East Limerick Substation Development

Flood Risk Assessment

September 2026

Prepared for:

Harmony Solar East Limerick Ltd

www.jbaconsulting.ie

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This report describes work commissioned by Harmony Solar East Limerick Ltd. The Client's representative for the contract was Fred Tottenham of Harmony Solar Ireland Ltd. Anastasiya Ilyasova and Ross Bryant of JBA Consulting carried out this work.

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taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this Report.

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Abbreviations

AEP	Annual Exceedance Probability
AFA	Area for Further Assessment
CFRAM	Catchment Flood Risk Assessment and Management
DoHELG	Department of the Environment, Heritage and Local Government
DTM	Digital Terrain Model
FB	Freeboard
FFL	Finished Floor Levels
FRA	Flood Risk Assessment
FSR	Flood Studies Report
GSI	Geological Survey of Ireland
LiDAR	Light Detection and Ranging
NIFM	National Indicative Fluvial Mapping
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
RR	Rainfall-Runoff
RMS	Root Mean Square
SAC	Special Area of Conservation
SAAR	Standard Average Annual Rainfall (mm)
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
SuDS	Sustainable Drainage Systems
WL	Water Level

1 Introduction

1.1 Statement of Consistency

Under the Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG & OPW, 2009), the East Limerick Substation Development (hereafter referred to as Proposed Substation Development) must undergo a Flood Risk Assessment (FRA) to ensure sustainability and effective management of flood risk. This FRA is in compliance and consistent with the Guidelines.

1.2 Terms of Reference

JBA Consulting was appointed to prepare an FRA for a substation of a solar farm located in East Limerick. The report was prepared in response to a request by Harmony Solar East Limerick Limited, to undertake an FRA for the site.

1.3 Flood Risk Assessment Aims and Objectives

This study has been completed to inform the future development of the site in relation to flood risk. It identifies, quantifies and communicates the risk of flooding to land, property and people, and recommends measures to manage that risk for consideration by the Planning Authority and other stakeholders.
The objectives of this FRA are to:

- Identify potential sources of flood risk;
- Confirm the level of flood risk and identify key hydraulic features;
- Assess the impact that the Proposed Substation Development has on flood risk;
- Develop appropriate flood risk mitigation and management measures which will allow for the long-term development of the site.

Recommendations for development have been provided in the context of the 2009 OPW / DoEHLG planning guidance, "The Planning System and Flood Risk Management". A review of the likely effects of climate change, and the long-term impacts this may have on any development has also been undertaken.

For general information on flooding, the definition of flood risk, flood zones and other terms see 'Understanding Flood Risk' in Appendix A.

1.4 Proposed Substation Development

Harmony Solar East Limerick Limited is seeking planning permission for a substation development within the townlands of Gotoon,Coolscart, and Kilfrush in County Limerick.

The Proposed Substation Development description, as contained on the statutory notices for the planning application, reads as follows:

10-year planning permission for the construction of a 220kV Loop In Loop Out (LILO) substation and associated works within a site of 17.02 hectares which will include the following:

- Transmission System Operator (TSO) compound with an area of approximately 14,158m², containing a two-storey 220kV GIS substation building with a footprint of approximately 1,844m², a total floor area of 3,550.8m², and a height of 20.7 m.
- Customer compound with an area of approximately 4,576m², containing a customer building with a footprint of approximately 346.2 m², a total floor area of 311.8m² and a height of 7.62m.
- 220kV customer transformer positioned within bunded enclosures, with a height of 9.5m above finished ground level.
- 220kV electrical infrastructure including transformers, switchgear, gantries, insulators, conductors, protection and control equipment, and all associated electrical plant and apparatus.
- A Battery Energy Storage System (BESS) located within a dedicated BESS compound and including:
    - 55 no. containerised battery storage modules, each measuring 6.06 m long, 2.44 m wide and 2.9 m high.
    - 28 no. containerised transformer and power conversion / conditioning units, each measuring 6.06 m long, 2.44 m wide and 2.9 m high.
    - Ancillary BESS infrastructure including inverters, transformers, switchgear, control equipment, thermal management systems, fire detection and suppression systems, acoustic screening, and associated electrical plant.
- Removal of 1 no. existing 25m high steel lattice tower, and the installation of 2 no. steel lattice towers of 26.5m high, foundations and associated insulators, hardware and conductor.
- 4no. lightning protection masts, with a height of 18m.
- 1 no. telecommunications mast, with a height of 37.52m.
- 140m of underground electrical cable and associated ducting, including joint bays, cable sealing end compounds, marker posts and associated infrastructure.
- Internal access tracks.
- A new access point from the L1509 public road.
- Removal of derelict farm building.
- Landscaping and biodiversity enhancement measures.
- Security gates, boundary fencing and all associated ancillary development, site works and services.

A Natura Impact Statement will be submitted with the application.

The Proposed Substation Development forms part of a wider “Overall Project”. The Overall Project comprises the following components:

- A new 220kV substation development, Battery Energy Storage System (BESS) and associated grid infrastructure (hereafter referred to as the Proposed

Substation Development), for which planning consent will be sought from An Coimisiún Pleanála (ACP) as a Strategic Infrastructure Development (SID) under Section 182A of the Planning and Development Act 2000 (as amended).

- A solar farm and associated cable route (the Proposed Solar Farm Development), for which planning consent is sought from Limerick City and County Council under Section 34 of the Planning and Development Act 2000 (as amended).

The Red Line Boundary for the Proposed Substation Development overlaps with, and is located within, the Red Line Boundary for the Proposed Solar Farm Development and therefore forms part of the wider Overall Project lands. The Proposed Substation Development is required to facilitate the connection of the Proposed Solar Farm Development to the national electricity transmission network. However, separate consenting routes are required under the Planning and Development Act 2000, as amended. Notwithstanding these separate consent processes, the Overall Project has been considered in this Report, with the Proposed Solar Farm Development and Proposed Substation Development assessed cumulatively.

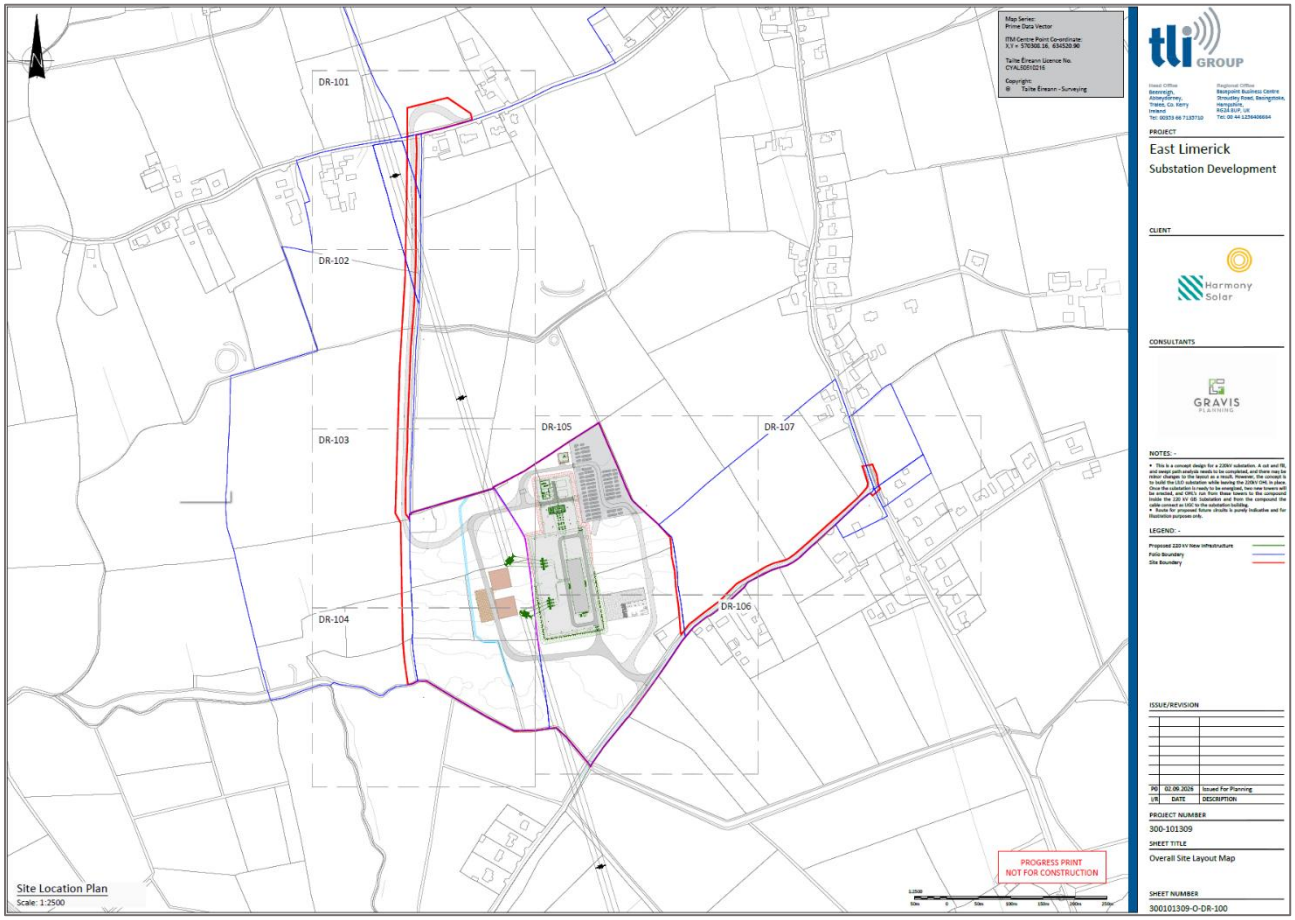


Figure 1-1: Proposed Substation Development

1.5 Report Overview

Section 2 of this report gives an overview of the study location and associated watercourses. Section 3 contains background information on flood risk. Section 4 provides initial assessment of flood risk and mitigation measures and Section 5 contains the conclusion.

2 Site Background

This section describes the background information of the Proposed Substation Development in East Limerick, including adjacent watercourses and its wider geographical area.

2.1 Site Location

The site of the Proposed Substation Development is situated in the townlands of Gotoon, Coolscart, and Kilfrush in County Limerick. The Overall Project further extends to the townlands of Ballyhaukish, Millfarm, Coolalough, Ballycahill, Newtown and Knocklong.

The Proposed Substation Development comprises 17.02 ha across one land parcel. The land parcel is located south-west of the village of Hospital and north-west of Knocklong village.

The Proposed Substation Development land is in agricultural use at present. There is an existing agricultural building located within the south-east corner of the parcel, and a derelict shed structure located in the northern area of the parcel. The parcel benefits from existing hedgerows along the field boundaries.

The site lies entirely within the 'Agricultural Lowlands' Landscape Character Area (LCA) as designated within the Limerick Development Plan 2022-2028.

There are no residential dwellings within the red line boundary for the Proposed Substation Development. There are, however, residential properties and farm holdings within the surrounding area, including properties located along the L1509 public road to the south of the site and within the wider rural area between Hospital and Knocklong.

The site associated with the Proposed Substation Development is within four private landownerships. Agreements are in place between the landowners and the Applicant to facilitate the construction and operation of the Proposed Substation Development on these lands. Letters of consent from the landowners have been provided to the Applicant and will be submitted with the SID application. The site location map is shown in Figure 2-1.

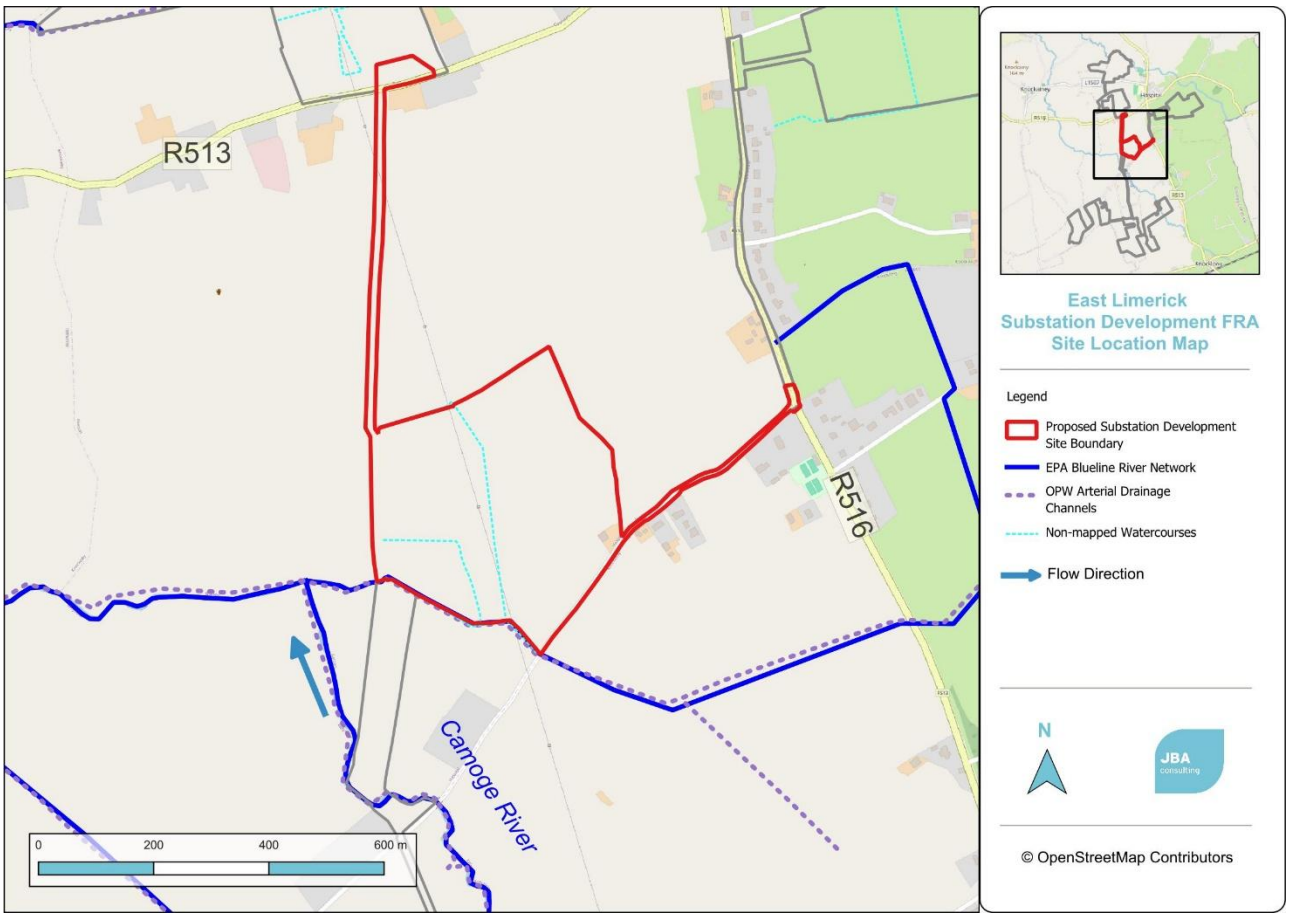


Figure 2-1: Site Location

2.2 Watercourses

The River Camogue and River Mahore are the main hydrological features in the area. Both rivers flow in a north westerly direction. The Proposed Substation Development is located within the catchment of River Camogue (refer to Figure 2-1 above). A tributary of the River Camogue flows along the southern red boundary of the Proposed Substation Development. The area has previously undergone Arterial Drainage works with many watercourses modified or extended under the OPW Arterial Drainage Scheme including River Camogue. Additionally, a couple of small drains, have been identified during the site visit draining to River Camogue to the south. Refer to photos below for an overview of the River Camogue tributary on site.

Figure 2-2: Photos taken during site visit

2.2.1 OPW Arterial Drainage Works

As noted above, the watercourse has been subject to an OPW Arterial Drainage Scheme (ADS). River Mahore is channel C21 and C1/25 and the River Camogue is channel C1/25/23. The main purpose of the ADSs was to improve land drainage and reduce the frequency and extent of overland flooding. ADSs can involve embankment construction, river straightening, lake storage development, and, most commonly, the deepening and widening of river channels. Through the implementation of ADSs the hydraulic conveyance efficiency of a catchment is increased, thereby leading to a reduction in overland flood storage. The reduction in overland storage results in downstream flood peaks of increased intensity with rapid recessions. Although it has been found that ADS generally achieve their main objectives, this increase in discharge-carrying capacity leads to an acceleration of the response to rainfall with flood peaks of increased intensity and more rapid recessions.

The Maigue Arterial Drainage Scheme was under the Arterial Drainage Acts of 1945 and 1995. The scheme took place between 1973 – 1986 and consists of 11,500km of channels, covering County Limerick, County Tipperary and County Cork.

Figure 2-3 below, shows the site to be within benefitting lands as managed by the Maigue ADS.

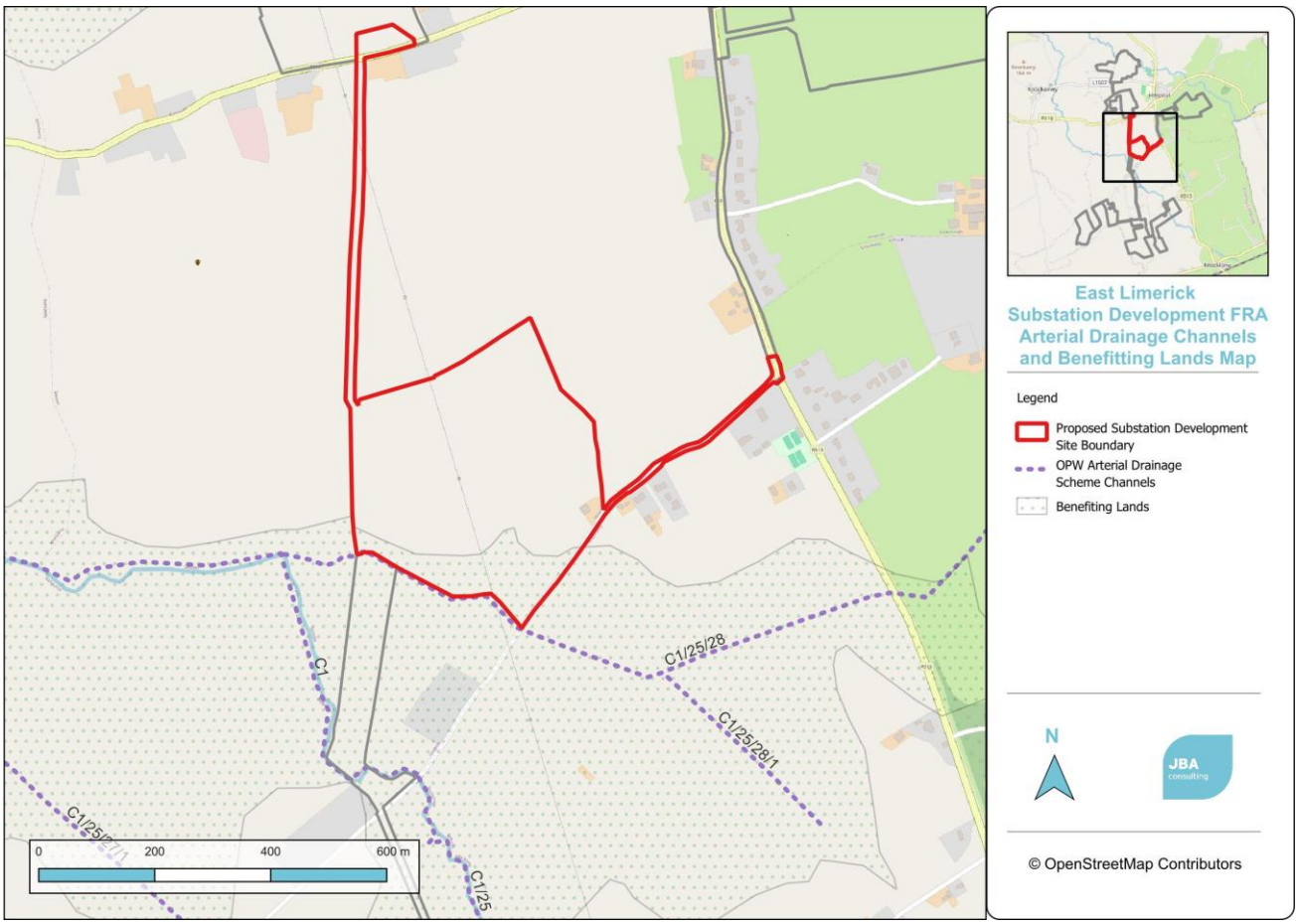


Figure 2-3: Arterial Drainage Channels and Benefitting lands

2.3 Topography

The Proposed Substation Development lands are in a rural area, and in agricultural use at present. They lie entirely within landscape designated as 'Agricultural Lowlands' Landscape Character Area (LCA) within the Limerick Development Plan 2022-2028. There is no sensitivity scale relating to the Agricultural Lowlands catchment.

As part of the FRA, a desktop study was undertaken to assess site topography using available LiDAR data. The LiDAR shows that ground levels across the site range from approximately 81mOD to 89mOD, as shown in Figure 2-3. This represents a fall of approximately 8m across the site from north to south.

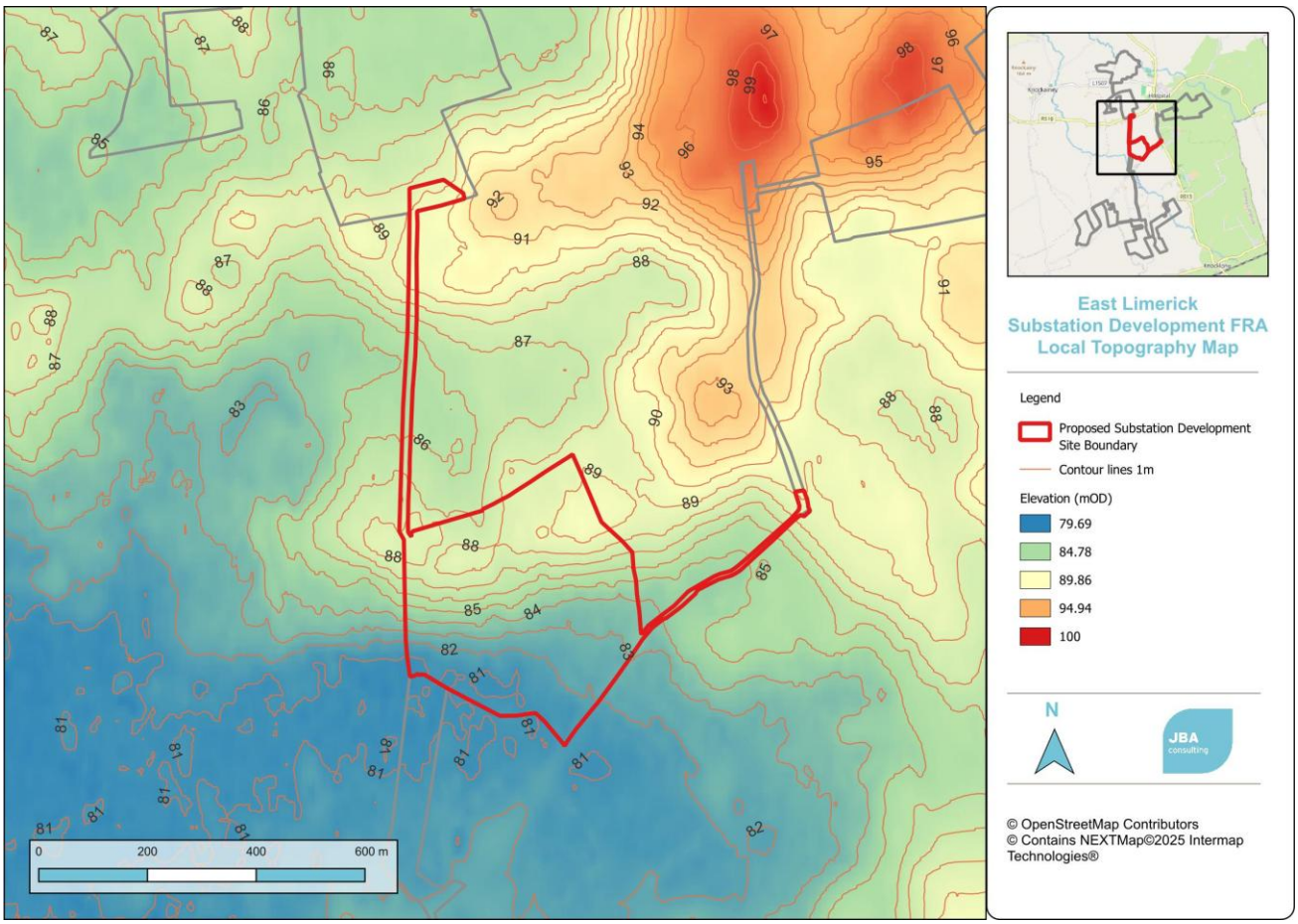


Figure 2-4: Site Topography

2.4 Site Geology

The groundwater and geological maps of the site, provided by the Geological Survey of Ireland (GSI), have been studied. The subsoils underlying the site are predominantly limestone till Carboniferous, with sandstone till Devonian to the south east, and small areas of alluvium and land sediments undifferentiated mostly along the watercourses, as shown in Figure 2-5 below.

The underlying bedrock is Ballysteen Formation, described as "Dark muddy limestone, shale". No karst features have been identified within the site boundary or in close vicinity. The groundwater vulnerability is "Moderate" and "High" as it can be seen on Figure 2-6.

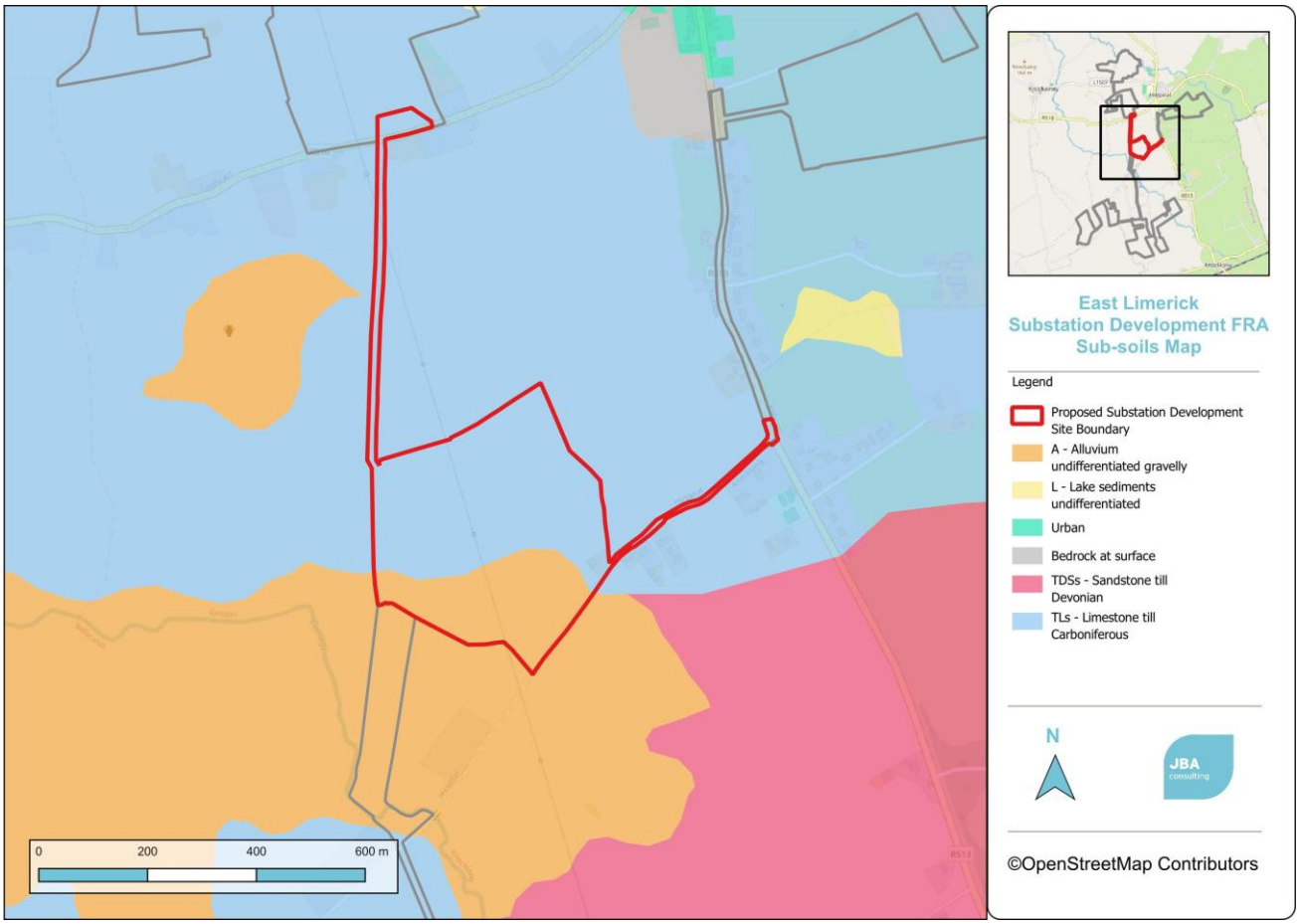


Figure 2-5: Subsoils

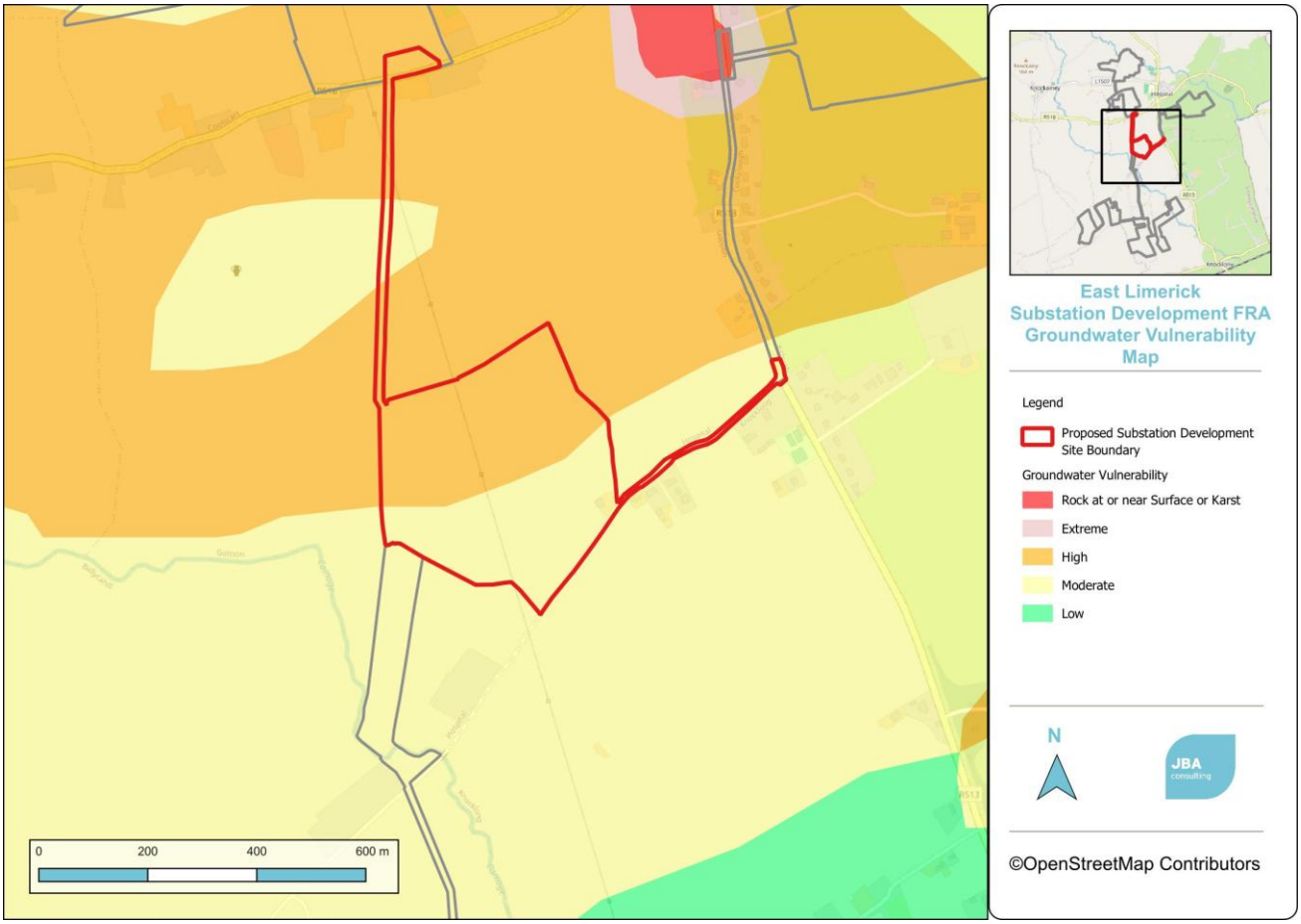


Figure 2-6: Groundwater Vulnerability

3 Flood Risk Identification

An assessment of the potential for and scale of flood risk at the site is conducted using historical and predictive information. This identifies any sources of potential flood risk to the site and reviews historical flood information. The findings from the flood risk identification stage of the assessment are provided in the following sections.

3.1 Flood History

Several sources of flood information have been reviewed to establish any recorded flood history at, or near the site. This includes the OPWs national flood information portal, www.floodinfo.ie, GSI database and general internet searches.

3.1.1 Floodinfo.ie

The OPW host a National Flood Risk Hazard Mapping website, www.floodinfo.ie, which highlights areas at flood risk through the collection of recorded data and observed flood events. Figure 3-1 shows historic flood events in the area.

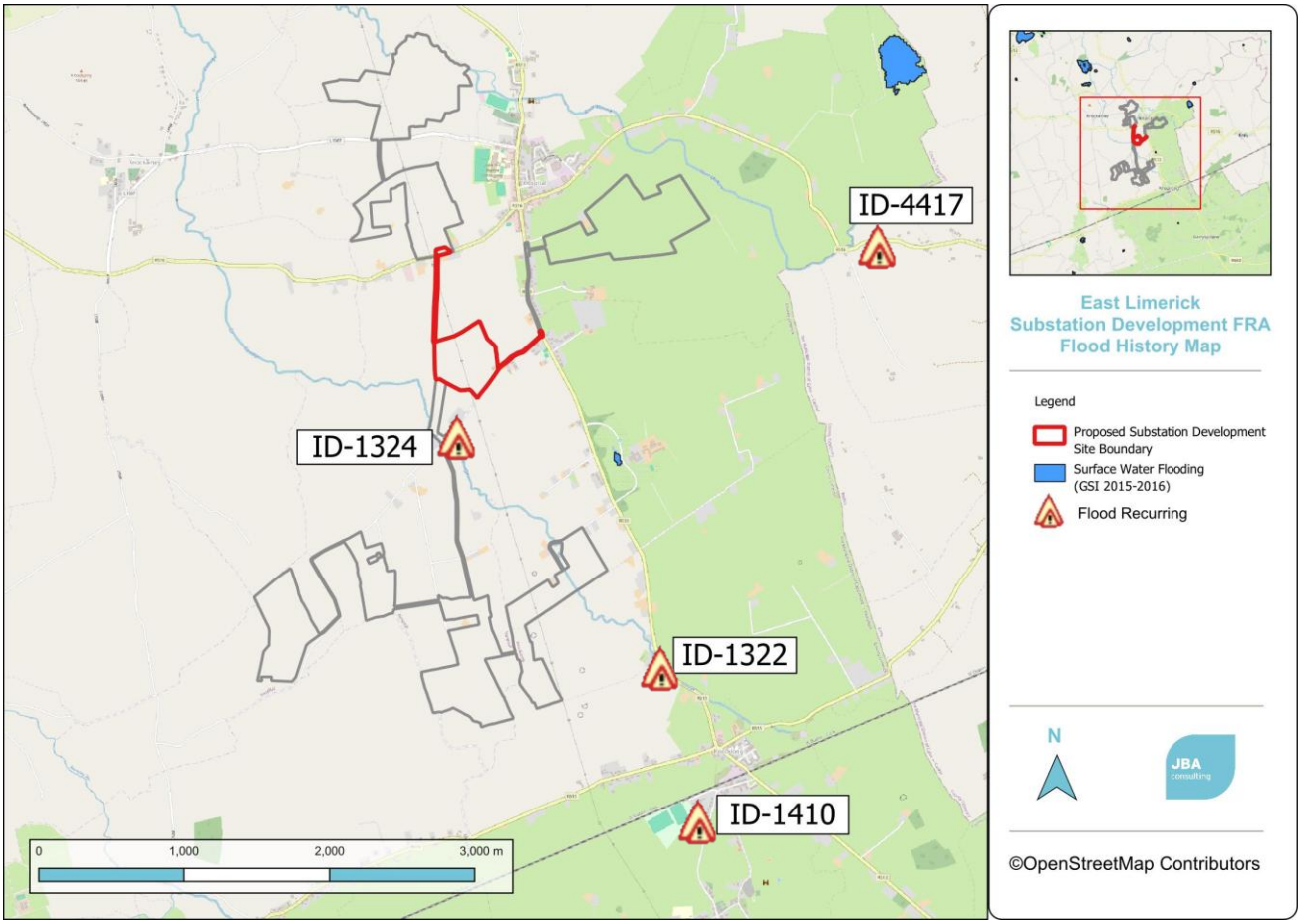


Figure 3-1: FloodInfo.ie Flood History

Floodinfo.ie identifies a number of occurring flood events around the Overall Project Lands, however only one event location is in close vicinity to the site. See Table 3-1 for flood details.

Table 3-1: Flood Summary (source: www.floodinfo.ie)

Flood ID	Flood Summary	Flood Source:	Distance from nearest site
1324	Ballycahill/ Hospital – Road (L1509) flooded occasionally. Frequency is approximately once in 10 years. Land on either side of road flooded more frequently. No houses affected. Last time road was flooded was in October 2004. Road remains passable.	Fluvial	220m

3.1.2 GSI Database

The Winter 2015/2016 Surface Water Flooding mapping, which shows fluvial and pluvial flood events from that period, was reviewed (Ref to Figure 3-1). The flood extent shows some ponding areas but there is no overlapping or connection with the Proposed Substation Development boundary.

3.1.3 Internet Searches

An internet search was conducted to identify whether the site had previously been affected by flooding. No reports of flooding at the site were identified.

3.2 Predictive Flood Mapping

The area has been a subject to a predictive flood mapping study which is derived from a single source and published in two locations;

- OPW National Indicative Fluvial Mapping (NIFM)
- Limerick Development Plan 2022–2028 SFRA (NIFM)

3.2.1 National Indicative Fluvial Mapping (NIFM)

The NIFM maps only provide an indication of areas that may be prone to flooding. They are not necessarily locally accurate and should not be used as the sole basis for defining the Flood Zones nor for making decisions on planning applications. The NIFM covers areas that have not been modelled under the CFRAM study.

A review of the NIFM flood extents shows that southern site boundary intersects with the 1%AEP and 0.1%AEP flood extent (ref. to Figure 3-2). Ground levels within the NIFM flood extents at the southern boundary are low-lying, typically in the 81-82mOD based on the available LiDAR data (ref. to Figure 2-4) and fall within the floodplain of the Camogue River tributary. It is noted that the site to the north slopes up to circa 88-89mOD and is significantly above the potential flood levels. The relatively steep incline is responsible for the relatively small offset between Flood Zone A and B.

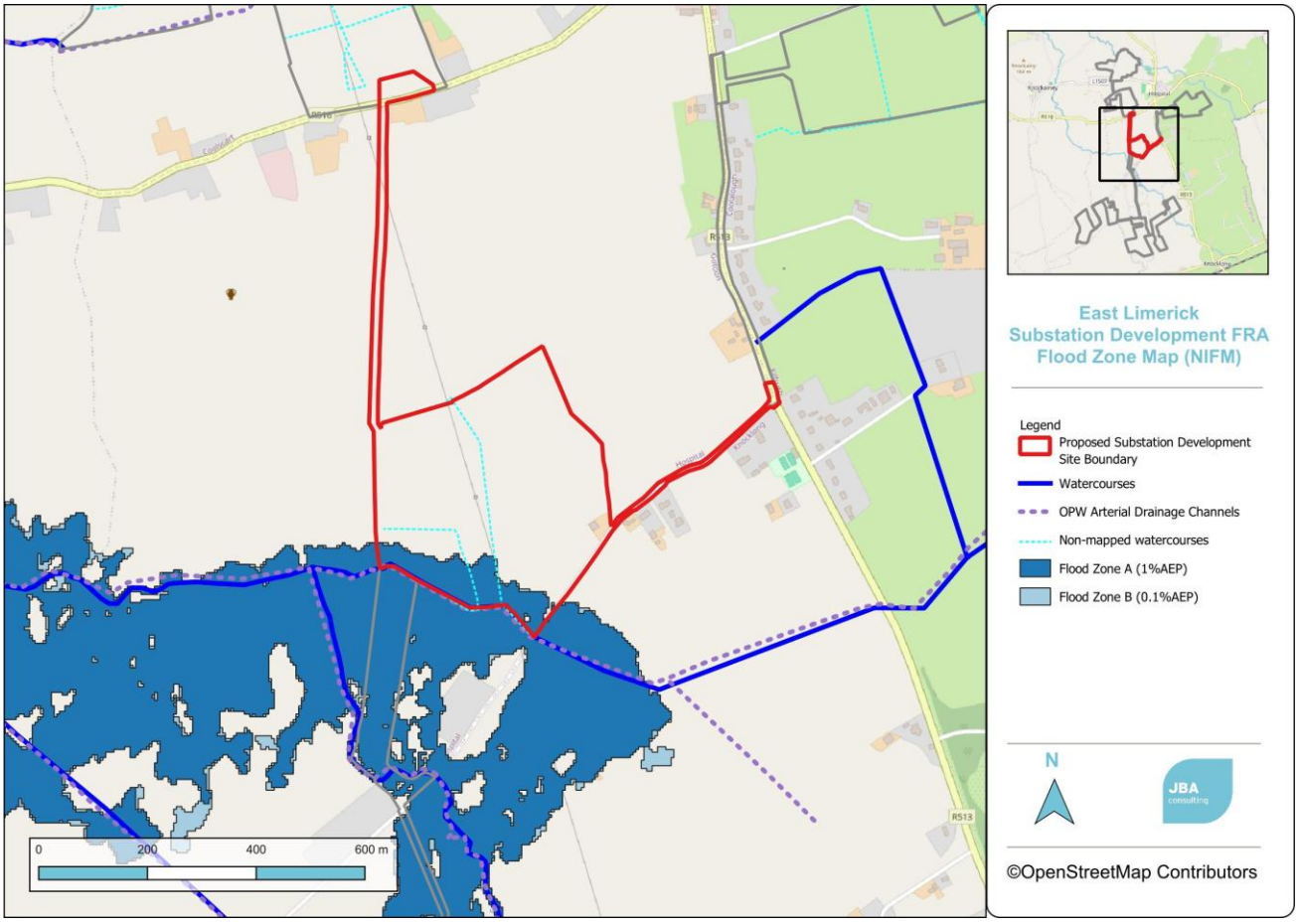


Figure 3-2: Flood Zone Map (NIFM)

3.2.2

3.2.3 Limerick Development Plan (2022–2028) SFRA

A Strategic Flood Risk Assessment (SFRA) was carried out to support the preparation of the Limerick Development Plan 2022-2028. This assessment aimed to ensure that flood risk was fully considered in shaping land use policies and zoning decisions across the county.

The proposed site is located around the environs of Hospital, which was assessed as part of the Limerick SFRA. The flood extents used in the SFRA are the same as the NIFM outlines (ref. to Figure 3-2 for the NIFM Flood Zones).

3.3 Sources of Flooding

The initial stage of a Flood Risk Assessment requires the identification and consideration of probable sources of flooding. Following this stage, the level of potential risk posed by each flood source can be summarised. The relevant flood sources are described below.

3.3.1 Fluvial

There is a history of recurring flood events from the rivers, one of which (ID-1324) is close to the site boundary. This flood event creates flooding of road L1509, however it remains passable.

The main flood risk to the site is from fluvial flooding due to the site's proximity to River Camogue tributary. Review of the NIFM flood extents shows that the southern boundary overlaps with the 1% and 0.1% AEP extents. The NIFM mapping is indicative and does not fully account in detail for the changes to channel geometry under the Arterial Drainage Scheme. The River Camogue tributary in the vicinity of the site has been subject to an OPW Arterial Drainage Scheme (ADS). This would suggest that much of the NIFM is a conservative estimation of flood extent for the Proposed Substation Development.

A review of the LiDAR data (ref. to Figure 2-4) shows that ground levels within the floodplain at the southern site boundary are typically around 81-82mOD, with the mapped NIFM extents generally contained below the 82mOD contour. Ground levels rise northwards to approximately 88-89mOD. Given the large increase in levels, floodwaters would not extend beyond the low-lying lands at the southern boundary even if flow was increased significantly. This is further discussed in Section 4.

Arterial drainage maintenance and monitoring is still carried out by OPW on channels, weirs, bridges and embankments to maintain adequate conveyance and ensure that flood waters (of varying magnitude but typically the 3-year flood) are retained in bank by lowering water levels during the growing season, thus reducing waterlogging on the adjacent land during wetter periods. Schemes are actively managed by OPW. The average channel requires maintenance every four to six years. In this regard, approximately 2,000km of channels are maintained annually and nearly all of the 11,500km of channels across

Ireland's Arterial Drainage Schemes will have been maintained at least once over a period of five years. Channel maintenance is organised on a regional basis.

As mentioned in Section 2.2, a couple of small drains have been identified during the site visit. These function as field drains that form part of the local land drainage network. Such features typically serve to intercept overland flow and convey surface water runoff from agricultural lands to nearby watercourses given the circa 8-9m elevation drop through the main portion of the site the field drains are relatively steep and would not trigger out of bank flooding, except within the floodplain of the Camogue tributary when there are high fluvial flows.

3.3.2 Pluvial / Surface Water

Pluvial, or surface water, flooding is the result of rainfall-generated flows that arise before runoff can enter a watercourse or sewer. It is usually associated with high-intensity rainfall events. There was no recorded historic pluvial flood events identified within the site or nearby. Flood risk from pluvial sources exists in all areas. The two surface water drains within the site serve to convey stormwater towards the formal river Camogue tributary. The diversion and any stormwater management measures for any impermeable access tracks or hardstanding areas associated with the development will mitigate this risk and have been reviewed and will be further discussed in Section 4.2.3.

3.3.3 Groundwater

Groundwater flooding results from high sub-surface water levels that impact upper levels of the soil strata and overland areas that are usually dry. The GSI historic mapping does not identify any historic flooding in the area. Review of the gsi.ie web-portal confirms that there are no known karst features in the area.

3.3.4 Tidal

The proposed site is located significantly a significant distance from the coast and therefore not subject to coastal flooding. Thus, it has been screened out at this stage.

4 Flood Risk Assessment

4.1 Flood Risk

This section will assess the likelihood of flooding at the site based on the information reviewed in Section 3. Review of the available information confirms that the southern boundary is partially located within Flood Zone A/B. All proposed highly vulnerable critical infrastructure (220kV substation and electrical infrastructure) are located in Flood Zone C and therefore are at low risk of flooding. This is supported by the site topography. Ground levels rise steadily away from the mapped Flood Zones at the southern boundary, where floodplain levels are typically in the order of 81-82mOD, up to approximately 86-87mOD at the location of the 220kV substation and BESS. The rise in levels of approximately 4-5m is well in excess of any uncertainty in the indicative NIFM mapping and provides confidence that flood waters would remain within the low-lying lands to the south and would not reach the proposed substation. Finished Floor Levels are discussed further in Section 4.2.1.

The mitigation measures will ensure flood risk is effectively managed and minimise any risk due to development of the site.

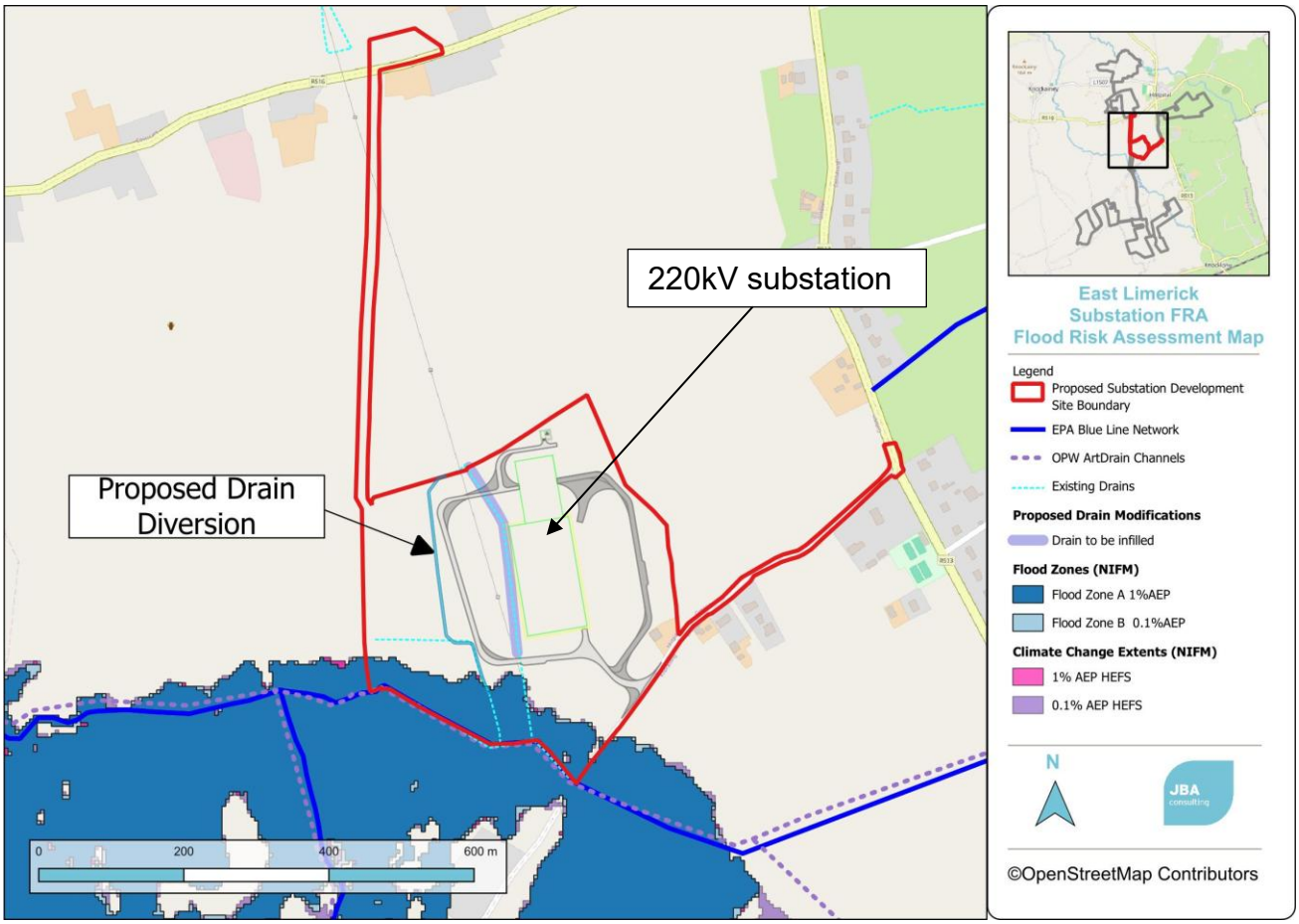


Figure 4-1: Flood Risk Assessment Map

4.2 Mitigation Measures

It is necessary to ensure that operations at the site are not impacted by a flood event and that the development will not increase the risk of flooding elsewhere in the catchment.

All highly vulnerable critical electrical infrastructures will be placed in Flood Zone C. It is also recommended that the 220kV substation and all critical infrastructure are raised by at least 100mm above the surrounding ground level so as to comply with ESB requirements.

4.2.1 Building FFLs (220kV Substation and BESS)

Finished floor levels for the 220kVsubstation and BESS compounds are designed to manage residual flood risk and maintain operation during extreme events. All critical electrical infrastructure is located in Flood Zone C, with FFL of 86.99mOD for the 220kV substation.

A review of the LiDAR data indicates that the mapped 0.1%AEP and Climate Change extents at the southern site boundary generally remains below 82mOOD contour. The proposed FFL of 86.99MOD therefore provides a freeboard of approximately 5m above the mapped flood extents - well in excess of the 500mm freeboard (above climate change levels) typically recommended for flood-sensitive buildings.

In addition, and in accordance with the ESB specifications, critical infrastructure will be raised at least 100mm above surrounding ground level.

4.2.2 Drain Diversion

The drain to be diverted is the field drain conveying surface water runoff only and is not a watercourse. The proposed diversion will maintain the existing function of the drain, and the significant fall in ground levels across the site will continue to convey surface water efficiently towards the south without overtopping the bank (whilst outside of the NIFM floodplain). The diverted drain will be offset from the substation compound, maintaining conveyance of surface water away from the critical infrastructure.

4.2.3 Surface Water/Pluvial Risk Management

Regarding the surface water management for the Proposed Substation Development, it is necessary to ensure that the development will not result in an increased risk of flooding elsewhere in the catchment.

The proposed drainage works involve the diversion of the existing drain to a new alignment immediately west of its current location. The diversion will maintain the existing drainage function and connectivity of the channel while accommodating the proposed development. The revised alignment will preserve the existing drainage regime and will not result in any increase in flood risk either within the site or downstream.

The proposed access tracks should be constructed from permeable materials and provided with additional drainage where required. Care will be required during construction to

prevent soil compaction and the use of permeable stone access tracks will ensure that the underlying soil conditions are not significantly affected by construction traffic.

The proposed measures will have a positive effect on the surface water conditions onsite and will reduce the total flow compared to its pre-development (greenfield) equivalent.

JBA is providing a separate drainage management plan for the site[1]. The conclusions in the Drainage Management Plan are in line with those in this FRA and support the view that the Proposed Substation Development will not increase pluvial or surface water flood risk.

4.2.4 Groundwater Risk Management

Groundwater vulnerability can generally be managed effectively through standard mitigation measures to be applied during the construction phase. Some groundworks needed for the BESS Compound. Care will be required during construction to prevent soil compaction, and the use of permeable stone access tracks will ensure that the underlying soil conditions are not significantly affected by construction traffic. Standard construction techniques with mitigation measures, to be described in the Hydrology and Hydrogeology report, will be sufficient for the areas of lower groundwater vulnerability.

4.2.5 Access

A new access point will be provided from the L1509 public road to serve the Proposed Substation Development. The access will facilitate construction, operation, maintenance and emergency access to the substation and BESS compounds.

Internal access tracks will be constructed within the site to provide access to the TSO compound, Customer / IPP compound, BESS compound, and other operational areas.

The alignment of the proposed access track is located entirely outside Flood Zones A and B. As a result, the access track is not expected to be affected by fluvial flooding and will not result in any loss of floodplain storage or impediment to flood flows. Consequently, the proposed access track will not increase flood risk on-site, upstream, downstream, or elsewhere, and its impact on flood risk is considered negligible.

4.3 Climate Change

In accordance with OPW guidance, it is necessary to assess the risk associated with climate change, represented by a 20% and 30% increase in flows for the 1% AEP and 0.1% AEP flood event under the Mid-Range Future Scenario (MRFS) and High-End Future Scenario. The 1% AEP and 0.1%AEP HEFS events are shown in Figure 4-1. A review of these extents shows that they are only marginally greater than the present-day extents, remaining within the low-lying lands at the southern site boundary. This finding is consistent with the steep rise in elevation through the lands. All critical infrastructure of the Proposed Substation Development is located in Flood Zone C, outside of the mapped climate change extents, and will therefore not be impacted by the potential effects of climate change.

[1] OSP-JBA-XX-XX-RP-C-0001-S3-P01-Drainage_Management_Plan_Substation

5 Conclusion

JBA Consulting has undertaken a Site-Specific Flood Risk Assessment for the Proposed Substation Development located in East Limerick.

Review of the available NIFM flood extents confirm that majority of the site, including all critical infrastructure (220kV substation) and access tracks are in Flood Zone C and located beyond the HEFS 0.1% AEP climate change scenario. The applicability of the NIFM mapping at this location was examined against LiDAR topographic data, which shows the mapped extents remaining within the low-lying lands at the southern site boundary (typically 81-82mOD), with ground levels rising to approximately 86-87mOD at the substation compound. This offset of approximately 5m, together with a proposed finished floor level of 86.99mOD, provides a high degree of confidence in the assessment. It is also recommended that the 220kV substation and all critical infrastructure are raised by at least 100mm above the surrounding ground level, in accordance with ESB specifications.

Regarding the potential impact on surface water runoff characteristics, as discussed in Section 4.2.3, the proposed mitigation measures will have a positive effect on the surface water regime within the site. The proposed diversion of the existing drain will reduce flow velocities and improve surface water attenuation.

As a result of the details discussed above it is concluded that the development proposal is in compliance with the core principles of the Planning System and Flood Risk Management Guidelines and has been subject to a commensurate assessment of risk.

Appendices

A Understanding Flood Risk

Flood risk is generally accepted to be a combination of the likelihood (or probability) of flooding and the potential consequences arising. Flood risk can be expressed in terms of the following relationship: Flood Risk = Probability of Flooding x Consequences of Flooding

A.1 Probability of Flooding

The likelihood or probability of a flood event (whether tidal or fluvial) is classified by its Annual Exceedance Probability (AEP) or return period (in years). A 1% AEP flood has a 1 in 100 chance of occurring in any given year.

In this report, flood frequency will primarily be expressed in terms of AEP, which is the inverse of the return period, as shown in the table below and explained above. This can be helpful when presenting results to members of the public who may associate the concept of return period with a regular occurrence rather than an average recurrence interval and is the terminology which will be used throughout this report.

Table A-1: Conversion between return periods and annual exceedance probabilities

Return period (years)	Annual exceedance probability (%)
2	50
10	10
50	2
100	1
200	0.5
1000	0.1

A.2 Flood Zones

Flood Zones are geographical areas illustrating the probability of flooding. For the purposes of the Planning Guidelines, there are 3 types or levels of flood zones, A, B and C.

Table A-2: Flood Zones

Zone	Description
Flood Zone A	Where the probability of flooding is highest; greater than 1% (1 in 100) from river flooding or 0.5% (1 in 200) for coastal/tidal flooding.

Flood Zone B	Moderate probability of flooding; between 1% and 0.1% from rivers and between 0.5% and 0.1% from coastal/tidal.
Flood Zone C	Lowest probability of flooding; less than 0.1% from both rivers and coastal/tidal.

It is important to note that the definition of the flood zones is based on an undefended scenario and does not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.

A.3 Consequence of Flooding

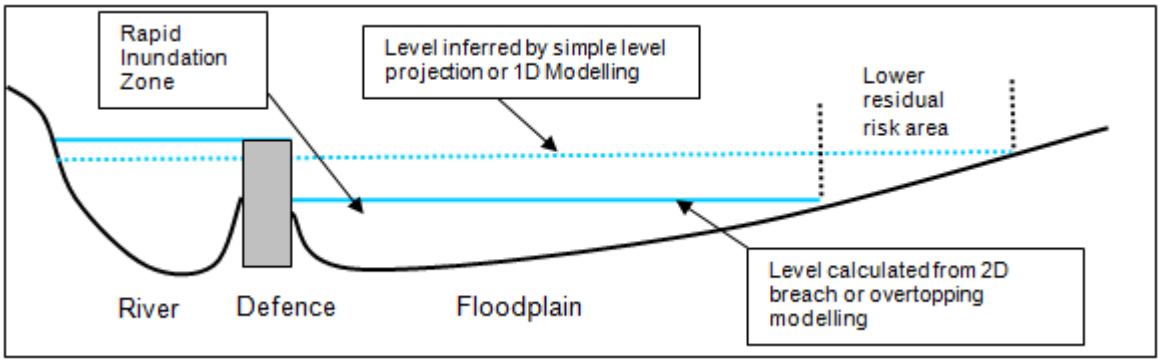
Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc.).

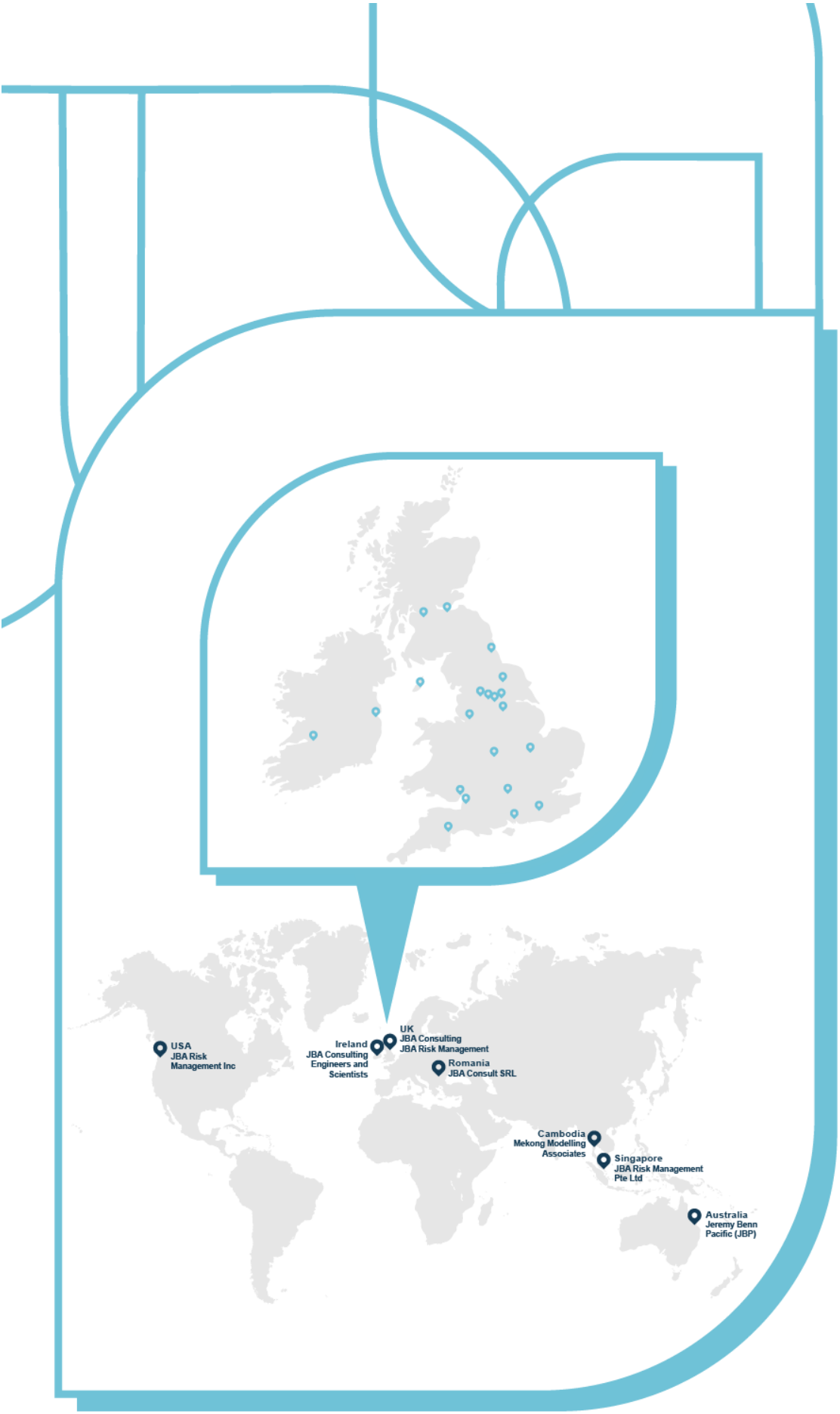
The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on the type of development, which are detailed in Table 3.1 of the Guidelines and are summarised as:

- Highly vulnerable, including residential properties, essential infrastructure and emergency service facilities;
- Less vulnerable, such as retail and commercial and local transport infrastructure;
- Water compatible, including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

A.4 Residual Risk

The presence of flood defences, by their very nature, hinder the movement of flood water across the floodplain and prevent flooding unless river levels rise above the defence crest level, or a breach occurs. This is known as residual risk.





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