McCloy Consulting

Flood Risk Assessment

Kellystown Wind Farm

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1 INTRODUCTION

1.1 Terms of Reference

This Flood Risk and Drainage Assessment (FRA) report was commissioned by EDF via its lead consultant (Jennings O'Donovan) to support a planning application for the proposed Kellystown Wind Farm development (hereafter referred to as the 'Proposed Development').

1.2 Statement of Authority

This FRA was prepared and reviewed by qualified professionals with appropriate experience in the fields of flood risk, drainage, and hydraulic modelling studies. The key staff members involved in this project are:

- Kate Macartney *BSc* – Graduate Environmental Consultant with experience in flood risk assessments, environmental assessments, and surface water environments.
- Iain Muir *MSc CEnv MIEnvSc* – Senior Consultant and Chartered Environmentalist specialising in environmental assessment and applied hydrology, with experience in fluvial flood hydrology and modelling.
- Kyle Somerville *BEng (Hons) CEng MIEI* – Director and Chartered Engineer specialising in flood risk assessment, flood modelling, and drainage / surface water management design.

1.3 Objectives of the Assessment

This Stage 2 FRA has the following objectives:

- To identify flooding or surface water management issues at the site that warrant further investigation.
- To confirm the sources of flooding that may be significant or possibly significant to the site.
- To appraise the adequacy of existing flood risk information.
- To determine whether further assessment is required.

Where necessary or appropriate, this report will set out recommended mitigation measures.

1.4 Approach to the Assessment

1.4.1 Method of Assessment

The method of assessment applied complies with the Source-Pathway-Receptor model and provides a spatial assessment of flood risk to people, property, and the environment at the Proposed Development. Consideration has been given to the sources and extent of all potential sources of flooding at the site, including fluvial, pluvial, urban drainage, and groundwater flooding. Existing runoff characteristics and the risk of flooding from surface water drainage are also considered.

1.4.2 Hydraulic Model Status

The application site is in County Louth. The primary stakeholders are Louth County Council (CC), as well as the Office of Public Works (OPW). OPW and Louth CC data has, therefore, been used to form the basis of this assessment and is presented in line with the relevant guidance and requirements.

Flood mapping for watercourses adjacent to and within the Proposed Development site has been produced as part of the OPW's Preliminary Flood Risk Assessment (PFRA) and more recent National Indicative Fluvial Mapping (NIFM) dataset. While the PFRA and NIFM flood mapping is relatively coarse, the indicative PFRA and NIFM flood extents can help build a general understanding of floodplains at the site and in surrounding areas (in the absence of more detailed model data).

1.4.3 Planning Guidelines

The requirements for FRAs are set out in the OPW's The Planning System and Flood Risk Management – Guidelines for Planning Authorities, 2009 (hereafter referred to as the 'OPW Guidelines') and accompanying Technical Appendices. Further guidance is provided in the OPW's Climate Change Sectoral Adaptation Plan, 2019, and CIRIA Research Project 624 Development and Flood Risk – Guidance for the Construction Industry, 2004.

The planning guidelines applicable to the Proposed Development are implemented in the County Louth Development Plan 2021-2027, specifically through the Strategic Flood Risk Assessments (SFRA) undertaken to inform the Development Plan.

The Louth SFRA was prepared in accordance with the requirements of the OPW Guidelines and adopt an identical Flood Zone standard. Flood Zones are the extents of a design flood event that determine whether development is appropriate from a flood risk point of view. They are defined in both the OPW Guidelines and SFRAs as follows:

- 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).

The SFRAs clarify that Flood Zones are to be used to determine suitability of proposed development and are to be derived from 'present day' hydrological estimates. The SFRA also states that Flood Zones are generated without the inclusion of climate change and that, in addition to flood zoning, developments should be designed to be resilient to the effects of climate changes.

The OPW Guidelines state that a Stage 2 Initial Flood Risk Assessment is "*to confirm sources of flooding that may affect a plan area of proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate*". Planning and development decisions can be made based on a Stage 2 FRA provided a precautionary approach is taken. However, further work as part of a detailed Stage 3 FRA may be recommended.

2 SITE AND DEVELOPMENT DETAILS

2.1 Site Location

The Proposed Development Site (ITM coordinates 708141, 783762) is located 8.3 km north of Drogheda, 23.6 km South of Dundalk and 50 km North of Dublin, and lies within the townlands of Brittas, Brownstown,Drumshallon, Gallstown, Groom, Kearneystown, Keeverstown, Piperstown, Rokeby, Stonehouse, and Swinestown. Context and location are shown Figure 2.1 and Figure 2.2, respectively, and on the drawings submitted in support of the application.

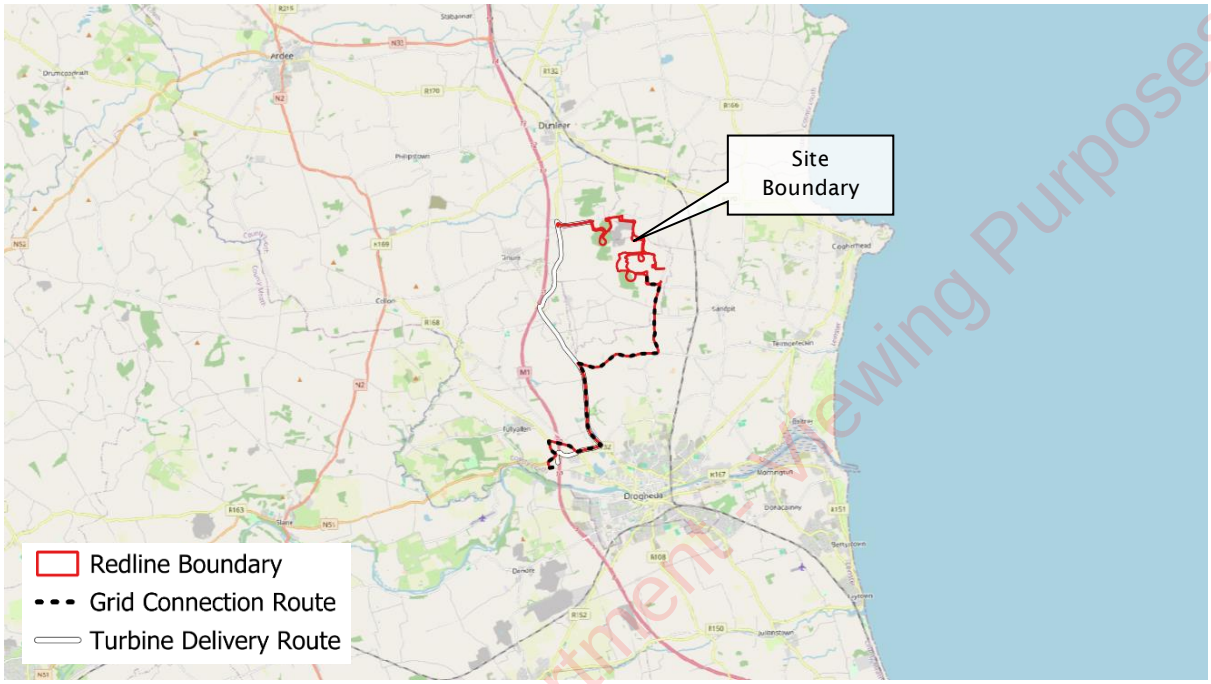


Figure 2.1 Location Context

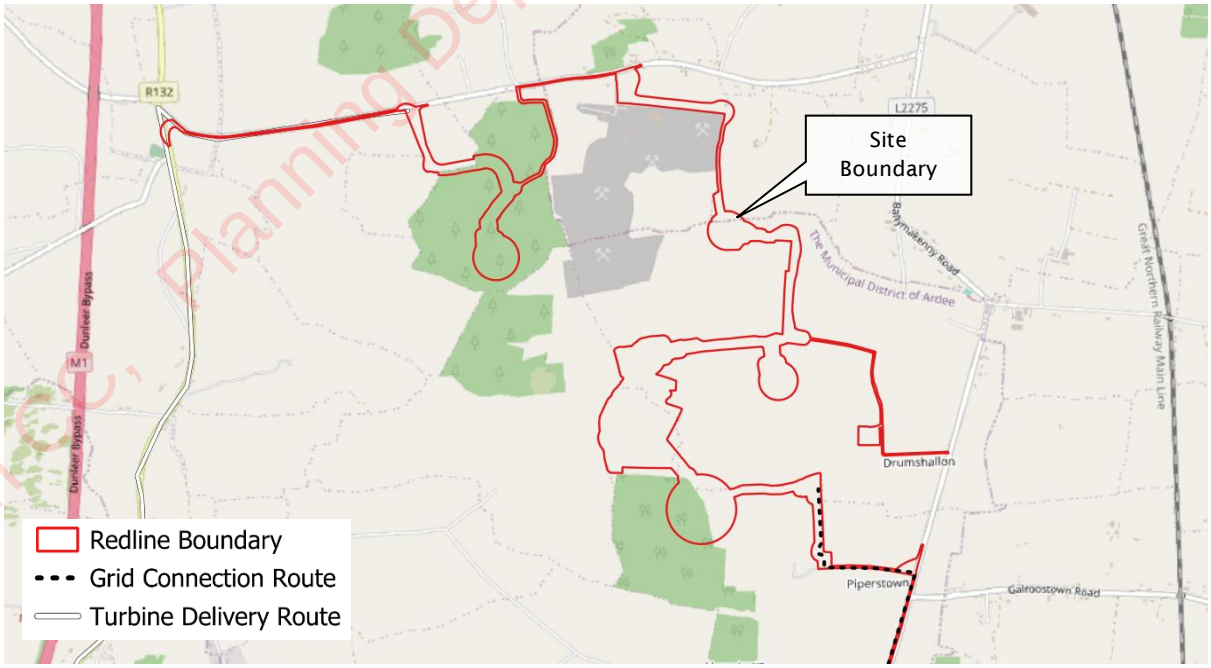


Figure 2.2: Site Location

2.2 Site Characteristics

Site characteristics are described in detail in 'Chapter 11: Hydrology & Hydrogeology' of the Environmental Impact Assessment Report (EIAR) that this assessment is intended to support. Any aspects that are relevant to flood risk and drainage are summarised in the following sections.

2.2.1 Existing Land Use

The Proposed Development site is located within an area of farmland, forestry and scrubland. The principle land use in the general area consists of a mix of forestry and cattle grazing, pasture farmland, residential properties, and agricultural structures.

2.2.2 Topography

The site is located over undulating lands. Maximum ground levels are on lands in the vicinity of the operational quarry (c. 120m OD). The lowest ground levels are located in the north-eastern corner of the site (c. 80m OD).

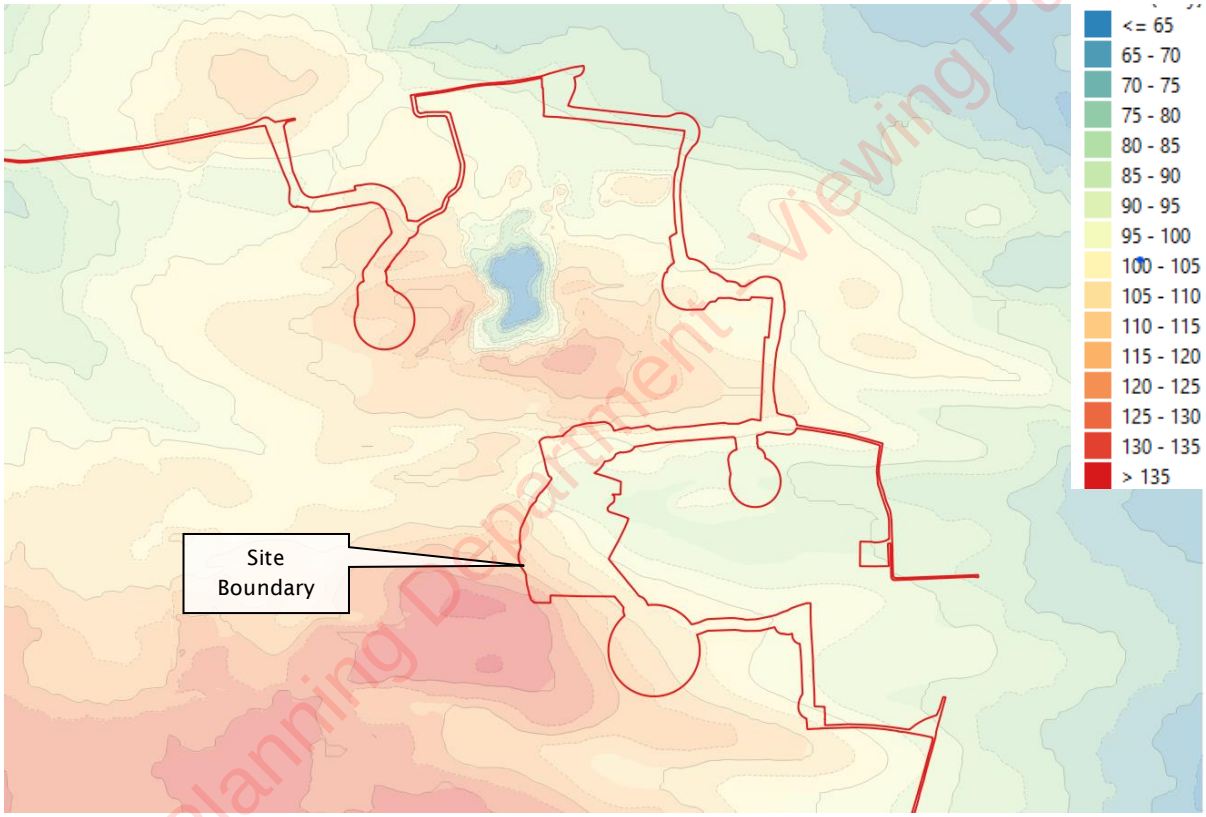


Figure 2.3: Topography Derived from 25m LiDAR

2.2.3 Hydrology & Drainage

The Environmental Protection Agency (EPA) 'flow network' dataset indicates the presence of 4 no. named watercourses within the site, shown in Figure 2.4; Drumshallon Lough Stream, Piperstown Stream, Hammondstown, and Slieveboy.

Walkover observations indicate that the hydrology of the site drains to water features consisting of a number of natural streams, man-made agricultural ditches, and natural ephemeral features.

There are wetlands present at the centre of the site, shown in Figure 2.4. The wetland extent is shown per EPA and OSI data ("map of Irish Wetlands"). Onsite verification and topographic analysis indicates that the actual extent of the wetland that encroaches onto the site is considerably smaller and does not extend to the area where development is proposed.

Further detail on watercourses at and downstream of the Proposed Development site are described in EIAR Chapter 9: Hydrology and Hydrogeology.

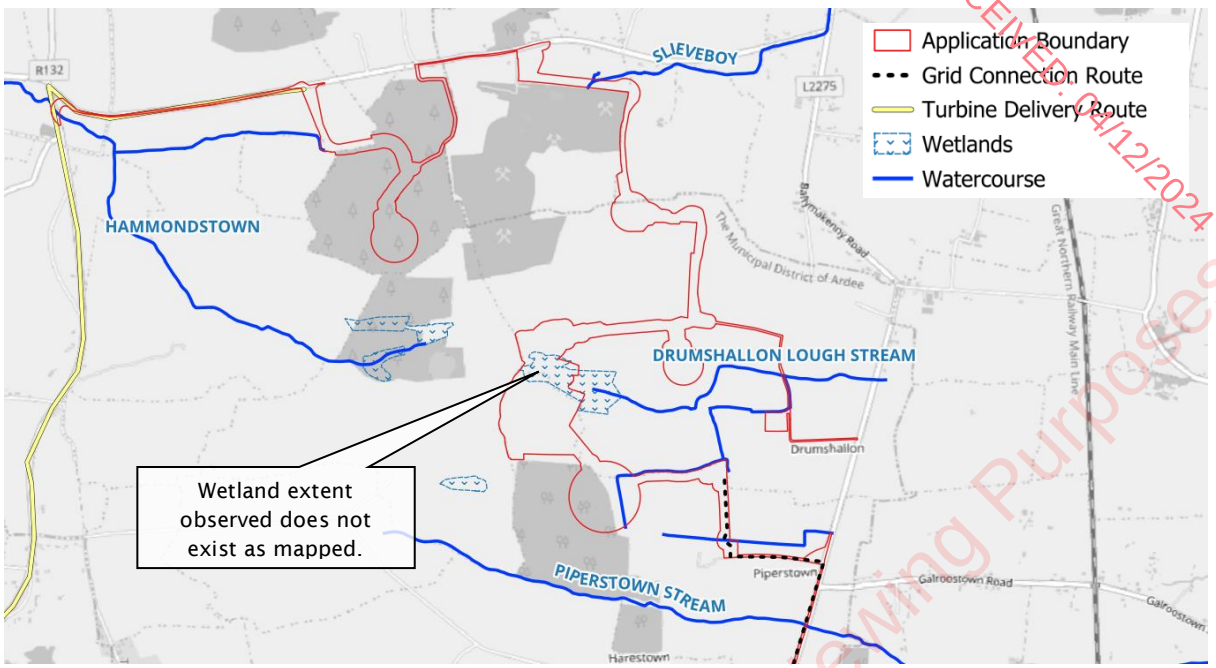


Figure 2.4: Water Features

2.2.4 Ground Conditions

Reference has been made to GSI data and site investigation data to inform likely permeability and identify flood prone areas from alluviums.

Quaternary sediments are shown at Figure 2.5 and subsoil permeability classification is shown at Figure 2.6. Further reference is made to the National Soils map to give better definition to likely permeability on land where there is no significant Quaternary cover and where the subsoil permeability map gives no classification. That map is shown at Figure 2.7. The datasets generally corroborate and confirm that where there is shallow soil cover then there is good to fair infiltration capacity. Alluviums coincide with watercourses mapped previously.

Intrusive site investigations tend to infer greater permeability in areas mapped as deep poorly drained soil, where localised trial pits tend to report sand and silt sand over greywacke.

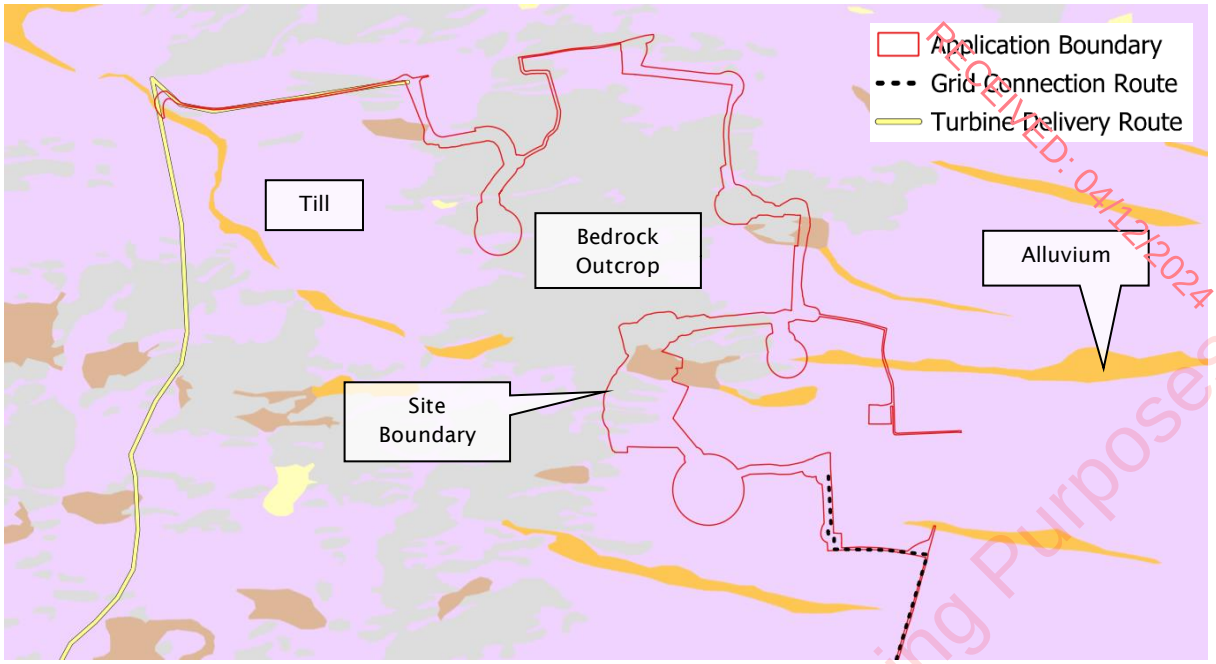


Figure 2.5: GSI Quaternary Sediments

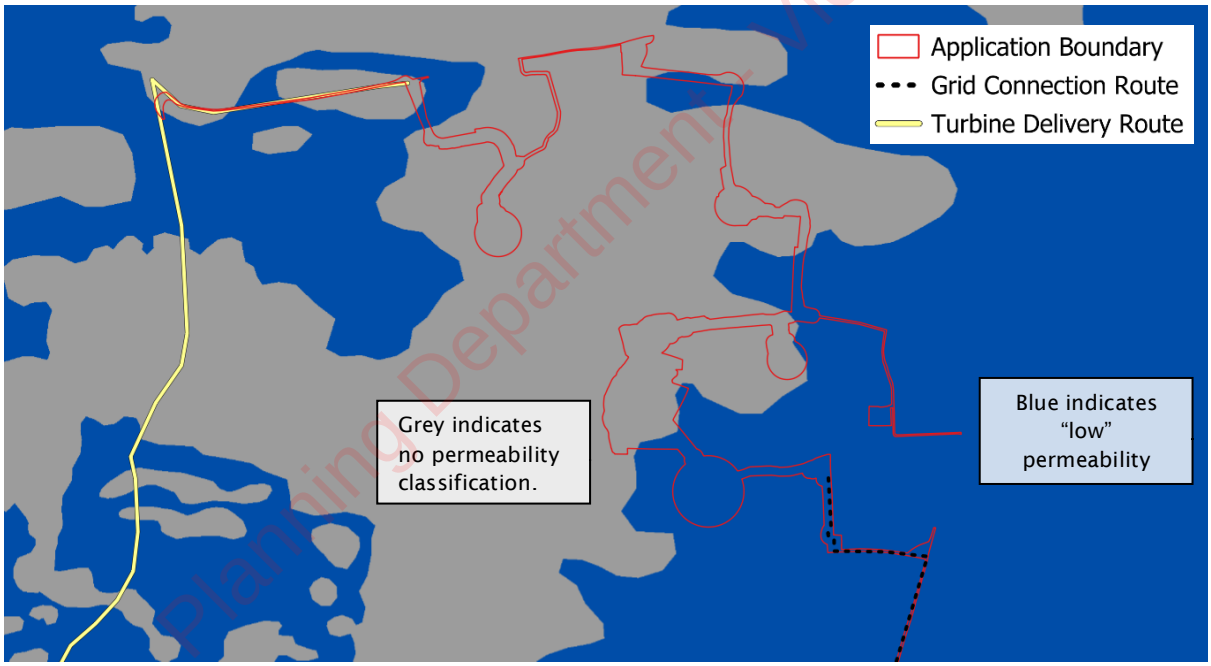


Figure 2.6: Subsoil Permeability

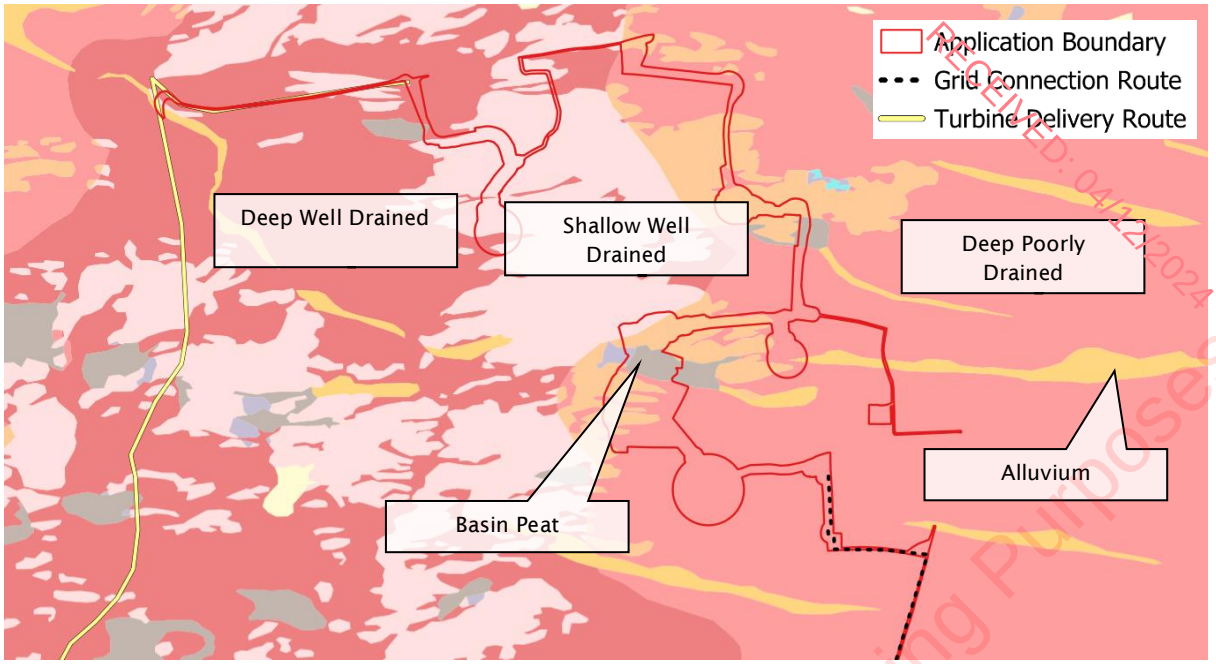


Figure 2.7: National Soil Classification

2.3 Proposed Development

The Proposed Development is detailed in the accompanying Environmental Impact Assessment Report (EIAR) Chapter 2: Development Description, but in summary comprises; the construction of 5 no. wind turbines, a Permanent Met Mast, A 38kV Onsite Substation and Control Building, all ancillary works and the construction of an underground Grid Connection to Drybridge 110kV Substation, Co. Louth.

Works relevant to this assessment comprise at-ground / on-ground built development which lies within the main application footprint, and a localised area of offsite widening to allow Turbine Delivery Route 4.

2.4 Vulnerability Classification

The Proposed Development comprises essential infrastructure including electricity-generating power stations (wind turbine generators), electrical sub-station, and ancillary infrastructure; and internal access roads. Vulnerability classifications are shown in Table 2.1, based on the classification criteria set out in the OPW Guidelines.

Table 2.1: Vulnerability Classification

Part	Use	Classification
Power Generation / Sub-Station and ancillary electrical infrastructure	Essential Infrastructure	Highly Vulnerable Development
Access Tracks / Roads	Local Transport Infrastructure	Less Vulnerable Development

3 BACKGROUND INFORMATION REVIEW

As part of the data collection phase for this assessment, several available sources of information generally as set out in the OPW Guidelines were investigated to build an understanding of the potential risk of flooding to the Proposed Development site. The following review highlights the key findings of the background information review.

3.1 Louth County Council

3.1.1 Louth County Development Plan 2021-2027

Chapter 10.3 of the Louth County Development Plan 2021-2027 sets out the following flood risk management policy objectives that are relevant to the Proposed Development:

- IU 26 – To reduce the risk of new development being affected by possible future flooding by avoiding development in areas at risk of flooding and, where development in floodplains cannot be avoided, taking a sequential approach to flood risk management based on avoidance, reduction, and adaptation to risk.
- IU 27 – To ensure all proposals for development within Flood Zones A or B are consistent with the OPW Guidelines. Proposals for development identified as being vulnerable to flooding must be supported by a site-specific FRA and demonstrate to the satisfaction of the Planning Authority that the development and its infrastructure will avoid significant risks of flooding and not exacerbate flooding elsewhere.
- IU 30 – To work with the OPW in the development and implementation of catchment-based strategies for the management of flood risk, including those relating to storage and conveyance.
- IU 32 – To ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the OPW's 'Flood Risk Management Climate Change Sectoral Adaptation Plan' applicable at the time.
- IU 33 – Where a portion of a site is at risk of flooding, the lands at risk will be subject to the sequential approach to ensure first and foremost that new development is directed towards lands at low risk of flooding and to restrict the type of development to one that is 'appropriate' to each Flood Zone in accordance with Tables 3.1 and 3.2 of the OPW Guidelines.
- IU 35 – To consult with the OPW in relation to proposed developments that include the construction, replacement, or alteration of a bridge or culvert and to require that the developers obtain consent from the OPW under Section 50 of the 'EU (Assessment and Management of Flood Risks) Regulations 2010' and Section 50 of the 'Arterial Drainage Act 1945', where appropriate.

3.1.2 Strategic Flood Risk Assessment for the Louth County Development Plan 2021-2027

Section 6.3 of the Louth SFRA provides the flood risk management policy objectives set out in the County Development Plan. Those relevant to the proposed development are listed above.

The Louth SFRA also specifies that site-specific FRAs for proposals for development within Flood Zones A or B should demonstrate the following:

- A sequential approach has been applied through site planning to avoid encroachment into or loss of the floodplain.
- Highly vulnerable development is not proposed in Flood Zones A or B.
- Development in Flood Zone A comprises either open space or water compatible development.
- Residual risk of culvert blockage (where applicable), increased flood extents under climate change scenarios, and pluvial risk have been assessed and can be mitigated through setting of finished floor levels.
- Compensatory storage is provided on a level for level basis for development that results in a loss of floodplain within Flood Zone A.

SFRA flood mapping was produced for Drogheda and Dunleer but does not include / cover the site.

3.2 Office of Public Works

3.2.1 Preliminary Flood Risk Assessment

The first phase of the OPW's National Catchment Flood Risk Assessment and Management (CFRAM) Programme involved a Preliminary Flood Risk Assessment (PFRA). As part of the PFRA, national-coverage indicative flood mapping was created. The purpose of the PFRA was to inform the next phase of the CFRAM Programme by identifying Areas for Further Assessment (AFAs) that would require more detailed modelling. The site and surrounding area are not within an AFA and, as such, more detailed CFRAM flood maps do not exist for the site. It is noted that the PFRA was based on available or readily derivable information and is considered coarse / indicative only.

PFRA data has latterly been superseded by National Indicative Fluvial Mapping (NIFM) (refer to Section 3.2.2) and PFRA data is therefore deemed withdrawn by OPW; however, NIFM coverage does not extend to small catchments and there is no new national pluvial dataset.

Reference is therefore made to PFRA flood data in relation to screening of pluvial flooding, and screening of fluvial data associated river reaches not included on the latter NIFM datasets due to their small catchment size.

Flood data indicates that the site is affected by the indicative 1% AEP flood extents of the Drumshallon Lough stream and Piperstown Stream, as shown in Figure 3.1, and that these flood extents follow the watercourse centrelines with no substantial out of bank flooding predicted.

The Proposed Development site is not indicated to be affected by pluvial flooding or groundwater flooding.

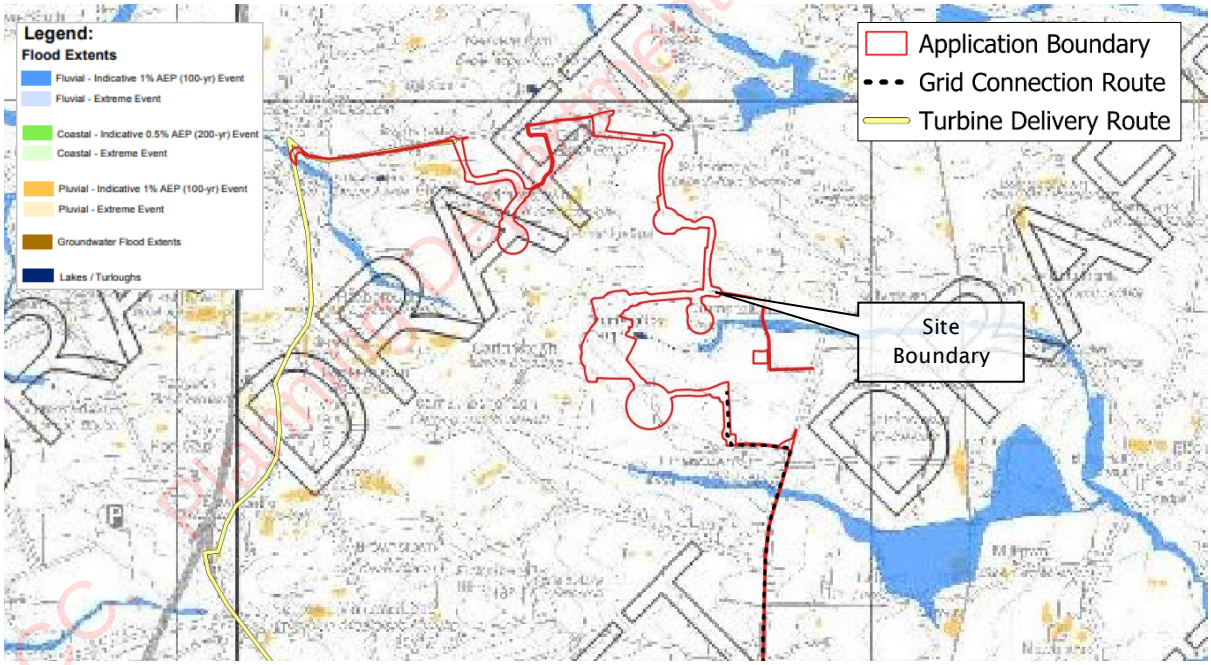


Figure 3.1: OPW PFRA Flood Map

3.2.2 National Indicative Fluvial Mapping

The OPW produced NIFM flood mapping for catchments greater than 5 km^2 in areas for which detailed CFRAM flood maps do not exist. NIFM flood mapping was produced for a range of present day and climate change (i.e., MRFS and HEFS) scenarios.

NIFM flood mapping indicates that the site is affected by present day, MRFS, and HEFS flood extents within a small portion of the access road to the northwest, as shown in Figure 3.2, Figure 3.3, and Figure 3.4, respectively.

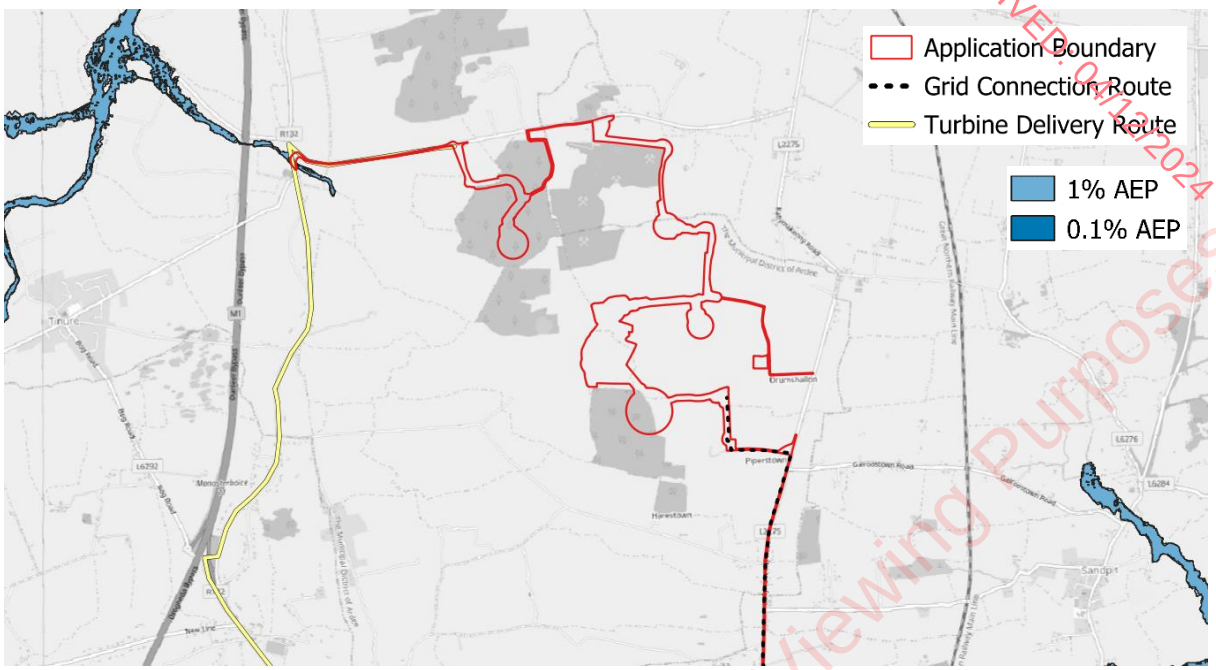


Figure 3.2: OPW NIFM 1% AEP and 0.1% AEP Present Day Flood Extents

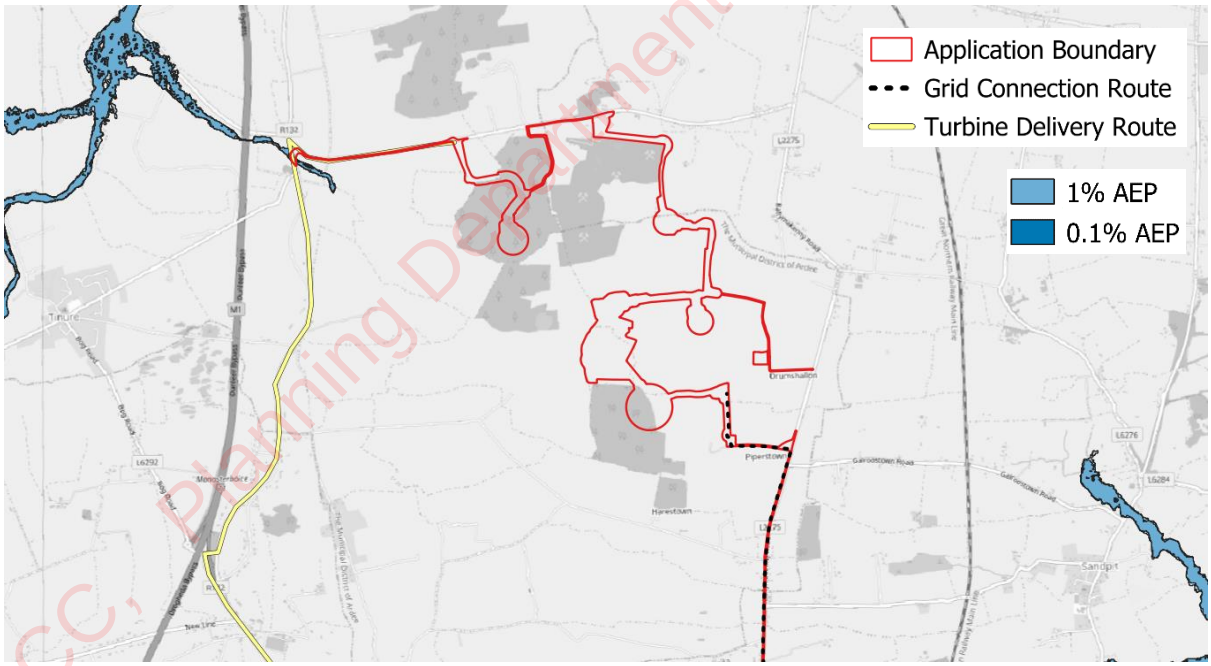


Figure 3.3: OPW NIFM 1% AEP and 0.1% AEP Mid-Range Future Scenario Flood Extents

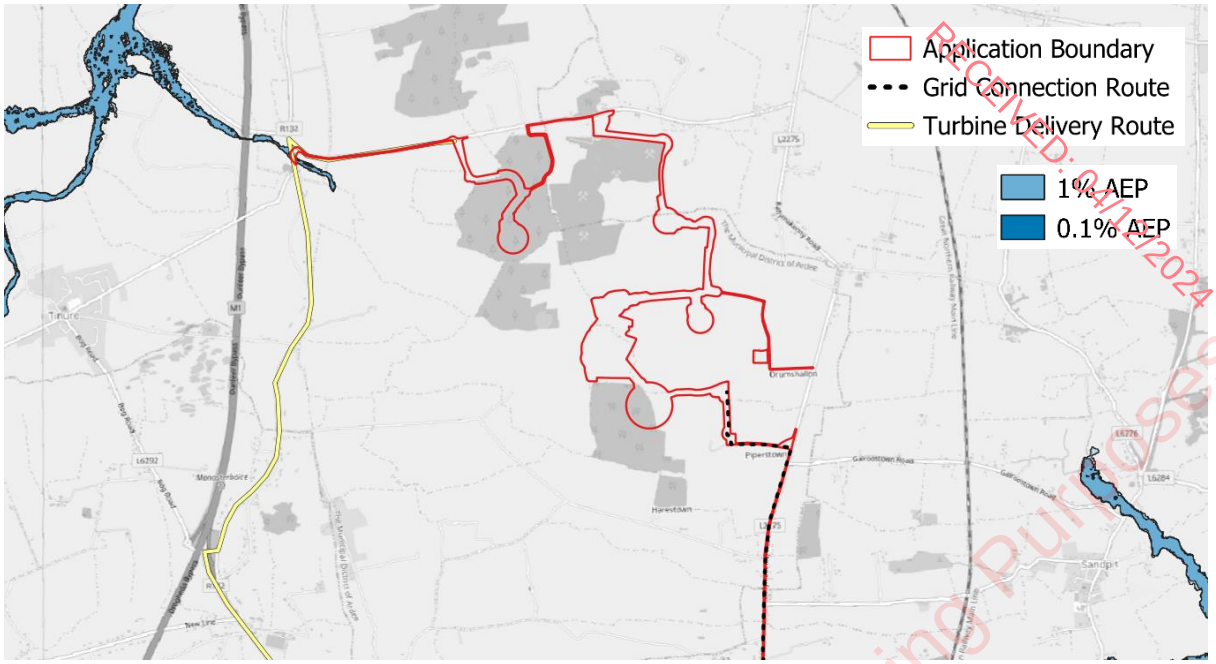


Figure 3.4: OPW NIFM 1% AEP and 0.1% AEP High End Future Scenario Flood Extents

3.2.3 Past Flood Events

OPW 'Past Flood Event' mapping (available through floodmaps.ie) does not provide any records of flooding within the Proposed Development site boundary. The nearest flood events are shown to have occurred at Gallstown Road in 2014, c. 200m north and downstream of the site, and a recurring flood at Carricknashanagh c. 800m west of the site.

3.3 Geological Survey Data

Review of the GSI Groundwater surface flood map dataset indicates no areas prone to potential above ground surface flooding within the application boundary.

3.4 Internet / Media Background Search

An internet / media background search found no reports of flooding at or in the immediate vicinity of the site.

4 ASSESSMENT OF FLOOD MECHANISMS

4.1 Preamble

In accordance with the OPW Guidelines, development management objectives advise against inappropriate development in areas at risk of flooding and aim to avoid new development that increases flood risk elsewhere. The following assessment determines the flood hazards to life and property at the Proposed Development site to subsequently assess the site relative to the OPW Guidelines.

4.2 Initial Assessment

Table 4.1 presents a screening assessment of the Proposed Development site for potential flooding mechanisms requiring further detailed assessment, based on the information established in Section 3. Flooding mechanisms screened as being significant or possibly significant and requiring further assessment have been assessed further in subsequent sections. Mitigation of flood hazards, where required, is detailed in Section 5.2.

Table 4.1: Potential Flooding Mechanisms

Source / Pathway	Significant?	Reason
Fluvial Flooding	Yes	OPW flood mapping indicates that the Proposed Development site is affected by marginal fluvial flooding from the Drumshannon Lough stream and Piperstown stream.
Coastal Flooding	No	The site is at an elevation where coastal flood levels do not influence inland watercourses.
Urban Drainage	No	There is no significant urban drainage infrastructure in the vicinity of the Proposed Development site.
Surface Water / Pluvial Flooding	Yes	OPW PFRA flood mapping indicates that the Proposed Development site is affected by pluvial flooding in the northeastern portion of the site.
Surface Water Discharge	Possible	Any development has the potential to increase the impermeable area at a site and thereby cause an increase in the rate and volume of surface water runoff from the site.
Groundwater	No	OPW PFRA mapping and GSI data indicates that the Proposed Development site is not in an area at risk of groundwater flooding. There are no significant enclosed depressions within site topography that would cause impoundment of groundwater.
Lakes / Loughs	No	OSI mapping shows that there are no lakes on or in the immediate vicinity of the site.
Impoundments / Artificial Sources	No	There are no impoundments that drain towards the Proposed Development site.

4.3 Fluvial Flooding

4.3.1 Existing Flood Risk (Present Day)

OPW indicative flood mapping indicates that the Proposed Development site is marginally affected by the flood extents of the Drumshallon Lough stream and Piperstown Stream within the Site Boundary.

Predicted flood levels are not available for the site. A composite flood zone map has been formed from NIFM and PFRA data, where NIFM supersedes PFRA in all instances but where NIFM flood mapping extents do not include some minor watercourses due to their being of insufficient scale to be included in that dataset, and so reliance is placed on PFRA flood outlines for those watercourses to ensure a precautious approach. There are localised inaccuracies in the PFRA location due to changes to the river blue-line network since it was originally prepared.

The approach is conservative appropriate for a Stage 2 FRA. The evolution of the site layout has taken into account hydrological constraints (water feature buffer zones and flood constraints) and as such all on-site development is sited away from watercourses and in Flood Zone C. Flood Zone mapping is included at Appendix A and the following Figure 4.1 and Figure 4.2.

Key findings at locations annotated on the following maps are as follows:

- At point [1] – No flooding is predicted at the proposed watercourse crossing of the Slieveboy Stream. The naturalised catchment of the is highly modified where the majority of the catchment is influenced by the quarry excavation, and discharge is primarily from quarry void sump per a consented discharge rate. The proposed design will be future-proofed to ensure that the culvert and track are appropriately designed by designed to accommodate a conservative estimate of flows from a naturalised catchment (following future quarry decommissioning) for the 1% AEP Climate Change design standard, in addition to the artificial pumped discharge rate, which will ensure a precautionary approach.
- At point [2] – the proposed turbine location is at an elevation of min. 91-92 m OD where 1% and 0.1% flooding is at c. 90 m OD. Freeboard between levels where development is proposed and where flooding is predicted is sufficient to overcome uncertainty in the indicative flood data and screen out potential for flood risk to the land where the turbine is proposed.
- At point [3] – the Turbine Delivery Route includes construction of a temporary widening to allow a turning radius. While the wider swept path overlaps with Flood Zone A and B denoted by NIFM mapping, the footprint of work required at ground level is confirmed to lie in Flood Zone C and no further assessment is required. The following Figure 4.3 (pg. 15) shows the planned at-ground footprint vs the NIFM flood zone extent.
- At point [4] – an existing watercourse crossing and access road is in-situ and is unaffected by the proposed development in the location where indicative flooding is predicted.
- At points [5] and [6] culvert crossings are proposed to unnamed tributaries of the Drumshallon Lough Stream. No flooding is predicted and the approach to culvert design (ensuring capacity and freeboard to the 1% AEP climate change flow) will ensure that track infrastructure is flood resilient.

Mapped watercourses where no flood model result exists are likely to be of insufficient scale to cause a flood risk. Pluvial flood analysis is likely to offer a reasonable screening of flooding from minor unmodelled watercourses and is discussed at Section 4.4.

The risk of flooding to the Proposed Development is sufficiently low as to require no further detailed assessment.

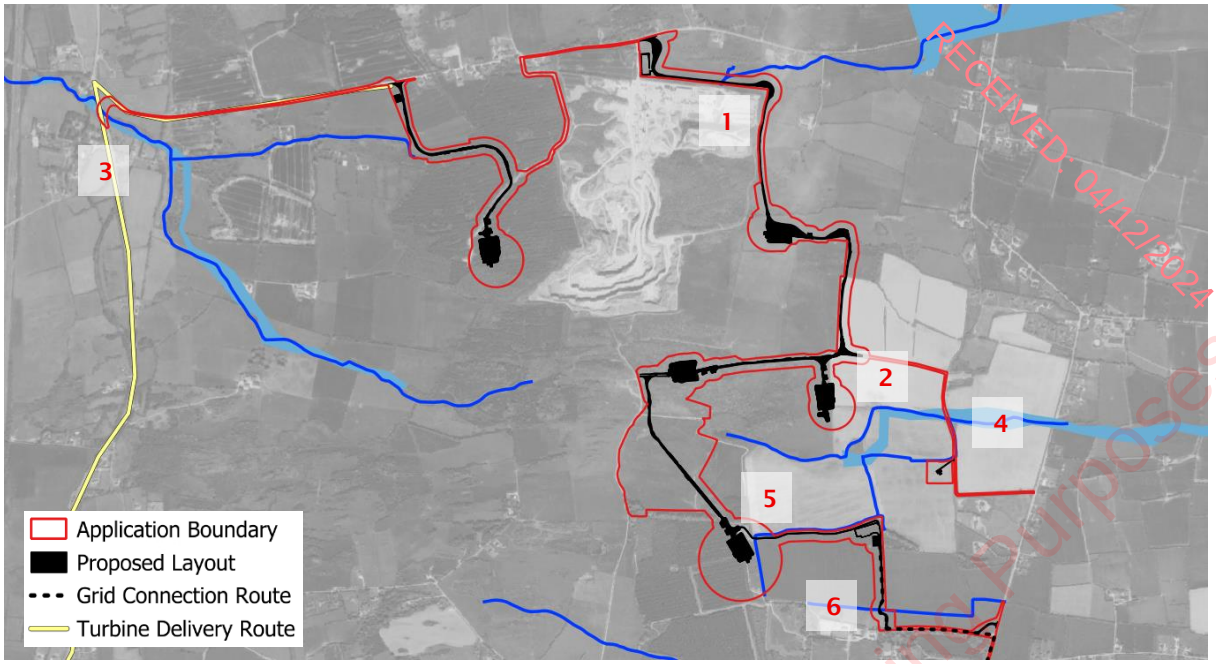


Figure 4.1: Flood Zone A vs. Proposed Layout

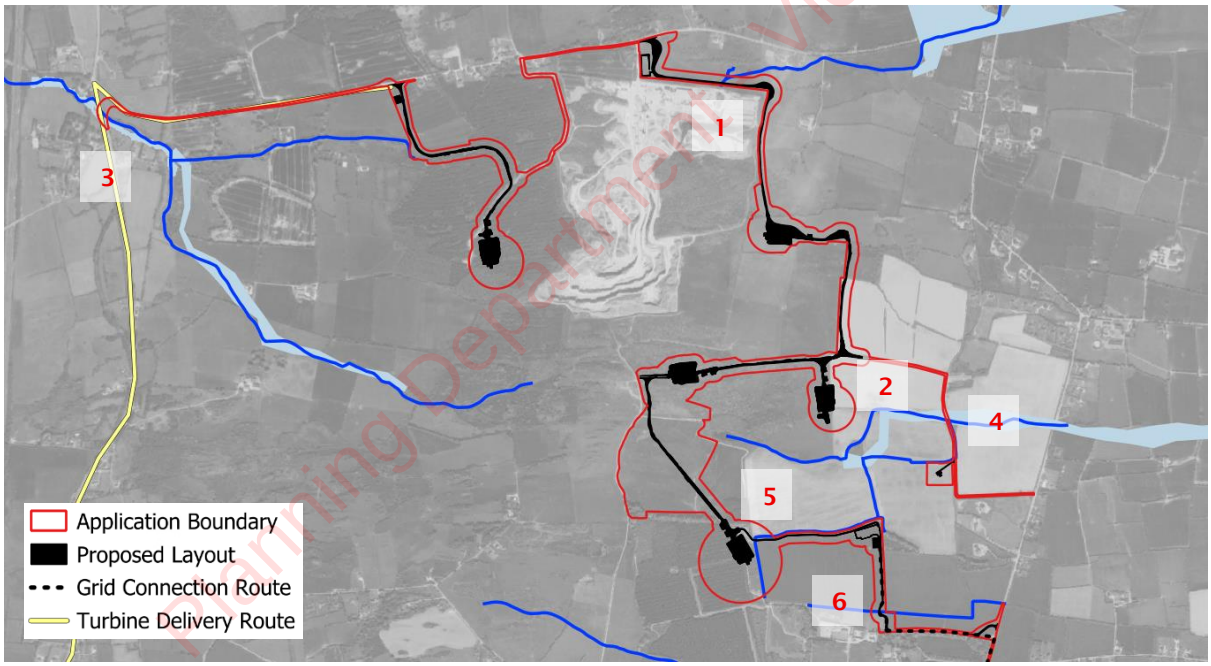


Figure 4.2: Flood Zone B vs. Proposed Layout

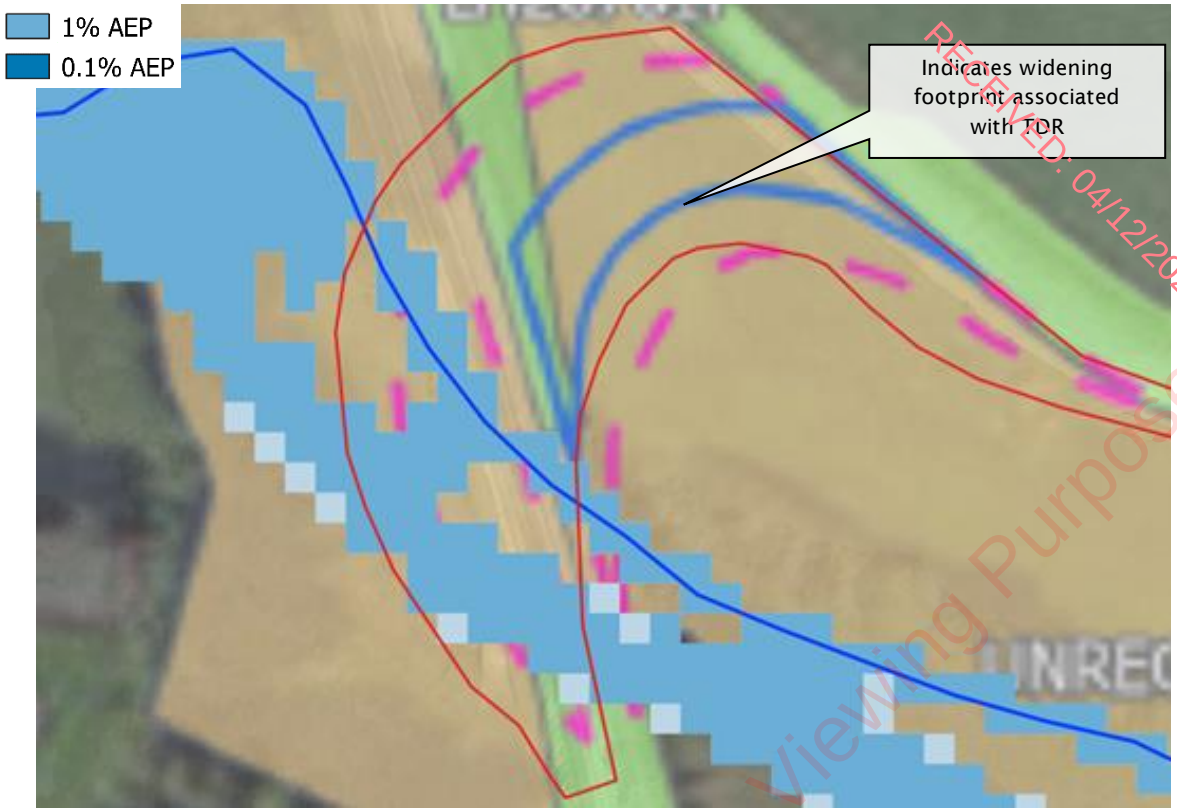


Figure 4.3: TDR (Point [3] vs Flood Zone A & B

4.3.2 Effect of Climate Change

The Louth County Council County Development Plan requires that development is assessed to ensure that it is resilient to the effect of climate change, with the Mid-Range Future Scenario (MRFS) being the relevant standard and High-End Future Scenario (HEFS) being applicable to essential infrastructure.

- The 1% AEP + Climate Change flood level is relevant to evaluation of flood risk to "less vulnerable" tracks and access roads. No flood zone mapping is available for PFRA 1% AEP outlines. In that instance, adoption of the 0.1% AEP / Flood Zone B outline is a reasonable proxy for the MRFS flood outline. That outline indicates no measurable change in flood outline vs the 1% AEP present day outline.
- The 0.1%AEP + Climate Change flood level is relevant to evaluation of flood risk to highly vulnerable development (electrical infrastructure). All highly vulnerable infrastructure is sufficiently separated from predicted flooding (by plan distance and elevation) that no further assessment is required, other than at Location [2] annotated on Figure 4.2. At that location, the proposed turbine location is at an elevation of min. 91-92 m OD where 1% and 0.1% flooding is at c. 90 m OD. Allowing for a conservative additional 0.5m depth of floodwater for the 0.1% AEP HEFS Climate Change scenario, the turbine location is sited at an elevation resilient to adjacent flooding.

Therefore, for the reasons outlined in Section 4.3.1, the Proposed Development is assessed as not being at risk from flooding including allowance for the impact of climate change, including for the climate change scenario.

Mitigation of flood risk to future development is discussed in Section 5.2.

4.3.3 Effect of Development

All development is sited within Flood Zone C, as defined in the OPW Guidelines, except for where an access track is required to cross a watercourse within the site.

Design of the 3 no. proposed watercourse crossings will be required to comply with OPW Section 50 guidelines, which will include providing freeboard to design flood levels and ensuring no increase in flood risk elsewhere because of the bridge / culvert.

Given that all development is sited in Flood Zone C and that new watercourse crossings shall meet the Section 50 requirements, the Proposed Development will have no impact on flood risk elsewhere.

A watercourse crossing schedule and culvert design is included in EIA Technical Appendix 9.2: Surface Water Management Plan.

4.4 Surface Water (Pluvial) Flooding

The site was initially screened using OPW PFRA pluvial data. A simple analysis has been undertaken to better define likely key surface water flow paths and enclosed depressions based on a GIS Algorithm and best available DTM height data. The outcome of that analysis is shown on Figure 4.4.

Key findings at locations annotated on the following maps are as follows:

- Location **[1]** coincides with a mapped wetland and corroborates the significantly lesser extent of the wetland as observed, vs EPA mapped datasets. The closest proximal proposed development is >150m from the area where flooding / ponding is predicted and is sited at >4m higher than the enclosed depression level.
- No other areas are identified indicating a potentially significant pluvial flood risk

Residual risk will be mitigated by implementing a surface water management plan and drainage design, using SuDS principles, to achieve a surface water flood protection standard catering for the 100-yr storm including climate change.

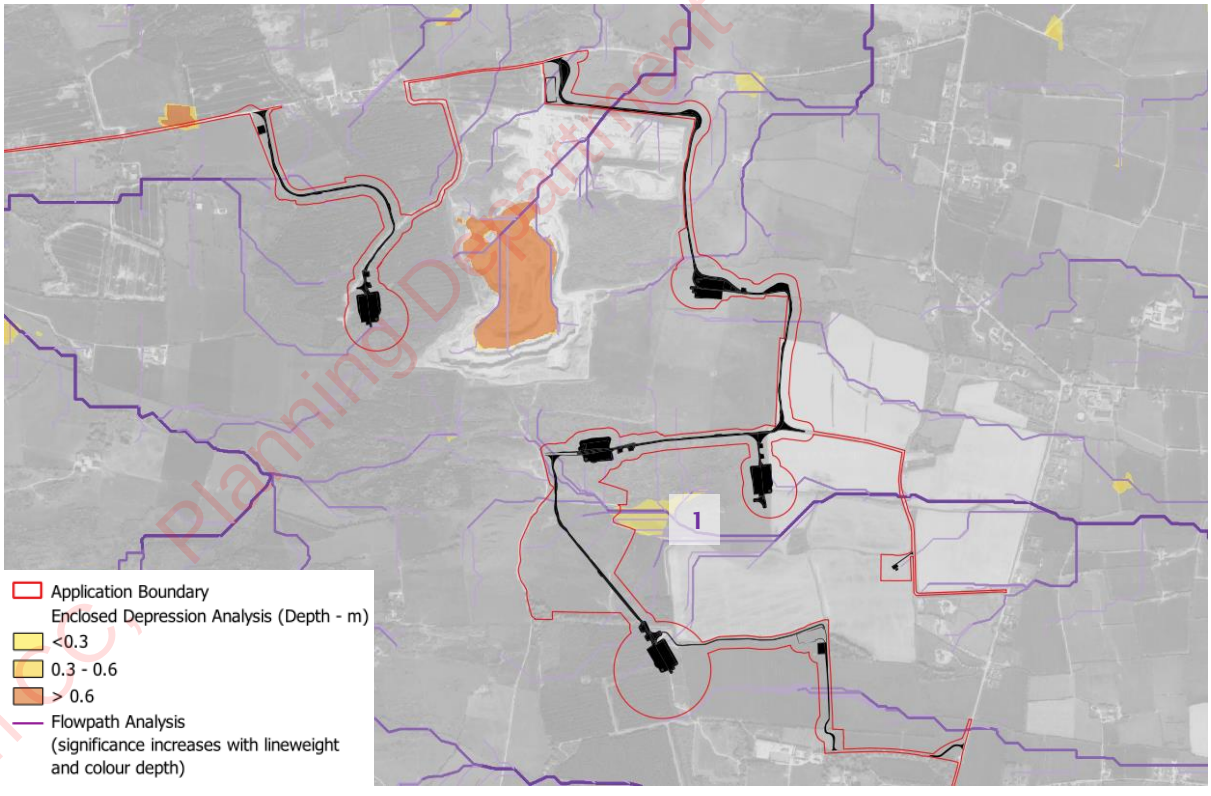


Figure 4.4: Surface Flow Paths and Enclosed Depressions

4.4.1 Surface Water Discharge

The Proposed Development will cause an increase in impermeable areas or semi-impermeable areas (i.e., tracks, hard standing), meaning it has the potential to cause an increase in flood risk elsewhere if surface water discharge is not adequately managed.

Mitigation of residual impact of surface water to the development and off-site receptors by means of an effective surface water drainage network and surface water management is outlined in Section 3.2.5 of this report and further detailed in EIA Technical Appendix 11.2: Surface Water Management Plan.

5 SUMMARY OF FINDINGS AND RECOMMENDATIONS

5.1 Summary of Findings

OPW indicative flood mapping indicates that parts of the Proposed Development site are affected by fluvial flooding. There are no other significant flood mechanisms affecting the site.

This Stage 2 FRA has determined that **all proposed development is sited in Flood Zone C**, as defined in the OPW Guidelines.

A watercourse crossing will be subject to OPW Section 50 guidelines and, as such, will provide freeboard to design flood levels and not increase flood risk elsewhere. In being resilient to flooding and not increasing flood risk elsewhere, the Proposed Development will comply with the OPW Guidelines.

5.2 Design Requirements / Schedule of Mitigation

The following section details measures to be incorporated into proposals submitted in support of a planning application and to be further developed in any detailed design or variation post-determination of the planning application.

5.2.1 Land Use

All aspects of the Proposed Development are sited in Flood Zone C and, therefore, considered 'appropriate'.

5.2.2 Design Levels

In accordance with the OPW Guidelines, 500 mm freeboard is generally applied to the Flood Zone A flood level for less vulnerable development (i.e., access roads) and to Flood Zone B flood level for highly vulnerable development (i.e., turbines and associated electrical infrastructure).

Height data suggests that the proposed turbine locations are min. 1 m higher than adjacent flood extents indicated on OPW flood mapping. Access tracks are outside floodplains.

All development is sufficiently remote from floodplains (on plan and by elevation) that specification of minimum design levels is unnecessary.

5.2.3 Permanent Access Levels

Permanent site access is in Flood Zone C, meaning safe access to and egress from the Proposed Development will be possible during an extreme flood event.

All proposed access tracks are sited in Flood Zone C or will provide freeboard to the relevant design flood level, in line with OPW Section 50 requirements.

5.2.4 Culvert Design

Three (3) no. watercourse crossings re proposed. The culverts shall be subject to Section 50 consent and will be designed to give min. 0.3m freeboard at the inlet to the 1 % AEP Climate Change design standard.

The proposed design for the crossing of the upper reach of the Slieveboy Stream will be future-proofed accommodate a conservative estimate of flows from a naturalised catchment (following future quarry decommissioning) for the 1% AEP Climate Change design standard, in addition to the artificial pumped discharge rate, which will ensure a precautionary approach.

Designs to comply with Section 50 standards is included at EIA Technical Appendix 9.2: Surface Water Management Plan.

5.2.5 Drainage Plan

Surface water drainage design is per the requirements of the Louth Development Plan and to the standards of the Louth County Council Water Services Department. The Development Plan has an objective to incorporate and promote the use of Sustainable Drainage Systems (SuDS), and that these are to be designed in accordance with the GDSDS and CIRIA SuDS Manual.

A drainage plan setting out SuDS and flood drainage for surface water management is submitted separately in EIA Technical Appendix 9.2: Surface Water Management Plan.

5.3 Maintenance Requirements

5.3.1 Drainage System Maintenance

The site owner / operator shall be responsible for maintenance of drainage networks at the site and ensure that maintenance of the drainage system is provided for. The drainage layout for the site ensures that key SuDS features requiring maintenance are situated in accessible locations.

Maintenance plans for drainage assets shall include (where applicable):

- Cyclical (min. annual) check of all surface water drainage features – in particular, clearing of debris.
- Cyclical (min. annual) visual inspection of any surface or underground features – blockages and obstructions to be removed by excavation and jetting, as required.

5.4 Summary of Flood Risk and Mitigation

Table 5.1 summarises the mechanisms of flooding identified by this study and their associated hazards / consequence, per the OPW Guidelines, as well as proposed measures to mitigate the predicted risk.

Table 5.1: Summary of Risks and Mitigation

Flood Mechanism / Potential Effect	Consequence	Summary and Mitigating Measures
Fluvial flooding	Risk to life and property	All proposed development is sited in Flood Zone C and at elevations that are sufficiently raised above adjacent indicative flood extents. No significant flood risk is predicted from unmodelled watercourses which are of insufficient scale to cause fluvial flooding
Effect of the development	Increased risk to adjacent lands and developments	All proposed development is sited in Flood Zone C and will therefore have no impact on flooding elsewhere. In obtaining Section 50 consent, new watercourse crossings will have no impact on flood risk elsewhere for the design flood event.
Pluvial / surface water flooding	Risk to property on the site, and risk to adjacent lands and property	No proposed development is located in areas screened as being prone to surface water flooding. On-site surface water flooding is mitigated by a site drainage system which meets Local Authority drainage standards. Off-site surface water effects are mitigated by provision of SuDS components and no increase in rate and volume of runoff of surface water from the site because of the development.

Appendix A

Flood Zone Mapping

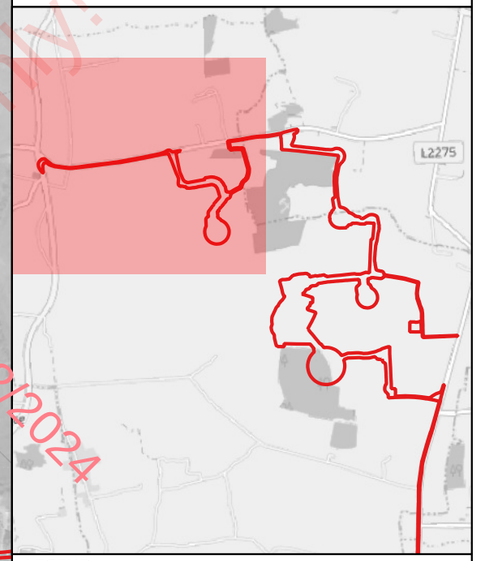
705500 706000 706500 707000 707500

785500 785000 784500 784000

N

0 200 400 600 m

MODEL OVERVIEW



LEGEND

- Application Boundary
- Proposed Infrastructure Outline
- Watercourse per Water Features Survey
- 0.1% PD Flood Zone B
- 1% PD Flood Zone A

NOTES

1.ALL GRID COORDINATE INFORMATION IS TO ITM

2.FLOOD EXTENT INFORMATION IS DERIVED FROM THE NIFM DATASET AND OPW PFRA DATASET FOR REACHES WHERE NO NIFM DATA IS AVAILABLE

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PROJECT KELLYSTOWN WIND FARM		**HYDROLOGY SCENARIO** PRESENT DAY	**SCALE** 1:7500	**ORIGINAL SIZE** A3
MAP TYPE FLOOD ZONES		**GEOMETRY SCENARIO** PRESENT DAY	**DRAWN BY** DKS	**APPROVED BY** DKS
SOURCE FLUVIAL	**FLOOD EVENT** 1% / 0.1%	**FIGURE NUMBER** FL01	**REVISION** 0	**DATE** 13/09/2024

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785500 785000 784500 784000

N

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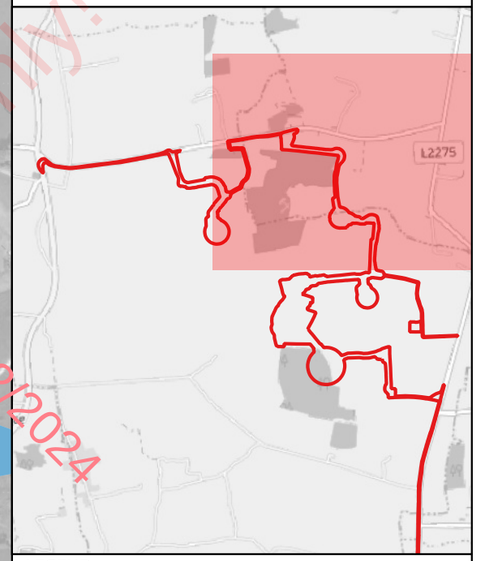
MODEL OVERVIEW



LEGEND

- Application Boundary
- Proposed Infrastructure Outline
- Watercourse per Water Features Survey
- 0.1% PD Flood Zone B
- 1% PD Flood Zone A

NOTES

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PROJECT: KELLYSTOWN WIND FARM		HYDROLOGY SCENARIO: PRESENT DAY	SCALE: 1:7500	ORIGINAL SIZE: A3
MAP TYPE: FLOOD ZONES		GEOMETRY SCENARIO: PRESENT DAY	DRAWN BY: DKS	APPROVED BY: DKS
SOURCE: FLUVIAL	FLOOD EVENT: 1% / 0.1%	FIGURE NUMBER: FL02	REVISION: 0	DATE: 13/09/2024

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783500

783000

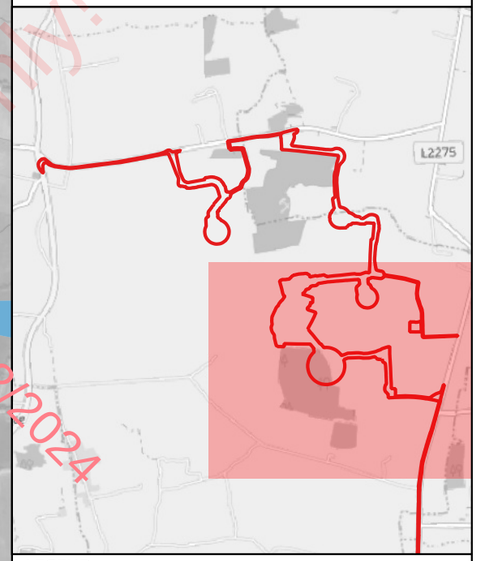
782500

782000

N

0 200 400 600 m

MODEL OVERVIEW



LEGEND

- Application Boundary
- Proposed Infrastructure Outline
- Watercourse per Water Features Survey
- 0.1% PD Flood Zone B
- 1% PD Flood Zone A

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PROJECT KELLYSTOWN WIND FARM		**HYDROLOGY SCENARIO** PRESENT DAY	**SCALE** 1:7500	**ORIGINAL SIZE** A3
MAP TYPE FLOOD ZONES		**GEOMETRY SCENARIO** PRESENT DAY	**DRAWN BY** DKS	**APPROVED BY** DKS
SOURCE FLUVIAL	**FLOOD EVENT** 1% / 0.1%	**FIGURE NUMBER** FL03	**REVISION** 0	**DATE** 13/09/2024