OCSC

O'CONNOR · SUTTON · CRONIN

MULTIDISCIPLINARY CONSULTING ENGINEERS

W370: WICKLOW FIRE STATIONS

FLOOD RISK ASSESSMENT - BALTINGLASS

For

Wicklow County Council

19 June 2023

NOTICE

This document has been produced by O'Connor Sutton Cronin & Associates for its client, Wicklow County Council. It may not be used for any purpose other than that specified by any other person without the written permission of the authors.

DOCUMENT CONTROL & HISTORY

OCSC Job No: W370	Project Code	Originator	Zone Volume	Level	File Type	Role Type	Number	Status / Suitability Code	Revision
	W370	OCSC	BG	XX	RP	C	0010	S4	P01

Rev.	Status	Authors	Checked	Authorised	Issue Date
P01	S4	Dharmesh Purohit	MK	AH	19/06/2023

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 FLOOD RISK ASSESSMENT

1.1 DESIGN GUIDELINES OVERVIEW

Any planning permission sought on the subject lands are required to adhere to the Local Authority requirements *i.e.* the Wicklow County Council Development Plan, and as such, The Planning System and Flood Risk Management (FRM), Guidelines for Planning Authorities, in which, its Technical Appendices outline the requirements for a Site Specific Flood Risk Assessment.

1.2 THE PLANNING SYSTEM AND FLOOD MANAGEMENT, GUIDELINES FOR PLANNING AUTHORITIES

The FRM Guidelines outline methodologies for the "transparent consideration of flood risk at all levels of the planning process, ensuring consistency of approach throughout the country.

The core objectives of the FRM Guidelines are to:

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

In order to achieve the aims and objectives that are set out in the FRM Guidelines, the key principles that should be applied to new development are as follow:

- Avoid the risk, where possible;
- Substitute less vulnerable uses, where avoidance is not possible; and
- Mitigate and manage the risk, where avoidance and substitution are not possible.

Justification for development is required in situations where 'avoid' and 'substitute' principles cannot be applied. This is further summarised in the FRM Guidelines Sequential Approach, as illustrated in *Figure 1*.

Figure 1: Sequential Approach Principles in Flood Risk Management

1.3 FLOOD RISK ASSESSMENT

The assessment of flood risk requires an understanding of where the water comes from (*i.e.* the source), how and where it flows (*i.e.* the pathways) and the people and assets that if affects (*i.e.* the receptors). This is illustrated further in *Figure 2*, as sourced from the FRM Guidelines.

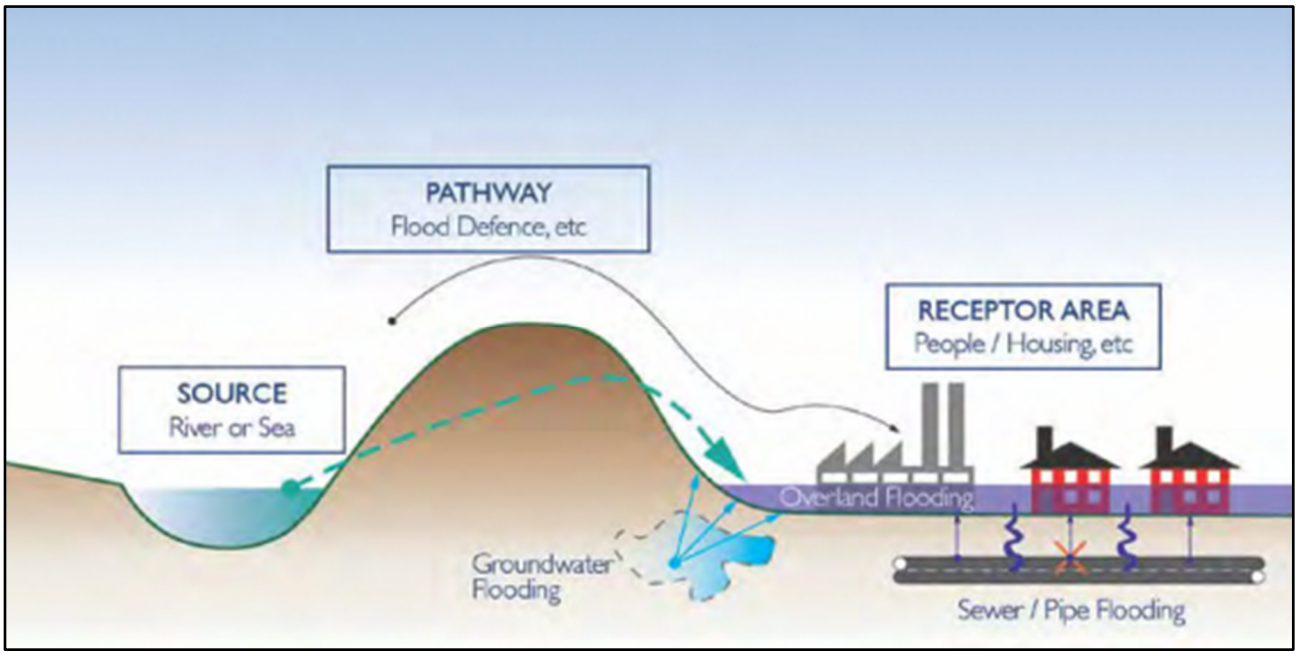

Figure 2: Source-Pathway-Receptor Model

The main sources of flooding are rainfall or higher than normal sea or river levels.

The main pathways include rivers, streams, sewers, drains, overland flow, and river and costal floodplains and their assets.

Receptors typically include people, their property, and their environment.
All three elements of this model must be examined as part of the flood risk assessment, including the vulnerability and exposure of receptors in order to determine its potential consequence.
Risks to people, property and the environment should be assessed over the full range of probabilities, including extreme events. Flood risk assessment should cover all sources of flooding, including effects of run-off from a development locally and beyond the development site.

1.3.1 FLOOD RISK ASSESSMENT STAGES

The FRM Guidelines outline that a staged approach should be adopted when carrying out a flood risk appraisal or assessment of flood risk for individual planning applications. These stages are:

- **Stage 1** – Flood risk identification
- **Stage 2** – Initial flood risk assessment
- **Stage 3** – Detailed flood risk assessment

1.4 FLOOD ZONES

The FRM Guidelines identifies three types, or levels, of flooding zones, which are defined as follows:

1. **Flood Zone A** – where the probability of flooding from rivers and sea is highest (greater than 1% AEP for fluvial, or 0.5% AEP for coastal flooding);
2. **Flood Zone B** – where the probability of flooding from river and sea is moderate (between 0.1% AEP and 1% AEP for fluvial and between 0.1% AEP and 0.5% AEP for coastal flooding);
3. **Flood Zone C** – where the probability of flooding from rivers and sea is low (less than 0.1% AEP for both fluvial and coastal flooding).

1.5 CLIMATE CHANGE

The *FRM Guidelines* require that account be taken of the effects of climate change over the design of a development, typically 100 years. Design parameters to take account of climate change were established in the *GDSDS* and revised following later studies, as directed within the Local Authority's Development Plan. These parameters are set out in the *Figure 3 – Climate Change – Impact on Design Parameters*, below.

Table 1: Climate Change - Impact on Design Parameters

Design Category	Impact of Climate Change
Drainage	10% increase in rainfall
Fluvial (River)	20% increase in flood flow
Tidal / Coastal	Sea level rise of 500mm

1.6 DEVELOPMENT VULNERABILITY

Table 3.1 of The Planning System and Flood Risk Management Guidelines, reproduced in *Figure 4* below, classifies the proposed Fire Station (essential infrastructure) as being **'Highly Vulnerable Development'** based on its proposed land use and type of development.

Table 2: Development Vulnerability Class

Vulnerability Class	Land uses and types of development which include:
Highly Vulnerable Development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; ***Dwelling houses***, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less Vulnerable Development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible Development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

Table 3.2 of the PSFRM Guidelines, reproduced in *Figures 5* below, illustrates the types of development that are considered appropriate to each flood zone, and those that would be required to meet the criteria of a Justification Test, which establishes the criteria under which desirable development of a site within a floodplain may be warranted.

Table 3: Matrix of Vulnerability Vs. Flood Zone

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-compatible Development	Appropriate	Appropriate	Appropriate

Therefore, based on the table above, *Highly Vulnerable Development*, such as the essential infrastructure like Fire Stations is classified as **'appropriate'** if it is located within Flood Zone C.

1.7 SEQUENTIAL APPROACH

A sequential approach, based on the development vulnerability and location with respect to flood zones, is a key tool in ensuring new development is first and foremost directed towards land that is at low risk of flooding. This approach is illustrated further in *Figure 6* below.

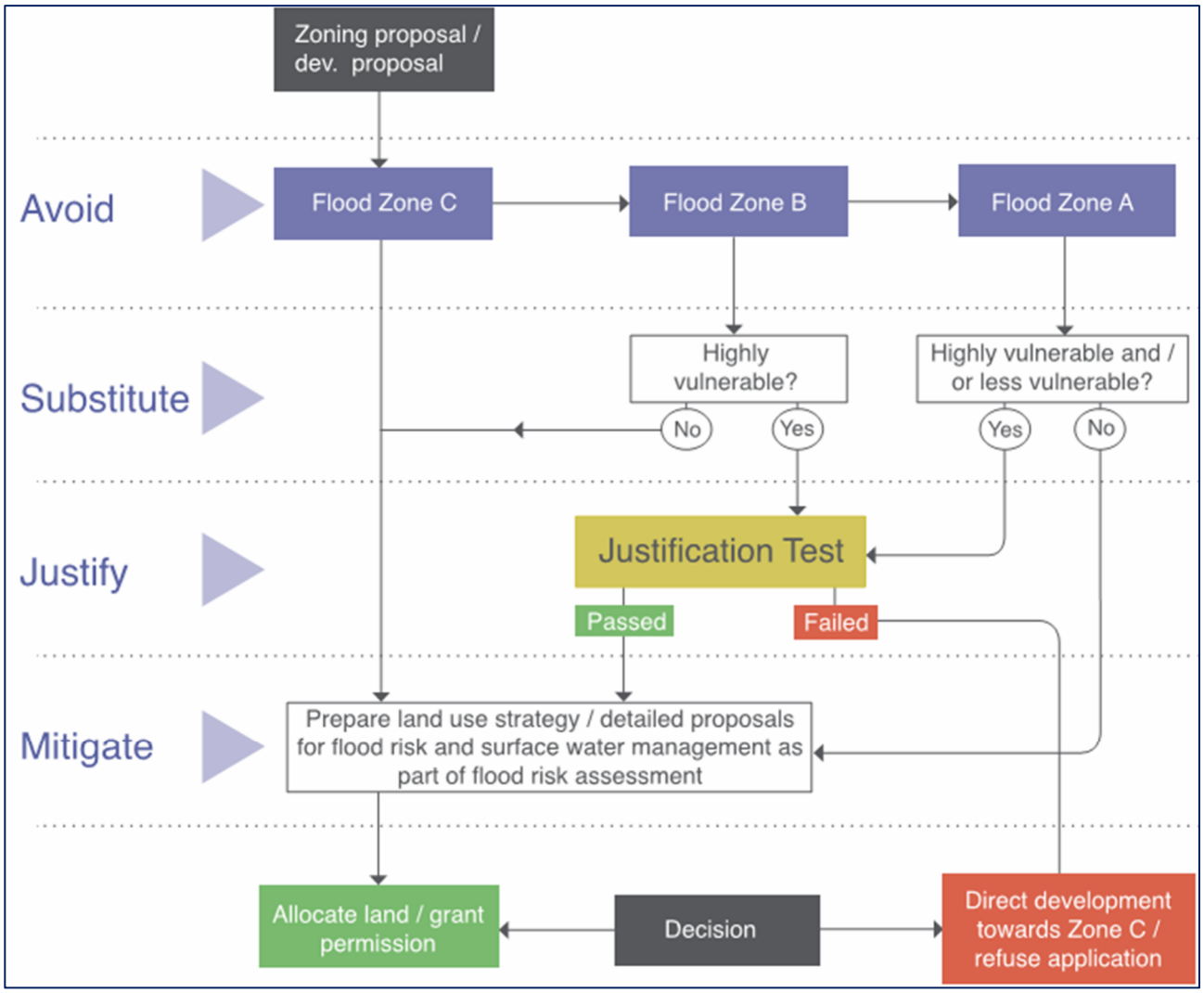

Figure 3: Sequential Approach Mechanism (FRM Guidelines)

2 FLOOD RISK IDENTIFICATION & ASSESSMENT - BALTINGLASS

2.1 HISTORICAL FLOODING

The Office of Public Works (OPW) collates all information available from reports of flooding from all sources on a nationwide basis. This information is available from the OPW's website **www.floodinfo.ie** , which was consulted in order to obtain any information on previous flooding in the vicinity of the site. There are no reported incidents of flooding in the vicinity of the proposed development.

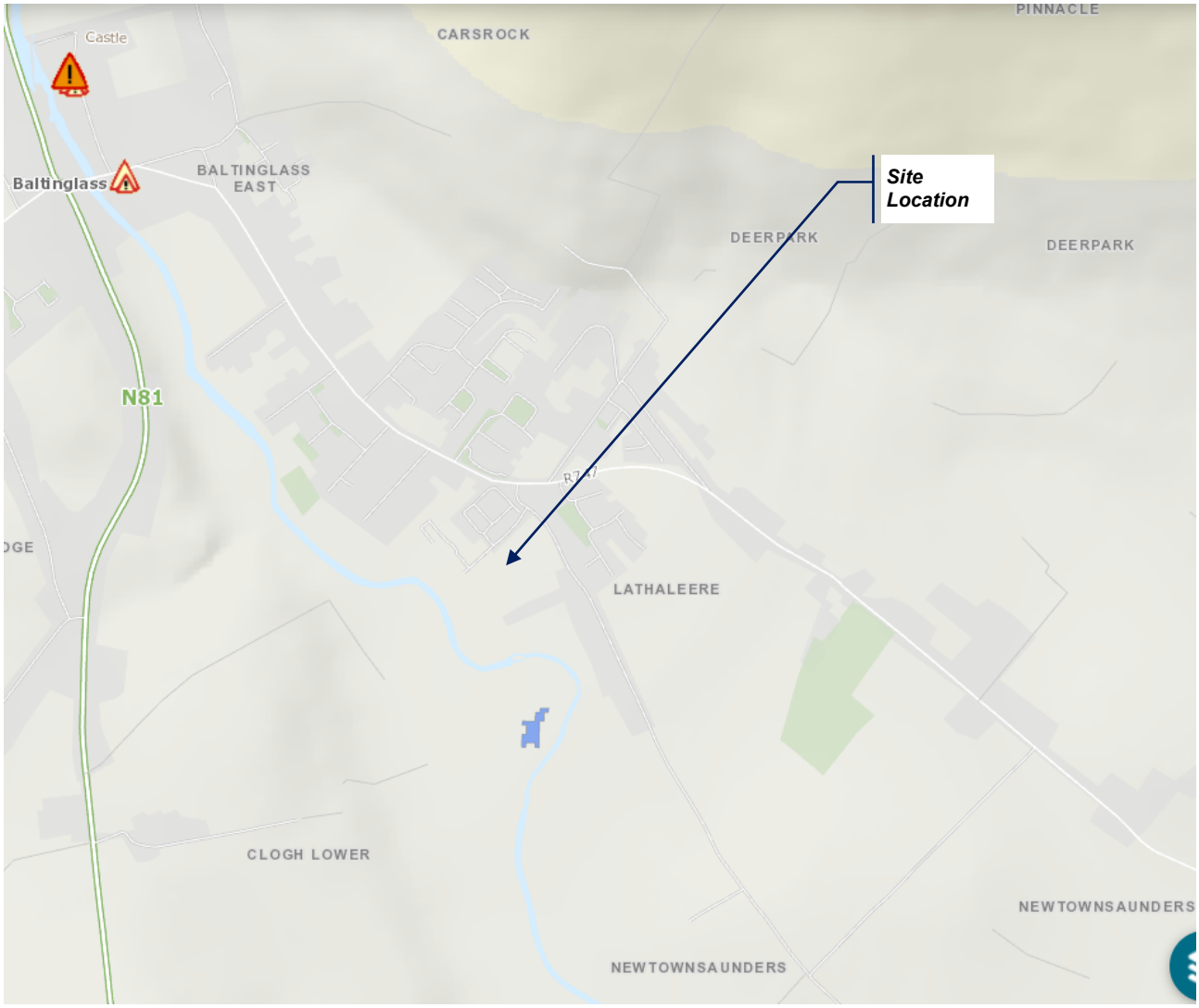

Figure 4: OPW Historical Flooding

2.2 FLUVIAL FLOODING

Fluvial flooding occurs when a river overtops its banks due to a blockage in the channel or the channel capacity is exceeded due to excess rainfall in its catchment area.

The Central Flood Risk Assessment and Management (CFRAM) programme published flood mapping for Baltinglass in July 2016. This mapping highlights the modelled 10% AEP fluvial extent (1:10), 1% AEP fluvial extent and 0.1% AEP fluvial extent. The developed site is substantially free from flood zones.

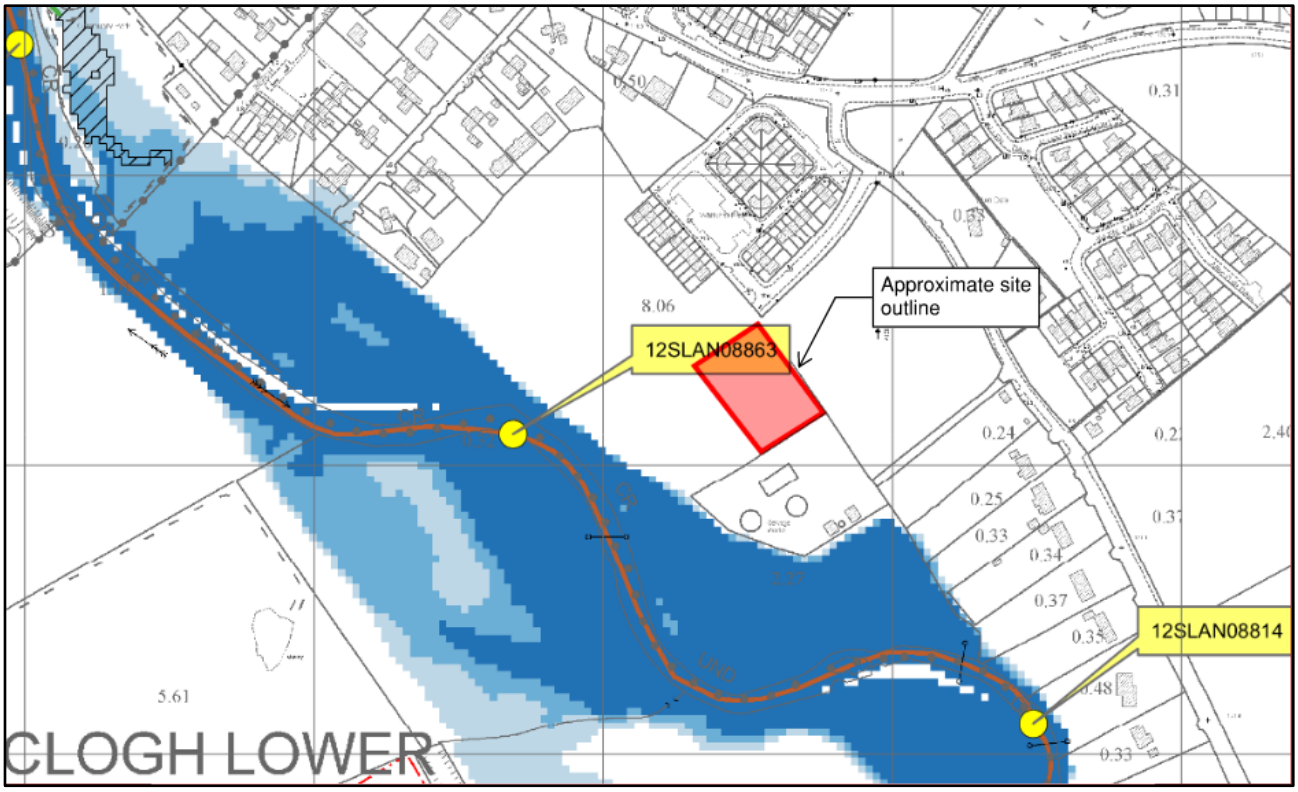

Figure 5: Extract from CFRAM fluvial flood map

Proposed site is outside of fluvial flood risk areas. The mapping provides modelled water levels for node 12SLAN08863 located west from the site. Flood levels are indicated as + 112.02 (10% AEP), +112.28 (1%) AEP and + 112.52 (.1% AEP). The proposed building floor level is likely to be set +114.50m OD (or higher) and will be comfortably above all flood levels.

2.3 COASTAL FLOODING

Coastal flooding is caused by high sea levels resulting in the sea overflowing onto the land. The proposed site is located outside the AEP Coastal Flood Event. With a site level set on +115.00 OD, the site is not considered at risk from Coastal Flooding. Refer to Figure 9 – Coastal Flooding, from OPW's website **www.floodinfo.ie**.

Figure 6: Coastal Flood Extent

2.4 PLUVIAL FLOODING

Pluvial flooding occurs when overland flow, resulting from rainfall events, cannot infiltrate into the ground, when drainage systems exceed their capacity or are blocked and when the water cannot discharge due to a high-water level in the receiving watercourse.

The proposed development is to contain a new gravity surface water network that is to discharge an attenuated flow of 2.0 l/s. Attenuation systems are to be provided at strategic locations, as a result of the restricted development discharge rates associated with design rainfall events up to, and including, the 1% AEP including a 20% allowance for climate change. Details of the proposed surface water drainage strategy associated with the subject development can be found through the included drainage drawings with this submission.
The proposed surface water drainage network has been designed to ensure that no flooding is experienced during design rainfall events up to and including the 1% AEP including an additional 20% intensity for climate change projections.

The above ensure that pluvial flooding is not considered a risk or caused by the proposed development. This ensures that pluvial flooding is not considered to be a significant risk to the proposed development.

2.5 GROUNDWATER FLOODING

Groundwater flooding occurs when the water table rises above the land surface, this means the natural underground drainage system is incapable of sufficiently draining itself, resulting in the emergence of groundwater at the surface. It generally requires sustained rainfall over relatively longer duration than other forms of flooding, its location is discontinuous, and they can last for weeks or months. The GSI have developed flood risk maps that shows the groundwater flooding and historic groundwater flooding. The groundwater flooding is classified as Low Probability, Medium Probability and High Probability. Refer to Figure 10 – Groundwater Flooding, below, *(**www.gsi.ie**)*.

Figure 10 Groundwater Flood Extent *(**www.gsi.ie**)*

The site is also not in vicinity of any tidally influenced area of groundwater flood and is therefore not considered at Risk from Groundwater flooding.

2.6 CONCLUSION AND RECOMMENDATION

It has been demonstrated in the earlier sections that the site is not at risk of flooding from Fluvial, Coastal, Pluvial or Groundwater sources. In order to minimise the risk of flooding within the development, it is recommended that all drainage infrastructure is designed and installed in accordance with the relevant standards.

As the proposed Fire Station is located outside the flood zones A & B for tidal and fluvial flooding, it is not considered to be at significant risk of flooding from pluvial or ground water flooding.

3 VERIFICATION

This report was compiled and verified by:

Dharmesh Purohit BE (Civil) MS Water Resources PMP
Senior Drainage Engineer
O'Connor Sutton Cronin & Associates

OCSC

O'CONNOR · SUTTON · CRONIN

MULTIDISCIPLINARY CONSULTING ENGINEERS

Head Office

9 Prussia Street
Dublin 7
Ireland
D07KT57
T: +353 (0)1 8682000
E: ocsc@ocsc.ie | W: www.ocsc.ie

Civil | Structural | Mechanical | Electrical | Sustainability | Environmental