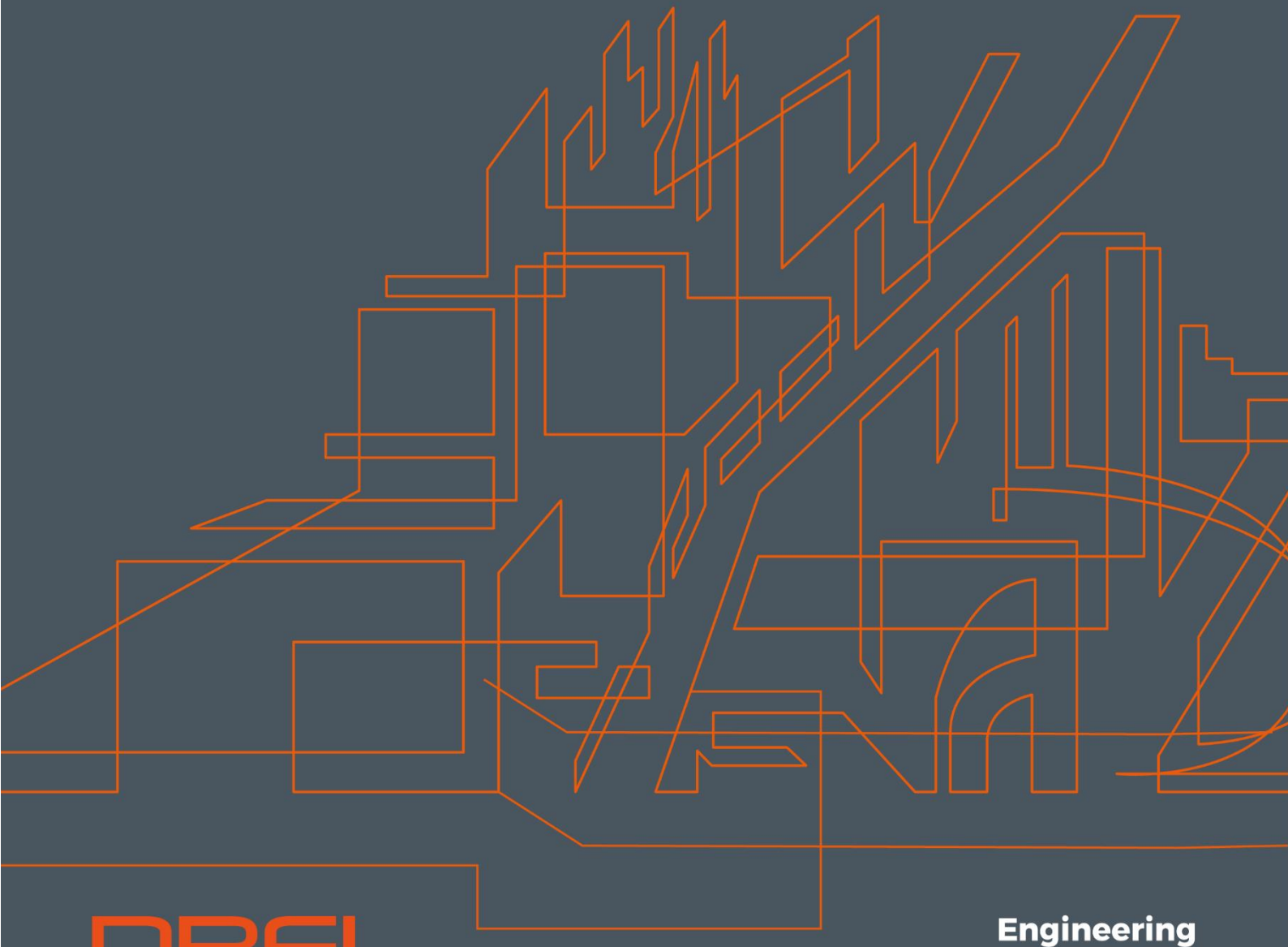
The Former Ford Distribution Site

Site Specific Flood Risk Assessment

240002-X-X-X-XXX-RP-DBFL-CE-0002

November 2024



DBFL CONSULTING ENGINEERS

Engineering Sustainable Futures

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1 Introduction

1.1 Background

DBFL Consulting Engineers were appointed to undertake a "Site Specific Flood Risk Assessment" (SSFRA) in accordance with "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" (FRM Guidelines), for a planning application for the proposed residential development at Centre Park Road in the South Docklands of Cork City.

1.2 Objectives

The objectives of this report are to inform the Planning Authority regarding flood risk for the potential development of the lands. The report will assess the site and development proposals in accordance with the requirements of *"The Planning System and Flood Risk Management Guidelines for Planning Authorities".*

The report will provide the following:

- The site's flood zone category.
- Information to allow an informed decision of the planning application in the context of flood risk.
- Appropriate flood risk mitigation and management measures for any residual flood risk.

1.3 Flood Risk Assessment Scope

This SSFRA relates only to the proposed development site at Centre Park Road in the South Docklands of Cork City Cork City and its immediate surroundings. This report uses information obtained from various sources, together with an assessment of flood risk for the existing land and proposed development. The report follows the requirements of *'The Planning System & Flood Risk Management – Guidelines for Planning Authorities'*, (referred to as the Guidelines for the remainder of this report).

1.4 Existing site

The existing brownfield site is approximately 0.84 Ha in size and is located along South Docks area of Cork City, approx. 2km east of the City Centre. The site slopes from southwest to the northeast with levels ranging from 1.8m to the southwest rising to 3.9m at the northeast. The site boundaries are generally formed by fencing and scrub vegetation. The east of the site is formed by marshlands located south of the Lee Rowing Club. Structures on the site are limited to an entrance canopy and adjoining industrial shed. Centre Park Road is characterised by mature trees on both sides. There

is an existing open drainage channel which runs along the northwestern and southeastern boundary of the subject site.

The lands to the southwest are to be developed with residential apartments as per planning reference: ABP-309059-20. The application site, known, refer to Figure 1-1 below for the site location.

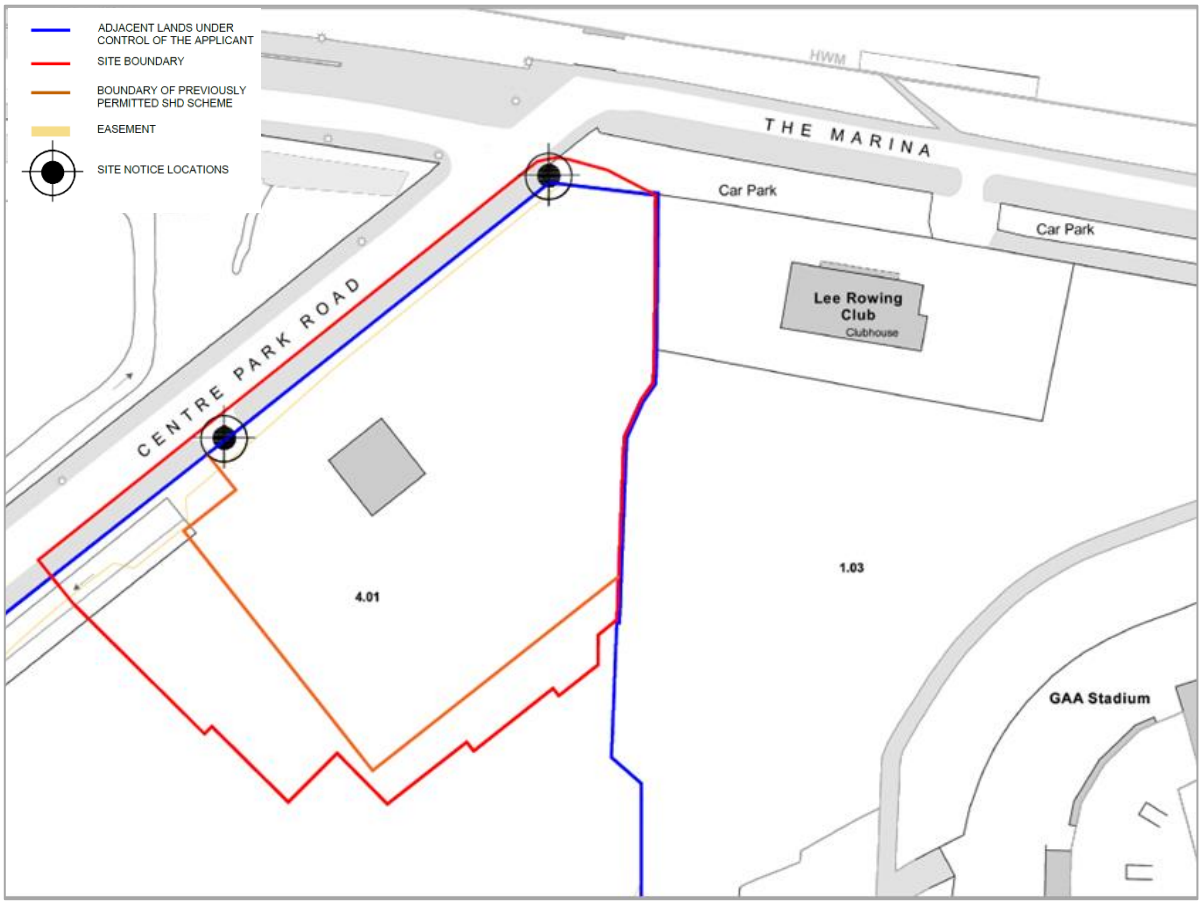


Figure 1-1: Site Location Plan (Source: JFA Architects)

1.5 Proposed Development

Permission for the construction of 176 no. 1, 2 and 3 bed apartment units in 2 no. blocks, 1 no. creche, 1 no. gym, a retail/café space and all associated ancillary development works.

1.6 Site Geology

A review of the Geological Survey of Ireland (GSI) maps indicates that the subsoil of the subject site most consists of clay deposits and there is no karst features located within the site or the immediate area. The associated groundwater vulnerability, which indicates the risk to the underlying waterbody for the site is classified as moderate for the subject site and surrounding area (refer to Figure 1-2).

Figure 1-2: Groundwater Vulnerability Mapping (Source: GSI Online Maps)

1.7 Site Investigation

Site investigation surveys were undertaken by PGL Priority Geotechnical in September 2019. The results of the site investigation reveal that the existing ground consist of three layers namely from the surface down:

1. 2-4m made ground
2. 1-3m silt
3. Substantial thickness of gravel

The made ground was found to be water bearing, however, the ground water was not considered to have any significant tidal influence and is presumed to drain naturally to surrounding drainage ditches which ultimately end up in discharging to the River Lee to the North of the site.

The gravel below the silt layer was found to be water bearing with the water level within the gravel to be greatly affected by the tide. Therefore, the gravel layer is considered to be a gravel aquifer.

The silt layer between the gravel layer and the made ground was found to have low permeability leading to a low possibility of hydraulic conductivity between the two layers, thus the silt layer acts as an aquitard for the gravel aquifer below. It is proposed to leave the aquitard undisturbed throughout the construction of the proposed development.

2 PLANNING GUIDELINES & FLOOD RISK ASSESSMENT

2.1 The Planning System and Flood Risk Management, Guidelines for Planning Authorities

The Planning System and Flood Risk Management, Guidelines for Planning Authorities [*The Guidelines*] provide "mechanisms for the incorporation of flood risk identification, assessment, and management into the planning process….". The key principles of *The Guidelines* are to apply the Sequential Approach to the planning process refer to Figure 2-1.

- "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."

Where the *Sequential Test's* **avoid** and **substitute** principals are not appropriate then *The Guidelines* propose that a *Justification Test* be next applied to assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk.

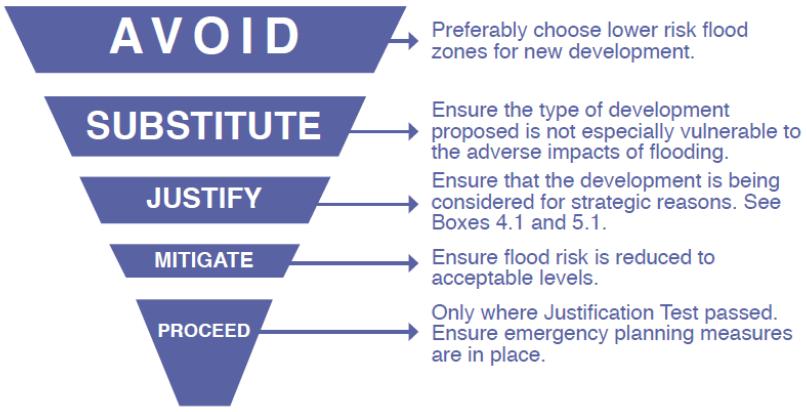


Figure 2-1: Sequential Approach Principles in Flood Risk Management

2.2 Flood Risk Assessment

The assessment of flood risk requires an understanding of where water comes from (the source), how and where it flows (the pathways), and the people and assets affected by it (the receptors). The principal **sources** of flooding are rainfall or higher than normal sea levels. The principal **pathways** are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets, refer to **Figure 2-3**.

The **receptors** can include people, their property, and the environment. All three elements are examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine potential consequences. Mitigation measures typically used in development management can reduce the impact of flooding on people and communities e.g., by blocking or impeding pathways. The planning process is primarily concerned with the location of receptors and potential sources and pathways that might put those receptors at risk.

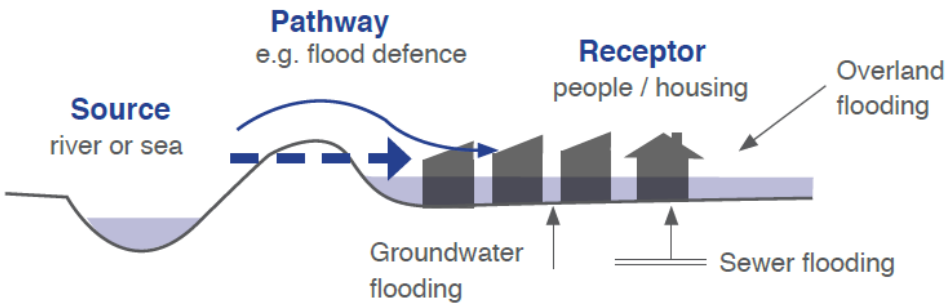


Figure 2-2: Source-Pathway-Receptor Model

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.

2.2.1 Flood Risk Assessment Stages

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

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

The FRA Guidelines require a SSFRA be undertaken to assess flood risk for individual planning applications. This SSFRA comprises Stages 1, 2 and 3 involving both identification and more detailed assessment of flood risks and surface water management related to the planned development site.

2.3 Flood Zones

The FRM Guidelines use flood zones to determine the likelihood of flooding and for flood risk management within the planning process. The three flood zones levels are:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP (Annual Exceedance Probability) or 1 in 100 for river flooding;
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1000 and 1% AEP or 1 in 100 for river flooding); and
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas outside zones A and B.

The FRM Guidelines categorises all types of development as either:

- Highly Vulnerable e.g. dwellings, hospitals, fire stations, essential infrastructure,
- Less Vulnerable e.g. retail, commercial or industrial buildings, local transport infrastructure.
- Water Compatible e.g. flood infrastructure, docks, amenity open space.

Table 2-1: Matrix of Vulnerability versus Flood Zone to illustrate appropriate development and that required to meet the Justification Test [Source: The Guidelines]

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

The Sequential Approach mechanism for proposed developments in the planning process is detailed in Figure 2-3 which uses the site's existing flood zone and the proposed development's vulnerability class to determine the approach.

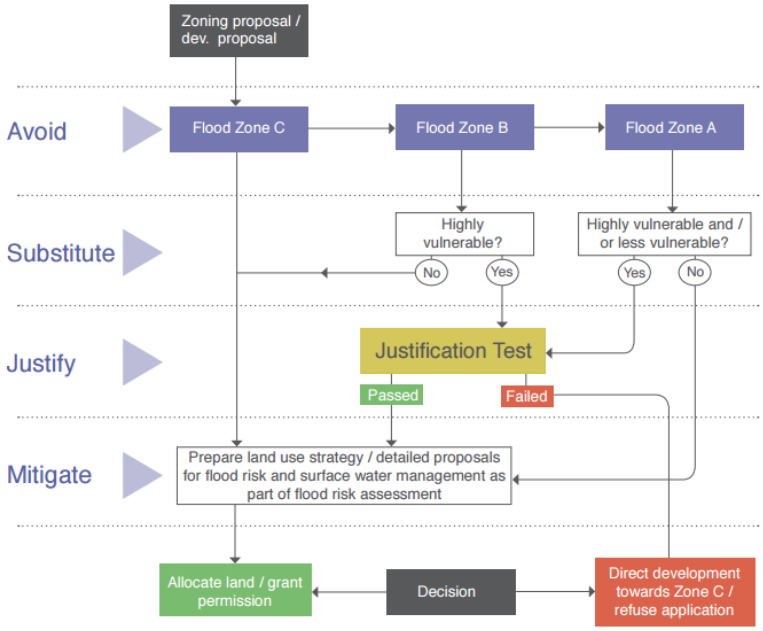


Figure 2-3: Sequential Approach mechanism in the Planning Process

3 STAGE 1 FLOOD RISK IDENTIFICATION

3.1 Available Flood Risk Information

The initial flood risk identification stage uses existing available information to identify and confirm whether there may be flooding or surface water management issues for the site in question which may warrant further investigation. The available information for the site is listed in Table 3-1.

Table 3-1: Review of Available Flood Risk Assessment Information

	Information Source	Coverage	Quality	Confidence	Identified Flood Risks	Flood Risk
Primary Data Source & Modelled Data	OPW CFRAM - Fluvial	Regional	High	High	Flood maps indicate that the subject site is within Flood Zone A but is defended by polder.	√
	OPW CFRAM - Coastal	Regional	High	High	Flood maps indicate that the subject site is within Flood Zone A but is defended by polder defences.	√
	Cork City Development Plan SFRA	Local	High	High	Proposed development site within Flood Zone A and within the Defended Area.	√
Secondary Data Source	Walkover Survey	Local	Varies	Varies	Brownfield site with no evidence of flooding. All drainage is underground. Levels fall from north-east to south.	X
	OPW Historic Flood Records & Benefitting Lands	Nationwide	Varies	Varies	No records of flooding on site.	X
	Historic OSI Maps	Nationwide	Moderate	Low	None	X
	EPA Ex. Rivers	Nationwide	Moderate	Moderate	No designated River / Stream in site.	X
	Drainage Records	County	Moderate	Moderate	No major sewers passing through or in proximity of site.	X
	Geological Survey Ireland Maps	Nationwide	Moderate	Low	Silt soils. Below these silts there are great depths of permeable gravels. No groundwater risks.	X
	Future drainage schemes	Local	Moderate	Low	The South Docklands masterplan is being undertaken and implemented which includes for an area wide drainage scheme.	X
	Topographic Survey	Local	High	High	Levels fall from north-east to south.	X

The proposed type of development for this site consists of residential infrastructure. This is categorised as **highly vulnerable** and is only appropriate to be located within Flood Zone C. To provide highly vulnerable type development within Flood Zone A or B requires a **Justification Test** to be completed to justify development in this moderate flood risk area.

3.2 Identified Flood Risks/Flood Sources

3.2.1 OPW Predictive, Historic & Benefiting Lands Maps & Flood Hazard Information

From consultation of flood information on the OPW's floodmaps.ie website, the site has not suffered from recorded flooding in the past. However, according to the website, there is a documented report from Cork City Council noting flooding of Centre Park Road which occurred on 12 January 1988 and concludes that it was a result of high-water levels in the River Lee. This is likely to have been caused by backing up of drains resulting in surface water flooding. An extract from the OPW "floodinfo" website indicating the location of the flooding is displayed in Figure 3-1. Further, recurrent flooding is noted between Centre Park Road and Monahan Road, see Appendix A for historic flood records. A past flood report (see Appendix A) shows that there have been 31 flood events recorded within a 2.5km radius of the subject site. The majority of these events occurred within Cork City Centre which is to be protected by flood relief measures.

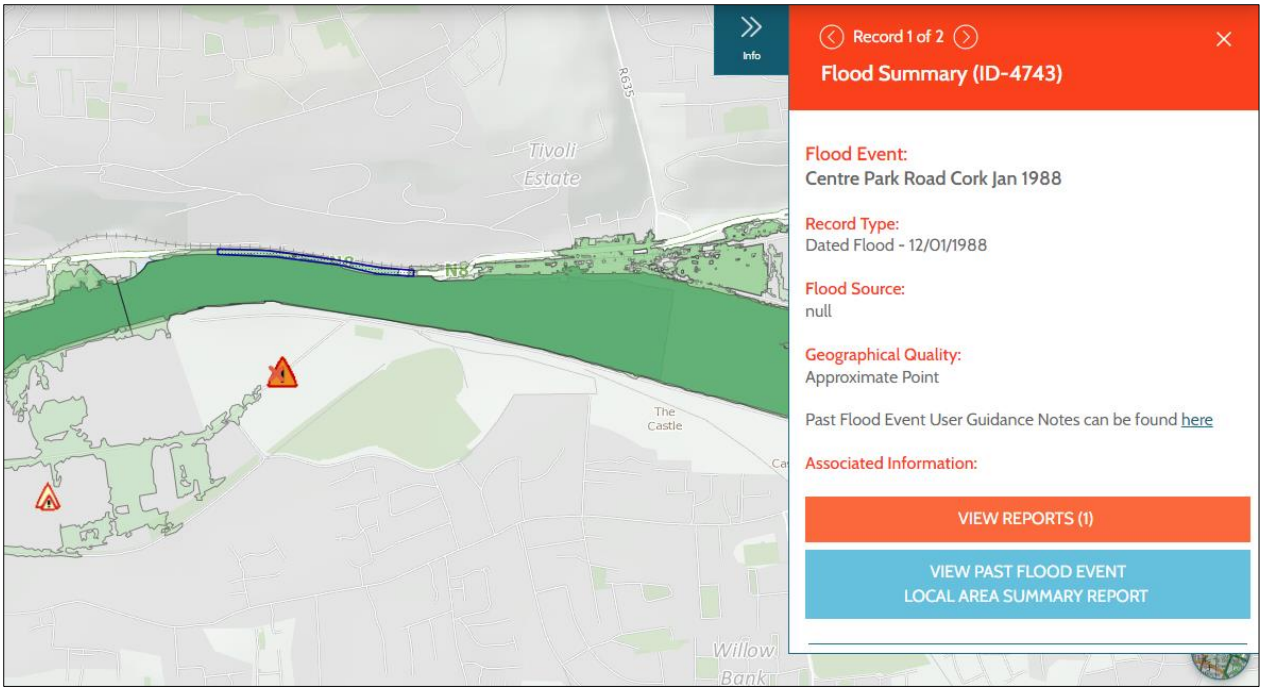


Figure 3-1: Flood Summary (Extract from Floodinfo.ie)

3.2.1.1 Fluvial Flood Risk

An extract from the Lee CFRAMS fluvial flood extent map is presented in Figure 3-2 below and illustrates the predicted current fluvial flood extents within the South Docklands area (1 in 10, 100, and 1000 year fluvial flood events). The site is at risk of fluvial flooding in the 1:1000 year event, however, the site is classified as defended due to the existing Polder defences to the North.

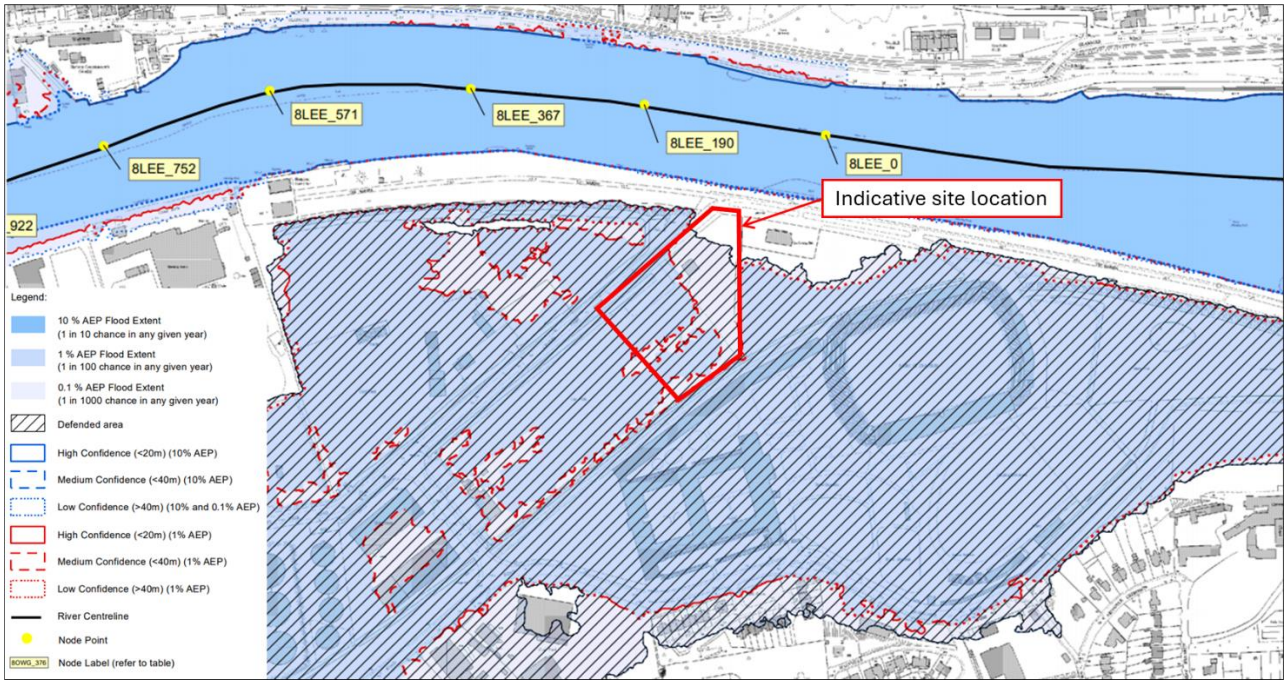


Figure 3-2: Extract from Lee CFRAMS fluvial flood extend map

3.2.1.2 Tidal Flood Risk

The subject site indicates that the majority of the site is located within Flood Zone A. An extract from the Lee CFRAMS tidal flood extent map is presented in Figure 3-3 below and displays the predicted current tidal flood extents within the South Docklands area (1 in 10, 200, and 1000 year tidal flood events).

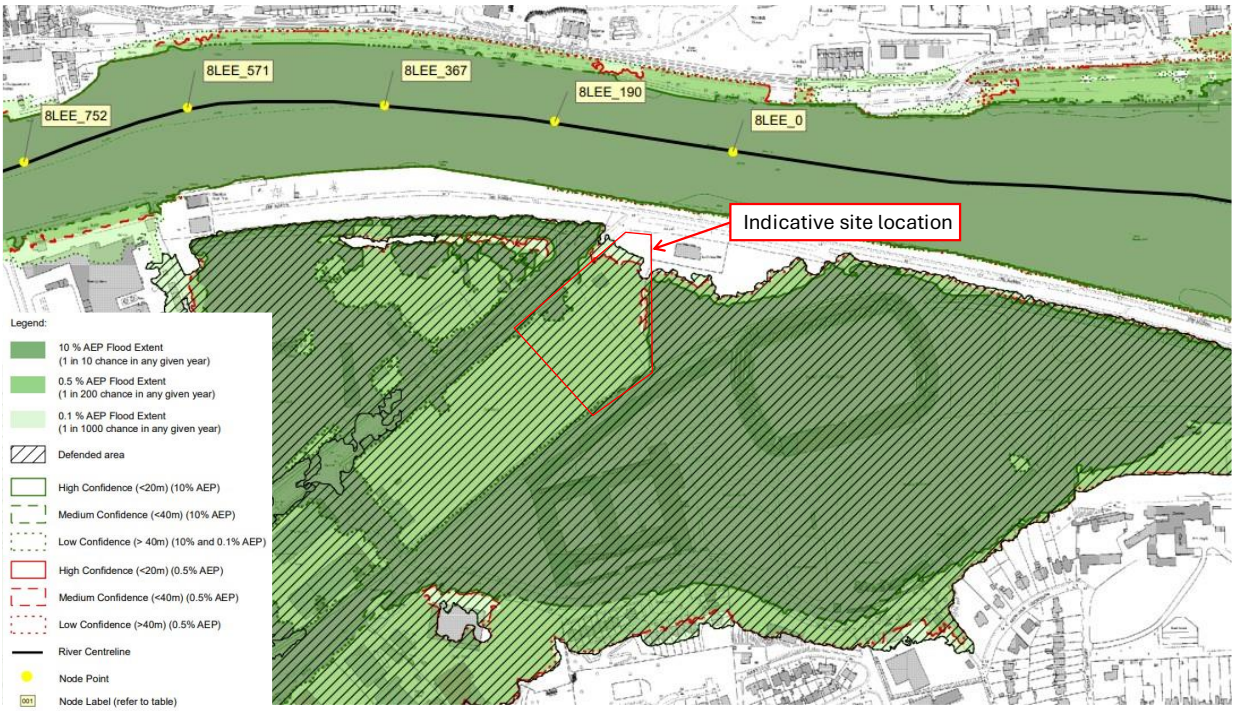


Figure 3-3: Extract from Lee CFRAMS coastal flood extend map

The flood map indicates that the majority of the site is located within Flood Zone A (1 in 200 year flood extent). However, the CFRAM maps also confirm that the site is within a defended area due to the presence of the existing polder flood defences to the north of the site. The closest recorded flood levels are at notes 8LEE_190 and 8LEE_0 which indicate peak tidal levels (WL 1% AEP or 1 in 200 year extent) of 2.99mOD and 3.00mOD respectively.

3.2.2 Cork City Council Development Plan 2022-2028

The Cork City Council Development Plan's Strategic Flood Risk Assessment provides a summary of all the OPW and ICPSS flood data. An extract of the relevant maps is included in Appendix B.

3.2.2.1 Mid-Range Future Scenario

The Cork City Council flood map summary is inclusive of mid-range future scenario data which projects the potential future flood risks based on predictive modelling of the potential effects of climate change and an assumed increase in river flow of 20% and sea level rise of 500mm. Figure 3-4 shows the National Indicative Fluvial Mapping (NIFM) Mid-Range Future Scenario (1% AEP) map for the proposed site which indicates that there is no future flood risk predicted for the site or the surrounding areas as a result of the flood protection measures implemented in the area. Predicted levels in the area of the subject site are circa 3.29mOD, which is approximately 0.56m above the currently predicted 1 in 100 year (1 % AEP) event.

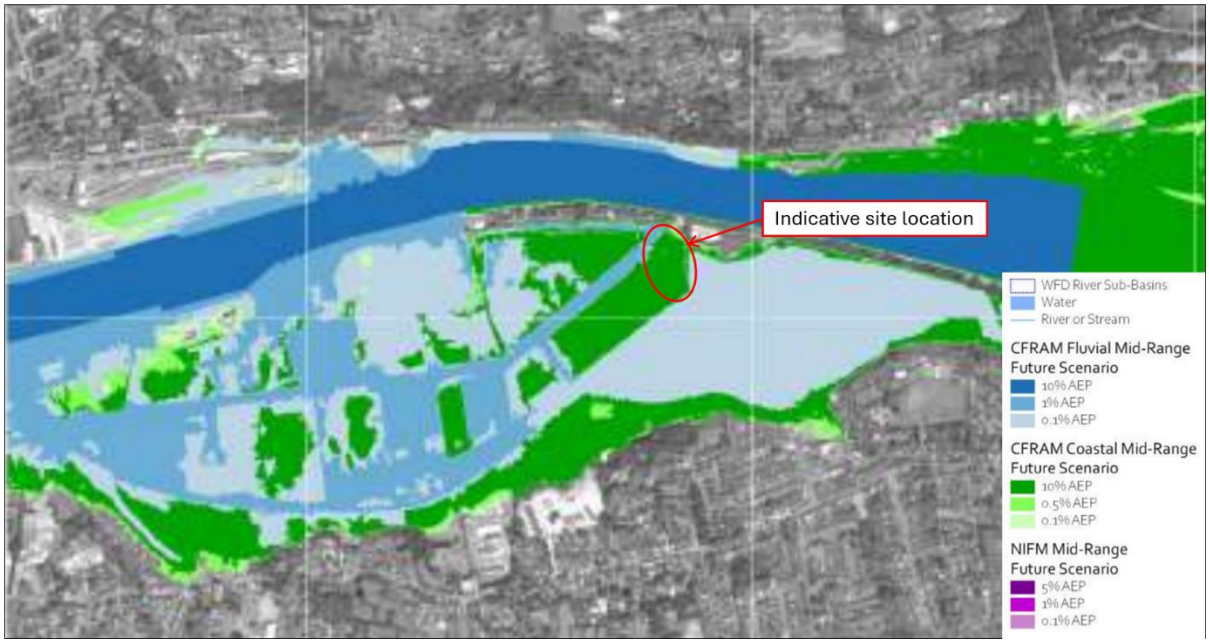


Figure 3-4: National Indicative Fluvial Mapping (NIFM) Mid-Range Future Scenario

The findings of the LLFRS or Lower Lee (Cork City) Drainage Scheme reaffirms the findings of the CFRAMS, showing that tidal flooding in the vicinity of the site for the 1 in 200 year event is limited to the lower extents of Centre Park Road and does not affect the site itself.

3.3 Source-Pathway-Receptor Model

A Source-Pathway-Receptor model was produced to summarise the possible sources of floodwater, the people and assets (receptors) that could be affected by potential flooding (with specific reference to the proposals), refer to Table 3-2. It provides the probability and magnitude of the sources, the performance and response of pathways and the consequences to the receptors in the context of the residential development proposal. These sources, pathways and receptors will be assessed further in the initial flood risk assessment stage.

Table 3-2: Source-Pathway-Receptor Analysis

Source	Pathway	Receptor	Likelihood	Impact	Risk
Tidal	Subject site within the defended flood extents for the 10% AEP if a breach or overtopping of flood defences occurs.	Future Development	Remote	Medium	Low
Fluvial	Proposed development site within defended zone (low risk of fluvial flooding).	Future Development	Remote	Medium	Low
Surface Water Drainage (Pluvial)	Flooding from the surcharging of the development's drainage systems	Future development including houses, resident vehicles etc.	Possible	Medium	Low
Groundwater Flooding	Rising GWL on the site	Future Development	Possible	Medium	Moderate
Infrastructural – Human or Mechanical Error	New drainage network blocks	Areas of development draining to the surface water network	Possible	Medium	Low

3.4 Source-Pathway-Receptor Model Results

As it can be seen in the flooding analysis, there is a low risk of groundwater flooding. This type of flooding occurs when water levels in the ground rise above surface levels. Prolonged storm events together with medium and/or high tides may increase the existing groundwater level on site. Considering the geology and topography of the subject site, and the proposed development will be raising the low points of the site, the possibility of groundwater rising above ground levels is considered low.

There is also a low risk of pluvial flooding due to the potential surcharging and blockage of the new drainage network.

Lastly there is a low risk associated with Fluvial and Tidal flooding should the flood defences breach.

Consequently, an initial flood risk assessment will follow to provide further detail on the causes, effects, and possible mitigation measures for the sources of flood risk identified above.

4 STAGE 2 INITIAL FLOOD RISK ASSESSMENT

The main sources of flooding identified from Stage 1 are:

- A low pluvial flood risk associated with the proposed developments proposed drainage network.
- A low groundwater flood risk associated with the groundwater levels encountered in the site investigation.
- A low risk of fluvial flooding associated with an extreme sea level rise.
- A low risk of tidal flooding associated with an extreme sea level rise.

4.1 Initial Pluvial Flood Risk Assessment

Pluvial flood risk associated with the proposed development has been addressed in detail within DBFL Infrastructure design report 240002-DBFL-X-X-X-XXX-RP-CE-0001.

Pluvial flooding occurs when intense rainfall exceeds the capacity of drainage systems resulting in rainwater pooling above ground in low-lying areas. There is a larger risk to the pluvial system in tidal locking scenarios when the surface water is not able to drain freely for a period especially if tidal locked periods coincide with intense rainfall periods. This issue is particularly significant in polder environments like the South Docks.

The proposed development's surface water drainage network was designed so there is no surface flooding in a 100-year rainfall event, including a 20% allowance for Climate Change.

The risk of pluvial flood risk to the site is considered moderate due to its higher elevation above the lower adjoining road network which will convey flood waters away from the site.

4.2 Initial Tidal Flood Risk Assessment

As stated above, the CCC Development Plan 2022- 2028 SFRA, CFRAMS and LLFRS identify the subject site as being within Zone A, although the is located in a flood protected area. Even though the site is deemed protected, and that the risk of flooding is low due to these defences, a further assessment will be undertaken to ensure reasonable mitigation measures are put in place to further protect the development either in a breach scenario or in an exceedance event.

4.3 Initial Groundwater Flood Risk Assessment

The Source-Pathway-Receptor model identified that there could be potential for groundwater flood risk on the proposed site due to the high water table. As part of the development proposals

and areas below the identified high ground water levels will be constructed using waterproofing methods to ensure full isolated from the water table. Furthermore, no known groundwater flooding has occurred in the vicinity of the site, therefore, flood risk associated with Groundwater can be deemed as low.

Although there is low risk due to ground water flooding, the geology of the South Docklands and that the site is such that the subject site is located within a polder. As per the requirements of the Cork City Council Docklands Drainage strategy any design proposals should be such that any risk of against puncturing the aquitard allowing ground water flows up into the South Docklands area is mitigated against. Consequently, piled foundations will be utilised and designed such that they do not create hydraulic connectivity between the aquifer and the made ground above the aquitard.

4.4 Conclusion

Due to the flood risk associated in the MRFS for Coastal flooding on subject site and in even though the site is protected from existing flood defences, it was deemed necessary to further assess the development proposals to ensure the subject site and surround developments are as safe as possible.

5 STAGE 3 DETAILED FLOOD RISK ASSESSMENT & MANAGEMENT

5.1 Assessment Of Development Layout And Flood Zones

It should be noted that the primary flood defence for the proposed development is the polder defence for the docklands area and as such any further protection measures are in addition to the already established polder defence. The proposed residential development is classified as 'highly vulnerable' development and is therefore appropriate to lands outside the 0.1% AEP flood extents i.e. Flood Zone 'C' lands. As the subject site is within Flood Zone 'A, The CCC SFRA 2022-2028 stipulates that any applications for vulnerable developments are to provide details of structural and non-structural risk management measures.

Cork City Council's preferred level strategy is to maintain existing levels where possible while ensuring flood mitigation measures are implemented. The Cork South Docklands Levels Strategy (CSDLS) stipulates a minimum finished floor level for 'low vulnerability' development of 1.3m. The existing site levels within the extents of the proposed undercroft range from approximately 1.95m to 3.1m with the entrance to the undercroft off Centre Park Road being approximately 0.6m. In accordance with the CCC SFRA and the CSDLS, the proposed development will utilise the ground floor areas, with a finished floor level of 2m AOD, for less vulnerable development such as under-croft car parking, landscaping, and recreational areas. This will ensure that the development is protected from potential pluvial flood risk by being elevated above the external road levels. Lastly, in an extreme flood event, the undercroft is designed to flood and therefore the proposed development does not displace any flood water from the existing scenario.

Further, the CSDLS stipulates that the finished floor levels of all highly vulnerable development should be above the 0.5% AEP MRFS Tidal flood level of 3.58m plus an appropriate freeboard. Consequently, the creche which is located at **4.00m** AOD with the remaining residential development located at a podium level of **6.05m** AOD which is significantly higher than the predicted future coastal flood level of 3.88m (comprising of 3.58m 1:200 CFRAMS mid range future scenario tidal flood level + 300mm freeboard allowance).

5.2 Surface Water Management

5.2.1.1 General

Surface water runoff from the proposed development is managed in accordance with the recommendations of the Cork City Development Plan 2022-2028 and the requirements of the Local Authority. This is achieved through a mix of traditional drainage (i.e. a standard gully and

pipe-work collection system) with attenuated outflows from the development and associated surface water storage and Sustainable Urban Drainage Systems (SUDS) where appropriate. While the proposed development would increase the impermeable area and run-off volume slightly when compared with the existing greenfield site, the proposed drainage system has the following features incorporated in the design to minimise the impact on the receiving environment:

- Hydrobrake or equivalent flow control to attenuate surface water runoff;
- SUDS features such as a green roofs, permeable podiums, rain gardens, and filter drains.
- Attenuated surface water runoff is stored on site within various SuDS features for up to a 1% AEP Annual Event Probability plus an allowance of 20% for climate change.

5.3 Impact Of Proposal On Flood Risk To Adjacent Areas

Surface water runoff from the development is attenuated and discharged to the adjacent SHD development planning reference: ABP-309059-20. A final runoff rate from the adjacent development includes for the proposed site and is in line with the strategic drainage scheme for the Docklands area. This will ensure that the development of the site will not increase flood risk downstream. Refer to DBFL's Infrastructure design report 240002-X-X-X-XXX-RP-DBFL-CE-0001 for more information.

Overall, the development complies with the requirements of the CCC Development Plan, the CCC SFRA and the Docklands Drainage Strategy and does not increase the risk of flooding elsewhere and does not result in displaced waters.

5.4 Climate Change

The potential impact of climate change has been allowed for in the design of the surface water drainage network and storage system, with an allowance for a 20% increase in rainfall intensities.

5.5 Residual Risks

Remaining residual flood risks, following the detailed assessment include the following;

1. Pluvial flooding from the drainage system related to a pipe blockage or from flood exceedance.
2. Moderate pluvial flooding from the development's drainage system for storms in excess of the 0.5% AEP tidal event.
3. Defence failure (overtopping or breach of the flood defences by a flood that exceeds the design level of the defence).

5.6 Mitigation Measures

The proposed development will look to implement a number of structural and non structural measures to minimise effects of a flood if it were to occur. Proposed mitigation measures to address residual flood risk are summarised below:

- All proposed residential development will be set above the 0.5% AEP tidal flood level including an allowance for climate change and an appropriate freeboard: 3.58m AOD (for the 1 in 200 year mid range future scenario tidal flood level in the vicinity of the subject site) + 0.3 (freeboard) 3.88m AOD.
- Any development below this level will be designed to be flood resilient in accordance with the Cork City Council's Code of Practice for Flood Resilience and Adaptation Measures to minimise damage. Some techniques used include:
    - Structural walls and columns designed for short-term immersion;
    - As much as possible, the location of the main electrical circuitry and other utilities should be located above the 0.5% AEP design level and that sockets and electrical connections are located 1m above floor level to give a level of protection.
    - Materials, details and finishes are selected and designed for durability and ease of maintenance and should be considered flood resilient.
- The proposed drainage system is to be maintained on a regular basis to reduce the risk of a blockage. Maintenance of SUDS features should also be carried out in accordance with the recommendations of "The SUDS Manual" (CIRIA).
- In the event of storms exceeding the 100-year design capacity of the drainage system, then possible flood routing for overland flows towards Centre Park Road should not be blocked.
- The drainage network is designed in accordance with the recommendations of the Cork City Council Development Plan 2022-2028 and provides attenuated outlets and associated storage up to the 1% AEP (1 in 100-year return period event) plus 20% climate change. The drainage network for the site has been designed to ensure that there is no out of pipe flooding for a 1% AEP or 1 in 100-year return period storm plus 20% climate change.
- At detailed design stage, the location of all dropped kerbs to be fully reviewed to ensure all overland flow paths are not impeded.

- Advanced warning systems such as alarms or notifications will be implemented where possible for residents and workers to be alerted of any imminent flood warnings. Depending on the level of warning, advice on appropriate action will be given to those residents with car parking spaces in the under croft. This will aid in the reduction of damage by allowing residents to move vehicles out of the development.

5.6.1 Effectiveness Of Mitigation Measures

It is considered that the flood risk mitigation measures once fully implemented are sufficient to provide a suitable level of protection to the proposed development. A regularly maintained drainage system will ensure that the drainage system remains effective and in good working order should a large storm occur.

5.7 Flood Warning and Evacuation

To facilitate an emergency warning and evacuation plan which will allow site users to leave the premises of the property in the event of a flood, the flood warning and evacuation plan should be prepared in liaison with the Local Authority and the Emergency Services.

The Local Authority is responsible for monitoring flood events and for issuing warnings to people in properties and businesses at risk of flooding. The site users will not be able to evacuate the development once a flood has occurred. The site will therefore be registered with the Local Authority's Warning Service as well as having a copy of the Warning and Evacuation plan on site.

A comprehensive and effective Flood Warning and Emergency Response Plan shall be produced with recommendations for required site procedures that should be taken in response to forecasted flooding and for any scenario where flooding starts to occur without prior warning. If flooding does occur without prior warning, the site users will not be able to leave the site safely, however the podium development will be raised above the flood level and will act as a "safe haven". Site users should therefore remain indoors and wait for the emergency services.

The Warning and Evacuation Plan can be found in Appendix C.

5.8 Access And Egress During Flood Events

Access and egress is via the Centre Park Road through the adjacent development to the south. Although it recommended residents stay within their homes and await direction from the emergency services. For further information please refer to the warning and evacuation plan in Appendix C.

5.9 Flood Exceedance

During an exceedance storm event, i.e. in excess of the 1% AEP event plus climate change, remaining additional storage volume within the surface water network will fill within the freeboard flood levels before wider flooding of the development. After remaining freeboard storage is exceeded, overland flow paths are designed to direct runoff either to landscape features and onto the public Centre Park Road. No flow paths direct runoff to third party lands.

6 CONCLUSION

The SSFRA concludes the following:

- The OPW document "The Planning System and Flood Risk Management (November 2009)" requires that the proposed development be compatible with flood risk for the site. It is concluded that the subject site is located within Flood Zone 'A' for tidal flood risk, assuming no defence in place. However, it is protected to a high standard by the existing polder defences along the quayside. Cork City Council intend to raise this polder defence in the future to ensure the existing standard of protection is maintained or increased. Accordingly, it will be the primary flood protection measure for the Docklands.
- The development passes the Justification Test in accordance with Box 5.1 of the guidelines and the proposed development is deemed appropriate to be located within Flood Zone A on the basis that the mitigation measures stipulated within he justification are met.
- There is a possible coastal flood risk, however, this risk is mitigated by utilising the ground floor areas for less vulnerable development such as under-croft car parking, landscaping, and recreational areas. All highly vulnerable development (i.e. residential apartments) will be located at a podium level higher than the predicted future coastal flood level of 3.88m (comprising of 3.08m 1:200 CFRAMS coastal flood level + 500mm mean sea level rise + 300mm freeboard allowance).
- The proposed development will not increase run-off rate when compared with the existing site and satisfies the requirement of the CCC Development Plan 2022-2028 SFRA to reduce flooding and improve water quality.
- SUDS features are incorporated into the drainage design for the scheme where feasible to manage surface water runoff from the development in accordance with the recommendations of the Cork City Development Plan 2022-2028.
- As part of the development proposals, a Warning and Evacuation Plan has been created to ensure the site users are aware of the potential risks of flooding.
- This SSFRA has demonstrated that the risks relating to flooding to the proposed development can be managed and mitigated to acceptable levels and therefore comply with DoEHLG / OPW and Cork City Council planning guidance.

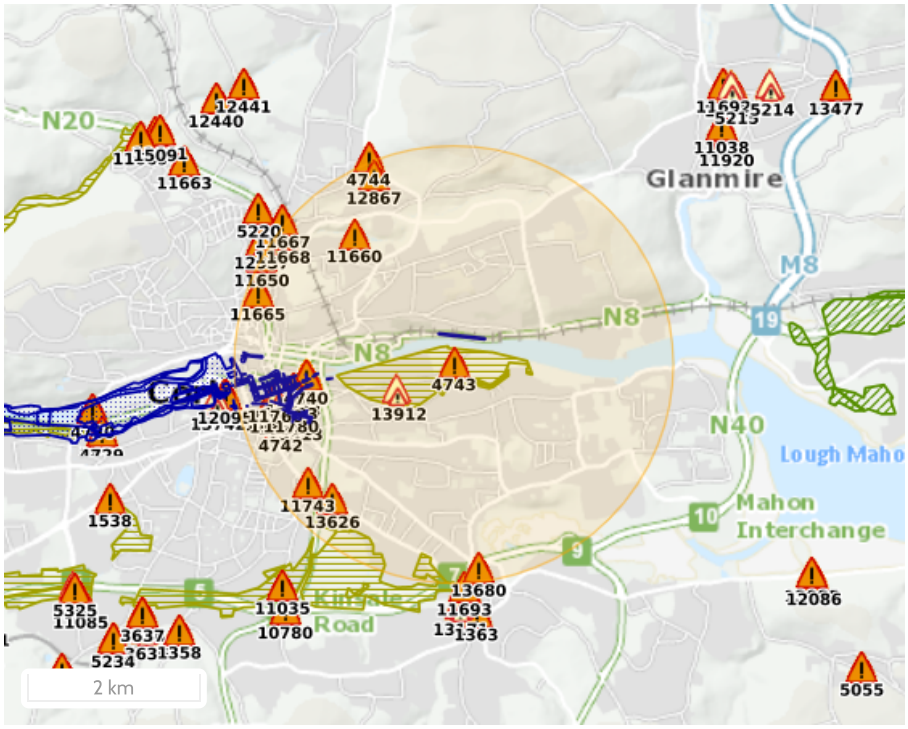
Appendix A : OPW Flood Hazard Report

Past Flood Event Local Area Summary Report

Report Produced: **11/6/2024 17:46**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

31 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Cork city centre 1945 (ID-4740)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
2.	Cork city centre 1955 (ID-4739)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (1)		
3.	Lee Cork City January 1789 (ID-1472)	16/01/1789	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
4.	Lee Cork City November 1853 (ID-1473)	02/11/1853	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
5.	Lee Cork City November 1916 (ID-1474)	16/11/1916	Approximate Point
	Additional Information: Reports (1) Press Archive (6)		
6.	Cork City centre Dec 1989 (ID-4735)	16/12/1989	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		

	Name (Flood_ID)	Start Date	Event Location
7.	Cork City centre March 1962 (ID-4737) Additional Information: Reports (1) Press Archive (0)	07/03/1962	Approximate Point
8.	Cork City centre Oct 1901 (ID-4738) Additional Information: Reports (1) Press Archive (0)	01/10/1901	Approximate Point
9.	Douglas St Cork Jan 1988 (ID-4742) Additional Information: Reports (1) Press Archive (0)	12/01/1988	Approximate Point
10.	Centre Park Road Cork Jan 1988 (ID-4743) Additional Information: Reports (1) Press Archive (0)	12/01/1988	Approximate Point
11.	Cork City October 2004 (ID-4731) Additional Information: Reports (1) Press Archive (0)	26/10/2004	Area
12.	Turner's Cross, Cork 28th June 2012 (ID-11743) Additional Information: Reports (1) Press Archive (0)	27/06/2012	Approximate Point
13.	Cork City on 17th October 2012 (ID-11760) Additional Information: Reports (1) Press Archive (0)	16/10/2012	Approximate Point
14.	Cork City 14th.December 2012 (ID-11780) Additional Information: Reports (1) Press Archive (0)	14/12/2012	Approximate Point
15.	Lee Cork City Jan 1996 (ID-455) Additional Information: Reports (10) Press Archive (1)	06/01/1996	Area
16.	Cork City 16th and 17th October 2012 (ID-11825) Additional Information: Reports (2) Press Archive (0)	15/10/2012	Approximate Point
17.	Cork City 17th.December 2012 (ID-11831) Additional Information: Reports (1) Press Archive (0)	17/12/2012	Approximate Point
18.	Flooding at Ballyvolane on 28/06/2012 (ID-12867) Additional Information: Reports (0) Press Archive (0)	28/06/2012	Approximate Point
19.	Cork City from 26th. To 29th.October 2015 (ID-12580) Additional Information: Reports (1) Press Archive (0)	26/10/2015	Approximate Point
20.	Watercourse Road (South of O Connell Street) Cork. 28th.June 2012 (ID-11665) Additional Information: Reports (1) Press Archive (0)	27/06/2012	Approximate Point
21.	Ballyvolane, Co.Cork. 28th June 2012 (ID-11660) Additional Information: Reports (2) Press Archive (0)	27/06/2012	Approximate Point
22.	Cork City Flooding 19th.Nov. 2009 (ID-10820) Additional Information: Reports (4) Press Archive (0)	19/11/2009	Area
23.	Flooding at Douglas on 14/10/2019 (ID-13680) Additional Information: Reports (0) Press Archive (0)	14/10/2019	Approximate Point
24.	Flooding at Cork City on 16/04/2018 (ID-13626)	16/04/2018	Approximate Point

	Name (Flood_ID)	Start Date	Event Location
	Additional Information: Reports (0) Press Archive (0)		
25.	Flooding at Cork City - Recurring (ID-13912)	n/a	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
26.	Flooding at Cork City on 17/12/2012 (ID-12910)	17/12/2012	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
27.	Flooding at Cork City on 27/10/2015 (ID-13193)	27/10/2015	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
28.	Flooding at Cork City - Recurring (ID-13913)	n/a	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
29.	Flooding at Cork City on 26/11/2019 (ID-13683)	26/11/2019	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
30.	Flooding at Cork City on 03/04/2018 (ID-13624)	03/04/2018	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
31.	Flooding at Cork City on 07/12/2021 (ID-14090)	07/12/2021	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		

Appendix B : OPW CFRAMS Maps

N

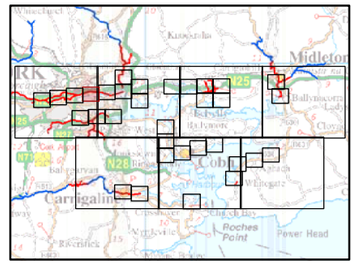
8LEE_922
8LEE_752
8LEE_571
8LEE_367
8LEE_190
8LEE_0

Fluvial flooding may also occur within the area shown on this map. Please refer to the fluvial flood extent map. Figure No. M8/UA/EXT/CURS/012

0.1 0.05 0 0.1 0.2 0.3 0.4 Kilometres

Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
8LEE_922	2.66	2.99	3.20
8LEE_752	2.66	2.99	3.20
8LEE_571	2.65	2.99	3.20
8LEE_367	2.65	2.99	3.20
8LEE_190	2.65	2.99	3.20
8LEE_0	2.65	3.00	3.20

Location Plan :



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (> 40m) (10% and 0.1% AEP)
- High Confidence (<20m) (0.5% AEP)
- Medium Confidence (<40m) (0.5% AEP)
- Low Confidence (>40m) (0.5% AEP)
- River Centreline
- Node Point
- 001 Node Label (refer to table)

USER NOTE :

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

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Halcrow Group Ireland
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Eastgate
Little Island
Cork
Ireland

OPW
Office of Public Works
17-19 Lower Hatch Street
Dublin 2
Ireland

Project :
LEE CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map :
CORK CITY

Map Type :	FLOOD EXTENT		
Source :	TIDAL FLOODING		
Map area :	URBAN AREA		
Scenario :	CURRENT		
Figure By :	Valeria Medina	Date :	10 March 2014
Checked By :	Ricardo Santaella	Date :	10 March 2014
Approved By :	Clare Dewar	Date :	10 March 2014

Figure No. : M9/UA/EXT/CURS/005
Revision : 2

Drawing Scale : 1:5,000
Plot Scale : 1:1 @ A3

N

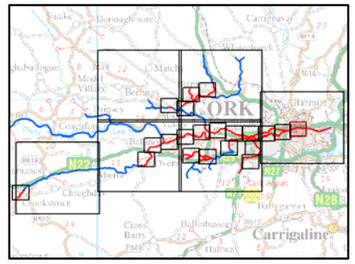
Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
8LEE_1094	1.94	2.74	3.07
8LEE_922	1.93	2.74	3.07
8LEE_752	1.93	2.74	3.06
8LEE_571	1.93	2.74	3.07
8LEE_367	1.92	2.73	3.06
8LEE_190	1.92	2.73	3.07
8LEE_0	1.92	2.74	3.07

8LEE_571
8LEE_367
8LEE_190
8LEE_0
8LEE_752
8LEE_922
8LEE_1094

Tidal flooding may also occur within the area shown on this map. Please refer to the tidal flood extent map. Figure No. M9/UA/EXT/CURS/005

0.1 0.05 0 0.1 0.2 0.3 0.4 Kilometres

Location Plan :



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- 8OWG_376 Node Label (refer to table)

USER NOTE :

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

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Dublin 2
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Project :
LEE CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

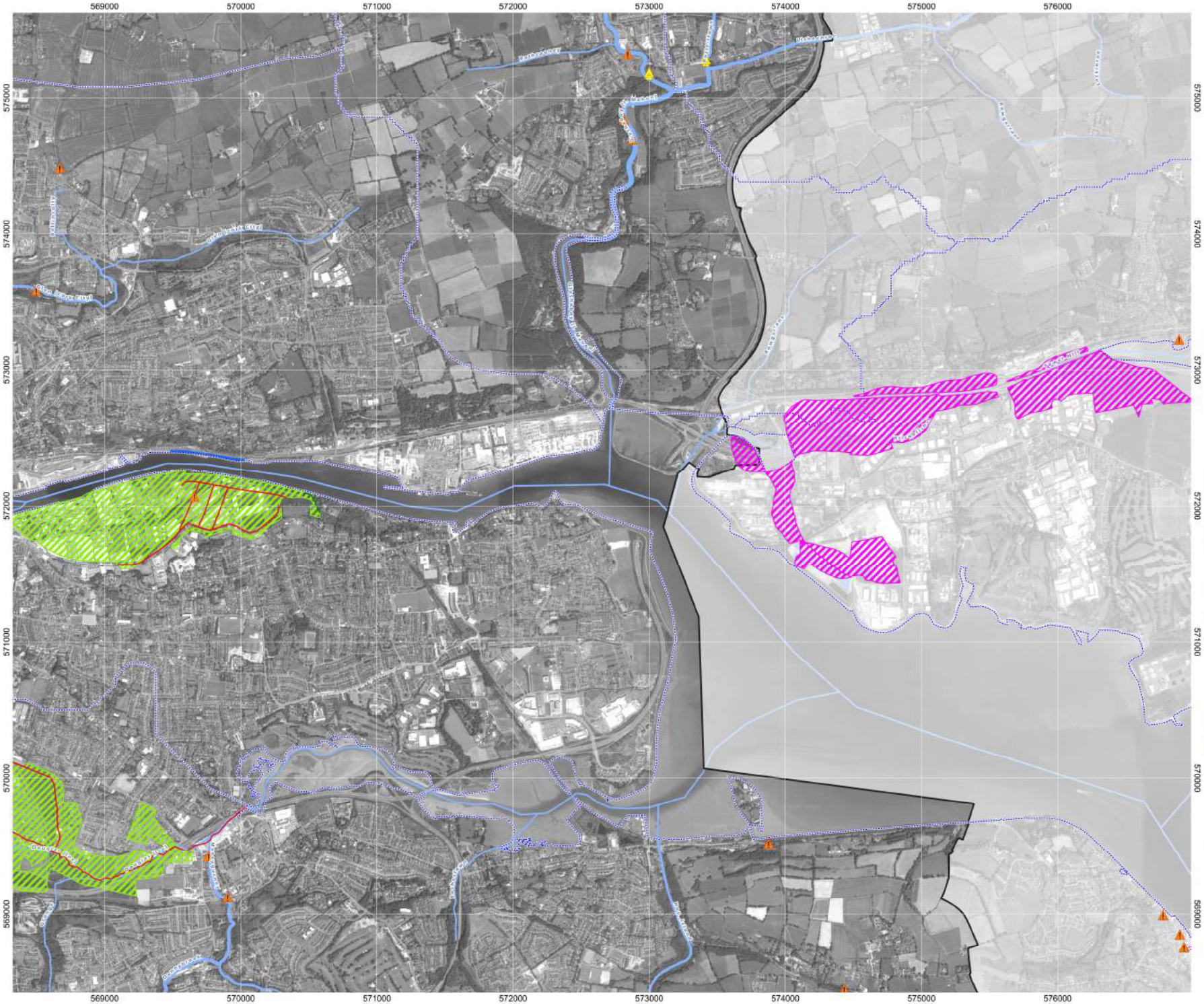
Map :
CORK CITY

Map Type :	FLOOD EXTENT		
Source :	FLUVIAL FLOODING		
Map area :	URBAN AREA		
Scenario :	CURRENT		
Figure By :	Valeria Medina	Date :	10 March 2014
Checked By :	Ricardo Santaella	Date :	10 March 2014
Approved By :	Clare Dewar	Date :	10 March 2014

Figure No. : M8/UA/EXT/CURS/012
Revision : 2

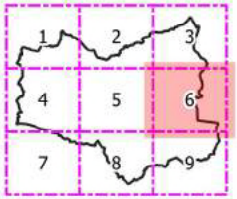
Drawing Scale : 1:5,000
Plot Scale : 1:1 @ A3

Appendix C : Cork City Council Flood Maps Extract



Cork City Development Plan 2022-2028

OPW Historical Flood Data



WFD River Sub-Basins
Water
River or Stream

OPW Past Flood Events

Recurring Flood Event
REMOVE FROM LEGEND
Past Flood Extent

Land Commission

Benefited Lands

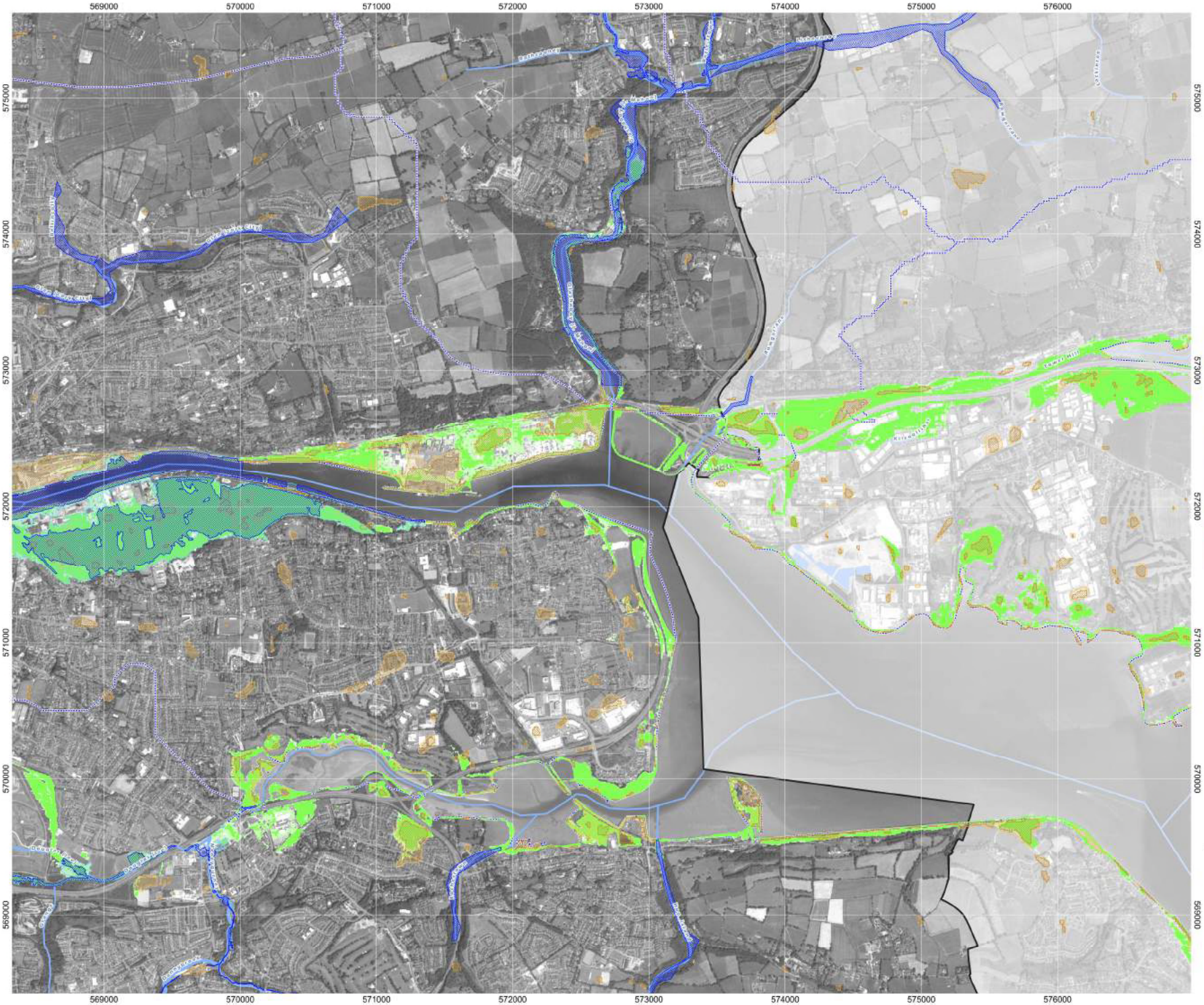
Drainage District

Channel
Embankment
Benefited Lands

Arterial Drainage Scheme

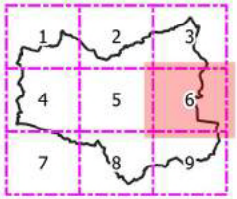
Channel
Embankment
Benefited Lands

Coordinates in ITM



Cork City Development Plan 2022-2028

OPW Preliminary Flood Risk Assessment (PFRA)



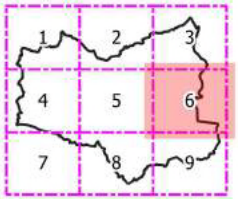
- WFD River Sub-Basins
- Water
- River or Stream

PFRA

- Fluvial 1% AEP
- Fluvial 0.1% AEP
- Pluvial 1% AEP
- Pluvial 0.1% AEP
- Coastal 0.5% AEP
- Coastal 0.1% AEP

Cork City Development Plan 2022-2028

OPW Irish Coastal Protection Strategy Study (ICPSS) Mid-Range Future Scenario



WFD River Sub-Basins

Water

River or Stream

ICPSS Mid-Range Future Scenario

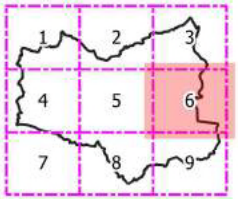
Coastal 0.5% AEP

Coastal 0.1% AEP

Coordinates in ITM

Cork City Development Plan 2022-2028

OPW Irish Coastal Protection Strategy Study (ICPSS) High-End Future Scenario



WFD River Sub-Basins

Water

River or Stream

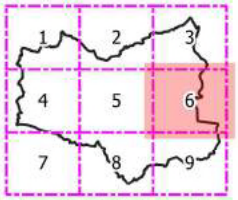
ICPSS High-End Future Scenario

Coastal 0.5% AEP

Coastal 0.1% AEP

Cork City Development Plan 2022-2028

OPW Catchment Flood Risk Assessment & Management (CFRAM) & National Indicative Flivial Mapping (NIFM) Present Day



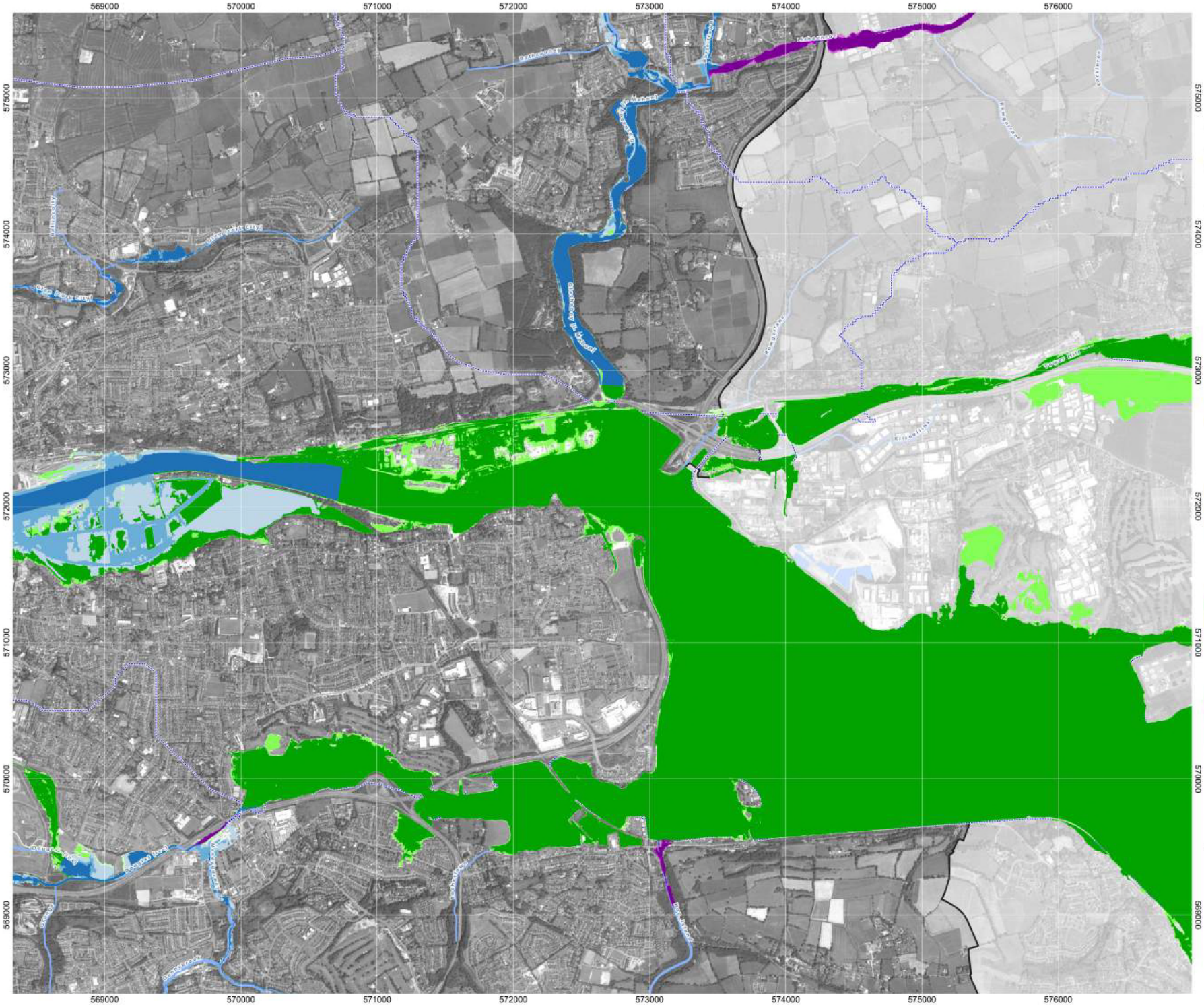
WFD River Sub-Basins
Water
River or Stream

CFRAM Fluvial Present Day
10% AEP
1% AEP
0.1% AEP

CFRAM Coastal Present Day
10% AEP
0.5% AEP
0.1% AEP

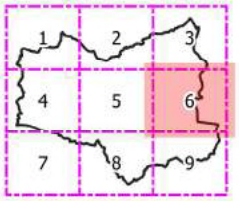
NIFM Present Day Scenario
5% AEP
1% AEP
0.1% AEP

Coordinates in ITM
© Google
© OSI & EPA (CC BY 4.0) / EU DEM
Contains Office of Public Works information
© Office of Public Works



Cork City Development Plan 2022-2028

OPW Catchment Flood Risk Assessment & Management (CFRAM) & National Indicative Fluvial Mapping (NIFM) Mid-Range Future Scenario



- WFD River Sub-Basins
- Water
- River or Stream

CFRAM Fluvial Mid-Range Future Scenario

- 10% AEP
- 1% AEP
- 0.1% AEP

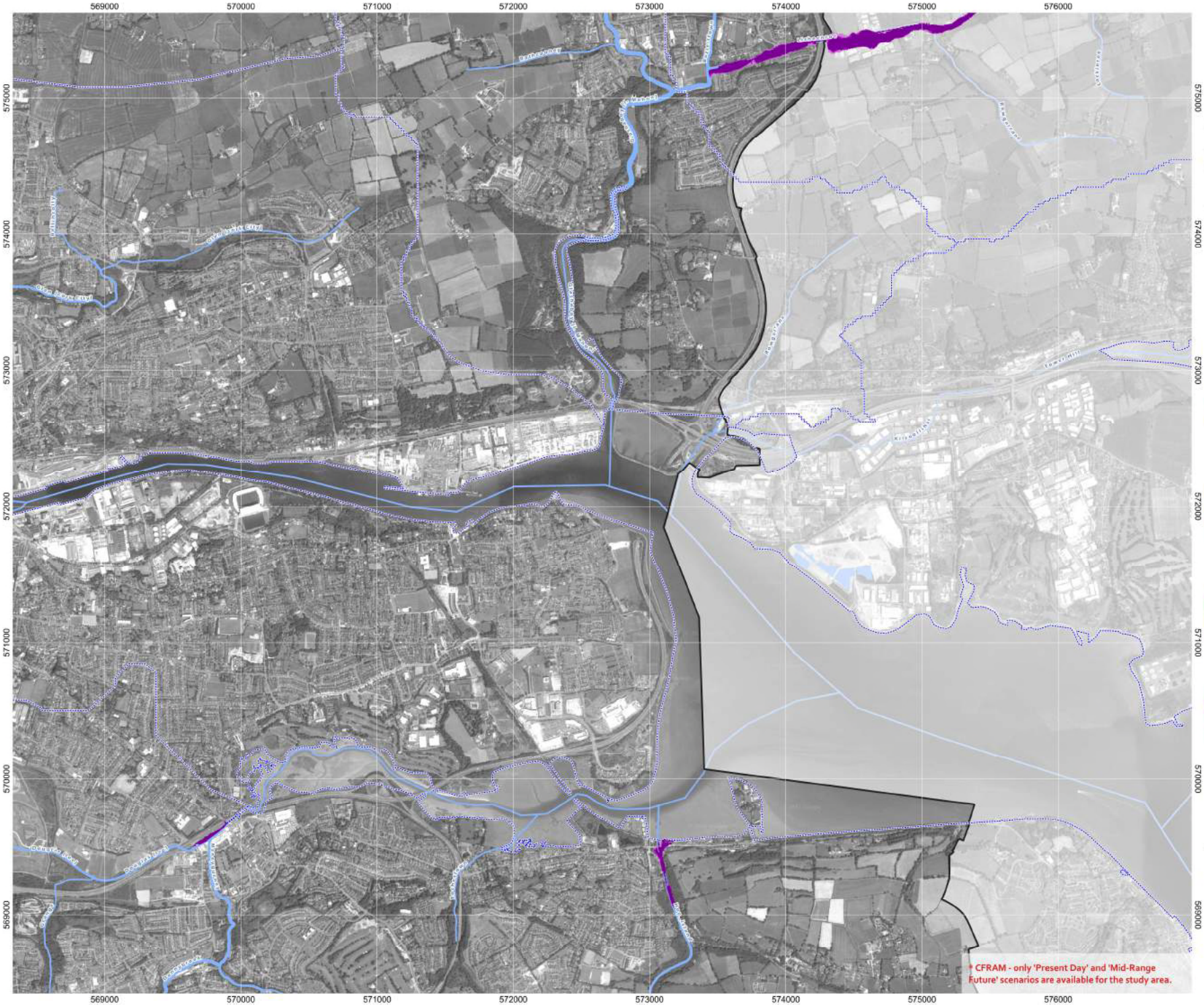
CFRAM Coastal Mid-Range Future Scenario

- 10% AEP
- 0.5% AEP
- 0.1% AEP

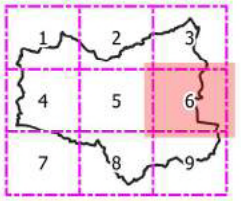
NIFM Mid-Range Future Scenario

- 5% AEP
- 1% AEP
- 0.1% AEP

Cork City Development Plan 2022-2028



OPW Catchment Flood Risk Assessment & Management (CFRAM) & National Indicative Fluvial Mapping (NIFM) High-End Future Scenario



- WFD River Sub-Basins
- Water
- River or Stream

CFRAM Fluvial High-End Future Scenario*

- 10% AEP
- 1% AEP
- 0.1% AEP

CFRAM Coastal High-End Future Scenario*

- 10% AEP
- 0.5% AEP
- 0.1% AEP

NIFM High-End Future Scenario

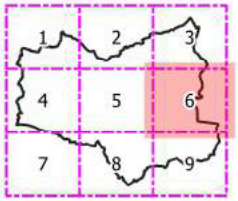
- 5% AEP
- 1% AEP
- 0.1% AEP

* CFRAM - only 'Present Day' and 'Mid-Range Future' scenarios are available for the study area.

Coordinates in ITM

Cork City Development Plan 2022-2028

GSI Historical Flood Data and Groundwater Predictive Modeling



WFD River Sub-Basins

Water

River or Stream

GSI Groundwater Flooding Predicitive Model

High Probability

Medium Probability

Low Probability

GSI Historical Flood Data

Surface Water Flooding

Winter 2015-2016 Surface Water Flooding

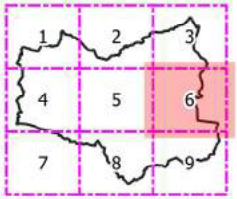
Maximum Historic Groundwater Flooding

Groundwater

Groundwater/Surface water

Cork City Development Plan 2022-2028

Indicative Flood Zones



WFD River Sub-Basins

Water

River or Stream

Indicative Flood Zones

Flood Zone A

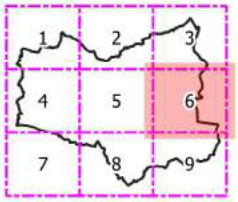
Flood Zone B

569000 570000 571000 572000 573000 574000 575000 576000

575000 574000 573000 572000 571000 570000 569000

Cork City Development Plan 2022-2028

Land Use Zoning that Intersects Indicative Flood Zones



WFD River Sub-Basins

Water

Land Use Zoning

- ZO 01 - Sustainable Residential Neighbourhoods
- ZO 02 - New Residential Neighbourhoods
- ZO 03 - Long-term Strategic Regeneration
- ZO 04 - Mixed Use Development
- ZO 05 - City Centre
- ZO 06 - Urban Town Centre
- ZO 07 - District Centre
- ZO 08 - Neighbourhood and Local Centres
- ZO 12 - Education
- ZO 14 - Public Infrastructure and utilities
- ZO 15 - Public Open Space
- ZO 16 - Sports Grounds and Facilities
- ZO 17 - Landscape Preservation Zones
- ZO 18 - Quayside Amenity Area
- ZO 19 - Rivers and Water Bodies Protection
- ZO 20 - Long-term Strategic Regeneration

Coordinates in ITM

Appendix D : Warning & Evacuation Plan

DBFL CONSULTING ENGINEERS

Engineering Sustainable Futures

The Former Ford Distribution Site, fronting onto Centre Park Road, Ballintemple, Cork

Flood Warning & Evacuation Plan

November 2024

Revision: 0

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DBFL Consulting Engineers Limited
trading as DBFL Consulting Engineers

VAT. No. IE6355828Q
Company No. 335828

1. General Precautions and Information

- This development is located within a defended area of the tidal flood extents and in the scenario there is a breach in tidal flood defences, this plan outlines the actions required by the site users.
- Although, it is likely the Local Authority will have prior warning of the increased tidal levels and have a flood warning for the area in effect. The time of first inundation of the site could be fast, and with little warning due to unknown status of a breach.
- Ensure all residents are aware of this plan, understand it and are fully briefed on the risk assessment, and provide basic training to any children at the site.
- The residents and site users will need to be aware that during a flood event there is likely to be a failure of the utilities.
- Ensure multiple emergency flood boxes are located within each floor and are accessible. This should be checked and maintained as part of a bi-annual check.
- The residents should be aware of higher risk periods e.g. high spring tides, paying particular attention to weather conditions and flood warnings during these times.
- Cork City Council operates a flood warning procedure and residents and site users are encouraged to sign up to notification systems such as MapAlerter (www.mapalerter.ie) and check websites such meteoalarm (https://www.meteoalarm.org/en/live/region/IE) to ensure they are aware of any flood warnings in place for the area. These warnings are published on the Local Authorities website with more details of how to prepare for flooding at available through the OPW Website, https://www.floodinfo.ie.
- This plan should be a live document and may need to be updated in the future as a result of local policies and strategies being changed. This Flood Plan should be amended as necessary with a log kept of any changes and reasons for change. This is included in Appendix 3 and should be completed following any revisions.

2. Response to Flood Alert or Flood Warnings

Once a 'Flood Alert or 'Flood Warning' has been reported, the following actions will be undertaken.

The Local Authority & Met Eireann are responsible for issuing severe flood warnings and residents and site users should listen to local media and watch other media to assess the developing situation.

Emergency Flood Boxes will be checked for contents - see Appendix 2 for box contents.

3. Response to Severe Flood Warnings

Once a 'Severe Flood Warning' has been issued, the following actions should be taken.

For Residents of the development:

- Obtain the Emergency Flood Box.
- Assemble all residents and visitors on the podium or in dwellings which have all been raised above the flood level.
- Avoid evacuation wherever possible, as it will be very difficult to evacuate people from the site to an area outside the floodplain using a designated safe route. Access to the evacuation route and trafficability can be lost early in the flood because of rising floodwaters. Evacuation must be organised by the emergency services in this instance.
- Contact the emergency services.
- Depending on the level of flood risk and its imminence the emergency services will advise the public on the quickest and safest way off the property.

IMPORTANT: DO NOT RE-ENTER THE PROPERTY UNTIL INSTRUCTED TO DO SO BY LOCAL AUTHORITY OR THE EMERGENCY SERVICES.

NO ACTIONS SHOULD BE TAKEN WHICH COMPROMISE THE SAFETY OF THE PERSONS INVOLVED.

APPENDIX 1: Warning System

(Following Met Eireann's Weather Warning System)

1: STATUS YELLOW – Flood Alert

Flooding is possible. Be prepared - Is used from two hours to two days in advance of flooding.

Following Actions:

- Watch water levels
- Monitor local news and weather forecasts on radio, TV or internet.
- Make sure you have what you need to put your flood plan into action.
- Check flood kit is fully equipped.
- Alert your neighbours, particularly the elderly and less able.
- Reconsider travel plans.
- Ensure all residents in your dwelling are accounted for.

2: STATUS ORANGE – Flood Warning

Flooding is expected. Immediate action is required - Is used from half an hour to one day in advance of flooding.

Following Actions:

As with Flood Alert plus;

- Move valuables and other items to safety
- Prepare flood kit.
- Prepare to turn off gas, electricity and other services.
- Be prepared for evacuation.
- Protect yourself and others that need your help.

3: STATUS RED – Severe Flood Warning

Severe flooding. Danger to life - Is used when flooding poses a significant threat to life.

Following Actions:

As with Flood Warning plus;

- Stay in a safe place.
- Turn off gas, electricity and water supplies if safe to do so
- Try to keep calm, and to reassure others, especially children
- Co-operate with emergency services and local authorities
- Prepare for evacuation.
- Call 999 if you are in immediate danger.

In the Event of a Breach Scenario no warning may be provided and the first sign of flooding may be water entering the site. In this situation ensure all site users are safely gathered inside the building and contact the emergency services. Follow the actions as shown on the Severe Flood Warning.

APPENDIX 2: Emergency Flood Box Contents

1. Encapsulated procedure checklist for Flood Officer with pen
2. Torch and battery back-up for mobile phone/tablet or dynamo radio
3. A first-aid kit, including a supply of any essential medication
4. Red and white hazard tape
5. A list of useful telephone numbers
6. An up to date copy of flood warning information (Met Eireann/Cork City Council)

Procedure list is to assist in delivery of the response plan:

Priority	Action	Complete ✓
1	Account for all residents and inform about flood warning.	
2	Continue to monitor situation by watching/listening to media.	
3	Gather residents and visitors to podium level and above.	
4	Contact Emergency Services	
LEAVE THE PROPERTY FOLLOWING EMERGENCY SEVICES INSTRUCTIONS		

APPENDIX 3: Document Log

Revision	Author	Date	Changes Made
Draft (Not official issue)	Melissa Crouch (DBFL Consulting Engineers)	15.11.24	-

ENVIRONMENT ISO 14001:2015 NSAI Certified

HEALTH & SAFETY ISO 45001:2018 NSAI Certified

QUALITY I.S. EN ISO 9001:2015 NSAI Certified

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