Appendix 22-1:
Flood Risk Assessment

ORIEL WINDFARM
OFFSHORE RENEWABLE ENERGY

A TETRA TECH COMPANY

PARK WIND
JERA GROUP

Energy for generations

Oriel 220 kV Onshore Substation

Oriel Windfarm Ltd.

Flood Risk Assessment

Document No.: PE605-F0027-R00-013-000

Date: 26-02-2024

Engineering and Major Projects, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin, K67 XF72, Ireland.

Phone +353 (0)1 703 8000

www.esb.ie

File Reference:	PE605-F0027	
Client / Recipient:	Oriel Windfarm Ltd.	
Project Title:	Oriel 220 kV Onshore Substation	
Report Title:	Flood Risk Assessment	
Report No.:	PE605-F0027-R00-013	
Revision No.:	000	
Prepared by:	Harry Griffin	Date: February 2024
Title:	Water and Geospatial Team Lead	
Verified by:	Michael Vaughan	Date: February 2024
Title:	Senior Civil Engineer	
Approved by:	Mairéad Hogan	Date: February 2024
Title:	Environmental Consenting Team Lead	

Template Used: T-020-017-Engineering and Major Projects Report Template

Change History of Report

Date	New Revision	Author	Summary of Change

Contents

List of Figures

1 Introduction

This Flood Risk Assessment addresses the proposed Oriel windfarm onshore substation, in the townland of Stickillin, 3 km east of Ardee on the N33, County Louth. The site for the proposed development is approximately 3 hectares in area and is on a greenfield site. The onshore substation will consist of three compounds:

- Compound 1 will contain Gas Insulated Switchgear (GIS) located inside a building.
- Compound 2 will contain outdoor Air Insulated Switchgear (AIS) and will form part of the transmission system for the offshore grid.
- The entrance compound, which will include a telecommunication building, standby diesel generator and car parking.

The onshore substation equipment will be maintained by the Transmission Asset Owner (TAO) and operated by the Transmission System Operator (TSO).

Transmission cables from the GIS substation in Compound 1 will connect to the existing overhead power line through two new Line Cable Interface Masts (LCIM). An existing 220 kV ESB tower adjacent to the substation compounds will be replaced by the two 'loop-in' towers to enable this connection.

This Flood Risk Assessment was prepared in accordance with *'The Planning System and Flood Risk Management - Guidelines for Planning Authorities*' issued by the Department of Environment, Heritage and Local Government in November 2009. Flood risk from fluvial, coastal, surface water and groundwater sources has been assessed based on existing available information.

1.1 Scope

This assessment considers the following:

- The Department of Environment, Heritage and Local Government guideline document to Planning Authorities in relation to Flood Risk Management.
- Review of data on recorded historic floods.
- Risk of flooding to the proposed development from flood flow from neighbouring watercourses.
- Risk of coastal flooding.
- Risk of flooding due to direct rainfall.
- Risk of flooding from groundwater.
- Impact of the presence of the proposed development on the existing flood risk regime at its proposed site. The impacts addressed under this heading comprise:
  - The impact of surface water runoff from the development on the flow regimes in neighbouring watercourses.
  - Loss of floodplain.

2 Planning Guidelines

In November 2009, the Department of Environment, Heritage and Local Government issued a guideline document to Planning Authorities in relation to Flood Risk Management.

These Guidelines set out the policy on development and flood risk in Ireland and provide a framework for the integration of flood risk assessment into the planning process. The objective is to ensure that flood risk is taken into account at all stages in the planning process and as a result to:

- Avoid inappropriate development in areas at risk of flooding,
- Avoid new developments increasing flood risk elsewhere,
- Ensure effective management of residual risks for development permitted in floodplains.

The Guidelines set out a staged approach for the consideration of flood risk in relation to developments as follows;

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and

Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

The Guidelines classify developments into three vulnerability classes based on the effects of flooding;

i) Highly vulnerable development,
ii) Less vulnerable development and,
iii) Water Compatible development.

Essential infrastructure such as energy storage systems are classed as highly vulnerable development.

The Guidelines classify Land areas within three flood zones based on the probability of flooding. Flood zones are defined as follows in the Guidelines:

Zone A is at highest risk. In any one year, Zone A has a 1 in 100-year (1%) chance of flooding from rivers and a 1 in 200-year (0.5%) chance of flooding from the sea.

Zone B is at moderate risk. The outer limit of Zone B is defined by the 1 in 1,000-year (or 0.1%) flood from rivers and the sea.

Zone C is at low risk. In any one year, Zone C has less than 1 in 1,000-year (<0.1%) chance of flooding from rivers, estuaries or the sea.

In the identification of flood zones, no account should be taken of any flood relief walls or embankments.

Development Classification	**Flood Zone A (High Probability of Flooding)**	**Flood Zone B (Moderate Probability of Flooding)**	**Flood Zone C (Low Probability of Flooding)**
Highly Vulnerable Development	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-Compatible Development	Appropriate	Appropriate	Appropriate

Table 2.1 : Matrix of vulnerability versus flood zone to illustrate appropriate development and development required to meet the Justification Test (reproduced from Table 3.2 of Planning Guidelines)

The table is reproduced from the guideline document to Planning Authorities in relation to Flood Risk Management, states that essential infrastructure, including energy storage systems should be located within Flood Zone C. Subsequent sections of this Flood Risk Assessment document will consider the Flood Zone assignment for the proposed site.

The table refers to the use of a Justification Test under certain circumstances. In cases where there are insufficient sites available to locate a development in the appropriate low flood risk zone, the guideline documents allow for consideration of sites within flood risk zones. A Justification Test is then required to assess such proposals in the light of proper planning and sustainable development objectives.

This report considers the flood risk of the proposed development in relation to Stage 1 and 2 of the approach outlined above.

3 Oriel 220 kV Substation Site

The proposed Oriel 220 kV substation will be in the town of Stickillin, towards the east of Ardee. The co-ordinates for the substation are 53.859430, -6.507282, and is accessed by the N33. The site is not situated in the vicinity of any coastal areas. The site is surrounded by agricultural lands which are drained by the Rock Stream. The Rock Stream then discharges to the River Dee approximately 1 km downstream of the site to the east. The existing elevation of the substation is approximately 22.5 mOD. Figure 3.1 and 3.2 depict the proposed substation location and the surrounding lands.

Figure 3. 1: General Site Location

Figure 3.2: Proposed 220 kV Substation Site Boundary

4 Historical Floods

A review of historical flooding was undertaken using the Office of Public Works (OPW) website http://www.floodinfo.ie.

The website forms a record of all available flood records held by the OPW, all local authorities and other relevant state organisations such as the EPA and the Department of Environment, Heritage and Local Government. This website represents the current most comprehensive database of historical flood information in this country.

There is no data for recurring floods at the proposed substation site. However, there are two single events of historic flooding recorded in the vicinity of the substation site. One flooding event occurred on the River Dee approximately 1 km to the northeast of the proposed site location in November 2000. The source of the flood was identified as the River Dee. Another flooding event occurred in late 1968 on the river Dee approximately 1 km to the west of the proposed site. The source of flooding was identified as the River Dee. A recurring flood event was recorded on the river Dee approximately 2 km to the southwest of the proposed site location. The flooding occurred on bogs, roads, agricultural lands and a few houses. The flood impact was determined to be medium to low. Localised flooding on these streams were primarily associated with development and culverting (as indicated in Annex A). However, the historical floods are more than 1 km away from the proposed substation site and hence have not had an impact on the site. Further information on the historical flooding is available in Annex B.

Figure 4.1: Past Flood Events layer from floodinfo.ie showing proximity of flood events in relation to site.

5 Flooding Risk

Flood risk to the site of the proposed development is considered in relation to the following criteria:

- Available Predictive Flood Risk Mapping.
- Fluvial Risk: Inundation from flow from neighbouring watercourses.
- Coastal Risk: Flooding from tidal water; considered under the current scenario and under possible future climate change scenarios.
- Pluvial Risk: Flooding due to direct rainfall.
- Groundwater flood risk.
- Impact of presence of the proposed development on the existing flood risk regime at its proposed site.

5.1 Fluvial Flood Risk

The site is located at an elevation of approximately 22 m OD Malin. A small stream, Rock Stream, lies approximately 50m to the north. This stream flows into the River Dee approximately 1 km to the east of the site. The bank level of the stream is approximately 20- 20.5 mOD at its closest point to the site. The finished floor level of the site is 22.45 mOD, which provides a difference of approximately 2 m between the bank level and the finished levels of the site. Hence, the proposed site is not anticipated to be at risk in an event of flooding from the stream. The River Dee is situated 500 m further north of the site. The River Dee catchment, named OPW Flood Studies Update (FSU) Catchment number 6, is approximately 1,675 km^2. Figure 5.1 illustrates the proposed site location with respect to the upstream catchment of the River Dee.

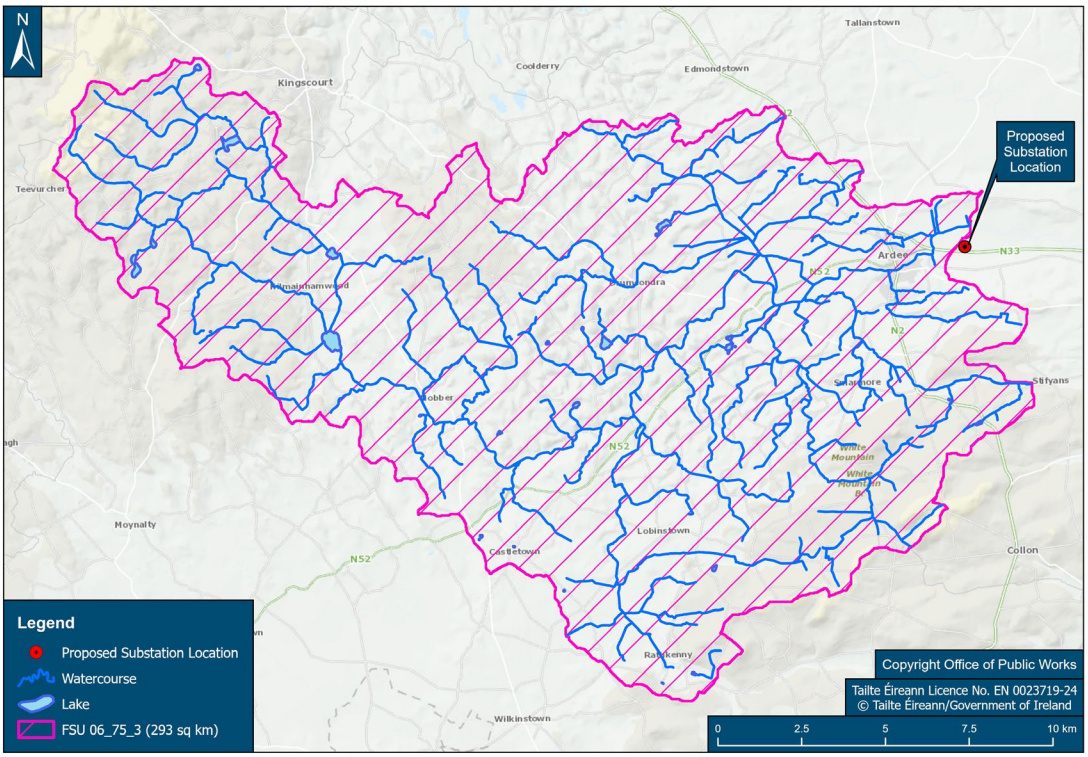


Figure 5.1: Upstream Catchment of River Dee

5.1.1 Catchment Flood Risk Assessment Management Studies

As part of Ireland's obligations under Directive 2007/60/EC on the assessment and management of flood risks, known as the "Floods" Directive, the OPW was engaged in the generation of mapping to provide predictive estimates of the extent of floodplains as part of its Catchment Flood Risk Assessment Management Studies (CFRAMS). This programme was undertaken on a River Basin District basis.

The Oriel 220 kV substation site is in the Dee Catchment. The OPW has undertaken a catchment-based flood risk assessment and management study of the North-Western CFRAMS. The North-Western CFRAMS is complete and finalised flood maps were released through floodinfo.ie in April 2018.

5.1.2 Preliminary Flood Risk Assessment (PFRA)

A Preliminary Flood Risk Assessment (PFRA), a requirement of the EU "Floods" Directive, was undertaken on a national basis. The objective of the PFRA was to identify areas where the risks associated with the flooding might be significant and requiring future more detailed assessment. The more detailed assessment was undertaken through the CFRAM studies.

According to the OPW, the PFRA was undertaken by:

- Reviewing records of historic floods
- An assessment to determine areas vulnerable to future flooding
- Consultation with relevant bodies (Local Authorities, Government departments and agencies)

This assessment considered flood risk from rivers, the sea and estuaries, direct rainfall and groundwater. Mapped output from the draft PFRA, with explanatory notes, is available for public consultation on the following website: https://www.floodinfo.ie/map/floodmaps/. The OPW notes that the flood extent maps are based on broad scale simple analysis and may not be accurate for specific locations. PFRA mapping is provided in Figure 5.2.

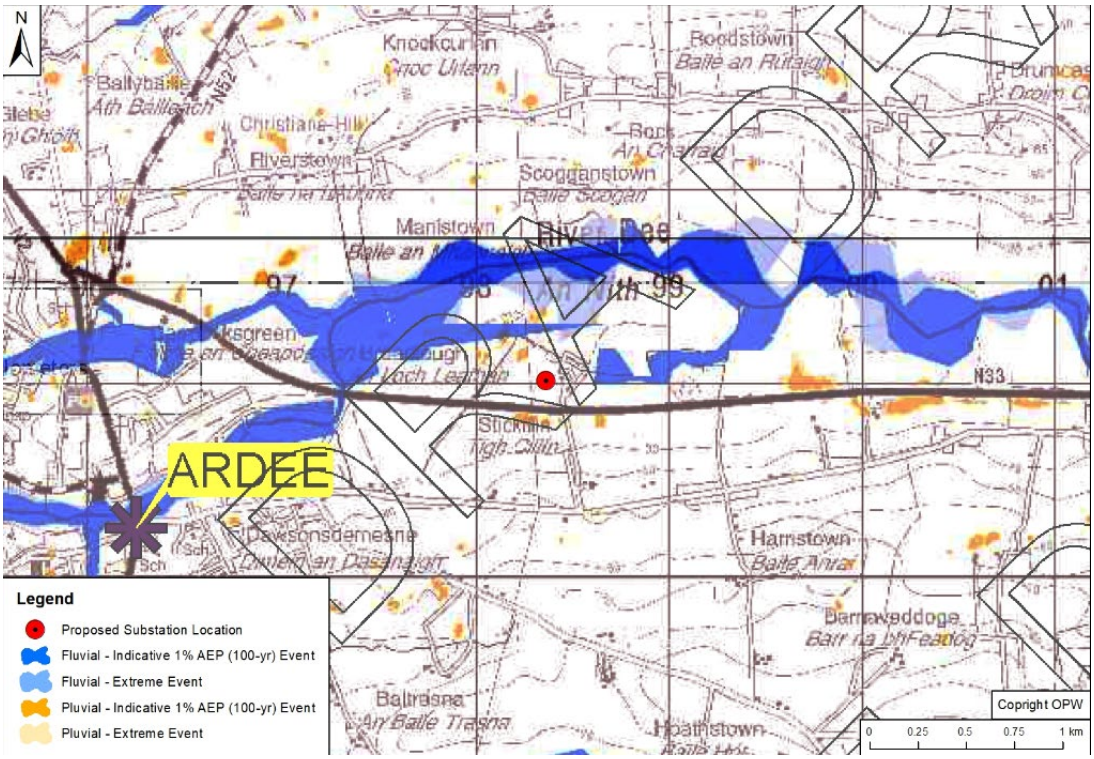


Figure 5.2: Preliminary Flood Risk Assessment (PFRA) map for the proposed site location.

Figure 5.2 indicates that the proposed site may be vulnerable to fluvial flooding of 1% Annual Exceedance Probability (AEP). The risk is due to the flooding of river Dee and Rock Stream. Figure 5.2 also indicates that a few locations in the vicinity of the proposed site is vulnerable to pluvial flooding of 1% AEP. The risk of pluvial flooding will be managed by the proposed drainage system. No ground water or coastal flooding is indicated on the site.

5.1.3 CFRAMS Mapping

The CFRAMS maps present indicative extents of lands at risk of flooding, predicted flood depths and predicted water levels in watercourses. The mapping indicates the following:

- Indicative extent of lands with 1 in 10 chance of flooding in any given year.
- Indicative extent of lands with 1 in 100 chance of fluvial flooding or 1 in 200 chance of tidal flooding in any given year (generally corresponds with Flood Zone A).
- Indicative extent of lands with 1 in 1000 chance of flooding in any given year (generally corresponds with Flood Zone B).

The proposed Oriel substation itself lies outside the predicted flood extents of the CFRAMS fluvial maps and is not at risk of fluvial flooding. The interactive mapping on the http://www.floodinfo.ie website indicates the areas outside the north and north-western boundaries of the proposed substation, but within the proposed redline boundary for the development, to be within Flood Zone B. It should be noted that no development is proposed in these areas with the exception of the new overhead lines which will be significantly above any predicted flood level and will not be at risk to flooding. The flood levels of the closest upstream node on the River Dee indicated by the North Western

CFRAMS mapping is 20.79 mOD (see Annex D). Compound 1 and the Control Building are at 22.45 mOD, the GIS building is at 22.6 mOD. The access roads are at 22.5 mOD and the rest of the site at 22.45 mOD with a minimum difference of 1.66 mOD between the proposed development and the predicted flood level.

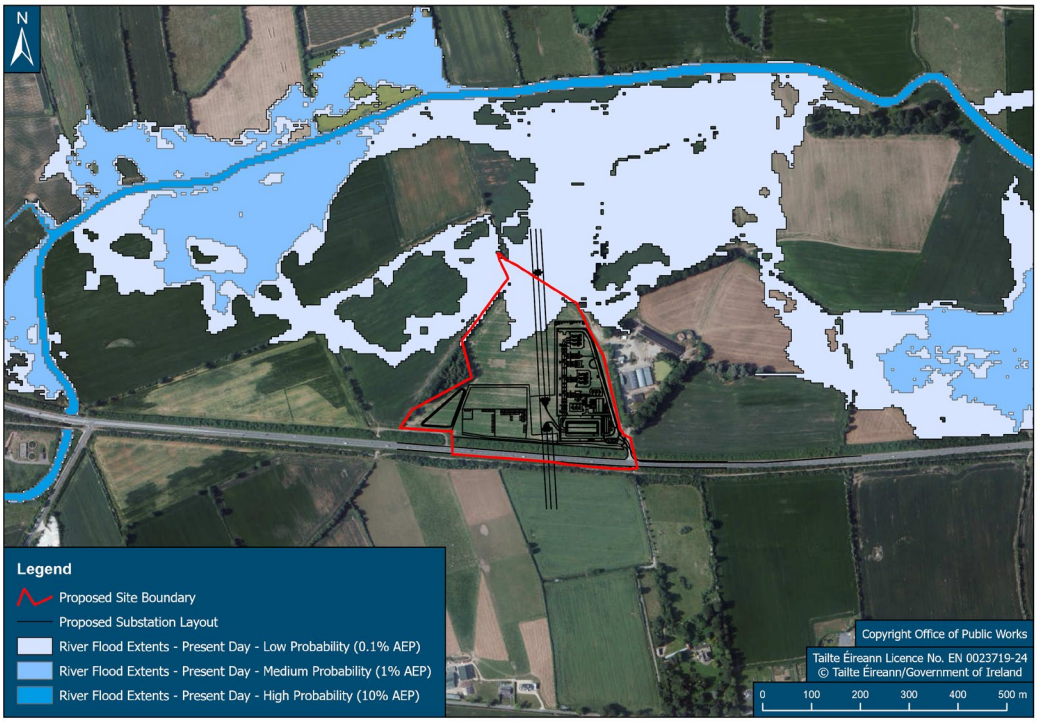


Figure 5.3: Site location and boundary with respect to the predicted flooding

5.2 Climate Change

The OPW released a report on "Implementing the National Flood Risk Policy" in May 2018. The report summarises the measures put in place to manage Ireland's flood risk, provides a summary of the outputs of the national CFRAM Programme and outlines the arrangements for implementation of the proposed measures set out in the 29 Flood Risk Management Plans. The report states that climate change will impact the flood risk in Ireland, resulting in the rise of sea level, a projected increase in the number of heavy rainfall days per year and projected wetter winters. The report was accessed via https://www.floodinfo.ie/static/floodmaps/docs/key_messges_page/Implementing_the_Gov_Nat_Flood_Risk_Policy_WEB.pdf (accessed 26/02/2024).

The OPW recommends that a climate change factor of up to 30% be considered for river flows for highly vulnerable developments. According to the report,

"While there is considerable uncertainty associated with most aspects of the potential impacts of climate change on flood risk (e.g. how fast sea levels will continue to rise into the future), the OPW considered that it was prudent to take the potential changes into account in the development of proposed measures in the Flood Risk Management Plans. Therefore, the OPW appraisal of flood risk and the choice of the measures proposed Flood Risk Management Plans took into account the assessment of risk for two potential future scenarios, the:

- *Mid-Range Future Scenario – increase in rainfall of 20% and sea level rise of 500mm (20 inches), and*
- *High-End Future Scenario – increase in rainfall of 30% and sea level rise of 1000mm (40 inches)".*

The CFRAM mapping takes into account the potential impact of climate change. Figures 5.4 and 5.5 depict the potential impact of climate change on the 0.1% AEP fluvial flooding near the proposed substation site under the mid-range future scenario and high-end future scenario. In both scenarios, the proposed substation site remains in Flood Zone C. However, the areas outside the north and north-western boundaries of the proposed substation, but within the proposed redline boundary for the development, are located within Flood Zone B in both climate change scenarios. This is the same as the present day predictions shown in Figure 5.3.

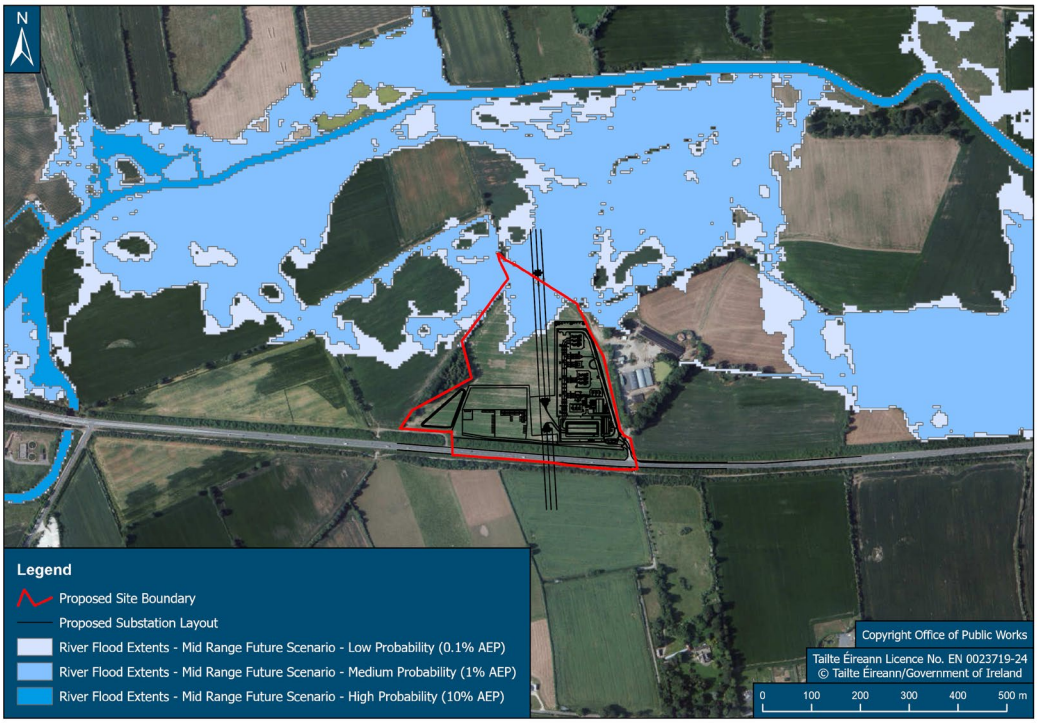


Figure 5.4: River flood extents mid-range future scenario for AEP 0.1%

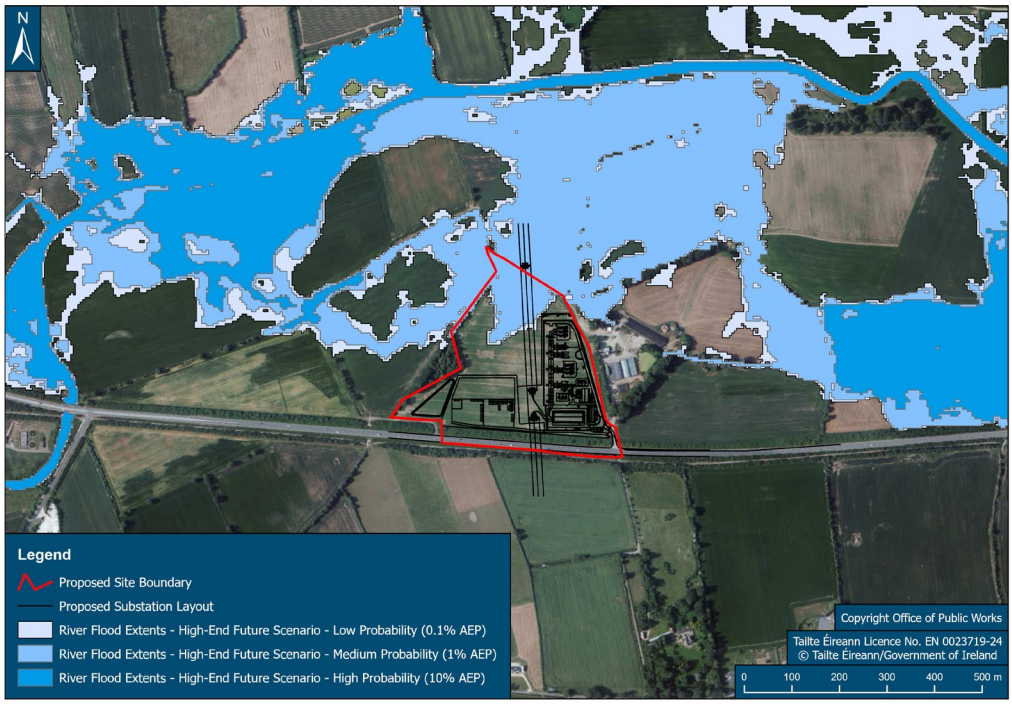


Figure 5.5: River flood extents high end future scenario for AEP 0.1%

5.3 Coastal Flood Risk

The proposed development site is located approximately 20 km to the west of Port Oriel. There is no significant risk to the proposed development from high, medium or low-level coastal flooding.

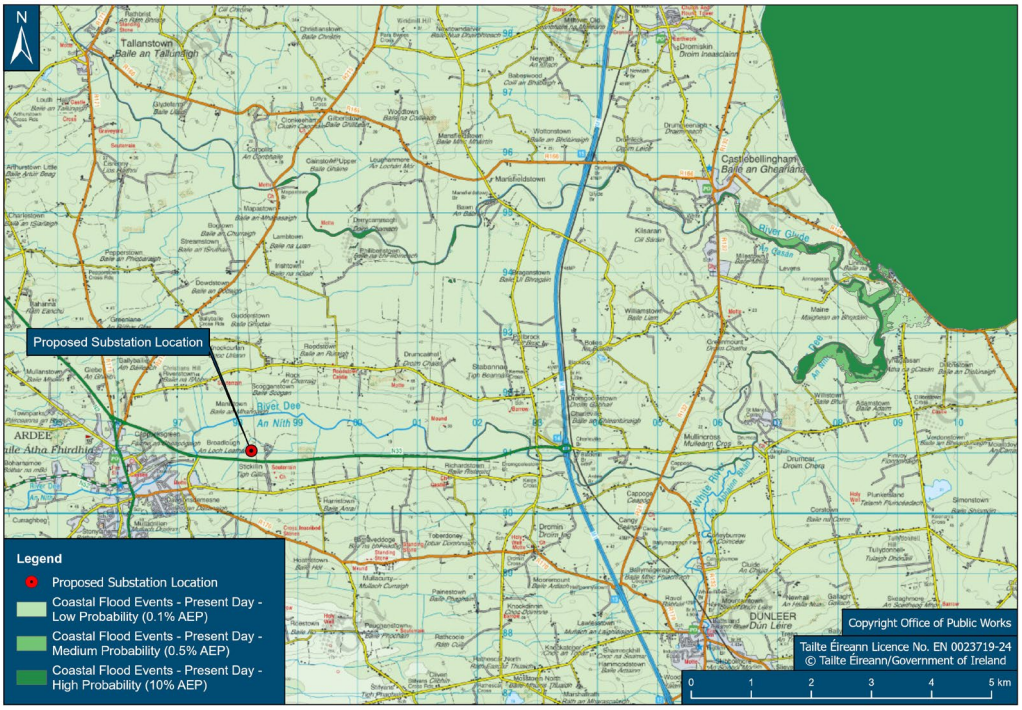


Figure 5.6: Coastal flooding indicated by interactive mapping on http://www.floodinfo.ie website

5.4 Pluvial Flood Risk

The proposed development will increase the impermeable area of the existing site and hence the surface water runoff from the site will be increased. The risk of pluvial flooding is not significant because the proposed drainage system will intercept the flow and dispose of surface water runoff within the site. The site surface water drainage system has been designed to best practice to provide protection from surface runoff (pluvial flooding) due to direct rainfall.

5.5 Groundwater Flood Risk

The Geological Survey of Ireland (GSI) mapping indicates that the site is underlain by Clontail Formation that comprises of greenish grey, medium to thickly bedded coarse and very fine grains of calcareous red mica greywackes. Groundwater recharge is roughly 60%. The ground water vulnerability is classified as medium. The subsoil is noted to be of moderate permeability and is overlain by well-drained soil. Furthermore, there are no groundwater karst features in the near surrounding of the site. The nearest karst feature is a borehole near the St. Brigids Hospital, approximately 2.8 km from the proposed site. The risk of groundwater flooding is deemed as not significant.

5.6 Impact of Development on Current Flood Regime in the Area

5.6.1 Impact of Site Surface Water Runoff

The site surface water drainage system will be designed to best practice to provide protection from surface water runoff due to direct rainfall. All surface runoff to be discharged from the site is to be collected in a dedicated drainage network. Attenuation of discharges from the site will be undertaken using best practise measures to preserve the current general flow regime. These measures will include as appropriate, the provision of onsite storage.

5.6.2 Loss of Floodplain

The existing levels of the site lie in the range of 21.4 – 21.9 mOD. The proposed development will not result in loss of floodplain as the proposed substation development is outside the area vulnerable to flooding. No development is proposed in the north and north western areas that are outside the proposed substation boundary but are within the redline site boundary. The only exception to this is the new overhead lines which will be significantly above any predicted flood level and will not impact on the current flood regime or be at risk to flooding. Hence, no compensatory flood storage is required for the development.

6 Conclusions

According to the assessment undertaken, the proposed 220 kV onshore substation site is not prone to any significant risk of flooding. The proposed substation site lies within Flood Zone C as defined by the guidance document to Planning Authorities in relation to Flood Risk Management. The areas outside the north and north-western boundaries of the proposed substation, but within the proposed redline boundary for the development, are located in Flood Zone B. No development is proposed in these areas with the exception of the new overhead lines which will be significantly above any predicted flood level and will not be at risk to flooding.

The site has no previous flood history.

The proposed substation will not increase flood risk elsewhere.

Annex A: Proposed Substation Layout

- Drawing No. PE605-D027-038-004-002

LEGEND:

- APPLICATION BOUNDARY
- EXISTING VEGETATION LINE
- PROPOSED PLANTING
- PROPOSED NEW CONCRETE POST & RAIL FENCE
- PROPOSED NEW PALISADE FENCE
- PROPOSED NEW WELD MESH FENCE
- PROPOSED TEMPORARY FENCE
- PROPOSED HIGH VOLTAGE UNDERGROUND CABLE
- PROPOSED LEVEL
- EARTHWORKS - CUT SLOPE
- EARTHWORKS - FILL SLOPE

NOTES:

1. CO-ORDINATES TO ITM GRID.
2. ALL LEVELS ARE IN METRES TO MALIN HEAD ORDNANCE DATUM.
3. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS.
5. ACRONYMS:
   - MK - MARSHALLING KIOSK
   - IK - INTERFACE KIOSK
   - LC - LIGHTING COLUMN
   - LM - LIGHTNING MONOPOLE
   - C2 - C2 CHAMBER
6. THIS DRAWING IS PRODUCED FOR PLANNING PURPOSES ONLY. ALL DIMENSIONS AND REFERENCES GIVEN ARE SUBJECT TO DETAILED DESIGN. THIS DRAWING IS NOT FOR CONSTRUCTION.
7. CIVIL AND ELECTRICAL CALCULATIONS ARE TO BE CARRIED OUT AT THE DETAILED DESIGN STAGE AND TAKE INTO ACCOUNT SPECIFIC, EXISTING SITE GROUND CONDITIONS.
8. SPECIFIC SWITCHGEAR AND BUILDING REQUIREMENTS ARE TO SUIT THE MANUFACTURER'S SPECIFICATIONS AND TO BE EVALUATED AT THE DETAILED DESIGN STAGE.
9. EXISTING MV OVERHEAD LINE IS TO BE DIVERTED AROUND THE COMPOUND THROUGH UNDERGROUND CABLE TO ESB NETWORK REQUIREMENTS.
10. All DUCTING IS A GENERAL ILLUSTRATION OF INSTALLATION AND IS SUBJECT TO DETAILED DESIGN.

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
2		PROJECT TITLE REVISED	SB			
1	21.08.23	TELECOMMUNICATIONS MAST AND HOUSE TRANSFORMER RELOCATED WITHIN COMPOUND 1. ALL BAYS REVISED IN COMPOUND 2. VOLTAGE TRANSFORMERS ADDED TO EACH BAY.C2 CHAMBERS AND FIBRE DUCTING ADDED TO COMPOUNDS 1 AND 2. PLANTING ADDED TO NORTH OF COMPOUND. ALL TEXT, DIMENSIONS AND LEVELS REVISED. COMPOUND NAMES CHANGED, ORIEL TELECOMMUNICATIONS BUILDING AND DIESEL GENERATOR ADDED.ELECTRICAL LAYOUT SIMPLIFIED. KEY PLAN REMOVED. DETAIL REVISED	SB	SB	RH	AH
0	17.12.20	INITIAL VERSION	RK	RH	BP	SK

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL [ ] PLANNING [X] TENDER [ ] CONSTRUCTION [ ] AS-BUILT [ ]

CLIENT: Oriel Windfarm Limited

PROJECT: Oriel Wind Farm Project

CONTRACT:

DRAWING TITLE: **ONSHORE SUBSTATION PROPOSED SITE LAYOUT**

PRODUCTION UNIT: Civil, Environmental and Renewable Engineering

Energy for generations
Engineering and Major Projects,
One Dublin Airport Central, Dublin Airport,
Cloghran, Co. Dublin, K67 XF72, Ireland.
Tel: +353 (0)1 703 8000 Web: www.esb.ie
Engineering and Major Projects is a division of ESB.

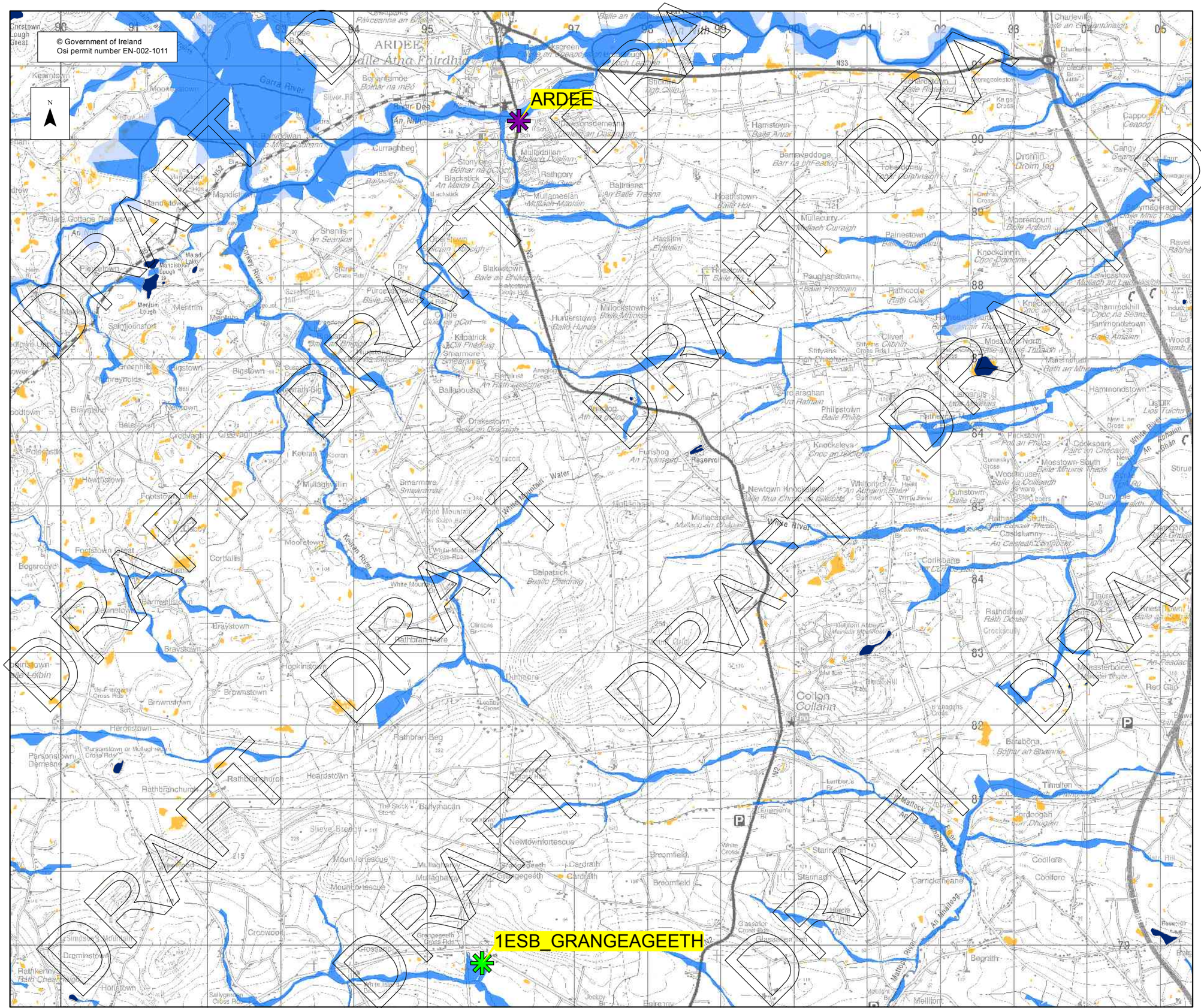
DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
S.Bolton	S.Bolton	A.Harte	J.McLoughlin	23/02/2024
CLIENT REF: TC223815		NO. OF SHTS: 1	SIZE: A0	SCALE: 1:500

DRAWING NUMBER: PE605-D027-038-004-002 | SHEET | REV

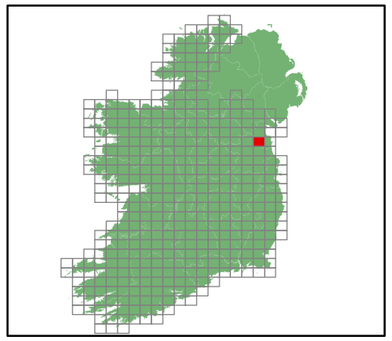
Annex B: Historical Flood Information

Map Ref	Location	Cause	Impact	Extent
1	Baltray	Tidal inundation on multi-annual basis. Exacerbated by high flood levels in the River Boyne	High	Upwards of 18 houses have been flooded in Feb 2002.
2	Seapoint	Bridge restriction, channel condition, tidal berm and tidal levels. Remedial works required.	Medium	A number of properties have been flooded (3-4) and approximately 20 properties are isolated.
3	Sandpit	Restricted capacity in field crossings and road crossings coupled with lack of channel maintenance.	Low	Localised flooding adjacent stream. A number of properties were at risk and one property flooded.
4	Termonfeckin	Flooding in village caused by obstructions to bridge eye and collapse of bank.	Low	One house flooded
5	Ganderstown	Localised flooding due to blockage/size of roadside drainage.	Low	Road Flooding
6	Dromiskin	Related to River levels in the Fane, high water table and deterioration of canalised drainage network.	High	Significant areas of land flooded. Roads flooded and some houses prone to recurrent flooding.
7	Ardee	Ardee Bog floods on a regular basis acting as attenuation for main channel. Channel capacity.	Medium	Significant lands flooded and occasional flooding of roads agricultural buildings and 5 houses.
8	Ardee	Localised flooding on streams primarily related to development and culverting.	Low	Flooding of roads and lands
9	Clogherhead	Localised flooding along the coast. Potential erosion problems.	Low	Small number of houses flooded during specific climatic conditions.
10	Mapastown	River Glyde, channel capacity.	Medium	Flooding of substantial area of lands and agricultural buildings
11	Blackrock	Blackrock Stream flooding due to inadequate channel cross section, culvert capacity and poor channel condition exacerbated by development	Medium	Flooding of roads gardens and lands adjacent to housing. Some houses have been flooded and sewerage collection system inundated.
12	Beaulieu	Beaulieu River capacity constraint, channel and development.	Medium	House road and lands
13	Blackrock	Mullagharlin Stream flooding due to inadequate channel cross section, culvert capacity and poor channel condition exacerbated by development.	Medium	Flooding of roads and a number of gardens at Ard na Mara. Potential to flood a large number of houses.
14	Annagassan	Localised flooding related to tidal backup in drains	Medium	Up to 10 houses flooded
15	Carlingford	Tidal factors. A considerable area of the village is below storm tide levels. When combined with high runoff flood risk arises.	High	Houses and commercial properties flooded. Substantial developed lands at risk from increased sea levels.
16	Belurgan	Tidal factors and condition of coastal protection embankments	High	Considerable lands and a number of houses affected by recent breach in sea defences.
17	Ballagan	Tidal factors	Medium	Erosion, road damage and lands

Annex C: PFRA Mapping



Location Plan :



Legend:

Flood Extents

- Fluvial - Indicative 1% AEP (100-yr) Event
- Fluvial - Extreme Event
- Coastal - Indicative 0.5% AEP (200-yr) Event
- Coastal - Extreme Event
- Pluvial - Indicative 1% AEP (100-yr) Event
- Pluvial - Extreme Event
- Groundwater Flood Extents
- Lakes / Turloughs

PFRA Outcomes

- Probable Area for Further Assesment
- Possible Area for Further Assesment

Important User Note:

The flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location. Information on the purpose, development and limitations of these maps is available in the relevant reports (see www.cfram.ie). Users should seek professional advice if they intend to rely on the maps in any way.

If you believe that the maps are inaccurate in some way please forward full details by contacting the OPW (refer to PFRA Information leaflets or 'Have Your Say' on www.cfram.ie).

Office of Public Works
Jonathon Swift Street
Trim
Co Meath
Ireland

Project :
PRELIMINARY FLOOD RISK ASSESMENT (PFRA)

Map :
PFRA Indicative extents and outcomes
- Draft for Consultation

Figure By : PJW Date : July2011

Checked By : MA Date : July 2011

Figure No. : 2019 / MAP / 306 / A

Revision 0

Drawing Scale : 1:50,000 Plot Scale : 1:1 @ A3

Annex D: Present Day Flood Extent: Northwestern CFRAMS Study

Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
0602M01775	20.42	30.15	20.68	33.53	20.84	35.59
0602M01775a	20.37	33.27	20.64	38.72	20.79	42.06
0603M00177I	23.46	N/A	23.67	N/A	23.98	N/A
0603M00126	22.19	N/A	22.40	N/A	22.62	N/A
0603M00076J	21.40	N/A	22.02	N/A	22.19	N/A
0603M00021	20.42	N/A	20.71	N/A	20.92	N/A
0603M00001a	20.37	1.36	20.64	2.73	20.80	5.36

296000 296200 296400 296600 296800 297000 297200 297400

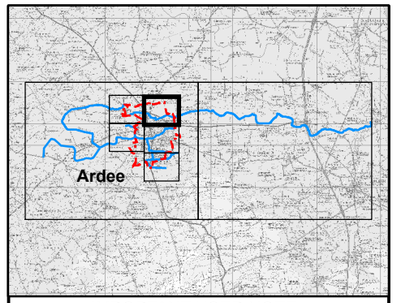
292200 292000 291800 291600 291400 291200 291000

RIVERSTOWN
Baile na hAbhna

ARDEE

0603M00177I
0603M00126
0603M00076J
0603M00021
0603M00001a
0602M01775a
0602M01775

0 50 100 200 300 400 500 Metres



IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:

NORTH WESTERN NEAGH BANN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW Oifig na nOibreacha Poiblí The Office of Public Works

RPS

The Office of Public Works
Jonathan Swift Street
Trim
Co Meath

Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

T +44(0) 28 90 667914
F +44(0) 28 90 668286
W www.rpsgroup.com
E ireland@rpsgroup.com

Map: Ardee Fluvial Flood Extents

Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By :	F.M.C. Date : 15 July 2016
Checked By :	J.C. Date : 15 July 2016
Approved By :	S.P. Date : 15 July 2016
Drawing No. :	N06AEE_EXFCD_F0_05
Map Series :	Page 05 of 07
Drawing Scale :	1:5,000 @ A3