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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED DREHID WIND FARM AND SUBSTATION, CO. KILDARE

VOLUME 2 – MAIN EIAR

CHAPTER 10 – Hydrology and Water Quality

Prepared for: North Kildare Wind Farm Ltd.

Date: **May 2025**

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10. HYDROLOGY AND WATER QUALITY

10.1 Introduction

This chapter has been prepared to examine any potential impacts of the Proposed Wind Farm, Proposed Substation and turbine delivery route on hydrology in the local environment.

Mitigation measures to reduce or eliminate effects on hydrology and water quality are prescribed as necessary. The assessment also considers the cumulative impacts associated with other nearby developments.

A full description of the Proposed Development assessed in this EIAR is provided in Chapter 3 Development Description and comprises the following elements:

- The 'Proposed Wind Farm' (consisting of 11 turbines, turbine foundations and hardstanding areas, new access tracks, underground electrical and communications cabling, drainage, temporary site compounds and associated works; The Proposed Wind Farm also includes the 'Proposed Recreation and Amenity Trail');
- The 'Proposed Substation' (110 kV substation and loop-in connection to the existing overhead lines);
- The Turbine Delivery Route (TDR).

The layout of the Proposed Wind Farm, the Proposed Substation and the TDR are presented in Figures 3.3 -of Chapter 3 of this EIAR.

The plans and particulars submitted with this application for consent are precise and provide specific dimensions for the turbine structures. This EIAR assesses wind turbine specifications for a Nordex N133 turbine model.

Specifics of the Proposed Development which relate to hydrology are described in Section 10.5.
This Chapter is supported by Figures 10.1 – 10.8, and should be read in conjunction with the following:

- Appendix 10.1, Volume III - Preliminary Technical Report for Proposed Bridges and Culverts
- Appendix 10.2, Volume III – Hydrology Report
- Appendix 3.2, Volume III - Construction Environmental Management Plan, including the Surface Water Management Plan
- Drainage Planning Drawings (101 Series, 300 Series and 501 series) accompanying the planning application

10.2 Study Area

The Study Area for hydrology and water quality comprises catchments, sub-catchments and sub-basins within which the Project is located, along with their associated waterbodies. The delineation of the catchments and their waterbodies is defined by the latest "Cycle 3" Water Framework Directive (WFD) (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy) reporting and can be viewed via https://www.catchments.ie/ and https://gis.epa.ie/EPAMaps/Water. The characteristics and associated hydrological features of the catchments within the Proposed Development are located are addressed within this Chapter and are listed in Table 10-1.

Table 10-1: WFD delineated waterbodies along the TDR and the Site

Catchment	Sub-catchment	Sub-Basin
Boyne Catchment (Hydrometric Area 7)	Boyne_SC_020	Blackwater(Longwood)_030
	Blackwater[Longwood]_SC_010	Blackwater(Longwood)_010
		Blackwater(Longwood)_020

Groundwater and hydrogeology is addressed in Chapter 9 - Land, Soils and Geology.

10.3 Methodology

The following sources of information were considered in this assessment:

- The design layout of the Proposed Development.
- Published literature as described below.
- A desk-based assessment of the surface water hydrology in the catchments relevant to the Proposed Development, including an assessment of the watercourses which will be intercepted by the layout of the Proposed Development and those which will receive surface water run-off from the Proposed Development. The desk study involved an examination of the hydrological aspects and water quality aspects using the following sources of information.

    - Ordnance Survey Ireland mapping
    - Science and Stories about Integrated Catchment Management (https://www.catchments.ie/).
    - OPW Indicative Flood Maps (https://www.floodinfo.ie/map/floodplans/).
    - Geological Survey of Ireland (www.gsi.ie).
    - History of flooding and status of drainage in the vicinity of the Proposed Development (available at http://www.floodinfo.ie/map/floodmaps/).
    - Environmental Protection Agency river flow data (http://www.epa.ie/hydronet).
    - Met Eireann Meteorological Database (available at https://www.met.ie).

The field assessment of the existing hydrological environment within the Proposed Development was undertaken to both verify desk-based assessment, record all significant hydrological features and assess the proposed crossing points along water features. Key tasks undertaken included;

- Identification of existing hydrological features and recording of locations for same;
- Measurements of on-site hydrological features, such as channel width, bank height and depth of water;
- Review of existing surface drainage network on and off site; and
- A photographic record of the hydrological features observed. The site walkover involved a review of available information gathered in the desk study followed by a site visit. The key observations of surface water features are presented in Appendix 10.

10.3.1 Relevant Guidance

The following guidance has been considered in the development of this chapter to identify relevant objectives relating the surface water.

- Guidelines on the information to be contained in Environmental Impact Assessment Reports, Environmental Protection Agency (EPA), May 2022;
- The Planning System and Flood Risk Management - Guidelines for Planning Authorities - Department of Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW), November 2009
- Environmental good practice on site guide (fourth edition) (C741) - Construction Industry Research and Information Association (CIRIA), January 2015.
- Best Practice Guide BPGCS005 Oil Storage Guidelines (Enterprise Ireland)
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (National Roads Authority, 2005)
- Guidelines on Planning for Watercourses in the Urban Environment (Inland Fisheries Ireland, 2020)
- Guidelines on protection of fisheries during construction works in and adjacent to waters' to allow cable construction (Inland Fisheries Ireland, 2016)
- Good Practice During Wind Farm Construction (Scottish Natural Heritage 2019)
- The SuDS Manual (C753) - Construction Industry Research and Information Association (CIRIA), 2015
- Control of water pollution from linear construction projects (C648) – Construction Industry Research and Information Association (CIRIA), 2006;
- Control of water pollution from construction sites. Guidance for Consultants and Contractors (C532) - Construction Industry Research and Information Association (CIRIA), December 2001
- UK Guidance for Pollution Prevention (GPP):
    - GPP2: Above ground oil storage tanks (Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), the Scottish Environment Protection Agency (SEPA), Energy Institute, Oil Care Campaign, June 2021)
    - GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (NRW, NIEA, SEPA, November 2017)
    - GPP5: Works and maintenance in or near water (NRW, NIEA, SEPA, January 2017)
    - GPP8: Safe storage and disposal of used oil (NRW, NIEA, SEPA, July 2017)
    - GPP21: Pollution Incident Response Plans (NRW, NIEA, SEPA, July 2017)
    - GPP22: Dealing with Spills (NRW, NIEA, SEPA, October 2018)
    - GPP26: Safe storage of Drums and intermediate Bulk Containers (IBCs), (NRW, NIEA, SEPA, February 2019)
- GE-INT-01203- Introduction to the NRA Design Manual for Roads and Bridges (Transport Infrastructure Ireland, December 2013)
- Coillte (2013): Forest Operations & Water Protection Guidelines.

10.3.2 Policy and Legislation

The following policy and legislation has been considered in the development of this chapter to identify relevant objectives relating to surface water.

- EU Water Framework Directive (2000/60/EC);
- River Basin Management Plan for Ireland 2022-2027;
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities, Nov 2009;
- Kildare County Development Plan 2023-2029;
- Strategic Flood Risk Assessment of the Kildare County Development Plan 2023-2029 (RPS, 2023)

Directive 2000/60/EC (WFD - Water Framework Directive) of the European Parliament and Council established a framework for community action in the field of water policy. The WFD requires EU member states to aim to reach good chemical and ecological status in inland and coastal waters. The WFD established a strategic framework for managing the water environment and requires a River Basin Management Plan (RBMP) to be developed every six years. The Third Cycle River Basin Management Plan 2022-2027 has been published in September 2024, and sets out the measures that are necessary to protect and restore water quality in Ireland. The overall aim of the plan is to ensure that our natural waters are sustainably managed and that freshwater resources are protected so as to maintain and improve Ireland's water environment.

The WFD has been transposed into Irish law following:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003).
- European Union (Water Policy) Regulations 2014 (S.I. No. 350 of 2014).
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009).
- European Communities Environmental Objectives (Groundwater) Regulations, 2012 (S.I. No. 9 of 2012).
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2012 (S.I. No. 612 of 2012).
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011).
- The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, 2009 (S.I. No. 296 of 2009).
- European Union (Drinking Water) Regulations, 2014 (S.I. No. 122 of 2014).

Directive 2008/125/EC of the European Parliament and Council of 16 December 2008 refers to the requirement to set environmental quality standards in the field of water policy, amended and subsequently repealed Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amended Directive 2000/60/EC of the European Parliament and Council. It is also known as the Priority Substances Directive (2008/125/EC) and was developed in response to the requirements of Article 16 of the WFD (2000/60/EC). The Priority Substances Directive requires the identification of priority substances to set Environmental Quality Standards (EQSs) for the concentrations of the priority substances in surface waterbodies and to review periodically the list of priority substances.

The European Communities Environmental Objectives (Surface Water) Regulations 2009 as amended define the criteria and standards used for classifying surface waters in accordance with the WFD. There are five categories of surface water status: 'High', 'Good', 'Moderate', 'Poor' and 'Bad'. Additionally, the Regulations prescribe maximum allowable concentrations and annual average concentrations for priority substances used to define chemical status and required to support biological elements.

The Kildare County Development Plan 2023-2029 lays down specific policies and objectives in relation to surface water run-off and flooding as follows:

- IN P1: Ensure the protection and enhancement of water quality throughout Kildare in accordance with the EU WFD and facilitate the implementation of the associated programme of measures in the River Basin Management Plan 2018-2021 (and subsequent updates).
- IN O3: Promote water conservation and best practice water conservation in all developments, including rainwater harvesting and grey water recycling.
- IN O5: Manage, protect, and enhance surface water and groundwater quality to meet the requirements of the EU Water Framework Directive.
- IN O6: Require an undisturbed edge or buffer zone to be maintained, where appropriate, having regard to the riparian buffer zones to maintain the natural function of existing ecosystems associated with water courses and their riparian zones, and to enable sustainable public access. The width of the edge or buffer zone shall be determined during the appropriate environmental assessment such as EcIA or AA.
- IN O7: Protect recognised salmonid water courses in conjunction with Inland Fisheries Ireland such as the Liffey catchment, which are recognised to be exceptional in supporting salmonid fish species.
- IN 08: Support the implementation of Irish Water's Water Safety Plans to ensure that public drinking water sources and their contributing catchments are protected from pollution.
- IN P4: Ensure adequate surface water drainage systems are in place which meet the requirements of the EU Water Framework Directive and the River Basin Management Plan in order to promote the use of Sustainable Drainage Systems.
- IN O20: Maintain, protect and enhance capacity of the existing surface water drainage systems in the county.
- IN O22: Require the implementation of Sustainable Urban Drainage Systems (SuDS) and other nature-based surface water drainage as an integral part of all new development proposals.
- IN 023: Require new developments to reduce the generation of storm water run- off and ensure all storm water generated is disposed of on-site OR attenuated and treated prior to discharge to an approved water system, with consideration for the following:
    - The infiltration into the ground through the provision of porous pavement such as permeable paving, swales, and detention basins.
    - The holding of water in storage areas through the construction of green roofs, rainwater harvesting, detention basins, ponds, and wetlands.
    - The slow-down in the movement of water.
- IN 027: Ensure that all development, including rural one-off residential developments will maintain existing surface water drainage systems, particularly at access points to the development.
- IN 028: Ensure development proposals in rural areas demonstrate compliance with the following:

- The ability of a site in an un-serviced area to accommodate an on- site wastewater disposal system in accordance with the County Kildare Groundwater Protection Scheme, and any other relevant documents and legislation as may be introduced during the Plan period.
- The ability of a site in an un-serviced area to accommodate an appropriate on-site surface water management system in accordance with the policies of the Greater Dublin Strategic Drainage Study (2005), in particular those of Sustainable Urban Drainage Systems (SuDS).
- The need to comply with the requirements of the Planning Systems and Flood Risk Management Guidelines for Planning Authorities, published by the Minister for the Environment, Heritage, and Local Government (2009).

- IN P5: Ensure the continued incorporation of Flood Risk Management and National Flood Risk Policy (2018) into the spatial planning of Kildare, to meet the requirements of the EU Floods Directive and the EU Water Framework Directive and to promote a climate resilient County.
- IN 032: Support the implementation of the EU Flood Risk Directive (2007/60/EC) on the assessment and management of flood risks and the Flood Risk Regulations (SI No 122 of 2010).
- IN 057: Assess applications for developments, having regard to the impact on the quality of surface waters and any targets and measures set out in the River Basin Management Plan and any subsequent local or regional plans. Where developments have the potential to impact the water quality of surface waters and/or any of the targets and measures set out in the RBMP, such a project should be subject to AA screening and where applicable, Stage 2 AA.
- IN 058: Require development proposals which may have an impact on water quality to undertake site specific assessments to determine localised pressures and demonstrate suitable mitigation measures to protect water quality.

The layout, design and construction methodology for the Proposed Development has taken account of these objectives, while ensuring compliance with the European Union Regulations and EPA policies and guidelines. Sustainable Drainage Systems measures have been incorporated into the design. Storm/ surface water management and run-off design has been carried out in accordance with Sustainable Urban Drainage Systems (SuDS) standards. Where possible, the causes of flooding to and from the Project will be reduced. Both ground and surface water resources will be protected.

10.3.3 Consultation

This EIAR chapter considers the consultation responses as referred to in Chapter 5 - EIA Scoping and Consultation, with particular regard to concerns relating to hydrology and water quality.

10.3.3.1 Office of Public Works (OPW)

The Office of Public Works requested maps showing the proposed crossings of arterial drainage. FT provided the ITM coordinates for each crossing, as well as a brief description of each crossing. The Office of Public Works responded to confirm they had looked at these locations and asked that they are “designed to the current standards”. The OPW provided a brochure on Section 50 with this response, which was shared with FT engineers who confirmed that the final designs of the crossings would be section 50 compliant.

10.3.3.2 Inland Fisheries Ireland

Comments and observations of a general nature were provided by IFI. IFI requested that potential impacts to fisheries waters are considered, forming part of the Eastern River Basin District. The role of smaller watercourses as contributories to downstream habitats, of which have the potential to convey deleterious matter from development works and regard should be had to this. Temporary crossing structures should follow IFI recommendations. These recommendations have been reviewed, and resulted in the three crossings of the Fear English to be proposed as a clear span bridge design rather than as culverted crossings.

10.3.4 Field Assessment

A site walkover was carried out on the 10th August 2018 to assess the existing drainage conditions and any significant hydrological features in the vicinity of the Proposed Development. Following some amendments to the layout of the Proposed Development, another site walkover was carried out on the 14th and 15th October 2024.

10.4 Evaluation Criteria

The significance of likely effects has been assessed in accordance with the Environmental Protection Agency (2022) Guidelines through comparison of the character of the predicted effect to the sensitivity of the receiving environment, as per Image 10-1.

Categories for defining the sensitivity of the receiving environment are set out in Table 10-2.

The sensitivity of a hydrological receptor is based on its vulnerability to be impacted/altered by the development, i.e. the ability of the receptor to absorb development without perceptible change.

Table 10-2: Criteria for Determining Receptor Sensitivity

Sensitivity	Criteria	Typical Examples	
		Surface Water	Hydro-ecological receptors
High	Receptor has a high quality and rarity on a local scale and limited potential for substitution. Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly.	Surface water providing a regionally important drinking water resource. Surface water with high WFD status objective / Blue Dot catchments. Waterbodies identified as nutrient sensitive areas / waterbodies under WFD RBMP Cycle 2/3.	Protected under EU or Irish habitat legislation (e.g., Special Area of Conservation (SAC) or Natural Heritage Area (NHA)). Designated Salmonid / Cyprinid Waters. Nationally and internationally designated sites where hydrology/hydrogeology is a key factor in designation (e.g. SAC / NHA/ Special Protection Areas (SPA) sites)/ freshwater pearl mussel designated waterbodies and their associated catchments.

Sensitivity	Criteria	Typical Examples	
		Surface Water	Hydro-ecological receptors
Medium	Receptor has a medium quality and rarity, local scale and limited potential for substitution/replacement or receptor with a low quality and rarity, regional or national scale and limited potential for substitution. Receptor is somewhat vulnerable to impacts that may arise from the project and/or has moderate to high recoverability.	Watercourses with designate features such as Environmental or ecological significance, Cultural or historical value, recreational purposes and Water supply or drinking water sources. Large lakes with an extension of 50ha or more and non-potable reservoirs.	Statutory designated sites where hydrology/hydrogeology is a key factor in designation (e.g. National Nature Reserves (NNR), Local Nature Reserves (LNR)).
Low	Receptor with a low quality and rarity, local scale and limited potential for substitution. Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability.	Watercourse with no designated features. Non-sensitive water resources (non WFD classified e.g. small lakes, ponds, land drain). Man-made feature not in hydraulic continuity (e.g. canal).	
Negligible	Attribute has a very low environmental importance and/or rarity on local scale. Receptor is of negligible value, not vulnerable to impacts that may arise from the project and/or has high recoverability.	Man-made feature with no ecological importance (e.g. farm land drainage ditches).	
Note	Professional judgement based on the baseline condition of the receptor should be used to determine a receptor's sensitivity.		

The scale of effect is determined in relation to the sensitivity of the receptor and the potential magnitude of change from baseline conditions, Image 10-1, presents how comparison of the magnitude of the predicted impact to the sensitivity of the receiving environment can determine the significance of the impact. Sensitivity of the receiving environment can be 'high', 'medium', 'low' or 'negligible'. Description of impact is defined by its character, magnitude, duration, probability and consequences (pre-mitigation). The magnitude of impact can be 'high', 'medium', 'low' or 'negligible'.

The conventional source-pathway-target model is applied to assess potential effects on environmental receptors resulting from the Proposed Development. The source being the activity that results in the potential effect or the potential source of pollution is described. The pathway being the route by which a potential source of effect can transfer or migrate. The receptor being a part of the natural environment that could potentially be affected, having regard to its sensitivity.

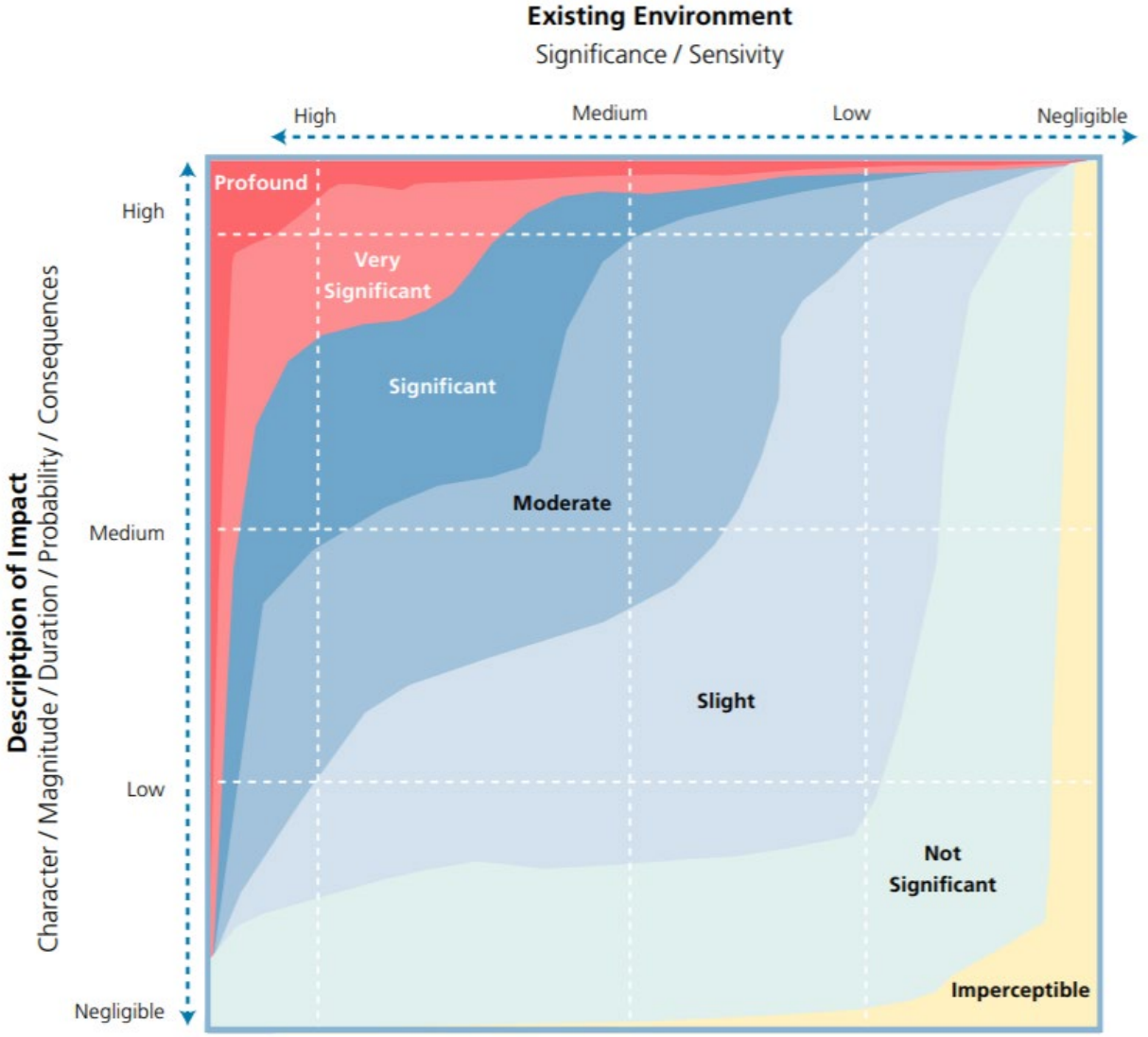

Plate 10-1: Classifications of the Significance of Impacts

10.4.1 Assessment of Cumulative Impacts

The assessment of cumulative effects on the water environment considers the combined potential effects of other developments (existing, approved but not yet built or operational, or proposed), with the potential to affect the water environment, within the same catchment(s) as the Proposed Development, as discussed further in Section 10.10.

10.4.2 Sensitivity of Receptors

The sensitivity of an environmental receptor is based on its ability to absorb an impact without perceptible change. The hydrological environment is considered to be of moderate sensitivity due to the proximity of a number of the European protected environmentally designated sites.

The Proposed Development does not traverse any Special Protection Area (SPA). The closest SPA (River Boyne and River Blackwater SPA (004232) is approximately 19.6km (by hydrological link) northwest of the site. The River Boyne and River Blackwater SPA (004232) follows the River Boyne from Longwood to Drogheda. The next closest SPA is the Poulaphouca Reservoir SPA (004063) which is approximately 31km to the south east near Blessington. There are two Special Area of Conservations located at Prosperous to the south east of the site (Ballynafagh Lake SAC (001387) and Ballynafagh Bog SAC (000391)) which are approximately 8.5km to the southeast.

There is a hydrological link from the Proposed Development to the River Boyne and River Blackwater SPA (004232). The Fear English, which is conveyed through the site converges with the River Blackwater at Johnstown Bridge, which then joins the River Boyne some 10km downstream near Longwood. Any other designated sites in the vicinity are in different waterbody catchments or are not hydrologically connected.

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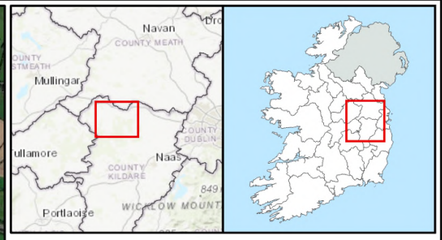

Legend

- Proposed Development Boundary
- Lakes
- Rivers
- Turbine Locations

TITLE:	Hydrological Features		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	10.1		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:50,000	**REVISION:**	0
DATE:	22/05/2025	**PAGE SIZE:**	A3

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10.5 EXISTING ENVIRONMENT

10.5.1 Site in Context

The area of the Proposed Development is located across a number of river catchments, as shown in Figure 10-1 Hydrological Features.

The Proposed Development predominantly drains to the River Boyne and its tributaries. The main tributary of the River Boyne is the River Blackwater and a number of its small tributaries.

The Fear English River flows through the site and the Kilcooney River flows adjacent to the site. Both rivers are tributaries draining to the River Blackwater. The Kilcooney River rises near Carbury at approximately 95mOD and flows in a north-easterly direction adjacent to the site for approximately 1km before its confluence with the Fear English River. It joins the Fear English River to the south of Ballynamullagh. It should be noted that the Fear English, the Kilcooney, and a number of drains in the area which drain into these rivers are part of the OPW's Arterial Drainage Network (see Figure 10-2).

The Fear English River rises in Parsonstown at approximately 88mOD and flows in a northerly to north-easterly direction along the eastern boundary of the site. After the confluence with the Kilcooney River, the Fear English River continues in a north easterly direction for 3km to Johnstown Bridge, where it converges with the River Blackwater.

From Johnstown Bridge the River Blackwater flows in a north-westerly to northerly direction for approximately 12.5km, crossing the Royal Canal and the Blackwater Bridge at Kilmurry after which it converges with the River Boyne at Rourkestown.

The River Boyne then flows on for 12km in a north easterly direction towards Trim in County Meath. At Trim the River Boyne turns northwards and flows for 18km to Navan Town. From Navan Town, the River Boyne veers in an easterly direction, flowing for 30km towards Drogheda. The River Boyne discharges to the Irish Sea 6km to the east of Drogheda.

The turbine delivery route (TDR) for the development is locally from the M4 at Johnstown to the site via the R402 and the L5025. Access to the site will be taken from the south for all loads. Access from the south to the northern turbine locations is not possible using internal access tracks, so all northern turbine components will need to access the southern junction where blades will be transferred to a blade lifting trailer (required to overcome physical constraints). Tower and all other loads will undertake a U turn in the southern area, and will then backtrack until the R402 Raven Junction, where they will turn right for the northern access junction. The proposed access route is as follows:

- Loads will depart the M4 at Junction 9 and will join the R402, southbound;
- Loads will pass through Johnstown Bridge and Kilshancoe;
- All loads will turn off the R402 onto the L5025, turning left at The Sweep Crossroads junction;
- Loads will continue on the L5025 heading southeast to the site access junction. At the site access junction, loads will turn left into a purpose designed junction;
- Blade loads for the northern turbines will be transferred onto a blade lifting trailer. All other northern turbine loads will undertake a U-turn and will rejoin the L5025, proceed northwest;
- Northern turbine loads will turn right onto the R402 and will proceed northbound;
- At the Raven Junction, loads will turn right onto Kilshanroe Road and will continue eastbound to the northern access junction.

In terms of stream crossings and major drain crossings along the TDR:

- Kilshanroe Road crosses the 'Fear English Bridge', before entering the northern extent of the site. No works are required for this crossing of the Fear English Bridge.

- The TDR then continues south into the site, crossing four drains, two of which are part of the Arterial Drainage Network. These two crossings will be temporary crossing structures, removed after the construction phase is complete.

- The Proposed Substation is located in the northern part of the site. The footprint of the Proposed Substation extends over a stretch of drain which forms part of the Arterial Drainage Network. This drain will be enclosed in a concrete pipe culvert, appropriately sized to convey the required stormwater volumes. The Proposed Substation will connect to the national grid by way of a 'loop-in/loop-out' connection to the existing 110 kV overhead line which lies to the north of the site.

The site is situated in a relatively flat landscape, with elevations of between 79m OD and 87 mOD (elevations derived from high-resolution data terrain model [DTM] obtained in 2023). The site is a mix of agricultural land with a number of forestry plots in various stages of their lifecycle within the site boundary.

The soil on the Proposed Development site is a diverse mix of subsoil types but predominantly comprises limestone tills, peat, and limestone sands and gravels. There are also significant deposits of lake sediment to the north of the site.

There is evidence of alluvium deposits downstream of the site, within 1km of the site boundary, in the River Blackwater.

Of the sites which are designated for environmental protection, as shown to be located within 15km of the Proposed Development site in Figure 8.1 of Chapter 8 Biodiversity, there are only hydrological links from the site to the River Boyne and River Blackwater SAC and SPAs, which are within 15 km of the site, but at an in-stream distance of 19.6 km from the site.

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Legend

- Proposed Development Boundary
- Drainage Districts
- Arterial Drainage Channels
- Turbine Locations

TITLE:	Arterial Drainage Network		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	10.2		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:30,000	**REVISION:**	0
DATE:	22/05/2025	**PAGE SIZE:**	A3

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10.5.2 General Description of the Catchment

The Proposed Development, including the Proposed Wind Farm, the Proposed Substation and the TDR are all contained within Hydrometric Area HA 07 known as Boyne of the Irish River Network, which is under the responsibility of the River Basin Management Plan for Ireland and previously part of the Eastern River Basin District (ERBD). This hydrometric area is also under the responsibility of IFI. The site is situated within the waterbody catchments as defined by the EU Water Framework Directive (WFD-2000/60/EC) (1), and as shown in Figure 10-3.

The relevant waterbodies within the Proposed Development are identified as follows:

- *Blackwater (Longwood)_020* (T01, T02, T03, T04, T05, T06, T07, T08, T09, T10, T11; the Temporary Construction Compounds and the Proposed Substation and grid connection)
- *Blackwater (Longwood)_010* (297m of access track between T07 and T08)

The turbine delivery route will be located along the route of the existing road network within the catchments noted above. These routes will cross a number of streams and the location of these crossings, together with the proposed methods for crossing these streams are outlined in Section 10.6.

There will be no significant additional hard standing areas associated with the turbine delivery route. Modifications to the turbine delivery route will be temporary.

The waterbodies associated with the turbine layout are described in more detail below.

10.5.2.1 Blackwater (Longwood)_020

All eleven turbines, along with approximately 9.37 km of new tracks, the Proposed Substation and two temporary construction compounds drain into the Fear English River and the Kilcooney River as well as to a number of their minor stream tributaries. This waterbody catchment is illustrated in Figure 10-3. The surface water run-off within this catchment drains towards the main channel of the Fear English River which runs in a north-easterly direction.

10.5.2.2 Blackwater (Longwood)_10

There are no turbines, which form part of the Proposed Wind Farm, within or upstream of this waterbody catchment. Approximately 297m of new tracks are proposed within this catchment and they drain towards the River Blackwater which runs in a north westerly direction.

10.5.3 Water Quality (WFD Status and Risk)

The third cycle of the River Basin Management Plan (RBMP) for Ireland 2022-2027 was published on 3rd September 2024. The overall aim of the RBMP is to ensure that our natural waters are sustainably managed and that freshwater resources are protected so as to maintain and improve Ireland's water environment.

The RBMP was consulted during the preparation of this chapter.

The main objectives of the River Basin Management Plan for Ireland 2022-2027 are to:

- Ensure full compliance with relevant EU legislation
- Prevent deterioration
- Meet the objectives for designated protected areas
- Protect high-status waters
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objective and (2) addressing more complex issues that will build knowledge for the third cycle plan

The site is situated in the Blackwater (Longwood)_SC_010 and Blackwater (Longwood)_20 river sub-catchments which lie entirely within the Boyne catchment, which drains into the sea at Drogheda. The Blackwater (Longwood) catchment under the Water Framework Directive water monitoring programme has an overall status of poor. The River Waterbody Risk status is 'at risk'.

The proposed site is located on groundwater waterbody Trim (IE_EA_G_002) which is currently 'At Risk' and is of 'Good' status.

The proposed site boundary does not encroach into the SACs or SPAs listed above at any point. No works are planned to take place in or at the SACs or SPAs.

The Lough Ennell, Co Westmeath, is the nearest nutrient sensitive area which is not within a 15km buffer of the site, it is approximately 30km to the northwest. There is one Salmonid River (Boyne S.I. 293) within a 15km buffer of the site, approximately 7.7km to the west.

The nearest EPA water quality monitoring point is at Johnstown Bridge River Station RS07B020100, 2km north of the Proposed Development. This monitoring station monitors the water quality of the Blackwater as it passes through Johnstown. There are also a number of stations further upstream along the Blackwater, including RS07B020060, RS07B020070 and RS07B020080 which are all located approximately 3 km to the east of the Proposed Development.

Details of water quality monitoring of the relevant rivers are outlined in the tables below. Figure 10-4 shows the locations of the nearby river water quality monitoring stations and water quality status of the closest monitoring stations to the Proposed Development.

Table 10-3: River Water Quality Monitoring Points

Type	Waterbody	Station Name	Status (2016–2021)
River Water Quality	Blackwater (Longwood)	RS07B020100	Poor
River Water Quality	Blackwater (Longwood)	RS07B020080	Unassigned
River Water Quality	Blackwater (Longwood)	RS07B020060	Poor
River Water Quality	Blackwater (Longwood)	RS07B020070	Poor

The Q value of the nearest downstream river station monitoring point (Blackwater (Longwood) RS07B020100 at Johnstown bridge) is '3', recorded in 2020. A value of 3 denotes 'poor' status in accordance with the *Biotoc Indices (Q Values) for the EPA River Quality Surveys: Biological*. Two monitoring stations along the 'Figile' (Station Names: RS14F010020 and RS14F010010) had been monitored in the previous River Waterbody WFD

Status 2013 to 2018 cycle, but was not monitored in the 2016 – 2021 cycle and therefore do not appear in Table 10-3.

The Blackwater(Longwood)_020 has been assigned a WFD ecological status as 'Poor'. The assigned status is based upon an assessment of 'Poor' Invertebrate Status or Potential. It has not been classified under any other status type e.g. there is no status for 'supporting chemical conditions'. While the waterbody is 'At Risk', the subcatchment assessment available on cathments.ie notes that 'Nutrients (ammonia) are the significant issue in Blackwater (Longwood)_020 but the significant pressures are unknown in this water body'.

The Blackwater(Longwood)_010 has been assigned a WFD ecological status as 'Poor'. The assigned status is based upon an assessment of 'Poor' Invertebrate Status or Potential. All other monitored conditions ('supporting chemical conditions') are identified as representing 'Pass', 'Good' or 'High' status; but as per the 'one-out-all-out rule', the overall status assigned is 'Poor'. While the waterbody is 'At Risk', the subcatchment assessment available on cathments.ie notes that 'The significant issues and pressures are unknown in Blackwater (Longwood)_010'.

Table 10-4 below provides an overview of the land use and soil present at the site from GSI and CORINE datasets.

Table 10-4: EPA Land Data

	Land Data
Soil (Teagasc Soils)	Fine loamy drift with limestones. Peat.
Subsoil	Limestone Till (Carboniferous)
CORINE 2018 Land Use	Agricultural Areas, Pastures, Forest and Semi-Natural Areas, Artificial Surfaces, Industrial

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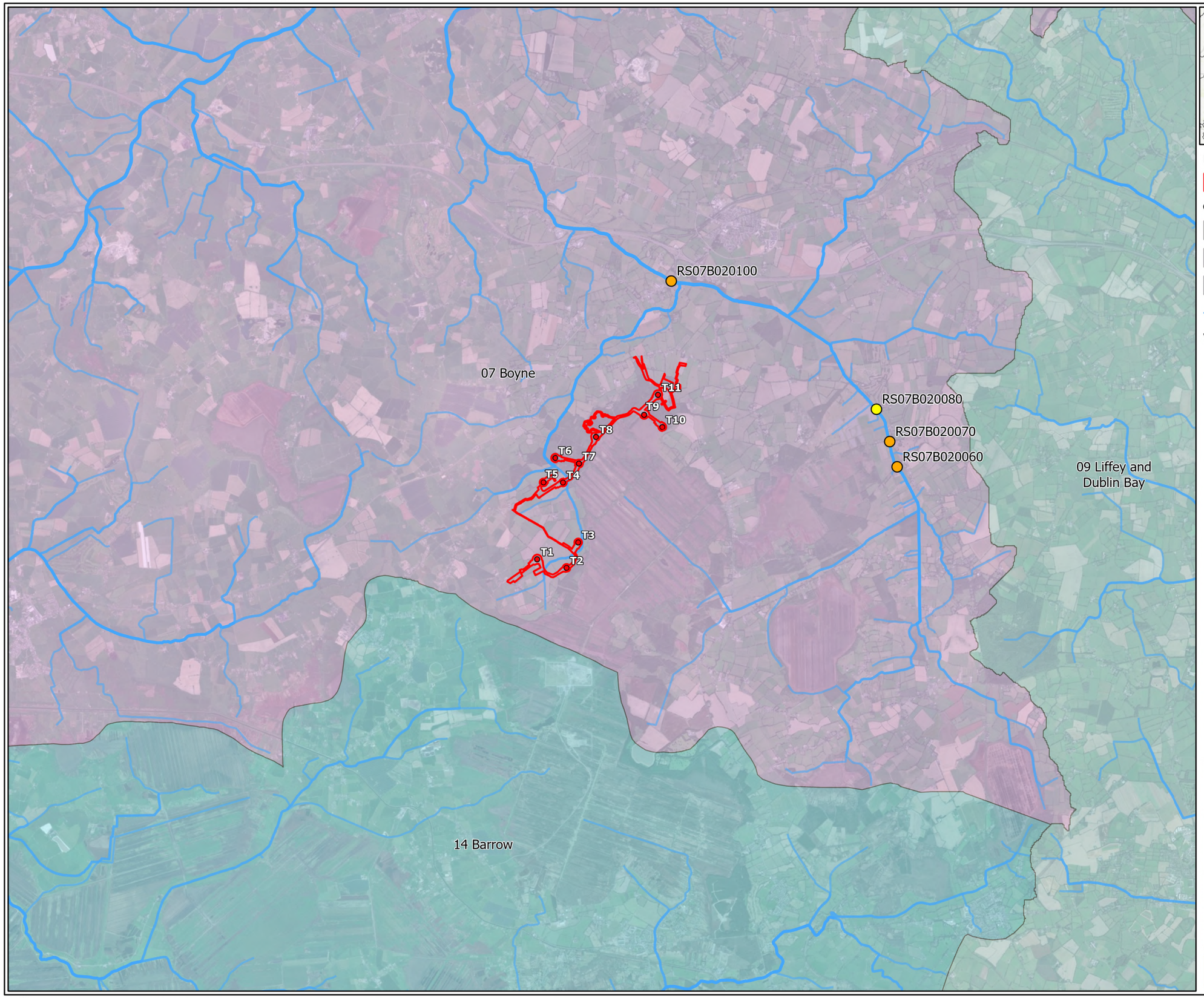

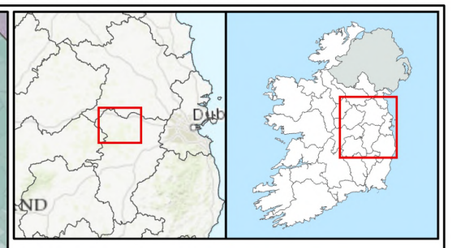

Legend

- Proposed Development Boundary

Catchment Name

- Barrow
- Boyne
- Liffey and Dublin Bay
- Rivers

Water Quality

- Poor
- Unassigned
- Turbine Locations

TITLE:	Waterbody Catchment Map		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	10.3		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:75,000	**REVISION:**	0
DATE:	22/05/2025	**PAGE SIZE:**	A3

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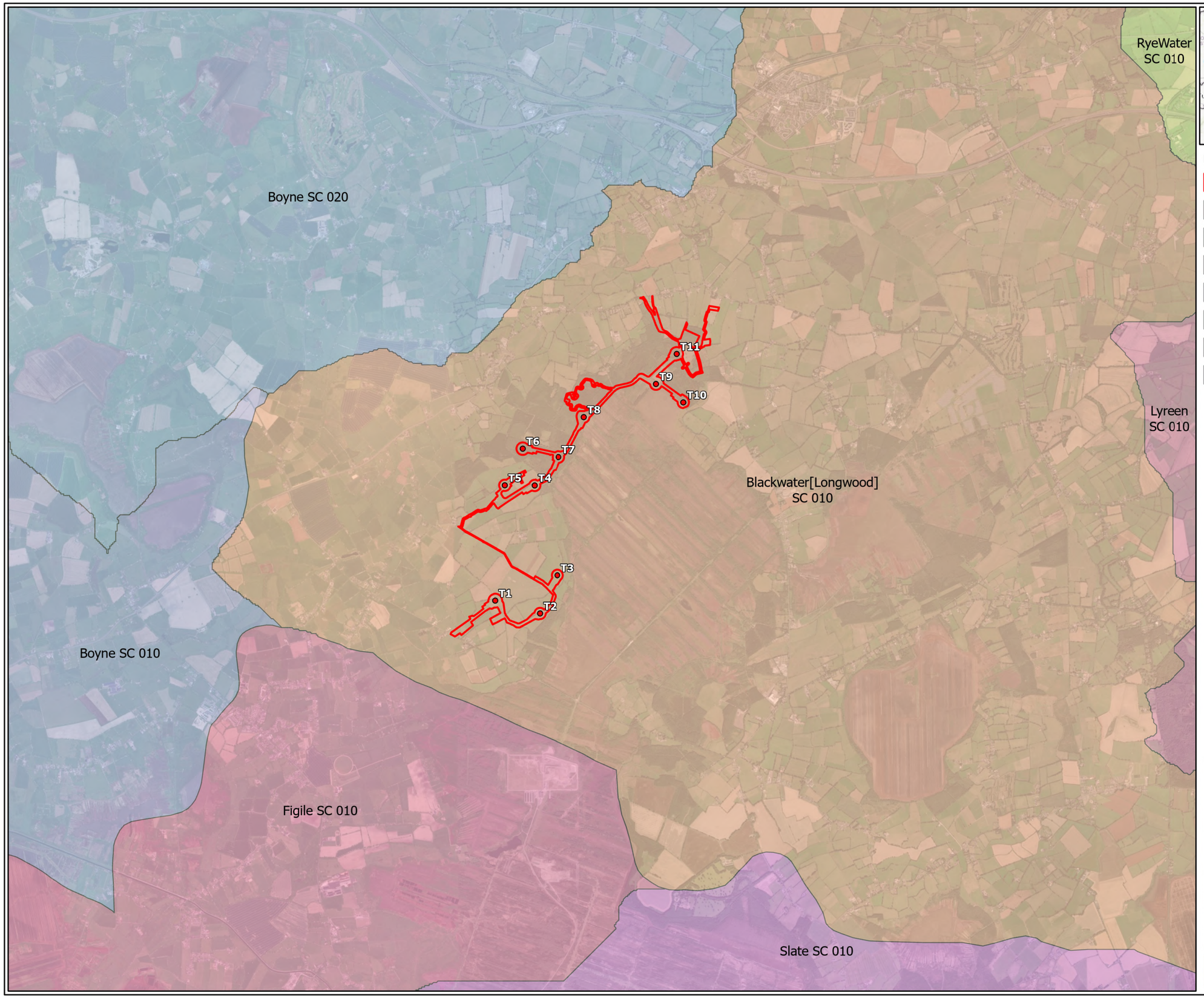

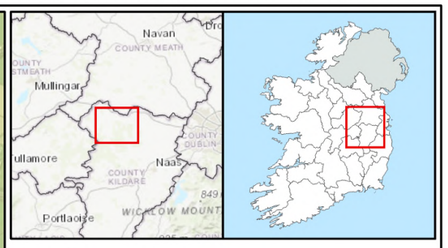

Legend

- Proposed Development Boundary
- 07_16
- 07_4
- 07_6
- 09_3
- 09_9
- 14_16
- 14_3
- Turbine Locations

N
W E
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0 0.5 1 2 Kilometers

TITLE:	Waterbody Sub-Catchments		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	10.4		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:50,000	**REVISION:**	0
DATE:	22/05/2025	**PAGE SIZE:**	A3

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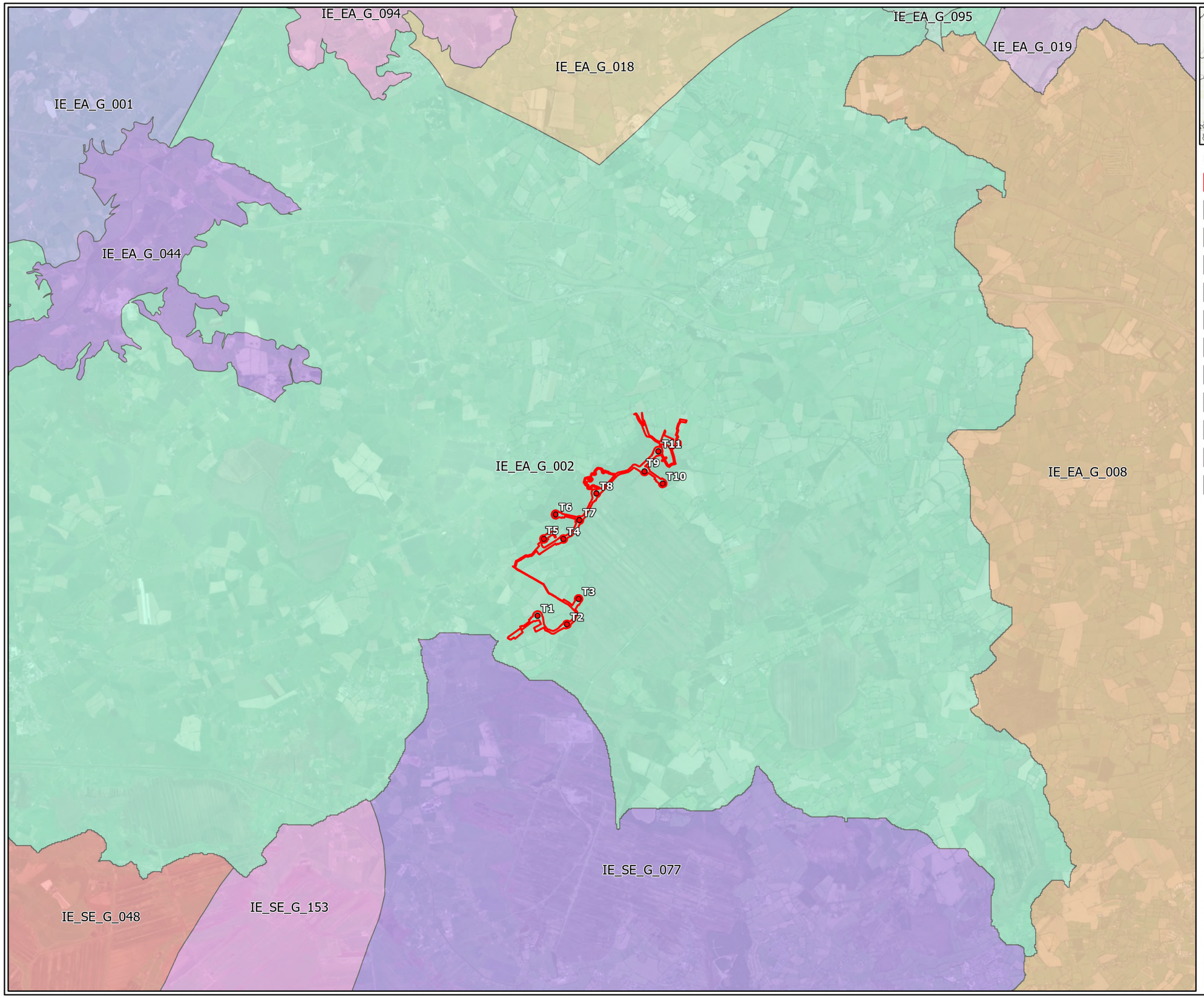

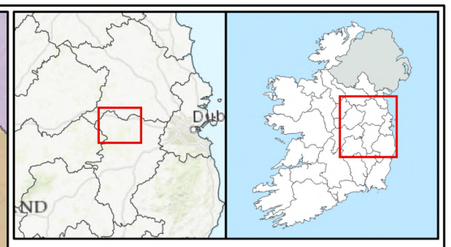

Legend

- Proposed Development Boundary
- IE_EA_G_001
- IE_EA_G_002
- IE_EA_G_008
- IE_EA_G_018
- IE_EA_G_019
- IE_EA_G_044
- IE_EA_G_094
- IE_EA_G_095
- IE_SE_G_048
- IE_SE_G_077
- IE_SE_G_153
- Turbine Locations

TITLE:	Groundwater Bodies		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	10.5		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:75,000	**REVISION:**	0
DATE:	22/05/2025	**PAGE SIZE:**	A3

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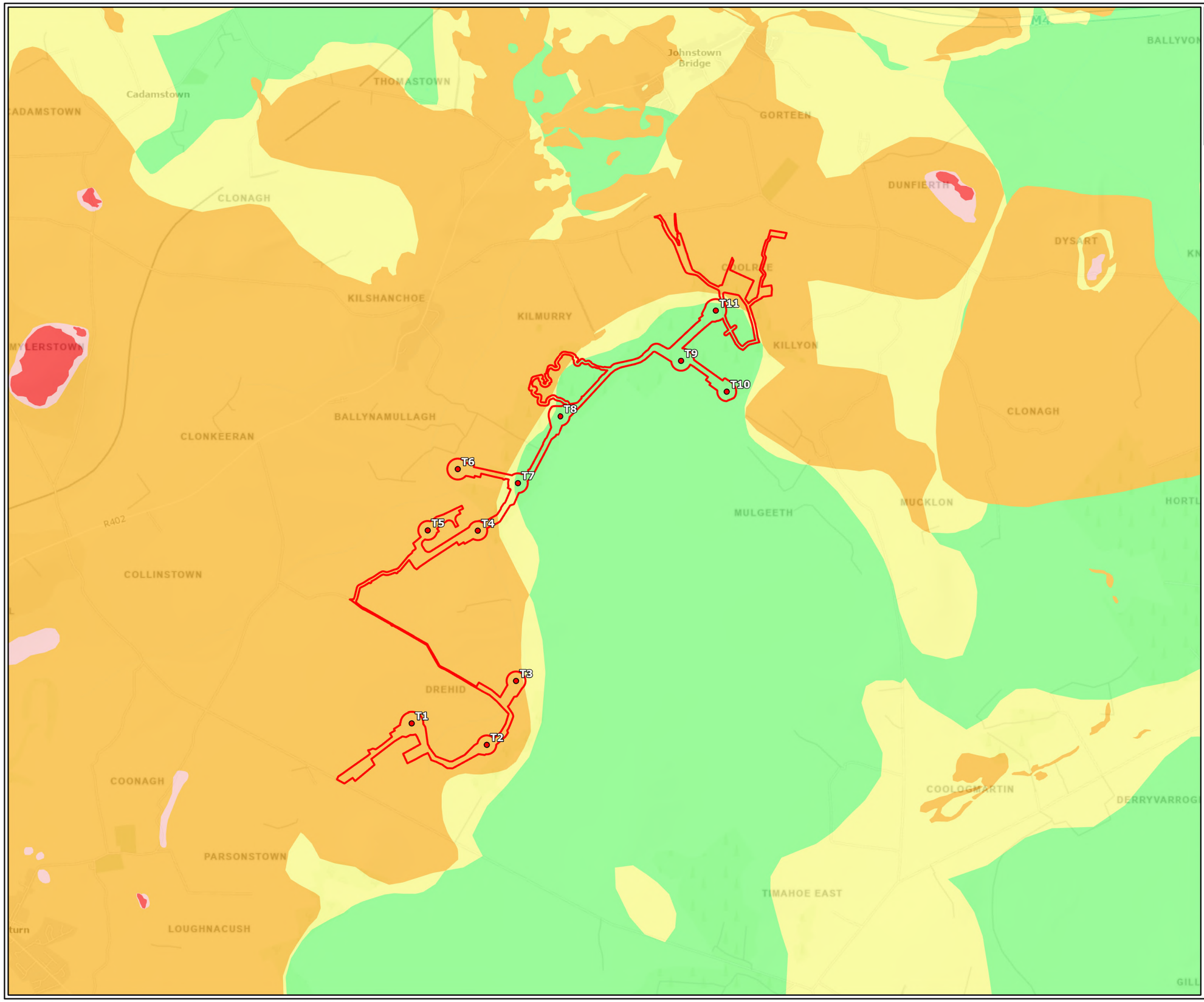

Legend

- Proposed Development Boundary

Groundwater Vulnerability

- E - Extreme
- H - High
- M - Moderate
- L - Low
- X - Rock Near Surface or Karst
- Turbine Locations

N
W E
S

0 0.5 1 2 Kilometers

TITLE: Groundwater Vulnerability			
PROJECT: Drehid Wind Farm and Substation			
FIGURE NO:	10.6		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:30,000	**REVISION:**	0
DATE:	22/05/2025	**PAGE SIZE:**	A3

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10.5.4 Source Protection Zones

A Source Protection Zone (SPZ) (Johnstown well field) was identified using the GSI map viewer at the northern extent of the Proposed Development, with the Proposed Substation and T11 both located within the SPZ.

10.5.5 Topography and Soils

The proposed wind farm site is located in limestone till and peat with a fall to the south west. The high elevation point is approximately 86mOD at the main site entrance and a low point of approximately 79 mOD at the location of T6 (elevations derived from high-resolution data terrain model [DTM] obtained in 2023).

The main soil associations within this part of Co. Kildare are Gleys, Basin Peat and Podzolics. The main underlying quaternary sediments present within the study area are taken from the GSI online mapping and comprise till derived from limestones and cut over raised peat.

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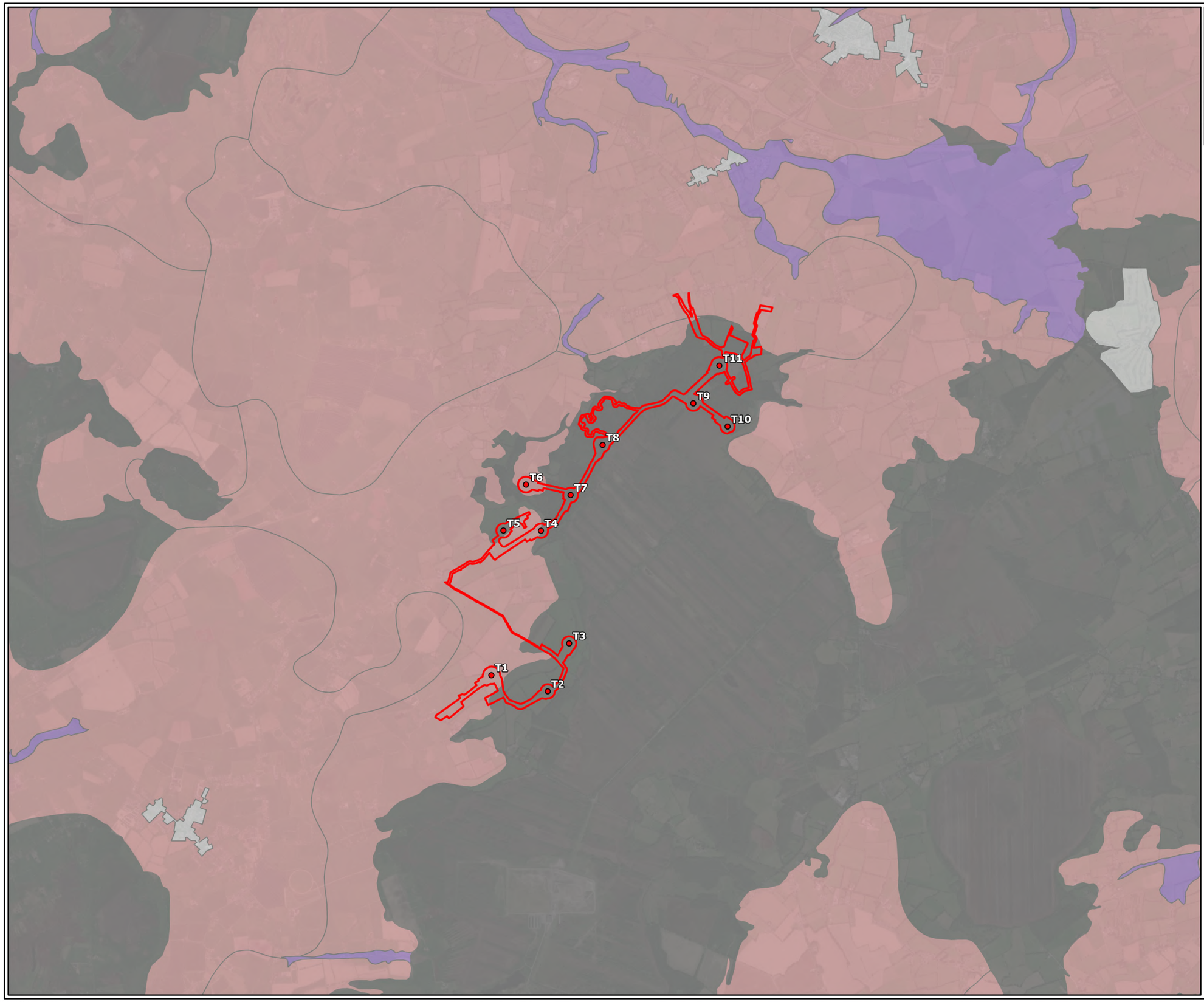

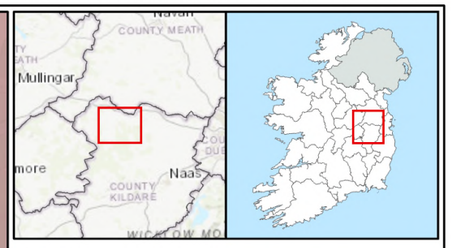

Legend

- Proposed Development Boundary
- Fine loamy drift with limestones
- Peat
- River alluvium
- Urban
- Turbine Locations

N
W E
S

0 0.5 1 2 3 4 Kilometers

TITLE:	Soils Map		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	10.7		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:40,000	**REVISION:**	0
DATE:	22/05/2025	**PAGE SIZE:**	A3

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10.5.6 Rainfall

Rainfall data from Met Éireann was analysed which was recorded at Enfield which is c.3.6 km north of the Site and associated infrastructure, Lullymore Nature Park weather station which is c.8.4 km south of the Site and associated infrastructure and Corbetstown which is c.19 km west of the Site and associated infrastructure.

The rainfall data is presented in Table 10-5 (source https://www.met.ie/climate/available-data/monthly-data).

Table 10-5: Met Eireann Rainfall data

Total rainfall in millimetres for Enfield weather station													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2025	71.4	65.3											
2024	72.2	92.8	93.4	93.1	45.9	41.6	56.3	61.3	44.4	59.5	62.8	57.9	781.2
2023	64.2	20.2	137.2	65.7	23.2	46	187.6	87.4	110.9	127.4	62.3	116.5	1048.6
2022	29.5	129.9	31.7	46	53.4	64	41.2	10.5	122.8	173	92.4	82.4	876.8
2021	101.8	95	40.3	18.4	126.8	19.1	81.5	83.2	46.5	112.7	26.5	104.8	856.6
Total rainfall in millimetres for Lullymore Nature Centre weather station													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2025	92.1	70											
2024	67.7	84.4	84.8	81.2	53.9	48.8	83.2	58.9	54.7	47.8	64.2	55	784.6
2023	71.5	27.4	126	58.5	26.5	42.3	210.5	95.3	109.4	122.6	48.4	99.5	1037.9
2022	32.1	109.8	NA	44.9	56.8	73.7	45.8	19.2	114.5	154.3	101.1	81.4	833.6*
2021	97.6	92	45.5	14.3	109	23.2	69.8	108.6	51.7	106.1	24	102.7	844.5
Total rainfall in millimetres for Corbetstown weather station													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2025	76.2	58.1											
2024	70.5	129.7	92.4	80.5	60.2	53.7	70.6	67.3	49.2	69.6	62.6	83.3	889.6
2023	77.6	28	149.5	74.1	34.5	52.9	184.1	130.4	133.9	118.1	70.6	118.3	1172
2022	41.8	142.5	40	51.6	76.5	84.8	45.7	17.2	127.4	185.6	118.9	97.8	1029.8
2021	118.9	92.1	58.1	26.3	124.7	17.1	63.2	74.6	57.7	99.6	35.7	120.1	888.1

10.5.7 Existing Flooding in the Area

The national flood hazard mapping website, www.floodmaps.ie, indicates records of historical flooding, as can be seen on Image 10-2. Fluvial and pluvial flood extremes (0.1% AEP) are also shown on Image 10-2.

Areas known as 'benefitting lands'[1] as defined in the OPW flood hazard mapping website have been identified. The turbines and the substation, located in areas identified as 'benefitting lands' are the following:

- Turbines T6, T7, T8, T9, T10, and T11
- Substation

Historically these lands were bogland, subject to flooding or poor drainage. From the site walkover undertaken, it was observed that these lands have now been artificially drained by agricultural or forestry drainage or artificial bog drainage, therefore the mapping presented on the OPW website for these zones, while worthy of note, requires updating to reflect the current situation on these lands. The OPW has produced indicative flood mapping to assist with flood risk identification as listed below:

- Preliminary Flood Risk Assessment (PFRA) [no longer available]
- Catchment Flood Risk Assessment and Management (CFRAM)
- National Indicative Fluvial Maps (NIFM)

The PFRA mapping was prepared to inform the CFRAM mapping, and is now considered to be obsolete. The CFRAM mapping targeted a selection of the most important parts of the country for modelling flood extents, but left vast swaths of the country without flood maps. As such, the National Indicative Fluvial Maps were created, which provide indicative mapping for those parts of the country that weren't covered in the CFRAM. Areas that could be subject to pluvial flooding are also covered on the OPW flood maps.

The turbine hard standing, associated tracks and the substation identified by OPW to be within 'benefitting lands' will drain satisfactorily during normal storm events. In an extreme event drainage may be temporarily impeded, with temporary standing water occurring in the swales draining the hardstanding areas and access tracks, however the drainage system will continue to operate as the flood event recedes.

The process for developing the pluvial flood extent maps, prepared by the OPW, was based on 'dropping' various depths and intensities of rainfall over a range of durations, and modelling how that rainfall would flow over the land and, in particular, pond in low-lying areas.

Any recorded incidents within 2.5km downstream of the Proposed Development and any relevant indicative fluvial or pluvial mapping from these sources is discussed below.

Two records of historical flooding, where recurring flood incidents have been recorded within 2.5km downstream of this Proposed Development, are as follows:

- At Newtown to the east of the proposed development where the River Blackwater overflows its banks after heavy rain
- Downstream at Knocknally, to the north, in the flood plain of tributaries of the River Blackwater

[1] A dataset prepared by the Office of Public Works identifying land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945) and indicating areas of land subject to flooding or poor drainage.

The study area is upstream of the area included in the Eastern CFRAMS, however no detailed mapping is currently available in the relevant area. There has been no area for further assessment identified for the area within the Proposed Wind Farm and Substation and therefore it is unlikely that a detailed assessment will need to be undertaken by OPW in this area.

There are three new crossings of the Fear English River proposed along the track from T1 to T2, T2 to T3 and from T4 to T7. The indicative flood mapping does not indicate any flood risk at any of these stream crossings.

The indicative flood zones in the area of T6 are associated with the Fear English River as illustrated on the NIFM flood maps for the area. T6 is located within zones A and B.

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding);
- Flood Zone C –where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas not in Flood Zone A or B.

Figure 10-8 below shows the location of T6 within flood zones A and B.

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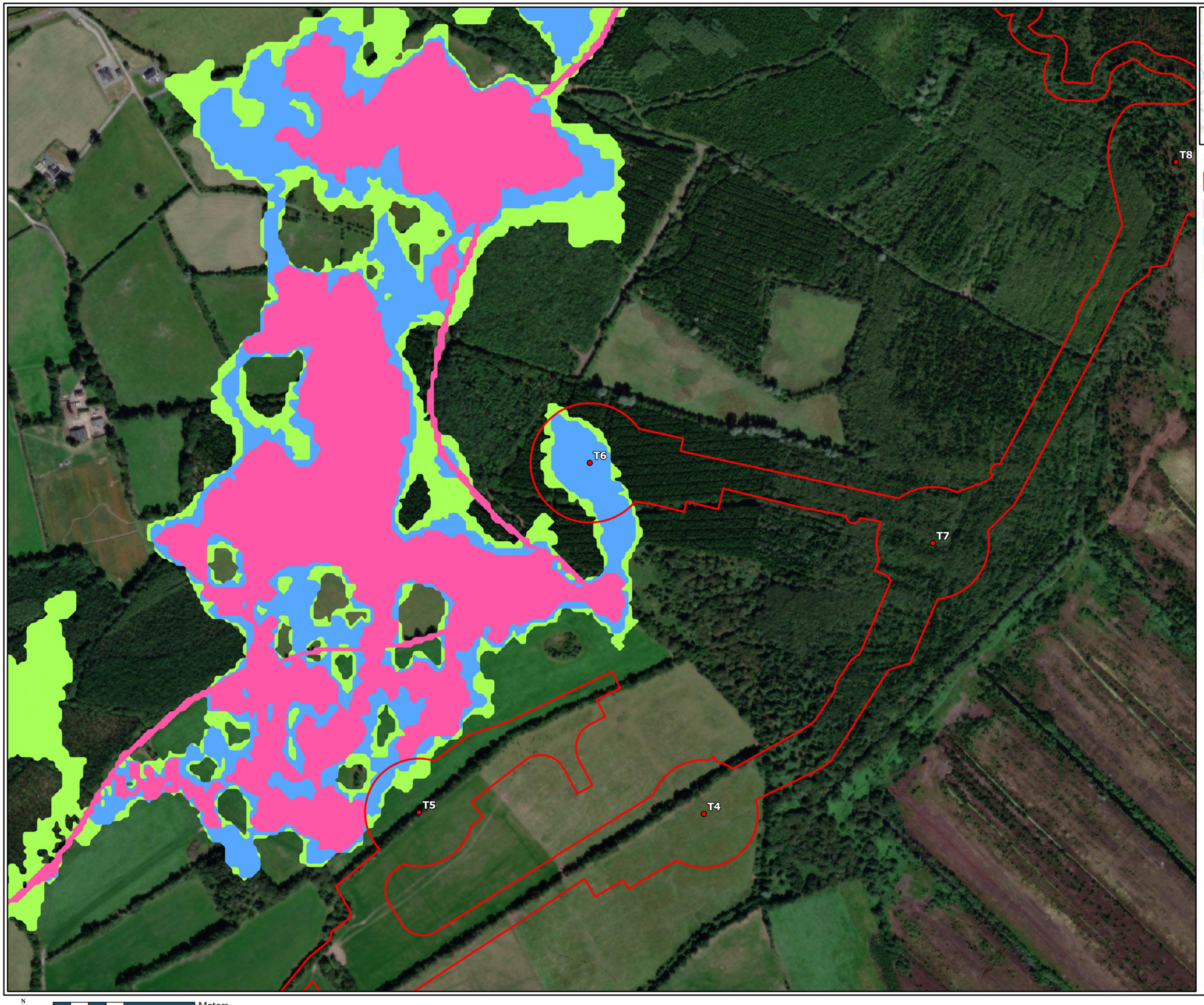

Legend

- Proposed Development Boundary
- Current Scenario - 20 Years
- Current Scenario - 100 Years
- Current Scenario - 1000 Years
- Turbine Locations

N
W E
S

Meters
0 50 100 200

TITLE:	T6 Location Within Flood Zones A and B		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	10.8		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:5,243	**REVISION:**	0
DATE:	22/05/2025	**PAGE SIZE:**	A3

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Due to its location within indicative flood zones, a 2-D flood model was run for the area using HEC-RAS flood modelling software, and a high-resolution data terrain model (DTM) acquired in 2023. The flood model confirmed that flood extents for a 1-in-100 year flood event would extend over the T6 location, as shown in Image 10-2 below:

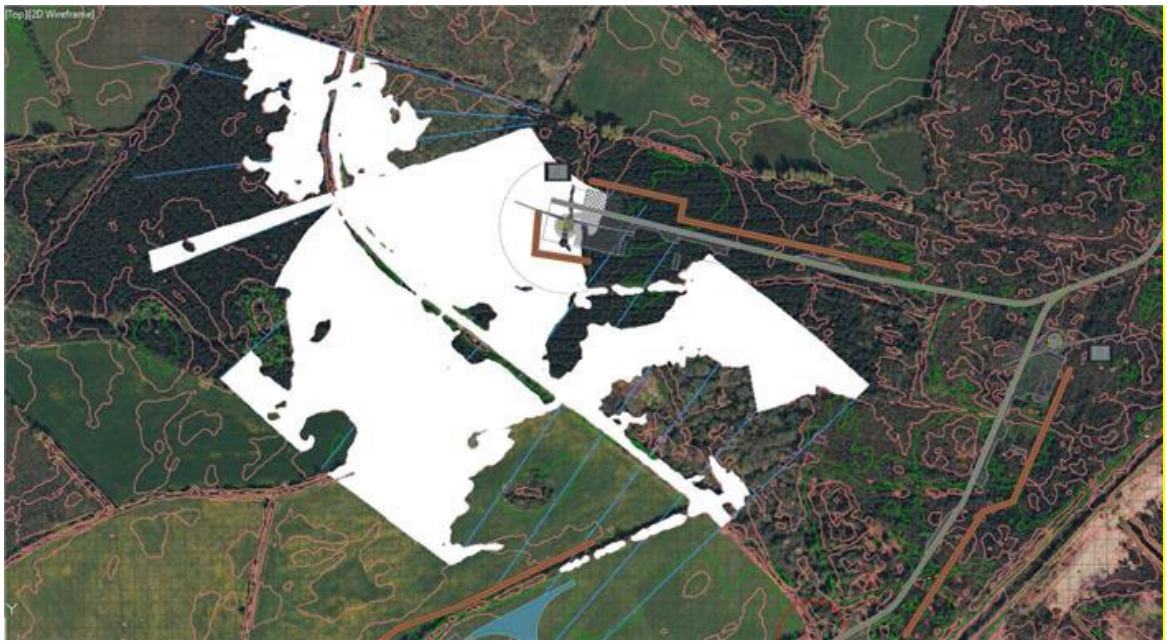


Plate 10-2: HEC-RAS Flood Model

The flood model revealed that the flood level at T6 would be 79.11 mOD; marginally above grade for the existing ground level in the area which is ca. 79 m.

The TDR runs from Junction 9 of the M4 to the site entrance. No significant works except the temporary laying of hardcore at 3 points along public road on the TDR is required, none of which are in areas which have been identified as at risk of flooding on the CFRAM or NIFM maps available on floodinfo.ie.

10.5.8 Existing Site Drainage

The internal site drainage was observed for the Proposed Development, during site walkover surveys to assess the drainage and any hydrological features in the vicinity of the proposed turbines, the Proposed Substation and other site infrastructure.

Observations from the site walkovers on the 10 August 2018 and the 14th and 15th October 2024 do not give rise to any significant concerns.

- T1 is located within agricultural land which is drained by field boundary drainage.
- T2 is located within agricultural land. The area drains to the Fear English River, which runs through the area in a northerly direction.
- T3 is located within agricultural land which drains to the Fear English River running through the area in a northerly direction.
- T4 is located within agricultural land which drains to the Fear English River in an easterly direction.
- T5 is located within agricultural land which is drained by field boundary drainage which ultimately drains the the Fear English River..

- T6 is located within existing forestry which is drained locally by field drainage.
- T7 is located within existing forestry which is drained locally by field drainage.
- T8 is located within forestry and peat lands which is drained by field drainage and a localised pond.
- T9 is located within felled forested area and peat lands which is drained by local forestry drainage.
- T10 is located within forested area and peat lands which is drained by local forestry drainage.
- T11 is located within forested area and peat lands which is drained by local forestry drainage.

The Proposed Substation is located within a forested area and peat lands which is drained locally by forestry drainage, including a large drain on the western boundary of the substation footprint which forms part of the OPW Arterial Drainage Network.

10.5.9 Existing Hardcore Tracks and Surfaced Access Roads

The drainage system for the existing tracks and roads will be retained. During the site walkover it was observed that the existing tracks were approximately 3m wide. It will be required to widen these tracks by 1.5-2m, with some additional local widening at bends. This will involve the re-location of existing roadside swales to allow for widening. Silt traps will be placed in the new roadside swales, upstream of the outfalls, leaving an allowance for a buffer.

Some of the existing piped stream crossings will need to be extended due to the widening of the tracks to 4.5-5m. However, the existing track is locally wider at most of the stream crossings, which will limit the number of modifications required. Where modifications are required, the existing pipe size will be matched for these extensions.

Existing bog, agricultural and forestry drains will be retained along their existing routes and only minor diversions are anticipated to be required to provide for track widening.

10.5.10 Existing Turbine Delivery Route Drainage

The turbine delivery route was examined, and a number of stream crossings were identified along the route, as follows:

- Structure over the River Blackwater at Johnstown Bridge on the R402
- Structure over the Togher River at Thomastown on the R402
- Structure over the Sweep River at Kilshanshoe on the R402
- Structure over the Kilcooney River at Collinstown
- Structure over the Fear English River at the Fear English Bridge at Kildwarden

No works are proposed at the above crossing points.

10.6 PROPOSED DRAINAGE

10.6.1 Drainage Design

Surface water drainage features will be installed as part of the construction phase and retained where required such that they can be used during the decommissioning phase, ensuring that there would be no increase in the risk of surface water flooding to off-site areas during any phase of the Project. Further details of proposed site drainage is included in Appendix 2.1
The drainage strategy within internal areas of the Site will incorporate three main components of Sustainable Drainage Systems (SuDS):

- Interceptor drains;
- Swales; and
- Settlement Ponds

A conceptual plan of the proposed drainage regime is included as Image 10-3 below.

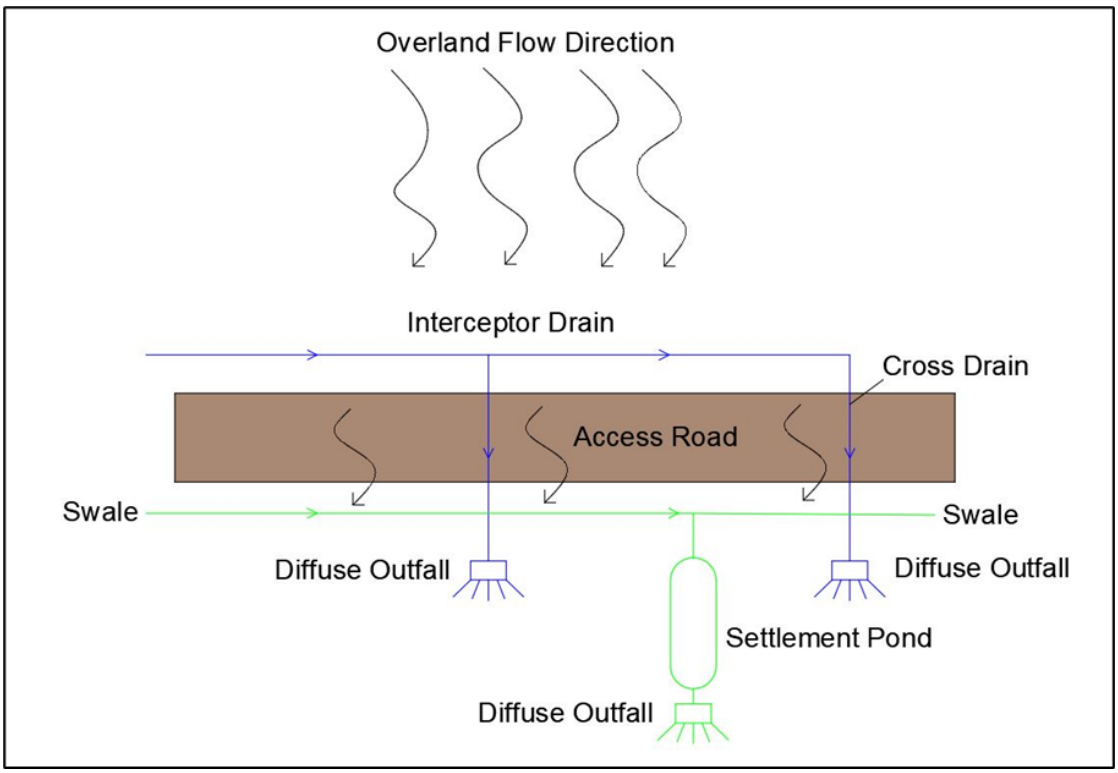


Plate 10-3: Drainage Design Principles

The drainage design has the capacity to introduce hydrological links from the Proposed Development to the receiving environment, during the construction and operational phases. An appropriate drainage design will be the primary mitigation measure for the Proposed Development which will incorporate silt protection control measures and a reduction in the rate of surface water run-off from the Proposed Development. The proposed drainage for the site is set out below. The mitigation measures that follow in Section 9 refer to the drainage design and also include other best practice measures to mitigate any potential impacts from the Proposed Development. Each county has specific concerns in relation to the control of surface water from new developments and the drainage design has taken account of these concerns.

In preparing the preliminary design for the proposed drainage for the site, the policies and objectives of the Kildare County Development Plan were considered as outlined in Section 10.3.2.

The proposed layout of the drainage for the development is shown on planning application drawings P22-242-0100-0002 to P22-242-0100-0006, and at a closer scale in the -0101 series of planning drawings (P22-242-0101-0001 to P22-242-0101-0040). Where possible, existing access roads and tracks have been utilised in the layout design for the Proposed Development to minimise the disturbance to soils.

There are two types of surfaces to be considered on this site in addressing the drainage for the Proposed Development:

1) Existing hardcore tracks and surfaced access roads which will be widened
2) Proposed new site access tracks (all floated) and hard surfaces associated with the construction of turbines

10.6.2 Proposed New Site Access Tracks and Hard Surfaces

Proposed new site access tracks and turbine hard-standing areas will be drained as per the existing drainage system via roadside swales with stilling ponds at the end of the swale run. The stilling ponds will remain in place following construction. The stilling ponds will drain diffusely overland, over existing vegetated areas, within the site boundary. Stilling ponds will be sized to suit the volume and velocity of flows discharged to it.

The swales will be 0.15m in depth with a bottom width of 0.9m and side slopes of 1 in 3. The swales will be constructed in accordance with CIRIA C698 Site Handbook for the Construction of SUDS.

In all it is proposed to construct approximately 9.67 km of completely new track and to utilise approximately 0.95 km of existing track for the Proposed Development. This length will be spread out across the different sub-catchments listed in Section 10.5.2 and will include minor spurs for access to the turbines and the substation.

A minimum buffer of 50m from watercourses has been adopted, where possible for access tracks (this is not possible when an access track is approaching a bridge crossing i.e. the track has to come closer than 50 m from the watercourse in order to cross the bridge over the watercourse). Existing tracks are being widened in their existing locations, which are also more than 50 m from watercourses. The temporary construction compound in the southern part of the site was originally located more that 30 m from the Fear English river, but in order to mitigate against potential impacts on badger setts, the compound had to be located closer to the Fear English River. In order to offset and potential impacts associated with this, the compound has been laid out so that any potentially contaminating sources or activities will be located on the far side of the temporary construction compound. This is explained further in the Section 10.6.5.

The site drains to tributaries of the River Boyne and River Blackwater via artificial drains, streams and larger tributaries. It will be necessary to mitigate any increase in sediment in the surface water running off the site. There is the potential for increased sediment to enter the drains on site due to the disturbance to underlying soils during the construction stage. Silt Protection Controls (SPCs) are proposed at the location of the drain crossings. It is recommended that the SPCs will consist of a minimum of silt traps containing filter stone and filter material staked across the width of the swales and upstream of the outfall to any watercourse. This would be in addition to the measures required in the IFI guidance document, IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters and specific requirements provided by IFI during the consultation process.

A buffer zone will remain between silt traps and watercourses with natural vegetation left intact so as to assist silt interception.

Additional silt fencing will be kept on site and erected as required during construction to prevent the ingress of silt into the watercourses. The silt fencing will be kept in place until the natural vegetation has been re-established.

Site drainage, including silt traps and stilling ponds, will be put in place in parallel with or ahead of construction, such that excavation for new infrastructure will have a functioning drainage system in place.

The existing drainage will be maintained along the sections of the turbine delivery route where modifications will be required. It is not envisaged that any relocation of gullies etc. will be required, as the areas of oversail required for the turbine delivery route will be reinstated when the delivery period is completed.

10.6.3 Proposed Watercourse Crossings

There are 3 no. watercourse crossings required within the Proposed Development site. It is proposed to construct clear span bridges at these locations to minimise the environmental impacts and avoid any instream works. Drawings P22242-0300-0021, P22242-0300-0022 and P22242-0300-0023 illustrate the proposed bridge structures and their locations within the site.

The bridges will be of adequate length and will be designed to ensure that no in-stream works will be required and that the existing stream banks are not disturbed during construction. Sufficient free-board will be allowed for in the proposed bridge designs to allow for 1 in 100-year fluvial flood conditions.

The methods and calculations for sizing are provided in Appendix 10.1 (Preliminary Technical Report for Proposed Bridges and Culverts). The crossings are sized to convey a 1 in 100-year flood with a 20% allowance for climate change, while maintaining a minimum freeboard of 300 mm.

The following methods have been selected for the catchments presented in order to estimate the peak flow of the streams:

- • ADAS Method.
- • Institute of Hydrology Report 124 Method (IoH124).
- • FSSR 6, 3 Variable Method.

In accordance with the consultation responses received from the IFI it is proposed to provide clear spans in place of culverts. To minimise adverse impacts on the fisheries resource, works in rivers, streams and watercourses are generally only permitted to be carried out during the period July-September. However, the specific period for the works at each of the river crossing locations will be reviewed on a site-specific basis with the IFI at detailed design stage.

The IFI has provided detailed specifications on the design of temporary and permanent stream crossings in fisheries sensitive streams. These specifications have been considered in the preparation of the planning drawings and will be followed in the detailed design of the stream crossings.

So as not to interfere in any way with the bed or bank of the watercourse, bridge foundations will be designed and positioned at least 2.5 m from the river bank.

A Section 50 application will be required to obtain the consent of the OPW for the design of the three new stream crossings. This is a separate process to planning consent, with the Section 50 application being progressed after a grant of planning consent for the Proposed Wind Farm and the Proposed Substation. The IFI will be further consulted at the detailed design stage.

Rock armour will be used to provide bank protection upstream and downstream of new structures, to ensure no undercutting or destabilisation of the structure. This rock armour will be at the structure, and will not involve any in-stream works. Silt fencing will be erected at the location of each crossing.

For the construction of the bridge crossings, the following methodology shall apply:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in the CEMP (Appendix 3.2).
- Bank protection will be installed as necessary to ensure that the existing stream banks are not disturbed during construction.
- The line of the access track and crossing will be marked out on site by a site engineer.
- On approach to the crossing, flow connectivity pipe drains will be installed at 50m centres in accordance with the final drainage design.
- The extent of the excavation for bridge supports will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter. Bridge foundations will be designed and positioned at least 2.5 m from the river bank.
- The excavated material will be stored at agreed locations within the site in accordance with the Soil Management Plan.
- A layer of concrete blinding will be laid directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface, followed by placement of the concrete blinding layer for the bridge supports.
- Steel reinforcement will be fixed in accordance with the designer's drawings & schedules and the supports will be shuttered.
- Concrete will be placed and compacted to the levels and profile indicated on the construction drawings.
- Upon completion of the concreting works the bridge supports will be covered from the elements and left to cure for a sufficient period in accordance with the design specification.
- The bridge supports will be backfilled using the material arising during the excavation and landscaped using the top-soil set-aside during the excavation. The suitability of backfill material is to be approved by the project geotechnical engineer.
- Following curing, MY3 pre-cast bridge beam sections will be lifted into place by a crane or HIAB truck in accordance with an approved lifting plan.
- The bridge parapets will be steel-fixed, shuttered and poured to tie in with the pre-cast bridge deck beams and the upper section of the bridge deck will be poured and finished using ST1 concrete.
- Ductwork will be installed within the bridge deck in accordance with the design to carry the grid connection cables across the watercourse.
- A timber post and rail fence will be installed, affixed to the bridge parapets, to run the length of the bridge deck.

10.6.4 Drain Crossings

There are four drain crossings required for the turbine delivery track in the northern portion of the site. These drains are man-made drains and two of these four are part of the OPW arterial drainage network and will be crossed with temporary crossing structures which will provide a clear-span crossing of the drains. The OPW were engaged in pre-application consultations and were made aware of the intention to provide these temporary crossings.

It is expected that all other drain crossings within the site will be crossed using piped culverts. Piped culverts will only be used over very short stretches i.e. at track crossings. Pipe culverts will be sized to take the 1 in 100-year flood flow with a 20% allowance for Climate Change. Concrete or HDPE pipes may be used depending on the size of the drain to be crossed. The locations and sizes of culverts can be found in Appendix 10.1.

Pipe culverts will be installed in accordance with the typical design shown in planning application drawing P22242-0501-0002.

The methods and calculations for sizing are provided in Appendix 10.1 (Preliminary Technical Report for Proposed Bridges and Culverts).

The following methods have been selected for the catchments presented in order to estimate the peak flow of the streams:

- • ADAS Method.
- • Institute of Hydrology Report 124 Method (IoH124).
- • FSSR 6, 3 Variable Method.

For a typical drain crossing using a piped culvert, the following outline methodology will be used.

- The access track construction will finish at least 10 m from the nearside bank of the drain.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of the CEMP in Appendix 3.2.
- Pipe culvert installation will only take place during dry periods.
- The bed of the drain will be prepared using a mechanical digger and hand tools to the required levels in accordance with the design.
- A bedding layer will be laid in the base of the drain using Class 6 aggregate material and blinding to the desired levels in accordance with the design.
- The pipe is laid in one lift or in sections using a crane in accordance with an approved lift plan.
- Bedding material is placed and compacted around the pipe to the desired levels in accordance with the design.
- Culverts will be installed with an invert level 500 mm below the existing drain bed level. The embedded section will be allowed to fill naturally.
- The pipe is covered using compacted Class 6N fill material in accordance with the design up to the levels required by the access track sub formation.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.
- For small drain crossings, pipes of suitable diameter will be laid directly into the bed of the drain.

Minor drains such as manmade agricultural, forestry and bog drains will be crossed using pipes of a sized diameter as calculated in the report presented as Appendix 10.1. All other existing stream and drain crossings will be left in place and extended where required to match the existing structure where it is proposed to widen the road. Existing stream crossings will be protected using silt fencing.

Some drain clearing will be required at existing crossings, where they have become blocked, to maintain the continuity of flows. These existing pipes may need replacing if they are found to be in a collapsed state.

The Proposed Substation is located within a forested area and peat lands which is drained locally by forestry drainage, including a large drain on the western boundary of the substation footprint which forms part of the OPW Arterial Drainage Network. The drain will be culverted with a round culvert as designed in the Preliminary Technical Report for Proposed Bridges and Culverts (Appendix 10.1). The associated calculations are included in the report and demonstrate that the culvert will not have an impact on the capacity of the drain.

10.6.5 Drainage of the Proposed Substation

The substation will be drained by a network of piped stormwater drains to a full retention interceptor. A drainage layout drawing for the substation is presented as planning drawing 23727 MWP 00 00 DR C 2100.

The access tracks approaching the substation will be drained by a network of swales and stilling ponds.

A Source Protection Zone (SPZ) (Johnstown well field) was identified at the substation location. The substation is located in the Inner Source Protection Zone. The Inner Source Protection Zone is differentiated from the Outer Source Protection Zone as a zone for the protection of groundwater against microbial pollution (e.g. from septic tanks). However, there will be no microbial source of pollution from the Proposed Substation.

Nevertheless, the SPZ will need to be protected from the potentially polluting elements of the Proposed Substation. Any diesel or fuel oils stored at the substation will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel and oil tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines). A full retention interceptor and spillage tank will be provided as an additional measure of protection, and will capture any potential pollutants found in the stormwater drainage which drains the roofs of the substation buildings and the parking spaces.

The proposed drainage layout is shown on planning drawing 23727-MWP-00-00-DR-C-2100.

Permanent sanitary facilities will be provided at the substation, and foul water will be held in a holding tank as shown in 23727-MWP-00-00-DR-C-2100 and detailed in 23727-MWP-SS-ZZ-DR-C-2400. As the proposed substation would be infrequently manned a wastewater treatment plant or septic tank would not be deemed necessary, and a septic tank would not be appropriate due to the location of the substation within an inner SPZ. Therefore, given its location within the SPZ, a holding tank was deemed to be the most appropriate system to use. A holding tank will be provided and serviced under contract by a licensed contractor.

10.6.6 Drainage of Temporary Site Compound

The proposed locations of temporary site compounds within the wind farm are as shown in Figure 3.3 in Chapter 3 of this EIAR. There are two temporary compounds one at the south and one at the north of the site. The temporary compound in the northern portion of the site will be set back a minimum of 50 m from watercourses.

The temporary construction compound in the southern portion of the site will be located approximately 15 m from the Fear English River at its closest point. This compound was previously located a minimum of 30 m from the Fear English River but has been relocated in order to mitigate potential impacts on badger using the field drain on the northern boundary of the field in which the compound is to be situated. It is understood that, on balance, the potential impacts to the Fear English River by locating the compound closer to it will be lower than the potential impacts associated with locating the compound in close proximity to the drains being used by badger. The format of the compound has been optimised so that the corner closest to the Fear English River will contain the minimal risk components, with riskier components such as fuel storage situated on the far corner of the compound, in excess of the 50 m set back distance applied as a standard on this project.

The temporary site compounds will drain to shallow grassed swales at the perimeter of the hard-standing areas, to minimize the disturbance to sub-soils. Filter drains may be used where trafficking by site staff is required to access the temporary site compounds. The filter drains/swales will drain to a stilling pond. The proposed drainage is included in the planning drawings for the temporary construction compounds (P22-242-0300-0019 and P22-242-0300-0020). The stilling pond will be backfilled following the construction period and the vacation of the temporary site compound.

Refuelling of plant during construction will be carried out at a number of dedicated refuelling station locations on site, typically at each compound or at least 100m from a watercourse using mobile bowsers. Each station will be fully equipped with a spill kit to activate a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site.

A designated concrete wash-down area will be used. Every concrete truck delivering concrete to the site must use this facility prior to leaving the site. A settlement lagoon will be provided to receive all run-off from the concrete wash down area.

Any diesel or oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines).

It is proposed to use portaloos and/or containerised toilets and welfare units with storage tanks to provide toilet facilities for site personnel during construction.

The sanitary waste will be removed from site by a licensed waste disposal contractor. All portaloo units located on site during the construction phase will be operated and maintained in accordance with the manufacturer's instructions and will be serviced under contract with the supplier. All such units will be removed off-site following completion of the construction phase.

Temporary petrol and oil interceptors will be installed at the site compound and at all locations dedicated for plant repairs/storage of fuel/temporary generator installation. Surface water run-off from the compound will be directed through a Class 1 Bypass Separator before discharge to the potential silt laden water drainage system for the site (see detail drawing P22-242-0501-0006). This dirty water flows to a stilling pond before final discharge over land.

A trained and dedicated environmental and fuel spill emergency response team will be set up on site before commencement of construction on-site.

10.6.7 Drainage of Excavated Material

There are no proposed borrow pits located within the Proposed Development site.

During the construction period, suitable excavated material will be used as ballast to reinstate the turbine bases. A number of berms will also be created around turbine hardstandings and parallel to the access tracks. These berms will be created from suitable excavated material and are located on the opposite side of infrastructure to any interceptor drains. The berms will therefore not obstruct flow or risk siltation to interceptor drains. Berms will be placed outside the roadside drains which drain the new access tracks. Silt fencing will be erected to further protect streams, where required. The stilling ponds will remain in place until the reinstated areas have attained satisfactory re-vegetation.

All excavations shall be constructed and backfilled as quickly as possible. Excavations will not be undertaken during heavy rainfall events.

Excavation will precede the turbine base construction, cable trench and access track construction. Soil will be excavated and replaced with granular fill where required. Excavation will be carried out from access roads where possible in order to reduce the compaction of topsoil.

During the construction period, spoil heaps from the excavations for the turbine bases will be stored temporarily. All stockpile material will be bunded adequately and protected from heavy rainfall to reduce silt run-off.

Surplus soil or rock excavated during the course of the works will be used on site in the form of landscaping including low berms. Material will only be stockpiled on the site where there will be immediate backfilling of the excavation with the excavated material e.g. cable laying or material will be stockpiled temporarily. These spoil heaps will be covered and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. It should be noted that any stockpiling will be short-term and temporary and will occur only within the site boundary as the construction proceeds.

The site drainage system will be put in place prior to excavation, therefore the discharge routes from any temporary stockpiling will be via the site drainage system as detailed in the planning drawings.

A minimum buffer of 50m will be provided between temporary stockpiles and the nearest watercourse. There will be no permanent or long-term stockpiling of material on the site.

Reinstated areas and berms will by preference re-vegetate naturally, and further measures will be undertaken, in the form of erosion control matting for example if deemed to be required.

10.6.8 Proposed Drainage of Turbine 6

To mitigate against the potential for flood events impacting on the T6 turbine as outlined in Section 10.7 below, the ground will be raised locally at the T6 location, so that the turbine foundation and hardstanding has a finished level that is at least 300 mm above the modelled flood level. The finished level of the hardstanding will be 79.5 mOD as can be seen on P22-242-0300-0006, which exceeds the 300 mm above the modelled flood level.

Raising the ground locally to elevate the T6 foundation and hardstanding will displace a volume from the flood capacity in the area, and therefore flood “compensation” must be provided to return the flood capacity to the same as pre-development. This will be achieved by providing a “flood compensation area” immediately adjacent to the T6 hardstanding, as shown on planning drawing P22-242-0101-0033.

The flood compensation area will comprise a depression in the local ground, excavated to 1.5 m below existing ground level, to cover an area as shown in the planning drawing P22-242-0101-0033 which will provide a compensation of flood capacity to cancel the volume displaced by raising the T6 foundation and hardstanding. The result of this is that flood extents in the local area are unchanged for a given flood event, as the capacity for the land to absorb flood water remains the same post-development.

There are no other turbines located within the indicative floodplain i.e. 'Flood Zone A' of 'Flood Zone B', as shown in Figure 10-8. The Proposed Substation is not located in the indicative floodplain either. This is a result of avoidance by design which aimed to locate the site infrastructure outside of flood zones. In addition, all seals on turbine towers will be designed and built to ensure no water ingress to the tower; the ducts in the foundation will be sealed to ensure no ingress of water; and the foundation will be designed and built to take account that the foundations could be exposed to water. There is no flood risk therefore to the turbines during a flood event.

There will be no appreciable obstruction to flood flows in the floodplain as a result of new access roads and turbine hardstanding areas, which have been located outside of floodplain area.

10.7 FLOOD RISK IDENTIFICATION AND ASSESSMENT

10.7.1 Methodology

National Planning Policy

The Planning System and Flood Risk Management Guidelines for Planning Authorities (PSFRM Guidelines) was published in 2009 by the Office for Public Works (OPW). These outline the core objectives for the management of flood risk, including those for new planning applications. Flood risk is defined as a combination of two components:

- The likelihood/probability of flooding; and
- The consequences of flooding.

The PSFRM Guidelines divide geographical areas into three flood zones based on the probability of flooding:

- Zone A (High Risk): a probability of greater than 1 in 100 (1% Annual Exceedance Probability) for river flooding or 1 in 200 (0.5% AEP) for coastal flooding;
- Zone B (Moderate Risk): a probability of between 1 in 1000 and 1 in 120 (0.1% - 1.0% AEP) for river flooding and 1 in 1200 and 1 in 200 (0.1% - 0.5% AEP) for coastal flooding; and
- Zone C (Low Risk): a probability of less than 1 in 1000 (0.1% AEP) for both river and coastal flooding.

The PSFRM Guidelines are based on a 'sequential' approach to ensure that new development is directed towards land at a low risk of flooding. If a Proposed Development lies within a higher risk area, appropriate justification is required and measures for mitigating the flood risk are to be identified via the Justification Test. The consequences of flooding depend on the hazards caused by flooding (e.g. depth of water, speed of flow, rate of onset and water quality) and the vulnerability of the receptor. Table 3.1 of the Guidelines, reproduced as Table 10-6 below, outlines the three vulnerability classifications and examples of the types of development included.

Table 10-6: Vulnerability Class and Development Types

Vulnerability Class	Example Land Use and Types of Development
Highly Vulnerable Development (including Essential Infrastructure)	• Garda, ambulance and fire stations and command centres required to be operational during flooding; • Hospitals; • Dwellings, student halls of residence, hostels, residential institutions (care homes, children's homes and social services homes), dwellings designed/constructed/adapted for the elderly or people with impaired mobility; • Caravans and mobile home parks; • Essential infrastructure including primary transport and utilities distribution, electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution in the event of flooding.
Less Vulnerable Development	• Buildings used for retail, leisure, warehousing, commercial, industrial and non-residential institutions • Land and buildings used for holiday or short-let caravans and camping (subject to specific warning and evacuation plans) • Land and buildings used for agriculture and forestry • Waste treatment (except landfill and hazardous waste) • Mineral working and processing • Local transport infrastructure
Water-Compatible Development	• Flood control infrastructure • Docks, marinas and wharves • Water-based recreation and tourism • Amenity open space, outdoor sports and recreation and essential facilities

Table 3.2 of the Guidelines, reproduced in Table 10-7 below, states what types of development would be appropriate within each Flood Zone and those that would be required to meet the criteria of the Justification Test.

Table 10-7: Appropriate Development within Flood Zones

Vulnerability	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable development (Including Essential Infrastructure)	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-Compatible Development	Appropriate	Appropriate	Appropriate

Essential Infrastructure is defined in Table 3.1 of The Planning System and Flood Risk Management Guidelines for Planning Authorities as "Primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO site, IPPC sites, etc.) in the event of flooding". The Proposed Substation in this development therefore comes under the category of 'Essential Infrastructure'. The turbines themselves are largely considered to be water compatible.

The subject lands have been designated for wind farm development in the Kildare County Development Plan and it is considered that the Proposed Development therefore complies with Item no. 1 of Box 5.1 of the FRMP Guidelines.

The OPW published the Flood Risk Management Climate Change Sectoral Adoption Plan for Flood Risk Management in 2015 (updated in 2022) and provides information on the potential changes in flood hazard as a result of climate change. The Plan outlines two potential future scenarios:

- Mid-Range Future Scenario (MRFS) -typical or near to the general average of future climate projections; and
- High-End Future Scenario (HEFS) - a more extreme future based on the upper end of the range of projections of future climatic conditions.

Table 5-1 of the Plan (reproduced as Table 10-8 below) shows the changes to flood-related parameters under both scenarios.

Table 10-8: Allowances Flood Parameters for Mid-Range and High-End Future Scenarios

Vulnerability	Mid-Range Future Scenario	High-End Future Scenario
Extreme Rainfall Depths	+20%	+30%
Peak Flood Flows	+20%	+30%
Mean Sea Level Rise	+500mm	+1200

A series of flood maps were produced in 2015 as part of the National Catchment based Flood Risk Assessment and Management (CFRAM) program. The mapping shows the extent of fluvial and coastal flooding in the present-day scenario, and the Mid-Range and High-End future scenarios.

A further series of flood maps were produced in 2019 as part of the National Indicative Fluvial Mapping (NIFM) project. The mapping extends to areas not covered by the 2015 CFRAM program and includes the present-day scenario, and the Mid-Range and High-End future scenarios.

Local Planning Policy

The Strategic Flood Risk Assessment for Kildare County Development Plan 2023-2029 (SFRA) (RPS, 2023) provides a broad assessment of all types of flood risk to inform strategic land-use planning decisions within County Kildare. The SFRA contains flood mapping, a Flood Risk Management Plan, and advice on zoning and land use proposals within settlements.

10.7.2 Predicted Flood Risk in the Area

There are 'benefitting lands' identified at the site, as well as some indicative flood extents.

PFRA mapping was prepared to inform CFRAM mapping, and PFRA is now considered to be obsolete. The CFRAM mapping targeted a selection of the most important parts of the country for modelling flood extents, but left vast swaths of the country without flood maps. As such, the National Indicative Fluvial Maps (NIFM) were created, which provide indicative mapping for those parts of the country that weren't covered in the CFRAM. Areas that could be subject to pluvial flooding are also covered on the OPW flood maps.

The study area is upstream of the area included in the Eastern CFRAM Study. There have been no Areas for Further Assessment (AFAs) identified for the area within or in the vicinity of the site and therefore it is unlikely that a detailed assessment will be undertaken by OPW in this area.

Turbine T6 is located within Flood Zone A and B as shown in Figure 10-8.

The substation is not located in a 'Flood Zone A' and 'Flood Zone B' area and not at high risk of flooding from rivers.

10.7.3 Historic Flood Events in the Area

Two records of historical flooding, where recurring flood incidents have been recorded within 2.5km downstream of the site, are as follows:

- At Thomastown to the west of the site, where the stream overflows its banks after significant rain
- Downstream at Knocknally, to the north of the site, in the flood plain of tributaries of the River Blackwater

10.7.4 Flood Zones

Turbine T6 is located within Flood Zone A and B according to the NIFM mapping. Due to its location within indicative flood zones, a 2-D flood model was run for the area using HEC-RAS flood modelling software, and a high-resolution data terrain model (DTM) acquired in 2023. The flood model confirmed that flood extents for a 1-in-100 year flood event would extend over the T6 location, as shown in Image 10-2 below:

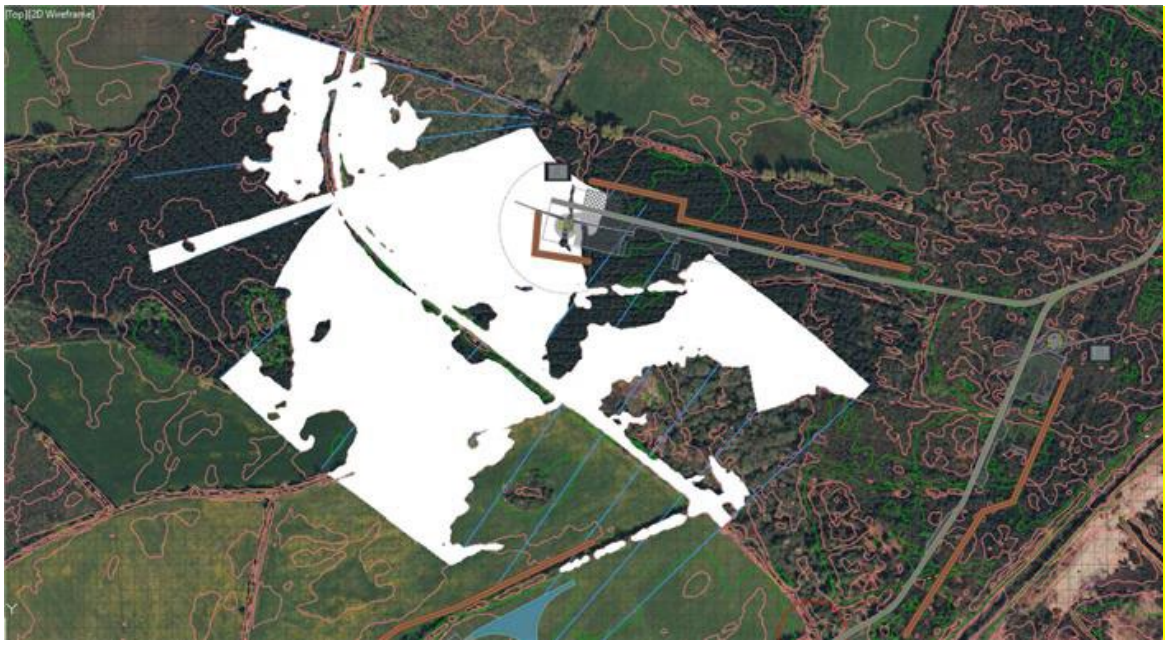


Plate 10-4: HEC-RAS Flood Model

A 2-D flood model was run to check the flood extent, and it was confirmed that T6 sits within the flood extent.

The flood model revealed that the flood level at T6 would be 79.11 mOD; marginally above grade for the existing ground level in the area which is ca. 79 m.

The TDR runs from Junction 9 of the M4 to the site entrance. No significant works except the temporary laying of hardcore at 3 points along public road on the TDR is required, none of which are in areas which have been identified as at risk of flooding on the CFRAM or NIFM maps available on floodinfo.ie.

10.7.5 Flood Mitigation

To mitigate against the potential for flood events impacting on the T6 turbine as outlined in Section 10.7 below, the ground will be raised locally at the T6 location, so that the turbine foundation and hardstanding has a finished level that is at least 300 mm above the modelled flood level. The finished level of the hardstanding will be 79.5 mOD as can be seen on P22-242-0300-0006, which exceeds the 300 mm above the modelled flood level.

Raising the ground locally to elevate the T6 foundation and hardstanding will displace a volume from the flood capacity in the area, and therefore flood "compensation" must be provided to return the flood capacity to the same as pre-development. This will be achieved by providing a "flood compensation area" immediately adjacent to the T6 hardstanding, as shown on planning drawing P22-242-0101-0033. The flood compensation area will comprise a depression in the local ground, excavated to 1.5 m below existing ground level, to cover an area as shown in the planning drawing P22-242-0101-0033 which will provide a compensation of flood capacity to cancel the volume displaced by raising the T6 foundation and hardstanding. The result of this is that flood extents in the local area are unchanged for a given flood event, as the capacity for the land to absorb flood water remains the same post-development.

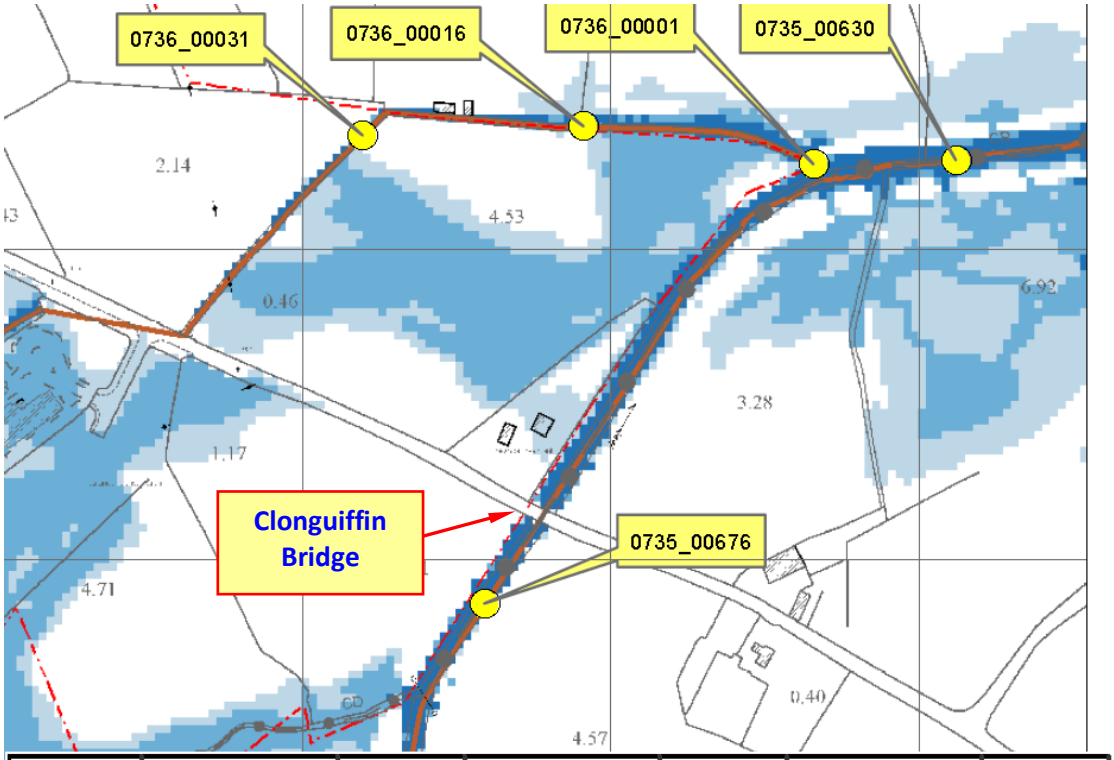
10.7.6 Estimated Increase in Flood Risk

A predictive assessment was carried out on the structures downstream of the initially proposed development to determine if the proposed development could increase flood risk elsewhere. In this regard the following area was examined.

- River Blackwater crossing of a local road at Clonguiffin to the south east of Longwood

The Eastern Catchment Flood Risk and Management Study (CFRAMS) has been undertaken by the OPW and the final version of the flood maps were issued in June 2016. Flood risk extent and depth maps for further assessment areas within Longwood village have also been produced. OPW CFRAMS predictive flood map number E07LON_EXFCD_F2_02 illustrates predictive extreme fluvial flood extent zones associated with the River Blackwater in the vicinity of Clonguiffin Bridge, located at ITM coordinates 672092, 745252, approximately 8.4 km northwest of the Proposed Development site.

Image 10-4 below (extracted from CFRAMS flood map E07LON_EXFCD_F2_02), illustrates the predicted extreme 10% AEP (1 in 10 year), 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) fluvial flood extents in the vicinity of Clonguiffin Bridge.



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
0735_00676	65.16	29.86	65.48	38.95	65.70	44.99

Plate 10-5: Extract from the CFRAM Study Flood Extent Map

The CFRAMS flood map also provides information on predicted flood levels and flood volumes for 10% AEP, 1% AEP and 0.1% AEP fluvial flood events at various node points along the River Blackwater. As illustrated in Figure 10-10 above, the node point closest to the proposed development site is referenced as node point 0735_00676 (13.25km by hydraulic link to the site).

Details of the predicted extreme fluvial flood levels and flood volumes for this CFRAMS node point is listed in Table 10-11 below, which has been extracted from CFRAMS flood map reference E07LON_EXFCD_F2_02. The table is a direct copy of the CFRAM table above, which shows water level and flow at Clonguiffin Bridge for three potential scenarios (10%, 1% and 0.1% AEP). This data will be used for the calculations below.

Table 10-9: CFRAMS Fluvial Map – Predicted Flood Volumes and Levels

Node Label	Flood Level (mOD) 10% AEP	Flow (m3/s) 10% AEP	Flood Level (mOD) 1% AEP	Flow (m3/s) 1% AEP	Flood Level (mOD) 0.1% AEP	Flow (m3/s) 0.1% AEP
0735_00676	65.16	29.86	65.48	38.95	65.70	44.99

10.7.6.1 Climate Change

It is generally acknowledged that future climate change will cumulate in decreases in summer rainfall amounts and increases in winter rainfall amounts. The levels or percentages of increase or decrease are still subjective and dependant on future studies and analysis.

The Greater Dublin Strategic Drainage Study (GDSDS) suggests that by the year 2100 summer rainfall depths will have decreased by 35-45%, with a corresponding increase in winter rainfall depths by 20%. The suggested increases in winter rainfall depth will inevitably result in higher catchment run-off and therefore greater flood peaks. It is therefore prudent to include a climate change factor in any estimation of flood peak volumes. In this instance a 20% increase in estimated flood peaks is provided for in this assessment.

Therefore, the 100-year and 1000-year flood peak flows taken from the Eastern CFRAMS has been increased to reflect the climate change factor:

$\Rightarrow Q_{100}$ = 38.95 m^3/s

$\Rightarrow$ ***Design Q_{100} = 38.95 x 1.20 = 46.74 m^3/s***

$\Rightarrow Q_{1000}$ = 44.99 m^3/s

$\Rightarrow$ ***Design Q_{1000} = 44.99 x 1.20 = 53.99 m^3/s***

10.7.6.2 Additional Runoff

The additional flow due the proposed works was estimated using the Modified Rational Method equation listed below:

Q = 2.78 x (Rainfall Intensity) x (Contributing Impervious Area) x (Impermeability Factor)

Where:

- Rainfall Intensity = 53.2 mm for a 1-in-100 year event, and 77.40 for a 1-in-1000 year event (from Met Eireann [Rainfall Return Period])
- Additional Contributing Impervious Area = 6.87 hectares for the Proposed Wind Farm, 3.52 hectares for the Proposed Substation
- Impermeability Factor = 0.75

Therefore, for the Proposed Wind Farm for a 1-in-100 year event:

Q = 2.78 x 53.2 x 6.87 x 0.75 = 762.03 m3/hr
Q = 0.21 m3/s

For the Proposed Substation for a 1-in-100 year event:

Q = 2.78 x 53.2 x 3.52 x 0.75 = 390.45 m3/hr
Q = 0.11 m3/s

Table 10-10: Increase in flow at Clonguiffin Bridge for the 1-in-100 year event (1% AEP)

	Existing flow (m3/s)	Plus allowance for climate change (x 1.2)	Increase in flow due to development (m3/s)	New flow (m3/s)
Existing Scenario	38.95	46.74	0.00	46.74
Proposed Wind Farm	38.95	46.74	0.21	46.95
Proposed Substation	38.95	46.74	0.11	46.85
Proposed Development	38.95	46.74	0.32	47.06

For the Proposed Wind Farm for a 1-in-1000 year event (0.1% AEP):

Q = 2.78 x 77.4 x 6.87 x 0.75 = 1108.7 m3/hr
Q = 0.31 m3/s

For the Proposed Substation for a 1-in-1000 year event (0.1% AEP):

Q = 2.78 x 77.4 x 3.52 x 0.75 = 568.05 m3/hr
Q = 0.16 m3/s

Table 10-11: Increase in flow at Clonguiffin Bridge for the 1-in-1000 year event (0.1% AEP)

	Existing flow (m3/s)	Plus allowance for climate change (x 1.2)	Increase in flow due to development (m3/s)	New flow (m3/s)
Existing Scenario	44.99	53.99	0.00	53.99
Proposed Wind Farm	44.99	53.99	0.31	54.30
Proposed Substation	44.99	53.99	0.16	54.15
Proposed Development	44.99	53.99	0.47	54.45

10.7.6.3 Hydraulic Analysis of the Clonguiffin Bridge

The Clonguiffin Bridge passes over the River Blackwater which flows as an open watercourse in the vicinity of the bridge.

A hydraulic model was developed for the Clonguiffin Bridge, using an upstream and downstream river cross section, along a short channel reach length of approximately 12.43m. The purpose of developing a hydraulic model is to estimate extreme flood water levels at specific locations along the modelled reach.

Plate 10-6: River Blackwater looking Upstream

10.7.6.4 Hydraulic Model Simulation Results

Table 10-12 below summarises the predicted 100-year (1% AEP) and 1000-year (0.1% AEP) flood levels upstream and downstream of the Clonguiffin Bridge for the existing and proposed scenarios.

Table 10-12: Predicted 1% and 0.1% AEP Flood Levels

		1 in 100 Year (1% AEP) Existing Scenario	1 in 100 Year (1% AEP) Proposed Scenario	1 in 1000 Year (0.1% AEP) Existing Scenario	1 in 1000 Year (0.1% AEP) Proposed Scenario
Proposed Wind Farm	Upstream	103.08	103.09	103.30	103.30
	Downstream	103.04	103.04	103.22	103.23
Proposed Substation	Upstream	103.08	103.09	103.30	103.30
	Downstream	103.04	103.04	103.22	103.22
Proposed Development	Upstream	103.08	103.09	103.30	103.31
	Downstream	103.04	103.05	103.22	103.23

The hydraulic model indicates that some out of bank flooding may occur upstream and downstream of Clonguiffin Bridge during the 1 in 100 year (1% AEP) and 1 in 1000 year (0.1% AEP) flood events for the existing and proposed scenarios but that the bridge has sufficient capacity to convey all estimated flows.

In addition, the hydraulic model predicts an increase of 0.01m for the 1 in 100 year event on the upstream face of the bridge for each of the potential scenarios (where the Proposed Wind Farm is completed, where the Proposed Substation is completed, and where the entire Proposed Development is completed). The bridge has the capacity to convey these flows. The hydraulic assessment can be found in Appendix 10.2.

10.7.7 Summary of Flood Risk Identification and Assessment

A flood risk assessment was undertaken in 2025 for the Proposed Development. All infrastructure except for T6 is located outside Flood Zone A and Flood Zone B. Therefore, further analysis was undertaken on T6 and minor flooding was predicted in the vicinity of T6. Mitigation measures for T6 include the minor increase in ground levels and the provision of compensatory flood area.

The area where the wind farm development is located is designated for Wind Energy development in the Kildare County Development Plan.

The FRA has also concluded that the Proposed Development has a minimal impact on flooding risk in the surrounding area. As part of the FRA, the increase in surface water run-off due to the Proposed Development was estimated within the catchments upstream of the bridge at Clonguiffin. The bridge at Clongruiffin has the capacity to convey the flows modelled.

To facilitate the turbine delivery route, some accommodation works will be required at various points along the route. None of which are in areas which have been identified as at risk of flooding on the CFRAM or NIFM maps available on floodinfo.ie.

10.8 Likely Significant Effects

The potential effects on the hydrological regime are assessed in the following sections for the activities associated with each phase (construction, operation and decommissioning) of the Proposed Wind Farm, the Proposed Substation and TDR. The potential effects (including cumulative) are assessed in accordance with the evaluation criteria outlined in Section10.3.

The drainage of the Proposed Wind Farm, Proposed Substation and TDR is then considered, taking account of mitigation measures to reduce or eliminate any residual effects.

10.8.1 Do Nothing Scenario

If the Proposed Development does not proceed, the Site will remain in parts as poor draining agricultural and bog land for the foreseeable future including grazing, arable and forestry uses. In areas where conifer forestry plantations are present, deforestation and reforestation will continue to occur.

10.8.2 Potential Effects During Construction

Potential construction phase effects, in the absence of mitigation, of the Project on Hydrology and Water Quality are set out hereunder.

Turbine T11 is in the outer zone of the SPZ. T11 is c. 60m from the Inner Source Protection Zone. There is the potential risk of pollution of the aquifer that feeds this SPZ through the infiltration of potentially contaminated surface water during works for the excavation and construction of turbine T11.

Any impact on the SPZ will be avoided by design. Specialized construction techniques will be used for development in the SPZ, limiting the time that the excavation for the foundation is open. Silt management techniques will be applied to ensure that silt is not generated and kept in excavations, water from excavations to be pumped out of the area and put through silt management before being discharged outside the zone.

The main objective of the Water Framework Directive (WFD) is to achieve 'good status' for all EU water bodies by 2027, encompassing surface and groundwater quality, and promoting sustainable water management through catchment-based planning. In the case of the waterbodies identified in 10.5.3, the status is currently 'Poor'. Due to the implementation of SUDS drainage, as well as clear-span bridges being proposed for the 3 crossings of the Fear English, the Proposed Wind Farm will not impact on the objectives of the WFD to improve the status of the waterbodies described in 10.5.3.

The Proposed Substation is located in an Inner Source Protection Zone. There is the potential risk of pollution of the aquifer that feeds this SPZ through the infiltration of potentially contaminated surface water during the construction and operation of the substation.

Any impact on the SPZ will be avoided by design. Specialized construction techniques will be used for development in the SPZ. These include limiting the time any excavation is open, keeping foundations for the substation shallow and above the groundwater table if possible.

10.8.2.1 Estimated Increase in Flood Risk

For the Proposed Wind Farm, tree felling, new site access roads, turbine hard-standing areas, and new, hard surfaces have the potential to contribute to a low-level increase in run-off.

Table 10-13 shows the estimated changes in the volume of runoff corresponding to a 1-in-100 year, 30-minute duration storm at the Proposed Wind Farm. The calculations include the increases in run-off due to the increase in hardstanding as a result of the development in each of the catchments as follows:

Table 10-13: Estimated changes in volume of run-off (Proposed Wind Farm)

Catchment	Increase in Run-off
Blackwater (Longwood)_020	0.19%
Blackwater (Longwood)_010	0.005%
Overall Increase in Runoff	0.10%

For the Proposed Substation, tree felling, new site access roads, and new, hard surfaces have the potential to contribute to a low-level increase in run-off. Overall, the footprint of the Proposed Substation will be significantly less than that of the Proposed Wind Farm site and as such it is not expected that increases in run-off will give rise to any significant impacts.

Table 10-14 shows the estimated changes in the volume of runoff corresponding to a 1-in-100 year, 30-minute duration storm at the Proposed Substation. The calculations include the increases in run-off due to the increase in hardstanding as a result of the development in each of the catchments as follows:

Table 10-14: Estimated changes in volume of run-off (Proposed Substation)

Catchment	Increase in Run-off
Blackwater (Longwood)_020	0.1%
Blackwater (Longwood)_010	None
Overall Increase in Runoff	0.1%

An overall increase in run-off of 0.19% could be expected from the parts of the Proposed Wind Farm draining to the River Blackwater catchment. An increase in run-off of 0.1% could be expected from the Proposed Substation draining to the River Blackwater Catchment. This estimated increase in run-off will reduce over time as vegetation is re-established on the site. It is not expected therefore that the estimated increases will give rise to any significant impacts.

Further, the magnitude of the impact does not take into account the proposed mitigation measures.

Table 10-15: Increase in Surface Water Run-off (Proposed Wind Farm)

			Catchment Area	Overland flow area x 0.3 Imp. Factor	Existing Tracks to be used as part of the development	x 0.75 Imp. Factor	New hardcore tracks, including widening of existing tracks	x 0.75 Imp. Factor	Turbines Base & Hard Standing	x 0.75 Imp. Factor	Total Run-off Imp. Area	Q flow coefficient Mod. Rational Method	Rainfall Intensity for 1 in 100 yr storm of 30 mins. X 1.2 for Climate Change, Met Eireann*	Run-off	Increase in Run-off	% Increase in Run-off	% Increase in Run-off in Main River Catchments
	Catchment	**Scenario**	ha	ha	ha	No unit	ha	No unit	ha	No unit	ha	No unit	mm/hr	m3/s	m3/s	%	%
Drehid	Increase in run-off to Blackwater Longwood 020 Waterbody	Existing	5300	1589.83	0.56	0.42					1590.25	2.78	62.88	277.986			**0.10**
		Post Development		1587.82	0.56	0.42	3.79	2.84	2.92	2.19	1593.27	2.78	62.88	278.514			
		Increase in Run-off													0.528		
		% Increase in Run-off														**0.190**	
	Increase in run-off to Blackwater Longwood 010 Waterbody	Existing	5000	1500.00	0.00	0.00					1500.00	2.78	62.88	262.210			
		Post Development		1499.95	0.00	0.00	0.16	0.12	0.00	0.00	1500.07	2.78	62.88	262.222			
		Increase in Run-off													0.013		
		% Increase in Run-off														**0.005**	

Notes:
Factor of 1.1 is applied to rainfall intensity to allow for climate change in accordance with GDSDS
Rainfall intensity for 1 in 100 year return period storm of 30 min. duration supplied by Met Eireann
Q100 flow derived using the Modified Rational method Q = 2.78 x (Rainfall Intensity) x (Contributing Impervious Area)
Main River Catchments highlighted as follows: Blackwater

Table 10-16: Increase in Surface Run-off (Proposed Substation)

			Catchment Area	Overland flow area x 0.3 Imp. Factor	Existing Tracks to be used as part of the development	x 0.75 Imp. Factor	New hardcore tracks, including widening of existing tracks	x 0.75 Imp. Factor	Substation footprint	x 0.75 Imp. Factor	Total Run-off Imp. Area	Q flow coefficient Mod. Rational Method	Rainfall Intensity for 1 in 100 yr storm of 30 mins. X 1.2 for Climate Change, Met Eireann*	Run-off	Increase in Run-off	% Increase in Run-off
	Catchment	**Scenario**	ha	ha	ha	No unit	ha	No unit	ha	No unit	ha	No unit	mm/hr	m3/s	m3/s	%
Drehid	Increase in run-off to Blackwater Longwood 020 Waterbody	Existing	5300	1590.00	0.00	0.00					1590.00	2.78	62.88	277.942		
		Post Development		1588.94	0.00	0.00	0.00	0.00	3.52	2.64	1591.58	2.78	62.88	278.219		
		Increase in Run-off													0.277	
		% Increase in Run-off														**0.100**
	Notes:															
	Factor of 1.1 is applied to rainfall intensity to allow for climate change in accordance with GDSDS															
	Rainfall intensity for 1 in 100 year return period storm of 30 min. duration supplied by Met Eireann															
	Q100 flow derived using the Modified Rational method Q = 2.78 x (Rainfall Intensity) x (Contributing Impervious Area)															
	Main River Catchments highlighted as follows:	Blackwater														

10.8.2.2 The Proposed Wind Farm

The relatively low increase in surface run-off water has the potential to cause localised soil erosion and consequent sediment release into the receiving watercourses via the drainage system for the Proposed Wind Farm if no mitigation is applied.

Possible potential effects on drainage and surface water quality during the construction phase of the Proposed Wind Farm prior to mitigation include:

- Increased sediment loading of streams from personnel and traffic activities; exposed areas and inappropriate management of excavations, excavated material and drainage of material storage areas could lead to siltation and physical effects on flora and fauna in aquatic habitats.
- Haul roads passing close to watercourses could allow the migration of silt laden run-off into watercourses.
- Silt carried on the wheels of vehicles leaving the site could be carried onto the public road.
- There is a potential for temporary drawdown at the foundation excavations in areas of bog (T6, T7, T8, T9, T10 and T11). This drawdown could occur for approximately five weeks until the foundation area is reinstated, after which the bog will recharge. Proposed piling at T8, T9 and T10 will mitigate against the potential drawdown as there will be lesser excavation works required. This will reduce potential effects on the bog.
- Tree felling could lead to an increase in sediment and nutrients in surface water run-off if brash is left in place in riparian buffer zones. There is potential for sediment, ammonia and phosphorus release to the local drainage network during the excavation works for the turbine bases. However, the forested area of the site is ca. 1.4km from the Fear English River, which in turn is ca. 19km (instream distance) upstream of the River Boyne and River Blackwater SAC and SPA. Due to the considerable dilution factor available, there is unlikely to be a significant effect on water quality in these watercourses.
- Small diameter cross-drains could lead to blockages and consequent flooding and concentration of flows.
- Refuelling activities adjacent to water bodies could result in fuel spillages, polluting receiving waters.
- Excavation of peat could lead to an increase in suspended solids in the surface water run-off and from minor quantities of exposed mineral soils. The removal of the vegetated material will also lead to an increase in the rate of run-off along the route of the site access roads and hard-standing areas. This increase in the rate of run-off could lead to a minor increase in flooding downstream.
- Blockage of cross-drains could lead to consequent flooding and concentration of flows.
- Flows from the new drainage system could be impeded, should blockages occur in the existing roadside drains which may lead to localised flooding.
- Overland flow entering excavations could increase the quantity of surface water to be treated for sediment removal.
- Internal cable trenches could act as a conduit for surface water flows and subsequent flooding elsewhere on the site.
- Stream flows could be impeded due to inappropriate design of stream crossings.
- Open bodies of water and saturated ground present a risk to the safety of site personnel and the public. Hazards of this type include the streams and rivers throughout the site.
- The construction of new infrastructure has the potential to obstruct existing overland flow.

- A blockage in the proposed roadside drains could allow a break out of silt laden run-off to reach adjacent watercourses or streams.
- Overland flows entering roadside drains could result in a concentration of flows and subsequent erosion of drains and a reduction in the efficiency of any proposed stilling ponds.

10.8.2.3 The Proposed Substation

Possible potential effects on drainage and surface water quality during the construction phase of the Proposed Substation prior to mitigation include:

- Increased sediment loading of streams from personnel and traffic activities; exposed areas and inappropriate management of excavations, excavated material and drainage of material storage areas could lead to siltation and physical effects on flora and fauna in aquatic habitats.
- Haul roads passing close to watercourses could allow the migration of silt laden run-off into watercourses.
- Silt carried on the wheels of vehicles leaving the site could be carried onto the public road.
- Tree felling could lead to an increase in sediment and nutrients in surface water run-off if brash is left in place in riparian buffer zones. It is not possible to determine the resultant levels as this is dependent on the existing levels in the soil; the level of rainfall when the soils are exposed during the works; and the existing levels within local drains.
- Small diameter cross-drains could lead to blockages and consequent flooding and concentration of flows.
- Refuelling activities adjacent to water bodies could result in fuel spillages, polluting receiving waters.
- Excavation of peat could lead to an increase in suspended solids in the surface water run-off and from minor quantities of exposed mineral soils. However, the Proposed Substation has intentionally been located in an area of shallow peat so this is expected to be less than the peat excavation required for the Proposed Wind Farm.
- Blockage of cross-drains could lead to consequent flooding and concentration of flows.
- Flows from the new drainage system could be impeded, should blockages occur in the existing roadside drains which may lead to localised flooding.
- Overland flow entering excavations could increase the quantity of surface water to be treated for sediment removal. However, there is significantly less excavation required for the Proposed Substation relative to the Proposed Wind Farm.
- Drain flows could be impeded due to inappropriate design of drain crossings.
- The construction of new infrastructure has the potential to obstruct existing overland flow.
- A blockage in the proposed roadside drains could allow a break out of silt laden run-off to reach adjacent watercourses or streams.
- Overland flows entering roadside drains could result in a concentration of flows and subsequent erosion of drains and a reduction in the efficiency of any proposed stilling ponds.

10.8.2.4 TDR

The Proposed Turbine Delivery Route was examined as it has the potential to impact on hydrology as follows.

To facilitate the turbine delivery route to the Proposed Wind Farm, two temporary crossing structures will have to be installed across the OPW Arterial Drainage channels. Flows in the drain could be impeded if the crossing structures are not designed correctly. However, the proposed crossing structures will be temporary bridges which will provide a clear span crossing, which will not obstruct flows within the drains.

10.8.3 Potential Effects during Operation and Maintenance

The main potential hydrological impact of the development is a 0.10% increase in the run-off to the River Blackwater catchment due to the change in land use resulting in an increase in impermeable ground conditions. The time of concentration of surface water flows will decrease as a result of the additional hard-surfaced areas resulting in additional flows being discharged to the roadside drains during rainfall events. Some infiltration will occur through the road construction material to be used in the site access roads.

Due to the insignificant increase in potential run-off from the site and the non-intrusive nature of site operations, there should be negligible release of sediment to the watercourses post-construction.

The potential increase in run-off from the Proposed Substation is significantly less than the increase associated with the Proposed Wind Farm. The increase would be considered to be imperceptible.

Once the Proposed Substation is operational, and the plant on site is maintained appropriately, potential for impacts to water quality will be imperceptible.

During the operation phase, small quantities of oil will be used in cooling the transformers. There is potential for contamination via the drainage system, in the event of an uncontrolled release of any oil to the drainage network.

It is not envisaged that the maintenance activities taking place on the wind farm, involving general maintenance for the operation of the wind farm and including maintenance of the drainage system and reinstated areas, will give rise to any significant impacts on the hydrological regime of the area.

During the operation phase, small quantities of oil will be used in cooling the plant in use at the substation. There is potential for contamination via the drainage system, in the event of an uncontrolled release of any oil to the drainage network and in the absence of oil and petrol interceptors.

It is not envisaged that the maintenance activities taking place on the substation, involving general maintenance for the operation of the substation and including maintenance of the drainage system will give rise to any significant impacts on the hydrological regime of the area.

10.8.4 Potential Effects during Decommissioning

It is proposed that the turbine foundations, site tracks and hardstandings will be left in place during decommissioning. These areas will be left to revegetate naturally.

There would be increased trafficking and an increased risk of disturbance to underlying soils at the wind farm, during the decommissioning phase, in this instance, leading to the potential for silt laden run-off entering receiving watercourses from the wheels of vehicles.

While the consent for the Proposed Wind Farm being sought is for a 35-year operational life, the Proposed Substation will be taken control of by EirGrid and utilized as a 'node' on the national grid, with no predetermined end of its operational life.

10.8.5 Potential Cumulative Effects

The increase in the rate of surface water run-off due to the increase in hard surface areas as a result of the Proposed Development within the waterbody catchments, in addition to existing large-scale development in these waterbody catchments, could lead to a minor cumulative risk of flooding downstream.

There is a number of additional wind farm projects (in planning, consented, in construction or operational) within a 20km buffer of the Proposed Development. The potential cumulative impacts are detailed in Section 10.

10.8.6 Summary of Unmitigated Hydrological Impacts of the Proposed Development on Sensitive Receptors

A summary of unmitigated potential impact due to the Proposed Development is provided in Table 10-17.

Table 10-17: Summary of Potential Hydrological Impact Significance on Sensitive Receptors

Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation	
				Magnitude	Significance
Construction Phase					
Site tracks, cabling, turbine construction, crane pad construction	Increase in rate of run-off	Fear English River	High	Low	Low
Substation	Increase in rate of run-off	Fear English River	High	Imperceptible	Imperceptible
Site tracks, cabling, turbine construction, crane pad construction	Release of suspended solids into watercourse	Fear English River	High	Low	Low
Substation	Release of suspended solids into watercourse	Fear English River	High	Imperceptible	Imperceptible
Site tracks, crossings, cabling, turbine construction, crane pad construction, tree felling and management of material storage areas	Erosion and sedimentation	Fear English River	High	Low	Low
Substation	Erosion and sedimentation	Fear English River	High	Imperceptible	Imperceptible

Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation	
				Magnitude	Significance
Site tracks, crossings, cabling, turbine construction, crane pad construction, tree felling and management of material storage areas	Release of hydrocarbons or fuel spill	Fear English River	High	Medium	High
Substation	Release of hydrocarbons or fuel spill	Fear English River	High	Low	Low
Site tracks, crossings, cabling, turbine construction, crane pad construction tree felling and management of material storage areas	Changes in ammonia and phosphorous levels in forestry drainage	Fear English River	High	Low	Low
Substation	Changes in ammonia and phosphorous levels in forestry drainage	Fear English River	High	Imperceptible	Imperceptible
Drainage crossings, turbine construction, temporary compounds	Chemical pollution	Fear English River	High	Imperceptible	Imperceptible
Substation	Chemical pollution	Fear English River	High	Imperceptible	Imperceptible
Drainage crossings, turbine construction, temporary compounds	Obstruct hydrological flow	Fear English River	Medium	Imperceptible	Imperceptible
Turbine 6	Flooding	Fear English River	High	High	High
Operation & Maintenance					
Site access tracks for the Proposed Wind Farm	Increase in rate of run-off	River Boyne & River Blackwater	High	Imperceptible	Imperceptible
Site access tracks for the Proposed Substation	Increase in rate of run-off	River Boyne & River Blackwater	High	Imperceptible	Imperceptible
Refuelling/Maintenance on the Proposed Wind Farm site	Release of hydrocarbons or fuel spill	Fear English River	High	Medium	High

Activity	Potential Impact	Receptor	Sensitivity	Prior to Mitigation	
				Magnitude	Significance
Refuelling/Maintenance on the Proposed Substation	Release of hydrocarbons or fuel spill	Fear English River	High	Medium	High
Decommissioning					
Increased trafficking to remove turbines	Erosion and sedimentation	River Boyne & River Blackwater	High	Imperceptible	Imperceptible

It can be observed from Table 10-17 that some activities during the construction of the Proposed Development, if unmitigated, could have an impact on receiving watercourses, with a risk of sedimentation of sensitive catchments. Operation and maintenance activities are not expected to have a significant effect on the receiving watercourses.

The risk of an increase in flooding is of minor significance due to the small percentage increase in run-off contributing to the catchments as a result of the Proposed Wind Farm, and the Proposed Substation as will be demonstrated in Section 10.7.5.

Wind farms are not generally associated with major risks regarding the water environment. The potential for landslides at the Site is determined to be low. Further details are provided in Chapter 9 – Land, Soils and Geology .

10.9 MITIGATION MEASURES

10.9.1 Mitigation By Avoidance and Design

A process of 'mitigation by avoidance', as informed by constraints assessment and consultation, was undertaken by the EIA team during the design of the wind farm layout and TDR (refer to Chapter 3 - Site Selection and Alternatives for further detail) with the objective of avoiding / minimising the potential for significant effects on water quality and hydrology. The Site layout and drainage infrastructure has been designed such that it is sympathetic to the existing topography and aims to maintain the existing hydrological regime of the Site such that it does not create a changed hydrological response to precipitation.

A Surface Water Management Plan for the construction, operation and decommissioning stages of the Proposed Development is contained in Section 4.3.5 of the CEMP in Volume III. The proposed drainage design will:

- Collect surface water runoff upgradient of the Proposed Development via interceptor drains and will redistribute this 'clean' collected runoff downgradient of the Proposed Development by means of cross drains which will release via diffuse outfalls to vegetated areas (within the same catchment) or will divert the runoff back into the existing network serving the catchment. This drainage design aims to maintain the hydrological regime at the Site.
- Collect surface water runoff from the footprint of the Proposed Development (during construction, operation and decommissioning) and discharge diffusely to adjacent vegetated areas via settlement ponds, such that a deterioration in water quality does not occur.

Attenuation and Flood Risk

The Proposed Development will increase the impermeable area within the Site and as such can potentially increase the rate and volume of surface water runoff in response to precipitation events. Mitigation measures to address surface water runoff and drainage include in line attenuation features including check dams and stilling ponds and diffuse outfalls with a view to maintaining the baseline hydrological regime and to provide attenuation at greenfield run-off rates.

All access tracks will be constructed from aggregate which will allow a portion of rainfall to infiltrate and, therefore, reduce surface water runoff. Adjacent swales will also intercept and retain surface water runoff allowing this to disperse naturally via infiltration and evapotranspiration. Where swales are installed on sloped ground, check dam structures will be used within the channels to provide attenuation, allowing a portion of the flows to disperse naturally.

Swales and drainage channels will discharge runoff from access roads and areas of hardstanding to settlement ponds. These will be suitably sized to accommodate flows from storm events up to and including the 1 in 100-year storm event.

Settlement ponds will not discharge directly to any drain or watercourse. Rather, flows from the ponds will be dispersed diffusely over land to allow natural overland flow and percolation within the catchment.

Watercourse crossings will be designed and suitably sized to accommodate peak, or storm discharge rates so as not to cause risk of impeding flows during extreme storm events and causing flooding upstream of the crossing. All drain and watercourse crossings will be designed in accordance with the requirements of Regulation 50 of the European Communities (Assessment and Management of Flood Risks) Regulations 2010 SI 122 of 2010. The channel width will be maintained and the crossings will be designed so as not to cause an impediment to the passage of woody debris or sediment transport. Appropriate freeboard will be provided to OPW requirements.

Cable trenches will be excavated in dry weather where possible and infilled and revegetated if required to prevent soil erosion or generation of silt pollution of nearby surface water. There will, therefore, be no increase in the risk of flooding.

The surface water management system at the Site will ensure that there will be no increase in the risk of fluvial or surface water flooding downstream as a result of the windfarm development.

10.9.2 Monitoring

An Environmental / Ecological Clerk of Works (EnCoW / ECoW) will be appointed by the Developer with responsibility for monitoring at the Site during the construction phase of the Development. The Clerk of Works will have the authority to temporarily stop works to prevent negative effects on hydrology or to ensure corrective action is taken to mitigate adverse effects.

A Surface Water Quality Monitoring Programme will be established which will commence 12 months prior to construction in order to establish baseline physio-chemical conditions and hydromorphological conditions of the watercourses within the Site and will continue throughout construction and for three months post-commissioning phase of the Proposed Development.

A record of monthly meteorological conditions (as a minimum precipitation and temperature) will be maintained.

Biological water quality assessment using the EPA Q-value methodology will be carried out once prior to the commencement of construction and on a six month basis during the monitoring period.
The hydromorphological baseline at the proposed watercourse crossings within the Site will be established using the River Hydromorphology Assessment Technique (RHAT)[2]. Annual RHAT assessments will be carried out which will be compares against the baseline. The Design and Construction of the bridge crossing and culverts will minimise upstream afflux, avoid turbulence and minimise loss of the natural channel bed due to the culvert or structure in order to ensure that hydromorphology is not affected. The Design will ensure that the baseline river Hydromorphological Condition Score derived from the initial RHAT assessment is not altered such that it would impact the derived WFD hydromorphology classification.

The Contractor will ensure that the daily visual monitoring of the surface water network for visible signs of construction impact is carried out on a daily basis for example, riparian vegetation loss, evidence of oil/fuel slick, sediment plumes, fish kill.

During the construction and commissioning phase, water quality monitoring results will be recorded and compared against baseline data and where there is a deviation beyond the 95%ile, the Contractor will investigate and as necessary sample further upstream and determine if elevated concentrations are coming from the Site, in which case the Contractor will ensure that emergency control measures are put in place to return the levels to the baseline. Similarly, the Contractor will compare results of water quality monitoring with the 95%ile High Status Environmental Quality Standards arising from the European Union Environmental Objectives (Surface Waters) Regulations 2009 as amended. Any deviation beyond these standards will be investigated and the findings will be report to the Community Water Officer.

During the construction and commissioning phase, daily inspection of environmental protection measures e.g. silt traps, check dams, ponds and outfalls and drainage channels will be carried out and any improvement works carried out within a timely manner.

[2] https://www.riverhabitatsurvey.org/RHSfiles/RHSToolboxHelp/RiverHabitatSurveyToolbox.html?RHAT.html

10.9.3 Proposed Mitigation Measures for the Construction Phase

Proposed drainage measures to reduce and protect the receiving waters from the potential impacts during the construction of the Proposed Development are as outlined above in Section 10.6. These include measures to prevent runoff erosion from vulnerable areas and consequent sediment release into the nearby watercourses to which the Proposed Development site discharges. The mitigation measures proposed to reduce potential direct, indirect and turbine delivery route and cable route impacts are outlined below.

- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the Proposed Development will include regular monitoring of the drainage system and maintenance as required. The increase in the rate of run-off along the route of the site access roads and hard-standing areas will be mitigated by the proposed drainage system which includes the provision of stilling ponds to reduce the concentration of suspended solids in the run-off from these areas, and the addition of silt fencing where deemed necessary.
- Stilling ponds will be put in place in advance as construction progresses across the site. The stilling ponds with a diffuse outflow detail will mitigate any increase in run-off. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase. The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream.
- Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. The excavations for turbines will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases. As the majority of turbine excavations will be within low permeability peat or glacial till, groundwater inflow is expected to be small. In areas of higher permeability soils, flows may be higher and exclusion techniques such as sheet piles may be required to control groundwater flow and stabilize excavations, particularly close to the river where a higher water table is expected.
- The excavated subsoil material will be removed, either to the designated material storage areas or stockpiled close to the excavation and used as backfill material if suitable.
- Temporary material storage areas will be covered with impermeable sheeting and surrounded with silt fencing, which will be monitored to manage any potential loss of suspended solids to surface waters. Temporary material storage areas will be a minimum of 50 m from the true bank edge of any watercourse.
- Drains around hard-standing areas will be shallow to minimise the disturbance to sub-soils.
- Cross-drains of a suitable diameter (as sized within the Preliminary Technical Report for Proposed Bridges and Culverts – Appendix 10.1) will be provided to prevent a risk of clogging for crossings conveying flows from bog drains, agricultural drains and forestry drains across the access roads.
- All tracks will be surfaced with clean well graded stone with the minimum of fines which will be imported, to mitigate the conveyance of silt-laden run-off in the track drainage.
- Silt fencing will be used as an additional protection to watercourses where deemed necessary, where floating roads are to be constructed.
- Interceptor cut-off drains will be provided on the upslope side of the site access roads to prevent the mixing of overland flows with the drainage for the proposed development. These interceptor drains will discharge diffusely over land.
- Cables will be installed in trenches adjacent to the site access roads, or laid within the access road line, where required. Trenches will be excavated during dry periods where possible in short sections and left

open for minimal periods, to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within the cable trench at regular intervals.

- The routes for the proposed access tracks are laid out to follow the existing tracks where practicable. Site access roads have been laid out to reduce the longitudinal slope of roadside drains and to follow natural flow paths where possible. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. This is unlikely to occur as the slopes on the site are flat, however the check dams, if required, will reduce the effective slope and run-off velocities and any consequent potential for erosion.
- Where agricultural tracks, and forestry tracks will be used to access the development, the roadside drains alongside these roads will be cleared of obstructions, should it be found that debris and vegetation are impeding flows. Silt traps will be provided at regular intervals to reduce the concentration of suspended solids in the surface water run-off being conveyed in the existing drains, which may result from vehicles trafficking these roads from the construction areas.
- All open water bodies adjacent to proposed construction areas will be protected by fencing, including the proposed stilling ponds.
- The site drainage has been designed to complement existing overland flow and existing bog, agricultural and forestry drainage. The drainage design will be developed in full at the detailed design stage.
- Additional protection will be provided in the form of silt fencing downslope where required and at existing stream crossings during construction, to further ensure that there is no impact from the development to streams and rivers crossing the site.
- All personnel working on site will be trained in pollution incident control response. Emergency Silt Control and Spillage Response Procedures contained within the Site Drainage Management Plan of the Construction Environmental Management Plan (CEMP) will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. A regular review of weather forecasts of heavy rainfall is required, and a contingency plan will be prepared for before and after such events. A record will be kept of daily visual examinations of watercourses which receive flows from the proposed development, during and for an agreed period after the construction phase. Water samples will be taken, and water quality will be monitored in accordance with a water monitoring programme, which will be agreed with Kildare County Council.
- The developer will ensure that erosion control, namely silt-traps, silt fencing and swales are regularly maintained during the construction phase.
- Existing overland flow channels will be maintained, and cross-drains provided in the access roads to allow continuity of flow. Interceptor drains will be constructed upslope where there are no existing channels, with cross-drains provided at regular intervals. The roadside drains will therefore only carry the site access road run-off and so avoid carrying large volumes of water and concentrating flows.
- During the construction period, an emergency facility will be provided to control the discharge from the stilling ponds. This will mitigate the risk of any accidental spillage on site affecting watercourses.
- Roads will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids being conveyed in the run-off into the drainage system.
- Where access tracks pass close to watercourses, silt fencing will be used to protect the streams by reducing the concentration of suspended solids being conveyed in the surface water run-off into watercourses. Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall.
- Wheel wash facilities will be located at the main site entrance to reduce construction traffic fouling public roads. The wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Waste will be removed

from each unit and from site by a permitted contractor. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.

- Silt traps and silt fencing for the proposed wind farm development are proposed as described above in Section 10.6 and will be put in place in advance as construction progresses across the site.
- Tree felling will be undertaken in accordance with the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) (2) and Forest Harvesting and Environmental Guidelines (2000) (3), to ensure a tree clearance method that reduces the potential for sediment and nutrient runoff.
- Trees will be felled away from aquatic zones where possible. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible. Additional silt fencing will be erected along the banks of any streams at the location of the proposed tree felling to provide additional protection to the watercourses.
- Where new cross-drains are proposed on this site to convey surface water from roadside swales to outfalls, these will be sized in accordance with the calculations contained in Appendix 10.1.
- Roadside swales will serve to attenuate any increase in surface water run-off due to new hardcore tracks or existing track widening.
- Refuelling of plant during construction will only be carried out at dedicated refuelling station locations on site, typically at each compound or at least 100m from a watercourse using mobile bowsers. This will reduce any risk of pollutants being conveyed in the surface water run-off, into the drainage system and subsequently into watercourses. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site.
- To avoid any risk of groundwater contamination resulting from the foul drainage for the site, portaloos and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor.
- Where existing drains will be covered with hardcore as part of modifications for road widening to facilitate the turbine delivery route, the surface water will be diverted into new drains which will connect to the existing drainage system.
- The Proposed Substation is located in an Inner Source Protection Zone. There is the potential risk of pollution of the aquifer that feeds this SPZ through the infiltration of potentially contaminated surface water during the construction of the substation. Any impact on the SPZ will be avoided by design. Specialized construction techniques will be used for development in the SPZ. These include limiting the time any excavation is open, keeping foundations for the substation shallow and above the groundwater table if possible.
- Turbine T11 is in the outer zone of this SPZ. T11 is c60m from the Inner Source Protection Zone. There is the potential risk of pollution of the aquifer that feeds this SPZ through the infiltration of potentially contaminated surface water during works for the excavation and construction of turbine T11. Specialized construction techniques will be used for development in the SPZ, limiting the time that the excavation for the foundation is open. Silt management techniques should be applied to ensure that silt is not generated and kept in excavations, water from excavations to be pumped out of the area and put through silt management before being discharged outside the zone.

10.9.4 Proposed Mitigation Measures for the Operation and Maintenance Stage of the Proposed Development

The Surface Water Management Plan, included in Appendix 2.1 – CEMP (Appendix D thereof – SWMP), in Volume III, will ensure that there is no effect on water quality as a result of the Proposed Development. The proposed drainage system will provide several stages of treatment to surface water runoff from constructed areas, which follows the concept of a multi-stage SuDS 'treatment train'.

Interceptor drains installed upslope of access tracks and areas of hardstanding will divert surface water runoff from undeveloped land around the constructed areas to disperse naturally within open ground without mixing with the construction drainage.

The proposed swales will intercept surface water runoff from access tracks and areas of hardstanding. The grass within the swales will provide some filtration to remove a portion of silt and suspended solids. Silt traps will be provided upstream of outfalls from roadside swales.

The settlement ponds will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of a very small particle size to fall out of suspension prior to discharge. Additional treatment will be provided upstream of the settlement pond with the use of drainage stone at the inlet to provide filtration. In an emergency, the outfall from a settlement pond will be blocked to provide a temporary holding area for accidental spillages on site.

As stated in the SWMP, to adhere to CIRIA C753, part of the maintenance routine that will mitigate issues relating to surface water will be the inspection of the following: drains, check-dams, cross-drains and culverts for blockages; outfalls to existing field drains and watercourses, existing roadside swales for obstructions; progress of re-vegetation.

10.9.5 Proposed Mitigation Measures for Decommissioning of the Wind Farm

As in the construction phase silt protection controls would again be put in place. The drainage system will remain operational during the decommissioning phase and will serve to treat any sediment laden surface water run-off due to a renewed disturbance of soils. Re-vegetation will be monitored. If it is deemed necessary, erosion control matting will be used to assist in the re-establishment of vegetation.

10.10 Potential Cumulative Impacts

Cushaling Wind Farm is currently under construction and when complete will comprise a 9-turbine wind farm; it is located 10.2 km southwest of the Proposed Wind Farm. The 21- turbine operational Cloncreen Wind Farm is located 15.2 km southwest of the Proposed Wind Farm. Mount Lucas wind farm, located c. 22.7 km southwest of the Proposed Wind Farm. Cushaling, Mount Lucas and Cloncreen are located in a separate catchment (River Barrow catchment), so no cumulative hydrological impacts are predicted in this regard.

The Yellow River wind farm located north of Rhode Co Offaly is a 29-turbine wind farm (17.4 km north-west of Proposed Wind Farm) has begun producing power and is expected to be fully operational later this year (2025). The recently consented Ballivor Wind Farm located 17.3 km north-west of the Proposed Wind Farm comprises 26 turbines. Both of these wind farms are located within the same catchment (River Boyne) as the Proposed Wind Farm, with drainage from Yellow River, Ballivor and the Proposed Wind Farm site ultimately draining to the River Boyne.

Flows draining the sub-catchments in which each of these projects are located meet at the Blackwater/Boyne confluence, over 16 km downstream from the Proposed Wind Farm along the Blackwater. The Yellow River wind farm is over 24 km upstream from the Boyne/Blackwater confluence. Ballivor wind farm drains to the Deel, Stonyford and Ballivor Rivers, all of which join the Boyne between the Blackwater/Boyne confluence and the Stonyford/Boyne confluence (a further 5 km downstream of the Boyne/Blackwater confluence). The Ballivor wind farm is located c. 9.3 km upstream of the Boyne/Blackwater confluence. While Yellow River wind farm, Ballivor wind farm and the Proposed Wind Farm are all located in the Boyne catchment, the in-stream distance between these projects and the section of the Boyne where the downstream flows from these project locations converge is such that any potential cumulative effects on water quality are assessed as Short-term Imperceptible.
The potential cumulative hydrological impact was examined in relation to current proposed TII road schemes. There are no such schemes planned or currently under construction in the vicinity of the site for the Proposed Development.

There is a number of additional wind farm projects (in planning, consented, in construction or operational) within a 20km buffer of the Proposed Development, but potential cumulative impacts were deemed to be Short Term Imperceptible as explained within that Section.

There are a number of other significant developments in the vicinity of the Proposed Development including a number of large housing developments, mixed use developments, solar farms, landscaping developments and the extension of the existing Drehid Landfill. Details of these cumulative developments are presented in Table 10-18:

Table 10-18: Cumulative developments within 5 km of the Proposed Development

Development	Direction from Proposed Development site	Distance from Proposed Development site (km)	Status
Timahoe North Solar Farm	**E**	**Adjoining eastern boundary**	**Operational**
The consented development comprises (a) the construction and operation of 2 areas of solar photovoltaic arrays mounted on metal frames over an area of approximately 200ha, and having a maximum overall height of 3 metres over ground level; (b) Internal solar farm underground cabling; (c) 2 no. temporary construction compounds; (d) recreation and amenity works, including looped walk (upgrade of existing tracks and provision of new tracks, car parking and vehicular access); (e) 1 no. Battery Storage compound; (f) upgrade of existing tracks and provision of new site access roads; (g) site drainage; (h) forestry felling and replanting; (i) permanent signage; and (j) all associated site development and ancillary works. The proposed renewable energy development will have an operational life of 35 years from the date of commissioning. The solar farm has been in construction since 2022 and is exporting power to the grid since September 2024. Construction is nearing completion at the time of writing this EIAR and is expected to be minor works at this time such as snagging.			
Mulgeeth Solar Farm	**NE**	**Adjoining eastern boundary**	**Refused Feb 2025 – may be appealed**
Kildare planning reference 2460568. Consent is for a period of 10 years to construct and complete a solar PV energy development with a total site area of 80.9 hectares, comprising of the construction of PV panels mounted on metal frames, transformer stations, GRP units, internal access tracks, perimeter fencing with CCTV cameras and access gates, electrical cabling and ducting, temporary construction compounds, widening of an			

Development	Direction from Proposed Development site	Distance from Proposed Development site (km)	Status
existing entrance, landscaping and all ancillary infrastructure and associated works. The solar farm would be operational for 35 years. The export capacity to grid is estimated to be c. 56MW MEC.			
Coolcarrigan Solar Farm	**SE**	**3.7 km**	**Granted consent**
Kildare planning reference 2360073. Consent for a 10-year permission, for the construction and operation of a renewable energy development within a site boundary of c. 114 ha. The proposed development will consist of a development area of circa 71.7 ha including solar on fixed on ground mounted frames with a maximum height of 3 metres, 1 No. battery storage compound, 1 No. customer switchgear container, 1 No. 110kv grid connected single storey substation, 1 No. single storey customer substation and all associated electrical plant, inverter units, electrical transformers, battery units, cooling equipment, underground cabling and ducting, boundary fencing, security entrance gates, CCTV, upgrading of existing access road and new internal access roads and all associated ancillary activities. The proposed development will have a 35-year operational life from the date of commissioning. Revised by significant further information which consists of Provision of quantum of energy export (of up to 80MW) in the proposed development and storage capacity of proposed battery compound (of up to 80MWh).			
Hortland Solar Farm	**E**	**3.9 km**	**Operational since 2022**
An existing solar farm with a total site area of 38.08 hectares. The consented development included two electrical substation buildings, six electrical transformer and inverter station modules, solar PV panels ground mounted on support structures, vehicular access, access gates and internal access tracks, one spare parts container, security fencing, electrical cabling and ducting, CCTV cameras and other ancillary infrastructure, drainage, temporary construction compound, landscaping and habitat enhancement as required and associated site development works and services.			
Dysart Solar Farm	**NE**	**2.5 km**	**Granted consent**
10 year permission for the construction of an up to 25 MW solar PV farm comprising approximately 86,200 no. photovoltaic panels on ground mounted frames within a site area of 35.6 hectares and associated ancillary development including 20 no. transformer stations, 20 no. auxiliary transformer stations, 20 no. inverters, 1 no. client side substation, 1 no. single storey storage building, 1 no. single storey communications building, 1 no. single storey DNO building, 6 no. CCTV security cameras mounted on 4 metre high poles and perimeter security fencing (2 metres high) and localized improvements to an existing agricultural access from the adjoining L1004 road to the south.			
A number of residential developments	**N**	**2.8 km**	**Granted consent**
There are a number of consented large residential developments in Enfield which have been integrated into one large project. The planning references are Meath Co. Co. Reg Ref. 21/1449, 21/1461, 21/1462, 23/272. The consents include 99 residential units (21/1449), 67 residential units (21/1461) 77 residential units (21/1462) and a further 77 residential units (23/272); all with ancilliary infrastructure such as public open space, car parking, bicycle parking etc.			
Johnstown Estate Renovations	**N**	**2 km**	**Granted consent**
Kildare planning reference 23/613. The proposed works are principally to the existing banquet hall and conference centre located to the south of the main hotel building and associated external landscaped areas. The proposed external works comprise: (i) the provision of a new 210 sq.m. store room extension (5.450m in height) over existing service yard to the rear (east) of the building; (ii) a 136 sq.m. extension to the south east corner of the building to provide a new glazed orangery bar; (iii) demolition of existing single storey draught lobby (30 sq.m.) and construction of a new 60 sq.m. extension (4.050m in height) on the northern side of the building to			

Development	Direction from Proposed Development site	Distance from Proposed Development site (km)	Status
provide for a bar area (44 sq.m.) and 2 no. store rooms (8sq.m. each); (iv) a new 20 sq.m. entrance lobby with an external canopy to the southern side of the building; (v) 2 no. new external seating areas to the east and west of the proposed entrance lobby; (vi) a new vehicular circulation layout with roundabout and water feature to the front of the proposed entrance lobby, loading bay, access ramp, external stair case, footpaths; (vii) relocation of the approved bike store located in the service yard (Reg. Ref. 22/1089) underneath proposed store building; and, (viii) the provision of a landscaped seating deck to the south of the building. Proposed internal works comprise reconfiguration of existing conference and banqueting accommodation to provide (a) 2 no. conference banqueting suites (320sq.m. and 280 sq.m.), (b) 2 no. meeting rooms (180 sq.m. and 110 sq.m.). (c) reception lobby (135 sq.m.) and (d) associated toilets, storage, cloakrooms and staff areas. Retention permission is sought for 4 no. accessible car parking spaces provided to the front of the hotel (southwest facade) and existing landscaping works comprising an existing timber pergola structure to south of the hotel development. The development also includes all other associated engineering works, landscaping, and ancillary works necessary to facilitate the development.			
Restoration of 5 ha of agricultural land	**N**	**3.2 km**	**Granted Consent**
Meath planning reference TA200121. The development comprises: a) use of existing stockpiles for site restoration (b) importation of inert excavation spoil comprising natural materials of clay, silt, sand, gravel or stone for the purposes of restoration of a previously extracted area (QY/54) to restore the site to a beneficial agricultural and ecological afteruse (5.85 hectares) (c) Temporary Portacabin Offices and Staff Facilities 100sqm. (d) Wheel Wash and weighbridge 134m2 (e) Site entrance and access road (f) Lockable access gate at the pit entrance (g) All other ancillary buildings, plant and facilities for the restoration, and all ancillary site works. The application is accompanied by an Environmental Impact Statement (Environmental Impact Assessment Report) and associated documents. The application relates to a restoration development for the purpose of an activity requiring a Waste Permit to be issued by the Meath County Council. Significant further information/revised plans submitted on this application			
Blackwood Equestrian Centre	**SE**	**2.5 km**	**Granted consent**
Kildare planning reference 191031. Proposed two storey stable block, consisting of 6 no. horse stables & 7 no. pony stables, a wheelchair accessible toilet & two no. stairwells at ground floor level, tack room, kitchen/dining/lounge area for refreshment purposes (for staff and patrons of the livery centre only), male and female changing rooms and toilets and an office at first floor level (total floor area 494.6 sq.m), proposed horse walker (305.8 sq.m) and horse lunge (305.8sq.m) with proposed dungheap/effluent tank (18.5 sq.m). Existing concrete slab to be demolished and removed off site to authorised waste facility and to install proposed exercise area (1732 sq.m) to include 6 no. floodlights & equine fencing along the existing driveway and proposed exercise area. Permission is sought to install a septic tank and percolation area, 8 no. car parking spaces, gravel pathway to forest, proposed signage (2m sq) at existing gate and all associated site works at the above address. Permission is also sought to retain existing storage shed (24sq.m) and existing driveway.			
Drehid Land Fill Extension	**S**	**0.5 km**	**Granted consent**
ABP reference 317292. Increase in waste material at disposal facility at Drehid Waste Management Facility to accept 440,000 tonnes per annum of non-hazardsous waste material.			
Mixed Use Development in Enfield	**N**	**3.9 km**	**Granted consent**

Development	Direction from Proposed Development site	Distance from Proposed Development site (km)	Status
The development will consist of: The construction of a mixed-use development including a 4 storey over ground floor level mixed use building (c.7,953 sq. m) comprising ground floor lobby (c.169 sq. m), bulky goods retail at ground (c.1,062sq,m) and first floor (c.l,219sq.m), ground floor cafe (c.304 sq. m), ground floor gym (c.352sq. m), first floor health centre (c.822 sq. m), second, third and fourth floor office and conference space (c.2,733 sq. m), core, circulation and plant facilities across all levels (c.1,292 sq.m) and 227 no. car and 80 no. cycle parking spaces to serve the building; 80 no. residential units comprising 1 3 no. 2 storey four-bedroom terraced housing units, 67 no. 2 storey three- bedroom terraced housing units with associated private open space in the form of rear gardens and terraces, 164 no. car and 320 no. cycle residential parking spaces plus 60 visitor cycle parking spaces; c.4,224 sq. m of landscaped public open space; a 2 storey creche facility (c.400 sq. m) with 12 no. car parking spaces; green roofs; solar panels; a two-lane access road linking the development to the roundabout where the R148 meets Dublin Road, providing 2 no. multimodal, priority-controlled junctions and segregated pedestrian and cyclist facilities with a controlled crossing; provision of roadway to access the development from the south via the existing roundabout on the Dublin Road; an internal road and shared surface network, including walkways and its associated infrastructure; watermain, foul and surface water drainage, extension to the proposed foul network and connection to the pump station (permitted under ABP-308357- 20), extension to the proposed watermain, connecting to the existing DN 300 HDPE adjacent to the R148 roundabout, an attenuation pond at the north east of the site (1770 sq.m); and all other ancillary site development works including hard and soft landscaping, boundary treatments, lighting, SuDs, and above and below ground services to facilitate the development.			
Royal Oaks Residential Development	**N**	**3.9 km**	**Granted consent**
Meath planning reference 2492, which is an extension of duration of reference SH304296. Construction of 133 no. dwelling units, creche and associated site works.			
68 residential units in Johnstown Bridge	**N**	**1.8 km**	**Granted consent**
Kildare planning reference 22488. Development of 68 No residential units comprising 59 No houses (10 No. 2 bed, 31 No. 3 bed and 18 No. 4 bed) and 9 No. maisonette apartments (8 No. 1 bed and 1 No. 2 bed) and a retail unit/cafe measuring 77.2 sq m, with heights ranging from two storeys to two storeys with attic accommodation over. The development also proposes a new vehicular entrance off Johnstown Road, ancillary car-parking; cycle parking; a pump station; hard and soft landscaping; lighting ;balconies; solar panels; boundary treatments; bin storage; ESB substation and all associated site works above and below ground.			

The projects listed in Table 10-18 above were examined for potential cumulative hydrological impacts. The proposed residential developments are mostly situated in the Enfield area, approximately 3 km north of the Proposed Development, as well as one large residential development in Johnstown. All of these developments are located within the same catchment and sub-catchment as the Proposed Development. It is noted from reviewing the planning reports for these developments that SuDS systems are proposed for each development which aims to increase the overall water quality of surface water runoff before it enters a natural watercourse or a public sewer. In addition, SuDS development requires that post development run-off is maintained as equivalent or lower levels than pre-development run-off for the site.

As such, it is not expected that any of the proposed housing developments in the surrounding area will act cumulatively with the Proposed Development on hydrology and water quality.

There are a number of existing and proposed solar farms within 5km of the Proposed Development. However, due to the insignificant increase in potential run-off from solar farm developments, it is not expected that the cumulative impact with the other permitted developments will give rise to any significant impacts.

Drehid landfill is located within a separate catchment to the Proposed Development and as such the two projects will not act cumulatively on hydrology and water quality.

The restoration of five hectares of agricultural land is taking place at a location 3.2 km north of the Proposed Development, immediately north of the Royal Canal. Due to the in-stream distance of this project (6.5 km downstream of the Proposed Development), together with the relatively small scale of the restoration of lands, no significant cumulative effects are envisaged.

The works at Johnstown Estate and the Blackwood Equestrian Centre are of a significantly smaller scale than the other cumulative projects and are of a nature which does not represent much risk to hydrology and water quality and therefore are not expected to act cumulatively with the Proposed Development.

Other developments are located at significant distances from the Proposed Development and/or drain into different tributaries of the main rivers running through the site (Carbury is located in Boyne_010 sub-catchment) and it is therefore not expected that they will have any significant potential cumulative hydrological impact with the Proposed Development, in particular given the small increase in surface water run-off expected in these catchments from the Proposed Development.

10.11 RESIDUAL IMPACTS

The residual significance of the effects of the Proposed Development on sensitive downstream receptors is expected to be low taking account of mitigation measures as outlined in Section 10.9.

The residual impact is summarised in Table 10-19 below, using the impact assessment outlined in Section 10.8.

Table 10-19 indicates that, following the implementation of mitigation measures, the residual risk to the receiving watercourses from hydrological impacts would be minor for impacts on the Fear English River due to changes in ammonia and phosphorous levels in forestry drainage, in the case of the construction of the Proposed Wind Farm and in the case of the construction of the Proposed Substation. The residual risk to the receiving watercourses from all other hydrological impacts would be negligible during the construction period and negligible during the operation of the Proposed Wind Farm and the Proposed Substation. The implementation and efficacy of the mitigation measures will be monitored throughout the construction and operation phases.

Mitigation systems will, where required, be in place before development works commence.

The proposed development will not have an adverse effect in terms of hydrology on the integrity of the following environmentally protected designated site:

- River Boyne and River Blackwater cSAC and SPA, located at 19.6km to the north of the site by hydrological links, from the site boundary.

As a result, the Proposed Development is not expected to contribute to any significant, negative cumulative effects with other existing or proposed developments in the vicinity. In circumstances where the proposed mitigation measures are implemented in full, any effects on the receiving environment will be of low significance.

Table 10-19: Residual Hydrological Impact Significance for Sensitive Receptors (the Proposed Wind Farm)

Activity	Potential Impact	Receptor	Sensitivity	Before Mitigation		After Mitigation	
				Magnitude	Significance	Magnitude	Residual Significance
Construction Phase							
Site tracks, cabling, turbine construction, crane pad construction	Increase in rate of run-off	River Boyne, & Blackwater River	High	Low	Low	Imperceptible	Imperceptible
Site tracks, cabling, turbine construction, crane pad construction,	Release of suspended solids into watercourse	Fear English River	High	Low	Low	Imperceptible	Imperceptible
Site tracks, crossings, cabling, turbine construction, crane pad construction, tree felling and management of temporary material storage areas	Erosion and sedimentation	River Boyne, & Blackwater River	High	Low	Low	Imperceptible	Imperceptible
Site tracks, crossings, cabling, turbine construction, crane pad construction, tree felling and management of material storage areas	Release of hydrocarbons or fuel spill	Fear English River	High	Medium	Profound	Imperceptible	Imperceptible
Site tracks, crossings, cabling, turbine construction, crane pad construction, tree felling and management of material storage areas	Changes in ammonia and phosphorous levels in forestry drainage	Fear English River	High	Low	Low	Low	Low

Activity	Potential Impact	Receptor	Sensitivity	Before Mitigation		After Mitigation	
				Magnitude	Significance	Magnitude	Residual Significance
Drainage crossings, turbine construction, temporary compounds	Chemical pollution	River Boyne, & Blackwater River	High	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Drainage crossings, turbine construction, temporary compounds	Obstruct hydrological flow	Fear English River	Medium	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Operation & Maintenance							
Site access tracks	Increase in rate of run-off	River Boyne, & Blackwater River	High	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Refuelling/Maintenance	Release of hydrocarbons or fuel spill	Fear English River	High	Medium	Profound	Imperceptible	Imperceptible
Decommissioning							
Increased trafficking to remove turbines	Erosion and sedimentation	River Boyne, & Blackwater River	High	Imperceptible	Imperceptible	Imperceptible	Imperceptible

Table 10-20: Residual Hydrological Impact Significance for Sensitive Receptors (the Proposed Substation)

Activity	Potential Impact	Receptor	Sensitivity	Before Mitigation		After Mitigation	
				Magnitude	Significance	Magnitude	Residual Significance
Construction Phase							
Site tracks, cabling, turbine construction, crane pad construction	Increase in rate of run-off	River Boyne, & Blackwater River	High	Low	Low	Imperceptible	Imperceptible
Site tracks, cabling, turbine construction, crane pad construction	Release of suspended solids into watercourse	Fear English River	High	Low	Low	Imperceptible	Imperceptible
Site tracks, crossings, cabling, turbine construction, crane pad construction, tree felling and management of temporary material storage areas	Erosion and sedimentation	River Boyne, & Blackwater River	High	Low	Low	Imperceptible	Imperceptible
Site tracks, crossings, cabling, turbine construction, crane pad construction, tree felling and management of material storage areas	Release of hydrocarbons or fuel spill	Fear English River	High	Medium	Profound	Imperceptible	Imperceptible
Site tracks, crossings, cabling, turbine construction, crane pad construction, tree felling and management of material storage areas	Changes in ammonia and phosphorous levels in forestry drainage	Fear English River	High	Low	Low	Low	Low

Activity	Potential Impact	Receptor	Sensitivity	Before Mitigation		After Mitigation	
				Magnitude	Significance	Magnitude	Residual Significance
Drainage crossings, turbine construction, temporary compounds	Chemical pollution	River Boyne, & Blackwater River	High	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Operation & Maintenance							
Site access tracks	Increase in rate of run-off	River Boyne, & Blackwater River	High	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Refuelling/Maintenance	Release of hydrocarbons or fuel spill	Fear English River	High	Medium	Profound	Imperceptible	Imperceptible
Decommissioning							
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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