project Design Environmental Protection Measure developed by members of the EIAR Team
ZTV	Zone of Theoretical Visibility
IEMA	Institute of Environmental Management and Assessment
GLVIA	Guidelines for Landscape and Visual Impact Assessment
UGC	Underground Cables
UWF	Upperchurch Windfarm

Executive Summary of the Landscape Chapter

Baseline Environment: The Landscape Character of the area is one of a rolling lowland rural landscape of fields and hedgerows at its western end in the vicinity of Newport, transitioning into a more extensively managed upland rural landscape of forestry and farmland within the Slievefelim to Silvermine Mountains, throughout the central and eastern extents. In recent years the strongest trend in the wider upland areas in the south and southeast of the Slievefelim to Silvermine Mountain upland area is the emergence of wind energy developments on upper slopes and ridges along with the ancillary development of roads and electrical infrastructure.

The Visual Amenity of the area includes two designated scenic routes one of which (V12) coincides with the 110kV UGC on the R503, between Newport and the L2264-50 junction, in Knockmaroe. The main amenity and heritage assets are way-marked walking and cycle trails- the Slieve Felim Way and the Ormond Way cycle route. The various trails, particularly in the upland area provide a recreational amenity for local residents, as well as a tourism amenity. Views in the uplands take in typical rural scenes of undulating farmland and forestry and occasional peaks of higher mountains passing through the Silvermines range. Views of the gently rolling lowland landscape of fields and hedgerows at the western end of the UWF Grid Connection have a something of a traditional 'pastoral' aesthetic and tend to be relatively contained by landform and vegetation.

In a general sense, the prevailing rural landscape character in these areas is sensitive to permanent changes to landscape patterns and features, which contribute to that character. It is also sensitive to the introduction of new and unfamiliar development, particularly that which includes intensive built development and activity of a typically non-rural nature

Survey Results for Sensitive Aspects in the Baseline Environment: The only permanent above ground feature of the development on the landscape will be Mountphilips Substation. The area was photographed and Zones of Theoretical Visibility within 2km of Mountphilips Substation and Photomontages of Mountphilips as it will appear from a Local Road in Coole townland were prepared.

Summary of the Significance of Impacts to Landscape Character: The impact on Landscape Character is evaluated as **Imperceptible** for alteration of land cover because of the typical and abundant nature of the affected land cover elements with excavations for the 110kV UGC taking place almost wholly within the public road; **Slight to Imperceptible** for construction activity causing a reduction in rural tranquillity, because of the small extent and visual containment of Mountphilips Substation and the small scale, transient nature of the 110kV UGC trenching works; the temporary duration of construction activities and; the works will not contravene the objectives of the Tipperary County Development Plan Landscape Character Areas; and **Slight to Imperceptible** for intensification of built development because the above ground structures associated with the development are essentially limited to Mountphilips Substation, which will have a minor, but permanent impact on the rural landscape fabric of its site and immediate surrounds. However, it is not readily visible from surrounding roads and residences, which limits the perceived impacts on landscape character and the development will not contravene the objectives of the Tipperary County Development Plan Landscape Character Areas. **The cumulative impact** of UWF Grid Connection with Other Elements of the Whole UWF Project and with Other Projects and Activities will be **Not Significant** mainly due to the temporary transient nature of construction works, and the separation distance and absence of inter-visibility between Mountphilips Substation and Other Elements of the Whole UWF Project and Other Projects.

Summary of the Significance of Impacts to Visual Amenity: it was evaluated that Intensification of activity during construction causing visual disharmony will be **Imperceptible to Slight** because of the degree of visual containment of the Mountphilips Substation site and the temporary and transient duration of construction

activities along the public road network; and **Imperceptible** for the addition of new features or loss of existing features causing visual disharmony in the operation stage because of the high level of screening around Mountphilips Substation; the barely discernible permanent surface expression of the 110kV UGC; combined with the medium sensitivity of visual receptors within the study area. **The cumulative impact** of UWF Grid Connection with Other Elements of the Whole UWF Project and with Other Projects and Activities will be **Not Significant** mainly due to the temporary transient nature of construction works, and the separation distance and absence of inter-visibility between Mountphilips Substation and Other Elements of the Whole UWF Project and Other Projects.

Conclusion: The UWF Grid Connection will not cause significant adverse effects to Landscape.

17 Environmental Factor: Landscape

17.1 Introduction to the Landscape Chapter

17.1.1 What is Landscape?

Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors[1].

Landscape is about the relationship between people and place it provides the setting for our day-to-day lives. The term does not mean just special or designated landscapes and it does not only apply to the countryside. Landscape can mean a small patch of urban wasteland as much as a mountain range, as much as an expansive lowland plain. It results from the way that different components of our environment - both natural (the influence of geology, soils, climate, flora and fauna) and cultural (the historical and current impact of land use, settlement, enclosure and other human interventions) are perceived by us.

People's perceptions turn land into the concept of landscape[2].

17.1.2 Overview of Landscape in the Local Environment

The landscape setting of the majority of the UWF Grid Connection is that of a rugged rural upland comprising of moderate and steep sided valleys that are cloaked in a combination of forestry and agricultural grassland. Aside from the small settlements of Rear Cross, Upperchurch and Kilcommon and the larger settlement of Newport the rural population is relatively sparse and dispersed. Nearer the Mountphilips Substation, the landscape transitions into a more gently rolling pastoral landscape of fields, hedgerows and mature treelines.

The location of the UWF Grid Connection is illustrated on OSI Mapping on Figure GC 17.1: Location of the UWF Grid Connection.

Figures and mapping referenced in this topic chapter can be found in **Volume C3 EIAR Figures.**

[1] European Landscape Convention (2002),
[2] Guidelines for Landscape and Visual Impact Assessment (2013)

17.1.3 Sensitive Aspects of the Landscape Environment included for further evaluation

Any sensitive receptor in the local environment which could be impacted by the project is a Sensitive Aspect. The following Sensitive Aspects **are included in this topic chapter** as they could be potentially impacted:

Sensitive Aspect No. 1	Landscape Character	Section 17.2
Sensitive Aspect No. 2	Visual Amenity	Section 17.3

Each of the above listed Sensitive Aspects are evaluated individually in Sections 17.2 to 17.3 of this Chapter.

To help readers navigate to individual sensitive aspect sections, the colour codes for each Sensitive Aspect used above are also used in the Sensitive Aspect sections Section 17.2 to 17.3. The colour-codes have been applied to section headings, tables and on side-tabs on the edge of the pages.

17.1.4 Sensitive Aspects excluded from further evaluation

No Sensitive Aspects were excluded from this topic chapter.

17.1.5 Overview of the Subject Development

The UWF Grid Connection is the subject development, being the subject of a current application to An Bord Pleanála. The main parts of the UWF Grid Connection are identified in Table 17-1 below.

Table 17-1: Subject Development – UWF Grid Connection

Project ID	The Subject Development	Composition of the Subject Development
Element 1	The Subject Development UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Ancillary Works at Mountphilips Substation site

Note: The UWF Grid Connection is 'Element 1' of the Whole UWF Project.

A description of the location, size and design, life-cycle stages, use of natural resources, emissions and wastes, and the vulnerability to major accidents and natural disasters is provided in Chapter 5: Description of the Development – UWF Grid Connection (Volume C2 EIAR Main Report).

This EIA Report is also available on www.upperchurchwindfarmgridconnection.ie.

17.1.5.1 Changes to the development from the 2018 Application

This is the 2nd Application for UWF Grid Connection (2019 Application). The previous application (2018 Application) was refused by An Bord Pleanála in December 2018. There are changes in this 2019 UWF Grid Connection Application from the 2018 Application. These comprise;

- In this 2019 Application, the route of the 110kV UGC from Mountphilips Substation Site entrance to the Consented UWF Substation site is wholly under the public road (except for 700m under a private paved road at the Consented UWF Substation end) and is 30.5km in length. By comparison, the 2018 Application 110kV UGC route was through agricultural and forestry tracks and lands with some public road crossings and 27.5km in length.

- Mountphilips Substation is at the same location, but the footprint of the Substation Compound is increased by 15% (from 8930m^2 to 10290m^2) and the footprint of the control building is increased from 205m^2 to 375m^2. A new Photomontage has been prepared for this 2019 Application: Figure GC 17.4: Visibility of Mountphilips Substation from VP1 on the L2166-10 in Coole townland

  Note: Details of the changes/no changes to the Mountphilips Substation Site as a result of the increased dimensions are listed in Chapter 5: Description of the Development: Section 5.1.1.1.

17.1.6 The Authors of the Landscape Chapter

This report was written by Richard Barker, Master Landscape Architecture and corporate member of the Irish Landscape Institute, of Macro Works consultancy. Richard's experience includes the landscape and visual impact assessment of more than 90 wind energy development proposals including 5 no. Strategic Infrastructure Development (SID) projects, numerous linear infrastructure projects including road schemes, electricity transmission lines (overhead and underground) as well as water and sewage pipelines. Macro Works specialise in visual impact analysis and visual impact graphics.

17.1.7 Sources of Baseline Information

The information sources outlined in Table 17-2 were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in the table, have been considered during the preparation of this chapter.

Table 17-2: Sources of Baseline Information for Landscape

Type	Source
Consultation	No feedback from Statutory Consultees or members of the public
Plans & Policy	• National Landscape Strategy for Ireland (2015-2025) • North Tipperary County Development Plan 2010-2016 (as varied), Chapter 7: Landscape, Water Quality and Heritage, Section 7.2 Landscape • Landscape Character Assessment of Tipperary 2017
Guidelines	• Institute of Environmental Management and Assessment (IEMA) • Landscape Institute (UK) 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA, 2013, 3rd Edition).
Desktop	• North Tipperary County Development Plan 2010 (as varied) • South Tipperary County Development Plan 2009 (as varied) • Landscape Character Assessment for County Tipperary (2017) • Online research and review of this EIA Report Chapter 6: Population to establish key tourist and amenity features, including waymarked walking and cycling routes in the study area • Review of planning/ environmental information documents for the Other Elements of the Whole UWF Project as contained in Volume F of the planning application • Chapter 8: Biodiversity • Chapter 9: Land
Fieldwork	• Site Visit • Baseline photography and drone survey

17.1.8 Methodology for Evaluating Effects

17.1.8.1 Landscape Evaluation Criteria

The criteria used by Macro Works for landscape and visual appraisals are derived from the above IEMA and GLVIA Guidelines (see Table 17-2). Whilst this is specific to the landscape and visual appraisal, the significance judgements correspond closely with the EPA significance criteria with the main point of note being that 'Substantial' impacts are equivalent to the EPA definition for 'Significant' impacts. The landscape and visual criteria are set out below.

When assessing the potential impacts on the landscape resulting from the development, the following criteria are considered:

- Landscape character, value and sensitivity
- Magnitude of likely impacts; and
- Significance of landscape effects

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area (LCA) or feature) can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics. Landscape sensitivity is classified using the criteria in Table 17-3.

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the proposal site boundary that may have an effect on the landscape character of the area. The magnitude of landscape impact is classified using the criteria in Table 17-4.

Table 17-3: Landscape Sensitivity

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically, this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

Table 17-4: Magnitude of Landscape Impacts

Magnitude of Landscape Impact	Description
Very High	Permanent change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
High	Permanent or long-term change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
Medium	Permanent or long-term changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality. Alternatively, Medium term, short term or temporary changes of greater extent and scale.
Low	Permanent or long-term Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements. Alternatively, short term or temporary changes of greater scale and extent.
Negligible	Permanent changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable. Alternatively, temporary changes of slightly greater extent and scale

17.1.8.2 Visual Impact Criteria

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape.

In accordance with the IEMA Guidelines for Landscape and Visual Assessment, receptor type was used to estimate the level of sensitivity for a particular visual receptor, as outlined in Table 17.5.

Table 17-5: IEMA Criteria for Evaluating the Sensitivity of Visual Receptors

Visual receptors most susceptible to changes in views and visual amenity	**Visual receptors that are less susceptible to changes in views and visual amenity**
Residents at home;	People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape; and
People, whether residents or visitors, who are engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views;	People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life
Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience;	
Communities where views contribute to the landscape setting enjoyed by residents in the area; and	
Travellers on road rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened	

The magnitude of visual impacts relates to the likely scale and nature of visual change in relation to the representative receptor location. It considers whether the proposal will be a visual obstruction (blocking a view) or just an intrusion on the view and how much of the view is affected. It is also a measure of whether the visual change is temporary or permanent and if such change conflicts or complements other elements within the scene in terms of tone, texture, scale and function for example. The textual criteria for determining visual impact magnitude are set out in Table 17.6.

Table 17-6: Magnitude of Visual Impacts

Criteria	Description
Very High	The proposed development is a permanent visual obstruction or intrusion into a large proportion or critical part of the available vista and is without question the most noticeable element. A high degree of visual clutter or disharmony is also generated, strongly reducing the visual amenity of the scene
High	The proposed development is a permanent or long term visual obstruction or intrusion into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual clutter or disharmony is also likely to be generated, appreciably reducing the visual amenity of the scene.
Medium	The proposed development represents a permanent or long-term intrusion into a moderate proportion of the available vista. It is a readily noticeable element and/or it may generate a degree of visual clutter or disharmony, thereby reducing the visual amenity of the scene. Alternatively, it may represent a balance of higher and lower order judgements in relation to visual presence and visual amenity or a shorter duration.
Low	The proposed development represents a permanent or long-term intrusion into a minor proportion of the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene. Alternatively, it may represent short term or temporary visual intrusion of a greater extent.
Negligible	The proposal would be barely discernible within the available vista and/or it would not detract from, and may even enhance, the visual amenity of the scene. Alternatively, it may represent short term or temporary visual intrusion of a slightly greater extent.

17.1.8.3 Significance of Landscape and Visual Impacts

The significance of both landscape and visual impacts is based on a balance between the sensitivity of the landscape / visual receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the matrix in Table 17-7.

Table 17-7: Landscape and Visual Impact Significance Matrix

	Sensitivity of Receptor				
Scale/Magnitude	***Very High***	***High***	***Medium***	***Low***	***Negligible***
Very High	Profound	Profound-substantial	Substantial	Moderate	Minor
High	Profound-substantial	Substantial	Substantial-moderate	Moderate-slight	Slight-imperceptible
Medium	Substantial	Substantial-moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Slight-imperceptible	Imperceptible
Negligible	Slight	Slight-imperceptible	Imperceptible	Imperceptible	Imperceptible

***Note**: The significance matrix provides an indicative framework from which the significance of impact is derived. The significance judgement is ultimately determined by the assessor using professional judgement. Due to nuances within the constituent sensitivity and magnitude judgements, this may be up to one category higher or lower than indicated by the matrix. Judgements indicated in orange are considered to be 'significant impacts' in EIA terms (EPA definitions).*

17.1.9 Certainty and Sufficiency of Evaluation/Information

A clear documentary trail is provided throughout this chapter and chapter appendices to the competency of data and methods used and the rationale for selection of same. The information used to compile this chapter is collated from reports and documents generated by local authorities and in particular, the North Tipperary County Development Plan 2010 (as varied). In all cases the most recent publications are relied on. All documentation used is referenced at the end of the chapter.

In respect of Landscape no significant limitations or difficulties were encountered.

17.2 Sensitive Aspect No.1: Landscape Character

This Section provides a description and evaluation of the Sensitive Aspect - Landscape Character.

17.2.1 BASELINE CHARACTERISTICS of Landscape Character

17.2.1.1 STUDY AREA for Landscape Character

The study area for Landscape Character in relation to the UWF Grid Connection is described in Table 17-8 and illustrated on Figure GC 17.2: UWF Grid Connection Study Area for Landscape Character (Volume C3 EIAR Figures).

Table 17-8: UWF Grid Connection Study Area for Landscape Character

Study Area for Landscape Character	Justification for the Study Area Extents
500m corridor from construction works areas 2km radius from the Mountphilips Substation	Distances outside of which, each aspect of the development could not materially affect prevailing landscape character

17.2.1.2 Baseline Context and Character of Landscape Character in the UWF Grid Connection Study Area

The Landscape of the UWF Grid Connection Study Area is contained within a combination of a rolling lowland rural landscape of fields and hedgerows at its western end in the vicinity of Newport, transitioning into a more extensively managed upland rural landscape of forestry and farmland within the Slievefelim to Silvermine Mountains throughout the central and eastern extents. See Appendix 17.1: Contextual Photographs and Theoretical Visibility within the Study Areas for contextual photographs illustrating the physical land cover of the receiving environment.

The Mountphilips Substation part of the UWF Grid Connection, along with the westernmost 10km of the 110kV UGC are contained within the rolling lowland farmland context around Newport. The remaining 20.5km of the 110kV UGC will be contained within the upland rural context of the Slievefelim to Silvermine Mountains.

The landscape encompassed by the Whole UWF Project is wholly rural (agriculture) in terms of land use and character, but varies slightly from typical upland agriculture to typical lowland agriculture. A recently updated Landscape Character Assessment (2017) is contained within the Tipperary Country Development Plan (2010 as varied) and this identifies that the uplands portions of the overall landscape context are contained within Landscape Character Areas (LCAs) '17 – Upperchurch, Kilcommon & Hollyford Mountain Mosaic' and '18 – 'Silvermines – Rearcross'. The westernmost lowland area is contained within 'LCA12 River Shannon – Newport'. Within LCA17 and LCA18 there is a relatively tranquil upland rural landscape character of low intensity land uses including pastoral farming and forestry with a sparse and dispersed population. Within the Lowland landscape of LCA12 River Shannon – Newport the population density is slightly greater and the land is farmed more intensively. Here the landscape character is more of a traditional pastoral one within gently rolling terrain.

The location of UWF Grid Connection in relation to LCA17, LCA18 and LCA12 is illustrated on Figure GC 17.1.

17.2.1.3 Importance of Landscape Character

Neither the upland nor lowland agricultural landscape within the study area is particularly rare or distinctive in a national or regional context. However, the tranquillity of the upland areas and the pastoral qualities of the lowland areas contributes to the rural amenity of residents in this area. The productive agricultural land uses also contribute to the subsistence of the rural lifestyle enjoyed by the local population.

17.2.1.4 Sensitivity of Landscape Character

The tranquil rural landscape character of the uplands and the traditional pastoral aesthetic of the lowlands contribute to the 'Class 3 - sensitive' sensitivity classification for LCA 17 and LCA18 and the 'Class 4 – transitional vulnerability' classification for LCA12 in the Tipperary Landscape Character Assessment.

In a general sense, the prevailing rural landscape character in these areas is sensitive to permanent changes to landscape patterns and features, which contribute to that character. It is also sensitive to the introduction of new and unfamiliar development, particularly that which includes intensive built development of a typically non-rural nature. Based on the universal landscape sensitivity criteria identified in Table 17.3 it is considered that the 'Class 3 – sensitive' landscape sensitivity classification from the Tipperary Landscape Character Assessment (classification specific to that document) corresponds to a **'Medium'** landscape sensitivity for both LCA17 – 'Upperchurch, Kilcommon & Hollyford Mountain Mosaic' and LCA18 – 'Silvermines – Rearcross'. For 'LCA12 River Shannon – Newport' the 'Class 4 – transitional vulnerability' classification is considered to correspond to a **'High medium'** sensitivity for the purposes of this appraisal.

17.2.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

In recent years the strongest trend in the wider upland areas in the south and southeast of the Slievefelim to Silvermine Mountain upland area is the emergence of wind energy developments on upper slopes and ridges along with the ancillary development of roads and electrical infrastructure.

This trend is likely to continue further to the north and west of these developments, with the recent development of Milestone Windfarm (operational since late 2018), and as the currently permitted wind energy developments such as Upperchurch Windfarm and Castlewaller Windfarm, and potentially Bunkimalta Windfarm, are constructed.

However, the predominant rural land use matrix of farming and forestry within the study area or wider upland area has not noticeably changed in recent years and is unlikely to change markedly or rapidly in the foreseeable future (see EIA Report Chapter 9 – Land).

17.2.1.6 Receiving Environment (the Baseline + Trends)

The identified trends are occurring gradually and in a consistent manner, so it is assumed in this report that the receiving landscape will be a very similar baseline environment to that identified above, albeit with Milestone Windfarm making the wind energy development a more characteristic feature of the overall rural landscape character, particularly in LCA17.

17.2.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

17.2.2.1 Cumulative Evaluation Study Areas

17.2.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Landscape Character	Justification for the Study Area Extents
1km corridor from construction works areas 4km radius from the Mountphilips Substation	Doubling the distance for cumulative study areas, identifies those parts of the Other Elements or Other Projects or Activities with potential to cause cumulative impacts with UWF Grid Connection. At distances greater than 1km and 4km from the development, the prevailing landscape character will not be materially affected on the basis that the proposed development will have become a negligible component of the broader scale landscape fabric.

The study is illustrated on Figure CE 17.2: UWF Grid Connection Cumulative Evaluation Study Area for Landscape Character.

17.2.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 17.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements and Other Projects or Activities which are described in Table 17-9 and illustrated on Figure WP 17.2: Whole Project Study Area for Landscape Character (Volume C3 EIAR Figures).

Table 17-9: Cumulative Evaluation Study Area for Landscape Character

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 1: UWF Grid Connection	500m corridor from works areas and activity locations, 1km to identify any Other Projects or Activities 2km radius from above ground level structures, 4km to identify any Other Projects or Activities	Distances outside of which, the Mountphilips Substation, Telecoms Relay Pole, UWF Replacement Forestry could not have a material cumulative effect on prevailing landscape character or visual amenity – i.e. any effects beyond 2km from the aforementioned elements will be Neutral. Any cumulative landscape character and visual amenity impacts beyond
Element 2: UWF Related Works		
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 5: UWF Other Activities		these study areas will only relate to the presence of cumulative turbines in views containing the consented UWF turbines, the cumulative impacts of which have previously been assessed as acceptable by An Bord Pleanála.

17.2.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Landscape Character also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Landscape Character with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.35).

The results of this scoping exercise are that: Milestone Windfarm, Foilnaman Mast, Cummermore Communications Pole and the activities of Forestry in the surrounding area have been scoped in for evaluation of cumulative effects to Landscape Character.

17.2.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Landscape Character

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Landscape Character. The results of this evaluation are included in Table 17-10.

The location of the Other Elements and Other Projects or Activities which are included for cumulative evaluation is illustrated on Figure WP 17.2.

Table 17-10: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Included for the evaluation of cumulative effects
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effects due to: • Upperchurch Hen Harrier Scheme: Once off activities will take place during the construction stage, and comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will not generate any adverse effects on the landscape character or to visual amenity. • Haul Route Activities: It is considered that there will be Neutral effects to landscape character or visual amenity, as there will be no disturbance of land cover, and any tree trimming will be in the context of road boundary tree trimming that regularly takes place along the public road network, and the presence of any machinery in the context of busy regional and national roads. • Overhead Line Activities do not require any works to land and any brief visibility of such minor works will have a Neutral effect on visual amenity. • Monitoring Activities do not require any works to land, no effects are expected from brief periods of very minor activity.

Other Projects or Activities	
Milestone Windfarm Foilnaman Mast Cummermore Communications Pole	Yes, included for the evaluation of cumulative operational stage effects, Excluded from evaluation in relation to cumulative construction stage effects as the Foilnaman Mast, Cummermore Communications Pole and Milestone Windfarm already exist and are considered part of the baseline.
Forestry activities in the Surrounding Area	Yes, included for the evaluation of cumulative construction stage effects, Excluded from evaluation in relation to cumulative operational stage effects as these activities are the prevailing and characteristic land uses in this area, i.e. they are the baseline rather than other sources of impact.

17.2.2.3 Cumulative Information: Baseline Characteristics – Context & Character

17.2.2.3.1 Element 2: UWF Related Works

The Landscape of the UWF Related Works Study Area is contained within an extensively managed upland rural landscape of farmland and forestry within the eastern extents of the Slievefelim to Silvermine Mountains upland area.

The landscape is wholly rural (agriculture) in terms of land use and character, but varies slightly from typical upland agriculture to typical lowland agriculture. A recently updated Landscape Character Assessment (2017) is contained within the Tipperary Country Development Plan (2010 as varied) and this identifies that the overall landscape context is contained within Landscape Character Areas (LCAs) '17 – Upperchurch, Kilcommon & Hollyford Mountain Mosaic'. Within LCA17 there is a relatively tranquil upland rural landscape character of low intensity land uses including pastoral farming and forestry with a sparse and dispersed population.

The location of UWF Related Works in relation to LCA17 is illustrated on Figure WP 17.2.

17.2.2.3.2 Element 3: UWF Replacement Forestry

The Landscape of the UWF Replacement Forestry Study Area is contained within an extensively managed upland rural landscape of farmland and forestry within the eastern extents of the Slievefelim to Silvermine Mountains upland area. See Appendix 17.1 for contextual photographs illustrating the physical land cover of the receiving environment.

The landscape is wholly rural (agriculture) in terms of land use and character, but varies slightly from typical upland agriculture to typical lowland agriculture. A recently updated Landscape Character Assessment (2017) is contained within the Tipperary Country Development Plan (2010 as varied) and this identifies that the overall landscape context is contained within Landscape Character Areas (LCAs) '17 – Upperchurch, Kilcommon & Hollyford Mountain Mosaic'. Within LCA17 there is a relatively tranquil upland rural landscape character of low intensity land uses including pastoral farming and forestry with a sparse and dispersed population.

The location of UWF Replacement Forestry in relation to LCA17 is illustrated on Figure WP 17.2.

17.2.2.3.3 Element 4: Already Consented Upperchurch Windfarm

Upperchurch Windfarm is also located within the upland rural context of the Slievefelim to Silvermine Mountains upland area, in LCA17.

Consideration of the Passage of Time: With the exception of the Milestone Windfarm, which is now operational, there has been no material change in the landscape character in the Upperchurch Windfarm area. It should be noted that Milestone Windfarm was considered cumulatively in the 2013/2014 planning assessments, and therefore the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this 2019 EIAR.

17.2.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 17.2.2.2.1

17.2.2.3.5 Other Projects or Activities

The existing Milestone Windfarm, Foilnaman Mast and Cummermore Communications Pole are also located in LCA17, within the upland rural context of the Slievefelim to Silvermine Mountains, where forestry and agriculture are the main land uses.

Forestry activity in the surrounding area, may include forestry harvesting operations from time to time, these activities occur frequently in the Slievefelim to Silvermines Mountains upland area resulting in familiar cutover forestry compartments with associated track widening and processing pads. Forest growth is also typical of these LCAs, with forest plots at various stages of growth located throughout the study area.

17.2.3 PROJECT DESIGN MEASURES for Landscape Character

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 17-11 are relevant to the Environmental Factor, Landscape, and in particular to the sensitive aspect **Landscape Character**.

Table 17-11: UWF Grid Connection Project Design Measures relevant to Landscape Character

PD ID	Project Design Environmental Protection Measure (PD)
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD07	110kV UGC construction works along the local roads L2264-50 and L6188-0, will not take place at the same time as the UWF Related Works Haul Route Works on these roads. The 110kV UGC construction works will also be scheduled so that the works do not occur on the same days as concrete deliveries for Consented UWF Turbines along these local roads.
PD11	Construction works for the 110kV UGC in Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons townlands, which are within 350m of local residences, will not take place at the same time as either the UWF Related Works or Upperchurch Windfarm where those works also occur within 350m.

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works, UWF Replacement Forestry and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3, 5.4 and 5.5 in Volume C4: EIAR Appendices.

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17.2.4 EVALUATION OF IMPACTS to Landscape Character

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Landscape Character.

As a result of the exercise, some impacts were included and some were excluded.

Table 17-12: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Alteration or division of land cover and vegetation patterns (construction stage)	*Intensification of activity causing a reduction in rural tranquillity (operational stage)*
Intensification of activity causing a reduction in rural tranquillity (construction stage)	*Decommissioning Effects*
Intensification of built development and reduction in the integrity of rural landscape patterns (operational stage)	

The source-pathway-receptor links for included impacts are described in the **Impact Evaluation Tables,** which are presented in the **following sections 17.2.4.1 to 17.2.4.3.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Table sections, in Section 17.2.4.4.

Relevant Figures and Appendices

A photomontage of the view from Coole townland of Mountphilips Substation when built is illustrated on Figure GC 17.4: Visibility of Mountphilips Substation from VP1 on the L2166-10 in Coole townland in **Volume C3 EIAR Figures**

Contextual photographs illustrating the physical land cover of the receiving environment and Zone of Theoretical Visibility mapping are presented in Appendix 17.1: Contextual Photographs and Theoretical Visibility within the Study Areas in **Volume C4 EIAR Appendices.**

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17.2.4.1 Impact Evaluation Table: Alteration or division of land cover and vegetation patterns

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Excavation of soil, and vegetation removal
Cumulative Impact Source: Excavation of soil, and vegetation removal
Impact Pathway: Physical land cover disturbance / change

Impact Description: Temporary change to physical landscape elements in the form of excavation, removal or disruption of soils, grassland, forestry, scrub, hedgerows and riparian vegetation that will impact on the integrity of landscape patterns that contribute to the salient rural landscape character of the area.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Alteration or division of land cover and vegetation patterns

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The Mountphilips Substation is proposed for a location in LCA-12, while the route of the 110kV UGC between the Mountphilips Substation and the Consented UWF Substation is located in all three Landscape Character Areas - LCA-12, LCA-18 and LCA-17.

The potential for alteration or disturbance of land cover or vegetation patterns is limited to the Mountphilips Substation site, and this impact will not occur outside of the Mountphilips Substation site due to the location of the 110kV UGC within public road pavements, with the eastern extremity of the 110kV UGC located under paved private road and future substation compound area, where no alteration or disturbance of land cover or vegetation patterns will occur as a consequence of the development of UWF Grid Connection.

In total 4.6ha of construction works areas will be carried out in LCA-12 in the open countryside at the Mountphilips Substation site (i.e. between the permanent site entrance to the east as far as the 2 new End Masts to the west).

Disturbance of landcover will comprise the removal of soils on grassland between the site entrance at Coole and the Mountphilips Substation, and the permanent change of c.1.75ha from grassland to hard surface area and new permanent berms in this area.

Alteration of vegetation patterns will comprise the permanent removal of a 40m of hedgerow (including 11 immature trees) from 2 no. locations of 30m and 10m in length along the new permanent access road. A new hedgerow, c.700m in length, will be planted on the berms on either side of the new Access Road between the Site Entrance and Mountphilips Substation and around Mountphilips Substation; the sides of the berms will be seeded with native grass and wildflower species, for the benefit of biodiversity in the area. 160m of hedgerow and 18 No. trees (1 of which is mature) will be removed at the Site Entrance, with an equivalent length of new hedgerow and equivalent number of trees (semi-mature) to be planted behind the new site entrance sightlines.

Significance of the Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 17-7, the Negligible magnitude combined with the medium to high sensitivity of LCA-12.
- Compliance with the 'control' of unavoidable new development objective for LCA-12
- In the context of the size of the landscape character areas

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- The typical and abundant nature of the affected land cover elements
- The predominantly temporary duration of effects.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: The potential for cumulative effects is limited to LCA-17, where works associated with UWF Grid Connection and Upperchurch Windfarm and UWF Related Works all occur. However UWF Grid Connection works will be confined to the public road, paved private road and future UWF Substation compound in this area and will not cause any disturbance, alteration or division of land cover within surrounding agricultural lands, therefore cumulative impacts with UWF Related Works or Upperchurch Windfarm works will not occur. The magnitude of cumulative impact is therefore deemed to be Negligible.

Significance of the Cumulative Impact: No Cumulative Impact

Rationale for Cumulative Impact Evaluation:

- The occurrence of UWF Grid Connection in paved surfaces and in future hardcore areas where UWF Related Works and Upperchurch Windfarm occur within the UWF Grid Connection Cumulative Evaluation Study Area.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
In total 20.9ha of construction works areas associated with the UWF Related Works will be carried out in LCA-17. Excavation and soil removal/disruption will take place in all construction works areas, 0.3ha of forestry will be felled along with the removal of 170m of hedgerow comprising primarily earthen banks and 4 No. mature trees, mainly along public road boundaries. Riparian habitat will be temporarily removed at 6 No. crossing points of watercourses along the routes of the Internal Windfarm Cabling and Realigned Windfarm Roads.

Significance of the Impact: Imperceptible

- Rationale for Impact Evaluation:
- As per Table 17-7 the Negligible magnitude combined with the medium sensitivity of LCA-17
- Compliance with the 'wise use and best choice' objective to maintain and enhance established patterns for LCA-17
- In the context of the extensive size of LCA-17
- the typical and abundant nature of the affected land cover elements
- The predominantly temporary duration and
- the reversibility of the impact with the restoration of the prevailing land cover over the vast majority of construction works areas.

Element 3: UWF Replacement Forestry

Impact Magnitude:
Change of 6 hectares, of agricultural grassland to plantation forestry in LCA-17. Minimal excavation of soils due to the planting of the new native woodland by hand. No removal of hedgerows or riparian habitats.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The small scale of the native woodland planting area adjacent to existing forested areas in a wider landscape that is defined by a combination of forestry and farmland
- The negligible magnitude of land disturbance required during planting operations
- The temporary nature of forest planting activities.

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Element 4: Consented Upperchurch Windfarm

Impact Magnitude:
As per the ABP Inspectors Report (2014, Section 2), "In overall terms the principle of locating windfarm development in the area which is the subject of this appeal is reasonable". The LVIA for the Upperchurch Windfarm, which was considered by the inspector, found the physical impact on landscape features and impact on landscape character to be of a Low magnitude. The significance of landscape impact was deemed to be 'Low negligible' - equivalent of 'Slight-imperceptible' in respect of terminology used herein.

Significance of the Impact: Slight - Imperceptible

Rationale for Impact Evaluation:

- The negligible to low magnitude of change within a relatively small area of agricultural and forested land being disturbed during construction in the context of the extensive landscape character areas contained within the study area where the affected land cover elements are typical and abundant.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 17.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Forestry Activities in the Surrounding Area

Impact Magnitude:
Forestry harvesting operations are periodic, of a modest scale and are a typical activity of the Slievefelim to Silvermines Mountains upland area resulting in familiar cutover forestry compartments with associated track widening and processing pads. Forest growth is also typical of these LCAs, with forest plots at various stages of growth located throughout the study area.

Significance of the Impact: Slight - Imperceptible

Rationale for Impact Evaluation:

- The modest scale and temporary nature of forest harvesting activities
- The reversibility of forest harvesting operations through forest replanting or agricultural conversion.

Evaluation of Other Cumulative Impacts – Alteration or division of land cover and vegetation patterns

Whole UWF Project Effect

Cumulative Impact Magnitude:

UWF Grid Connection, UWF Related Works, UWF Replacement Forestry and Upperchurch Windfarm works areas occur across three Landscape areas; LCA-12, LCA-18 and LCA-17, and three of these Elements overlap in the Knocknabansha, Knockmaroe and Knockcurraghbola area in LCA-17.

In relation to UWF Grid Connection, the alteration or disturbance of land cover or vegetation patterns is limited to the Mountphilips Substation site, outside of which the UWF Grid Connection (110kV UGC) is located predominately on the public road, with the eastern extremity of the 110kV UGC located under paved private road and future substation compound area.

In relation to UWF Related Works and Upperchurch Windfarm, the temporary disturbance of land cover in the Knocknabansha, Knockmaroe and Knockcurraghbola area will not occur at the same time, as the promoter has committed to undertake the works for the UWF Related Works and the Upperchurch Windfarm separately to avoid cumulative impacts to local residents.

UWF Related Works will only alter small and independent sections of land cover and vegetation, including at Foilnaman where the UWF Replacement Forestry is also located, that will be temporarily disrupted and restored independently, thereby avoiding noticeable cumulative effects. Planting works associated with UWF Replacement Forestry will be carried in the vicinity of some UWF Related Works and Upperchurch

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Windfarm construction works locations, however the planting works will have a negligible magnitude of land disturbance.

The magnitude of cumulative impacts is reduced by the colocation of c.60% of Internal Windfarm Cabling in Upperchurch Windfarm roads, these works will be carried out by Upperchurch Windfarm crews and will not cause any noticeable increase in intensification.

The overall magnitude of cumulative impact is therefore deemed to be Low-negligible.

Significance of the Cumulative Impact: Slight

Rationale for Cumulative Impact Evaluation:

- the Low-negligible magnitude of impact in the context of the extensive size and medium sensitivity of landscape character area LCA-17
- The relatively small extent of works for UWF Grid Connection in the Mountphilips/Coole area, and the separation distance to the UWF Related Works/Upperchurch Windfarm area;
- The negligible magnitude of the UWF Replacement Forestry
- the typical and abundant nature of the affected land cover elements
- the predominantly temporary duration and the reversibility of the impact with the restoration of the prevailing land cover over the vast majority of construction works areas.

All Elements of the Whole UWF Project with Other Projects or Activities

Cumulative Impact Magnitude:

During construction, the various elements of the Whole UWF Project in conjunction with periodic forest harvesting operations will result in discrete areas of land cover disturbance and vegetation removal. This will result in very minor impacts on the integrity and uniformity of the rural landscape fabric of the subject LCAs. The UWF Replacement Forestry will not cause noticeable cumulative effects, given the negligible magnitude of planting works associated with this Element.

Cumulative Impact with Other Projects: Slight Imperceptible

Rationale for Cumulative Impact Evaluation:

- The small scale and discrete areas of land cover that are affected, which are also typical and abundant in these LCAs.
- The temporary nature of construction works
- The reversibility of the vast majority of the Whole UWF Project works and forest harvesting through reinstatement / replanting

Note: No cumulative evaluation of Other Projects or Activities (Milestone Windfarm, Foilnaman Mast, Cummermore Communications Pole) is included in the table above, because these Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 17.2.2.2.1).

17.2.4.2 Impact Evaluation Table: Intensification of activity causing a reduction in rural tranquillity

Impact Description	
Project Life Cycle Stage:	Construction stage

Impact Source: Construction related activities
Cumulative Impact Source: Construction related activities, forestry harvesting in the surrounding area
Impact Pathway: Visibility

Impact Description:
Construction activity will include the near constant movement, during daylight hours, of machinery, vehicles and people to and from both linear and fixed working areas. Temporary fencing and welfare facilities will be erected and there will be temporary stockpiling of excavated materials and construction materials. This intensity of construction activity is not typical of baseline land uses in this rural area and will detract from the tranquillity that forms an integral part of the rural landscape character in these LCAs.

Works along the public road, involving trenching (UWF Grid Connection and UWF Related Works) and road widening works in the verge/boundary (UWF Related Works); are unlikely to detract from rural tranquillity and will generally be perceived as road works, which are a common occurrence on the public road network.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Intensification of activity causing a reduction in rural tranquillity

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The greatest intensity and duration of construction related activity for the UWF Grid Connection will occur at the Mountphilips Substation site which also includes a temporary construction compound that will provide office, welfare, storage and parking facilities to construction workers. The Mountphilips Substation site is well contained by existing terrain and vegetation and the substation compound and temporary construction compound are located 420m from the local public roads, which will restrict the extent to which construction activity can impact the surrounding landscape character, and as a result the impact magnitude is Low negligible.

Along the route of the 110kV UGC, which is entirely located on paved roads/hardstanding area, there will be up to 4 No. construction crews, each made up of 4-5 men, a large excavator and tractor and trailer, working from 4 separate locations along the 110kV UGC. While some sections of the 110kV UCG will be more visually exposed, than the substation, the intensity and duration of trenching works will be much lower and due to the largely transient nature (moving through the landscape) of construction works along the 110kV UGC, only short sections of the works for the 110kV UGC will be perceived from most locations in the study area, and it is considered the impact magnitude is Low negligible.

Significance of the Impact: Slight to Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the Low negligible magnitude combined with the medium to high sensitivity of LCA-12 and the medium sensitivity of LCA-17 and LCA-18
- The small extent and visual containment of Mountphilips Substation works (including the new access road and construction compound) and the small scale, transient nature of the 110kV UGC trenching works
- The temporary duration of construction activities and the reversibility of effects once temporary construction areas along the road are reinstated, which will not contravene the 'control' of unavoidable new development objective for LCA-12 and the 'wise use and best choice' objective to maintain and enhance established patterns for LCA-17 and LCA-18.

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Sensitive Aspect

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Cumulative effects of UWF Grid Connection with UWF Related Works and Upperchurch Windfarm may occur in the Knockmaroe, Knockcurraghbola Commons, Knockcurraghbola Crownlands area where Haul Route Works and Internal Windfarm Cabling works and Upperchurch Windfarm works are located close to UWF Grid Connection 110kV UGC works. However, UWF Grid Connection works in this area are confined to the public road network at these locations, and therefore the magnitude of cumulative impact is deemed to be Negligible.

Surrounding area forestry operations are not likely to cause noticeable cumulative effects as UWF Grid Connection is not located within any forestry plots and does not involve any felling. While Mountphilips Substation is located adjacent to a small individual forestry plot, this forestry is not mature and will not be harvested during the same period as construction works for the new substation. In relation to the 110kV UGC, while the works along the public road will be in close proximity to forestry at some locations, the 110kV UGC works generally will be perceived as road works on the public road network. It is therefore evaluated that the magnitude of cumulative impact will be Negligible.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 17-7, the Negligible magnitude combined with the medium to high sensitivity of LCA-12 and the medium sensitivity of LCA-17 and LCA-18
- The absence of any felling required for UWF Grid Connection, and the location of the 110kV UGC within public road pavements with road works a common occurrence on Irish roads

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Construction activities will involve single 3-4 man crews each using an excavator and dump truck and working linearly at Internal Windfarm Cabling, Realigned Windfarm Roads and Haul Route Works locations. Construction activities at the Telecoms Relay Pole will be at a fixed location but will be minimal and will not be noticeable in the context of the windfarm construction works which will be carried out at the same time. It is considered that the reduction in rural tranquillity arising from the intensification of activity will have a negligible impact magnitude due to the small scale and somewhat transient nature of the construction activities within a relatively broad site area that will disperse the intensity of construction activity, even if it is all occurring at once.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the negligible magnitude combined with the medium sensitivity of LCA-17
- compliance with the 'wise use and best choice' objective to maintain and enhance established patterns for LCA-17
- In the context of the size of LCA-17,
- The transient and dispersed nature of construction activity for this project element.
- The temporary duration of construction activities and
- The reversibility of effects once temporary construction areas and compounds are cleared and restored.

Element 3: UWF Replacement Forestry

Impact Magnitude:
Very low intensity planting activities involving the delivery and temporary storage of seedlings prior to hand planting by a small team of workers over a very short time period will have a negligible reduction in rural tranquillity.

Significance of the Impact: Imperceptible

Landscape

Topic

Rationale for Impact Evaluation:

- The medium sensitivity of LCA-17and the negligible magnitude of impacts due to the small extent and intensity of planting activities
- compliance with the 'wise use and best choice' objective to maintain and enhance established patterns for LCA-17
- The perception of the activities as typical rural activities in this landscape, which include forest planting
- The temporary duration of planting activities

Element 4: Consented Upperchurch Windfarm

Impact Magnitude:
As per the ABP Inspectors Report (2014, Section 2), "In overall terms the principle of locating windfarm development in the area which is the subject of this appeal is reasonable". The LVIA for the Upperchurch Windfarm, which was considered by the inspector, found the impact on landscape character to be of a Low magnitude. The overall significance of landscape impact was deemed to be 'Low negligible' - equivalent of 'Slight-imperceptible' in respect of terminology used herein.

Significance of the Impact: Slight to Imperceptible

Rationale for Impact Evaluation:

- The modest extent of construction activities, focused on somewhat dispersed turbine locations as well as the transient nature of such activity (moving between turbine locations at various times)
- The temporary – short-term duration of construction activity and the reversibility of effects once temporary construction areas and compounds are cleared and restored.

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 17.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Forestry Activities in the Surrounding Area

Impact Magnitude:
In the surrounding area Forestry harvesting operations are periodic, of a modest scale and are a typical activity of the Slievefelim to Silvermines Mountains upland area. Such operations also consist of frequent movement of HGV logging trucks along local and regional roads.

Significance of the Impact: Slight Imperceptible

Rationale for Impact Evaluation:

- The modest scale, familiar form and temporary nature of forest harvesting activities.

Evaluation of Other Cumulative Impacts – Intensification of activity causing a reduction in rural tranquillity

Whole UWF Project Effect

Cumulative Impact Magnitude:
UWF Grid Connection, UWF Related Works, UWF Replacement Forestry and Upperchurch Windfarm works areas occur across three Landscape areas; LCA-12, LCA-18 and LCA-17, and three of these Elements overlap in the Knocknabansha, Knockmaroe and Knockcurraghbola area, in LCA-17. However the promoter has committed to undertake the works for the UWF Grid Connection, UWF Related Works and the Upperchurch Windfarm, in the overlap area, separately to avoid cumulative impacts to local residents, and therefore there will be NO combined construction activity occurring over the same time period. The duration of the effect will be longer in this area, but does not increase the cumulative magnitude, which remains negligible. There will be no cumulative effects from construction activities relating to other discrete sections of the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm works.

Due to the very low intensity of planting activities associated with UWF Replacement Forestry, this Element will not cause cumulative impacts with the Other Elements of the Whole UWF Project.

Landscape Character

Sensitive Aspect

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 17-7, the negligible magnitude combined with the medium to high sensitivity of LCA-12 and the medium sensitivity of LCA-17 and LCA-18
- The separate construction / restoration periods for the UWF Grid Connection, UWF Related Works and the Upperchurch Windfarm, in the Knockmaroe and Knockcurraghbola area and the very small scale in the context of the extensive size and medium sensitivity of landscape character area LCA-17
- The modest scale and extent of construction activities with somewhat transient working areas dispersed across a relatively broad area of undulating topography (albeit with some common compound and welfare facilities for Upperchurch Windfarm and the UWF Related Works)
- The temporary – short-term duration of construction activity and the reversibility of effects once temporary construction areas and compounds are cleared and restored.

All Elements of the Whole UWF Project with Other Projects or Activities

During construction, Elements of the Whole UWF Project (in particular Upperchurch Windfarm and to a lesser extent UWF Related Works) could potentially be constructed during the same time as periodic forest harvesting operations, and these activities cumulatively are likely to result in an overall intensity of construction related activity that is slightly greater than for the Whole UWF Project in its own right. However, working areas tend to be relatively discrete from each other and not generally intervisible.

Forestry harvesting in the area could also increase HGV traffic along local and regional roads, which along with Whole UWF Project HGV traffic and roadworks associated with UWF Grid Connection (110kV UGC) and Haul Route Works (UWF Related Works) and road related activities for UWF Other Activities (Haul Route Activities) is likely to have a Low-negligible in-combination effect due to the increased frequency and intensity of HGV traffic within this relatively tranquil rural area.

Due to the very low intensity of planting activities associated with UWF Replacement Forestry, this Element will not cause cumulative impacts with Other Projects or Activities.

Significance of the Cumulative Impact: Slight

- As per Table 17-7, the Low-negligible magnitude of cumulative effect combined with the medium to high sensitivity of LCA-12 and the medium sensitivity of LCA-17 and LCA-18
- The small scale and extent of construction works in forestry landholdings
- The temporary – short-term duration of in-combination construction activity and the reversibility of effects once construction works are completed.

Note: No cumulative evaluation of Other Projects or Activities (Milestone Windfarm, Foilnaman Mast, Cummermore Communications Pole) is included in the table above, because these Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 17.2.2.2.1).

Landscape

Topic

17.2.4.3 Impact Evaluation Table: Intensification of built development and reduction in the integrity of rural landscape patterns

Impact Description	
Project Life Cycle Stage:	Operational stage

Impact Source: Presence of above ground structures, permanent alterations to landform/ vegetation patterns
Cumulative Impact Source: Presence of above ground structures, permanent alterations to landform/ vegetation patterns
Impact Pathway: visibility

Impact Description: There will be an increase in the amount of above-ground built development within the rural landscape of the study area once construction of the Whole UWF Project is complete. There will also be very minor permanent/ long-term changes to land cover and vegetation patterns. These structures / above ground expressions of the Whole UWF Project will add to the intensity of development and alteration of existing landscape patterns within a rural area where low levels of built development currently occur and there is a strong degree of uniformity and integrity of typical rural landscape features and patterns.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Intensification of built development and reduction in the integrity of rural landscape patterns

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The above ground structures associated with the UWF Grid Connection are limited to the Mountphilips Substation. This new substation will have a minor, but permanent impact on the rural landscape fabric of its site and immediate surrounds. However, it is not readily visible from surrounding roads and residences, which limits the perceived impacts on landscape character. At the Mountphilips Substation site 1.75ha of grassland will change land cover to: stone access road (0.25ha), permanent berms (0.5ha) and substation compound/end mast footprint (1.0ha). In addition, at the entrance, a length of hedgerow will change landcover to public road verge, while some narrow strips of grassland along the new access road and at the Mountphilips Substation site entrance will change cover to newly planted hedgerow, however these uses are a typical type of rural landscape feature that will have an imperceptible effect on landscape character. Overall the impact of the Mountphilips Substation and ancillary works at the Mountphilips Substation site is considered to have a Low-negligible magnitude of impact.
The 110kV UGC will be underground, and entirely located under paved roads (outside of the Mountphilips Substation site) with surface expression in the form of periodic joint bay covers, which will not be noticeable in the context of the location of joint bays within road structures.

Significance of the Impact: Slight to Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the Low negligible magnitude combined with the medium to high sensitivity of LCA-12 and the medium sensitivity of LCA-17 and LCA-18
- compliance with the 'control' of unavoidable new development objective for LCA-12 and the 'wise use and best choice' objective to maintain and enhance established patterns for LCA-17 and LCA-18
- The visual containment of Mountphilips substation,
- the barely discernable permanent surface expression of the 110kV UGC.

Landscape Character

Sensitive Aspect

Element 1: UWF Grid Connection – cumulative impact
Cumulative Impact Magnitude: Above ground structures for UWF Grid Connection relate to the Mountphilips Substation which will be built in Mountphilips townland near Newport on the western side of the Slievefelim to Silvermines Mountain Upland area. Above ground structures for the Other Elements of the Whole UWF Project (i.e. the Consented UWF Turbines and Consented UWF Substation for Upperchurch Windfarm, Telecom Relay Pole for UWF Related Works, and new woodland for UWF Replacement Forestry) along with landcover changes associated with these projects will occur in the Upperchurch area on the eastern side of the upland area. The Mountphilips Substation element of the UWF Grid Connection is also not located close to any Other Projects or Activities (Foilnaman Mast, Milestone Windfarm or Cummermore Communications Pole). Therefore there is no potential for the UWF Grid Connection to cause cumulatively impacts to Landscape Character with either Other Elements of the Whole UWF Project or with Other Projects or Activities.
Significance of the Cumulative Impact: No Cumulative Impact
Rationale for Cumulative Impact Evaluation: • Separation distance, and absence of inter-visibility, between built structures and landcover changes associated with UWF Grid Connection and the Other Elements or Other Projects.
Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project
Element 2: UWF Related Works
Impact Magnitude: Absence of surface expression and land cover changes following reinstatement of construction works relating to the Internal Windfarm Cabling and Haul Route Works areas. Some land cover changes (0.22ha) from forestry or agricultural grassland to Realigned Windfarm Roads. The Telecoms Relay Pole is a modest and typical rural feature, structurally similar to single wooden electricity poles and will have a Neutral effect on landscape character.
Significance of the Impact: Imperceptible
Rationale for Impact Evaluation: • As per Table 17-7, the negligible magnitude combined with the medium sensitivity of LCA-17 • compliance with the 'wise use and best choice' objective to maintain and enhance established patterns for LCA-17 • The barely discernable above ground expression and permanent changes to land cover resulting from the UWF Related Works.
Element 3: UWF Replacement Forestry
Impact Magnitude: 6ha of land cover change from one of the main characteristic land cover patterns contained within this upland rural area (agricultural grassland) to another (forestry).
Significance of the Impact: Neutral
Rationale for Impact Evaluation: • The exchange of a small section of one characteristic form of land cover in this upland rural area to another
Element 4: Consented Upperchurch Windfarm
Impact Magnitude:

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As per the ABP Inspectors Report (2014, Section 9.2 Reference Documents – Volume F10), "In overall terms the principle of locating windfarm development in the area which is the subject of this appeal is reasonable". The LVIA for the Upperchurch Windfarm, which was considered by the inspector, found the impact on landscape character to be of a Low magnitude. The overall significance of landscape impact was deemed to be 'Low negligible' - equivalent of 'Slight-imperceptible' in respect of terminology used herein.

Significance of the Impact: Slight to Imperceptible

Rationale for Impact Evaluation:

- The rationale provided in the Upperchurch Windfarm LVIA and ABP Inspectors Report (2014, Section 9.5.5 Reference Documents – Volume F10) "the undulating and rolling nature of the landscape coupled with the diverse vegetation does provide for a level of absorption capacity for the nature and scale of the proposed development. Therefore accepting that the development will impact visually on the area it will not be to a significant degree, I consider, to adversely impact on the area"

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 17.2.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Milestone Windfarm

Impact Magnitude:
Milestone Windfarm is an operational 4-turbine windfarm which comprises two planning permissions, the first for 5 turbines (of which 3 were constructed) at Knockcurraghbola Commons, Knockcurraghbola Crownlands, Graniera and Shevry, and the second for 2 turbines (of which 1 was granted planning permission and constructed) in Knockduff and Inchivara. The locality of the Milestone Windfarm was assessed by the planning authority to have a 'Medium' impact

Significance of the Impact: Not Significant

Rationale for Impact Evaluation: The rationale provided in the Milestone Windfarm Planners Report (Tipperary County Council Ref: 12510385, 28th November 2013) – '*I consider furthermore that the visual impact in the context of the local and regional topography is acceptable', and*

- The rationale provided in the Inchivara Windfarm ABP Inspectors report (ABP Ref: PL92.243611, page 19) – "I would consider that having regard to the permitted wind farms and the landscape designations applicable to the site that the proposed two turbines would not adversely impact on the visual amenities or the landscape character of the area. I would also consider that the proposed development would not adversely impact on the established residential amenities in the area from a visual perspective".

Other Project: Foilnaman Mast

Impact Magnitude:
The existing Foilnaman Mast is very small scale and a typical structure that does not noticeably detract from the integrity of landscape character in its own right. Thus, the magnitude of the cumulative impact is deemed to be negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the Negligible magnitude of cumulative effect combined with the medium to high sensitivity of LCA-12 and the medium sensitivity of LCA-17 and LCA-18

Other Project: Cummermore Communications Pole

Impact Magnitude:
The Cummermore Communications Pole is very small scale and will not not noticeably detract from the integrity of landscape character in their own right. Thus, the magnitude of the cumulative impact is deemed to be negligible.

Landscape Character

Sensitive Aspect

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the Negligible magnitude of cumulative effect combined with the medium to high sensitivity of LCA-12 and the medium sensitivity of LCA-17 and LCA-18

Evaluation of Other Cumulative Impacts – Intensification of built development and reduction in the integrity of rural landscape patterns

Whole UWF Project Effect

Cumulative Impact Magnitude:
Above ground structures will be built in Mountphilips townland (UWF Grid Connection) near Newport on the western side of the Slievefelim to Silvermines Mountain Upland area, and in the Upperchurch area (UWF Related Works, UWF Replacement Forestry and Upperchurch Windfarm) on the eastern side of the upland area.

The Mountphilips Substation will not be visible with the Telecoms Relay Pole, the UWF Replacement Forestry or the Upperchurch Windfarm elements.

Any cumulative impacts only relate to the inter-visibility of the Telecoms Relay Pole and the UWF Replacement Forestry and the Upperchurch Windfarm. It is considered that due to the common and typical nature of the UWF Replacement Forestry and the similarity to common single wooden electricity poles in the area, that neither the UWF Replacement Forestry nor the Telecoms Relay Pole will contribute to cumulative landscape character effects with the Upperchurch Windfarm, as these elements (Telecoms Relay Pole and UWF Replacement Forestry) are unlikely to be noticeable when viewed in combination with the turbines and met masts. Thus, the magnitude of the cumulative impact is deemed to be negligible.

A 'Medium' (moderate) cumulative impact was previously assessed in the 2013 RFI for Upperchurch Windfarm, and ABP considered the impacts not to be significantly adverse.

Significance of the Cumulative Impact: Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 17-7, the Negligible magnitude of cumulative effect combined with the medium to high sensitivity of LCA-12 and the medium sensitivity of LCA-17 and LCA-18
- Very minor, albeit long term / permanent, imperceptible impacts of the UWF Grid Connection and UWF Related Works, such that they will not cumulatively cause noticeable impacts with the Upperchurch Windfarm.

All Elements of the Whole UWF Project with Other Projects or Activities

Cumulative Impact Magnitude:
The Mountphilips Substation element of the UWF Grid Connection is not located close to any of the Other Projects or Activities, therefore there is no potential for the UWF Grid Connection to cause cumulative impacts to Landscape Character with Other Projects or Activities.

The Telecom Relay Pole aspect of the UWF Related Works will contribute in a barely perceptible way to the intensity of built development (structures) in combination with Milestone Windfarm and the Foilnaman Mast or Cummermore Communications Pole.

A 'Medium' (moderate) cumulative impact was previously assessed in the 2013 RFI for Upperchurch Windfarm, in respect of the Consented Upperchurch Windfarm and Milestone Windfarm and ABP considered the same cumulative impacts not to be significantly adverse.

Significance of the Cumulative Impact: Not Significant

Rationale for Cumulative Impact Evaluation:

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- The very minor and localised contribution to cumulative impact arising from the Telecom Relay Pole in conjunction with Milestone Windfarm (and the Upperchurch Windfarm), which will be long-term and reversible.
- The rationale provided in the Upperchurch Windfarm LVIA and 2014 ABP Inspectors Report (Section 9.5.5 Reference Documents – Volume F10) "I also consider that, cumulatively when considered with existing and permitted wind energy developments the development will change the visual character of the area, but in overall terms it will not be to a significant degree as to be considered to adversely impact on the area."

Note: No cumulative evaluation of Other Projects or Activities (Forestry and Agricultural Activities) is included in the table above, because these Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 17.2.2.2.1).

17.2.4.4 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 17-13 below.

Table 17-13: Description and Rationale for Excluded Impacts to Landscape Character

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway(s)	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Operational Stage				
Operational Activities	1, 2, 3, 4	Visibility	Intensification of activity causing a reduction in rural tranquillity	Rationale for Excluding: Maintenance activities will range from annual testing of the UWF Grid Connection (with some very infrequent works at Joint Bays), to twice yearly maintenance on the UWF Replacement Forestry lands, to monthly inspection of UWF Related Works, to weekly maintenance of the Upperchurch Windfarm. All of these activities will take place from hard-core areas, with the vast majority of activity taking place on the turbine hardstands. Therefore, operational activities will have a Neutral effect on landscape character.
Decommissioning Stage				
Rationale for Excluding: No potential for impacts/ Neutral effects due to: Neither the UWF Grid Connection nor the UWF Replacement Forestry will be decommissioned/harvested. In relation to the UWF Related Works and Upperchurch Windfarm, decommissioning works will involve very minor temporary works resulting in no change or improved landscape condition and visual amenity due to the removal of structures and windfarm associated development. This will not result in negative impacts on landscape character.				

17.2.5 Mitigation Measures for Impacts to Landscape Character

Mitigation measures were incorporated into the UWF Grid Connection project design including the Project Design Measures. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Landscape Character**.

17.2.6 Evaluation of Residual Impacts to Landscape Character

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Landscape Character above (Section 17.2.4) – i.e. **no significant adverse impacts**.

17.2.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

17.2.8 Summary of Impacts to Landscape Character

A summary of the Impact to Landscape Character is presented in Table 17-14.

Table 17-14: Summary of the impacts to Landscape Character

Impact to Landscape Character:	**Alteration or division of land cover and vegetation patterns**	**Intensification of activity causing a reduction in rural tranquillity**	**Intensification of built development and reduction in the integrity of rural landscape patterns**
Evaluation Impact Table	*Section 17.2.4.1*	*Section 17.2.4.2*	*Section 17.2.4.3*
Project Life-Cycle Stage	*Construction*	*Construction*	*Operation*
UWF Grid Connection Impact *Direct/indirect impact*	**Imperceptible**	**Slight to Imperceptible**	**Slight to Imperceptible**
UWF Grid Connection Impact *Cumulative impact*	**No Cumulative Impact**	**Imperceptible**	**No Cumulative Impact**
Element 2: UWF Related Works	Imperceptible	Imperceptible	Imperceptible
Element 3: UWF Replacement Forestry	Imperceptible	Imperceptible	Neutral
Element 4: Upperchurch Windfarm	Slight to Imperceptible	Slight to Imperceptible	Slight to Imperceptible
Element 5: UWF Other Activities	Neutral Impacts/No Impacts - Evaluated as Excluded, see Section 17.2.2.2.1		
Cumulative Impact:			
All Elements of the Whole UWF Project	Slight	Imperceptible	Imperceptible
All Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities Milestone Windfarm Foilnaman Mast Cummermore Communications Pole Forestry activities Agricultural activities	Slight to Imperceptible	Slight	Not Significant

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

17.3 Sensitive Aspect No.2: Visual Amenity

This Section provides a description and evaluation of the Sensitive Aspect - Visual Amenity.

The visual amenity of a range of population-based receptor types, which are located within the UWF Grid Connection Study Area and/or within the Cumulative Evaluation Study Area and are relevant to this appraisal include; designated scenic views; local community views; and views from centres of population; major routes; heritage and amenity features.

17.3.1 BASELINE CHARACTERISTICS of Visual Amenity

17.3.1.1 STUDY AREA for Visual Amenity

The study area for Visual Amenity in relation to the UWF Grid Connection is described in Table 17-15 and illustrated on Figure GC 17.3: UWF Grid Connection Study Area for Visual Amenity (Volume C3 EIAR Figures).

Table 17-15: UWF Grid Connection Study Area for Visual Amenity

Study Area for Visual Amenity	Justification for the Study Area Extents
500m corridor from construction works areas 2km radius from the Mountphilips Substation	Distances outside of which, each aspect of the development could not materially affect prevailing visual amenity

17.3.1.2 Baseline Context and Character of Visual Amenity in the UWF Grid Connection Study Area

There are two designated scenic routes which also coincide with the only two major routes in the area; these are identified in Appendix 4 of the North Tipperary County Development Plan as; **V12** – 'Views north and south on sections of the R503 from Newport to Ballycahill, and; **V13** – 'Views east and west of the R497 from the R503 through the mountains to Dolla - including Mother Mountain to the West, Knockacreggan to the East, Coneen Hill to the East and the Silvermines to the west'.

The 110kV UGC will be located along the V12 scenic route for 22.1km, on the R503 between Derryleigh and the L2264-50 junction in Knockmaroe. The proposed development is not located on the R497.

Local community views include views from local residences which are located along public roads throughout the study area. Settlements relevant to the UWF Grid Connection includes the villages of Rear Cross and the town of Newport, while the main, amenity and heritage assets within the UWF Grid Connection study area are way-marked walking and cycle trails- the Slieve Felim Way and the Ormond Way cycle route. These routes are delineated on Figure GC 17-3.

Views from all visual receptor types take in typical upland rural scenes of undulating farmland and forestry and occasional peaks of higher mountains passing through the Silvermines range. Views from upper slopes and ridges such as those afforded from walking tracks can be extensive, but most other receptors in the base of valleys (roads and settlements) are afforded more enclosed views. Views of the gently rolling lowland landscape of fields and hedgerows at the western end of the UWF Grid Connection Study Area are only relevant to local community receptors. These views have a something of a traditional 'pastoral' aesthetic and tend to be relatively contained by landform and vegetation.

Contextual photographs illustrating the physical land cover of the receiving environment and Zone of Theoretical Visibility mapping are presented in Appendix 17.1: Contextual Photographs and Theoretical Visibility within the Study Areas in **Volume C4 EIAR Appendices**.

17.3.1.3 Importance of Visual Amenity

The value of the views on offer from all of these receptor types relates to the pleasant rural setting with strong landscape integrity rather than a strong sense of the naturalistic or the provision of vast, panoramas. Rural visual amenity is an integral and important aspect of the lifestyle of the local community who live and work in areas such as this. This visual amenity also extends to the greater number of major route users that pass through the Slievefelim to Silvermine Mountains upland area on regional roads, which are also designated scenic routes in this instance. The various walking trails within this upland area provide a recreational amenity for local residents as well as a tourism amenity for visitors to the area.

17.3.1.4 Sensitivity of Visual Amenity

The key visual amenity sensitivity for the relevant receptors is the permanent obstruction (blocking) of open views and/or permanent visual change in the form of new or unfamiliar landscape elements that detract from scenic and rural amenity. All of the relevant receptor types are identified in the first column of Table 17.5 as being amongst the 'most susceptible' to visual change. However, in accordance with GLVIA 2013 'susceptibility' must be balanced against the 'value' of the views on offer in order to determine overall sensitivity and in this case visual amenity relates to fairly typical upland and lowland rural views. On balance, visual sensitivity is considered to be **Medium**.

17.3.1.5 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

In recent years, the key contributor to visual change is the emergence of wind energy developments on upper slopes and ridges within the south and southeast of the Slievefelim to Silvermine Mountain upland area, which can be seen intermittently in the distance from all of these receptor types.

With the construction of nearer currently permitted wind farms including Milestone (constructed) Upperchurch, and *potentially* Bunkimalta wind energy development is likely to be more prominent and more frequent within views.

First rotation forestry compartments are also beginning to be harvested resulting in temporary visual impacts from harvesting operations and short to medium term loss of forest vegetation.

17.3.1.6 Receiving Environment (the Baseline + Trends)

The identified trends are occurring gradually and in a predictable and consistent manner, so it is assumed in this report that the receiving landscape is the same as the baseline environment identified above.

17.3.2 CUMULATIVE INFORMATION - Cumulative Projects & Baseline Characteristics

17.3.2.1 Cumulative Evaluation Study Areas

17.3.2.1.1 UWF Grid Connection Cumulative Evaluation Study Area

The UWF Grid Connection was evaluated for cumulative effects with other projects and the study area is set out in the table below.

UWF Grid Connection Cumulative Evaluation Study Area for Landscape Character	Justification for the Study Area Extents
1km corridor from construction works areas 4km radius from the Mountphilips Substation	Doubling the distance for cumulative study areas, identifies those parts of the Other Elements or Other Projects or Activities with potential to cause cumulative impacts with UWF Grid Connection. At distances greater than 1km and 4km from the development, visual amenity will not be materially affected. This is due to the increased likelihood of screening by intervening landform and vegetation or the combined ameliorating factors of diminishing 'scale in relation to distance' and 'visual absorption' into the overall landscape setting.

The study is illustrated on Figure CE 17.3: UWF Grid Connection Cumulative Evaluation Study Area for Visual Amenity.

17.3.2.1.2 Whole Project Cumulative Evaluation Study Area

UWF Grid Connection is part of a whole project which comprises the following Other Elements; Element 2: UWF Related Works, Element 3: UWF Replacement Forestry, Element 4: Upperchurch Windfarm (UWF), and Element 5: UWF Other Activities. The Subject Development, UWF Grid Connection is Element 1. All five elements are collectively referred to as the Whole UWF Project in this EIA Report.

The Other Elements must be considered because UWF Grid Connection is part of a whole project. Therefore, the cumulative information and evaluations for the Other Elements of the Whole UWF Project are included in order to present the totality of the project.

A description of these Other Elements is included in this EIA Report at Appendices 5.3, 5.4, 5.5 and 5.6**,** in Volume C4 EIAR Appendices**.** Scoping of these Other Elements is presented in Section 17.2.2.2.1 below.

The Whole Project Cumulative Evaluation Study Area comprises of the UWF Grid Connection Study Area along with the study areas for Other Elements and Other Projects or Activities which are described in Table 17-16 and illustrated on Figure WP 17.3: Whole Project Study Area for Visual Amenity (Volume C3 EIAR Figures).

Table 17-16: Whole Project Cumulative Evaluation Study Area for Visual Amenity

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
Element 2: UWF Related Works	500m corridor from works areas and activity locations, 1km to identify any Other Projects or Activities 2km radius from above ground level structures, 4km to identify any Other Projects or Activities	Distances outside of which, the Mountphilips Substation, Telecoms Relay Pole, UWF Replacement Forestry could not have a material cumulative effect on prevailing landscape character or visual amenity – i.e. any effects beyond 2km from the aforementioned elements will be Neutral. Any cumulative landscape character and visual amenity impacts beyond these study areas will
Element 3: UWF Replacement Forestry		
Element 4: Upperchurch Windfarm (UWF)		
Element 5:		

Cumulative Project	Cumulative Study Area Boundary	Justification for Study Area Extent
UWF Other Activities		only relate to the presence of cumulative turbines in views containing the Consented UWF Turbines, the cumulative impacts of which have previously been assessed as acceptable by An Bord Pleanála.

17.3.2.2 Scoping for Other Projects or Activities & Potential for Impacts

The evaluation of cumulative impacts to Visual Amenity also considered Other Projects or Activities. A scoping exercise was carried out to determine which projects or activities, if any, have potential to cause cumulative effects to Visual Amenity with either the UWF Grid Connection or the Other Elements of the Whole UWF Project and therefore should be brought forward for evaluation in this topic chapter. A brief overview of the Other Projects or Activities and the scoping exercise by the topic authors is included in Appendix 2.1: Scoping of Other Projects or Activities for the Cumulative Evaluations (Section A2.1.4.36).

The results of this scoping exercise are that: Milestone Windfarm, Foilnaman Mast, Cummermore Communications Pole and the activities of Forestry and Agriculture have been scoped in for evaluation of cumulative effects to Visual Amenity.

17.3.2.2.1 Potential for Other Elements or Other Projects to cause Impacts to Visual Amenity

An evaluation was carried out by the topic authors of the likelihood for the Other Elements of the Whole UWF Project and for the Other Projects or Activities to cause cumulative effects to the Sensitive Aspect Visual Amenity. The results of this evaluation are included in Table 17-17.

The location of, and study area boundary associated with, the Other Elements and Other Projects or Activities which are included for cumulative evaluation is illustrated on Figure WP 17.3.

Table 17-17: Results of the Evaluation of the Other Elements and Other Projects or Activities

Other Elements of the Whole UWF Project	
Element 2: UWF Related Works	Included for the evaluation of cumulative effects
Element 3: UWF Replacement Forestry	Included for the evaluation of cumulative effects
Element 4: Upperchurch Windfarm (UWF)	Included for the evaluation of cumulative effects
Element 5: UWF Other Activities	Evaluated as excluded: Neutral effects/No Effects due to: • Upperchurch Hen Harrier Scheme: Once off activities will take place during the construction stage, and comprise planting and fencing at hedgerows, watercourse boundaries and areas of scrub. These activities will not generate any adverse effects to visual amenity. • Haul Route Activities: It is considered that there will be Neutral effects to visual amenity, as there will be no disturbance of land cover, and any tree trimming will be in the context of road boundary tree trimming that regularly takes place along the public road network, and the presence of any machinery in the context of busy regional and national roads. • Overhead Line Activities do not require any works to land and any brief visibility of such minor works will have no effect on visual amenity.

	• Monitoring Activities do not require any works to land, no effects to visual amenity are expected from brief periods of very minor activity.
Other Projects or Activities	
Milestone Windfarm Foilnaman Mast Cummermore Communications Pole	Yes, included for the evaluation of cumulative operational stage effects, Excluded from evaluation in relation to cumulative construction stage effects as the Milestone Windfarm, Foilnaman Mast and Cummermore Communications Pole already exist and are considered part of the baseline.
Forestry activities in the surrounding area	Yes, included for the evaluation of cumulative construction stage effects, Excluded from evaluation in relation to cumulative operational stage effects as these activities are the prevailing and characteristic land uses in this area, i.e. they are the baseline rather than other sources of impact.

17.3.2.3 Cumulative Information: Baseline Characteristics – Context & Character

The visual amenity of a range of population-based receptor types, which are located within the within the Cumulative Evaluation Study Area and are relevant to this appraisal include; designated scenic views; local community views; and views from centres of population; major routes; heritage and amenity features.

Views from all visual receptor types take in typical upland rural scenes of undulating farmland and forestry and occasional peaks of higher mountains passing through the Silvermines range. Views from upper slopes and ridges such as those afforded from walking tracks can be extensive, but most other receptors in the base of valleys (roads and settlements) are afforded more enclosed views. Views of the gently rolling lowland landscape of fields and hedgerows at the western end of the Cumulative Evaluation Study Area are only relevant to local community receptors. These views have a something of a traditional 'pastoral' aesthetic and tend to be relatively contained by landform and vegetation.

17.3.2.3.1 Element 2: UWF Related Works

Visual amenity receptors within the study area for the UWF Related Works includes the two designated scenic routes; V12 and V13; the R503 and R497 regional roads, views from local residences which are located along public roads, and views from the settlement of Upperchurch village, while the main amenity and heritage assets are way-marked walking trails – the Ormond Way walking route, the Ormond Way cycle route and the Eamonn a Chnoic Loop. These routes are delineated on Figure WP 17.3.

17.3.2.3.2 Element 3: UWF Replacement Forestry

Visual amenity receptors within the study area for the UWF Replacement Forestry includes local residences which are located along public roads, and views from the Ormond Way cycle route The UWF Replacement Forestry will not be visible from designated scenic routes, major routes or from settlements..

17.3.2.3.3 Element 4: Already Consented Upperchurch Windfarm

The UWF Related Works and UWF Replacement Forestry are located in the near vicinity of the Upperchurch Windfarm, and many of the visual amenity receptors identified above for these Elements will view the UWF Related Works and the UWF Replacement Forestry in conjunction with the already consented Upperchurch Windfarm.

Consideration of the Passage of Time: With the exception of the Milestone Windfarm, which is now operational, there has been no material change in visual amenity in the Upperchurch Windfarm area. It should be noted that Milestone Windfarm was considered cumulatively in the 2013/2014 planning assessments, and therefore the descriptions in the 2013 and 2014 documents remain relevant to the cumulative evaluations in this 2019 EIAR for UWF Grid Connection.

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17.3.2.3.4 Element 5: UWF Other Activities

Not applicable – Element evaluated as excluded. See Section 17.3.2.2.1

17.3.2.3.5 Other Projects or Activities

The existing Milestone Windfarm, comprises 4 turbines, and is located on lands adjacent to the Upperchurch Windfarm, and across a valley from the Telecom Relay Pole.

The existing Foilnaman Mast is located on the same hill as the Telecom Relay Pole (UWF Related Works).

The existing Cummermore Communications Pole is located c.2km to the southwest of the Upperchurch Windfarm.

Forestry activity in the surrounding area, may include forestry harvesting operations from time to time, these activities occur frequently in the Slievefelim to Silvermines Mountains upland area resulting in familiar cutover forestry compartments with associated track widening and processing pads. Forest growth is also typical of these LCAs, with forest plots at various stages of growth located throughout the study area.

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17.3.3 PROJECT DESIGN MEASURES for Visual Amenity

At the conception of the UWF Grid Connection, the design team evaluated the potential for significant impacts to the environment. Impacts will only take place where three components exist together; (1) the source of the impact (project), (2) the receptor of the impact (sensitive aspect) and (3) a pathway between the source and the sensitive aspect. The objective of mitigation measures is to avoid, prevent or reduce, one of the three components of an impact by choosing an alternative location, alternative design or an alternative process.

Potential or likely significant impacts were avoided, prevented or reduced by integrating mitigation measures into the fundamental design of the development – these are the Project Design Environmental Protection Measures, which are shortened to 'Project Design Measures' in this EIA Report.

The development as evaluated in the EIA Report incorporates the Project Design Measures.

The Project Design Measures outlined in Table 17-18 are relevant to the Environmental Factor, Landscape, and in particular to the sensitive aspect **Visual Amenity**.

Table 17-18: UWF Grid Connection Project Design Measures relevant to Visual Amenity

PD ID	**Project Design Environmental Protection Measure (PD)**
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).

Cumulative Information: Potential or likely significant impacts caused by the Other Elements of the Whole UWF Project were avoided, prevented or reduced by incorporating Project Design Measures into the design of the UWF Related Works, UWF Replacement Forestry and into the consented design of the Upperchurch Windfarm. These Project Design Measures are included in the description of these Elements, and can be found in this EIA Report in Appendices 5.3, 5.4 and 5.5, in Volume C4: EIAR Appendices.

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17.3.4 EVALUATION OF IMPACTS to Visual Amenity

In this Section, the likely direct and indirect effects of the UWF Grid Connection are identified and evaluated. Then the likely cumulative effects of the UWF Grid Connection together with the Other Elements of the Whole UWF Project and Other Projects or Activities are identified and evaluated.

A conceptual site model exercise was carried out to facilitate the identification of source-pathway-receptor links between the project (source) and the sensitive aspect (receptor) - Visual Amenity.

As a result of the exercise, some impacts were included and some were excluded.

Table 17-19: List of all Impacts included and excluded from the Impact Evaluation Table sections

Impacts Included (Evaluated in the Impact Evaluation Table sections)	***Impacts Excluded*** *(Justification at the end of the Impact Evaluation Table sections)*
Intensification of activity causing visual disharmony, clutter or complexity (construction stage)	*Intensification of activity causing visual disharmony, clutter or complexity (operational stage)*
Addition of new features or loss of existing features causing visual disharmony, clutter or complexity (operational stage)	*Decommissioning Effects*

The source-pathway-receptor links for included impacts are described in the Impact Evaluation Tables, which are presented in the following **Sections 17.3.4.1 to 17.3.4.2.**

The source-pathway-receptor links and the rationale for excluded impacts are described in the section directly after the Impact Evaluation Tables, in Section 17.3.4.3.

Relevant Figures and Appendices

A photomontage of the view from Coole townland of Mountphilips Substation when built is illustrated on Figure GC 17.4: Visibility of Mountphilips Substation at VP1 on the L2166-10 in Coole townland in **Volume C3 EIAR Figures**

Contextual photographs illustrating the physical land cover of the receiving environment and Zone of Theoretical Visibility mapping are presented in Appendix 17.1: Contextual Photographs and Theoretical Visibility within the Study Areas in **Volume C4 EIAR Appendices.**

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17.3.4.1 Impact Evaluation Table: Intensification of activity causing visual disharmony, clutter or complexity

Impact Description	
Project Life Cycle Stage:	Construction Stage

Impact Source: Construction related activities
Cumulative Impact Source: Construction related activities, forestry harvesting in the surrounding area
Impact Pathway: Visibility

Impact Description: Construction activity will include the near constant movement, during daylight hours, of machinery, vehicles and people to and from both linear and fixed working areas and, to a lesser effect, to and from construction compounds. Temporary fencing and welfare facilities will be erected and there will be temporary stockpiling of excavated materials and construction materials. This intensity of construction activity is not a typical component of views in this upland rural area.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Intensification of activity causing visual disharmony, clutter or complexity

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The greatest intensity and duration of construction related activity for the UWF Grid Connection will occur within and around the Mountphilips Substation site. The Mountphilips substation site is well contained by existing terrain and vegetation, which will restrict the extent to which construction activity can affect visual amenity. The Mountphilips Substation works and new access road/entrance works will be partially visible from a handful of local residences and will not be visible from any other sensitive visual receptors.

At the remaining UWF Grid Connection works (outside of the Mountphilips Substation site), where the 110kV UGC will be constructed within the public road network and along a short length of private paved road, terminating at the future (already consented) substation compound for Upperchurch Windfarm, construction activity will be largely transient in nature (moving through the landscape) with work areas coming into use and then becoming redundant. While some sections of these works areas will be more visually exposed, than the new substation, the intensity and duration of the works will be much lower. The remaining UWF Grid Connection works be intermittently visible from a number of receptors, mainly local community views from local residences that are located along the local public road network, and from the designated scenic routes comprising the Regional Roads the V12 scenic route between Derryleigh and Knockmaroe. Walkers on the Slievefelim Way could encounter works where the walk crosses the R503 at Rearcross, while the Ormond Way cycle route crosses the 110kV UGC at one point in the Knockcurraghbola area.

Due to the degree of visual containment of the Mountphilips Substation site and the temporary duration of construction activities along the public road network, it is considered that any visual disharmony, clutter or complexity caused by the construction works associated with the UWF Grid Connection will have a Low negligible impact magnitude.

Significance of the Impact: Slight to Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the Low negligible magnitude combined with the Medium sensitivity of visual receptors within the study area
- visual containment of Mountphilips Substation works transient nature of the 110kV UGC trenching works
- The temporary duration of construction activities and
- the reversibility of effects once construction works are completed, and road reinstatement/land reinstatement works are complete.

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Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude: Cumulative effects of UWF Grid Connection with UWF Related Works and Upperchurch Windfarm may occur in the Knockmaroe, Knockcurraghbola Commons, Knockcurraghbola Crownlands area where Haul Route Works and Internal Windfarm Cabling works and Upperchurch Windfarm works are located close to UWF Grid Connection 110kV UGC works. However, the construction activity for these elements will not occur at the same time. Although this deliberate sequencing of construction works will result in a slightly longer construction period, the intensity of activity will be much less than if each of these elements was constructed at the same time. There may be very minor cumulative effects from construction activities, where emerging turbines from the Upperchurch Windfarm are also visible in the distance in conjunction with more localised construction activity for UWF Grid Connection. Overall, the magnitude of impact is deemed to be **low-negligible**.

Forestry harvesting in the surrounding area could also increase HGV traffic along local and regional roads, which along with UWF Grid Connection HGV traffic and roadworks is likely to have a Low-negligible in-combination effect to visual amenity due to the increased frequency and intensity of HGV traffic within this relatively tranquil rural area.

Significance of the Cumulative Impact: Slight imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 17-7, the Low-negligible magnitude combined with the medium to high sensitivity of scenic route V12 along the R503 regional road within which the works will take place.
- The absence of any felling required for UWF Grid Connection, and the location of the 110kV UGC within public road pavements with road works a common occurrence on Irish roads

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude:
Construction activities will involve single 3-4 man crews working linearly at Internal Windfarm Cabling, Realigned Windfarm Roads and Haul Route Works locations and at the Telecoms Relay Pole site. Works will be minimal and will not be noticeable in the context of the windfarm construction works which will be carried out at the same time. Parts of the UWF Related Works will be visible from the V12 designated scenic route which is routed on the Regional Road R503, a small number of local residences and from sections of the Eamonn a Chnoic (4.2km within 500m), Ormond Way walking trail (5.4km within 500m) and the Ormond Cycle route (4.5km within 500m). It is considered that the magnitude of visual clutter, disharmony and complexity will be **negligible** due to the small scale and somewhat transient nature of the construction activities within a relatively broad site area that will disperse the intensity of construction activity, even if it is all occurring at once.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the **negligible** magnitude combined with the **medium sensitivity** of visual receptors within the study area
- The very small scale, transient and dispersed nature of construction activity for these project elements.
- The temporary duration of construction activities and
- the reversibility of effects once temporary construction areas are cleared and restored.

Element 3: UWF Replacement Forestry

Impact Magnitude: Very low intensity planting activities involving the delivery and temporary storage of seedlings prior to hand planting by a small team of workers over a short time period will cause negligible visual disharmony, clutter or complexity.

Significance of the Impact: Imperceptible

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Rationale for Impact Evaluation:

- As per Table 17-7, the negligible magnitude combined with the medium sensitivity of visual receptors within the study area
- The very small extent and intensity of planting activities that will not conflict with typical rural activities in this landscape, which include forest planting
- The temporary duration (1 month) of planting activities

Element 4: Consented Upperchurch Windfarm

Impact Magnitude:
The Upperchurch Wind Farm LVIA (2013) evaluated visual impact magnitude at 21 no. viewpoints and this ranged between high and low depending on proximity and visual exposure. In reviewing this LVIA as part of his own assessment, the ABP Inspector concluded (2014 report, Section 9.5.5 Reference Documents – Volume F10) *"the undulating and rolling nature of the landscape coupled with the diverse vegetation does provide for a level of absorption capacity for the nature and scale of the proposed development. Therefore accepting that the development will impact visually on the area it will not be to a significant degree, I consider, to adversely impact on the area*".

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The rationale provided in the ABP Inspectors Report (2014, Section 9.5.5 Reference Documents – Volume F10) – reproduced in Impact Magnitude box above)
- The temporary / short term duration of construction related activities

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 17.3.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Milestone Windfarm

Impact Magnitude:
Milestone Windfarm is an operational 4-turbine windfarm which comprises two planning permissions, the first for 5 turbines (of which 3 were constructed) at Knockcurraghbola Commons, Knockcurraghbola Crownlands, Graniera and Shevry, and the second for 2 turbines (of which 1 was granted planning permission and constructed) in Knockduff and Inchivara. The locality of the Milestone Windfarm was assessed by the planning authority to have a 'Medium' sensitivity.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The rationale provided in the Milestone Windfarm Planners Report (Tipperary County Council Ref: 12510385, 28th November 2013) – '*I consider furthermore that the visual impact in the context of the local and regional topography is acceptable'*
- The rationale provided in the Inchivara Windfarm ABP Inspectors report (ABP Ref: PL92.243611, page 19) – "I would consider that having regard to the permitted wind farms and the landscape designations applicable to the site that the proposed two turbines would not adversely impact on the visual amenities or the landscape character of the area. I would also consider that the proposed development would not adversely impact on the established residential amenities in the area from a visual perspective".

Other Project: Forestry Activities in the Surrounding Area

Impact Magnitude:
Forestry is one of the prevailing land uses in the area. Forest harvesting operations are periodic, of a modest scale and are a typical activity of the Slievefelim to Silvermines Mountains upland area. Forestry harvesting operations, in the surrounding area, also consist of periodic frequent movement of HGV logging trucks along local and regional roads.

Significance of the Impact: No impact

Visual Amenity

Sensitive Aspect

Rationale for Impact Evaluation:

- Forestry is one of the prevailing and characteristic land uses in this area (i.e. part of the baseline rather than a source of impact)

Evaluation of Other Cumulative Impacts – Intensification of activity causing visual disharmony, clutter or complexity

Whole UWF Project Effect

Cumulative Impact Magnitude:

UWF Grid Connection, UWF Related Works, UWF Replacement Forestry and Upperchurch Windfarm works areas will occur across a wide (c.30 km) area, with construction of UWF Grid Connection, UWF Related Works and Upperchurch Windfarm overlapping in the Knocknabansha, Knockmaroe and Knockcurraghbola areas. However, the construction activity for these elements will not occur at the same time. Although this deliberate sequencing of construction works will result in a slightly longer construction period, the intensity of activity will be much less than if each of these elements was constructed at the same time.

There may be very minor cumulative effects from construction activities relating to other discrete aspects of the UWF Grid Connection and to the UWF Replacement Forestry where emerging turbines from the Upperchurch Windfarm are also visible in the distance in conjunction with more localised construction activity and planting works. Overall, the magnitude of impact is deemed to be **low-negligible**.

Significance of the Cumulative Impact: Slight to Imperceptible

Rationale for Cumulative Impact Evaluation:

- As per Table 17-7, the low negligible magnitude combined with the medium sensitivity of visual receptors within the study area
- The modest scale and extent of construction activities with somewhat transient working areas dispersed across a relatively broad area of undulating topography (albeit with common compound and welfare facilities)
- The very low intensity of planting activities associated with the UWF Replacement Forestry
- The temporary – short-term duration of construction activity and the reversibility of effects once temporary construction areas and compounds are cleared and restored.

All Elements of the Whole UWF Project with Other Projects or Activities

Cumulative Impact Magnitude:

No above ground UWF Grid Connection structures inter-visible with the Milestone Windfarm.

Milestone Windfarm was previously assessed in the 2013 RFI for Upperchurch Windfarm, to have a 'Medium' (moderate) cumulative impact in conjunction with Upperchurch Windfarm and ABP considered the same cumulative impacts not to be significantly adverse.

If the construction of the Whole UWF Project occurs at the same time as periodic forest harvesting operations, this would result in an overall intensity of activity that is slightly greater than for the Whole UWF Project in its own right. However, working areas tend to be relatively discrete from each and not generally intervisible. HGV traffic along local and regional roads is likely to have a **Low** in-combination effect.

Forestry harvesting activities in the area could also increase HGV traffic along local and regional roads, which along with Whole UWF Project HGV traffic and roadworks associated with UWF Grid Connection (110kV UGC) and Haul Route Works (UWF Related Works) and road related activities for UWF Other Activities (Haul Route Activities) is likely to have a Low-negligible in-combination effect to visual amenity due to the increased frequency and intensity of HGV traffic within this relatively tranquil rural area.

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Significance of the Cumulative Impact: Slight *(with Forestry),* Not Significant *(with Milestone)*

Rationale for Cumulative Impact Evaluation:

- As per Table 17-7, the low magnitude combined with the medium sensitivity of visual receptors within the study area
- The modest scale and extent of construction/forestry activities where hubs of intensive activity are dispersed and discrete from each other
- The temporary – short-term duration of in-combination construction activity and the reversibility of effects once temporary construction areas and compounds are cleared and restored
- The rationale provided in the ABP Inspectors Report (2014, Section 9.5.5 Reference Documents – Volume F10) - "I also consider that, cumulatively when considered with existing and permitted wind energy developments the development will change the visual character of the area, but in overall terms it will not be to a significant degree as to be considered to adversely impact on the area."

Note: No cumulative evaluation of Other Projects or Activities (Foilnaman Mast, Cummermore Communications Pole) is included in the table above, because these Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 17.3.2.2.1)

Visual Amenity

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17.3.4.2 Impact Evaluation Table: Addition of new features or loss of existing features causing visual disharmony, clutter or complexity

Impact Description	
Project Life Cycle Stage:	Operational stage

Impact Source: Presence of above ground structures, permanent alterations to landform/ vegetation patterns
Cumulative Impact Source: Construction related activities, forestry harvesting in the surrounding area
Impact Pathway: Visibility

Impact Description: There will be an increase in the amount of above-ground built development within the rural landscape of the study area once construction of the UWF Grid Connection and Other Elements of the Whole UWF Project are complete. There will also be very minor permanent/ long-term changes to land cover and vegetation. Partial enclosure of views in also likely to result from the UWF Replacement Forestry. These structures / above ground expressions of the UWF Grid Connection (Mountphilips Substation) and of the Other Elements of the Whole UWF Project will add to the intensity of development and alteration of existing landscape patterns within a rural area where low levels of built development currently occur and there is a strong degree of landscape uniformity and integrity within rural vistas.

Impact Quality: Negative

Evaluation of the Subject Development Impact – Addition of new features or loss of existing features causing visual disharmony, clutter or complexity

Element 1: UWF Grid Connection – direct/indirect impact

Impact Magnitude:
The Mountphilips Substation will have a very minor impact on visual amenity due to the fact that it is substantially screened from view. See Figure GC 17.4: Visibility of the Mountphilips Substation from VP1 on the L2166-10 in Coole townland and Appendix 17.1, Section A-17.1.2 for Zone of Theoretical Visibility Mapping. In conjunction with fieldwork investigation, these figures highlight the strong degree of both landform and vegetative screening that surrounds the Mountphilips Substation site. Indeed, the main permanent visible components will be the site entrance and the initial section of the access road along with the very top sections of the lattice towers amongst treetops at distances of around 500m. It is considered that the magnitude of visual impacts caused by the **Mountphilips Substation** will be of a **negligible** magnitude.

The 110kV UGC will be underground, predominately along the public road, and will have negligible effects on visual amenity, the sole surface expression of the 110kV UGC will be in the form of periodic link box man-hole type covers at Joint Bay locations. It is considered that the magnitude of visual impacts caused by the 110kV UGC will be **negligible.**

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the negligible magnitude combined with the medium sensitivity of visual receptors within the study area
- The high level of screening around Mountphilips Substation,
- the barely discernible permanent surface expression of the 110kV UGC.

Element 1: UWF Grid Connection – cumulative impact

Cumulative Impact Magnitude:
Above ground structures for UWF Grid Connection relate to the Mountphilips Substation which will be built in Mountphilips townland near Newport on the western side of the Slievefelim to Silvermines Mountain Upland area. Above ground structures for the Other Elements of the Whole UWF Project (i.e. the Consented UWF

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Turbines and Consented UWF Substation for Upperchurch Windfarm, Telecom Relay Pole for UWF Related Works, and new woodland for UWF Replacement Forestry) along with landcover changes associated with these projects will occur in the Upperchurch area on the eastern side of the upland area.

The Mountphilips Substation element of the UWF Grid Connection is also not located close to any Other Projects or Activities (Foilnaman Mast, Milestone Windfarm or Cummermore Communications Pole).

Therefore there is no potential for the UWF Grid Connection to cause cumulatively impacts to Landscape Character with either Other Elements of the Whole UWF Project or with Other Projects or Activities.

Significance of the Cumulative Impact: No Cumulative Impact

Rationale for Cumulative Impact Evaluation:

- Separation distance, and absence of inter-visibility, between built structures and landcover changes associated with UWF Grid Connection and the Other Elements or Other Projects.

Cumulative Information: Individual Evaluations of Other Elements of the Whole UWF Project

Element 2: UWF Related Works

Impact Magnitude: No surface expression or land cover change following reinstatement of construction works relating to the Internal Windfarm Cabling, Haul Route Works and RW Ancillary Works. Barely discernible surface expression and land cover change (0.22ha) following reinstatement of construction works relating to the Realigned Windfarm Roads and the Telecoms Relay Pole which are also both modest and typical rural features that will have a very minor effect on the visual amenity from immediately surrounding local roads and several nearby dwellings. Though visible, the Telecom Relay Pole is the type of small scale, innocuous structure that is unlikely to be noticed by a casual observer or even by local residents a short period of time after it is initially erected. The Telecoms Relay Pole will not be visible / have any impact on visual amenity from any other types of receptor than local roads and residents and for these reasons the magnitude of impact is negligible.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the negligible magnitude combined with the medium sensitivity of visual receptors within the study area
- The barely discernable, permanent above-ground expression of all aspects of the UWF Related Works except the Telecoms Relay Pole.
- The barely noticeable, localised, long-term impact on visual amenity arising from the presence of the Telecoms Relay Pole.

Element 3: UWF Replacement Forestry

Impact Magnitude:
Small scale (6 hectares) visual change of a typical nature (farmland to woodland) in this upland rural area. Likely very localised partial enclosure of views from several residences and from the Ormond Way cycle route which is routed along the adjacent local road a short distance to the west and only when the new native woodland is reaching maturity.

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- As per Table 17-7, the negligible magnitude combined with the medium sensitivity of visual receptors within the study area the small scale and typical nature of visual change
- The very minor visual enclosure experienced by a few very localised receptors

Element 4: Consented Upperchurch Windfarm

Impact Magnitude:

Topic: Landscape
Sensitive Aspect: Visual Amenity

The Upperchurch Wind Farm LVIA evaluated visual impact magnitude 21 no. viewpoints and this ranged between high and low depending on proximity and visual exposure. In reviewing this LVIA as part of his own assessment, the ABP Inspector concluded (2014 report, Section 9.5.5 Reference Documents – Volume F10) *"the undulating and rolling nature of the landscape coupled with the diverse vegetation does provide for a level of absorption capacity for the nature and scale of the proposed development. Therefore accepting that the development will impact visually on the area it will not be to a significant degree, I consider, to adversely impact on the area*".

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The rationale provided in the Upperchurch Windfarm LVIA and ABP Inspectors Report (2014, Section 9.5.5 Reference Documents – Volume F10) "the undulating and rolling nature of the landscape coupled with the diverse vegetation does provide for a level of absorption capacity for the nature and scale of the development. Therefore accepting that the development will impact visually on the area it will not be to a significant degree, I consider, to adversely impact on the area"

Element 5: UWF Other Activities – *N/A, evaluated as excluded, see Section 17.3.2.2.1*

Cumulative Information: Individual Evaluations of Other Projects or Activities

Other Project: Milestone Windfarm

Impact Magnitude:
Milestone Windfarm is an operational 4-turbine windfarm which comprises two planning permissions, the first for 5 turbines (of which 3 were constructed) at Knockcurraghbola Commons, Knockcurraghbola Crownlands, Graniera and Shevry, and the second for 2 turbines (of which 1 was granted planning permission and constructed) in Knockduff and Inchivara. The locality of the Milestone Windfarm was assessed by the planning authority to have a 'Medium' sensitivity.

Significance of the Impact: Not Significant

Rationale for Impact Evaluation:

- The rationale provided in the Milestone Windfarm Planners Report (Tipperary County Council Ref: 12510385, 28th November 2013) – '*I consider furthermore that the visual impact in the context of the local and regional topography is acceptable'*
- The rationale provided in the Inchivara Windfarm ABP Inspectors report (ABP Ref: PL92.243611, page 19) – "I would consider that having regard to the permitted wind farms and the landscape designations applicable to the site that the proposed two turbines would not adversely impact on the visual amenities or the landscape character of the area. I would also consider that the proposed development would not adversely impact on the established residential amenities in the area from a visual perspective"

Other Project: Foilnaman Mast

Impact Magnitude:
The existing Foilnaman mast is a modest scale telecommunications structure, which is unlikely to be noticed by casual observers and has a very minor impact on visual amenity in a relatively localised area

Significance of the Impact: Imperceptible

Rationale for Impact Evaluation:

- The small scale permanent impacts arising from the existing Foilnaman mast

Other Project: Cummermore Communication Pole

Impact Magnitude:
The existing Cummermore Communications Pole is a modest scale telecommunications structure, which is unlikely to be noticed by casual observers and have a very minor impact on visual amenity in a relatively localised area

Significance of the Impact: Imperceptible
Rationale for Impact Evaluation: • The small scale permanent impacts arising from the existing Cummermore Communications Pole
Evaluation of Other Cumulative Impacts – Addition of new features or loss of existing features causing visual disharmony, clutter or complexity
Whole UWF Project Effect
Cumulative Impact Magnitude: Above ground structures will be built in Mountphilips townland (UWF Grid Connection) near Newport on the western side of the Slievefelim to Silvermines Mountain Upland area, and in the Upperchurch area (UWF Related Works, UWF Replacement Forestry and Upperchurch Windfarm) on the eastern side of the upland area. Following reinstatement of construction works areas, other than the Upperchurch Windfarm, there will be very minor surface expression of Whole UWF Project elements in the overlapping study areas and only the Telecoms Relay Pole aspect of the UWF Related Works will have any potential to cause visual impact in the form of visual clutter in-combination with the Consented UWF Turbines and this will be a very minor effect and only from a very limited sections of the local road and several residences. The UWF Replacement Forestry is also likely to be visible from very localised receptors in-combination with some of the Consented UWF Turbines. However the cumulative effect of this is likely to eventually be neutral as the new native woodland will eventually screen the turbines as it matures. The cumulative magnitude of visual effects is considered to be **negligible.**
Significance of the Cumulative Impact: Imperceptible
Rationale for Cumulative Impact Evaluation: • As per Table 17-7, **negligible** magnitude combined with the **medium sensitivity** of visual receptors within the study area • The very limited visible expression of the UWF Grid Connection, UWF Related Works or UWF Replacement Forestry in conjunction with the Upperchurch Windfarm
All Elements of the Whole UWF Project with Other Projects or Activities
Cumulative Impact Magnitude: The Telecoms Relay Pole aspect of the UWF Related Works will contribute in a barely perceptible way to the intensity of built development (structures) in combination with Milestone Windfarm and the Foilnaman and Cummermore Communications Poles. The UWF Replacement Forestry will not have any discernible in-combination impact other than the potentially positive screening of structures over time. Milestone Windfarm was previously assessed in the 2013 RFI for Upperchurch Windfarm, to have a 'Medium' (moderate) cumulative impact in conjunction with Upperchurch Windfarm and ABP considered the same cumulative impacts to be acceptable.
Significance of the Cumulative Impact: Not Significant
Rationale for Cumulative Impact Evaluation: • As per Table 17-7, **negligible** magnitude combined with the **medium sensitivity** of visual receptors within the study area • The very minor and localised contribution to cumulative impact arising from the Telecom Relay Pole in con-junction with the Foilnaman and Cummermore Communications Poles and the Milestone Windfarm (and the Upperchurch Windfarm), which will be long-term and reversible.

Visual Amenity

Sensitive Aspect

- The rationale provided in the ABP Inspectors Report (2014, Section 9.5.5 Reference Documents – Volume F10) - "I also consider that, cumulatively when considered with existing and permitted wind energy developments the development will change the visual character of the area, but in overall terms it will not be to a significant degree as to be considered to adversely impact on the area."

Note: No cumulative evaluation of Other Projects or Activities (Forestry and Agricultural Activities) is included in the table above, because these Other Projects or Activities were evaluated as excluded from this particular impact table (see Section 17.3.2.2.1).

Landscape

Topic

17.3.4.3 Description and Rationale for Excluded (scoped out) Impacts

The source-pathway-receptor links and the rationale for impacts excluded from the Impact Evaluation Table sections are described in Table 17-20 below.

Table 17-20: Description and Rationale for Excluded Impacts to Visual Amenity

Key: 1: UWF Grid Connection; 2: UWF Related Works; 3: UWF Replacement Forestry; 4: Upperchurch Windfarm; 5: UWF Other Activities

Source(s) of Impacts	Project Element	Pathway	Impacts (Consequences)	Rationale for Excluding (Scoping Out)
Operational Stage				
Operational Activities	1, 2, 3, 4	Visibility	Intensification of activity causing visual disharmony, clutter or complexity	Rationale for Excluding: Maintenance activities will range from annual testing of the UWF Grid Connection (with some very infrequent works at Joint Bays), to twice yearly maintenance on the UWF Replacement Forestry lands, to monthly inspection of UWF Related Works, to weekly maintenance of the Upperchurch Windfarm. All of these activities will take place from hard-core areas, with the vast majority of activity taking place on the turbine hardstands. Therefore operational activities will have a Neutral effect on visual amenity.
Decommissioning Stage				
No potential for impacts/ Neutral effects due to: Neither the UWF Grid Connection nor the UWF Replacement Forestry will be decommissioned/harvested. In relation to the UWF Related Works and Upperchurch Windfarm, decommissioning works will involve very minor temporary works resulting in no change or improved visual amenity due to the removal of structures and windfarm associated development. This will not result in negative neutral impact on visual amenity.				

17.3.5 Mitigation Measures for Impacts to Visual Amenity

Mitigation measures were incorporated into the UWF Grid Connection project design. No additional mitigation measures are required as the topic authors conclude that **significant impacts are not likely to occur to Visual Amenity**.

17.3.6 Evaluation of Residual Impacts to Visual Amenity

Residual Impacts are the final or intended effects that will occur after mitigation measures have been put into place. No additional mitigation measures are required and thus the Residual Impact is the same as the Impact set out in Impact Evaluation Table sections for Visual Amenity above (Section 17.3.4) – i.e. **no significant adverse impacts**.

17.3.7 UWF Grid Connection Environmental Management Plan

The Project Design measures will be implemented by the Project Manager and the main Contractor during the construction stage, under the Environmental Management Plan for the UWF Grid Connection (EMP). The EMP is appended to this EIA Report as Volume D.

The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP. An Environmental Clerk of Works will be appointed, who will be independent of the construction Contractor, and it will be the responsibility of the Environmental Clerk of Works to monitor the compliance of the Contractor with the EMP through liaising with the Construction Site Manager and the Project Manager, monitoring construction works on a daily basis and by carrying out regular audits on EMP compliance. The Environmental Clerk of Works will be resourced to employ a team of environmental specialists including a Site Ecologist, Site Hydrologist and an Invasive Species Specialist.

17.3.8 Summary of Impacts to Visual Amenity

A summary of the Impact to Visual Amenity is presented in Table 17-21.

Table 17-21: Summary of the impacts to Visual Amenity

Impact to Visual Amenity:	**Intensification of activity causing visual disharmony, clutter or complexity**	**Addition of new features or loss of existing features causing visual disharmony, clutter or complexity**
Evaluation Impact Table	*Section 17.3.4.1*	*Section 17.3.4.2*
Project Life-Cycle Stage	*Construction*	*Operational*
UWF Grid Connection Impact *Direct/indirect impact*	**Slight to Imperceptible**	**Imperceptible**
UWF Grid Connection Impact *Cumulative impact*	**Slight to Imperceptible**	**No Cumulative Impact**
Element 2: UWF Related Works	Imperceptible	Imperceptible
Element 3: UWF Replacement Forestry	Imperceptible	Imperceptible
Element 4: Upperchurch Windfarm	Not Significant	Not Significant
Element 5: UWF Other Activities	Neutral Impacts/No Impacts - Evaluated as Excluded, see Section 17.3.2.2.1	
Cumulative Impact:		
All Elements of the Whole UWF Project	**Slight to Imperceptible**	**Imperceptible**
All Elements of the Whole UWF Project *cumulatively with* Other Projects or Activities Milestone Windfarm Foilnaman Mast Cummermore Communications Pole Forestry activities Agricultural activities	**Slight** *(forestry)* **Not Significant** *(Milestone)*	**Not Significant**

The greyed out boxes in the above summary table relate to the cumulative information for the Other Elements of the Whole UWF Project, which are included to show the totality of the project.

Visual Amenity

Sensitive Aspect

Landscape

Topic

17.4 Reference List

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Irish Sports Council, *Irish Trails*. Retrieved from https://www.irishtrails.ie/trails.aspx?c=Tipperary

Reference List

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Chapter 18: Interaction of the Foregoing

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Glossary of Terms

Term	Definition
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.
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
EMF	Electromagnetic Fields
GHG	Green House Gasses

Executive Summary

Interaction between the Environmental Factors relates to cross-factor effects. A cross factor effect occurs when the effect on one Environmental Factor causes an indirect effect on another Environmental Factor.

In Chapters 6 to 17, the potential for likely direct and indirect effects was evaluated. Cross-factor effects are indirect effects. Potential cross factor effects were identified during EIAR Team meetings and evaluated by the authors of the receiving environmental factor topic chapter.

In summary there are no effects on one Environmental Factor likely to cause significant indirect effects on another Environmental Factor.

18 Interaction of the Foregoing

18.1 Cross Factor effects between the Environmental Factors

Interaction of the foregoing Factors, or interaction between the environmental factors, relates to cross-factor effects, which are indirect effects. A cross factor effect occurs when the effect on one environmental factor causes an indirect effect on another environmental factor.

In Chapters 6 to 17, the potential for likely direct and indirect effects was evaluated. Potential cross factor effects were identified during EIAR Team meetings and evaluated by the authors of the receiving environmental factor topic chapter.

Likely cross factor effects that were examined in the environmental factor topic chapters are identified and summarised in the sections below, presented by receiving environmental factor.

18.1.1 Potential Cross-Factor effects to Population (Chapter 6)

- Potential cross-factor effects to **Population** (reduction in tourism revenue), caused by effects to **Air** (increased levels of ambient dust and ambient noise).
- Potential cross-factor effects to **Population** (business disruption), caused by effects to **Material Assets - Roads** (increased traffic and road works).
- Potential cross-factor effects to Population (reduction in tourism revenue), caused by effects to **Landscape** (visual impacts).

18.1.2 Potential Cross-Factor effects to Human Health (Chapter 7)

- Potential cross-factor effects to **Human Health** (improved health prospects), caused by effects to **Population** (increased spending and employment opportunities in the Local Economy),
- Potential cross-factor effects to **Human Health** (impacts on gastrointestinal health), caused by effects to **Water** (water quality or quantity effects to local wells and springs)
- Potential cross-factor effects to **Human Health** (impact on health, respiratory, cardiovascular and mental health), caused by effects to **Air** (increase in ambient dust, noise, EMF)
- Potential cross-factor effects to **Human Health** (impacts on gastrointestinal health), caused by effects to **Material Assets - Built Services** (contamination or disruption of public piped water supply)
- Potential cross-factor effects to **Human Health** (risk of injury), caused by effects to **Material Assets – Roads** (increased risk of road traffic accidents).

18.1.3 Potential Cross-Factor effects to Biodiversity (Chapter 8)

- Potential cross-factor effects to **Biodiversity** (habitat loss, fragmentation or degradation, loss of flora species, physical injury), caused by effects to **Soils** (excavation, relocation, erosion and contamination effects to soils at the Mountphilips Substation Site).
- Potential cross-factor effects to **Biodiversity** (aquatic habitat degradation), caused by effects to **Water** (decreases in water quality as a result of cross factor soil effects and morphological impacts to watercourses during crossing works).
- Potential cross-factor effects to **Biodiversity** (habitat degradation and disturbance), caused by effects to **Air** (due to dust soiling, increased ambient noise and vibration levels).

18.1.4 Potential Cross-Factor effects to Land (Chapter 9)

- Potential cross-factor effects to **Land** (reduction in grass growth rates), caused by effects to **Water** (change in drainage regime at Mountphilips Substation Site).

18.1.5 Potential Cross-Factor effects to Soils (Chapter 10)

No cross-factor effects to **Soils** caused by effects to the other Environmental Factors were identified by the EIAR Team.

18.1.6 Potential Cross-Factor effects to Water (Chapter 11)

- Potential cross-factor effects to **Water** (decreases in water quality due to sedimentation or contamination), caused by effects to **Soils** (earthworks, groundworks, storage of overburden, erosion and contamination effects to soils from fuel, oil and cement).

18.1.7 Potential Cross-Factor effects to Air (Chapter 12)

- Potential cross-factor effects to **Air** (increased ambient levels of dust), caused by effects to **Soils** (earthworks, groundworks, storage of overburden, erosion).
- Potential cross-factor effects to **Air** (increased ambient levels of dust and noise), caused by effects to **Material Assets - Roads** (increase in traffic volumes).

18.1.8 Potential Cross-Factor effects to Climate (Chapter 13)

- Potential cross-factor effects to **Climate** (Increases in GHG emissions), caused by effects to **Soils** (due to excavations) and effects to **Material Assets - Roads** (increase in traffic volumes).

18.1.9 Potential Cross-Factor effects to Material Assets - Built Services (Chapter 14)

- Potential cross-factor effects to **Material Assets – Built Services** (risk of damage to water pipes and sub-sequent contamination of public water supply), caused by effects to **Material Assets - Roads** (excavation of road pavements).

18.1.10 Potential Cross-Factor effects to Material Assets - Roads (Chapter 15)

No cross-factor effects to **Material Assets - Roads** caused by effects to the other Environmental Factors were identified by the EIAR Team.

18.1.11 Potential Cross-Factor effects to Cultural Heritage (Chapter 16)

- Potential cross-factor effects to **Cultural Heritage** (visual setting), caused by effects to **Landscape** (visual impact of above ground structures).

18.1.12 Potential Cross-Factor effects to Landscape (Chapter 17)

Potential cross-factor effects to **Landscape** (visual impact), caused by effects to **Biodiversity** (severance of hedgerows and removal of mature trees) and effects to **Land** (change of use).

18.2 Potential Cross Factor Effects – Other Elements of the Whole UWF Project

Cross factor effects to environmental factors associated with the Other Elements of the Whole UWF Project can be found in the corresponding EIAR Main Report Chapter 18 of the UWF Related Works EIA Report and UWF Replacement Forestry EIA Report, both of which are included in Volume F: Reference Documents.

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Chapter 19:

Mitigation Measures & Monitoring Arrangements

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Glossary of Terms

Term	Definition
Environmental Commitments	The environmental protection measures including Project Design Measures, Best Practice Measures and Management Plans which were developed during the EIA process and incorporated into the Environmental Management Plan as Environmental Commitments.
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.
Sensitive Aspect	Any sensitive receptor in the local environment which could be impacted by the project.

List of Abbreviations

Abbreviation	Full Term
EMP	Environmental Management Plan
UWF	Upperchurch Windfarm

Executive Summary

Mitigation Measures are environmental protection measures incorporated into the design of the project to avoid, prevent or reduce significant effects on the receiving environment. The UWF Grid Connection project includes a suite of environmental protection measures – Project Design Measures (Mitigation Measures), Management Plans and Best Practice Measures. Monitoring arrangements will involve an Environmental Clerk of Works team, monitoring the implementation of these environmental protection measures.

These measures form the Environmental Commitments in the Environmental Management Plan (EMP). The Environmental Commitments will be updated post consent with any additional requirements of planning conditions or statutory bodies. The EMP comprises Volume D of this EIA Report.

Mitigation Measures: The design of UWF Grid Connection includes 69 No. Project Design Environmental Protection Measures which are mitigation measures incorporated into the design of the project. The project also includes an Environmental Management Plan which sets out the additional measures to be implemented through a site specific Traffic Management Plan, Surface Water Management Plan, Waste Management Plan, Invasive Species Management Plan and Best Practice Measures.

Monitoring Measures: Monitoring measures are included throughout the EIA Report and additional monitoring measures are also proposed as part of the Environmental Management Plan (EMP). A Schedule of these Monitoring Measures has been collated and is included in the EMP as Tab 9: Environmental Surveying & Monitoring.

As most potential for adverse effects to the environment arises during the construction stage of the UWF Grid Connection, monitoring arrangements concentrate on this stage of the development.

Implementation of the EMP: An Environmental Clerk of Works, who will be independent of the Construction Contractor, will be employed during the construction and early operational stages and sufficient resources will be provided (including engaging extra environmental managers and specialist environmental and engineering consultants) to monitor, audit and report on the compliance of construction works with the EMP, including all of the Environmental Commitments.

The EMP includes contingency measures for unforeseen events. The Environmental Clerk of Works will have a 'stop-works' authority to temporarily stop works over part of the site to avoid either an infringement of the Environmental Commitments or an unforeseen adverse environmental event. Works will not be allowed to re-commence until the issue is resolved.

The implementation of the Environmental Commitments in the EMP will be the responsibility of the Project Manager and a contractual obligation on the Construction Site Manager during the construction stage.

During operation, monitoring and auditing of the compliance of UWF Grid Connection with the EMP will be the responsibility of ESB Networks in relation to UWF Grid Connection, and will be the responsibility of the Project Promoter for Upperchurch Windfarm in relation to monitoring and measures for Upperchurch Windfarm maintenance and operation.

19 Mitigation Measures & Monitoring Arrangements

19.1 Introduction

Mitigation Measures are environmental protection measures incorporated into the design of the project to avoid, prevent or reduce significant effects on the receiving environment.

Monitoring measures are the procedures to keep under systematic review the adverse effects on the environment resulting from the construction and operation of a Project, and to identify unforeseen significant adverse effects, in order to be able to undertake appropriate remedial action.

Monitoring arrangements will involve an Environmental Clerk of Works team, monitoring the implementation of a suite of environmental protection measures – **Project Design Measures (Mitigation Measures), Management Plans, and Best Practice Measures** which have been developed to avoid, prevent or reduce adverse effects on the receiving environment. These measures are incorporated into the UWF Grid Connection Environmental Management Plan (EMP) for the development. The EMP comprises Volume D of this EIA Report.

19.2 Likely Significant Adverse Effects

Due to the location, nature and design of the UWF Grid Connection, and with the implementation of the suite of environmental protection measures i.e. the Project Design Measures (Mitigation Measures), Management Plans, and Best Practice Measures, the **topic experts have evaluated that UWF Grid Connection is not likely to cause significant effects to any sensitive aspect** of the Environmental Factors**.**

19.3 Mitigation Measures

19.3.1 Project Design Environmental Protection Measures (mitigation measures)

The design of UWF Grid Connection includes 69 No. Project Design Environmental Protection Measures which are Mitigation Measures incorporated into the design of the project to avoid, prevent or reduce significant effects on the receiving environment. These Project Design Measures (mitigation measures) are listed as a schedule in Table 19-2:

Table 19-1: Schedule of Project Design Measures (Mitigation Measures) for UWF Grid Connection

PD ID	UWF Grid Connection Project Design Environmental Protection Measure (PD)
PD01	UWF Grid Connection construction works during the Hen Harrier breeding season (March to August inclusive) will only take place at the Mountphilips Substation Site; construction of the 110kV UGC between the Mountphilips Substation site and the Consented UWF Substation compound will be carried out during the months of September to February inclusive.
PD02	If works at Mountphilips Substation site are programmed to begin in the Hen Harrier breeding season (March to August) confirmatory Hen Harrier breeding surveys will be completed, before such works initiate, such that all pre breeding nuptial activity, nesting activity and active nests are recorded within 2km of the entire construction works area boundary. These surveys will be

PD ID	UWF Grid Connection Project Design Environmental Protection Measure (PD)
	completed prior to the start-up of all construction activities. No works will take place within 2 km of any identified active Hen Harrier nest during the hen harrier breeding season.
PD03	Although no hen harrier roosts are currently known to occur within 1km of UWF Grid Connection, confirmatory surveys will be completed to record any roosting locations within 1km of UWF Grid Connection. Should a hen harrier roost occur within 1km of UWF Grid Connection works, then construction works within 1km of a roost will be limited to the period between 'one hour after sunrise' to 'one hour before sunset' during the Hen Harrier roosting season (October to February inclusive).
PD04	All construction works will be carried out during daylight hours.
PD05	At the Mountphilips Substation site, construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted. A speed limit of 25km/hr for all traffic/machinery will be implemented at the Mountphilips Substation site. Outside of Mountphilips Substation site, all construction will be restricted to the paved road surfaces or built surfaces along the 110kV UGC. A speed limit of 50km/hr for all delivery and construction traffic will be implemented on Local Roads ('L' roads).
PD06	Construction works will not be carried out within 150m of Rear Cross National School or Lackamore National School, during school hours. In addition, the project Community Liaison Officer will keep each school informed of construction timetables and scheduling.
PD07	110kV UGC construction works along the local roads L2264-50 and L6188-0, will not take place at the same time as the UWF Related Works Haul Route Works on these roads. The 110kV UGC construction works will also be scheduled so that the works do not occur on the same days as concrete deliveries for Consented UWF Turbines along these local roads.
PD08	Confirmatory consultations with Irish Water, Eir and ESB and review of all relevant infrastructure mapping before works, along with 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 banksman will accompany each excavator to oversee all excavation works.
PD09	Close contact with the local Newport Regional Supply office at Newross will be maintained by the Environmental Clerk of Works throughout the construction of the 110kV UGC. The Environmental Clerk of Works will keep the Newport Regional Water Supply office up-to-date with the location and schedule of works. To reduce risk of damaging water mains; pre-construction confirmatory surveys will be carried out, and excavations will be hand dug within 500mm of pipes. So that any damage (should it occur) can be fixed immediately, a supply of water mains repair materials will be kept at the Mountphilips Substation compound and at each works location on the public road network.
PD10	Flag-men will be used at 110kV UGC works locations on the public roads subject to one lane closures. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the public road network in a in a safe and efficient manner. The works will be carried out according to the Traffic Management Plan for UWF Grid Connection. The Traffic Management Plan forms part of the Environmental Management Plan.
PD11	Construction works for the 110kV UGC in Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons townlands, which are within 350m of local

PD ID	UWF Grid Connection Project Design Environmental Protection Measure (PD)
	residences, will not take place at the same time as either the UWF Related Works or Upperchurch Windfarm where those works also occur within 350m.
PD12	As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the works along the public road network will be scheduled to minimise impacts on schools and local businesses. The works will be scheduled so that they do not disrupt or interfere with Tipperary County Council's road works programme on the R503 through Newport town.
PD13	As requested by the Roads Department of Tipperary County Council, during pre-planning consultations, the Promoter will fund the costs of Tipperary County Council engaging a chartered Civil Engineer to oversee quality control and compliance with drawings, specifications and road opening conditions for the duration of the works
PD14	All initial groundworks within 500m of an RMP or NIAH site, 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.
PD15	Where excavations occur at culvert replacement locations along the 110kV UGC, and at the 3 No. new watercourse crossing at the Mountphilips Substation site, excavations will be monitored by an appropriately qualified archaeologist under license from the National Monuments Service, the excavated material will be examined for any evidence of archaeological material and metal detected as part of a finds retrieval strategy.
PD16	No refuelling of plant or equipment will be permitted within 100m of identified water supply wells
PD17	At Mountphilips Substation, water for operational stage welfare facilities will be obtained from a Rain Water Harvesting system. Waste water will be collected in tanks and removed from site by an appropriately licensed operator, for treatment in a licensed water treatment plant. These two measures will avoid the need for a new well or mains water connection and will avoid the need to treat waste water on-site.
PD18	The new substation compound and the new permanent access road at the Mountphilips Substation site will have a permanent surface water drainage network in place which will include check dams. These check dams will allow the settlement of suspended solids in water runoff while also slowing down the rate of water run-off from these areas.
PD19	At Mountphilips Substation location, where dewatering of trenches or excavations is required, there will be no direct discharge of untreated 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 to the volume of water requiring treatment (if any) to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD20	At Mountphilips Substation site, all excavated material will be removed for temporary or permanent storage at designated berms, which will be located more than 25m away from the watercourses on Mountphilips Substation site. All storage berms will be graded and sealed

PD ID	UWF Grid Connection Project Design Environmental Protection Measure (PD)
	following emplacement. The berms will be covered if there is a risk of erosion. Temporary silt control methods such as silt fencing will be placed around all overburden storage areas. The existing vegetative buffer between the berms and the nearest watercourses will be maintained and no works will occur in the buffer zone.
PD21	At Mountphilips Substation site, the permanent storage berms will be along the new access road and around the substation compound will be planted with local provenance native fruiting hedge species, with grasses and native flower species common to the surrounding vegetation sown along the sides of the berms. Local provenance native wildflower seed of flowering plants like clovers, vetches and knapweed will be included. Revegetation works will take place at the soonest practicable opportunity after emplacement.
PD22	Outside of the Mountphilips Substation site, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the UWF Grid Connection Waste Management Plan. Loads of excavated material will be covered during transportation to prevent spillages of excavated material.
PD23	All Joint Bays for the 110kV UGC will be located at least 50m from a Class 1 or Class 2 watercourse and at least 25m from Class 3 or Class 4 watercourses.
PD24	Outside of the Mountphilips Substation site, where dewatering of trenches or excavations is required for the 110kV UGC, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated using a mobile water treatment train and then discharged via a silt bag to ensure there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009.
PD25	Construction works along the 110kV UGC route will cease during heavy or prolonged rainfall events, and any open trenches or excavations will be covered. Use of weathering forecasting will be undertaken in advance of works.
PD26	A phased approach will be undertaken in relation to excavations, excavation dewatering and any culvert replacement works, where these works occur within 50m of a watercourse. The phased approach will only permit one of main potential sediment producing activities (i.e. excavations, excavation dewatering or culvert replacement works), to be carried out within 50m of a watercourse, at any one time.
PD27	At Mountphilips Substation site, works within 50m of watercourses, 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.
PD28	Along the 110kV UGC on the public road, where works will take place within 50m of a watercourse, additional mitigation measures will be implemented which include silt fencing and placement of sandbag arrangements along preferential surface water flowpaths on the road pavement. Following works on any particular section, any works debris will be removed from the road before the sandbags and silt fences are removed.
PD29	Cable trenching works, joint bay chamber installation and culvert replacement works on the section of 110kV UGC between W13 and W20 (inclusive) and the culvert replacement works at

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	W32 and W34 will only be completed during dry weather in the dryer months of the year – i.e. February to September included. This will minimise/avoid the requirement for any excavation dewatering as a result of waterlogged soils or surface water runoff. None of these 110kV UGC sections are within the Lower River Shannon SAC.
PD30	Lines of silt fencing and sandbags will be erected along the edge of the road so that surface water runoff from adjacent construction works areas is captured and directed to the excavated trench, where it can be pumped and treated before being released, as per PD24.
PD31	Works to bridge parapet walls at watercourse crossings W7, W36, W53 will be carried out during dry weather, and debris netting will be fixed to the outside of the walls in order to prevent any debris falling into the watercourse below.
PD32	At Mountphilips Substation site, instream construction works at the watercourse crossings W1, W2 and W3 will be followed by site-specific reinstatement measures to ensure the equilibrated restoration of flow character and morphology within the affected reach to achieve baseline character and avoid any deterioration in morphology as required under the Water Framework Directive (WFD). Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and 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 margins to stabilise banks, add flood protection and provide riparian buffer; and the use of deflector plates during the restoration of flow. Instream works at W1, W2 and W3 at the Mountphilips Substation site will be undertaken during dry weather within the IFI instream works window (July – September inclusive). As per PD41, instream works at W1, W2 and W3 will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice are followed. Although intended for the purpose of the WFD, this measure will also indirectly contribute to downstream water quality protection in the SAC.
PD33	All new permanent watercourse culverts at the Mountphilips Substation site and any replacement culverts along the public road for the 110kV UGC will be sized to cope with a minimum 100-year flood event.
PD34	Only precast concrete culverts or structures will be used at the watercourse crossing locations at Mountphilips Substation site and for any culvert replacements along the 110kV UGC. Only precast concrete chambers will be used at Joint Bay locations. No batching of wet cement will take place on-site.
PD35	Concrete pours will be required for the 110kV UGC cables trench. Only chutes will be washed out at the works locations into the cable trench, with the washout of the tank taking place at the concrete supplier depot. Concrete chute washouts within the SAC boundary will take place into designated bins for removal to the designated concrete wash settlement pond at the Mountphilips Substation site.
PD36	The sections of 110kV UGC trenches that overlap the Lower River Shannon SAC will be lined with an impermeable geotextile material to prevent potential migration of cement from the trench base or sides into the SAC.
PD37	In addition to PD22, there will be no storage of overburden within the Lower River Shannon SAC.

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PD38	110kV UGC works outside of Mountphilips Substation site will be carried out entirely on paved roads and where the 110kV UGC crosses watercourses, the works will be carried out over the existing bridges and over/under existing culverts. No in-streams works are proposed at any watercourse crossing points (including the Newport River and Bilboa River crossings) within the boundary of the Lower River Shannon SAC and therefore there will be no placement of cement or other materials within the river channels or on the river banks within the SAC.
PD39	In addition to PD42, there will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within 100m of the boundary of the Lower River Shannon SAC.
PD40	In addition to PD29, all 110kV UGC works within the boundary of the Lower River Shannon SAC will only be completed during dry weather in the dryer months of the year – i.e. February to September included.
PD41	The instream works at W1, W2 and W3 at Mountphilips Substation site, and the culvert replacement works at the 13 existing culverts on the public road, and all works (including concrete placement) within the boundary of the Lower River Shannon SAC, will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice Measures are followed.
PD42	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD43	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 at the Mountphilips Substation site. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse. Spill response apparatus including spill-kits and hydrocarbon absorbent packs will be stored at the designated location in the temporary compound and all operators will be fully trained in the use of this equipment. The Environmental Emergency Response Procedure will be implemented immediately in the event of any spills. The Environmental Emergency Response Procedure is part of the UWF Grid Connection Environmental Management Plan.
PD44	Overnight parking of plant and machinery will only be permitted at the temporary compound at the Mountphilips Substation site and at a distance greater than 50m from watercourses.
PD45	The horizontal directional drilling works at W8 and W9 will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will advise the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of

PD ID	UWF Grid Connection Project Design Environmental Protection Measure (PD)
	drilling fluid will be cleaned up immediately and stored in an adequately sized water tight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures; In the event of break-out occurring in the river bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures; In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point; and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the UWF Grid Connection Environmental Management Plan (see Volume D).
PD46	All construction works will be monitored on a daily basis by the Environmental Clerk of Works and by members of the Environmental Clerk of Works team (for example Site Ecologist) as required, for compliance with the Environmental Commitments, which include the Project Design Measures, as per the UWF Grid Connection Environmental Management Plan (see Volume D).
PD47	Surface water quality monitoring of the main watercourses downstream of the works will be carried out to ensure that the downstream water quality status in the receiving water is maintained and that there is no exceedance of the criteria listed in Schedule 5 and Schedule 6 of the EC Environmental Objectives Surface Water Regulations 2009 (as amended) and will ensure that the water quality status in downstream waterbodies are maintained in accordance with the Surface Water Regulations 2009. Where non-compliance in water quality is measured or recorded, works will stop until the issue is resolved. The surface water monitoring locations and sampling programme are defined in the Surface Water Management Plan for UWF Grid Connection. The Surface Water Management Plan is part of the UWF Grid Connection Environmental Management Plan (see Volume D).
PD48	The new permanent cross structures at the Mountphilips Substation site and the replacement culvert at W14 along the R503 will be bottomless or clear spanning.
PD49	In-stream works at Mountphilips Substation site and culvert replacement works at W14 along the R503 Regional Road will only be undertaken during the IFI specified period (July, August and September) and will be carried out to best practice (IFI, 2016).
PD50	Culvert replacement works along the 110kV UGC will not be undertaken without isolation of flow within the watercourse. Isolation of flow will be achieved through the use of sandbags filled with clean, washed sand. Any fish within the isolated section will be removed prior to works commencing. This will require the engagement of licensed fisheries personnel to deplete the works area 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 using a flume (pipe), with deflector plates used on the downstream side of the flume to reduce the hydraulic power of the water. Construction works at the crossing will be followed by site-specific reinstatement measures to ensure the equilibrated restoration of flow character and morphology within the affected reach to achieve baseline character and avoid any deterioration in morphology as required under the Water Framework Directive (WFD). Measures will include: bank stabilization measures, reinstatement of bank slope and character; and reinstatement of instream flow features such

PD ID	UWF Grid Connection Project Design Environmental Protection Measure (PD)
	as boulder substrates, pool / riffle sequences, or spawning cobbles; and the use of deflector plates during the restoration of flow. As per PD41, culvert replacement works will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice are followed. These measures will ensure that the baseline character is maintained and will ensure that a deterioration in morphology is avoided, as required under the Water Framework Directive. This in turn will protect Aquatic Ecology.
PD51	The sections of the 110kV UGC trench within the R503, in the central part of the 110kV UGC where the adjacent lands comprise predominantly peaty soils, will be lined with a geotextile membrane which will provide support to the cables trench and the road structure.
PD52	Confirmatory surveys for active Otter holts and breeding activity will be carried out 150m upstream and downstream of watercourse crossing locations including those watercourses evaluated as unsuitable for Otter in the current appraisal.
PD53	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 and outside of 1 hours after sunrise or before sunset during winter.
PD54	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 breeding females or cubs are present in the holt and NPWS will be notified immediately
PD55	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 will not take place within 15m of such holts, except under license.
PD56	The prohibited area associated with otter holts, should they be located in confirmatory surveys, will, where appropriate, be protected from any inadvertent disturbance from any works or personnel occurring nearby such as at a bridge and declared as 'Ecology Restriction Zone' with no mention of otters to any onsite staff. Appropriate awareness of the purpose of the excluded area will be conveyed through toolbox talks with site staff and sufficient signage will be placed on each possible access point. All contractors or operators on site will be made fully aware of the procedures pertaining to Ecology Restriction Zones 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.
PD57	All excavation works will take place in line with protective measures required to avoid damage to trees during the construction phase of road projects, as stipulated in the NRA document 'Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub prior to, during and post construction of National Road Schemes'. This will include consultation with a qualified arborist, where appropriate to ensure works within the Root Protection Area (RPA) avoid any significant damage to tree roots. Exposed tree roots will be protected where required and excavation methods will be appropriately undertaken so as to avoid damage to RPA's. All excavation works in the RPA will be overseen by the Project Ecologist.
PD58	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. This includes hedgerow and scrub removal in addition to hedgerow trimming.

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PD59	Works will not take place at any bridge during the Dipper breeding season (Feb-June inclusive) without a confirmatory survey to determine Dipper presence or absence. If Dippers are present, where possible works will not proceed until breeding has completed. All works at these and other bridges will be overseen by a project ecologist to ensure the requirements of the Wildlife Acts are being met. During culvert replacement works at W13, a Dipper nest box will be fitted to the new crossing structure. Additional nest boxes (c.10) will be provided for Dipper at suitable bridges to provide a net gain for this species.
PD60	Where works will be carried out at parapet walls, no works will take place between the period April-August without confirmatory survey as to the presence or absence of breeding Grey Wagtail. If breeding Grey Wagtail is present, then works will be overseen by a suitably qualified ecologist to ensure no effects occur to Grey Wagtail present in adherence to the requirements of the Wildlife Act. Works at all bridges will be overseen by the project Ecologist. Nest boxes (c.10) will be provided for Grey Wagtail at suitable bridges to provide a net gain for this species.
PD61	Works will not take place at any bridge during the Kingfisher breeding season (March to July inclusive) without a confirmatory survey to determine the presence of nesting Kingfisher within 150m upstream or downstream of the bridge. If nesting Kingfishers are present, works will not proceed until breeding has completed.
PD62	All bridges/structures where works are proposed will be subject to confirmatory surveys for General breeding birds prior to works commencing. All works will be supervised by the project Ecologist.
PD63	All construction works will be carried out during daylight hours. Security lighting will be used at the temporary compound at Mountphilips Substation site. 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.
PD64	Tree felling only pertains to the Mountphilips Substation site. Confirmatory surveys will be carried out at all trees that will require felling or other major modifications (e.g. removal of rotten branches) in order to confirm the findings of the 2016 / 2017 surveys regarding the suitability of the trees for roosting bats. 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.
PD65	While it is not expected that any trees with high suitability for roosting bats will be felled, the following measures will be implemented where a tree with moderate or high bat suitability is to be felled: a presence/absence bat surveys will be carried out; 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; and 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.

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	Boxes will be placed in locations that will receive at least 6-7 hours of sunlight during summer months, and will 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.
PD66	All bridges of moderate suitability for bats will be subject to a confirmatory survey prior to the commencement of construction works. Bridges of negligible or low suitability do not need to be surveyed, but this will be reviewed by the Environmental Clerk of Works and Project Ecologist. If a bat roost is found, the Project Ecologist will review the proposed works at that bridge, and determine whether there could be a risk of impacts on the roost. If there is a risk of impact on a bat roost in a bridge, the Project Ecologist will develop a case-specific mitigation strategy and apply to the NPWS for a derogation licence. Bats will be excluded from the bridge for the duration of construction works (typically only a few days), and replacement roosting opportunities (i.e. wall-mounted bat 'tubes' or boxes) will be provided at a suitable location nearby. When construction work is complete, bats will be able to return to their former roosting site.
PD67	No badger setts were recorded within 50m of the UWF Grid Connection during pre-planning surveys. Confirmatory surveys will be carried out within 50 m of either side of the construction works area boundary 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 12 months in advance of proposed construction activities, during the period November and April when vegetation cover is reduced. Should a badger sett be confirmed, the following measures will be implemented: NWPS will be notified immediately of any new active setts which are 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); No construction works will be carried within 50m of an active badger sett during the main breeding season (December 1st to June 30th); and Construction activity in the environs of an 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 will not take place within 10m of sett entrances.
PD68	As amphibians and reptiles will use brash piles for refuge and hibernation, all logs/brash created from hedgerow/tree removal at the Mountphilips Substation site will be removed off site immediately to prevent disturbance to amphibians/reptiles which may use brash piles if left in situ.
PD69	All covering of vegetative invasive knotweed infestations with high density polyethylene grass carpet terram will take place, at all identified locations prior to any works commencing on UWF Grid Connection or any other element of the Whole UWF Project. The covering of infestations will be completed on sections seven days in advance of works occurring on those sections. The infestations will be covered so that their full extent plus 1 metre is covered entirely and no vegetation is visible. The covering of these infestations will only be carried out under the direct supervision of an ecologist with prior experience of this type of work i.e. this work cannot be carried out by any general construction staff. No posts will be used to secure the coverings i.e. there will be no ground interference during any of these operations.

19.3.2 Environmental Commitments in the EIA Report

The environmental protection measures identified in this EIA Report (and reproduced at 19.3.1) form part of the Environmental Commitments in the UWF Grid Connection Environmental Management Plan. Additional measures are also included in the Traffic, Surface Water, Invasive Species, Waste Management Plans and Best Practice Measures. The current List of Environmental Commitments is presented in Table 19-3. The list of Environmental Commitments will be updated post consent with any additional requirements of planning conditions or statutory bodies.

Table 19-2: List of Environmental Commitments for UWF Grid Connection

Environmental Commitment (EC)	Location in the EMP	Implemented By:	Method by which the EC will be met
The Project Promoter is committed to implementing the Project Design Measures as set out in Tab 1, and as per the EIA Report (2019), Main Report, Chapter 5, Section 5.2.3, and as per the Appropriate Assessment Reporting (2019).	EMP, Tab 1	Project Team, specialist environmental and engineering experts, all site personnel	Incorporation of PD's listed in Tab 1 into Method Statements, Management Plans, Scheduling & Timing of Works and Surveying & Monitoring requirements (EMP docs).
The Project Promoter is committed to implementing the Traffic Management Plan.	EMP, Tab 2	Project Team, specialist environmental and engineering experts, all site personnel	Implementation of the Traffic Management Plan during construction works (EMP T2)
The Project Promoter is committed to implementing the Surface Water Management Plan.	EMP, Tab 3	Project Team, specialist environmental and engineering experts, all site personnel	Implementation of the Surface Water Management Plan during construction works (EMP T3)
The Project Promoter is committed to implementing the Invasive Species Management Plan.	EMP, Tab 4	Project Team ECoW, Invasive Species Specialist	Implementation of the Invasive Species Management Plan during construction works (EMP T4)
The Project Promoter is committed to implementing the Waste Management Plan.	EMP, Tab 5	Project Team, ECoW,	Implementation of the Waste Management Plan during construction works (EMP T5)
The Project Promoter is committed to implementing the Environmental Emergency Response Procedures as set out in Tab 6.	EMP, Tab 6	Project Team, specialist environmental and engineering experts, all site personnel	Implementation of the Emergency Response Procedures should an environmental emergency occur (EMP T6)
The Project Promoter is committed to implementing the Scheduling & Timing of Works Measures as set out in Tab 7.	EMP, Tab 7	Project Manager in liaison with the Construction Manager, ECoW and specialist environmental experts (e.g. Site Ecologist) regarding temporal restrictions	Implementation of the specific Scheduling & Timing Project Design Environmental Protection Measures (Tab 1) as set out separately in a schedule in Tab 7 of the EMP.

Environmental Commitment (EC)	Location in the EMP	Implemented By:	Method by which the EC will be met
The Project Promoter is committed to implementing the Surveying & Monitoring Measures as set out in Tab 8.	EMP, Tab 7	ECoW and specialist environmental experts (e.g. Site Ecologist) and engineering experts.	Implementation of the specific Surveying & Monitoring Project Design Environmental Protection Measures (Tab 1) as set out separately in a schedule in Tab 8 of the EMP.
The Project Promoter is committed to implementing Best Practice Measures as set out in Tab 9.	EMP, Tab 9	Project Team, specialist environmental and engineering experts, all site personnel	Incorporation of BPM's listed in Tab 9 into Method Statements, Management Plans, Scheduling & Timing of Works Measures, and Surveying and Monitoring requirements (EMP docs).
The Project Promoter is committed to monitoring the development to check that the project is in practice, conforming to the predictions made in the EIA Report.	EMP, Section 5, and Tab 8	ECoW, and specialist environmental and engineering experts	Carrying out of audits of compliance, through the completion of EMP Compliance Record Sheets, and carrying out Environmental Surveying.

19.4 Schedule of Monitoring Measures

Monitoring measures are included in the 2019 EIA Report – in Chapter 5 of the EIAR Main Report and throughout the Environmental Topic Chapters 6 to 17. Additional monitoring measures are also proposed as part of the Traffic Management Plan, Surface Water Management Plan, Waste Management Plan, Invasive Species Management Plan and Best Practice Measures. These management plans and best practice are included in the UWF Grid Connection Environmental Management Plan (EMP), which is appended to the EIA Report as Volume D.

A Schedule of these Monitoring Measures has been collated from the EIAR Main Report and the EMP, this schedule is included below, and reproduced in the EMP as Tab 9: Environmental Surveying & Monitoring.

Table 19-3: Schedule of Monitoring Measures

Schedule of Monitoring Measures		
Location in EIA Report	**Monitoring Measure ID**	**Description of Monitoring Measure**
EIAR Main Report, Chapter 5, Section 5.2.3	PD02 Hen Harrier	If works at Mountphilips Substation site are programmed to begin in the Hen Harrier breeding season (March to August) confirmatory Hen Harrier breeding surveys will be completed, before such works initiate, such that all pre breeding nuptial activity, nesting activity and active nests are recorded within 2km of the entire construction works area boundary. These surveys will be completed prior to the start-up of all construction activities. A report including nesting activity and levels of usage will be provided to the Competent Authority and NPWS following the completion of each survey season. The Project Ecologist will keep NPWS informed of the real-time status of nesting Hen Harrier as a result of the monitoring associated with this project. All surveys for breeding or roosting Hen Harrier, and monitoring of temporal restrictions of works in relation to nesting or roosting Hen Harrier will be undertaken by a suitably qualified Ornithologist(s) (and member of CIEEM) with experience in the survey and management of Hen Harrier.
EIAR Main Report, Chapter 5, Section 5.2.3	PD03 Hen Harrier	Although no hen harrier roosts are currently known to occur within 1km of UWF Grid Connection, confirmatory surveys will be completed to record any roosting locations within 1km of UWF Grid Connection. A report including roosting activity and levels of usage, will be provided to the Competent Authority and NPWS following the completion of each survey season.
EIAR Main Report, Chapter 5, Section 5.2.3	PD08 Material Assets	Confirmatory consultations with Irish Water, Eir and ESB and review of all relevant infrastructure mapping before works, along with confirmatory ground surveys at service locations will be carried out ahead of works.
EIAR Main Report, Chapter 5, Section 5.2.3	PD14 Archaeology	All initial groundworks within 500m of an RMP or NIAH site, 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..

Schedule of Monitoring Measures		
Location in EIA Report	**Monitoring Measure ID**	**Description of Monitoring Measure**
EIAR Main Report, Chapter 5, Section 5.2.3	PD16 Underwater archaeology	Where excavations occur at culvert replacement locations along the 110kV UGC, and at the 3 No. new watercourse crossing at the Mountphilips Substation site, excavations will be monitored by an appropriately qualified archaeologist under license from the National Monuments Service, the excavated material will be examined for any evidence of archaeological material and metal detected as part of a finds retrieval strategy.
EIAR Main Report, Chapter 5, Section 5.2.3	PD32, PD41 Water quality, aquatic species	The instream works at W1, W2 and W3 at Mountphilips Substation site, and the culvert replacement works at the 13 existing culverts on the public road, and all works (including concrete placement) within the boundary of the Lower River Shannon SAC, will be supervised by a member of CIEEM and the Institute of Fisheries Management to ensure both the Project Design Measures and Best Practice Measures are followed.
EIAR Main Report, Chapter 5, Section 5.2.3	PD45 Water quality	The horizontal directional drilling works at W8 and W9 will be supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures.
EIAR Main Report, Chapter 5, Section 5.2.3	PD46 All	All construction works will be monitored on a daily basis by the Environmental Clerk of Works and by members of the Environmental Clerk of Works team (for example Site Ecologist) as required, for compliance with the Environmental Commitments, which include the Project Design Measures, as per the Environmental Management Plan for UWF Grid Connection (see Volume D).
EIAR Main Report, Chapter 5, Section 5.2.3	PD47 Water Quality	Surface water quality monitoring of the main watercourses downstream of the works will be carried out to ensure that the downstream water quality status in the receiving water is maintained. The surface water monitoring locations and sampling programme are defined in the Surface Water Management Plan for UWF Grid Connection.
EMP Tab 2: Traffic Management Plan (TMP)	TMP Tab 2, Section 1.3.1 Section 1.4.2	• Along the 110kV UGC route on the public road, confirmatory condition surveys involving pre-construction and post-construction inspections, high definition video surveys and FWD surveys will be undertaken • Along the additional local road L5337-1 at Tullow, which will be used for construction materials haulage only (i.e. no trenching works), confirmatory condition surveys involving pre-construction and post-construction inspections, high definition video surveys and FWD surveys will be undertaken along the routes of concentrated construction traffic between the R503 and the works locations on the local road network.
EMP Tab 3 Surface Water	SWMP Tab 3, Section 4 .1	<u>Drainage Inspections at Mountphilips Substation site</u> The following periodic inspection regime at Mountphilips Substation site will be implemented, and inspections recorded: • Daily general visual inspections by Environmental Clerk of Works; • Weekly (existing & new drains) inspections by site Construction Manager;

Schedule of Monitoring Measures		
Location in EIA Report	**Monitoring Measure ID**	**Description of Monitoring Measure**
Management Plan (SWMP)		• All inspection to include all elements of drainage systems; • Inspections required to ensure that drainage systems are operating correctly and to identify any maintenance that is required; • Any changes, such as discolouration, odour, oily sheen or litter should be noted and corrective action should be implemented immediately. • High risk locations such as settlement ponds will be inspected on a daily basis by the Construction Manager; • Daily inspections checks will be completed on plant and equipment, and whether materials such as straw bales or oil absorbent materials need replacement; • Event based inspections by the Environmental Clerk of Works as follows: o >10 mm/hr (*i.e.* high intensity localised rainfall event); o >25 mm in a 24 hour period (heavy frontal rainfall lasting most of the day); or, o Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week). • Weekly, Fortnightly and Monthly (depending on weather conditions and the nature of on-going construction works) site inspections by the Project Hydrologist during construction phase
EMP Tab 3 Surface Water Management Plan (SWMP)	SWMP Tab 3, Section 4.2	<u>Water Quality Monitoring</u> • Daily field monitoring of water quality parameters and collection of samples will be undertaken by the Environmental Clerk of Works. He/she will be appropriately trained on the required monitoring methods and the use, calibration and maintenance of all monitoring equipment used. • Regular (i.e. weekly or fortnightly depending on weather conditions) field monitoring will be carried out by the Project Hydrologist. • Surface water quality will be monitored during the construction phase and this monitoring will also extend into the post construction phase. Proposed monitoring locations downstream of the works areas. The locations of the surface water monitoring points will be agreed with Inland Fisheries Ireland and Tipperary County Council in advance of the construction phase. • Laboratory analysis of water samples will also be undertaken as part of the monitoring programme by an independent and appropriately certified laboratory.
EMP Tab 3 Surface Water Management Plan (SWMP)	SWMP Tab 3, Section 4.2	<u>Frequency of Water Quality Monitoring</u> • Daily visual checks at watercourse crossing locations where works are taking place; • Weekly sampling for suspended solids and turbidity in catchments where earthworks or watercourse crossing work is on-going; • Fortnightly sampling for the full suite of parameters (Table 7) in catchments where works are on-going; • Event based sampling, e.g. after heavy rainfall; • Additional sampling in the event of trigger level exceedance, after heavy rainfall, etc; and, • Post construction sampling programme (monthly sampling) for a period of six months

Schedule of Monitoring Measures		
Location in EIA Report	**Monitoring Measure ID**	**Description of Monitoring Measure**
EMP Tab 4 Invasive Species Management Plan (ISMP)	ISMP Tab 4, Section 4.1.1 Section 4.2 Section 4.2.1	• Pre-Construction confirmatory surveys will be completed by an invasive species specialist, 3 – 4 weeks before construction begins. Mapping, showing the most up to date distribution and extent of each infestation, will be distributed to the Client, Owners Engineer and the Contractor; • The covering of vegetative knotweed infestations with high density polyethylene grass carpet terram at all identified locations prior to any works commencing on that section and the monitoring of construction works at that section when it happens; • To ensure the effective implementation of the biosecurity measures, an invasive species specialist will monitor each infestation location during all critical stages of construction works; • Visual inspections will be carried out on all machinery and equipment (particularly for machinery and equipment exiting the site and which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris.
EMP Tab 4 Invasive Species Management Plan (ISMP)	ISMP, Section 5.3	• During the operational phase: Before planned maintenance or unplanned repair works commence, an ecology or invasive species specialist will survey the works locations for invasive plant species infestations in proximity to the works location(s), … the ecologist/invasive species specialist will supervise any works in proximity (5m) to infestations to ensure that construction machinery and operatives do not come into contact with these infestations;
EMP Tab 9 Best Practice Measures (BPM)	BPM 1, BPM 2, BPM 4, BPM 5, BPM 6, BPM 7	• The Construction Manager will be responsible for monitoring weather conditions • All construction works will be monitored on a daily basis by the Environmental Clerk of Works and by members of the Environmental Clerk of Works team (for example Site Ecologist) as required, for compliance with the Environmental Commitments • Surface water quality monitoring of the main watercourses downstream of the works will be carried out to ensure that the downstream water quality status in the receiving water is maintained. The surface water monitoring locations and sampling programme are defined in the Surface Water Management Plan for UWF Grid Connection • Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by a suitably qualified person during the construction phase • All permanent overburden storages areas will be checked / monitored daily until stabilised to ensure no drainage issues of surface water quality impacts are occurring
EMP Tab 7 Best Practice Measures (BPM)	BPM 8	• Public roads works areas will be regularly inspected for cleanliness, and swept to remove mud and aggregate materials from their surface, as necessary; • The private paved road in Knockcurraghbola Commons will also be regularly inspected for cleanliness, and swept to remove mud and aggregate materials from its surface, as necessary;

Schedule of Monitoring Measures		
Location in EIA Report	**Monitoring Measure ID**	**Description of Monitoring Measure**
EMP Tab 9 Best Practice Measures (BPM)	BPM 9	• Monitor the recruitment and training of local employees in line with Local Employment & Local Sourcing Policy
EMP Tab 9 Best Practice Measures (BPM)	BPM 10	• A confirmatory survey of Electromagnetic Field emissions from the Mountphilips 110kV Substation and from locations along the 110kV UGC will be carried out by a competent engineer following commissioning of the UWF Grid Connection.
EMP Tab 9 Best Practice Measures (BPM)	BPM 11	• Recording and reporting of the annual renewable electricity production of the operational Upperchurch Windfarm.

19.4.1 Duration of Monitoring

As most potential for adverse effects to the environment arises during the construction stage of the UWF Grid Connection, monitoring arrangements concentrate on this stage of the development. Monitoring during the operational stage relates to infrequent planned maintenance/unplanned repairs along the 110kV UGC and to the operational electricity production of the related project Upperchurch Windfarm.

19.4.2 Resourcing of Monitoring Arrangements

The Project Promoter will be responsible for the costs of monitoring.

An Environmental Clerk of Works will be employed during the construction and early operational stages and sufficient resources will be provided to monitor, audit and report on the compliance of construction works with the EMP including all of the environmental protection measures.

Sufficient resources will also be provided to the Environmental Clerk of works to engage a team of environmental managers to assist with monitoring and auditing, and for specialist environmental and engineering consultants as required.

19.5 Implementation of Mitigation Measures and Monitoring Arrangements

19.5.1 UWF Grid Connection Environmental Management Plan

To facilitate the implementation and monitoring of the environmental protection measures, a site specific Environment Management Plan (EMP) has been prepared for the UWF Grid Connection. The EMP is appended to the EIA Report as Volume D: UWF Grid Connection Environmental Management Plan.

The EMP describes the approach to environmental management during the construction of UWF Grid Connection. The objectives of the EMP are to:

(a) identify management responsibilities and reporting requirements for environmental management;

(b) identify the relevant Environmental Commitments;

(c) set out the environmental protection measures to be implemented;

(d) Outline how compliance with the EMP will be achieved; and

(e) Promote best environmental practices for the duration of the development.

19.5.1.1 Compliance with the EMP

The UWF Grid Connection Environmental Management Plan will be used by the Environmental Clerk of Works and the Environmental Clerk's team of managers/experts, to audit compliance of the Contractors with the EMP.

19.5.1.2 Unforeseen Significant Adverse Effects

The EMP includes contingency measures for unforeseen events, such as oil/fuel spillages, frac-out or water pollution.

The Environmental Clerk of Works will have a full time presence on-site during the construction stage, and environmental experts will supervise works at environmentally sensitive locations. This will ensure that any unforeseen significant adverse effects are identified in a timely manner and appropriate remedial action taken immediately.

The Environmental Clerk of Works will have a 'stop-works' authority to temporarily stop works over part of the site to avoid either an infringement of the Environmental Commitments or an unforeseen adverse environmental event. Works will not be allowed to re-commence until the issue is resolved.

19.6 Responsibilities & Management

It will be the overall responsibility of the Project Promoter to ensure that the UWF Grid Connection is developed as consented. The implementation of the Mitigation Measures and Environmental Commitments will be the responsibility of the Project Manager and a contractual obligation on the Construction Site Manager during the construction stage.

The protection of the environment during construction works and during the operational stage will be managed through the UWF Grid Connection Environmental Management Plan (EMP).

During construction, monitoring and auditing of the compliance of UWF Grid Connection with the EMP, will be carried out by an Environmental Clerk of Works, who will be independent of the Construction Contractor. The Environmental Clerk of Works will work with a suitably qualified team. The Environmental Clerk of Works will prepare weekly EMP Compliance Reports.

During operation, monitoring and auditing of the compliance of UWF Grid Connection with the EMP will be the responsibility of ESB Networks in relation to UWF Grid Connection, and will be the responsibility of the Project Promoter for Upperchurch Windfarm in relation to monitoring and measures for Upperchurch Windfarm maintenance and operation.

REFERENCE DOCUMENTS