TOBIN

# Galway Port LRD
# Co. Galway
# Flood Risk Assessment

LDA

BUILT ON KNOWLEDGE

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# 1. INTRODUCTION

TOBIN were appointed on behalf of the Land Development Agency (LDA) to undertake a Flood Risk Assessment (FRA) for a proposed large scale residential development at Galway Port, Galway.

The subject site is located within the existing Galway Port boundary, and in the vicinity of the River Corrib and Galway Bay. The proposed development comprises of 4 blocks with uses varying from residential to commercial (see Figure 1-22Figure 1-2).

The Planning System and Flood Risk Management (PSFRM) Guidelines categorise types of development into three vulnerability classes based on their sensitivity to flooding. As per Table 2.11 for the classification of vulnerability of different types of development in the PSFRM Guidelines, "residential properties" and "childcare facilities" are categorized as "highly vulnerable" development and as such are considered appropriate in Flood Zone C (Low probability of flooding i.e., 0.1% AEP), "commercial properties" are categorized as "less vulnerable" development and as such are considered appropriate in Flood Zone B (Medium probability of flooding i.e., 1% AEP).

The subject site is bounded to the north-east and south-east by Lough Atalia. The subject site is bounded to the west and south by existing commercial properties and port land. Access to the site will be provided via Lough Atalia Road and Dock Road.

The River Corrib is located approximately 500m west of the subject site and is therefore, a hydraulic feature of particular interest to the subject site. The River Corrib originates in its headwaters at Lough Corrib, approximately 5.5km north of the subject site before flowing in a southerly direction and eventually draining into Galway Bay which is just south of the subject site. Galway Bay's vicinity to the subject site also increases the risk of coastal flooding to the subject site.

The purpose of this Stage 2 FRA report is to identify, quantify, and communicate the risks of flooding, if any, to the proposed development.

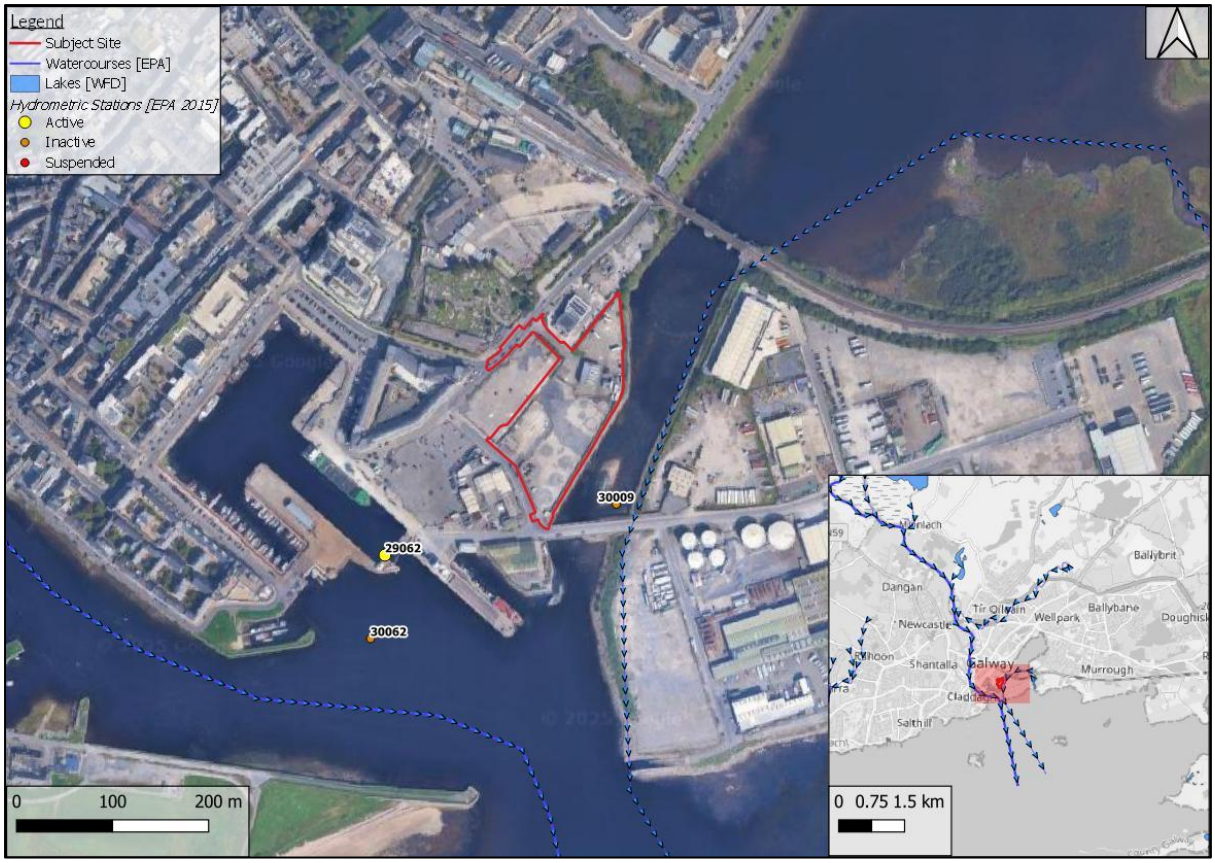


Figure 1-11: Site Location

Figure 1-22: Site Layout

# 2. FLOOD RISK MANAGEMENT GUIDANCE

This Stage 2 Flood Risk Assessment was carried out in accordance with the following flood risk management guidance documents:

- The Planning System and Flood Risk Management Guidelines for Planning Authorities
- Flood Risk Management Climate Change Sectoral Adaptation Plan
- Galway City Development Plan (2023 – 2029)
    - Galway City Strategic Flood Risk Assessment

## 2.1 THE PLANNING SYSTEM AND FLOOD RISK MANAGEMENT GUIDELINES

The Planning System and Flood Risk Management Guidelines for Planning Authorities (PSFRM Guidelines) were published in 2009 by the Office of Public Works (OPW) and Department of the Environment, Heritage, and Local Government (DoEHLG). Their aim is to ensure that flood risk is considered in development proposals and the assessment of planning applications.

### 2.1.1 Flood Zones and Vulnerability Classes

The PSFRM Guidelines discuss flood risk in terms of three flood zones (A, B, and C), which correspond to areas of high, medium, or low probability of flooding, respectively. The extents of each flood zone are based on the Annual Exceedance Probability (AEP) of various flood events.

The PSFRM Guidelines also categorise different types of development into three vulnerability classes based on their sensitivity to flooding. The guidelines classify residential properties as "highly vulnerable" and are therefore considered appropriate in Flood Zone C (less than 0.1% AEP), commercial properties as "less vulnerable" and are therefore considered appropriate in Flood Zone B (less than 1% AEP).

Table 2.11 shows a decision matrix that indicates which types of development are appropriate in each flood zone and when the Justification Test (see Section 2.1.2) must be satisfied. The annual exceedance probabilities used to define each flood zone are also provided.

**Table 2.11: Decision Matrix for Determining the Appropriateness of a Development**

| Flood Zone: (Probability) | Annual Exceedance Probability (AEP) | Highly Vulnerable | Less Vulnerable | Water Compatible |
|---|---|---|---|---|
| A (High) | Coastal Flooding: More frequent than 0.5% AEP<br>Fluvial & Pluvial Flooding: More frequent than 1% AEP | Justification Test Required | Justification Test Required | Appropriate |
| B (Medium) | Coastal Flooding: 0.1% to 0.5% AEP<br>Fluvial & Pluvial Flooding: 0.1% to 1% AEP | Justification Test Required | Appropriate | Appropriate |
| C (Low) | Fluvial, Pluvial & Coastal Flooding: Less frequent than 0.1% AEP | Appropriate | Appropriate | Appropriate |

### 2.1.2 Justification Test

Chapter 5, Box 5.1 of the Planning System Flood Risk Management Guidelines for Planning Authorities sets out that all of the following criteria must be satisfied in order to meet the development management Justification Test. Any proposed development being considered in an inappropriate flood zone (as determined by Table 2.11) must satisfy the criteria of the Justification Test outlined in Figure 2-11Figure 2-1(taken from the PSFRM Guidelines).

**Box 5.1 Justification Test for development management (to be submitted by the applicant)**

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
   - (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
   - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
   - (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
   - (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Refer to section 5.28 in relation to minor and infill developments.

Figure 2-11: Criteria of the Justification Test

## 2.2 The Flood Risk Management Climate Adaption Plan

The Flood Risk Management Climate Change Sectoral Adaptation Plan was published in 2019 under the National Adaptation Framework and Climate Action Plan. This plan outlines the OPW's approach to climate change adaptation in terms of flood risk management.

This approach is based on a current understanding of the potential impacts of climate change on flooding and flood risk. Research has shown that climate change is likely to worsen flooding through more extreme rainfall patterns, more severe river flows, and rising mean sea levels.

To account for these changes, the Adaptation Plan presents two future flood risk scenarios to consider when assessing flood risk:

- Mid-Range Future Scenario (MRFS)
- High-End Future Scenario (HEFS)

Table 2.22 indicates the allowances that should be added to estimates of extreme rainfall depths, peak flood flows, and mean sea levels for the future scenarios.

**Table 2.22: Climate Change Adaptation Allowances for Future Flood Risk Scenarios**

| Parameter | Mid-Range Future Scenario (MRFS) | High-End Future Scenario (HEFS) |
|---|---|---|
| Extreme Rainfall Depths | + 20% | + 30% |
| Peak River Flood Flows | + 20% | + 30% |
| Mean Sea Level Rise | + 0.5 m | + 1 m |

For the purpose of this flood risk assessment, the proposed development has been assessed against the Mid-Range Future Scenario as it represents a likely future scenario.

The likely future scenario is typically based on the Medium Range Future Scenario (MRFS) as outlined in the OPW's Catchment Flood Risk Assessment and Management (CFRAM) programme. This scenario incorporates:

- Moderate climate change allowances for sea level rise, rainfall intensity, and river flows.
- Projected changes over the medium term (typically to 2100), based on current climate modelling and guidance from the OPW

The MRFS is considered the most appropriate planning baseline for development control because it balances realism with precaution, aligning with national guidance and the Planning System and Flood Risk Management Guidelines (2009).

The (HEFS) represents a worst-case climate change projection, incorporating extreme assumptions about sea level rise and rainfall. While it is useful for long-term strategic planning and infrastructure resilience, it is not typically required for site-specific development assessments unless:

- The site is critical infrastructure (e.g., hospitals, emergency services).
- The site is in a highly vulnerable flood zone (e.g., Flood Zone A).
- The development is of national or regional strategic importance.

Owing to the Galway City Development Plan Flood Zone mapping (Figure 2-33) and the NCFHM mapping (Figure 3-44), only a marginal area of the site is in Flood Zone A, therefore HEFS assessment is not required

## 2.3 GALWAY CITY DEVELOPMENT PLAN (2023 – 2029)

The Current Galway City Development Plan[1] provides a strategic framework for planning and sustainable development in Galway City for 2023-2029. The Galway City Development Plan (GCDP) for 2023-2029 was adopted by the Elected Members of Galway City Council at the conclusion of the Special Meeting on 24th November 2022 and it came into effect on the 4th January 2023.

Chapter 9 of the Galway City Development Plan 2023-2029 outlines the City plan for Environment and Infrastructure. Section 9.2 of the Galway City Development Plan discusses Flood Risk Management for the City.

Flood Risk Policy 9.1 for Galway City states the following:

1. Support, in co-operation with the OPW, the implementation of EU Flood Risk Directive (2007/60/EC), the Flood Risk Regulations (SI No, 122 of 2010) and the DECLG and OPW Guidelines for Planning Authorities, the Planning System and Flood Risk Assessment Management (2009), updated/superseding legislation or departmental guidelines and have regard to the findings and relevant identified actions of the Corrib Catchment Flood Risk Management (CFRAM) Study.
2. Support and facilitate the implementation of the Coirib go Cósta Galway City Flood Relief Scheme in conjunction with the OPW to support a climate resilient city, protect against flooding and minimise the impact of future climate events. Support in general the associated mitigation and adaptation measures in order to prevent flooding and coastal erosion, subject to appropriate environmental, visual, built heritage and other relevant considerations.
3. Ensure the recommendations of the Strategic Flood Risk Assessment (SFRA) for the Galway City Development Plan 2023-2029 are taken into consideration in the assessment of developments in identified areas of flood risk and require site specific Flood Risk Assessment (FRA) and associated design and construction measures appropriate to the scale and nature of the development and the risks arising, in all areas of identified flood risk including on sites where a only small proportion of the site is at risk of flooding and adopt a sequential approach in accordance with the Planning System and Flood Risk Management Guidelines for Planning Authorities (2009).
4. Protect and promote sustainable management and uses of water bodies and watercourses from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands, and natural floodplains.
5. Ensure flood risk is incorporated into the preparation of any future local area plans, framework plans and masterplans in the city.
6. Ensure any proposed measure designed to alleviate flooding/coastal erosion is subject to Appropriate Assessment in accordance with Article 6 of the EU Habitats Directive, where appropriate.
7. Continue to protect the coastal area and the foreshore and avoid inappropriate development in areas at risk of coastal erosion and/or would cause and escalate coastal erosion in adjoining areas.

[1] https://www.galwaycity.ie/development-plan-2023-2029

8. Protect and maintain, where feasible, undeveloped riparian zones and natural floodplains along the River Corrib and its tributaries.

The Galway City Development Plan zones the subject site as "City Centre" land, as seen in Figure 2-22. It should be noted that a portion of the site is 'unzoned', but this only relates to infrastructure.

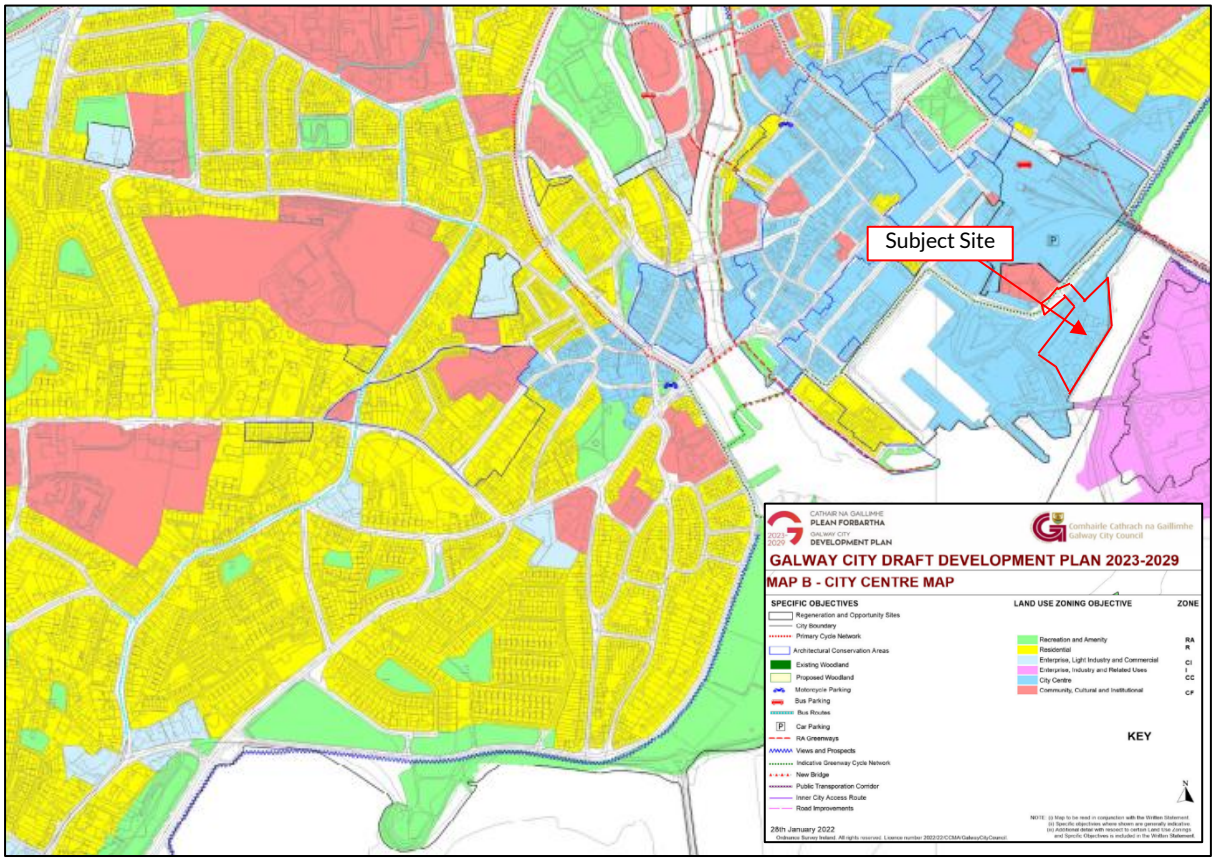


Figure 2-22: Galway City Development Plan Map B - Land Use Zoning

## 2.3.1 Galway City Strategic Flood Risk Assessment

The Galway City Development Plan 2023-2029 has been prepared in accordance with requirements of the Department of Environment Communities and Local Government (DECLG) and Office Public Works OPW Planning Guidelines, 'The Planning System and Flood Risk Management' (2009). The Strategic Flood Risk Assessment provides tools and methods to assist users in identifying the level of flood risk associated with an area to inform planning decisions.

The flood outline and flood mechanism for the subject site area in the SFRA (refer to Figure 2-33) is the same as in Western CFRAM, reviewed in the section 3.4. Based on the results of the SFRA there is no flood risk to the subject site.

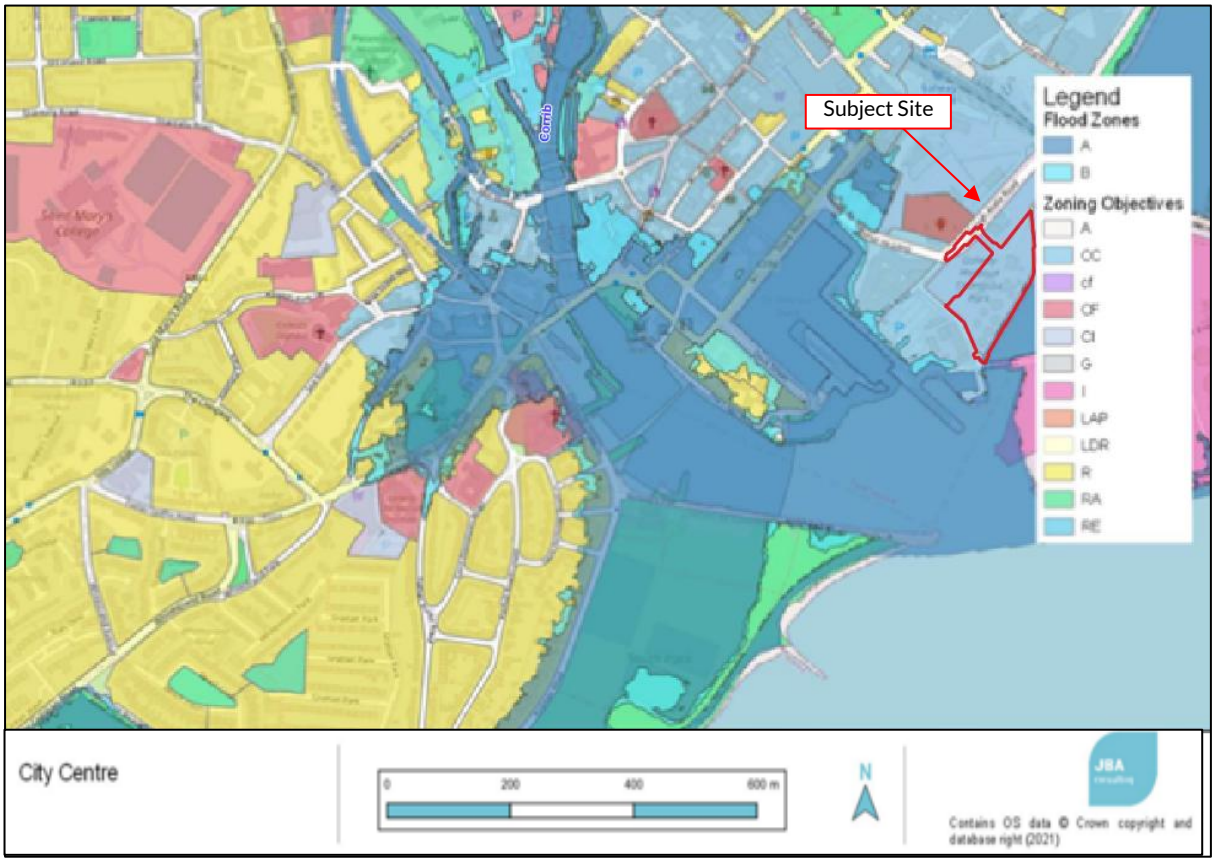


Figure 2-33: Galway City Flood Zone Mapping[2]

## 2.4 COIRIB GO CÓSTA FLOOD RELIEF SCHEME[3]

The Western Catchment Flood Risk Assessment and Management (CFRAM) study, as prepared by the Office of Public Works (OPW) in 2016, identified Galway City as an Area for Further Assessment (AFA) and concluded that a flood relief scheme would be viable and effective for the community. This project has since commenced and the City Council working with the OPW have commissioned the scheme known as the Coirib go Cósta project to address the sustainable and effective management of flood risk in the city. It is envisaged that this project, including the design, consent and construction will be completed by 2029.

The Coirib go Cósta Galway City Flood Relief Scheme commenced in November 2020. The objective of the scheme is to assess, design and deliver a viable, cost-effective, and environmentally sustainable flood relief scheme for Galway City. Coirib go Cósta, while primarily focused on addressing the sustainable and effective management of flood risk, will ensure that the design of any measures, in particular structural measures, takes cognisance of the sensitivity of the distinctive context of the city.

As per the figure below, the subject site falls within the Scheme Area.

[2] https://consult.galwaycity.ie/en/consultation/draft-galway-city-development-plan-2023-2029/chapter/draft-strategic-flood-risk-assessment-environmental-report

[3] https://www.floodinfo.ie/frs/en/galway/home/

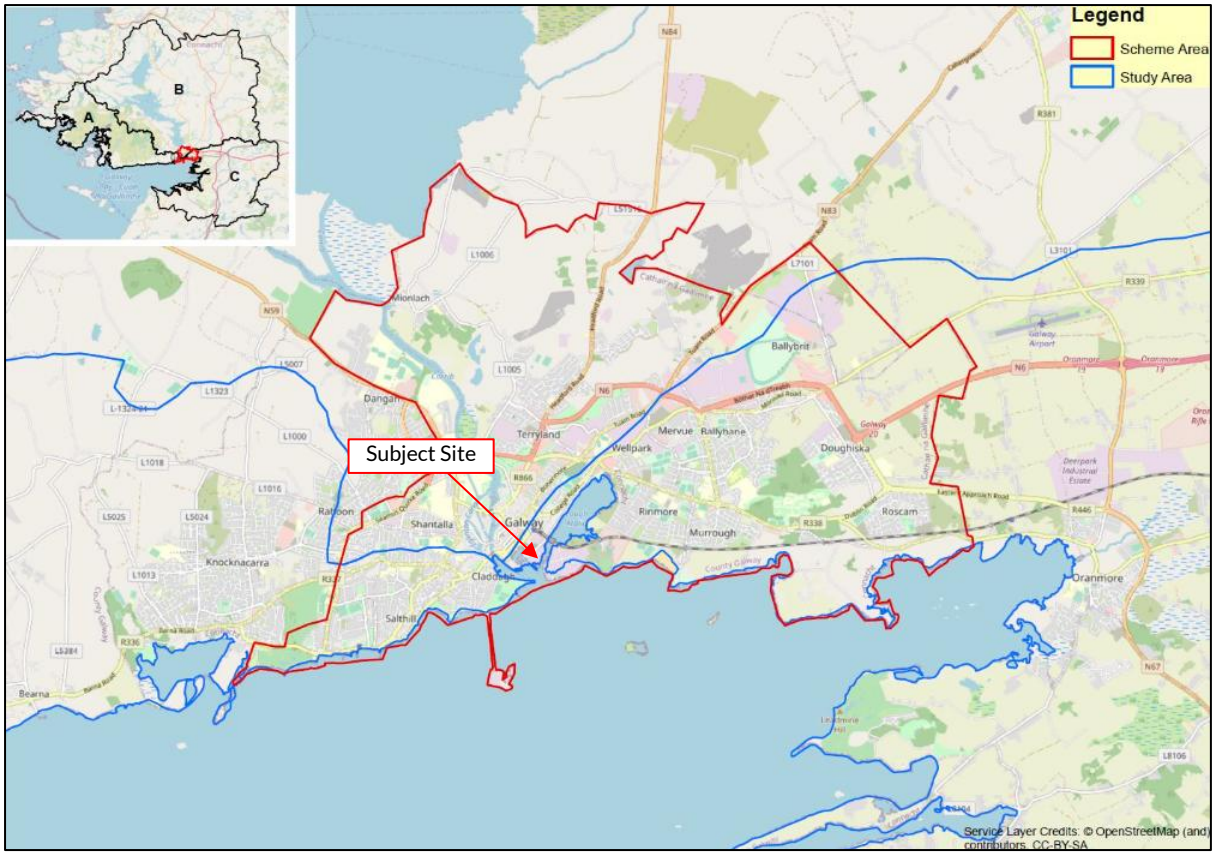


Figure 2-44: Coirib go Cósta Flood Relief Scheme Project Area (Arup, 2020)[4]

[4] https://www.floodinfo.ie/frs/en/galway/project-info/timeframe/

# 3. INITIAL FLOOD RISK ASSESSMENT

## 3.1 PAST FLOOD EVENTS

The OPW's National Flood Information Portal[5] provides past flood event mapping with records of flooding reports, meeting minutes, photos, and/or hydrometric data. Based on the flood map shown in Figure 3-11, there are several past flood events in the vicinity of the subject site. All flood events are as a result of coastal/estuarine waters. The closest recorded flood event to the subject site is approximately 300m west of the subject site, on the opposite side of the Galway Docks. Therefore, the numerous flood events are not expected to impact the subject site, and there is no recorded history of flooding at the subject site.

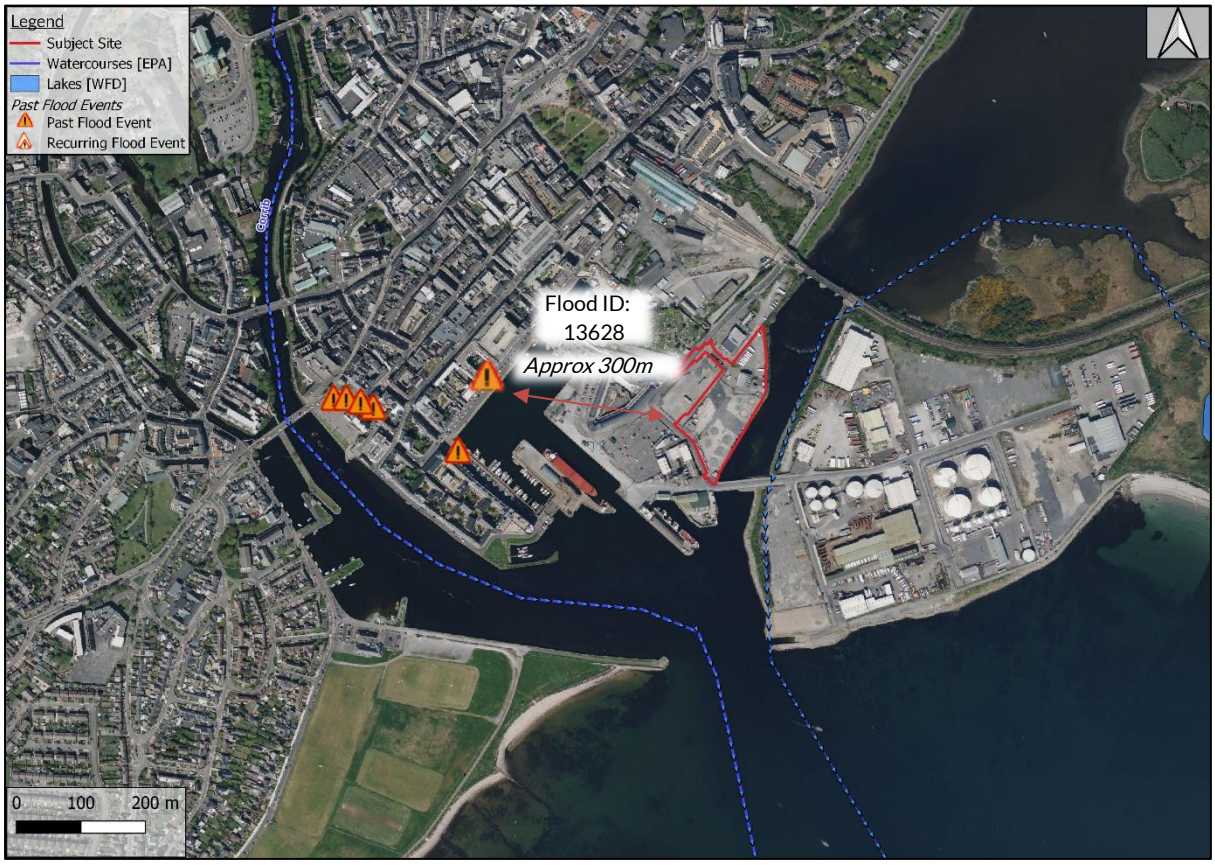


Figure 3-11: Past Flood Events

[5] floodinfo.ie

## 3.2 OPW Preliminary Flood Risk Assessment (PFRA) Study

In 2009, the OPW produced a series of maps to assist in the development of a broad-scale FRA throughout Ireland. These maps were produced from several sources.

The OPW's National Preliminary Flood Risk Assessment (PFRA) Overview Report from March 2012 noted that *"the flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location".*

Figure 3-22 provides an overview of the fluvial, coastal, pluvial, and groundwater indicative flood extents in the vicinity of the subject site.

As per Figure 3-22, the subject site is not predicted to be liable to pluvial, fluvial or groundwater flooding during extreme events.

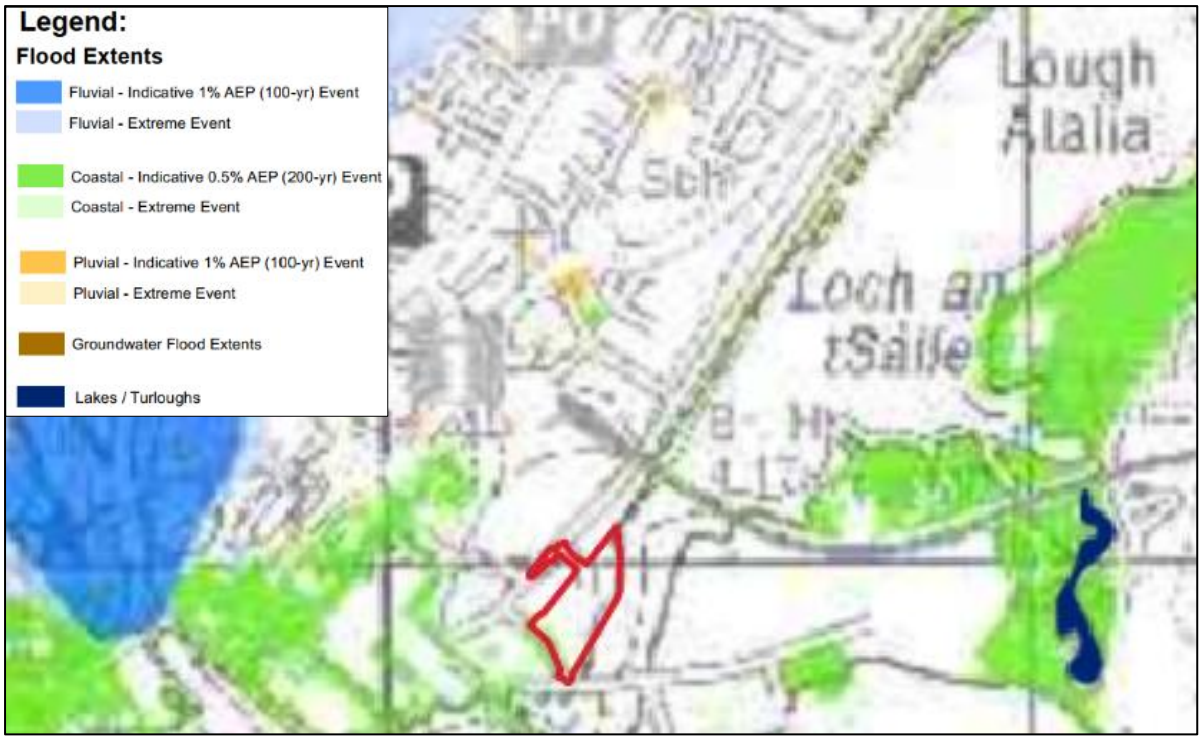


Figure 3-22: Indicative Flood Mapping [extract from PFRA Map 227]


Figure 3-33: PFRA Flood Extents

The PFRA mapping indicates no areas of fluvial flooding within the subject site. The southwestern boundary of the subject site is seen as liable to coastal flooding, as shown in Figure 3-22.

There are no fluvial, pluvial or groundwater flood extents within the subject site.

Limitations on potential sources of error associated with the PFRA maps include:

- Assumed channel capacity (due to absence of channel survey information)
- Absence of flood defences and other drainage improvements and channel structures (bridges, weirs, culverts)
- Local errors in the national Digital Terrain Model (DTM)

Improved hydraulic modelling was carried out through the Catchment Flood Risk Assessment and Management Study (CFRAM) in 2015 (discussed in Section 3.4) and is considered more accurate than the PFRA study as it utilised surveyed river geometry and was subject to greater model calibration.

## 3.3 National Coastal Flood Hazard Mapping (NCFHM)

The National Coastal Flood Hazard Mapping (NCFHM) was completed in 2021. The aim of the project is to produce updated national scale coastal flood extent and depth maps for the 50%, 20%, 10%, 5%, 2%, 1%, 0.5% and 0.1% Annual Exceedance Probabilities (AEPs) for the present day scenario and for the Mid-Range Future Scenario (MRFS), High End Future Scenario (HEFS), High+ End Future Scenario (H+EFS) and High++ End Future Scenario (H++EFS) which represent a 0.5m, 1.0m, 1.5m and 2.0m increase in sea level respectively. The mapping is based on the extreme levels calculated in the Irish Coastal Wave and Water Level Modelling Study (ICWWS).

The Irish Coastal Wave and Water Level Modelling Study (ICWWS) was undertaken in 2018. The study provides an update to the Extreme Coastal Water Levels for the coastal of Ireland. The study provides an update to the water levels presented in the Irish Coastal Protection Strategy Study (ICPSS) undertaken between 2004 and 2013.[6]

Table 3-11 below outlines the extreme water levels at node W6 which is the closest ICWWS node to the subject site. The node is approximately 1.3km southeast of the subject site.

**Table 3-11: ICWWS Modelled Extreme Water Levels**

| Return Period | Existing Scenario Water Level (mOD) | Mid-Range Future Scenario (MRFS) Water Level (mOD) |
|---|---|---|
| 1 in 100-Year (1% AEP) Event | 3.9 | 4.4 |
| 1 in 200-Year (0.5% AEP) Event | 4.01 | 4.51 |
| 1 in 1,000-Year (0.1% AEP) Event | 4.26 | 4.76 |

The NCFHM current flood extents are shown in Figure 3-44 below. The mapping shows that approximately 25% of the subject site is inundated in a 1 in 1000-year (0.1% AEP) event, with a small area liable to coastal flooding in a 1 in 200-year (0.5% AEP) event. The southwestern portion of the subject site is the area which is at risk of coastal flooding. The water levels in a 1 in 200- and 1 in 1000-year (0.5% and 0.1% AEP) current event are 4.01mOD and 4.26mOD respectively.

Based on this, 75% of the subject site is located in Flood Zone C (flooding less frequent than the 1 in 1000-year event), approximately 20% of the site is located in Flood Zone B (between 1 in 200-year and 1 in 1000-year event) and approximately 5% of the site is located in flood Zone A (More frequent than the 1 in 200-year event)

[6]Irish Coastal Wave and Water Level Modelling Study(ICWWS)
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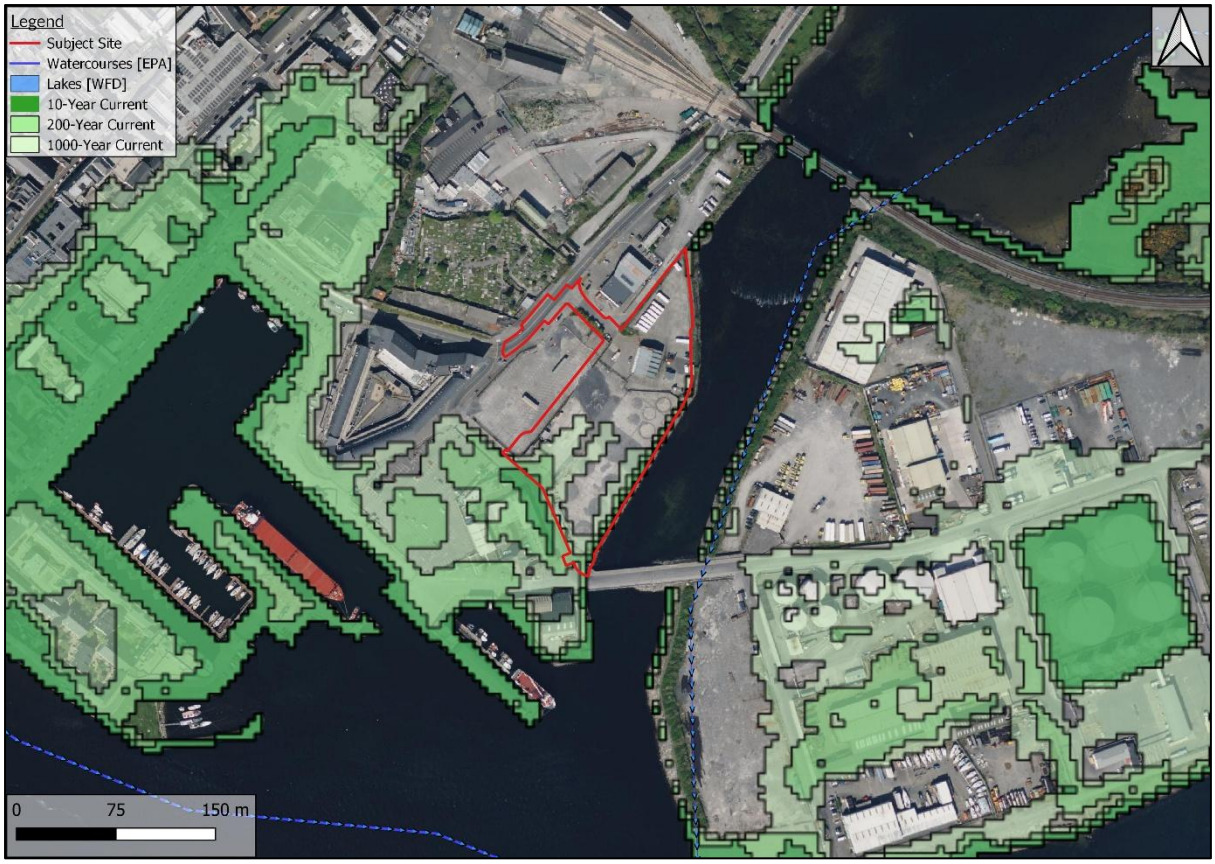



Figure 3-44: NCFHM Current day flood extents

The NCFHM mid-range future scenario (MRFS) flood extents are shown in Figure 3-55 below. The mapping shows that approximately half of the subject site is inundated in a 1 in 200-year (0.5% AEP) event, with approximately 60% of the subject site inundated in a 1 in 1000-year (0.1% AEP) event. Again, the southwestern portion of the subject site is the area which is at risk of coastal flooding. There are two small areas of the subject site which are liable to flooding in the 1 in 10-year (10% AEP) event; along the southeastern and southwestern borders. The water levels in a 1 in 200- and 1 in 1000-year (0.5% and 0.1% AEP) MRFS event are 4.51mOD and 4.76mOD respectively.


Figure 3-55: NCFHM MRFS flood extents

## 3.4 CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

In 2015, the OPW produced flood maps as part of the Catchment Flood Risk Assessment and Management (CFRAM) Study. The flood extents in these maps are based on detailed modelling of Areas for Further Assessment identified by the National Preliminary Flood Risk Assessment.[7].

### 3.4.1 Fluvial Flood Risk (CFRAM)

The River Corrib which is in the vicinity of the subject site is modelled as part of the CFRAM study. CFRAM mapping of the existing 1 in 100-year (1% AEP) and 1 in 1000-year (0.1% AEP) predicted fluvial flood extents, is presented in Figure 3-66. The predicted flood mapping produced as part of the CFRAM Study indicates that the subject site is not liable to fluvial flooding during a 1 in 1000-year (0.1% AEP) event.

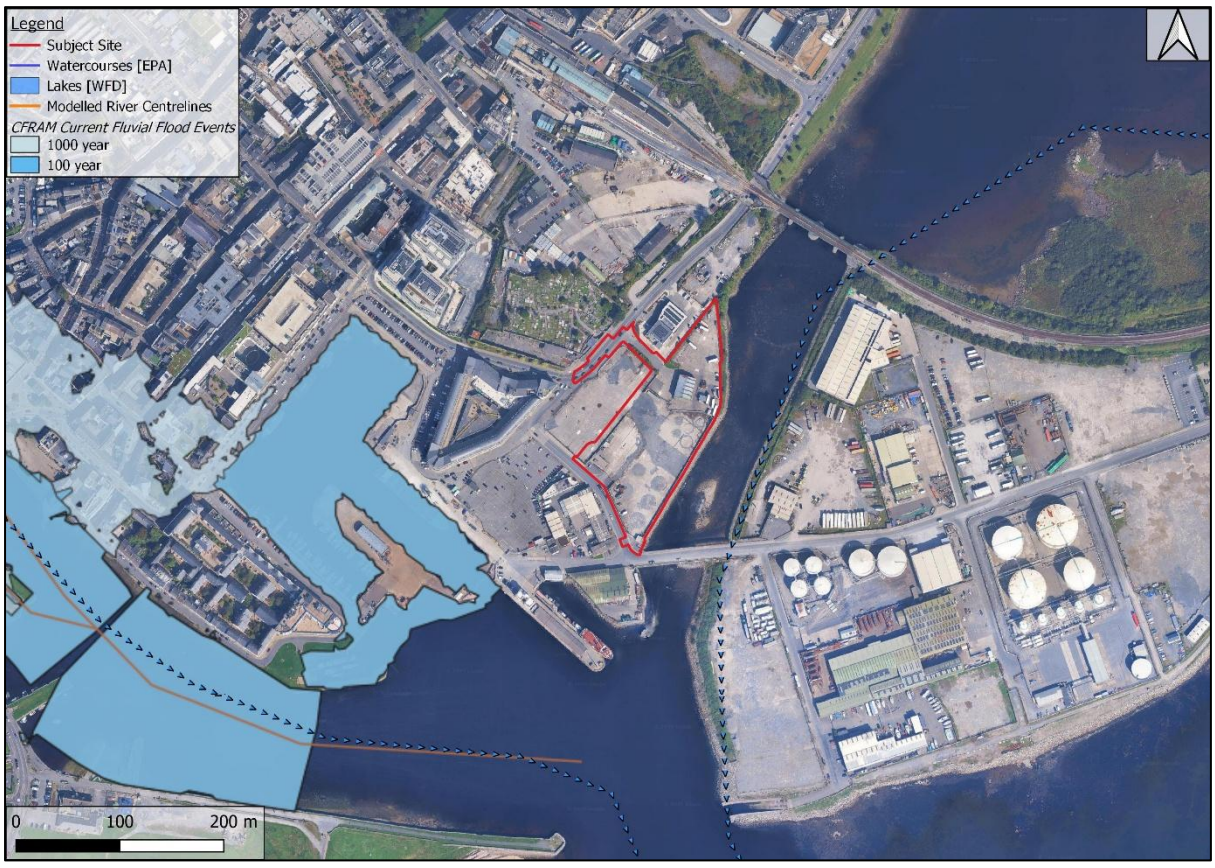



Figure 3-66: CFRAM Existing Fluvial Flood Extents

Figure 3-77 indicates the MRFS fluvial flood extents produced as part of the CFRAM Study during the 1 in 100-year (1% AEP) and 1 in 1000-year (0.1% AEP) flood event. Again, the subject site is not indicated as liable to flooding in a 1 in 1000-year (0.1% AEP) MRFS event.

[7] https://www.floodinfo.ie/about_frm/

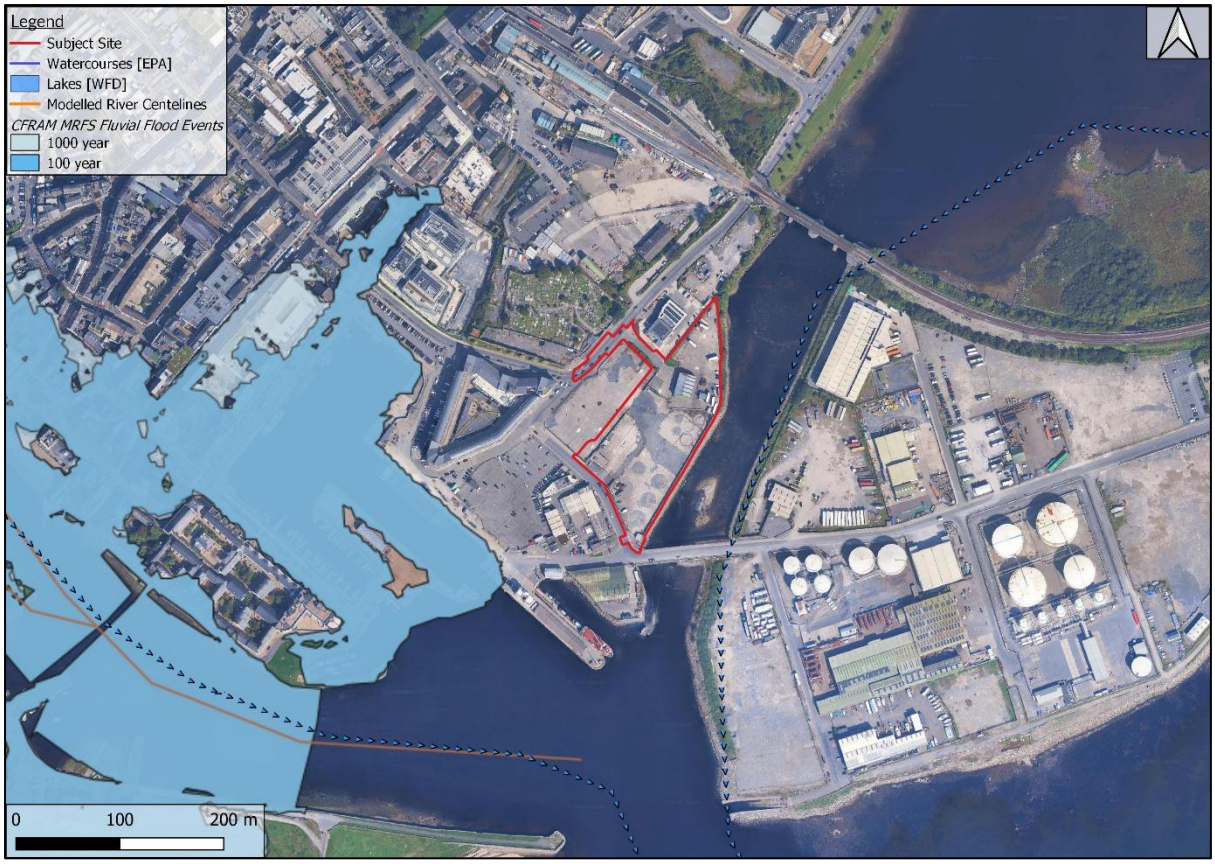



Figure 3-77: CFRAM MRFS Fluvial Flood Extents

### 3.4.2 Coastal flood Risk (CFRAM)

The subject site's coastal location, with its proximity to Galway Bay and the River Corrib which is estuarine in nature, suggests a heightened risk of coastal flooding.

Tidal flood mapping has been prepared for Galway City through the CFRAM study and indicates that in a current scenario the subject site is not at risk of coastal flooding in a 1 in 1000-year (0.1% AEP) event. The current scenario coastal flood extents are seen in Figure 3-88 below.

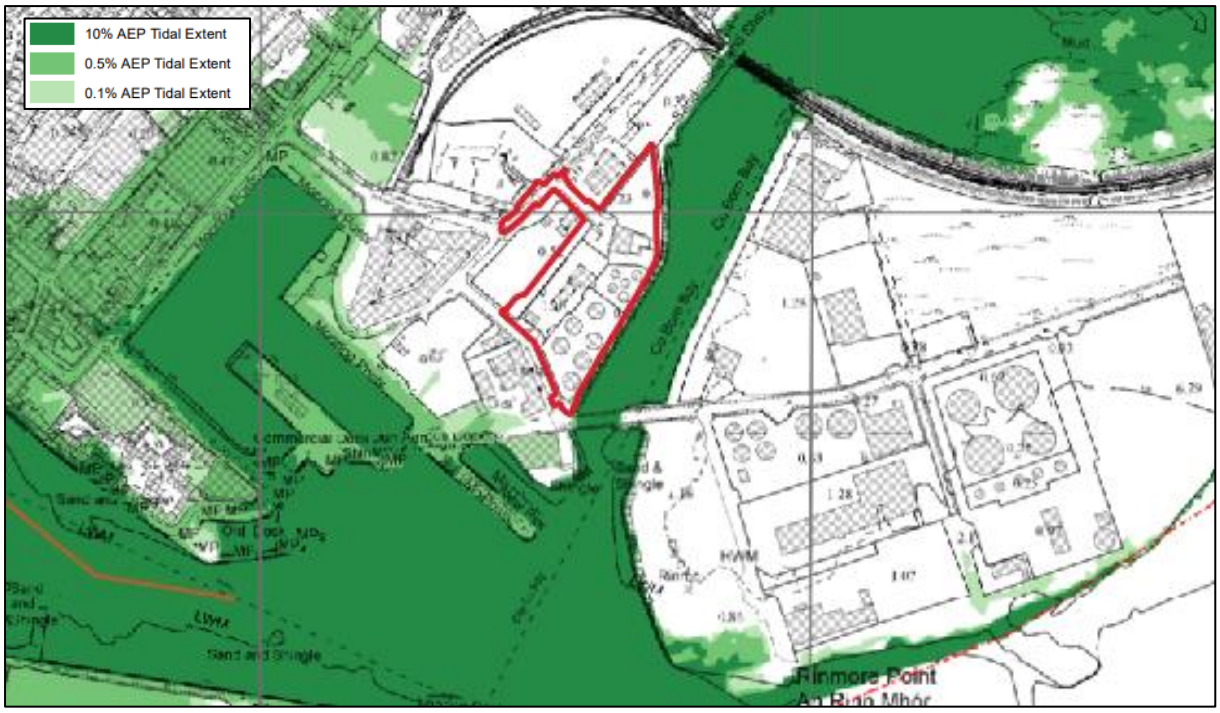



Figure 3-88: CFRAM Existing Coastal flood extents

Modelled CFRAM Coastal flood extents taking into account for climate change (MRFS Scenario) are seen in Figure 3-99. The mapping shows that the subject site is approximately 10% inundated in a 1 in 200-year (1% AEP) MRFS event at the southwestern corner and approximately 50% inundated in a 1 in 1000-year (0.1% AEP) MRFS event.


Figure 3-99: CFRAM MRFS Coastal flood extents

## 3.5 OPW Drainage Districts and Arterial Drainage Schemes

The OPW Drainage Districts were carried out by the commissioners of Public Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding.[8] The local authorities are charged with the responsibility to maintain Drainage Districts.

Benefited lands are areas that were previously subject to poor drainage and/or flooding but that have benefited from the implementation of Arterial Drainage Schemes carried out under the Arterial Drainage Act 1945.

The subject site has not benefited from any arterial drainage scheme and is not located in a Drainage District.

[8] www.floodinfo.ie

## 3.6 GEOLOGICAL SURVEY IRELAND MAPPING

Based on a review of the OPW's Preliminary Flood Risk Assessment (PFRA) mapping (see Figure 3-22) there is no noted risk of groundwater flooding to the subject site.

GSI Groundwater Flooding Probability Maps[9] for the subject site were reviewed. There are no historic groundwater flood extents noted in the vicinity of the subject site.


Figure 3-1010: GSI Mapping of Groundwater Flooding

The closest surface water flooding is approximately 675m east of the subject site, assumed to be as a result of flooding from an existing lake and is not expected to have any effect on the sites hydrology.

Geological Survey Ireland (GSI) subsurface mapping of karst features[10] in the area show that there are no karst features located in the vicinity of the subject site (see Figure 3-1111). The closest karst feature to the subject site is a swallow hole located 2.6km northeast of the site.

[9]FloodInfo.ie | National Flood Information Portal, Available at: https://www.floodinfo.ie/map/floodmaps/

[10]GSI Groundwater Data Viewer, Available at: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef

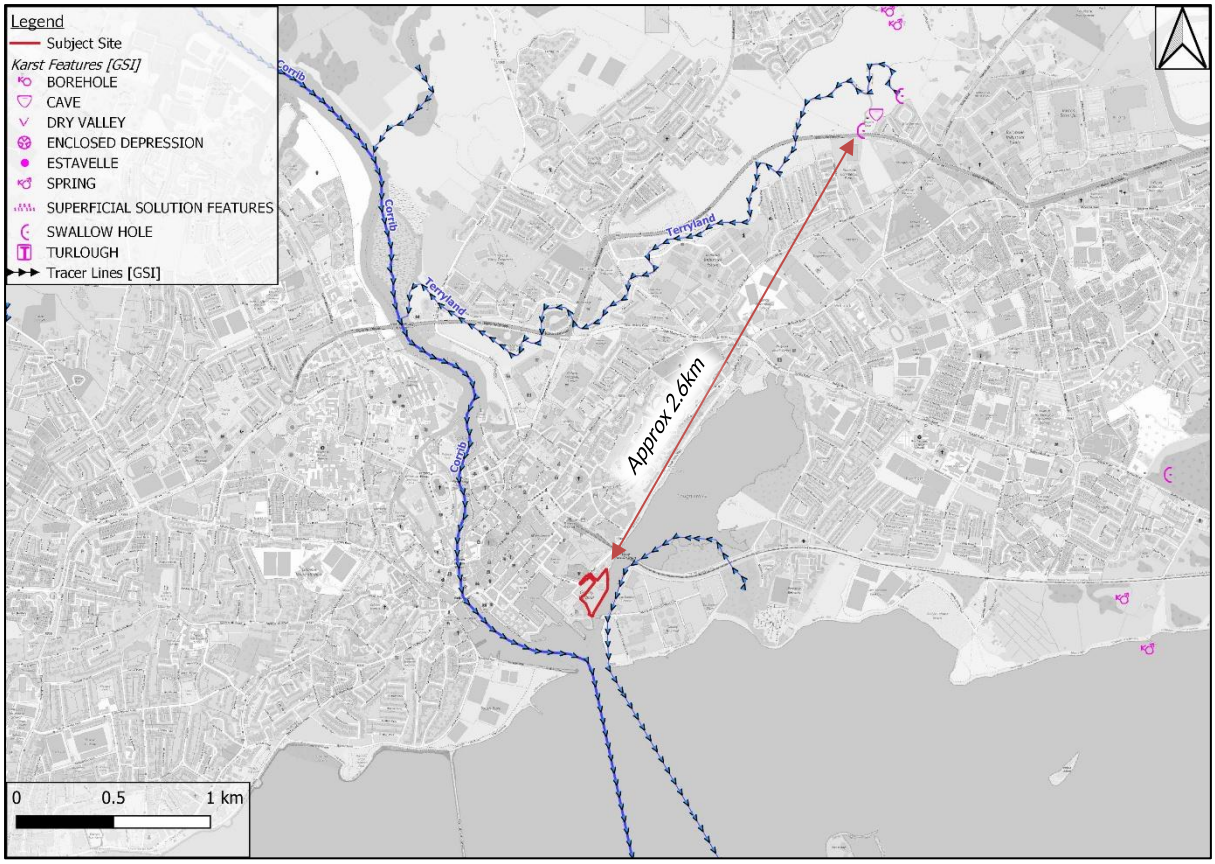



Figure 3-1111: GSI Mapping of Karst Features

# 4. DETAILED FLOOD RISK ASSESMENT

With reference to the PSFRM guidelines, the proposed development is comprised of "highly vulnerable" (residential properties), and "less vulnerable" (commercial properties).

Therefore, residential properties area considered appropriate in Flood Zone C (Low probability of flooding i.e., 0.1% AEP), while commercial properties are considered appropriate in Flood Zone B (Medium probability of flooding i.e., 1% AEP)

## 4.1 FLUVIAL FLOODING

The hydraulic feature of consideration to the subject site is the river Corrib. PFRA and CFRAM mapping indicate that the subject site is not liable to fluvial flooding in a 1 in 100-year (1% AEP) or 1 in 1000-year (0.1% AEP) event. The CFRAM study also provides mapping which takes into account climate change and again the subject site is not seen as liable to fluvial flooding in a 1 in 1000-year (0.1% AEP) event. The closest 1 in 1000-year (0.1% AEP) fluvial flood extents are approximately 120m southwest of the subject site.

Therefore, it is estimated that the risk of fluvial flooding to the subject site is minimal.

## 4.2 COASTAL FLOODING

The subject site's coastal location, with its proximity to Galway Bay and the River Corrib, which is estuarine in nature, suggests a heightened risk of coastal flooding.

NCFHM and CFRAM mapping were available for the subject site, and both indicated that the subject site is liable to coastal flooding. The NCFHM uses the ICWWS water levels, whereas the CFRAM uses the ICPSS coastal water levels, which has since been superseded by the ICWWS.

CFRAM mapping indicates no flooding in a current scenario. MRFS mapping shows that the subject site is approximately 10% inundated in a 1 in 200-year (1% AEP) event and approximately 50% inundated in a 1 in 1000-year (0.1% AEP) MRFS.

The NCFHM mapping indicates that in a current scenario approximately 25% of the subject site is inundated in a 1 in 1000-year (0.1% AEP) event, with a small area liable to coastal flooding in a 1 in 200-year (0.5% AEP) event. The area prone to flooding is the southwestern portion of the subject site. In the MRFS approximately half of the subject site is inundated in a 1 in 200-year (0.5% AEP) event, with approximately 60% of the subject site inundated in a 1 in 1000-year (0.1% AEP) event. Again, the southwestern portion of the subject site is the area which is at risk of coastal flooding. There are two small areas of the subject site which are liable to flooding in the 1 in 10-year (10% AEP) event; along the southeastern and southwestern borders. The ICWWS water levels in a 1 in 200- and 1 in 1000-year (0.5% and 0.1% AEP) MRFS event area 4.51mOD and 4.76mOD respectively.

Based on the NCFHM study, which supersedes the CFRAM, 75% of the subject site is located in Flood Zone C (flooding less frequent than the 1 in 1000-year event), approximately 20% of the site is located in Flood Zone B (between 1 in 200-year and 1 in 1000-year event) and approximately 5% of the site is located in flood Zone A (More frequent than the 1 in 200-year event)

In order to defend the subject site against a 1 in 1000-year (0.1% AEP) MRFS flood event, which is required for residential developments, the Finished Floor Level (FFL) at the subject site is required to be at minimum 5.05mOD to account for climate change and a freeboard of 300mm.

Therefore, it is estimated that risk of coastal flooding associated with the proposed development is minimal, provided that the recommended minimum FFL is adhered to.

## 4.3 PLUVIAL FLOODING

The PFRA indicative mapping indicates that there are no areas of pluvial flooding within the subject site.

Surface water arising on the proposed mixed-use development will be managed by a dedicated stormwater drainage system in accordance with Sustainable Drainage Systems (SuDS) principles, limiting discharge from the site to greenfield runoff rates.

The proposed stormwater drainage system has been designed to cater for all surface water runoff from hard surfaces within the development including roadways, roofs etc. All surface water generated onsite will pass through oil/petrol interceptors designed to separate hydrocarbons from water before discharging to one of 2 no. proposed attenuation units. Ultimate disposal is to outfall in the public storm culvert adjacent the bridge to the south of the site, which in turn discharges into the Galway Bay at the mouth of Lough Atalia.

The landscaping and topography of the developed site will provide safe exceedance flow paths and prevent surface water ponding to minimise residual risks associated with an extreme flood event or a scenario where the stormwater drainage system becomes blocked.

Therefore, it is estimated that risk of pluvial flooding associated with the proposed development is minimal.

## 4.4 GROUNDWATER FLOODING

Based on a review of Geological Survey Ireland (GSI) subsurface mapping of karst features (Figure 3-1111), predicted groundwater flooding in the area (Figure 3-1010), and the PFRA study (Figure 3-22), there is no evidence to suggest liability to groundwater flooding at the proposed development site.

## 4.5 THE JUSTIFICATION TEST

With reference to the PSFRM guidelines, residential properties are classified as "highly vulnerable" in terms of sensitivity to flooding (see Section 2.1.1)

| | Requirement | Response |
|---|---|---|
| 1. | The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these guidelines | The Subject site is zoned city centre, and it is expected that the proposed development will be beneficial to Galway City. |
| 2. | The proposal has been subject to an appropriate flood risk assessment that demonstrates: | The site has been subject to this detailed FRA, which demonstrates: |

| | Requirement | Response |
|---|---|---|
| (i) | The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk | As the flood risks are coastal, mitigation through land raising will have no impact on neighbouring development, so compensatory storage will not be required |
| (ii) | The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible | It is predicted that the proposed development will not impede flow of surface water during extreme flood events. The layout of the development will minimise the flood risk to people, property, the economy, and the environment. Key design features include:<br>**Elevated Finished Floor Levels (FFLs)**: All buildings will have a minimum FFL of 5.05mOD, which includes a 300mm freeboard above the 1 in 1000-year (0.1% AEP) MRFS tidal flood level<br>**Safe Access and Egress:** The designated access/egress point is via the road to the northwest of the site, which lies outside all mapped flood extents under both current and MRFS scenarios. This ensures uninterrupted access during flood events.<br>**Surface Water Management:** The development incorporates permeable surfaces and drainage infrastructure designed to manage runoff and prevent localised flooding.<br>As the flood risk is tidal in nature, it can be forecasted with high reliability. A tidal gauge located just upstream at Wolfe Tone Bridge provides real-time data to support early warning and response measures. |
| (iii) | The development proposed includes measures to ensure that residual risks to the area and/or the development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management provisions for emergency services access | Residual risks to the subject site and to the proposed development during an extreme flood event are managed to an acceptable level by raising the minimum floor level at the site to 5.05mOD, which accounts for the 1 in 1000-year (0.1% AEP) MRFS event with an additional freeboard of 300mm. An appropriate stormwater drainage system and effective landscaping and topography of the developed site will provide safe exceedance flow paths and prevent surface water ponding to minimise residual risks associated with an extreme flood event or a scenario where the stormwater drainage system becomes blocked.<br>The proposed stormwater drainage system has been designed to cater for all surface water runoff from hard surfaces within the development including roadways, roofs etc. All surface water generated onsite will pass through oil/petrol interceptors designed to separate hydrocarbons from water before discharging to one of 2 no. proposed attenuation units. Ultimate disposal is |

| | Requirement | Response |
|---|---|---|
| | | to outfall in the public storm culvert adjacent the bridge to the south of the site, which in turn discharges into the Galway Bay at the mouth of Lough Atalia. |
| (iv) | The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to the development of good urban design and vibrant active streetscapes | The proposed development is compatible with the wider planning objectives of the area, which promotes sustainable growth and development. |

The proposed development therefore, satisfies the PSFRM criteria for the Justification test.

# 5. CONCLUSIONS

TOBIN was appointed on behalf of the Land Development Agency (LDA) to carry out a Stage 2 FRA for the proposed construction of commercial and retail properties on their lands at Galway Port, Co. Galway

With reference to the PSFRM guidelines, the proposed development is comprised of "highly vulnerable" (residential properties and childcare facilities) and "less vulnerable" (commercial properties).

Fluvial Flooding

The river Corrib, which is located approximately 500m west of the subject site was studied as part of the Western CFRAM Study. The mapping shows that in a 1 in 1000-year (0.1% AEP) MRFS event, the fluvial flood extents are at minimum 120m southwest of the subject site.

Therefore, the risk of fluvial flooding to the subject site is minimal.

Coastal Flooding

Based on the NCFHM study, which supersedes the CFRAM, 75% of the subject site is located in Flood Zone C (flooding less frequent than the 1 in 1000-year event), approximately 20% of the site is located in Flood Zone B (between 1 in 200-year and 1 in 1000-year event) and approximately 5% of the site is located in Flood Zone A (More frequent than the 1 in 200-year event)

In order to defend the subject site against a 1 in 1000-year (0.1% AEP) MRFS flood event, which is required for critical infrastructure, the FFL at the subject site is required to be at minimum 5.05mOD to account for climate change and a freeboard of 300mm.

Therefore, it is estimated that risk of coastal flooding associated with the proposed development is minimal.

Pluvial Flooding

The PFRA indicative mapping indicates that there are no areas of pluvial flooding within the subject site.

Surface water arising on the proposed mixed-use development will be managed by a dedicated stormwater drainage system in accordance with Sustainable Drainage Systems (SuDS) principles, limiting discharge from the site to greenfield runoff rates.

The proposed stormwater drainage system has been designed to cater for all surface water runoff from hard surfaces within the development including roadways, roofs etc. All surface water generated onsite will pass through oil/petrol interceptors designed to separate hydrocarbons from water before discharging to one of 2 no. proposed attenuation units. Ultimate disposal is to outfall in the public storm culvert adjacent the bridge to the south of the site, which in turn discharges into the Galway Bay at the mouth of Lough Atalia.

The landscaping and topography of the developed site will provide safe exceedance flow paths and prevent surface water ponding to minimise residual risks associated with an extreme flood event or a scenario where the stormwater drainage system becomes blocked.

Therefore, it is estimated that risk of pluvial flooding associated with the proposed development is minimal.

Groundwater Flooding

There is no evidence to suggest groundwater as a potential source of flood risk to the proposed subject site.

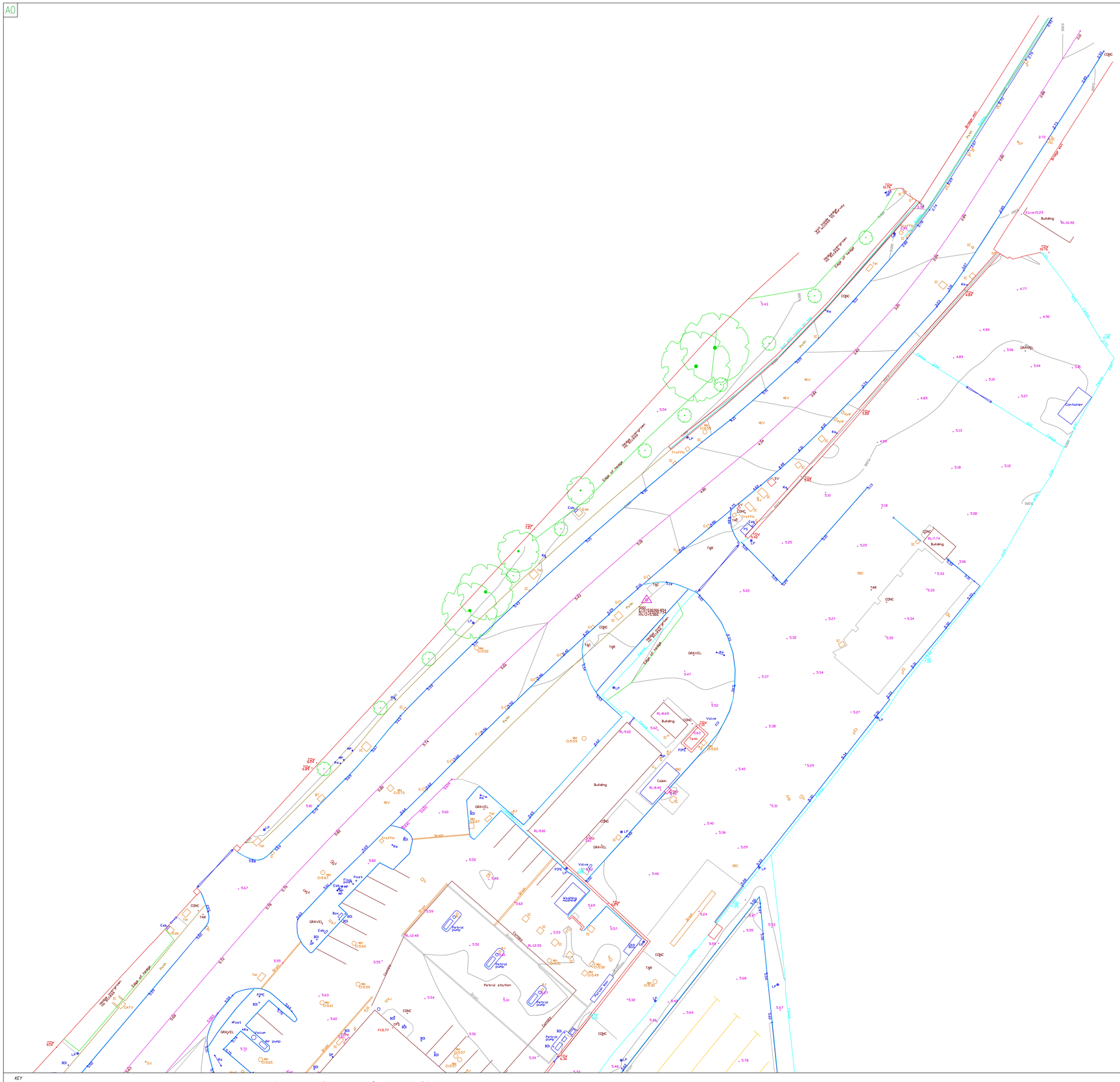
Justification Test

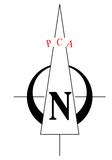
The proposed development was subject to the Justification Test as the southwestern corner of the subject site was shown as flooding in the 1 in 1000-year coastal flood event by the NCFHM Study, with an even smaller area liable to flooding in the 1 in 200-year event, and as such was partially located in Flood Zone B and A respectively. The proposed development satisfied all criteria of the Justification Test in Section 4.5.

Based on the results of this flood risk assessment, it is estimated that the risk of flooding to the proposed development will be minimal, and that the development will not increase the risk of flooding elsewhere. There is an evident coastal risk at the southwestern portion of the subject site. We propose to mitigate the flood risk to "Highly vulnerable" infrastructure by raising the minimum FFL to 5.05mOD, this allows for a 300mm freeboard above the 1 in 1000-year (0.1% AEP) MRFS event. Additionally, the proposed stormwater drainage system, as discussed, is capable of managing all surface water on the development. The designated access and egress route, located to the northwest of the site, lies outside all mapped flood extents under both current and MRFS scenarios, ensuring safe evacuation during the highly unlikely event of a flood. Furthermore, the tidal nature of the flood risk allows for reliable forecasting, supported by a tidal gauge located just upstream at Wolfe Tone Bridge.

# Appendix A TOPOGRAPHIC SURVEY

A0




Sheet 1

KEY

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fence | Hedge | Rd | Rail | Road marking solid | Inspection chamber | Gas valve | Electricity pole | Marker | Service marker | Ridge | Building ridge height |
| Road | Wall | Track | Gate | Road marking dashed | Orcon | Armstrong junction | Telegraph pole | Stay | Pole stay | Level | Building eave height |
| Path | Surface | Steps | Top of kerb | Road marking dashed | Gully | Cable | Road sign | Bol | Circular bollard | | Station |
| Btm of kerb | Furniture | Ditch | Btm of kerb | Road marking solid | Hydrant | Circular manhole | Lamp post | Sq | Square bollard | | |
| Building | Top of bank | Water edge | Road marking solid | Armco | Stop valve | Square manhole | Traffic light | | | | |

0 1m 5m 10m 20m

Notes :
- This Survey was produced for original clients specification at time of instruction.
- If the survey is to be used by any other parties, or for purposes other than those originally considered, further details or higher accuracies may be required - Please contact PCA
- PCA take no responsibility for additions made by third parties to survey.
- Accuracy and amount of detail is based on scale of mapping.
- Drainage pipe sizes (where shown) have been gauged from the surface for safety reasons and should be regarded the surface for safety reasons and should be regarded as approximate only.

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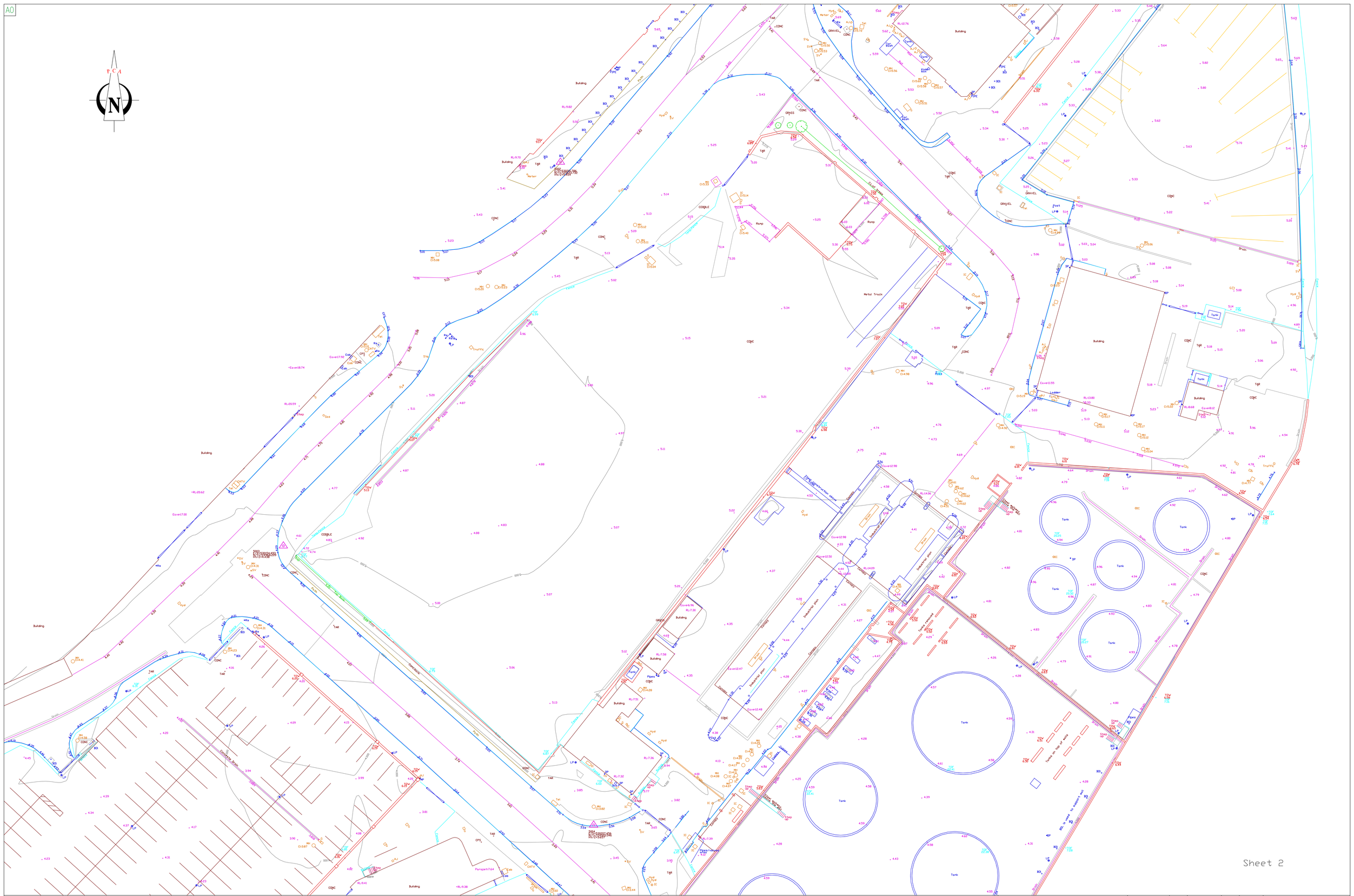
| | | | |
|---|---|---|---|
| Grid | ITM | Job No. | 17DMOOU |
| Levels | Malin Head | Date | 20/06/2017 |
| Scale | 1:200@A0 | Drawn | KJ |
| Revision | 0 [none] | Checked | RS |

# GALWAY HARBOUR THE DOCKS

SITE SURVEY

A0



Sheet 2

KEY

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fence | Hedge | Btm of bank | Rail | Road marking solid | Ic Inspection chamber | Gas Gas valve | Ep Electricity pole | Marker Service marker | Ridge Building ridge height |
| Road | Wall | Track | Gate | Road marking dashed | Tel Eircom | Aj Armstrong junction | Tp Telegraph pole | Stay Pole stay | Eave Building eave height |
| Path | Surface | Steps | Top of kerb | Road marking dashed | G Gully | Catv Cable | Rs Road sign | Bol Circular bollard | Station |
| Btm of kerb | Furniture | Ditch | Btm of kerb | Armco | Hyd Hydrant | Mh Cl Circular manhole | Lp Lamp post | Bol Square bollard | |
| Building | Top of bank | Water edge | Road marking solid | | Sv Stop valve | Mh Cl Square manhole | Tl Traffic light | | |

0 1m 5m 10m 20m

Notes :
- ✱ This Survey was produced for original clients specification at time of instruction.
- ✱ If the survey is to be used by any other parties, or for purposes other than those originally considered, further details or higher accuracies may be required - Please contact PCA
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- ✱ Accuracy and amount of detail is based on scale of mapping.
- ✱ Drainage pipe sizes (where shown) have been gauged from the surface for safety reasons and should be regarded the surface for safety reasons and should be regarded as approximate only.

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| | | | |
|---|---|---|---|
| Grid | ITM | Job No. | 170530VJ |
| Levels | Malin Head | Date | 20/06/2017 |
| Scale | 1:200@A0 | Drawn | VJ |
| Revision | Original | Checked | AH |

# GALWAY HARBOUR
# THE DOCKS

SITE SURVEY

A0

# GALWAY HARBOUR
# THE DOCKS

## SITE SURVEY

Sheet 3

KEY

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fence | Hedge | Bttm of bank | Rail | Road marking solid | Inspection chamber | Gas valve | Electricity pole | Service marker | Building ridge height |
| Road | Wall | Track | Gate | Road marking dashed | Orcon | Armstrong junction | Telegraph pole | Stay Pole stay | Eave Building eave height |
| Path | Surface | Steps | Top of kerb | Road marking dashed | Gully | Cable | Road sign | Circular bollard | Station |
| Bttm of kerb | Furniture | Ditch | Bttm of kerb | Arnco | Hydrant | Circular manhole | Lamp post | Square bollard |
| Building | Top of bank | Water edge | Road marking solid | | Stop valve | Square manhole | Traffic light | |

0 1m 5m 10m 20m

Notes -
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| | | | |
|---|---|---|---|
| Grid | ITM | Job No. | 17095CW |
| Levels | Malin Head | Date | 20/06/2017 |
| Scale | 1:200@A0 | Drawn | MJ |
| Revision | Original | Checked | RR |

# Appendix B SITE LAYOUT


THE INFORMATION ON THIS DRAWING IS TO THE TAILTE ÉIREANN - SURVEYING ITM COORDINATE SYSTEM

**Legend**

Site Boundary

NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE.
3. ENGINEER/EMPLOYERS REPRESENTATIVE, AS APPROPRIATE, TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES.
4. THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES.
5. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| P04 | 15.09.2025 | Minor Revisions | JC | RB |
| P03 | 27.08.2025 | Revised Site Layout | EC | RB |
| P02 | 01.08.2025 | Minor Revisions | EC | RB |
| P01 | 04.07.2025 | Issued to Planning | DT | RB |

Client:
Land Development Agency

Project:
Galway Port LRD
Mixed Use Development

Title:
Site Location Map

Scale @ A1: 1:2500 / @ A3 1:5000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| DT | RB | July 2025 |

Drawing Status: Planning

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Drawing No.: 11910-2000

Revision: P04