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APPENDIX 9-2

FLOOD RISK ASSESSMENT

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SESKIN WIND FARM, CO. CARLOW

FLOOD RISK ASSESSMENT

FINAL REPORT

Prepared for:

MKO

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

DOCUMENT INFORMATION

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Signed:	 _____ ***Michael Gill B.A., B.A.I., M.Sc., MIEI*** ***Managing Director – Hydro-Environmental Services***

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1. INTRODUCTION

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1.1 BACKGROUND

Hydro-Environmental Services (HES) was engaged by MKO Ireland (MKO) on behalf of EDF Renewables Ireland (the Client) to undertake a Flood Risk Assessment (FRA) for the Proposed Project.

This FRA is written to accompany Chapter 9 of the Environmental Impact Assessment Report (EIAR) for the Proposed Project. The Proposed Project is described in full in Chapter 4 of the EIAR. For the purposes of this FRA, and consistent with the EIAR, the various components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm', 'Proposed Grid Connection Route' and the 'site'.

The following assessment is carried out in accordance with '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*' (DoEHLG, 2009).

1.2 STATEMENT OF QUALIFICATIONS

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and their head office is located in Dungarvan, County Waterford.

HES's core area of expertise and experience is hydrology and hydrogeology, including flooding assessment and surface water modelling. HES routinely work on surface water monitoring and modelling, and prepare flood risk assessment reports.

Michael Gill P.Geo (BA, BAI, Dip Geol., MSc, MIEI) is a Civil/Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland. In addition, he has substantial experience in geological characterisation, peatland morphology, and surface water drainage design and SUDs design and surface water/groundwater interactions. Michael has worked on the EIS/EIAR for Oweninny WF, Cloncreen WF, Derrinlough WF and over 100 other wind farm related projects across the country.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with over 3 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor routinely prepares the land, soils and geology chapters of environmental impact assessment reports for wind farm development on peatlands.

Jenny Law (BSc, MSc) is an environmental geoscientist holding a first honours degree in applied environmental geosciences from the University College Cork. Jenny has assisted in the preparation of the land, soils and geology and hydrology chapters for various environmental impact assessment reports, hydrological impact assessments, Water Framework Directive Assessment reports and Flood Risk Assessment reports for a variety of projects including wind farm developments and strategic housing developments.

1.3 REPORT LAYOUT

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This FRA report has the following format:

- Section 2 describes the site setting and details of the Proposed Project;
- Section 3 outlines the hydrological and geological characteristics of the Nore and Barrow River Catchments;
- Section 4 presents our initial flood risk identification undertaken for the Proposed Project based on desk studies and walkover surveys and a resultant Justification Test based on our findings;
- Section 5 presents the drainage design for the Proposed Project in terms of flood prevention,
- Section 5 presents the FRA report conclusions.

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2. BACKGROUND INFORMATION

2.1 INTRODUCTION

This section provides details on the topographical setting of the site along with a description of the Proposed Project.

2.2 SITE LOCATION AND TOPOGRAPHY

The Proposed Wind Farm is located ~3.1km northwest of the village of Oldleighlin, ~5km northwest of the Leighlinbridge town, in west Co. Carlow and ~9.9km southeast of Castlecomer, Co. Kilkenny. The Carlow – Kilkenny County border, locally marked by the Coolcullen River, is situated ~1km west of the Proposed Wind Farm. The Proposed Wind Farm is situated in the townlands of Agharue and Coolnakisha in the north, Seskinrea towards the centre and the townland of Ridge in the south. The site has a total area of 370 hectares (ha).

The Proposed Wind Farm is located in an upland settling and is dominated by coniferous forestry plantations with some heath and agricultural lands. The Proposed Wind Farm contains an existing network of local roads and forestry roads. It is proposed to access the Proposed Wind Farm site during both the construction and operational phase via an existing agricultural site entrance off the L3037 local road along the western boundary of the Proposed Project site in the townland of Ridge. Access can be gained from a local road (L30372) which dissects the Proposed Wind Farm, joining a small hamlet to the west, known as The Butts, to Tullouoreen Cross Roads in the east. Another local road (L7123) runs along the eastern boundary of the Proposed Wind Farm.

The Proposed Wind Farm is located on the Castlecomer Plateau, an upland area in north Co. Kilkenny which also extends into Co. Laois and Co. Carlow at its northern edge. The local topography within the Proposed Wind Farm is hilly, with land generally sloping in a westerly direction towards the Coolcullen River. Elevations within the Proposed Wind Farm range from ~250mOD (metres above Ordnance Datum) in the west to ~280m in the northeast.

The Proposed Grid Connection Route from the proposed onsite 38kV substation to the existing Kilkenny 110kV substation is 20.1km in length. The Proposed Grid Connection Route begins along the L30372, travelling to the west. The Proposed Grid Connection Route then travels to the southwest along the L30371 as far as Ballysallagh, Co. Kilkenny. The Proposed Grid Connection Route continues southwards along the L2627 before joining the R712. The Proposed Grid Connection Route continues for ~1.8km along this regional road before terminating at Kilkenny 100kV substation. Much of the Proposed Grid Connection Route is located within the Castlecomer Plateau and has elevations in excess of 100mOD. The southern section has lower elevations of 70 - 80mOD.

Some minor accommodation works are located at several locations along the Turbine Delivery Route (TDR) (detailed in Chapter 4 of this EIAR). More significant works are located at 2 no. locations;

- The Junction between the N78 and the L1834 will require the construction of a new temporary road to facilitate the delivery of the turbine components; and,
- Permanent carriageway strengthening works are required at the Black Bridge, where the L1835/L3037 crosses the River Dinin.

A site location map is shown as **Figure A** below.

2.3 PROPOSED PROJECT DETAILS

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The Proposed Project is detailed in full in Chapter 4 of the EIAR.

In summary the Proposed Project includes 7 no. proposed wind turbines, an onsite 38kV substation, a battery storage compound, 2 no. temporary construction compounds, a permanent meteorological mast, peat and spoil management areas, new site access roads, upgrades to existing site access roads, an underground 38kV grid connection to the existing Kilkenny 110kV substation and works along the turbine delivery route.

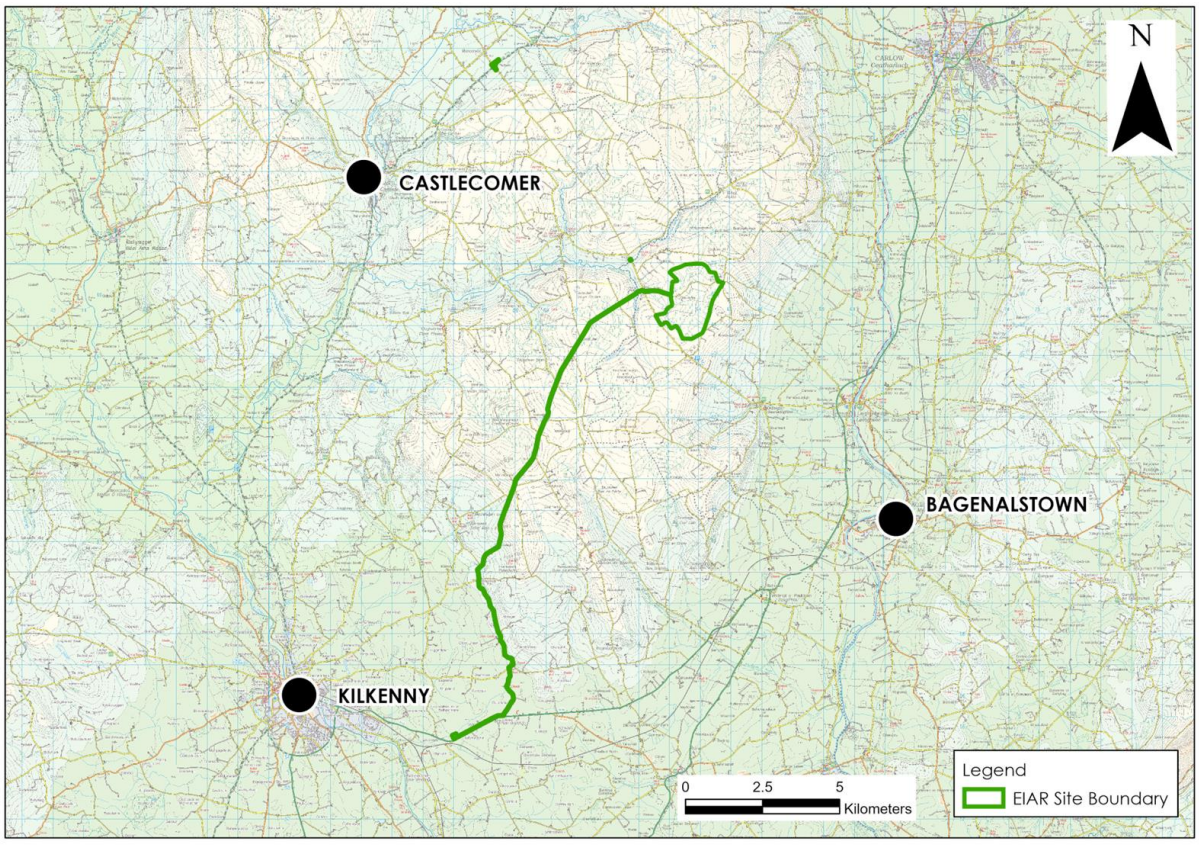

Figure A: Site Location Map

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3. EXISTING ENVIRONMENT AND CATCHMENT CHARACTERISTICS

3.1 INTRODUCTION

This section gives an overview of the hydrological and geological characteristics of the site and the local area.

3.2 HYDROLOGY

3.2.1 Regional and Local Hydrology

Regionally, the Proposed Wind Farm site is located in 2 no. surface water catchments. The vast majority of the Proposed Wind Farm site, including all proposed infrastructure is located in the River Nore surface water catchment within Hydrometric Area No. 15 of the South Eastern River Basin District. Small areas in the northeast of the Proposed Wind Farm site, which do not include any proposed infrastructure, are mapped within the River Barrow surface water catchment within Hydrometric Area No. 14 of the South Eastern River Basin District.

Within the River Nore surface water catchment, the Proposed Wind Farm site is located in the Dinin River sub-catchment (Dinin[South]_SC_010) and the Dinin(South)_020 WFD river sub-basin. The Proposed Wind Farm site drains towards the Coolcullen River which flows to the north ~1km west of the Proposed Wind Farm site. This watercourse discharges into the Dinin River ~1.8km northwest of the Proposed Wind Farm site. The Dinin River flows to the west before it veers to the southwest ~10km west of the Proposed Wind Farm site. The Dinin River flows southwards before it discharges into the River Nore ~17km to the southwest.

More locally the Proposed Wind Farm site is drained by several tributaries of the Coolcullen River. These 1st order streams originate within the Proposed Wind Farm site and flow to the west. These watercourses are locally unnamed but some have been assigned names by the EPA (www.epa.ie). The watercourse north of the Proposed Wind Farm site drains towards the Seskinrea stream (EPA Name), mapped ~70m east of T01. Further south the Proposed Wind Farm site is drained by a tributary of the Seskinrea Stream which is mapped ~130m north of T06. The streams confluence to the east of the L3037 before joining the Coolcullen River.

The Proposed Grid Connection Route is predominantly located in the River Nore surface water catchment. Within this catchment there are a total of 10 no. watercourse crossings, comprising 7 no. bridge crossings and 3 no. culvert crossings. A small section of the Proposed Grid Connection Route along the L30371 is also mapped in the River Barrow surface water catchment. However, there are no mapped watercourses in close proximity to this section of the Proposed Grid Connection Route.

A local hydrology map for the Proposed Project site is shown as **Figure B**.

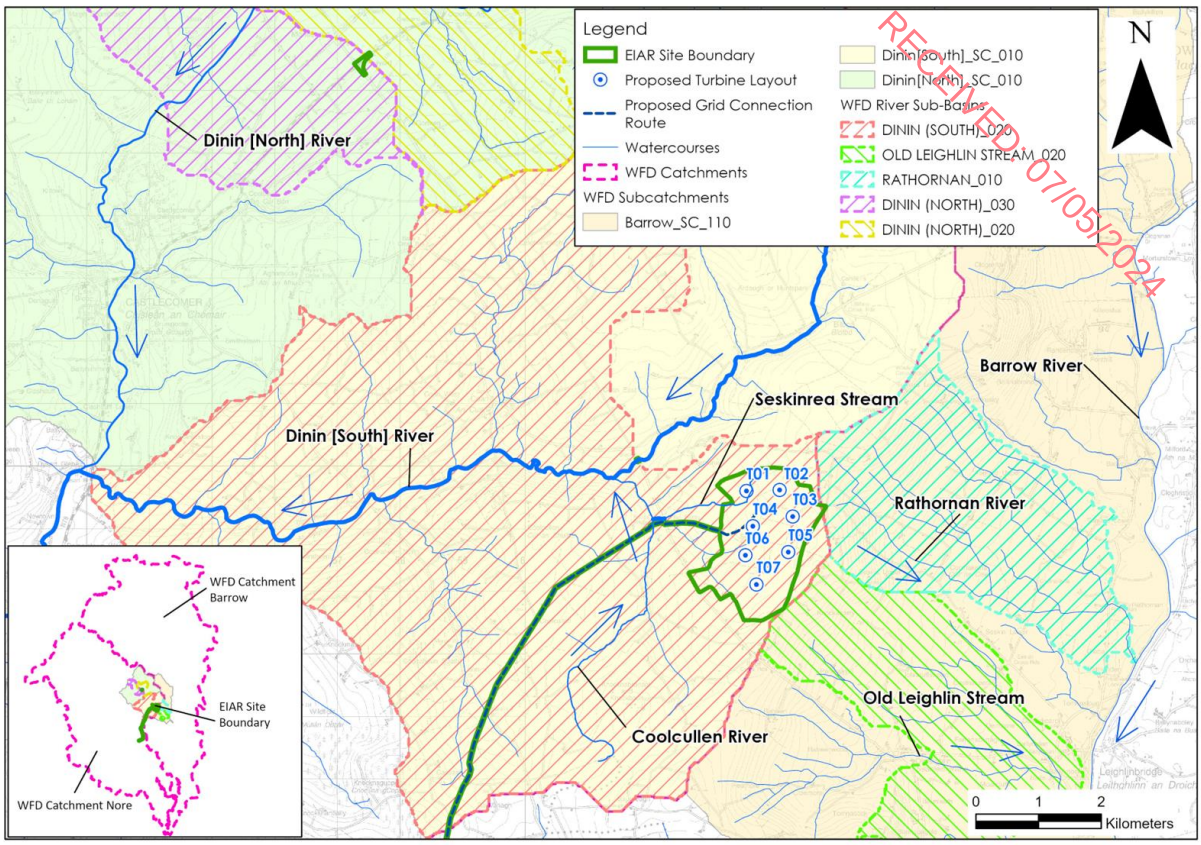

Figure B: Local Hydrology Map

3.2.2 Rainfall and Evaporation

Long term rainfall and evaporation data were sourced from Met Éireann. The 30-year annual average rainfall (1981-2010) recorded at Coon rainfall station, located ~3.5km northwest of the Proposed Wind Farm site, is ~1,056mm/year.

However, the average annual rainfall (AAR) at Coon rainfall station may underestimate the actual AAR at the Proposed Wind Farm site due to the elevation difference (the highest elevations at the Proposed Wind Farm site (~280mOD) are ~100m higher than the elevation of Coon rainfall station (~178mOD)).

Met Éireann also provide a grid of average annual rainfall for the entire country for the period of 1991 to 2020. Based on this more site-specific modelled rainfall values, the average annual rainfall at the Proposed Wind Farm site ranges from 1,121 to 1,134mm/year. The AAR is 1,127.5mm/yr (this is considered to be the most accurate estimate of AAR from the available sources).

The average potential evapotranspiration (PE) at Kilkenny (~17km southwest from the Proposed Wind Farm site) is taken to be 458.8mm (www.met.ie). The actual evapotranspiration (AE) is calculated to be 435.9mm (95% PE). Using the above figures, the effective rainfall (ER)[1] for the area is calculated to be (ER = AAR – AE) 691.6mm/yr.

In addition to average rainfall data, extreme value rainfall depths are available from Met Éireann. **Table A** below presents return period rainfall depths for the area of the Proposed Wind Farm site. This data is taken from https://www.met.ie/climate/services/rainfall-return-periods and provide rainfall depths for various storm durations and sample return periods (1-year, 5-year, 30-year, 100-year).

[1] *ER – Effective Rainfall is the excess rainfall after evaporation which produces overland flow and recharge to groundwater.*

Table A. Seskin – Return Period Rainfall Depths (mm)

	Return Period (Years)			
Duration	**1**	**5**	**30**	**100**
5 mins	3.5	5.7	9.5	13.1
15 mins	5.7	9.4	15.6	21.5
30 mins	7.4	12.0	19.6	26.6
1 hours	9.7	15.3	24.5	32.9
6 hours	19.2	28.9	43.9	56.8
12 hours	25	36.9	54.9	70.3
24 hours	32.7	47.2	68.8	86.9
2 days	40.2	56.3	79.4	98.4

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3.3 GEOLOGY

The published Teagasc soils map (www.gsi.ie) shows that the Proposed Wind Farm site is predominantly overlain by acid peaty and non-peaty poorly drained mineral soils. Blanket peat is also mapped to overlie some areas of the Proposed Wind Farm site and many of the Proposed Project infrastructure locations. Acid shallow poorly drained mineral soils are also mapped in the southeast of the Proposed Wind Farm site.

Other mapped soils in the surrounding lands include local pockets of acidic deep well drained mineral soils. Mineral alluvium is also mapped along the Coolcullen River and its tributaries.

The GSI subsoils map (www.gsi.ie) shows that the Proposed Wind Farm site is largely underlain by till derived from Namurian sandstones and shales. Areas of blanket peat are also mapped within the Proposed Wind Farm site and underlie several Proposed Project infrastructure locations. The GSI also map the occurrence of bedrock outcrop or subcrop in the southeast of the Proposed Wind Farm site. A small area of alluvium is also mapped to encroach upon the west of the Proposed Wind Farm site; it is mapped along a tributary of the Coolcullen River.

The mapped subsoils in the surrounding lands are largely similar to those mapped within the Proposed Wind Farm site, dominated by till derived from Namurian sandstones and shales and areas of bedrock outcrop, with smaller pockets of blanket peat and alluvium mapped along local watercourses.

Based on site investigations completed by HES, the peat at the Proposed Project infrastructure locations was noted to be shallow, ranging from 0 to 0.45m. The subsoils beneath the peat were noted to comprise of grey, firm, dense gravelly SILT/CLAY.

Based on the GSI bedrock mapping (www.gsi.ie) the Proposed Wind Farm site is underlain by 3 no. bedrock geological formations. The mapped boundary between these formations is orientated approximately north to south. The western section of the Proposed Wind Farm site is underlain by the Clay Gall Sandstone Formation which is comprised of feldspathic quartzitic sandstone. The eastern section of the Proposed Wind Farm site is underlain by the Bregaun Sandstone Formation described as thick flaggy sandstone and siltstone. A small area in the centre of the Proposed Wind Farm site is underlain by the Moyadd Coal Formation which comprises of shale siltstone and minor sandstone.

No competent bedrock was encountered at any of the intrusive site investigations. The trial pits completed at T02 and T03 encountered possible weathered bedrock at depths of 1.9 and 1.6mbgl respectively. These deposits were described as sandy silty angular gravel deposits. Bedrock outcrops were recorded in several of the streams draining the Proposed Wind Farm site and was consistent with the description provided by the GSI.

3.4 DESIGNATED SITES & HABITATS

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Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SAC), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs).

The Proposed Wind Farm site is not located within any designated conservation site, however there are downstream hydrological connections with some of the Natura 2000 sites in the region as described below:

- The River Barrow and River Nore SAC (002162) is located ~1km west of the Proposed Wind Farm site and is hydrologically connected via the Seskinrea Stream. This SAC consists of the freshwater stretches of the Barrow and River Nore catchment as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary.
- The River Barrow and River Nore SPA (Site Code: 004233) is located ~16.5km (straight line distance) southwest of the Proposed Wind Farm site and is hydrologically connected via the Seskinrea Stream and the Dinin River.

Other designated sites in close proximity to the Proposed Wind Farm site include:

- Coans Bog NHA (Site Code: 002382) situated ~3km to the northwest of the Proposed Wind Farm site. The Dinin River acts as a hydrological boundary between the Proposed Wind Farm Site and this NHA and as a result, there is no hydrological connection. Due to the low permeability of the bedrock aquifers and the short groundwater flowpaths there is no hydrogeological connection.
- Mothel Church pNHA (Site Code: 000408) is located ~3.3km to the west of the Proposed Wind Farm site. The Coolcullen River acts as a hydrological boundary between the Proposed Wind Farm site and this NHA and as a result, there is no hydrological connection. Due to the low permeability of the bedrock aquifers and the short groundwater flowpaths there is no hydrogeological connection.
- Cloghristick Wood pNHA (Site Code: 002162) is located ~5.5km to the east of the Proposed Wind Farm site. This pNHA is located in the Barrow catchment and is located upstream of the Rathornan and Oldleighlin Streams and is therefore upstream of the Proposed Wind Farm site. Furthermore, no proposed infrastructure within the Proposed Wind Farm site is located within the Barrow Catchment. Therefore, there is no hydrological or hydrogeological connection between the Proposed Wind Farm site and this pNHA.
- Whitehall Quarries (Site Code: 000855) are located ~5km south of the Proposed Wind Farm site. There is no hydrological or hydrogeological connection.

In addition, all watercourses draining the Proposed Grid Connection Route and the TDR work areas drain to the River Barrow and River Nore SAC (002162).

4. SITE-SPECIFIC FLOOD RISK ASSESSMENT

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4.1 INTRODUCTION

The following flood risk assessment is carried out in accordance with '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*' (DoEHLG, 2009) (hereafter referred to as 'the Guidelines'). The basic objectives of these guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and,
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

4.2 FLOOD RISK ASSESSMENT PROCEDURE

This section of the report details the site-specific flood risk assessment carried out for the Proposed Project site and surrounding area. The primary aim of the assessment is to consider all types of flood risks and the potential impact on the Proposed Project. As per the Guidelines, the stages of a flood risk assessment are:

- *Flood risk identification* – identify whether there are surface water flooding issues at a site;
- *Initial flood risk assessment* - confirm sources of flooding that may affect a proposed development; and,
- *Detailed flood risk assessment – quantitative appraisal of potential risk to a proposed development*.

As per the Guidelines, there are essentially two major causes of flooding:

Coastal flooding which is caused by higher sea levels than normal, largely as a result of storm surges, resulting in the sea overflowing onto the land. Coastal flooding is influenced by the following three factors, which often work in combination:

- High tide level;
- Storm surges caused by low barometric pressure exacerbated by high winds (the highest surges can develop from hurricanes); and,
- Wave action, which is dependent on wind speed and direction, local topography and exposure.

Due to its inland location, coastal flooding is not applicable to the site.

Inland flooding which is caused by prolonged and/or intense rainfall. Inland flooding can include a number of different types:

- Overland flow occurs when the amount of rainfall exceeds the infiltration capacity of the ground to absorb it. This excess water flows overland, ponding in natural hollows and low-lying areas or behind obstructions. This occurs as a rapid response to intense rainfall and eventually enters a piped or natural drainage system.
- River flooding occurs when the capacity of a watercourse is exceeded or the channel is blocked or restricted, and excess water spills out from the channel onto adjacent

low-lying areas (the floodplain). This can occur rapidly in short steep rivers or after some time and some distance from where the rain fell in rivers with a gentler gradient.

- Flooding from artificial drainage systems results when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity and the system becomes blocked, and / or cannot discharge due to a high water level in the receiving watercourse. This mostly occurs as a rapid response to intense rainfall. Together with overland flow, it is often known as pluvial flooding. Flooding arising from a lack of capacity in the urban drainage network has become an important source of flood risk, as evidenced during recent summers.
- Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall to meet the ground surface and flows out over it, i.e. when the capacity of this underground reservoir is exceeded. Groundwater flooding tends to be very local and results from interactions of site-specific factors such as tidal variations. While water level may rise slowly, it may be in place for extended periods of time. Hence, such flooding may often result in significant damage to property rather than be a potential risk to life.
- Estuarial flooding may occur due to a combination of tidal and fluvial flows, i.e. interaction between rivers and the sea, with tidal levels being dominant in most cases. A combination of high flow in rivers and a high tide will prevent water flowing out to sea tending to increase water levels inland, which may flood over river banks.

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The Guidelines provide direction on flood risk and development. The guidelines recommend a precautionary approach when considering flood risk management and the core principle of the guidelines is to adopt a risk based sequential approach to managing flood risk and to avoid development in areas that are at risk. The sequential approach is based on the identification of flood zones for inland and coastal flooding.

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning.

There are three types or levels of flood zones defined within the guidelines:

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and,

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

Once a flood zone has been identified for a site, the Guidelines set out the different types of development appropriate to each identified zone (pg 25, Table 3.1 of the Guidelines). Exceptions to the restriction of development due to potential flood risks are provided for through the application of a Justification Test, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated by the applicant.

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that, for the reasons outlined above, are being considered in areas of moderate or high flood risk. The test is comprised of two processes.

- The first is the **Plan-making Justification Test** described in chapter 4 of the Guidelines and used at the plan preparation and adoption stage where it is intended to zone or

otherwise designate land which is at moderate or high risk of flooding. Plan making Justification Tests are made at Plan/Policy development stage such as County Development Plans, or Local Area Plans.

- The second is the **Development Management Justification Test** described in chapter 5 of the Guidelines and used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

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4.3 FLOOD RISK IDENTIFICATION

4.3.1 Historical Mapping

To identify those areas as being at risk of flooding, historical mapping (i.e. 6" and 25" base maps) were consulted. There was no identifiable map text on local available historical 6" or 25" mapping for the area of the Proposed Project site that would identify lands that are "liable to flood" within the area and the vicinity of the Proposed Project.

4.3.2 Soils Maps - Fluvial Maps

A review of the soil types in the vicinity of the Proposed Project site was undertaken as soils can be a good indicator of past flooding in an area. Due to past flooding of rivers, deposits of transported silts/clays referred to as alluvium build up within the flood plain and hence the presence of these soils is a good indicator of potentially flood prone areas.

Based on the EPA/GSI soil map for the area, mineral alluvium is mapped along the Coolcullen River and its tributaries downstream of the Proposed Wind Farm site. A relatively small area of mineral alluvium soils is mapped ~160m west of T06, along an unnamed tributary of the Seskinrea stream, within the southwestern corner of the Proposed Wind Farm site. No infrastructure is proposed within this area of the Proposed Wind Farm site. No other areas of mapped alluvium deposits encroach upon the Proposed Wind Farm site.

Alluvium is also mapped downstream of the TDR works at Black Bridge along the Dinin River. Meanwhile, no alluvium is mapped in the vicinity of the junction accommodation works along the TDR.

Meanwhile, along the Proposed Grid Connection Route, alluvium soils are mapped at several locations:

- Along the L30372 over an unnamed tributary of the Seskinrea Stream;
- An existing bridge crossing (Philips Bridge) along the L30371 over the Coolcullen River;
- Along sections of the L2627 in the vicinity of the Lyrath Stream; and,
- Along the Lyrath Stream~150m north of the Proposed Grid Connection Route in the vicinity of existing Kilkenny substation.

4.3.3 OPW Past Flood Events Mapping

To identify those areas as being at risk of flooding, OPW's indicative river and coastal flood map (www.viewer.myplan.ie) were consulted.

No recurring flood incidents within the Proposed Wind Farm site were identified from OPW's indicative river and coastal flood map.

The closest mapped historic and recurring flood events are situated in the Barrow River catchment. The nearest flood incident is a recurring event mapped to be at the town of Oldleighlin, ~4km southeast of the Proposed Wind farm site (ID: 2598). However as stated previously, no Proposed Project infrastructure within the Proposed Wind Farm site is located in

the River Barrow surface water catchment. Meanwhile, no section of the Proposed Grid Connection Route is located upstream of this recurring flood event.

The nearest downstream recurring flood event, within the River Nore surface water catchment, to the Proposed Wind Farm site is located at the confluence of the Dinin and Nore Rivers (ID: 2812), ~17km southwest (straight line distance) of the Proposed Wind Farm site (see **Figure C** below).

The OPW Past Flood Events map does not record any historic or recurring flood events along the local watercourses which drain the Proposed Grid Connection Route. Flood events are mapped further downstream of the Proposed Grid Connection Route along the Nore and Barrow Rivers. Additionally, the OPW Past Flood Events map does not record any historic or recurring flood events in the immediate vicinity of the TDR work areas.

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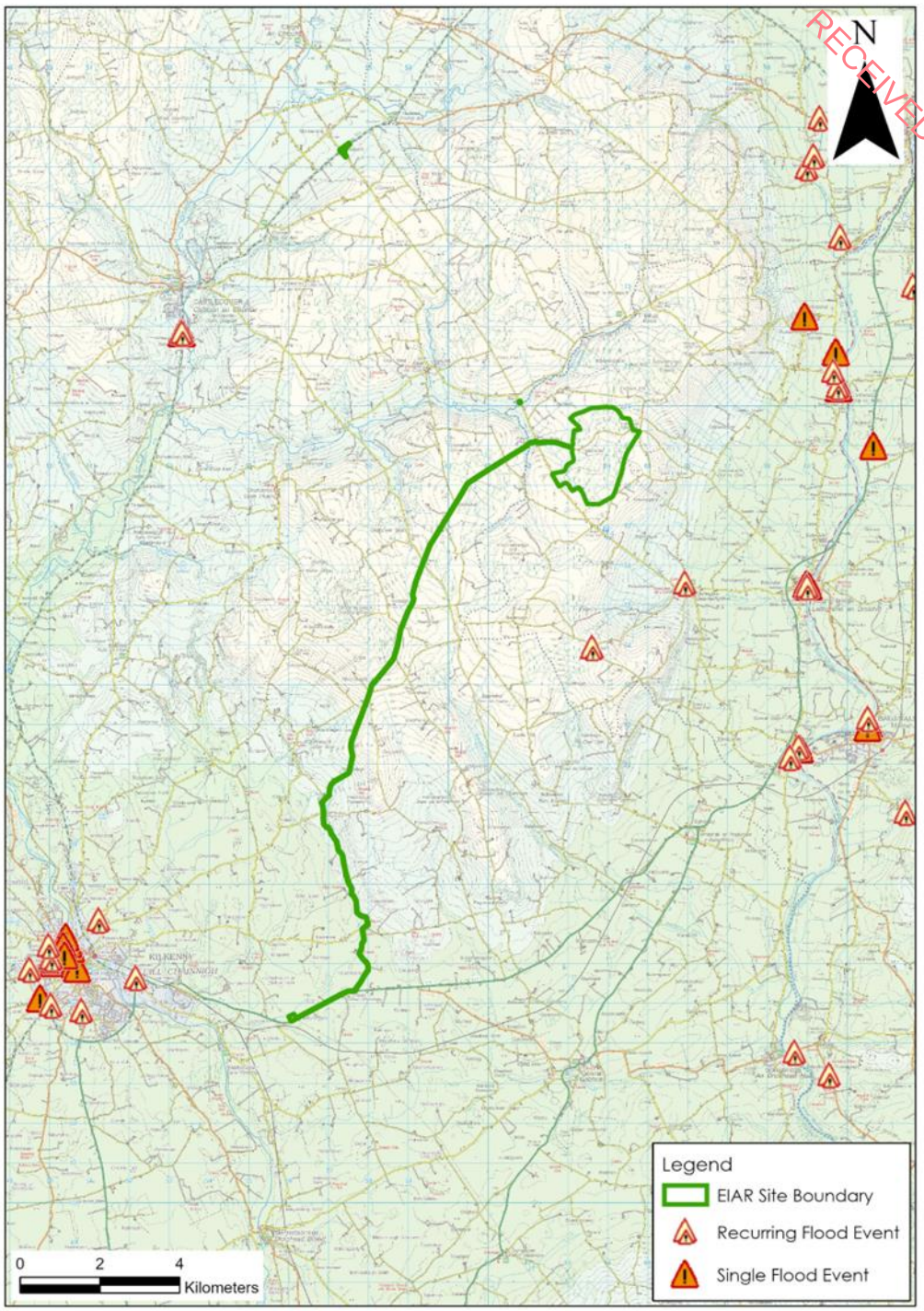

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Figure C: OPW Past Flood Events Map

4.3.4 GSI Winter 2015/2016 Surface Water Flood Mapping

The GSI Winter (2015/2016) Surface Water Flooding map shows areas of fluvial and pluvial flood extents during the Winter 2015/2016 flood event, which was the largest recorded flood event in many areas. This surface water flood map is available to view at www.floodinfo.ie.

The nearest Winter 2015/2016 Surface Water Flooding mapped areas from the Proposed Wind Farm site are along the watercourse of the Barrow River approximately 6km to the east. As stated above, no infrastructure associated with the Proposed Wind Farm is located in the Barrow River surface water catchment.

The GSI's Winter 2015/2016 Surface Water Flood Map does not record any surface water flood zones along the Proposed Grid Connection Route, or in the immediate vicinity of the TDR work areas.

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4.3.5 CFRAM Flood Extent Mapping

Catchment Flood Risk Assessment and Management (CFRAM) OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the previous PFRA maps. CFRAM mapping of river flood extents are available at www.floodinfo.ie.

CFRAM mapping has not been completed for the area of the Proposed Project.

The closest CFRAM River mapping to the Proposed Wind Farm site has been completed approximately 5km to the east, along the River Barrow. As stated previously, no Proposed Project infrastructure within the Proposed Wind Farm site is located in the River Barrow surface water catchment. Downstream of the Proposed Wind Farm site CFRAM fluvial mapping has been completed along the River Nore, approximately 17km to the southwest (straight line distance).

No CFRAM flood zones are mapped along any of the local watercourses draining the Proposed Grid Connection Route. The closest CFRAM flood zones are located along the River Nore, ~1.8km southwest of the existing Kilkenny 110kV substation. Within the Barrow River catchment, the closest CFRAM flood zones downstream of the Proposed Grid Connection Route are located on the Barrow River near Goresbridge, ~13km from the Proposed Grid Connection Route.

Furthermore, no CFRAM flood zones are mapped along any of the local watercourses in the vicinity of the proposed TDR work areas.

CFRAM Flood Extents Mapping (Present Day) for the Proposed Wind Farm site is shown in **Figure D** below.

4.3.6 National Indicative Fluvial Mapping (NIFM) River Flood Extents

The National Indicative Fluvial Flood Mapping (NIFM) (www.floodinfo.ie) shows probabilistic fluvial flood zones for catchments greater than 5km^2 for which flood maps were not produced under the CFRAM Programme.

The Present Day Scenario has been generated using methodologies based on historic flood data and does not consider the potential changes due to climate change. The potential effects of climate change on flooding have been separately modelled (see **Section 4.3.9** below.)

For the Present Day Scenario, no high probability (1 in 10-year), medium probability (1 in 100-year) or low probability (1 in 1,000-year) fluvial flood zones have been mapped within the Proposed Wind Farm site. However, low and medium probability NIFM river flood extents for the present day are mapped along the lower reaches of the Seskinrea stream as it confluences with the Coolcullen River. NIFM river flood extents for the present day continue downstream along the Dinin and Nore rivers.

These NIFM flood zones are shown in **Figure D** below. As such, the NIFM mapping suggests that there is no potential for fluvial flooding within the Proposed Wind Farm site.

With regards to the Proposed Grid Connection Route, the National Indicative Fluvial Flood Mapping for the Present Day Scenario shows fluvial flooding along the Seskinrea Stream and the Coolcullen River to the west of the Proposed Wind Farm site. An existing watercourse crossing already exists at this location. No other fluvial flood zones encroach upon the

Proposed Grid Connection Route. Meanwhile, fluvial flood zones are mapped along the Lyrath Stream immediately to the north of the existing Kilkenny 110kV substation.

With regards to the TDR work areas, the National Indicative Fluvial Flood Mapping for the Present Day Scenario shows fluvial flooding along the Dinin River, ~2km to the northwest of the junction accommodation works between the N78 and the L1834. Meanwhile, NIFM fluvial flood zones are mapped along the Dinin River at Black Bridge. However, there is an existing watercourse crossing at this location and the works will result in no displacement of floodwaters.

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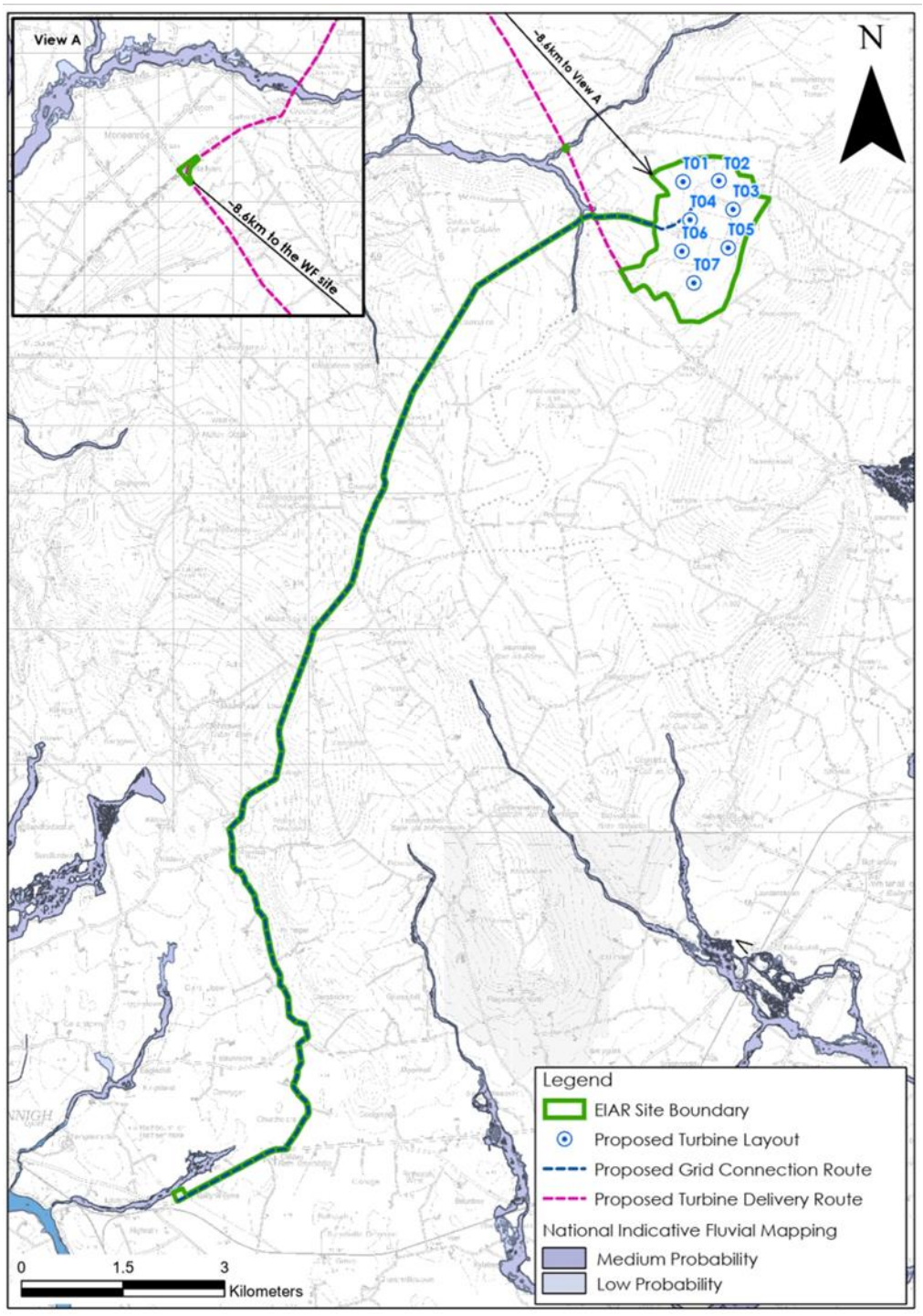

Figure D: Mapped CFRAM and NIFM Fluvial Flood Zones surrounding the Proposed Project

4.3.7 Groundwater Flooding

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The GSI Historical Groundwater flood map and the modelled groundwater flood extents map (www.floodinfo.ie) do not show the occurrence of any groundwater flooding within the Proposed Wind Farm site or in the vicinity of the TDR work areas.

Meanwhile, the GSI's Maximum Historic Groundwater Flood Map records a small area of groundwater flooding ~130m west of the Proposed Grid Connection Route in the townland of Churchclara. This section of the Proposed Grid Connection Route is underlain by a karst limestone aquifer. However, no mapped groundwater flood zones encroach upon the Proposed Grid Connection Route.

4.3.8 Coastal Flooding

The Proposed Wind Farm site is located approximately 57km inland from the east coast of Ireland and at an elevation of 240m to 270mOD.

As such, there is no risk of coastal flooding at the Proposed Wind Farm site, along the Proposed Grid Connection Route or in the TDR work areas.

4.3.9 Climate Change

It is likely that climate change will have significant impacts on flooding and flood risk in Ireland due to rising sea levels, increased winter rainfall and more intense rainfall. The CFRAM Programme has modelled flooding associated with potential future climate change scenarios. These CFRAM flood zones have been modelled for 2 no. potential future climate change scenarios, with the Mid-Range and High-End Future Scenario flood extents generated using an increase in rainfall of 20% and 30% respectively.

However as stated above no CFRAM modelling has been completed in the vicinity of the Proposed Project site. CFRAM River flood extents show similar flood zones along the Barrow River and the Nore River as described above in **Section 4.3.5**, and as such, remain distant to the Proposed Project site.

Similarly, there are NIFM flood zones have also been modelled for the 2 no. potential future climate change scenarios. Both of these modelled flood extents show similar flood zones to the Present Day Scenario discussed above in **Section 4.3.6**. Therefore, flood zones at the Proposed Wind Farm site, along the Proposed Grid Connection Route or at the TDR work areas are unlikely to be significantly impacted by future climate change.

4.3.10 Summary – Flood Risk Identification

Based on the information gained through the flood identification process, the Proposed Wind Farm site is not constrained by coastal, fluvial or groundwater flooding. The entire Proposed Wind Farm site, including all proposed infrastructure locations, is located in Fluvial Flood Zone C and is at a low risk of fluvial flooding.

With regards to the TDR works, the proposed strengthening works at the Black Bridge are mapped in Fluvial Flood Zone A associated with the Dinin River. Due to the nature of the TDR, this will have no effect during the operational phase of the Proposed Project. During the construction phase, works along the TDR may have to be postponed following heavy rainfall events which may cause flooding at this location.

Much of the Proposed Grid Connection Route is located in Flood Zone C. However an existing crossing over the Coolcullen River is mapped in Fluvial Flood Zone A. Due to the nature of the Proposed Grid Connection Route, this will have no effect during the operational phase of the Proposed Project. During the construction phase, works along the Proposed Grid

Connection Route may have to be postponed following heavy rainfall events which may cause flooding at this location.

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4.4 INITIAL FLOOD RISK ASSESSMENT

4.4.1 Site Surveys

Detailed walkover surveys of the Proposed Wind Farm site were undertaken by HES on 24th August 2022, 14th July 2023 and 14th December 2023.

The Proposed Wind Farm site was noted to comprise of a mixture of forested and felled areas, with an existing network of forestry tracks, and agricultural lands. As discussed above, several watercourses have their upper reaches within the Proposed Wind Farm site and these flow rapidly downslope before discharging into the Coolcullen River.
During walkover surveys and flow monitoring there was little evidence of previous out of bank flow from within the various watercourse channels. During targeted visits following considerable rainfall in the prior day/s, high flows were observed within the local streams, with many estimated to be several multiples of the typical dry weather flow. No widespread or localized flooding was observed during these site visits, all flow was contained within the channels.

Monitoring of stream discharge in the main streams within and downstream of the Proposed Wind Farm site and Proposed Grid Connection Route was undertaken on 2 no. occasions at 4 no. monitoring locations (SW1-SW4). The data are presented in **Table B**. We note that the flow volumes are typical of seasonal flows for first/second order streams.

In summary, no areas of concern regarding flood risk within the Proposed Wind Farm site were noted during the walkover surveys due to:

- The elevation of much of the Proposed Wind Farm site located at elevations in excess of 200mOD;
- The sloping nature of the land, with the Proposed Wind Farm site being drained by numerous streams which flow rapidly downslope; and,
- The existing drainage regime in forested areas (forestry mound and ribbon drains) and agricultural lands (field drains) facilitates the movement of water downslope and into the existing natural drainage system and local streams/rivers.

Surveys were also completed along the Proposed Grid Connection Route and in the TDR work areas. No issues or signs of flooding were recorded in these areas.

Table B: Surface Water Flow Monitoring

Location/Date	Easting	Northing	Watercourse – EPA Name	Flow Volume Range (l/s)
SW1	663,473	668,782	Tributary of Seskinrea stream	10 – 12
SW2	662,129	669,193	Seskinrea stream	30 - 35
SW3	664,121	669,344	Unnamed (Unmapped feature along existing road)	2 – 3
SW4	657,251	658,808	Lyrath	5 - 10

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4.4.2 Existing Site Drainage

The forestry drains are the primary drainage routes towards the natural streams in the forested areas of the Proposed Wind Farm site, but the flows in these drains are generally very low. The integration of the existing main forestry drains with the proposed wind farm drainage is a key component of the drainage design.

Within the Proposed Wind Farm site there are numerous manmade drains that are in place predominately to drain the forestry plantations. Mound drains and ploughed ribbon drains are generally spaced approximately every 15m and 2m respectively. Interceptor drains are generally located up-gradient (cut-off drains) and down-gradient of forestry plantations. Interceptor drains are also located up-gradient of forestry access roads. Culverts are generally located at stream crossings and at low points under access roads which drain runoff onto down-gradient forest plantations. A schematic of a typical standard forestry drainage network and one which is representative of the site drainage network is shown as **Figure E**.

In the agricultural areas, several deeply incised drains were also recorded along field boundaries and hedgerows.

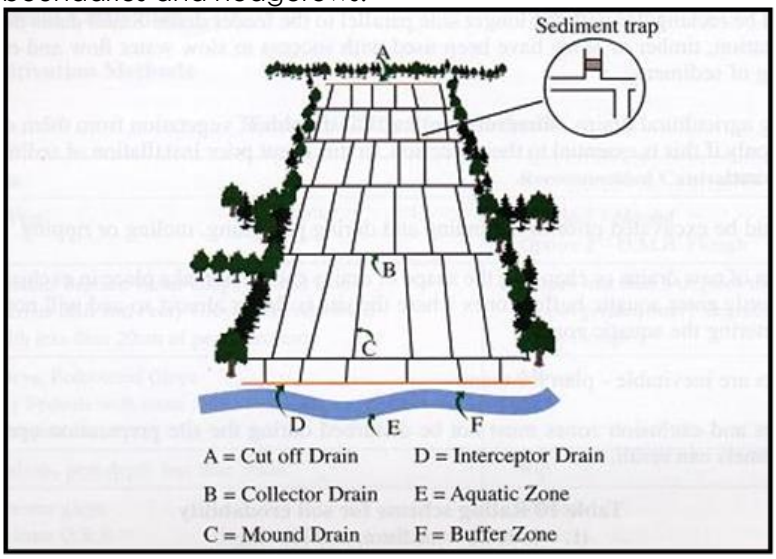

Figure E: Schematic of Typical Forestry Drainage Layout

4.4.3 Hydrological Flood Conceptual Model

Potential flooding in the vicinity of the Proposed Wind Farm site, along the Proposed Grid Connection Route and in the TDR work areas can be described using the Source – Pathway – Receptor Model ("S-P-R"). Given the typical sloping topography and ground elevations, the potential for pluvial flooding is generally low. The primary potential source of flooding in this area, and the one with most consequence for the Proposed Project, is fluvial flooding of the local streams which drain the Proposed Project site during significant rainfall events. The potential receptors in the area are infrastructure and land as outlined below.

There are no apparent sources of flooding at the Proposed Wind Farm site having considered tidal, fluvial and pluvial sources. The main risk of flooding is via pluvial flooding. This risk is limited to local flat areas due to the mountainous and sloping nature of the wider area. Surface water ponding/pluvial flooding may occur in some flat areas of the Proposed Wind Farm site due to the presence of low permeability peat at the surface. However, mostly the risk of pluvial flooding is very low, due to the elevated and sloping nature of the Proposed Wind Farm site and the high density of streams and drains which flow rapidly downslope.

The Proposed Grid Connection Route also is at a low risk of flooding. However, there are areas which may be prone to flooding, principally at existing watercourse crossings. Due to the depth of the Proposed Grid Connection Route underground cabling, this will have no impact during the operational phase of the Proposed Project. During the construction phase, works along the Proposed Grid Connection Route may have to be postponed following heavy rainfall events which could cause flooding in this area.

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The TDR works at Black Bridge are also located in a fluvial flood zone associated with the Dinin River.

4.4.4 Summary – Initial Flood Risk Assessment

Based on the information gained through the flood identification process and Initial Flood Risk Assessment process it would appear that flooding is unlikely to be problematic at or downstream of the Proposed Wind Farm site or along the Proposed Grid Connection Route. The potential sources of flood risk for the Proposed Project site are outlined and assessed in **Table C**.

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Table C. S-P-R Assessment of Flood Sources

Source	Pathway	Receptor	Comment
Fluvial	Overbank flooding of the rivers and streams that are close to some of Proposed Project infrastructure and the rivers and streams that flow throughout the site	Land & infrastructure	Based on National Indicative Fluvial Flood Mapping, the Proposed Wind Farm site is located in Fluvial Flood Zone C where there is a low risk of fluvial flooding. Due to the slope of the land, water flows rapidly downslope in the numerous 1st and 2nd order streams which drain the Proposed Wind Farm site. There is little risk of fluvial flooding at the Proposed Wind Farm site. The TDR works at the Black Bridge are mapped in a fluvial flood zone, however an existing crossing already exists at the location. A small section of the Proposed Grid Connection Route is mapped in Fluvial Flood Zone A and B, associated with fluvial flooding along the Coolcullen River. However, an existing public road and watercourse crossing already exists at this location. Therefore, the Proposed Development will have no effect on flooding in this area.
Pluvial	Ponding of rainwater on site	Land & infrastructure	There is very little risk of pluvial flooding within the Proposed Wind Farm site due to the sloping nature of the land. Drainage moves relatively freely downslope due to the sloping topography; the existing forestry drains and the high density of natural watercourses and streams. Therefore, there is little risk of pluvial flooding at the Proposed Wind Farm site.
Surface water	Surface ponding/ Overflow	Land & infrastructure	Same as above (pluvial).
Groundwater	Rising groundwater levels	Land & infrastructure	Based on local hydrogeological regime and GSI mapping, there is no risk of groundwater flooding at the Proposed Wind Farm site. A section of the Proposed Grid Connection Route is mapped to be underlain by a karst limestone aquifer. However, no historic or modelled groundwater flood zones encroach upon the Proposed Grid Connection Route.
Coastal/tidal	Overbank flooding	Land, People, property	Not applicable. The Proposed Project is ~57km from the east coast of Ireland (straight line distance) and therefore there is no risk of coastal flooding.

4.5 REQUIREMENT FOR A JUSTIFICATION TEST

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The matrix of vulnerability versus flood zone is shown in **Table D** to illustrate appropriate development types or indicate when a Justification Test[2] is required. The detailed flood risk assessment has determined that the Proposed Wind Farm site is within Flood Zone C.

It may be considered that the Proposed Project can be categorised as "Highly Vulnerable Development". However, as stated above, with the exception of existing watercourse crossings on the Proposed Grid Connection Route and the works along the TDR at Black Bridge, all Proposed Project infrastructure, including the proposed onsite 38kV substation and battery energy storage system, is located in Flood Zone C (Low Risk). Therefore, the Proposed Project is appropriate from a flood risk perspective.

A justification test has been completed below for the Proposed Grid Connection Route crossings which are located in the mapped fluvial flood zones and for the TDR works at Black Bridge.

Table D: Matrix of Vulnerability versus Flood Zone

	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

Note: *Taken from Table 3.2 (DoEHLG, 2009)*
Bold: *Applies to this project.*

Box 5.1 (**Table E**) of "The Planning System and Flood Risk Management Guidelines" (PSFRM Guidelines) outlines the criteria required to complete the "Justification Test".

Table E: Format of Justification Test for Development Management

Box 5.1 Justification Test for Development Management (to be submitted by the applicant)
When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied: 1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines. 2. The proposal has been subject to an appropriate flood risk assessment that demonstrates: i. The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk; ii. The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible; iii. The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and iv. The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of

[2] *A 'Justification Test' is an assessment process designed to rigorously assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk, (DoEHLG, 2009).*

good urban design and vibrant and active streetscapes. The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: *this table has been adapted from Box 5.1 of "The Planning System and Flood Risk Management Guidelines" (2009).*

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Referring to Point 1 and Points 2 (i) to (iv) inclusive:

Some of the Proposed Project is located in mapped fluvial flood zones along the Dinin River at Black Bridge (TDR work area) and along the Coolcullen River at Phillips Bridge (Proposed Grid Connection Route). The closest third-party sensitive receptor is a dwelling located ~74m upstream of the Coolcullen watercourse crossing. There are no dwellings located in the vicinity of Black Bridge on the Dinin River.

No displacement of floodwaters will result from the emplacement of the Proposed Grid Connection Route underground cable at Phillips Bridge. This will be achieved by directional drilling and there will be no in-stream works or alteration of the existing hydromorphological regime.

The carriageway strengthening works proposed at Black Bridge will be carried out to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland.

During the construction phase, works at these locations may be postponed in the event of flooding.

1. The Proposed Project has been the subject of a flood risk assessment (this report) and the following has been determined:

   i. Due to the relatively small footprint of the Proposed Project and given that the only portions of the Proposed Project located within modelled flood zones are at existing watercourse crossings, the Proposed Project is predicted to have no impact on flood water levels downstream. No increase in downstream flood risk will occur.
   ii. All proposed turbines and all other site infrastructure are located outside of the flood zones. These measures will mitigate against any potential disruption to the natural hydrology of the Proposed Wind Farm site. No increase in flood risk to people, property, the economy or the environment during extreme flood events as a result of the Proposed Project is predicted due to the appropriate design measures which will result in unmeasurable/imperceptible upstream and downstream effects;
   iii. The Proposed Grid Connection Route crossing of the Coolcullen River at Philips Bridge is located within the modelled flood zone, but this will not have an effect on flood levels. This crossing will be achieved by horizontal directional drilling. Therefore, there will be no displacement of flood waters;
   iv. The carriageway strengthening works at Black Bridge, over the Dinin River, comprise of the provision of a new reinforcing concrete slab on the existing stone arch and road surface dressing. These works have no potential to displace any significant volumes of floodwater.
   v. The Proposed Project is compatible with the wider planning objectives of the area, including the provision of wind energy developments at appropriate locations and the proper planning and sustainable development of the area.

5. FLOOD IMPACT PREVENTION AND DRAINAGE MANAGEMENT

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5.1 PROPOSED DRAINAGE

The site drainage system was designed integrally with the Proposed Project design layout as a measure to ensure that the proposal will not change the existing flow regime across the Proposed Project site, will not deteriorate water quality and will safeguard existing water quality status of the catchments from wind farm related sediment runoff.

Overland flow rates are likely to be significant and the drainage system must be designed and managed properly if it is to work effectively. A fundamental principle in the drainage design is that clean water flowing in the upstream catchment, including overland flow and flow in existing streams and drains, is allowed to bypass the works areas without being contaminated by silt from the works. The dirty water from the works areas is collected in a separate drainage system and treated by removing the suspended solids before discharging it to the downstream watercourse. This minimises the volume of dirty water requiring treatment.

Existing streams crossing the works area will be piped to isolate them from the works. New drains will be constructed to collect overland flow that is intercepted by the works areas or by new access roads. These will be constructed on the uphill side of the works and piped to the downhill side, bypassing the works areas. However, this will cause the normally dispersed flow to be concentrated at specific discharge points downstream of the works. In order to disperse this flow each clean water drain will be terminated in a discharge channel running parallel to the ground contours that will function as a weir to disperse the flow over a wider area of vegetation. This will prevent erosion of the ground surface and will attenuate the flow rate to the downstream receiving waters.

The resultant diversion of clean water runoff will ensure that the treatment system will only need to deal with construction related runoff. The treatment system consists of a series of settlement ponds that are located at each works site and at intervals along the access roads. The outflow from the settlement ponds will be allowed to disperse across vegetation and will become diluted through contact with the clean water runoff in the buffer areas before entering the downstream watercourses.

5.2 PROPOSED ON-SITE RUNOFF ATTENUATION

The creation of impermeable areas within a site has the effect of increasing rates of runoff into the downstream drainage system and this may increase flood risk and flood severity downstream. This applies particularly to urban areas that drain to closed pipe systems which do not have the capacity to cater for increased hydraulic loads. The Proposed Project is located within a large rural catchment with an open drainage system. The footprint of the impermeable areas and the associated increase in runoff rate is very small in the context of the catchment size and therefore represents a negligible increase in downstream flood risk. Notwithstanding the low increase in flood risk due to the Proposed Project, the drainage system has been designed to prevent any increase in discharge rates above that which already exist in the undeveloped site.

The volume of water requiring attenuation relates to direct precipitation on the roads and hard-standing footprint only. The aim of the storm water attenuation measures is to limit the flow rate from the developed area to that which prevails on the undeveloped site. This is achieved by limiting the flow rate to the downstream receiving waters and temporarily storing the excess water that accumulates as a result. The developed surfaces have some permeability and this reduces the attenuation requirement. Conventional attenuation systems use proprietary flow control units but these can become blocked with debris and vegetation and require regular maintenance. They are therefore not appropriate for use within a forestry environment or where routine maintenance would not be practical.

It is proposed to provide the temporary storage within the drainage channels by creating stone dams within them at regular intervals. The spacing of the dams is typically 100m but depends on the channel slope, with steeper channels requiring shorter intervals. The dams, which are constructed with small sized aggregate, also reduce the flow rate through the drainage system and are an effective means of providing flow control. Silt fence also provide storage and flow control.

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All runoff from the developed areas will be routed through settlement ponds downstream. The outflow from the settlement ponds will be released in a controlled and diffuse manner. Therefore, the Proposed Project will not increase the magnitude of the hydrograph peak. The control measures are passive as opposed to mechanical and do not require maintenance to ensure their ongoing effectiveness.

6. REPORT CONCLUSIONS

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- A flood risk identification study was undertaken to identify existing potential flood risks associated with the Proposed Project at Seskin, Co. Carlow. From this study:
    - No instances of historical flooding were identified in historic OS maps;
    - No instances of recurring flooding were identified on OPW maps within the Proposed Wind Farm site;
    - No instances of recurring flood incidents were identified on OPW maps immediately downstream of the Proposed Wind Farm site;
    - The GSI Historical 2015/2016 flood map does not record any historic flood zones in the area of the Proposed Wind Farm site;
    - The Proposed Wind Farm site is not mapped within any historic or predictive groundwater flood zone;
    - The Proposed Wind Farm site is not identified as being within CFRAM Flood Zones; and,
    - The National Indicative Fluvial Food Mapping does not show any fluvial flood zones along the local watercourses within the Proposed Wind Farm site.
- During the walkover surveys and flow monitoring at the Proposed Wind Farm site there was no evidence of out-of-bank flow from within the various stream/river channels. No widespread or even localized flooding was observed during these site visits;
- The risk of flooding at the Proposed Wind Farm site is very low due to the elevated and sloping nature of the site and the high density of streams and drains which flow rapidly downslope;
- The Proposed Wind Farm site is mapped within Fluvial Flood Zone C and is at low risk of fluvial flooding;
- The Proposed Grid Connection Route is also largely located in Flood Zone C and is at a low risk of flooding. However, local public roads and watercourse crossings already exist along the Proposed Grid Connection Route and the Proposed Project will have no effect on flooding or mapped flood zones. During the construction phase, works along the underground Proposed Grid Connection Route may have to be postponed following heavy rainfall events which could cause flooding in this area;
- The carriageway strengthening works at Black Bridge, along the TDR, are mapped within flood zones associated with the Dinin River. Due to the nature of the works, comprising a new reinforcing concrete slab and road surface dressings, there is no potential for the displacement of floodwaters;
- The Proposed Project can be categorised as "Highly Vulnerable Development", however, the key proposed infrastructure is located outside of areas mapped as Flood Zones and therefore the Proposed Project is appropriate from a flood risk perspective;
- The overall risk of flooding is estimated to be very low. A low risk would typically relate to the probability of being impacted by a 1000-year flood (i.e. the entire area of the Proposed Project footprint is located in fluvial Flood Zone C). The flooding risk at the Proposed Wind Farm site has an estimated AEP of <0.1%; and,
- In addition, the risk of the Proposed Project contributing to downstream flooding is also very low, as the long-term plan for the site is to retain and slow down drainage water rates prior to release. Robust drainage measures on the site will include swales, silt traps, check dams, settlement ponds and buffered outfalls. Please refer to the Chapter 9 Water of the EIAR for further details.

* *

7. REFERENCES

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