Mixed Use Development at Chadwicks, Santry Avenue, Dublin 9.

Site Specific Flood Risk Assessment

200060-X-X-X-XXX-RP-DBFL-CE-0002

INFRASTRUCTURE

June 2022

DBFL CONSULTING ENGINEERS

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1 Introduction

1.1 Background

DBFL Consulting Engineers were commissioned by the applicant to prepare a Site Specific Flood Risk Assessment (SSFRA) for a strategic housing development on a site measuring c.1.5 hectares located at the junction of Santry Avenue and Swords Road, Santry, Dublin 9. The development site is bounded to the north by Santry Avenue, to the east by Swords Road, to the west by Santry Avenue Industrial Estate and to the south by the permitted Santry Place development (granted under Dublin City Council Ref's. 2713/17 & 2737/19).

The proposed development provides for 350 no. apartments, comprised of 113 no. 1 bed, 218 no. 2 bed, & 19 no. 3 bed dwellings, in 4 no. seven to fourteen storey buildings, over basement level, with 4 no. retail / commercial units, a medical suite / GP Practice unit and a community use unit located at ground floor level facing onto Santry Avenue and Swords Road. A one storey residential amenity unit, facing onto Santry Avenue, is also provided for between Blocks A & D.

The development will consist of the following

(1) Demolition of the existing building on site i.e. the existing Chadwicks Builders Merchants (c. 4,196.8m^2).

(2) Construction of 350 no. 1, 2, & 3 bed apartments, retail / commercial and community uses in 4 no. buildings that are subdivided into Blocks A-G as follows:

- Block A is a 7 to 14 storey block consisting of 59 no. apartments with 2 no. commercial/retail units located on the ground floor. Adjoining same is Block B, which is a 7 storey block consisting of 38 no. apartments with 1 no. commercial/retail unit, 1 no. medical suite / GP practice unit and refuse storage areas provided for at ground floor level.
- Block C is a 7 storey block consisting of 55 no. apartments with refuse storage areas provided for at ground floor level. Adjoining same is Block D which is a 7 to 10 storey block consisting of 51 no. apartments with 1 no. commercial unit / café located on the ground floor. A refuse storage area is also provided for at ground floor level.
- Block E is a 7 to 10 storey block consisting of 58 no. apartments with 1 no. community use unit located on the ground floor. A refuse storage area, substation, & switchroom are also provided for at ground floor level. Adjoining same is Block F which is a 7 storey block

consisting of 55 no. apartments. A refuse storage area & bicycle storage area are also provided for at ground floor level.

- Block G is a 7 storey block consisting of 34 no. apartments with a refuse storage area & bicycle storage area provided for at ground floor level.

(3) Construction of a 1 storey residential amenity unit located between Blocks A & D.

(4) Construction of basement level car parking accommodating 173 no. car parking spaces & 719 no. bicycle parking spaces. Internal access to the basement level is provided from the cores of Blocks A, B, C, D, E, & F. External vehicular access to the basement level is from the south, between Blocks B & C. 36 no. car parking spaces & 58 no. bicycle parking spaces are also provided for within the site at surface level.

(5) Public open space is provided for between Blocks C, D, E, & F. Communal open space is provided for between (i) Blocks E, F, & G, (ii) Blocks A, B, C, & D, and (iii) in the form of roof gardens located on Blocks A, C, & F and the proposed residential amenity use unit. The development includes for hard and soft landscaping & boundary treatments. Private open spaces are provided as terraces at ground floor level of each block and balconies at all upper levels.

(6) Vehicular access to the development will be via 2 no. existing / permitted access points: (i) on Santry Avenue in the north-west of the site (ii) off Swords Road in the south-east of the site, as permitted under the adjoining Santry Place development (Ref. 2713/17).

(7) The development includes for all associated site development works above and below ground, bin & bicycle storage, plant (M&E), sub-stations, public lighting, servicing, signage, surface water attenuation facilities etc.

This SSFRA was prepared to comply with current planning legislation, in particular the recommendations of "The Planning System & Flood Risk Management - Guidelines for Planning Authorities".

Figure 1.1 – Site Location, Santry Avenue, Dublin 9 (Extract Google Maps)

1.2 Objectives

The objective of this report is to inform the planning authority regarding flood risk for the development of residential units on the subject site. The report assesses the site and development proposals in accordance with the requirements of "The Planning System and Flood Risk Management Guidelines for Planning Authorities".

The report clarifies the site's flood zone category and presents information which would facilitate an informed decision of the planning application in the context of flood risk. The report also outlines appropriate flood risk mitigation and management measures for any residual flood risk.

2 Planning System and Flood Risk Management Guidelines

2.1 General

"The Planning System and Flood Risk Management Guidelines for Planning Authorities", November 2009 and its technical appendices outline the requirements for a site specific flood risk assessment.

Residential development is classified as "highly vulnerable development" according to Table 3.1 of the Guidelines. Table 3.2 of the Guidelines indicates that this type of development is appropriate and compatible with flood zone C i.e. outside the 1000 year (0.1% AEP) flood extents.

Highly vulnerable development may also be compatible with Flood Zone Category B depending on its performance in a site justification test. Therefore, as part of the sequential approach mechanism of the Guidelines, a justification test is only required if 'highly vulnerable development' is proposed in Flood Zone B.

2.2 Flood Risk Assessment Stages

This site-specific flood risk assessment will initially use existing flood risk information to determine the flood zone category of the site and to check if the Guidelines Sequential Approach has been applied or if a justification test is required; - refer to Figure 2.1 below for details. Flood risk is normally assessed by a flood risk identification stage followed by an initial flood risk assessment. A more detailed flood risk assessment stage may then follow which includes an assessment of surface water management, flood risk and mitigation measures to be applied.

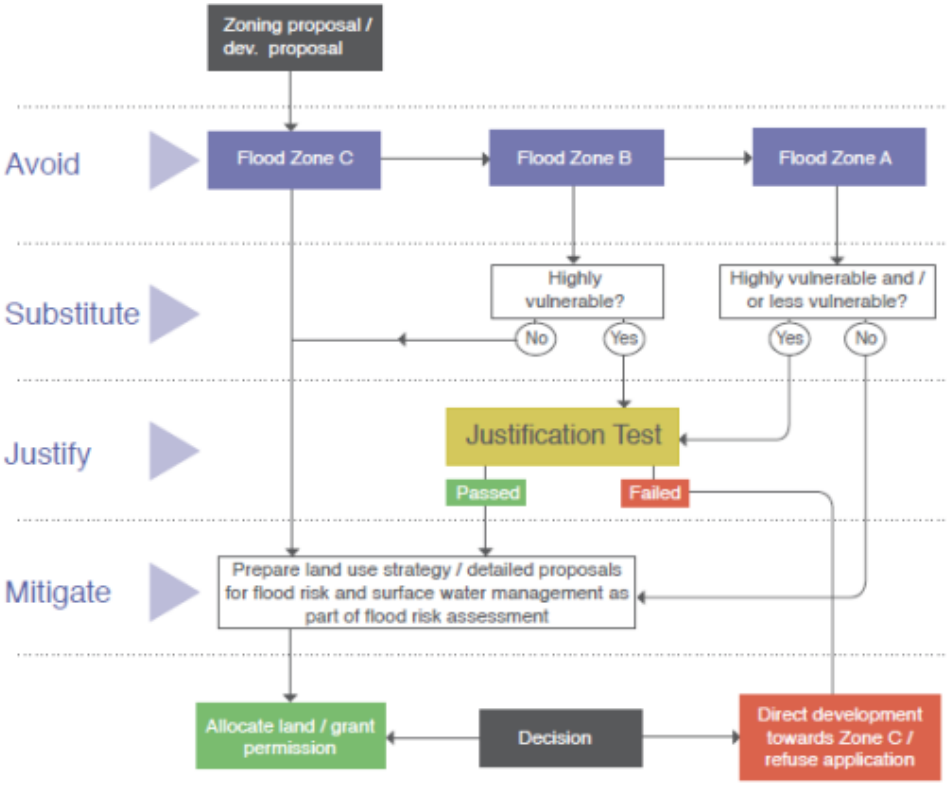

Figure 2.1 – Sequential Approach Mechanism in the Planning Process

3 Flood Risk Identification Stage

3.1 General

The initial flood risk identification stage uses existing information to identify and confirm whether there may be flooding or surface water management issues for the lands in question that warrant further investigation.

3.2 Information Sources Consulted

Information sources consulted for the identification exercise are outlined in Table 3.1 below.

Information	Source	Assessment
Predictive and historic flood maps, and benefiting lands maps, such as those available on http://www.floods.ie;	OPW www.floodmaps.ie and ECFRAMS website consulted.	The proposed development is located outside the extents of the 1 in 1000 year (0.1% AEP) of the Santry River (Fig 3.1). Flood events were recorded by DCC on the 24/04/1958 and 20/01/1965 approximately 300m to the south of the site on Swords Road (Fig 3.2). A Report produced by D.C.C. titled "Wad River catchment Study - Full Catchment Report Rev E " concludes the flooding was pluvial, originating from the mostly culverted River Wad. The proposed site is within the catchment of the River Wad. It is noted that a number of defence assets have since been put in place downstream of the site. We believe these works to be the 1967 diversion via a culvert along Ballymun Road to the River Tolka. Information on the River Wad is not available on the ECFRAMS website. The site is located over 7km from the coast and outside tidal flooding extents.
Management areas available on www.floodinfo.ie	OPW flood plans www.floodinfo.ie website consulted.	There were no OPW land commission schemes or benefitting land zones within the subject site's boundary.

Information	Source	Assessment
Ground Investigation January 2019	Ground investigation conducted by GII on adjacent site in January 2019 as part of Planning Ref: 2713/17 & 2737/19 (directly south of the proposed development).	Perched water was encountered in one of the three boreholes conducted. The stratification is consistent with the groundwater vulnerability declared on the GSI mapping.
Topographical maps.	OSI Maps consulted, site topographic survey undertaken and analysed.	No evidence found of flooding within the proposed bounds of development. Historic maps (1888-1913) (Fig 3.3) were consulted. No evidence of previous water course or culvert in vicinity of site.
Information on existing public sewerage condition and performance;	GDSDS performance maps for existing sewerage in the vicinity of the subject site examined.	GDSDS flood mapping shows that the site is outside the Santry River catchment (Fig 3.4).
Alluvial deposit maps of the Geological Survey of Ireland. These maps, while not providing full coverage, can indicate areas that have flooded in the past.	GSI maps consulted.	The site consists primarily of till derived from limestones. Groundwater vulnerability is low. Locally important aquifer-Bedrock which is moderately productive only in local zones.
Study on River Wad Catchment	River Wad Drainage Catchment Study Nicholas O'Dwyer Consulting Engineers.	The site was found to be within the catchment of the River Wad (Fig 3.5). The lower section of the Swords Road downstream of the site is also within the catchment of this River explaining the historical flooding event. D.C.C. has carried out a study on this river catchment and the report can be found under heading 'Wad River catchment Study - Full Catchment Report Rev E ' on D.C.C's website.
Hydrogeological Impact Assessment	AWN Consulting.	A hydrogeological Impact Assessment was completed for the site by Awn consulting under a different cover on 18/06/2021. It was found that the

Information	Source	Assessment
		proposed basement will have no long term impact on water levels in the overburden or underlying aquifer and no impact on the current water body status. The bedrock water table will not be affected by the excavation works.

Table 3.1 – Information Sources Consulted

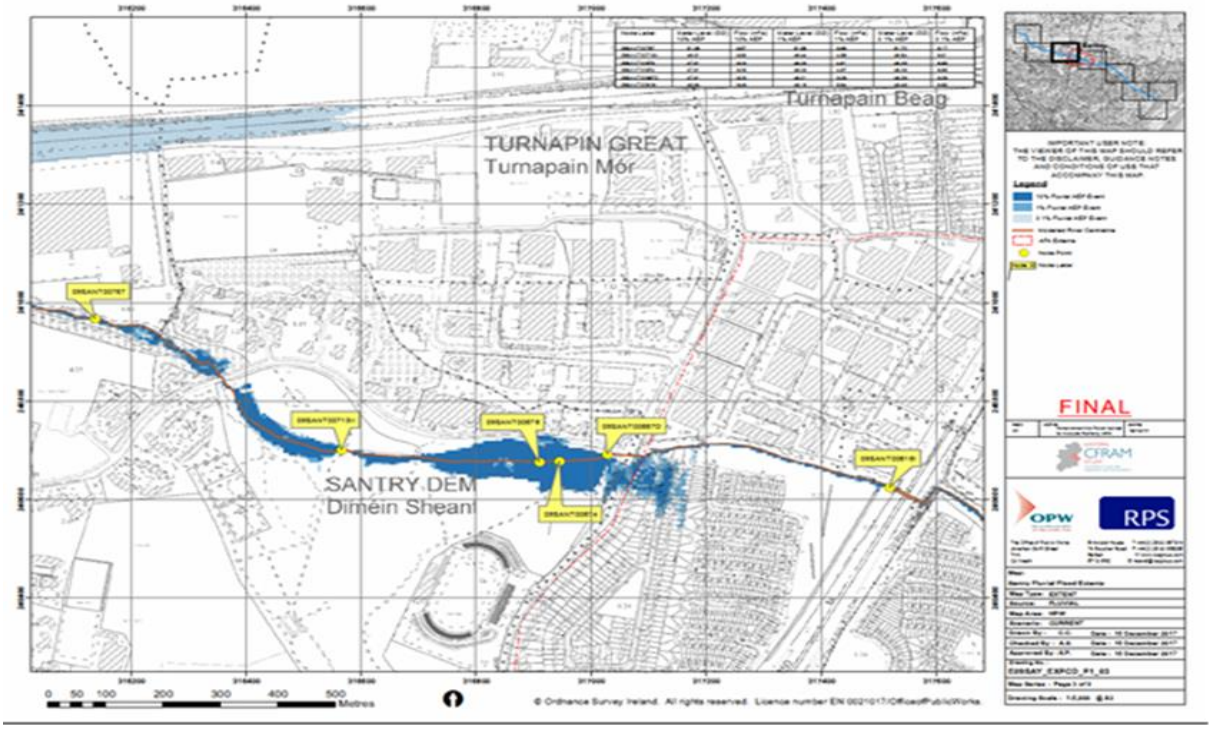

Figure 3.1 – Extract from ECFRAMS Mapping

(Site is to the south of the Santry River 0.1% AEP Flood Extents.)

Figure 3.2 – Extract from ECFRAMS Mapping, Location of 1958 Flood Event

Figure 3.3 – Extract from OSI Historical Mapping (1888-1913)

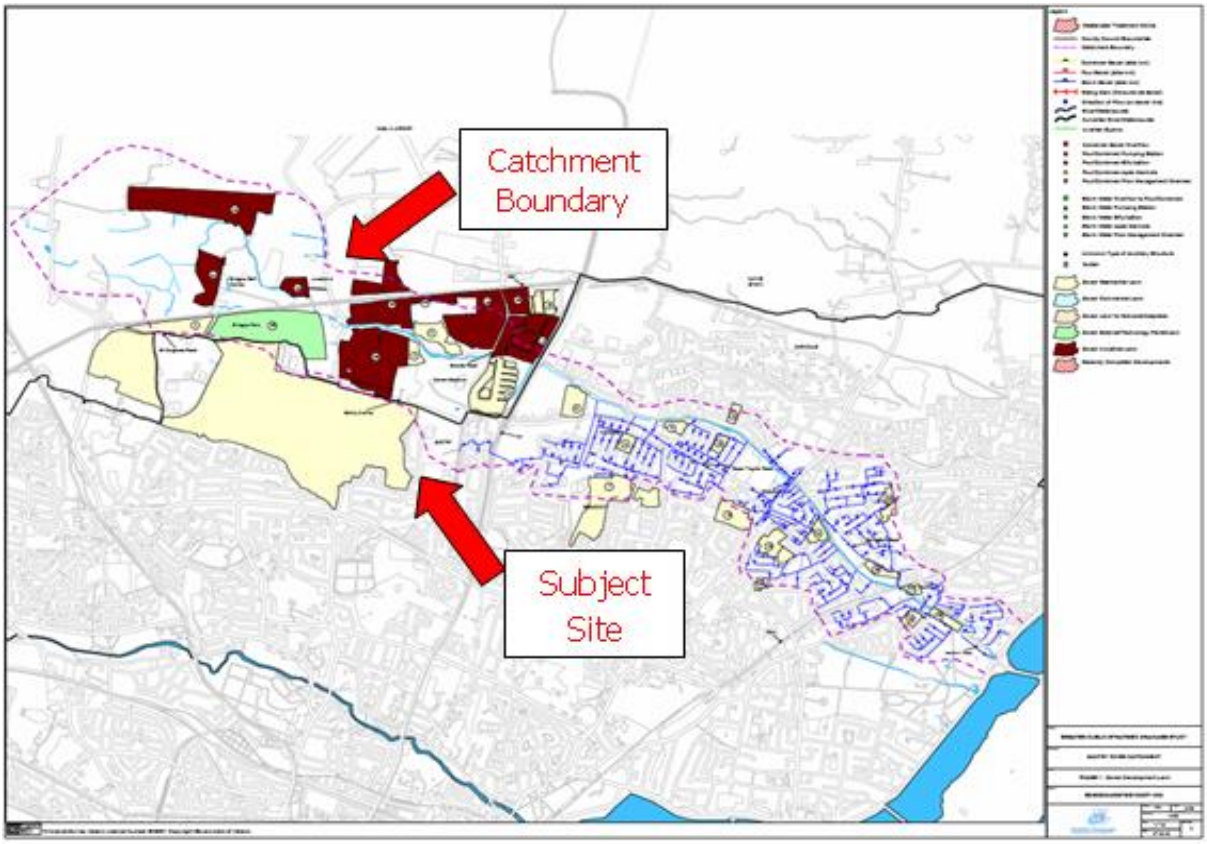

Figure 3.4 – Extract from Greater Dublin Strategic Drainage Study (GDSDS)

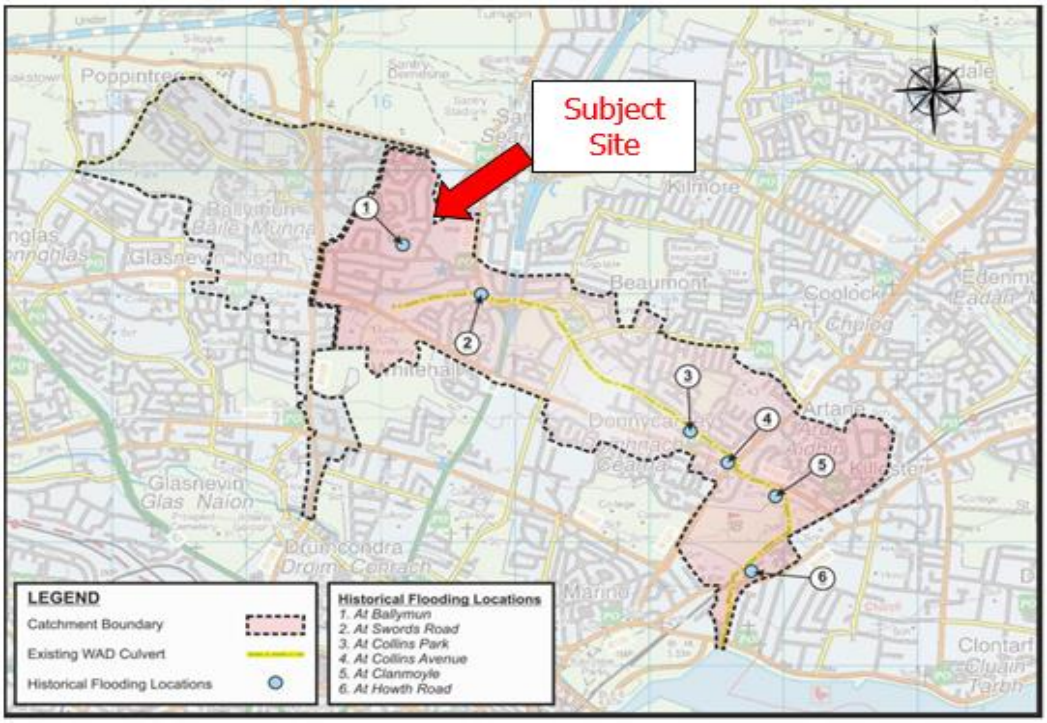

Figure 3.5 – Extract from 'River Wad Catchment Study – Full Catchment Report Rev. E'

(Site outside River Wad Catchment.)

3.3 Source – Pathway – Receptor Model

A Source-Pathway-Receptor model was produced to summarize the possible sources of floodwater, the people and assets (receptors) that could be affected by potential flooding (with specific reference to the proposals) and the pathways by which flood water from an event exceeding 1%AEP (Annual Exceedance Probability) would follow - see 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 commercial development proposal. These sources, pathways and receptors will be assessed further in the initial flood risk assessment stage.

Source	Pathway	Receptor	Likelihood	Impact	Risk
Tidal	Tidal flooding from coast 5km away.	**Residents (people)** development, **visitors** and the **buildings** themselves and other **property** such as **vehicles** located in basement car park.	Remote	High	Very Low
Fluvial	Flooding from Santry River.	**Residents (people)** development, **visitors, Road Bridge** and the **buildings** themselves and other **property** such as **vehicles** located in car park areas.	Remote	High	Low
Surface Water - Fluvial	Flooding from River Wad.	**Residents (people)** development, **visitors** and the **buildings** themselves and other **property** such as **vehicles** located in car park areas.	Remote	High	Low
Surface Water - Pluvial	Flooding from surcharging of the development's drainage systems.	**Residents (people)** development, **visitors** and the **buildings** themselves and other **property** such as **vehicles** located in car park areas.	Possible	High	Moderate
Surface Water - Pluvial	Flooding from internal sources	**Residents (people)** development, **visitors** and the **buildings**	Possible	High	Moderate

Source	Pathway	Receptor	Likelihood	Impact	Risk
	– overland flows.	themselves and other **property** such as **vehicles** located in car park areas.			
Surface Water - Pluvial	Flooding from external sources – overland flows.	**Residents (people)** development, **visitors** and the **buildings** themselves and other **property** such as **vehicles** located in car park areas.	Possible	High	Moderate
Groundwater Flooding	Rising GWL on the site.	**Residents (people)** development, **drainage infrastructure**, **basements**, **visitors** and the **buildings** themselves and other **property** such as **vehicles** located in car park areas.	Possible	High	Moderate
Human or Mechanical Error (Pluvial)	Petrol interceptor and hydrobrake.	Areas of development draining to the surface water network; **Residents (people)** development, **visitors** and the **buildings** themselves and other **property** such as **vehicles** located in car park areas.	Possible	High	Moderate

Table 3.2 – Source – Pathway – Receptor Analysis

It is clear from the above flooding analysis that the proposed site is not at risk from tidal or fluvial flooding due to its geographic location and topography.

There is a moderate risk of groundwater flooding the basement of the site. GSI records state that groundwater vulnerability is low. A ground investigation conducted by GII on an adjacent site in January 2019 as part of Planning Ref: 2713/17 & 2737/19 (directly south of the proposed development) noted that perched water was encountered in one of the three boreholes drilled but no significant water bearing gravels were identified. It has also been noted that no groundwater was encountered during the construction of the basement on the development to

the south (planning ref: 2713/17 & 2737/19). A full site investigation will be undertaken prior to construction and following grant of planning approval, the basement design/construction will take the findings into account.

Please refer to AWN Consulting's Hydrogeological Impact Assessment report under a separate heading.

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

4 Initial Flood Risk Assessment Stage

The flood risks to the proposed residential development identified from Stage 1 are a moderate risk of groundwater flooding of the underground drainage system and basement and a moderate risk of flooding due to the potential surcharging, blockage and mechanical failure of the proposed drainage network.

4.1 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified that there could be potential for pluvial flood risk within the development site related to the drainage system that could potentially cause local flooding unless it is designed in accordance with the regulations e.g. Greater Dublin Strategic Drainage Study (GDSDS) and to take account of flood exceedance for storm return periods exceeding 1%AEP (Annual Exceedance Probability).

Proper operation and maintenance of the drainage system should also be implemented to reduce the risk of human or mechanical error causing pluvial flood risk from blockages etc.

Finally, the Source-Pathway-Receptor model identified that there could be potential for groundwater flood risk within the development site. A detailed site investigation will be carried out prior to construction, following grant of planning approval. It should be noted however that there was no groundwater encountered during construction of the development adjacent, to the south of the proposed development.

4.2 Flood Zone Category

Following the assessment of the flood risks to the site and the available information it is considered that the proposed site is located within Flood Zone Category C as defined by the Guidelines and as indicated by the ECFRAMS maps – refer to Fig 3.1. Therefore, the proposed residential development on the subject site is appropriate for this flood zone category, and a justification test is not required.

5 Detailed Flood Risk Assessment Stage

5.1 General

As a justification test is not required, a detailed flood risk assessment must be carried out which considers moderate pluvial flood risk in relation to the following;

- Proposed surface water management measures.
- Flood exceedance.
- Impact of proposals on flood risk to adjacent areas.
- Effects of climate change.
- Access and egress during flood events
- Residual risks.
- Effectiveness of any flood mitigation measures.

5.2 Proposed Surface Water Management Measures

The following approach and parameters have been used:-

- Drainage design consists of Sustainable Drainage system (SuDS) with roof downpipes, gullies, pipes, manholes, attenuation systems, and discharge control at outlets;
- SuDS systems to be provided including green roofs, permeable pavers, attenuation systems and petrol interceptors. Attenuation and permeable paving to be tanked;
- Attenuation to an underground attenuation system;
- Climate change factor of 20% has been applied;
- Site discharge rate is controlled to Greater Dublin Strategic Drainage Study (GDSDS) standards;
- Overland flow routes have been designed to direct surface flows away from buildings.

5.3 Assessment of Flood Risk

Flooding from overland flows:-

Site levels have been designed such that overland flow caused by flooding from the site drainage system, or from surface water that fails to enter the site drainage system in extreme events, will not flood buildings, or footpaths. Surface water is designed to remain within the bounds of roadway reservations or be directed to green areas.

Pluvial Flood Risks:-

Flooding from surcharging of the development's drainage systems:-

The surface water pipe system has been designed using MICRODRAINAGE Simulation modelling. MICRODRAINAGE Simulation uses the Wallingford Procedure, time/area full hydrograph methodology, including energy and momentum equations for dynamic analysis of surface water networks. The site drainage network is modelled as one system where all flows, capacities, water levels, surcharged manholes etc. are determined throughout the network for each critical storm duration.

The pipe system is considered to exceed the requirements of the GDSDS for a 1 in 30-year return period surcharge check.

The attenuation system has been sized for a 1 in 100-year return period, which exceeds the requirements of the GDSDS and it is designed using the current rainfall depth values available from Met Eireann including 20% increase for the effects of climate change.

Human or Mechanical Error - Pluvial

If petrol interceptors and hydrobrakes are not adequately cleaned and maintained, there is a risk that they would become a throttle and cause flooding upstream.

5.4 Access and Egress During Flood Events

During flood events, access and egress would need to be maintained and overland flow routes and extents would need to be carefully planned. All habitable spaces are located more than 400mm above the top water levels for attenuation systems for the 1 in 100 year event and are at no perceivable risk of flooding.

5.5 Mitigation Measures

Proposed mitigation measures to address residual flood risks are summarized below;

M1. The drainage network is designed in accordance with the recommendations of the GDSDS and provides attenuated outlets and associated storage up to the 100 year event plus 20% climate change.

M2. The proposed drainage system including the tanked attenuation system to be maintained on a regular basis to reduce the risk of blockages and unidentified damage.

M3. A maintenance contract for the hydrobrake should be entered into with a specialist maintenance company.

M4. In the event of storms exceeding the design capacity of the drainage system, water will be routed away from the proposed buildings onto green areas. Overland flow routes for pluvial events should not be built on or become blocked off.

M5. All proposed finished floor levels are at minimum 400mm above the calculated water level of a 1 in 100yr storm event.

6 Residual Risks

There is a low risk of pluvial flooding of the development from surcharging of the development's drainage system. However, the surface water network is designed in accordance with the recommendations of the GDSDS and provides attenuated outlets and associated storage up to the 100 year event plus 20% climate change.

7 Conclusion

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 and will not cause an increased risk of flooding to external properties.

It is determined that the proposed site is located within Flood Zone C and therefore a Justification Test is not required.

A regularly maintained drainage system will ensure that the network remains effective and in good working order should a large pluvial storm occur. In the event of extreme pluvial flooding then overland flood routes will direct water towards the open space areas.

While the development constitutes 'highly vulnerable' development, it is appropriate for this flood zone and the scheme is designed to ensure that the risk of flooding of the development is reduced as far as is reasonably practicable. The development does not increase the risk of flooding to adjacent areas and roads once mitigation measures are implemented.

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