

Woodbrook Phase 1

Flood Risk Assessment

Aeval

October 2019



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1. Introduction and Background

1.1. Proposed Scheme

The purpose of this Flood Risk Assessment (FRA) is to review the flood risk associated with the proposed development at Lands at Woodbrook.

For the purposes of planning, the Woodbrook Development lands have been split into two Phases; Phase 1 (to which this planning application applies) and Phase 2 which will be delivered at a later stage. The FRA has been undertaken for the overall Woodbrook development site including Phase 1 and the future Phase 2.

The proposed Phase 1 development (21.9ha to which this planning application applies within the red line) consists of a residential-led development comprising 685no. residential units (207 no. houses, 48 no. duplexes & 430 no. apartments) and 1 no. creche facility (429 m²) in buildings ranging from 2 to 8-storeys. The proposed Phase 1 development also includes the provision of 2 no. replacement golf holes for Woodbrook Golf Club and a 164-no. space temporary car park adjacent to the future Woodbrook Dart Station, see Figure 1-1 below for the site location. A detailed description of the development is included in the Architectural Design Statement associated with this application.

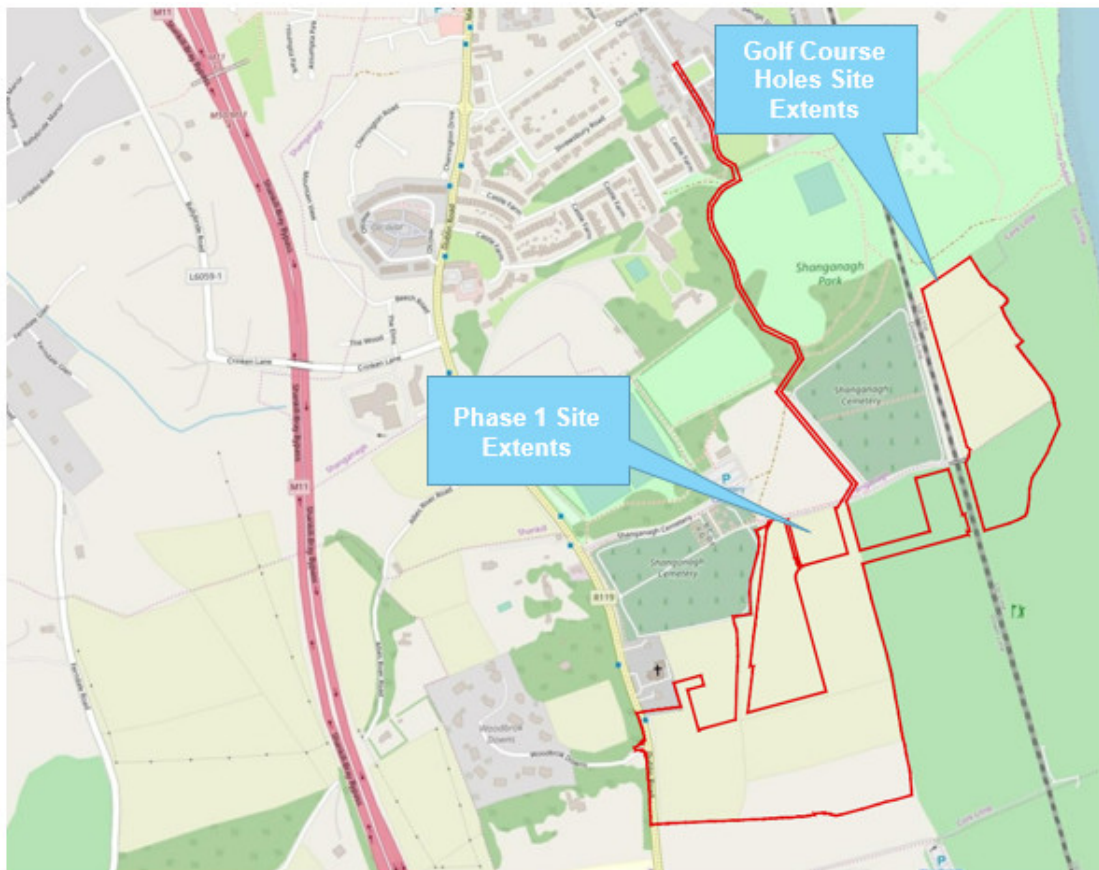


Figure 1-1 - Site Location (Phase 1)

It is currently proposed that the future Phase 2 development will consist of 803no. residential units (53 no. houses, 53 no. duplexes & 697 no. apartments), a 720 no. pupil primary school and a commercial use area within the neighbourhood centre (1,200 m²).

As noted above, this FRA will hereafter refer to 'the site' as the entire Woodbrook development i.e. Phase 1 (to which this application applies) & Phase 2 (future development). Furthermore, the FRA will review only the residential area to the west of the railway line. Proposed works to the east of the railway line relate to replacement of 2 no. golf holes for Woodbrook Golf Club. As this area will remain a green landscaped area the 2 no. replacement golf holes will not be included in the site area to be reviewed as part of this FRA. Figure 1-2 below displays the site extents reviewed as part of this FRA.



Figure 1-2 – Site Extents for Assessment

1.2. Site Location

The proposed development site is located at Woodbrook, Co Dublin. The proposed development site is located on existing agricultural lands and a section of the existing golf course.

The residential site is bound to the North by a cemetery and greenfields, to the East by an active railway line, to the south by greenfields and a small number of residential and business developments, and to the west by a church and the R119 Dublin Road.

The most immediate hydrological features in the vicinity of the site are the Crinkeen/Woodbrook stream, and the Irish Sea coastline as shown in Figure 2-1 below.

A full description of the development is included in the Planning Report associated with this application and full details of the proposed drainage are contained within the engineering drawings and in the engineering report.

1.3. Flood Risk Assessment

This FRA has been undertaken to satisfy the requirements of the Planning System and Flood Risk Management Guidelines, here after referred to as 'The Guidelines', and is aimed at scoping sources of flooding, assessing whether any significant flood risk issues exist and proposing appropriate flood risk management measures as required. The flood risk assessment can be considered to satisfy the Stage 1 – Flood Risk identification and Stage 2 – Preliminary Flood Risk Assessment requirements as set out in The Guidelines. It is considered that this level of assessment is sufficient given the nature of the development and the level of flood risk identified for the site.

2. Site Description

2.1. Site Location

The proposed development site is located on agricultural lands and a section of a golf course (approx. area 21ha). The site is bound to the North by a cemetery and greenfields, to the East by an active railway line, to the south by greenfields and a small number of residential and business developments, and to the west by a church and the R119 Dublin Road.

The existing topographical levels within the proposed development site range from 14.95m.AD to 24.50m.AD. The site is slightly to moderate sloping in two directions. The highest point within the site is located to the North-Eastern corner and falls towards the West and South.

2.2. Local Hydrology & Existing Drainage

The most immediate hydrological features in the vicinity of the site are the Crinkeen/Woodbrook stream, and the Irish Sea coastline as shown in Figure 2-1 below.

The Crinkeen / Woodbrook stream runs from North-West to East approx. 150 metres from the southern boundary of the proposed development site. The catchment upstream of the site is 3.564km² and discharges directly into the Irish Sea approx. 1 km downstream. The catchment area is steeply to shallow sloping and consists largely of greenfields and residential developments.

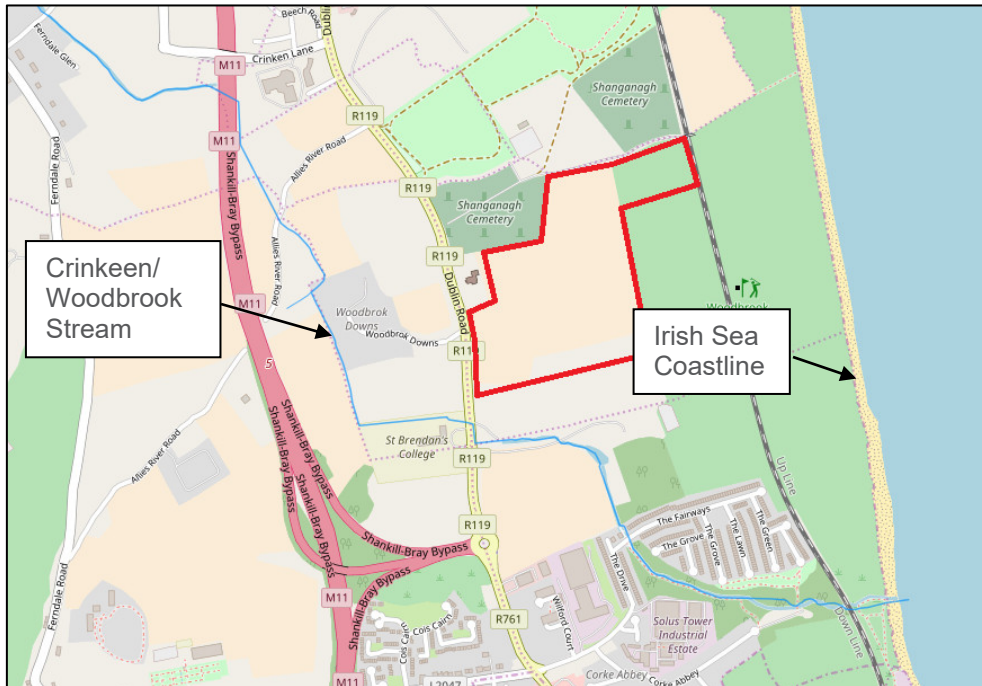


Figure 2-1 – Hydrological Features

3. The Planning System and Flood Risk Management Guidelines

3.1. General

Flooding is a natural process that can happen at any time in a variety of locations, and which affects people indiscriminately. Flooding from the rivers and sea is probably the best known source of flooding, however flooding can also occur from prolonged, intense, and localised rainfall leading to flooding from sewers, overland flow and groundwater flooding. Flooding can be beneficial to the environment; however, it can also lead to significant effects on people's lives and properties.

Due to climate change, it is expected that the effects of flooding will continue to increase. These increases can be exacerbated by development increasing and accelerating runoff rates, removing floodplain storage and altering watercourses.

In September 2008 the OPW and DoEHLG posted a consultation document 'The Planning System and Flood Risk Management, Consultation Draft Guidelines for Planning Authorities, September 2008', which have subsequently been superseded by the final publication of The Planning System and Flood Risk Management, Guidelines for Planning Authorities in November 2009 (The Guidelines). The guidelines aim to integrate flood risk management into the planning process to assist in the delivery of sustainable development. It aims to encourage a transparent and consistent consideration of flood risk in the planning process.

The objectives of the guidelines are given as being (Paragraph 1.6):

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

3.2. Flood Risk Assessment Methodology

The recommended stages of flood risk assessment within the guidelines are:

- Flood risk identification – A desk based study to identify whether there may be any flooding or surface water management issues related to a plan area or proposed development site that may warrant further investigation;
- Initial flood risk assessment – A qualitative or semi-quantitative study to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information, to provide a qualitative appraisal of the risk of flooding to development, including the scope of possible mitigation measures, and the potential impact of development on flooding elsewhere, and to determine the need for further detailed assessment.
- Detailed flood risk assessment – A methodology to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of flood hazard to a proposed or existing development, of its potential impact on flood elsewhere and of the effectiveness of any proposed measures.

In Appendix A of the Planning Guidelines an explanation is given on the identification of flood risk and on undertaking the Flood Risk Assessment.

3.3. Decision Making Planning Process

Management of flood hazard and potential risks in the planning system should be based on an interpretation of the issues of both planning and flood risk set out within the guidelines and primarily, but not solely, based around the use of:

- Sequential Approach through the use of identified flood zones (see section 3.3.2 for definition of Flood Zones);
- Justification Test for development that needs to be in flood risk areas for reasons of proper planning and sustainable development.

The Sequential Approach and the Justification Test are explained in the following sections. The key principles of making decisions on planning in relation to flood risks are:

- Avoid risk where possible;
- Substitute less vulnerable uses, where avoidance is not possible,
- Justify if development is considered for strategic reasons; and
- Mitigate and manage the risk, where avoidance and substitution are not possible.

It is important to note that the guidelines are not intended to be unnecessarily restrictive to development but are aimed at promoting sustainable development through proper consideration of flood risk issues at all stages of planning and project development. They recognise the need for development on wider economic and social grounds and the fact that flood risk can be balanced against that need. They acknowledge that a considerable part of the urban structure of many of our major towns and cities are currently at risk of flooding.

Furthermore, they acknowledge that management of flood risk through design/mitigation measures is an acceptable process and that the guidelines themselves form only one element of helping to manage flood risk issues.

The other element, which will be used to help inform decisions in the future both with respect to planning and the need to protect existing infrastructure, which is at risk from flooding, is the Catchment-based Flood Risk Assessment and Management (CFRAM) Studies.

3.4. Flood Zones

The Planning Guidelines express the likelihood of flooding in the form of three flood zones. These flood zones each relate to geographical areas at high, moderate or low risk of flooding, depending on if they are Zone A, B or C respectively (as defined in Figure 3-1 and Table 3.2 Source: The Planning System and Flood Risk Management).

The likelihood of flooding can be defined either as a percentage, or the number of years it may, on average, happen in. For example, a 1 in 100 year event is expected, on average, to occur once every hundred years. This has a probability of occurring in any year of 1%.

Table 3.1 – Definitions of Flood Zones

Flood Zone	Description
A	The probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding, or 0.5% or 1 in 200 for coastal flooding)
B	The probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 years and 1% or 1 in 100 years for river flooding, and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 year for coastal flooding for coastal flooding)
C	The probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 years for both river and coastal flooding). Flood Zone C covers all areas of the plan which are non in Zones A or B

The determination of the extent of the flood zones should be based on current extreme water levels without any allowance for climate change. Specifically, The Guidelines state the following;

“They are based on the current assessment of the 1% and the 0.1% fluvial events and the 0.5% and 0.1% tidal events, without the inclusion of climate change factors.”

Aspects of climate change should then be addressed as part of any flood risk assessment including residual risks.

Furthermore, it is important to note that the flood zones shown in Figure 3-1 (Source: Figure 2.3, The Planning System and Flood Risk Management) are indicative of fluvial (river) and coastal flooding only, and do not include other information on the risk of flooding from sources such as groundwater or artificial drainage systems.



Figure 3-1 - Indicative Flood Zone Map Extract

3.5. Sequential Approach

The aim of the sequential approach is to guide development away from areas at risk from flooding. This approach, which should be applied to all stages of the planning and development management process, can be summarised by Figure 3-2, taken from The Guidelines.



Figure 3-2 - Sequential approach principles in flood risk management

The Guidelines detail the key actions to be undertaken when considering flood risk in the planning process. The first step is to identify flood risk at an early stage of the planning process. Once flood risk has been identified, steps should be taken to avoid the flood risk, by locating development in areas with little or no flood risk where possible. Development should only be permitted in areas known to be at risk of flooding where there are no alternative, reasonable sites available in areas of lower risk that also meet proper planning and sustainable development objectives.

A precautionary approach should then be applied, to take account of uncertainties inherent in flood datasets, flood risk assessment techniques, prediction of climate change and the performance of flood defences. Development should therefore not be proposed for areas which may be at increased risk of flooding in the future from, for example, climate change or coastal erosion.

The mechanism by which the sequential approach is applied is described in Figure 3-3 below.

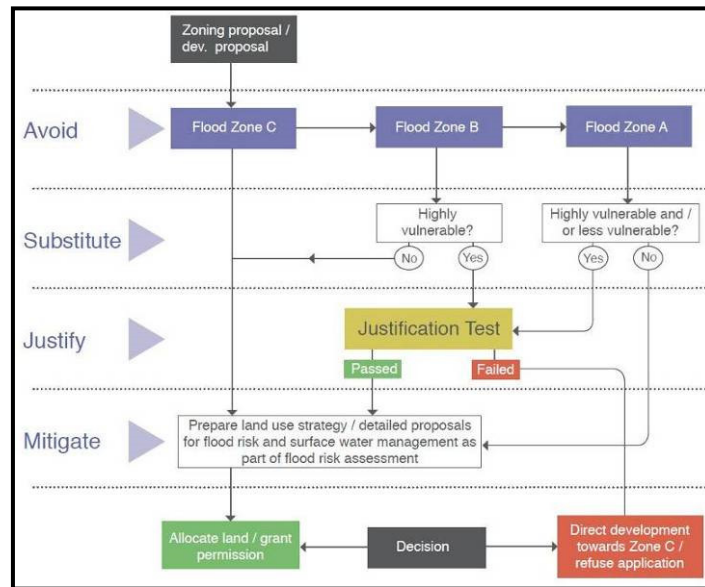


Figure 3-3 - The Sequential Approach mechanism in the planning process

The Guidelines classify what types of development are considered highly vulnerable, less vulnerable and water compatible (Table 3.1 of the Planning Guidelines) and these are shown in Figure 3-4.

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	<ul style="list-style-type: none"> Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility, and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	<ul style="list-style-type: none"> Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	<ul style="list-style-type: none"> Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

*Uses not listed here should be considered on their own merits

Figure 3-4 – Land Use Vulnerability Classifications

The assessment of the development's vulnerability together with the previously identified flood zones is used to determine which development types are appropriate for each of the Flood Zone categories. Figure 3-4 and Table 3.2 (Copied from The Guidelines) can be used to inform which types of development are appropriate for each flood zone and which would be required to undertake and meet the requirements of the Justification Test (see section below).

Table 3.2 - Classification of vulnerability of different types of development and the need to meet the Justification Test

	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

Flood zones do not account for the effect of any defences present at that location. Whilst areas benefiting from defences have a reduced risk of flooding, there is still a residual risk. In addition, sites can be vulnerable to the increased speed of flooding caused when these defences are overtopped, breached, or subjected to another type of failure. As a result of this residual risk, the Sequential Approach, and if required, the Justification Test should still be applied to defended locations.

3.6. Justification Test

The Justification Test has been designed to rigorously assess the appropriateness of developments that are being considered in areas of medium or high flood risk. The glossary in the Planning Guidelines describes a justification test as: “An assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The justification test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk based approach adopted by this guidance.”

The Justification Test is comprised of two processes:

1. Plan-making Justification Test
2. Development management Justification Test

1. Plan-making Justification Test

Is used at the plan preparation and adaptation stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding. The following criteria must be satisfied:

1. The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.
2. The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:
 - [i] Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement;
 - [ii] Comprises significant previously developed and/or under-utilised lands;
 - [iii] Is within or adjoining the core of an established or designated urban settlement;
 - [iv] Will be essential in achieving compact and sustainable urban growth; and
 - [v] There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.
3. A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere.

N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment.

The Plan-making Justification Test is intended for use at the plan preparation and adoption stage where it is intended to zone land which is located in Zone A or B.

2. Development Management Justification Test

Is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding, which would generally be inappropriate for that land. The development management justification test is to be submitted by the applicant.

If the requirements of the Plan-making Justification Test are satisfied, then the following additional detailed criteria must also 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: In the event that land is zoned without the benefit of the guidelines, please refer to Para 5.27 of the guidelines.

4. Flood Risk Identification for the Site

4.1. OPW / EPA / Local Authority Hydrometric Data

The OPW, EPA and local authority hydrometric data were investigated. This investigation has determined that there are no existing active permanent or historic hydrometric gauging stations for the land drains in the vicinity of the proposed development site.

4.2. OPW Draft PFRA Mapping

Draft Preliminary Flood Risk Assessment (PFRA) Maps have been produced for the whole country by the OPW Figure 4-1 below, extracted from OPW PFRA Map number 2019/MAP/222/A illustrates predictive flood zones in the vicinity of the site.

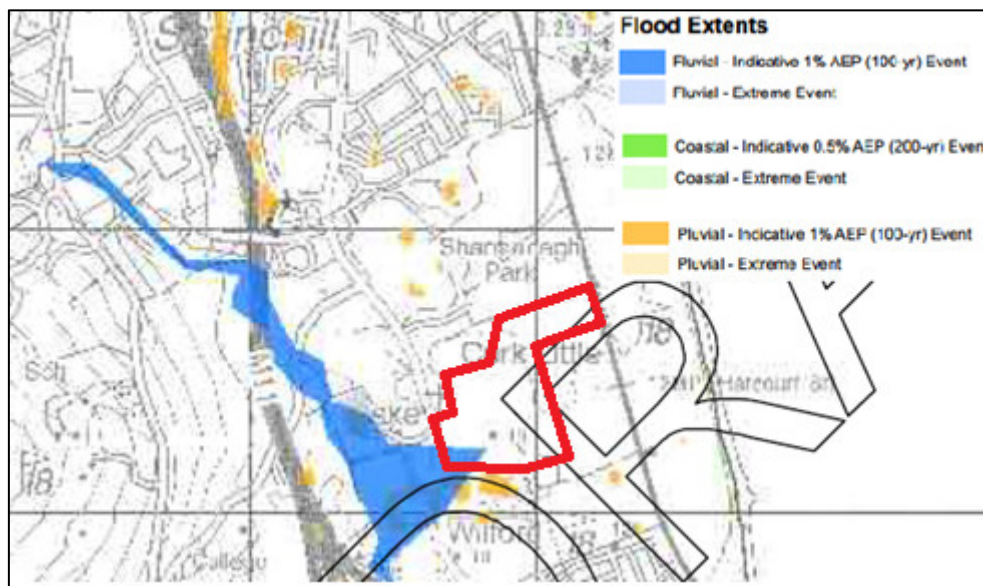


Figure 4-1 – OPW PFRA Map

Figure 4-1 above indicate that the site is within the predicted 1 in 100 year fluvial flood extents. It should be noted that the predicted extent of the flooding shown on these maps was developed using low resolution digital terrain model (DTM) and the terrain model does not account for man-made infrastructures, hence the illustrated flood extents are intended to be indicative only.

4.3. OPW Flood Hazard Website

The OPW Flood Hazard Mapping website (www.floodmaps.ie) was consulted in relation to available historical or anecdotal information on any flooding incidences or occurrences in the vicinity of the site Figure 4-2 below shows mapping from the Flood Hazard Mapping website in vicinity of the study area:

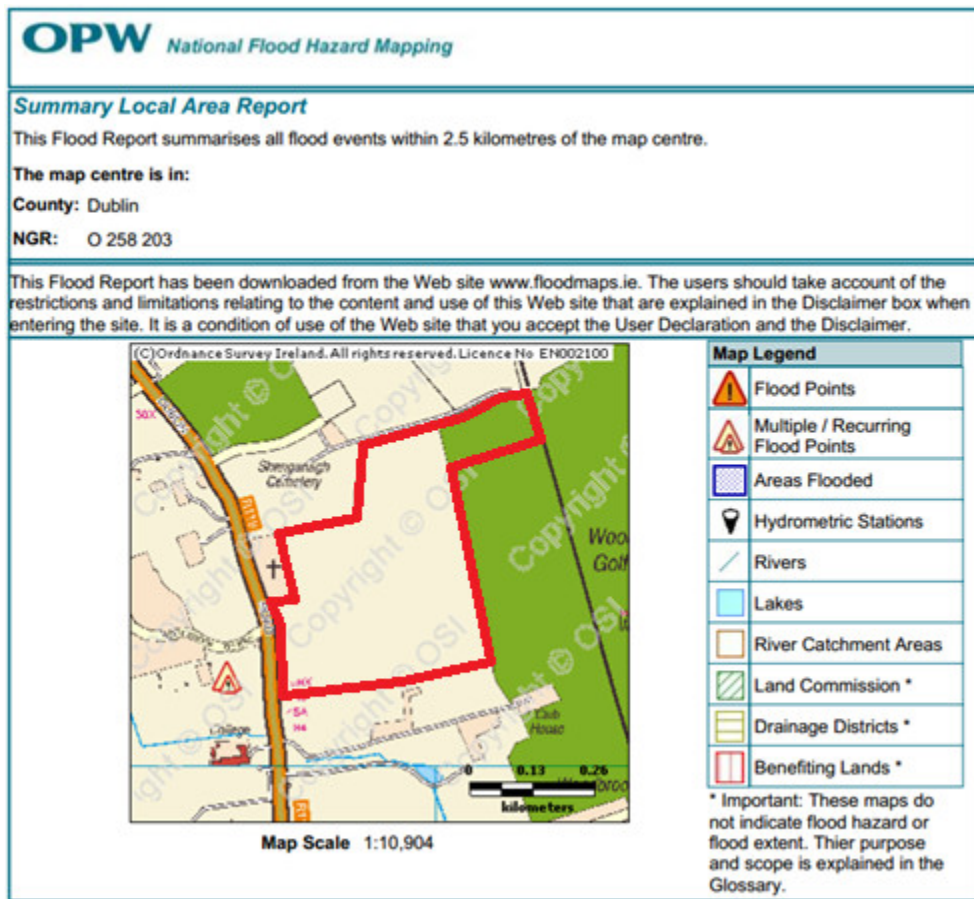


Figure 4-2 – OPW Flood Hazard Map

Figure 4-2 above indicates flooding at 1 No. location in the vicinity of the proposed development site. Occasional flooding from the Crinkeen / Woodbrook Stream occurs at this location which affects a section of the R119 Dublin Road at the junction with the access road to Woodbrook Golf Club and Woodbrook College. The flooding is believed to be contributed from a blockage in the culvert within the watercourse underneath the Dublin Road.

4.4. Ordnance Survey Historic Mapping

Available historic mapping for the area was consulted as this can provide evidence of historical flooding incidences or occurrences. The maps consulted were the pre-1900's historic 6-inch colour and 25-inch maps. The flood maps layer was investigated to identify any potential flood plains within the environs of the site.

Figure 4-3 and Figure 4-4 below illustrates the historic map for the site environs:

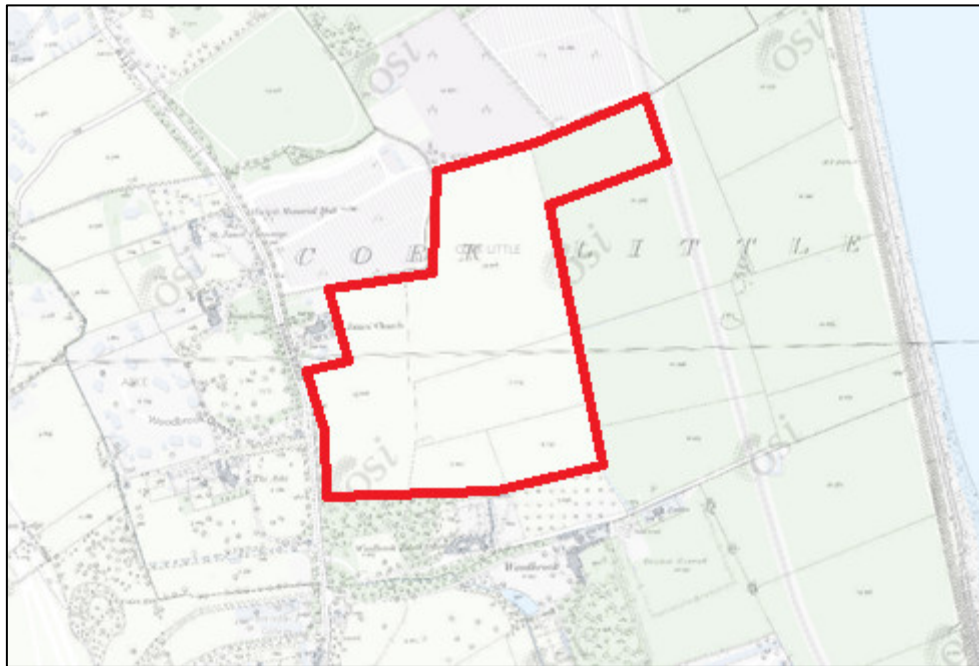


Figure 4-3 – OSI 25 Inch Map

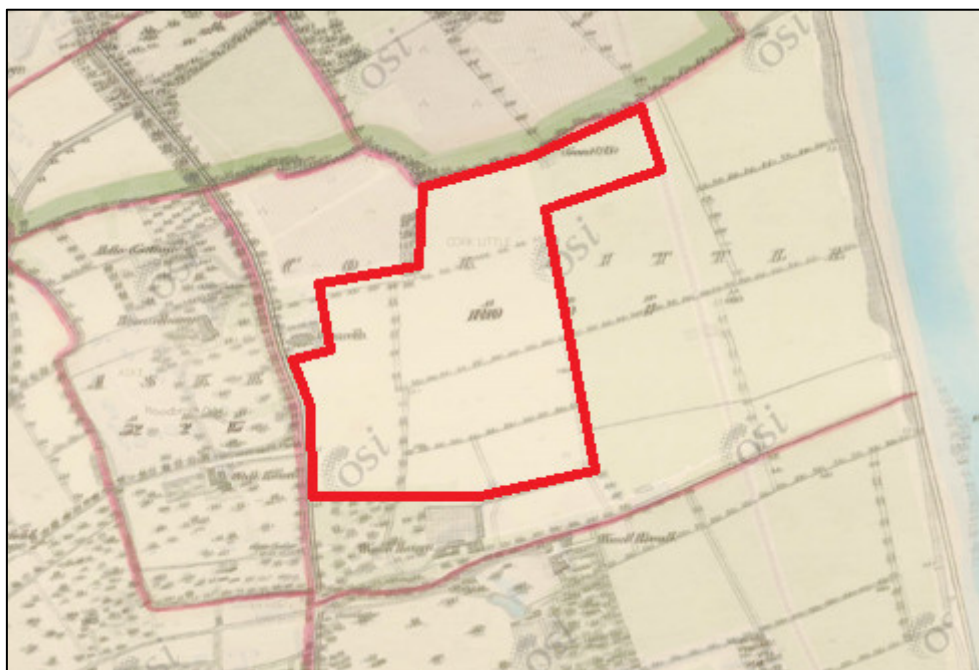


Figure 4-4 – OSI 6 Inch Colour Map

With reference to the pre-1900's historic maps and the flood maps layer, no indication of historical or anecdotal instances of flooding were observed within the environs of the site.

4.5. Geological Survey of Ireland Mapping

The soils maps of Geological Survey of Ireland (GSI) were consulted to determine the presence of alluvium deposits in the vicinity of the site. Deposition of Alluvium deposits can be an indicator of areas which have flooded in the recent geological past.

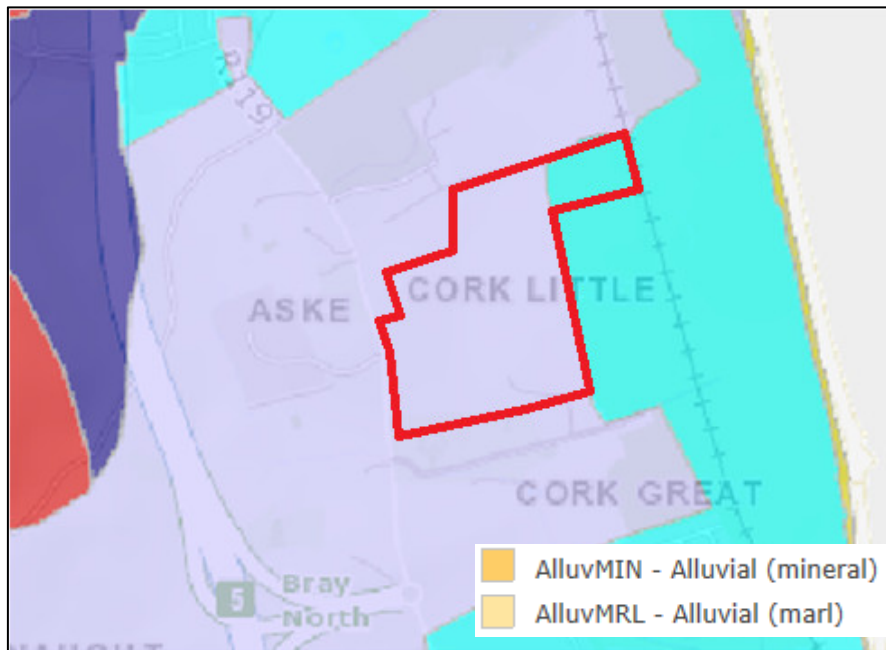


Figure 4-5 – GSI Soils Map

Figure 4-5 above shows the soils mapping for the proposed development site, which does not indicate alluvium deposits within the proposed development site.

4.6. Eastern CFRAM Study

The Eastern Catchment Flood Risk Assessment Management (CFRAM) Study was undertaken by the Office of Public Works (OPW) and its partners. The study produced detailed flood maps and a catchment flood risk management plan which identified a programme of prioritised studies, actions and works to manage the significant flood risks in the Eastern River Basin District.

A detailed flood map produced for the Crinkeen / Woodbrook Stream shown in Figure 4-6 below, indicate that the proposed development site would not be affected by out of bank flooding from the Crinkeen / Woodbrook Stream during the 1 in 10 year, 1 in 100 year and 1 in 1000 year flood events.

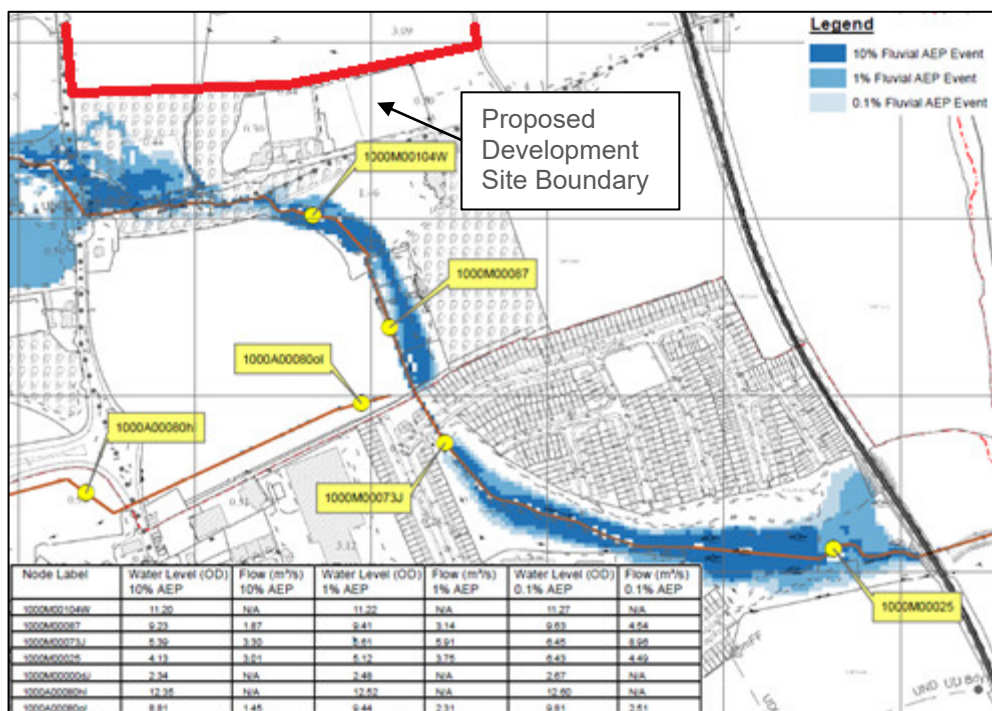


Figure 4-6 – Eastern CFRAM Predicted Flood Map

4.7. DLR CDP SFRA 2016-2022

The Strategic Flood Risk Assessment (SFRA) produced as part of the County Development Plan (CDP) 2016-2022 for the Dun Laoghaire – Rathdown County Council District Area includes Flood Zone Maps, which covers the proposed development site.

Flood Zone maps were produced based on information compiled from a data collection exercise. The information incorporated into the Flood Zone Maps were obtained from sources listed below:

- Draft PFRA Maps
- Draft ECFRAM Maps
- Irish Coastal Protection Strategy Study
- Previous Recorded Flood Events
- JFLOW® (Site specific 2D hydraulic fluvial flood modelling software)

Figure 4-7 below indicate the proposed development site to be outside Flood Zone A (1% Annual Exceedance Probability) and Flood Zone B (0.1% Annual Exceedance Probability).

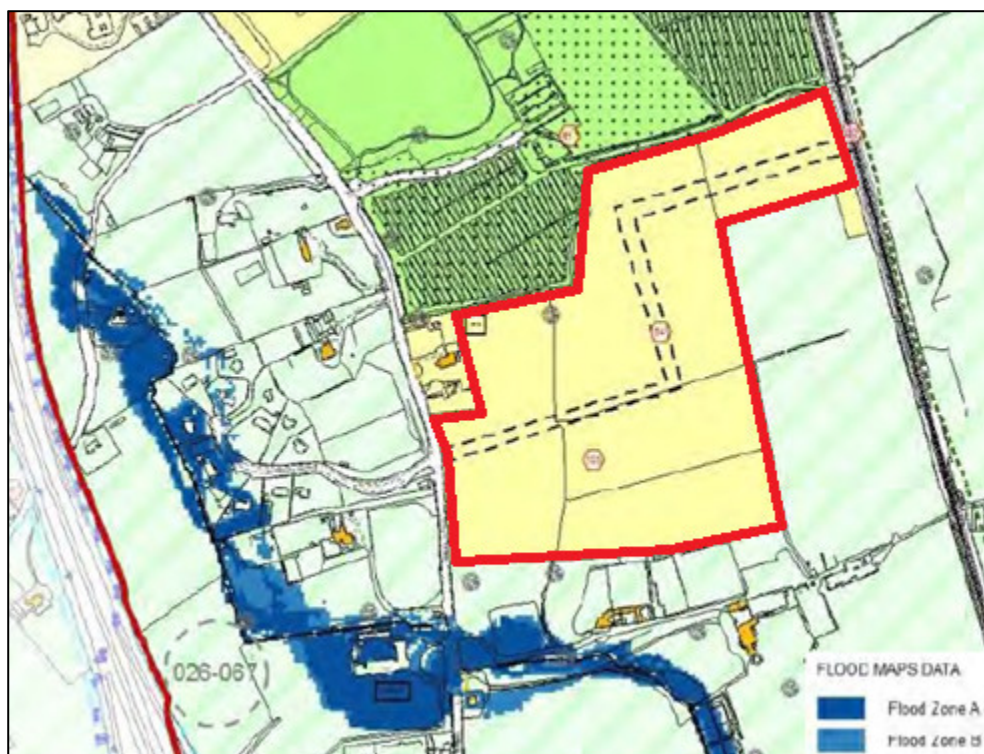


Figure 4-7 – DLR SFRA Predicted Flood Map

4.8. Woodbrook-Shananagh LAP SFRA 2017-2023

The Strategic Flood Risk Assessment (SFRA) of the Woodbrook Shanganagh Local Area Plan (LAP) provided a Justification Test for the proposed development site having regard to 'The Planning System and Flood Risk Management Guidelines for Planning Authorities', 2009 (DEHLG & OPW) and the Strategic Flood Risk Assessment (SFRA) undertaken at County level for Dún Laoghaire-Rathdown.

The proposed development site was noted in this SFRA to be within Flood Zone C (Low Probability), and also that it is designated for new residential development as per the objectives listed in Woodbrook-Shanganagh LAP.

4.9. Site Walk Over

A description of the site is provided in Section 2.1 above. This concluded that the site has a gradual slope falling from North to South.

The site had no visual sign of excess water apart from a number of minor low points with the agricultural field and appeared to be relatively well drained.

5. Application of the Planning Guidelines to the Proposed Development

5.1. General

This section sets out the details of how the proposed development at the site is considered to meet the wider requirements of The Guidelines.

5.2. Flood Zoning

The findings of the Flood risk identification as outlined above, including a desk based study to identify whether there may be any flooding or surface water management issues which may warrant further investigation, concludes that an Initial flood risk assessment is not required. As such it can be concluded that the entire site falls within Zone C, low probability of flooding.

5.3. Sequential Approach

On the basis of the fact that the proposed development is considered to fall within Zone C and applying the principles of the sequential approach as set out in The Guidelines, as presented above, it is considered that the development is appropriate for the location subject to the completion of a FRA (i.e. this report) and the satisfaction of the wider principles of proper and sustainable development.

5.4. Justification Test

Given that the proposed development is considered to be located within Zone C it can be concluded that the Justification Test is not required.

6. Exceedance Flows

6.1. General

Surface Water exceedance flows and measures to accommodate such flows from the site have been considered as part of the drainage design. Further details of which can be reviewed within the Stormwater Impact Assessment Report Atkins Document No. 5157801DG0011 and planning drawings 5154251_EWE_DR_0515 & 516.

7. Conclusions and Recommendations

7.1. Conclusions of Screening Assessment

The purpose of the screening assessment is to establish whether a flood-risk issue exists or may exist in the future. If there is a potential flood risk issue then this procedure should move to “Step 2 – Scoping Assessment” or if no potential flood risk is identified from the screening assessment, then the overall assessment can end at Step 1.

A Stage 1 flood risk assessment has been completed in accordance with The Guidelines the following conclusions can be drawn;

- There is no historic risk of flooding at the site.
- The OPW CFRAM flood extent maps studies have not been carried out in the area of the site and therefore do not show any flood risk at the site. On the basis of the maps the site could be considered to be located within Zone C, low probability of flooding.
- Given that the proposed development site is located in Zone C, low probability of flooding, is thus appropriate from a flood risk perspective subject to the completion of this FRA which considers other sources of flood hazard than river flooding and subject to it meeting the normal range of proper planning and sustainable development requirements.
- Given that the proposed development is located in Zone C and is appropriate development, consideration of the Justification Test is not required.
- The proposed development is not at risk of flooding from the 1% AEP event.
- Surface water runoff will be managed through the use of appropriate Suitable Sustainable urban Drainage Systems (SuDS) which include;
 - Swales within Open Space / Park areas adjacent to roads
 - Permeable paving in light traffic areas (parking bays) and temporary car park
 - Green roofs to suitable apartment blocks
 - Green courtyards to suitable apartment blocks
 - Underground modular system within green corridors / park areas
 - Filter drains in rear gardens
 - Tree pits along the main avenue
 - Flow control devices including vortex and orifice plates

Residual risks from more extreme events have been considered and it is concluded that these will not affect the site.

The PFRA predicted flood map indicate the south-west corner of the proposed development site to be within the 1 in 100 year fluvial floodplain from the Crinkeen / Woodbrook Stream. However it should be noted that the predicted flood extents are based on low resolution data and is intended to be indicative only. The Eastern CFRAM and DLR SFRA provide further detailed predicted flood maps for the Crinkeen / Woodbrook Stream. Both detailed flood maps show the proposed development site to be outside the potential 1 in 100 year and 1 in 1000 year floodplain. Hence this flood study is not required to proceed to “Step 2 – Scoping Assessment”.

7.2. Recommendations of Screening Assessment

The following recommendations should be considered;

- The proposed discharge for the storm-water outfall to the existing watercourse should be set at a maximum discharge rate of QBAR or 2 l/s/ha, whichever is the greater as per the ‘Greater Dublin Strategic Drainage Study Volume 2 – New Developments’ guidelines. Discharge rates to be agreed with Dun Laoghaire Rathdown County Council at planning stage.
- The proposed discharge for the storm-water drainage to the watercourse required be designed in accordance with best practice including the treatment (via SuDS systems) of surface water prior to discharge to watercourse.

- The design for the proposed storm-water drainage is to take into consideration all other standards for drainage design, from the 'Greater Dublin Strategic Drainage Study Volume 2 – New Developments.'
- SuDS are to be used within the proposed development to reduce surface water runoff from the site where feasible and designed in accordance with CIRIA report C753 'The SuDS Manual V-6'.
- Green roofs are to be implemented within the site for suitable apartment blocks. Where a green roof is not suitable, roof runoff is to discharge to soft SuDS in accordance with DLRCC Development plan requirements.
- A Storm Water Impact Assessment is to be carried out prior to planning submission in accordance with DLRCC Development plan requirements
- Soil Infiltration testing to be carried out prior to design of SuDS options to ensure site is suitable.

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