Project

Hollystown - Kilmartin SHD

Dublin 15

Report Title

Site Specific Flood Risk Assessment Report

Client

Glenveagh Homes Limited

INFRASTRUCTURE

DBFL CONSULTING ENGINEERS

December 2021

Document Control

Job Title:	**Hollystown - Kilmartin SHD, Hollystown, Dublin 15**
Job Number:	**170182**
Report Title:	**Site Specific Flood Risk Assessment Report**
Report Reference:	**170182-DBFL-XX-XX-RP-C-008**
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Date:	**December 2021**
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Revision	Issue Date	Description	Prepared	Reviewed	Approved
	06.04.2021	Stage 2 SHD	GH	DMW	DMW
Draft	08.10.2021	Stage 3 SHD	ASM	BCM	BCM
Draft	**29.10.2021**	Stage 3 SHD	ASM	BCM	BCM
Final	**10.12.21**	Stage 3 SHD	ASM	BCM	BCM

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1.0 INTRODUCTION

1.1 Background

DBFL Consulting Engineers (DBFL) has been commissioned by Glenveagh Homes Limited to prepare a Site Specific Flood Risk Assessment (SSFRA) for a proposed mixed-use development at Hollystown, Dublin 15. The proposed development relates to at a site of c. 25.3 ha at the townlands of Hollystown, Kilmartin, Hollywoodrath, Cruiserath, Yellow Walls, Powerstown, and Tyrrelstown, Dublin 15, which includes lands in the former Hollystown Golf Course and lands identified under the Kilmartin Local Area Plan 2013 (as extended). The lands are bound by the R121 and Hollywoodrath residential development to the east, the under construction Bellingsmore residential development to the south and north, the former Hollystown Golf Course to the north, Tyrrellstown Educate Together National School, St.Luke's National School and Tyrellstown Community Centre to the west and south and the existing Tyrrellstown Local Centre to the south.

The proposed development will consist of the development of 548 no. residential units, consisting of 147 apartments/duplexes and 401 houses, ranging in height from 2 to 5 storeys and including retail/café unit, 2 no. crèches, 1 no. Montessori, 1 no. community hub, car and bicycle parking, open space, public realm and site infrastructure over a site area of c. 25.3 ha. On lands to the north of the application site (referred to as Hollystown Sites 2 & 3) the proposed development includes for 428 units consisting of 401 no. 2 and 3 storey houses and 27 no. apartments set out in 9 no. 3-storey blocks. On lands to the south of the application site and north of the Tyrellstown Local Centre (referred to as Kilmartin Local Centre) the proposed development includes 120 no. apartment/duplex units in 4 no. blocks ranging in height from 3 to 5 storeys. The local centre includes 2 no. crèches (including 1 standalone 2 storey crèche), 1 no. Montessori, a retail/café unit, and 1 no. community hub. The scheme also proposes a new vehicular access onto the R121 and an extension of the existing partially constructed Link Street which currently serves the Le Chéile Secondary School. A pedestrian / cycle linkage has also been provided from Site 2 &3 to Rathoath Road to the north which is zoned as Open Space. A pedestrian / cycle linkage has also been provided from Site 2 &3 to Rathoath Road to the north which is zoned as Open Space. Refer to Figure 1 below. It is also proposed to construct a circa 3km long foul outfall sewer which continues west from the residential site before heading south and connecting to the existing 750mm diameter foul sewer to the south of Powerstown Road. This 3km foul sewer outfall is already permitted under FCC Ref FW21A/0042. The Local Centre will be connected to the existing 225mm foul sewer on the west of the link road to serve this development.

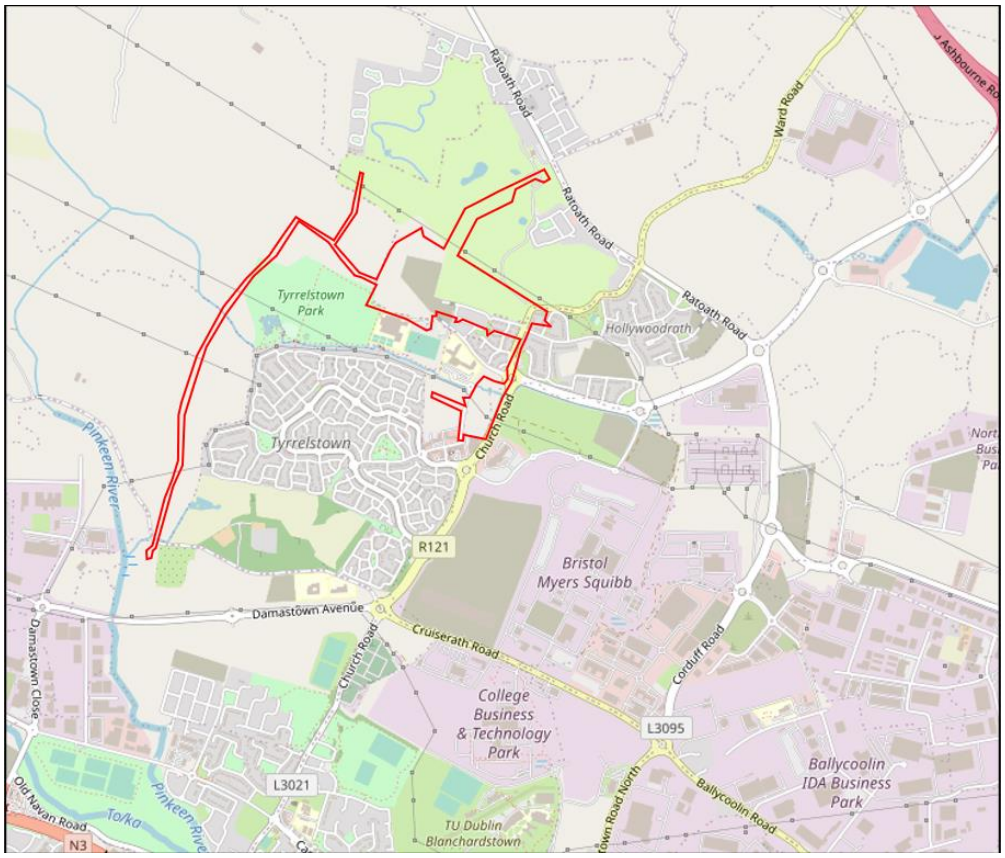


Figure 1: Local Area Plan (Source: EPA Maps)

Other drainage infrastructure includes above ground detention basins and some below ground structures to store surface water runoff from a 1% AEP storm event and SuDS features including swales and tree pits.

The subject site is located on an undeveloped greenfield site with limited hardstanding areas that has an approximate site area of c.25.3 hectares. The site which is located within the administrative area of Fingal County Council and is zoned under 'Zoning Objectives RA – Residential Area' which is described within the Fingal Development Plan 2017 - 2023 as to "Provide for new residential communities subject to the provision of the necessary social and physical infrastructure". The lands which form the northern link towards Ratoath Road are zoned OS-Open Space to "Preserve and provide for open space and recreational amenities". The lands which form the proposed Kilmartin Local Centre are zoned LC-Local Centre to "Protect, provide for and/or improve local centre facilities".

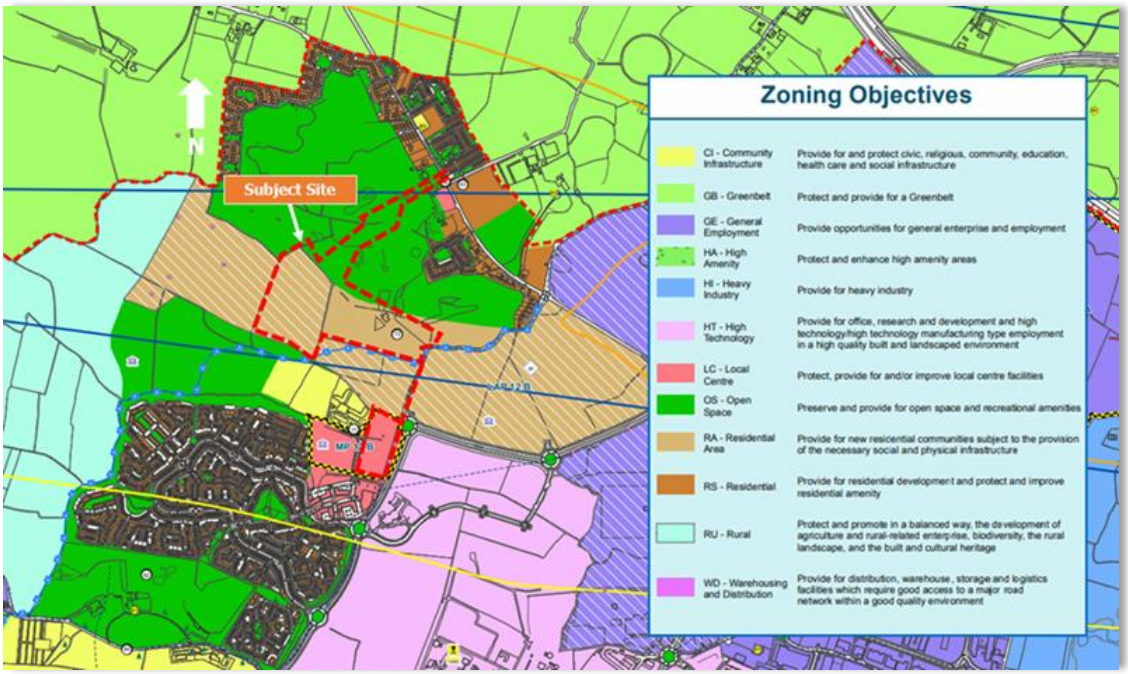


Figure 2: Extract from the Fingal Development Plan 2017-2023 (Source: FCC Blanchardstown North Sheet No.12)

1.2 Objectives

The objective of this report is to inform the planning authority regarding flood risk for the proposed residential development. This report assesses the lands and zoning proposals in accordance with the requirements of "*The Planning System and Flood Risk Management Guidelines for Planning Authorities*". This report clarifies the lands flood zone category and presents information which would facilitate an informed decision of the planning application in the context of flood risk.

1.3 Site Characteristics

Site 2 & 3

The site slopes generally in a north-westerly direction. The majority of Site 2 is located within the former golf course lands, which has natural undulations and landscaping features typical of a golf course, including an internal network of open drains which are culverted locally to provide crossing points.

An open drain forms the boundary between site 2 and 3 and continues in a northerly direction where it connects to an open drain along the north eastern boundary of Site 3. This open drain continues westwards before connecting to the Pinkeen East Stream circa 1200m to the west (Refer to Figure 1). The is a dry drain along the western boundary of site 3.

There are overhead ESB cables traversing the northern portion of the site, with an associated buffer zone of 40m. Development within this zone is subject to certain restrictions in terms of height, location etc and is subject to agreement with ESB.

Within Site 2, the existing golf course open drain shown in Figure 3 collects surface water runoff from the site and from a section of Hollywoodrath Road (via road gullies at the existing gated maintenance entrance to the former golf club). This drain also accommodates attenuated surface water runoff (maximum attenuated flow rate of 83l/s) from Hollywoodrath Estate to the east (FW14A/0108).

Figure 3: Existing Golf Course Drain

The existing detention basin for Bellingsmore Residential Development is located within Site 3.

Local Centre

The site is bound by residential developments to the west and by Tyrrelstown Local Centre, which comprises a mix of retail and commercial units with office and residential above, to the south. To the north is another residential development, Bellingsmore, and north west are several schools while the east of the site is bound by the R121.

The site is predominantly green-field with a road that connects Tyrrelstown Town Centre and Tyrrelstown Educate Together School currently crossing the site in a north south direction.

There is an existing ditch that meanders from east to west through the local centre site which appears to take road drainage from the R121. The ditch is currently culverted before entering the site from the east and is also culverted under the existing school access roundabout. The ditch flows to the west of the site and connects to field drainage that discharges to the Pinkeen River to the west of the site location as shown in Figure 4 below. It is proposed to culvert an additional section of the ditch to provide a regularised development and the ditch is expected to provide a suitable surface water discharge point for this portion of proposed development.

A topographical survey of the site is provided as a background to the road layout drawings 170182-DBFL-RD-SP-DR-C-1004 to 170182-DBFL-RD-SP-DR-C-1007 & 1011.

1.4 Proposed Development

To maximise the development potential of site 2, it is proposed to re-route the existing open channel Golf Course Drain to the north within the ESB sterilisation zone, as indicated on DBFL drawings no. 170182-DBFL-CS-SP-DR-C-1004 and 170182-DBFL-CS-SP-DR-C-1007. Sections of this re-routed drain will be piped and culverted to facilitate crossing points. Refer to the DBFL *Infrastructure Design Report* for further details.

The existing open drain which forms the boundary between Site 2 and 3 will be maintained with a buffer of circa 10m maintained on both sides. The existing open drain along the north eastern and north western boundary of Site 3 will also be maintained with a 10m buffer maintained on the development side.

It is proposed to incorporate the surface water storage requirements for Bellingsmore Residential Development into the scheme design for Site 3, in the form of two interlinked detention basins adjacent to the south eastern boundary of Site 3. The existing detention basin for Bellingmore will be removed to facilitate this arrangement with the existing storage volume of circa 810m^3 for a 1% AEP event accommodated in the relocated basins. A new surface water outfall will be constructed to the same receiving water (the open drain which forms the north eastern boundary of Site 3).

The methodology of treating the existing surface water drainage networks is outlined in drawing nos. 170182-DBFL-CS-SP-DR-C-1004 to 170182-DBFL-CS-SP-DR-C-1011.

There is an existing ditch that meanders from east to west through the site which appears to take road drainage from the R121. The ditch is currently culverted before entering the site from the east and is also culverted under the existing school access roundabout. The ditch flows to the west of the site and connects to field drainage that discharges to the Pinkeen River to the west of the site location as shown in Figure 4 below. It is proposed to culvert an additional section of the ditch to provide a regularised development and the ditch is expected to provide a suitable surface water discharge point for the proposed.

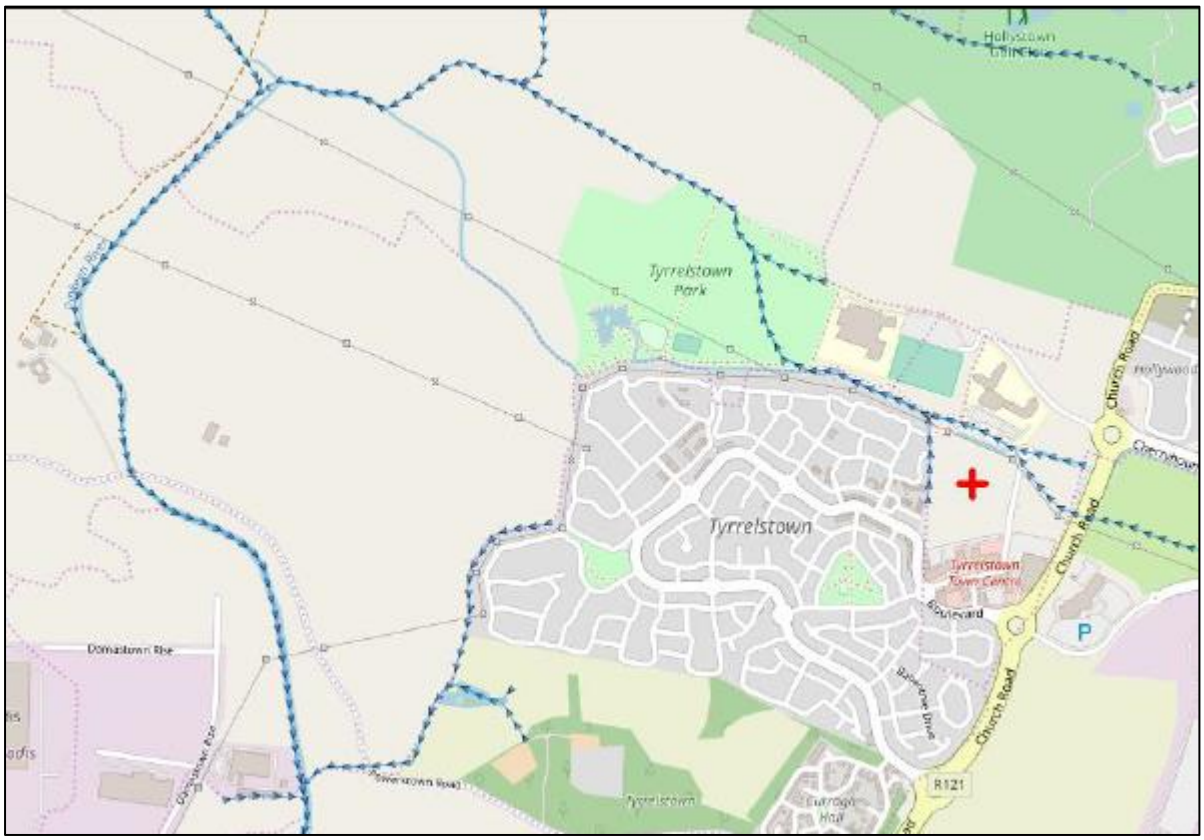


Figure 4 Existing Surface Water Systems (EPA)

1.5 Site Geology

A review of the Geological Survey of Ireland (GSI) maps indicate that the main underlying bedrock indicated on the Geological Survey Ireland geology map are dark limestone and shale('calp), with small corridors of alluvial deposits, indicated within Figures 5 and 6 below.

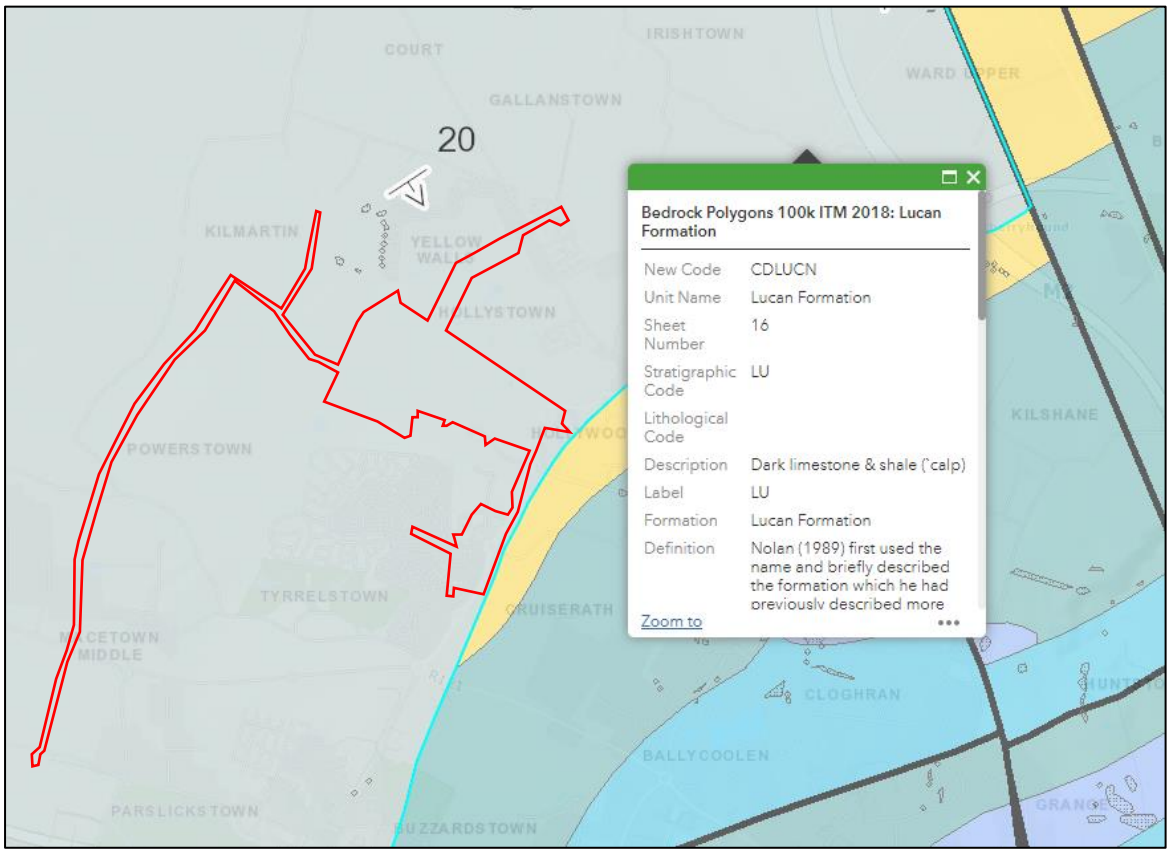


Figure 5: Geological Survey Ireland Maps (GSI Maps)

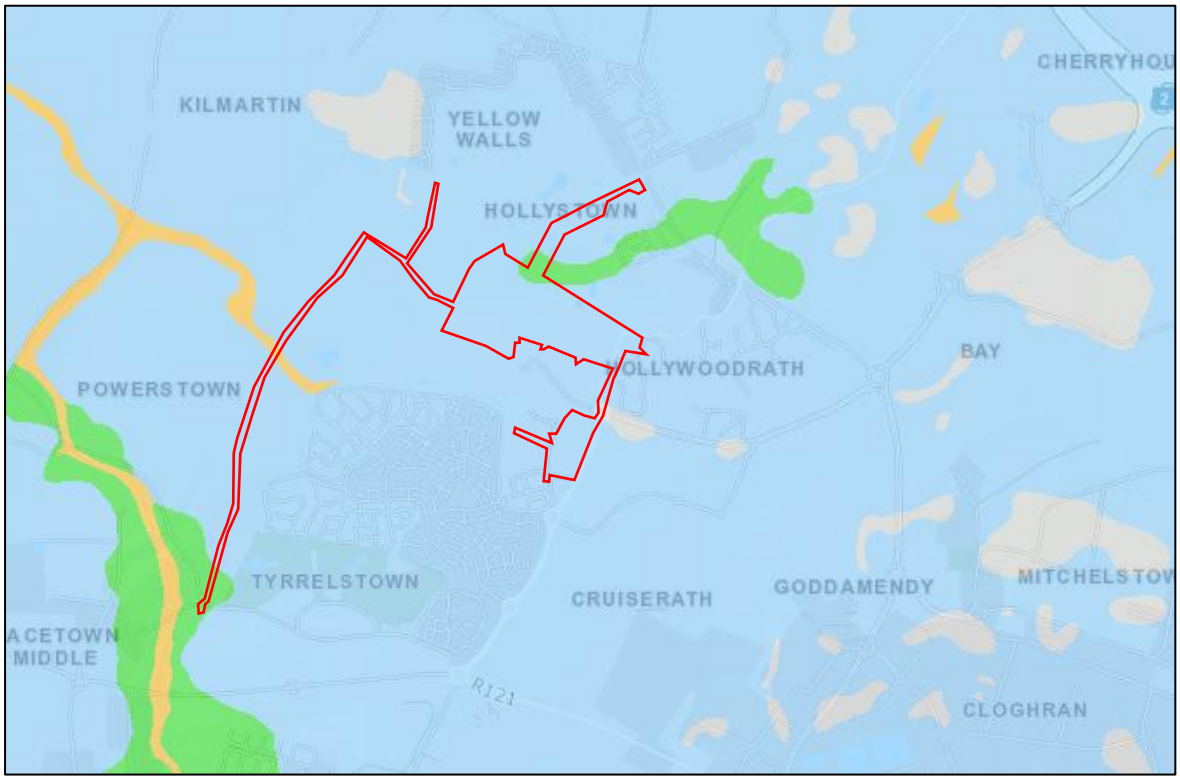


Figure 6: Geological Survey Ireland Maps (GSI Maps)

The associated groundwater vulnerability, which indicates the risk to the underlying waterbody for the development is majority low risk, with a proportion of moderate risk in the North-West corner of Site 3 and moderate to high in the area of Local Centre (Figure 7).

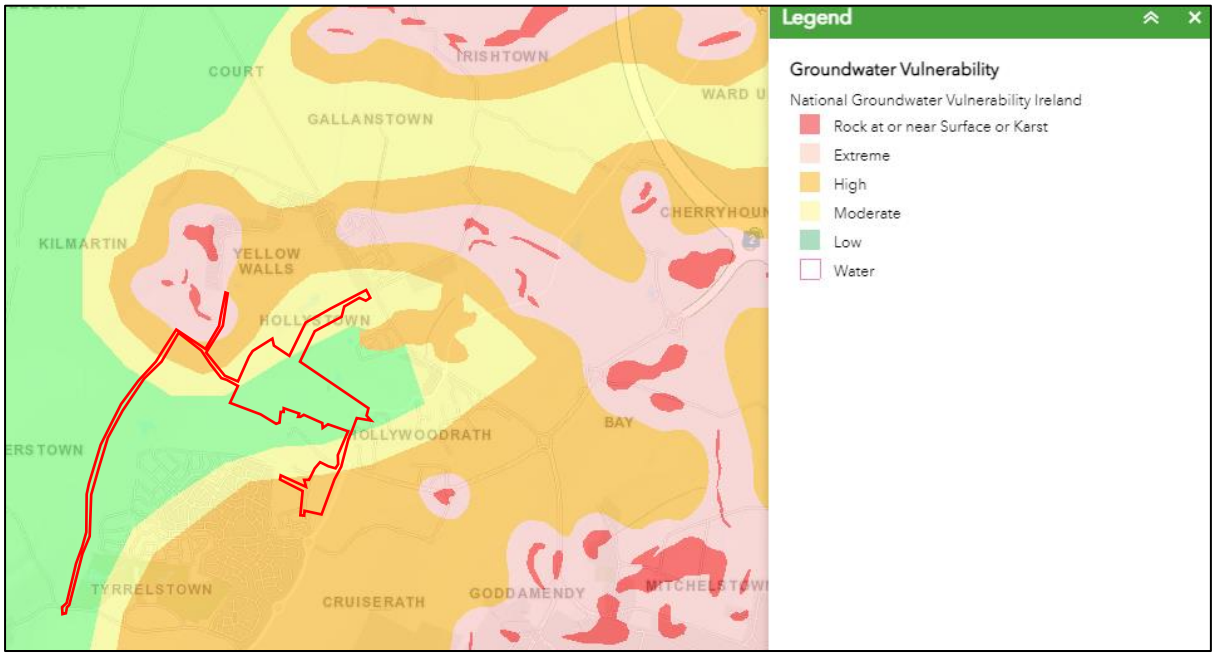


Figure 7: Groundwater Vulnerability Mapping (GSI Maps)

The EPA mapping for aquifers in the area in Figure 8, indicates a Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones.

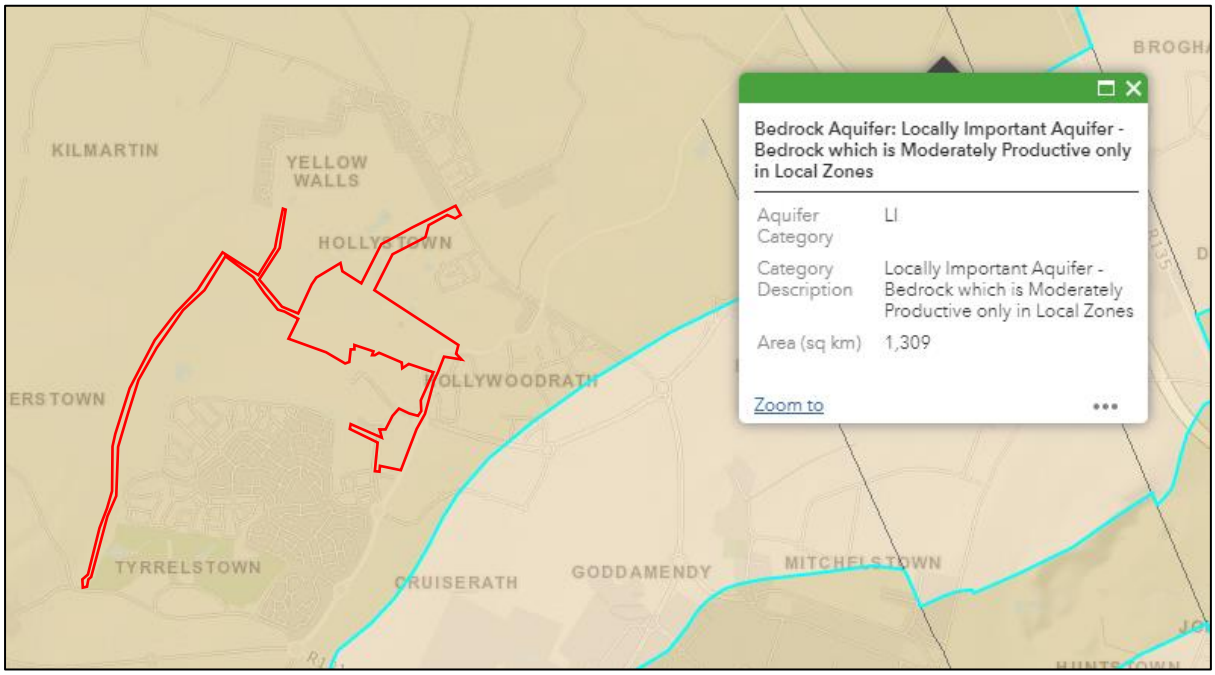


Figure 8: Aquifer Mapping (EPA Maps)

The EPA mapping as indicated below in Figure 9, shows that the development is within an area characterised by low soil permeability.

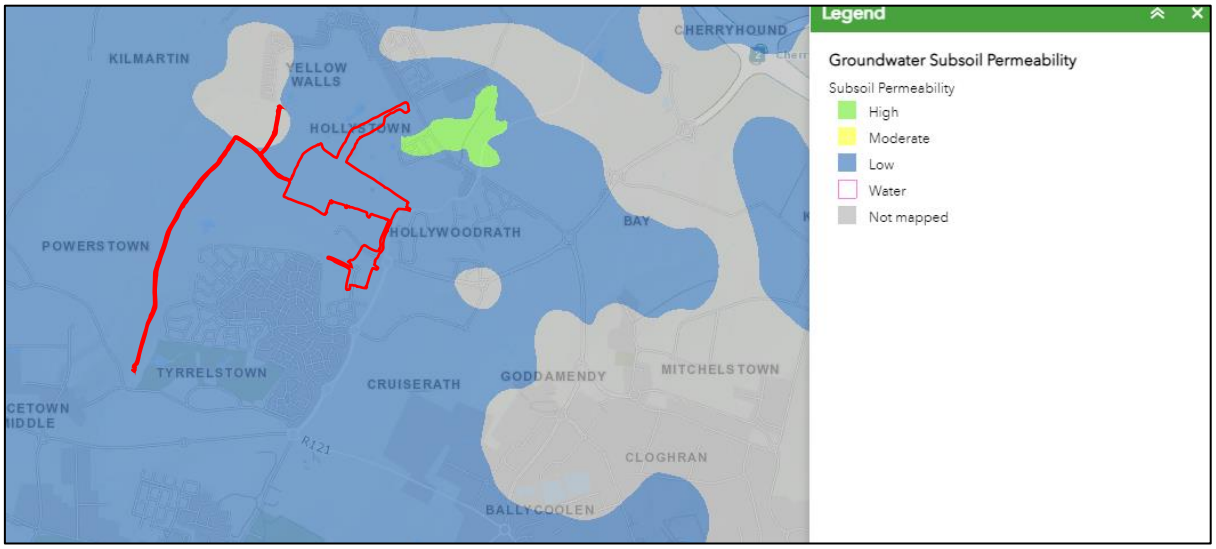


Figure 9: Soil Permeability Mapping (EPA Maps)

Further to this, preliminary site investigations were carried out in the eastern side of the former Golf Course lands by “Ground Investigations Ireland” in July 2018 comprising 4 no trial pits and 4 no. surface water soakaway tests. The site investigations identified topsoil, on cohesive deposits comprising grey or brown slightly sandy slightly gravelly CLAY with occasional cobbles. The secondary sand and gravel constituents varied across the site with depth, with granular lenses occasionally present in the glacial till matrix.

Site investigation was also carried out for Local Centre by “Ground Investigations Ireland” in February 2019 comprising 3 no trial pits and 2 no boreholes. The site investigations identified topsoil on made ground deposits described as brown sandy slightly gravelly CLAY with frequent cobbles. Cohesive deposits were encountered beneath the Made Ground and were described typically as brown or brown/grey with orange mottling sandy gravelly CLAY with occasional cobbles and boulders overlying a stiff black sandy gravelly CLAY with occasional cobbles and boulders.

2.0 PLANNING GUIDELINES & FLOOD RISK ASSESSMENT

2.1 Planning System and Flood Risk Management

Guidelines for Planning Authorities

The FRM Guidelines provide "mechanisms for the incorporation of flood risk identification, assessment and management into the planning process….". They ensure a consistent approach throughout the country requiring identification of flood risk and flood risk assessment to be key considerations when preparing development plans, local area plans and planned development.

"The core objectives of The FRM Guidelines are to:

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

The FRM Guidelines outlines the key principles that should be adopted by regional and local authorities, developers and their as agents as follows

- 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."

The Sequential Approach in the Management of Flood Risk is included in Figure 10. Where the avoid and substitute principles of the sequential approach are not appropriate, then the Guidelines allow application of a Justification Test to assess the appropriateness or otherwise, of developments under consideration in areas of moderate or high flood risk.

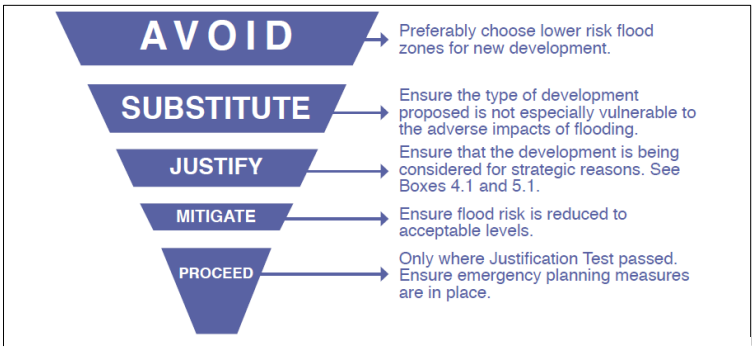


Figure 10: Sequential Approach Principles in Flood Risk Management (Extracted from FRM Guidelines)

2.2 Flood Risk Appraisal & Assessment

2.2.1 General

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).

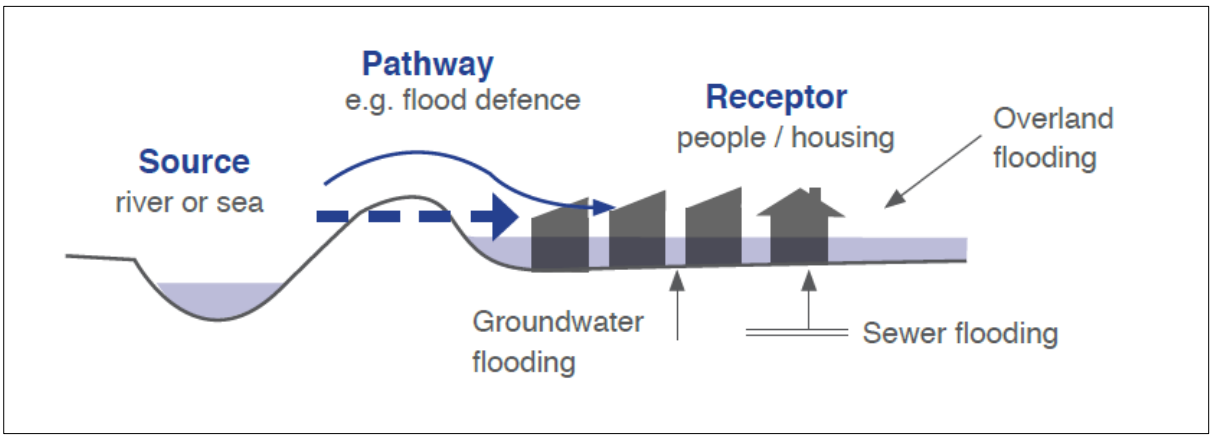


Figure 10: Source-Pathway-Receptor Model (Extracted from FRM Guidelines)

The principal sources 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. The receptors can include people, their property, and the environment.

*The Guidelines further state that "*A staged approach should be adopted, carrying out only such appraisal and or assessment as is needed for the purposes of decision-making at the regional, development and local area plan levels, and also at the site-specific level. The stages of appraisal and assessment are":

***Stage 1: Flood risk identification** – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower-level plan or planning application levels;*

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped;

Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

2.2.2 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 1% AEP (Annual Exceedance Probability) for rivers and 0.5% AEP for coastal;
- 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,
- Vulnerable e.g. retail, commercial or industrial buildings, local transport infrastructure,
- Water Compatible e.g. flood infrastructure, docks, amenity open space.

2.3 Vulnerability v Flood Zone

The FRM Guidelines states that "*a sequential approach to planning is a key tool in ensuring that development, particularly new development, is first and foremost directed towards land that is at low risk of flooding*". The Sequential Approach restricts development types to occur within the flood zone appropriate to their vulnerability class, as outlined below in Table 1.

	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

Table 1 : Matrix of Vulnerability versus Flood Zone to illustrate where development appropriate for flood zone or where justification test required (Extract from FRM Guidelines)

Alternatively, a Justification Test can be completed to justify development in higher risk areas, which is shown in Figure 11 below:

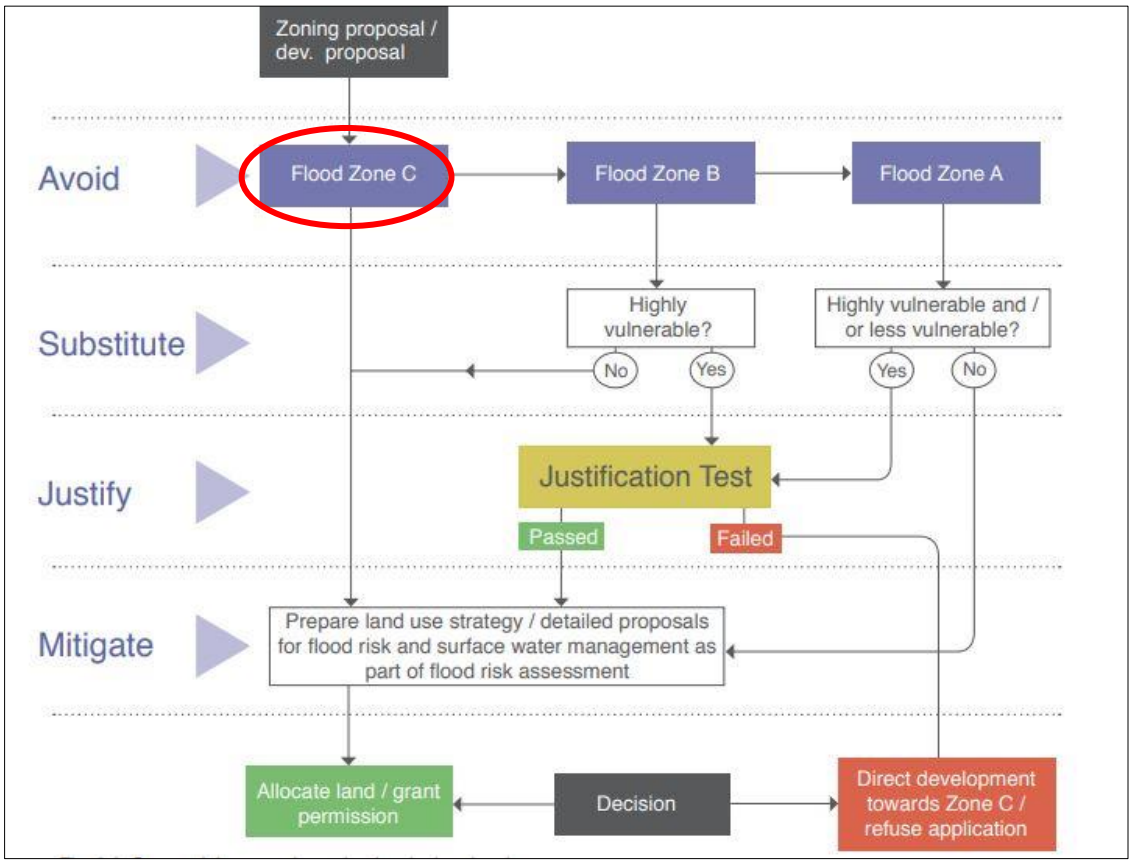


Figure 11: Sequential Approach & Justification Test Mechanism in the Planning Process (FRM Guidelines)

3.0 FLOOD RISK IDENTIFICATION

The initial flood risk identification stage uses predictive and historical 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. Findings from the flood risk identification stage are outlined below:

3.1 Predictive Flood Data

3.1.1 OPW ECFRAMS Flood Extent Mapping

The Eastern CFRAM study is the most comprehensive flood mapping undertaken in the Dublin region. It commenced in June 2011 with final flood maps issued during 2016. The study involved detailed hydraulic modelling of rivers and their tributaries. The Eastern CFRAM supersedes the fluvial flood extent mapping identified in the OPW PRFA study. The ECFRAM final mapping does not extend to the residential area of the site and the final ECFRAM mapping in the vicinity of the site is currently under review. Refer to Figure 12 below.

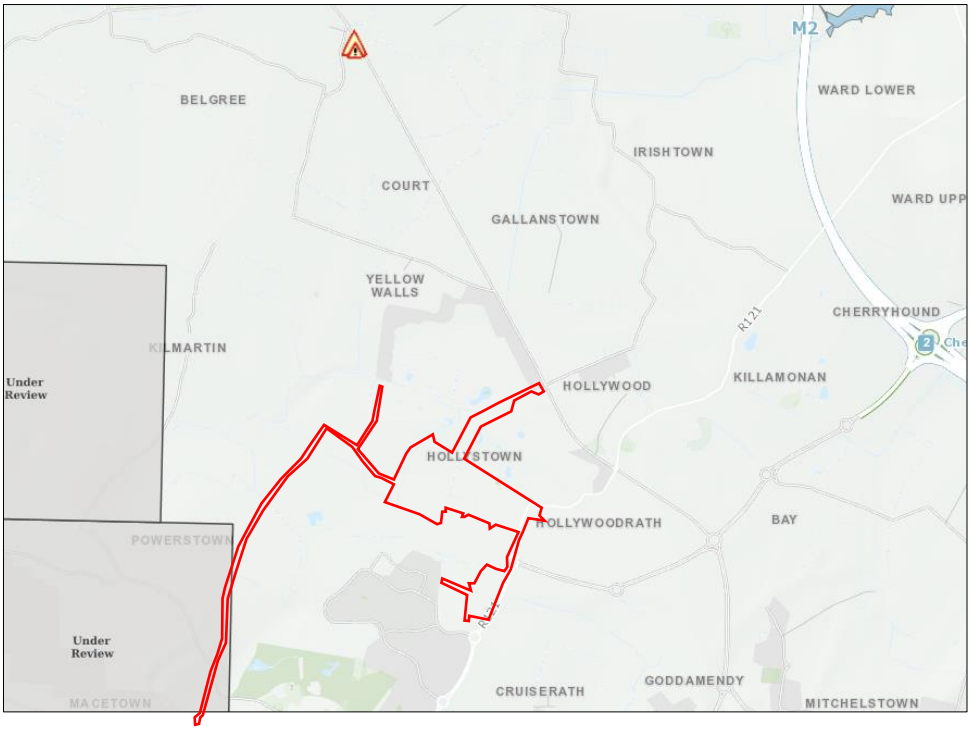


Figure 12: Extract from OPW Floodinfo Website

3.1.2 Strategic Flood Risk Assessment for the Fingal County Development Plan 2017-2023 (March 2017)

No flooding identified within the site. Refer Figure 13 and to Appendix A.

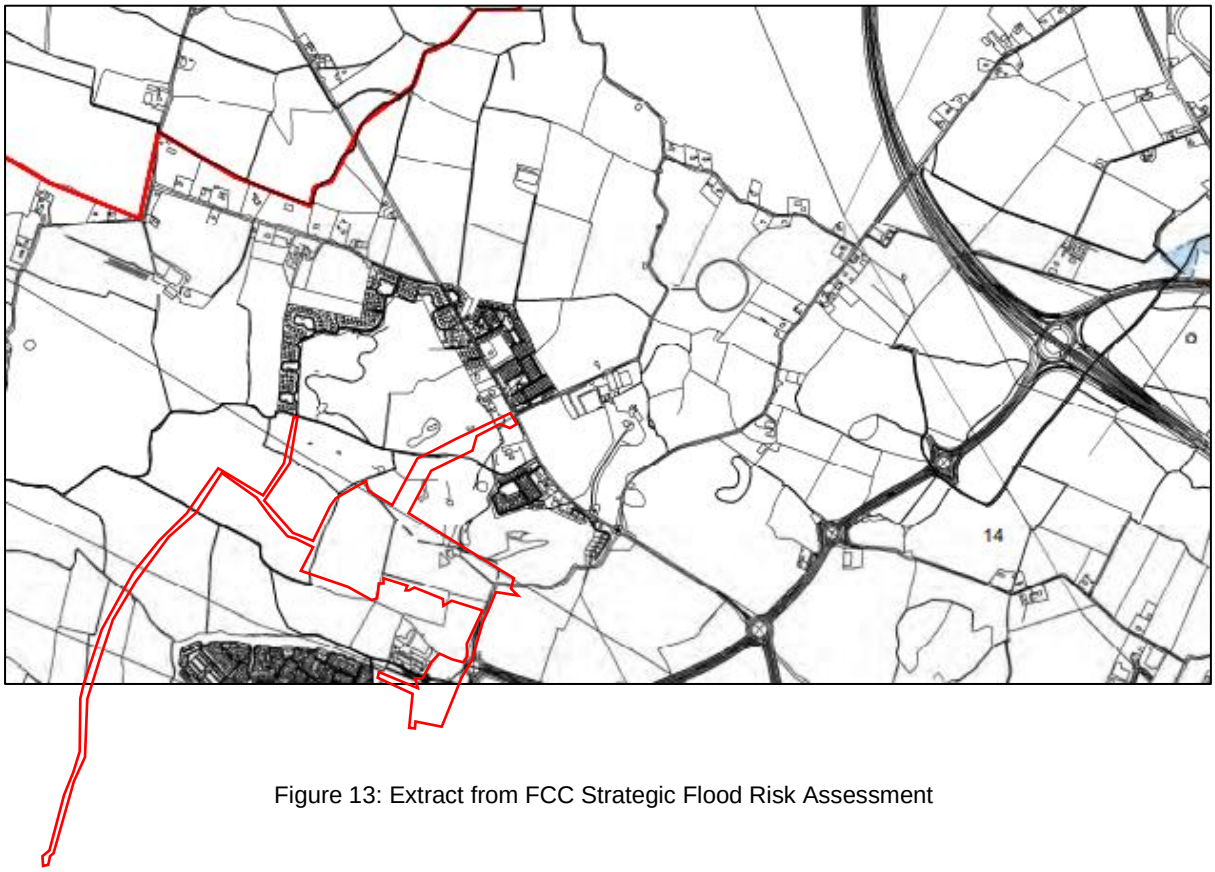


Figure 13: Extract from FCC Strategic Flood Risk Assessment

3.1.3 Kilmartin Local Area Plan, 2012 – 2018- Strategic Flood Risk Assessment

No flooding identified within the site. Refer to mapping in **Appendix A**.

3.2 Flood History

3.2.1 OPW Historic Flood Records & Benefitting Lands

No records of flooding on the lands. No benefitting lands indicated, see Figure 12.

3.2.2 Historical and Recorded Flood Events

A search for recorded flood events near the subject site was carried out using the OPW's *floodinfo.ie* website and using a general internet search. The *floodinfo.ie* website provides information on recorded flood events nationwide. There are no historical flood incidences recorded for the subject site or in the immediate vicinity of the site.

4.0 INITIAL FLOOD RISK ASSESSMENT

4.1 Sources of Flooding

The following sources of flooding are considered:

- Fluvial
- Pluvial (Pluvial or surface water flooding is the result of rainfall-generated flows that arise before run-off can enter a watercourse or sewer).
- Coastal
- Groundwater

4.2 Source-Pathway-Receptor Model

A source-pathway-receptor model has been produced to summarize the possible sources of floodwater, the receptors and the pathways by which floodwater could reach the receptors.

Source		Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	T1	Tidal flooding from coast, circa 17km away.	Entire Site	Remote	Medium	Low
Fluvial	F1	From the ditches feeding the Pinkeen River to the west	Residents / buildings / vehicles	Remote	Medium	Low
Surface Water Drainage (Pluvial)	P1	Flooding from the surcharging of the development's drainage systems	Residents - people / buildings / vehicles;	Possible	Medium	Moderate
Groundwater Flooding	G1	Rising GWL on the site	Residents - people / buildings / vehicles;	Remote	Medium	Low
Human or Mechanical Error (Pluvial)	H1	New drainage network blocks	Areas of development draining to the drainage network. Residents – people / buildings/ vehicles	Possible	Medium	Moderate

Table 2: Source- Pathway- Receptor- Analysis

The above table indicates that there is a moderate risk of pluvial flooding on site from the potential surcharging and blockage of the new drainage network.

4.3 Stage 2 – Initial Flood Risk Assessment

Flood risks identified during Stage 1 – Flood Risk Identification, are outlined in Table 2 (Source Pathway Receptor Analysis) and noted below. These risks are assessed further in this section of the SSFRA**.**

- Low risk of tidal flooding;
- Low risk of fluvial flooding;
- Medium risk of pluvial flooding (surface water and human / mechanical error);
- Low risk of groundwater flooding;
- Medium risk of flooding due to mechanical or human error;

The information sources identified in Section 3 are considered adequate for the purpose of an Initial Flood Risk Assessment for the site and no further technical studies are proposed.

4.3.1 Initial Tidal Flood Risk Assessment

The site is circa 17km west of the coast is therefore not at risk of tidal flooding.

4.3.2 Initial Fluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified a low risk of fluvial flooding. The Pinkeen (East) River is located circa 1.9km west of the site. Available mapping indicates that the site is not at risk of fluvial flooding and the site is within flood zone “C” as defined by the “Guidelines”. Refer to flood extent mapping in **Appendix A.**

4.3.3 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified a medium risk of pluvial flooding relating to the proposed surface water drainage network and human / mechanical error. This risk can be mitigated by designing the surface water network in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) including attenuation of the 1% AEP storm event. A comprehensive and detailed design of the surface water system, design of road, ground levels, finished floor levels, and SuDS measures will mitigate pluvial flood risk to the site. 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, fuel / oil interceptor operation problems etc.

4.3.4 Initial Groundwater Flood Risk Assessment

The OPW flood risk mapping does not indicate any groundwater flooding at the site or surrounding area. The GSI groundwater vulnerability for the site is classified as low. Furthermore, there are no karst features in the area which would indicate areas at risk of groundwater flooding. There is no known risk of groundwater flooding in this area, therefore groundwater should not be considered as a likely source of flood risk to the site.

4.3.5 Flood Zone Category

On completion of Stage 2 – Initial Flood Risk Assessment, the site is considered to be located in Flood Zone "C" as defined by the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices. The proposed development is therefore considered appropriate as it is in Flood Zone "C".

5.0 MANAGEMENT OF FLOOD RISK AND FLOOD RISK MITIGATION

Flood risk to the proposed development will be managed using different strategies as outlined below.

5.1 Drainage Design

5.1.1 General Surface Water Drainage Strategy

A new surface water drainage system will be constructed to accommodate surface water runoff from the proposed development. It is designed in accordance with the recommendations of the GDSDS (Greater Dublin Strategic Drainage Study), EN752 and CIRIA SuDS Manual. The drainage system includes traditional drainage features and SuDS features, with surface water runoff attenuated to greenfield runoff rate and surface water storage provided for a 1% AEP storm event.

The surface water drainage network is designed for a 50%AEP (1 in 2-year return period) storm event and is “flood checked” for a 1%AEP (1 in 100-year return period) event, i.e. it is designed to accommodate runoff from a 1%AEP rainfall event under surcharged conditions. The surface water drainage system was modelled using the ‘NETWORK module of ‘Microdrainage’, for a range of storms with returns periods of 1 in 30 and 1 in 100 years. For a 1 in 100-year return period storm (1% AEP event), while the surface water drainage system surcharges there is no ‘out of system / pipe’ flooding on site.

SuDS features proposed for the development include permeable paving, swales, detention basins and underground storage structures.

It is proposed to store runoff for a 1% AEP (Annual Exceedance Probability) storm event plus 20% allowance for climate change in constructed open detention basins, swales (under-drained) and underground Stormtech chamber tanks.

Where possible, detention basins have been shaped to aesthetically fit within site layouts and proposed landscaping plans. Once the detention basin has stored the attenuated surface run off, it will have the added benefit of acting as natural ‘’bioretention areas’’. This will form part of the treatment train, discussed in subsequent sections to follow. Additionally, it has the added benefit of creating a positive visual aesthetic for the development.

Refer to the Infrastructure Design Report for further details.

5.1.2 Surface Water Attenuation & Storage

Site 2&3

Surface water runoff from Sites 2 and 3 will be attenuated to Qbar "Greenfield Runoff" as required in the GDSDS. To manage surface water runoff from Site 2, the site will be split into 2 catchments, with runoff exceeding the allowable outflow stored on site for up to a 1% AEP (Annual Exceedance Probability) event, plus 20% for climate change, with circa 1513m^3 of storage provided. To manage surface water runoff from Site 3, the site will be split into 5 catchments with runoff exceeding the allowable outflow stored on site for up to a 1% AEP (Annual Exceedance Probability) event, plus 20% for climate change, with circa 2250m^3 of storage provided.

Attenuated surface water runoff from Site 2 will discharge to the re-routed golf course drain along the northern boundary of Site 2. Attenuated surface water runoff from Site 3 will discharge to the existing open drain along the northern boundary of Site 3.

Local Centre

Surface water runoff from Local Centre will be attenuated to Qbar "Greenfield Runoff" as required in the GDSDS. To manage surface water runoff from Local Centre, the site will be split into 3 catchments, with runoff exceeding the allowable outflow stored on site for up to a 1% AEP (Annual Exceedance Probability) event, plus 20% for climate change, with circa 630m^3 of storage provided.

In accordance with the recommendations of the GDSDS, a minimum 500mm buffer is provided between the top water level in the storage system and the lowest floor level within the development.

5.1.3 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.

5.1.4 Foul Drainage

A new foul drainage system will be constructed to collect flows from the proposed development.

5.2 Maintenance

The proposed drainage system to be maintained on a regular basis by Fingal County Council 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).

5.3 Site Layout

Finished floor levels of proposed buildings are minimum 500mm above the top water level in the surface water storage system. A comprehensive and detailed design of the surface water system, design of road, ground levels, finished floor levels, and SuDS measures will mitigate pluvial flood risk to the site.

Riparian corridors of minimum 10m are proposed for the existing open drain which forms the boundary between sites 2 and 3 and the existing open drain along the northern boundary of Site 3.

5.4 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. Pluvial flooding from the development's drainage system for storms exceeding the design capacity.

Mitigation measures to address residual flood risks are as follows:

1.0 Pluvial flooding from the drainage system related to a pipe blockage or from flood exceedance:

- **Mitigating Measure M1:** The proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.

2.0 Pluvial flooding from the development's drainage system for storms exceeding the design capacity:

Mitigating Measure M2:

- The drainage network is designed in accordance with the recommendations of the GDSDS and provides attenuated outlets and associated storage up to the 1% AEP (1 in 100-year return period event). The drainage network for the site has been designed to ensure that it can accommodate the 1% rainfall event in surcharged conditions.

Mitigating Measure M3:

- Overland Flow Paths are towards open space areas and away from houses and apartments during extreme events (i.e. exceeding the 1% AEP event).

Mitigating Measure M4:

- At detailed design stage, the location of all dropped kerbs to be fully reviewed to ensure all overland flow paths are not impeded.

6.0 CONCLUSION

We consider that the proposed development, can be delivered on the site in the context of flood risk to same and that the implementation of mitigation measures, as outlined in this report, can be accommodated by the site's detailed design and the surface water drainage design.

The OPW document "The Planning System and Flood Risk Management Guidelines (November 2009)" requires that the proposed development be compatible with flood risk for the site. In accordance with these guidelines, the subject site is located within Flood Zone 'C'. Flood Zone C lands are suitable for all types of land use, including residential developments which are classified as "highly vulnerable" in the "Guidelines". Therefore, the proposed development is suitable for this type of flooding zoning and the Planning Guidelines Sequential Approach is passed (refer to Figure 10).

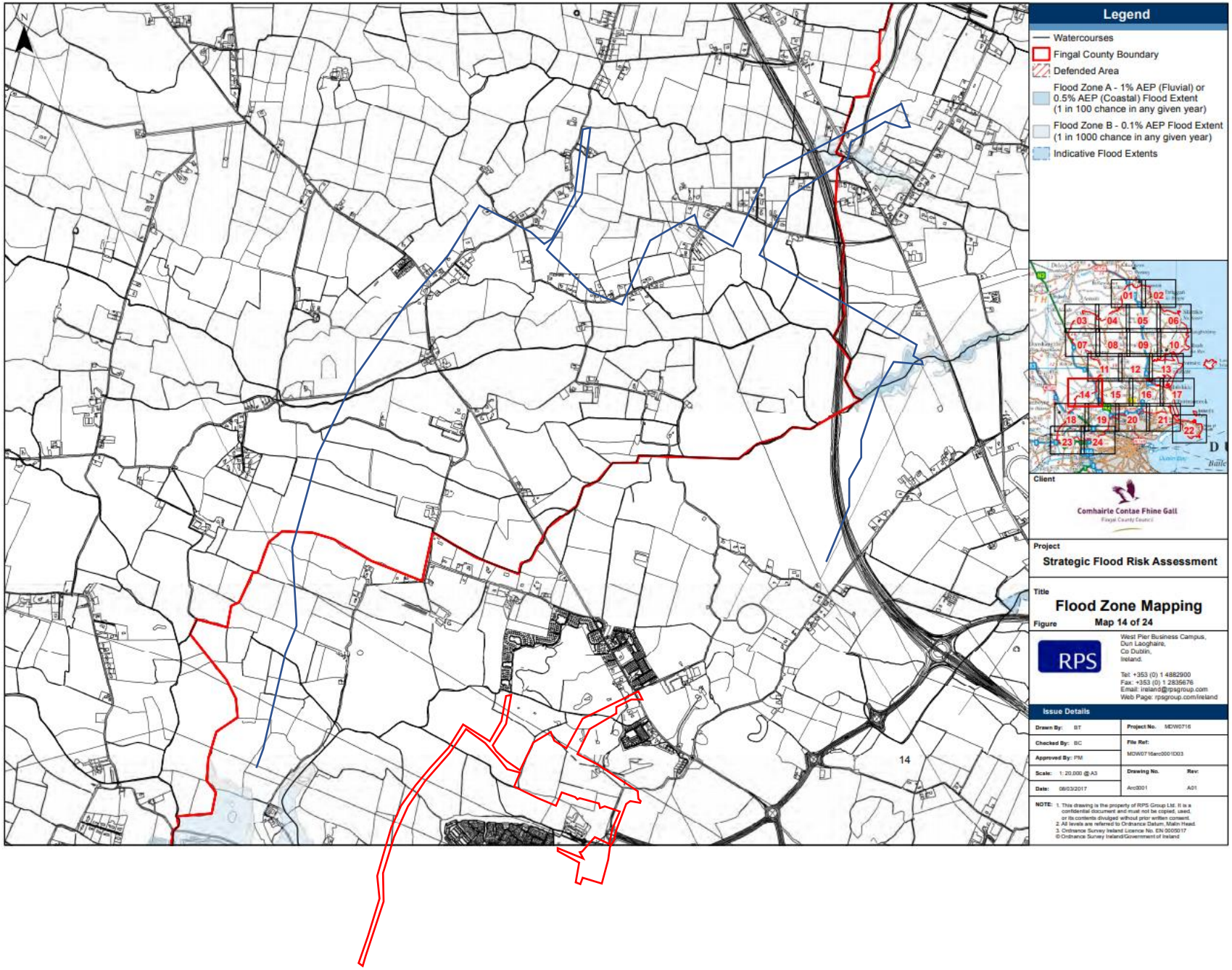
The proposed development layout was assessed and it was concluded that it can be delivered on the Site in the context of flood risk to same and that the implementation of the proposed mitigation measures, by the developments detailed design will address the remaining residual risks.

Taking into consideration the management of surface water runoff from extant neighbouring permissions their discharge rates are all limited to greenfield runoff and they would not increase flood risk elsewhere. The developments surface water runoff will be limited to Qbar (greenfield runoff rate). Therefore, the development complies with the requirements of the GDSDS and does not increase the risk of flooding elsewhere and does not result in displaced waters.

It is concluded that the development meets the requirements of The FRA Guidelines and that the proposed development is appropriate to this flood zoning and a justification test is not required.

APPENDIX A

FLOOD MAPPING


Legend
Watercourses
Fingal County Boundary
Defended Area
Flood Zone A - 1% AEP (Fluvial) or 0.5% AEP (Coastal) Flood Extent (1 in 100 chance in any given year)
Flood Zone B - 0.1% AEP Flood Extent (1 in 1000 chance in any given year)
Indicative Flood Extents
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Client
Comhairle Contae Fhine Gall
Fingal County Council
Project
Strategic Flood Risk Assessment
Title
Flood Zone Mapping
Figure
Map 14 of 24
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Issue Details
Drawn By: BT
Checked By: BC
Approved By: PM
Scale: 1: 20,000 @ A3
Date: 08/03/2017
Project No. MDW0716
File Ref: MDW0716arc0001D03
Drawing No. Arc0001
Rev: A01
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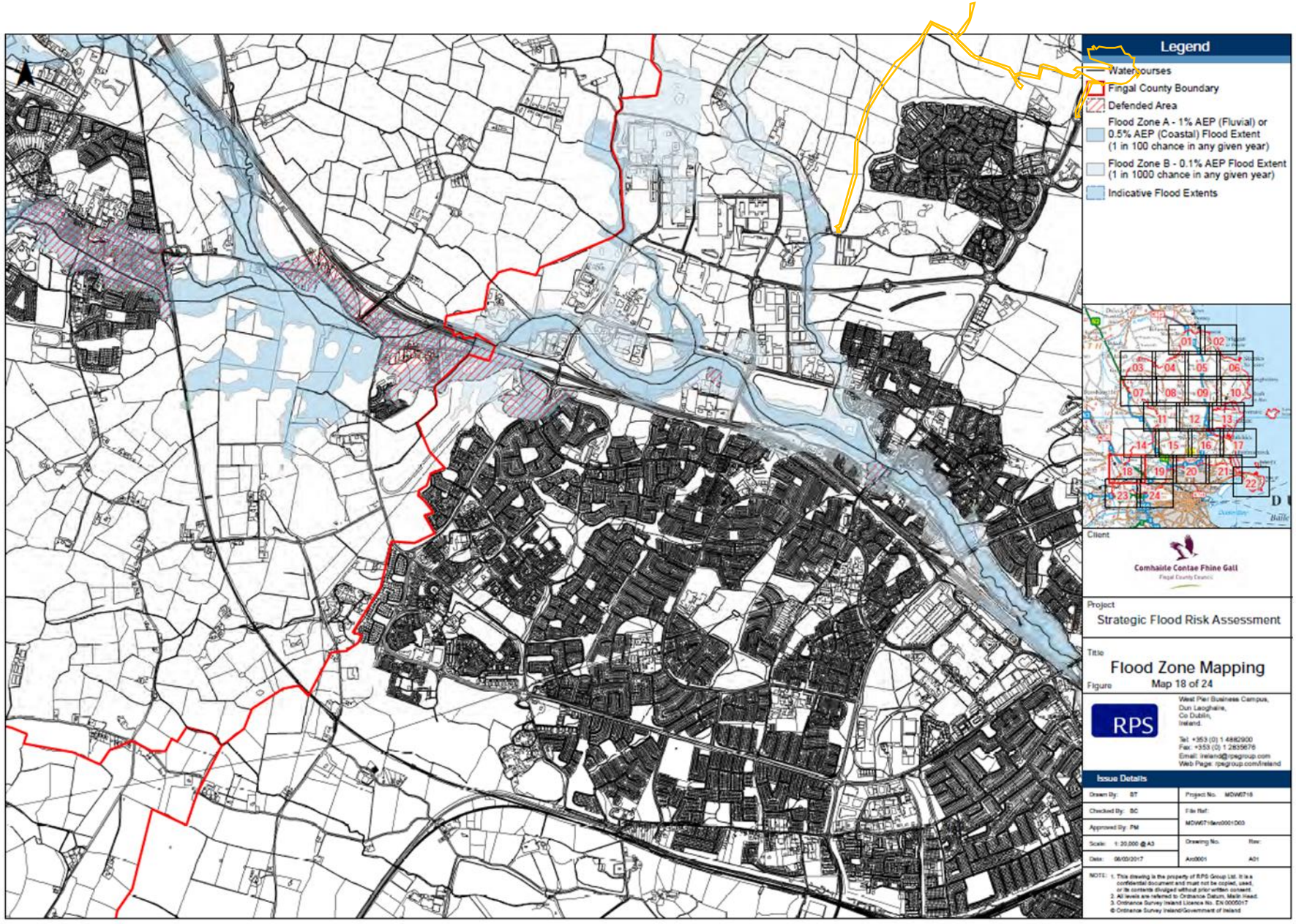
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Watercourses
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Indicative Flood Extents
Client
Comhairle Contae Fhine Gall
Fingal County Council
Project
Strategic Flood Risk Assessment
Title
Flood Zone Mapping
Figure
Map 18 of 24
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Drawn By: BT
Project No. MDW6718
Checked By: BC
File Ref:
Approved By: PM
Scale: 1: 20,000 @ A3
Drawing No.
Rev:
Date: 06/03/2017
A01
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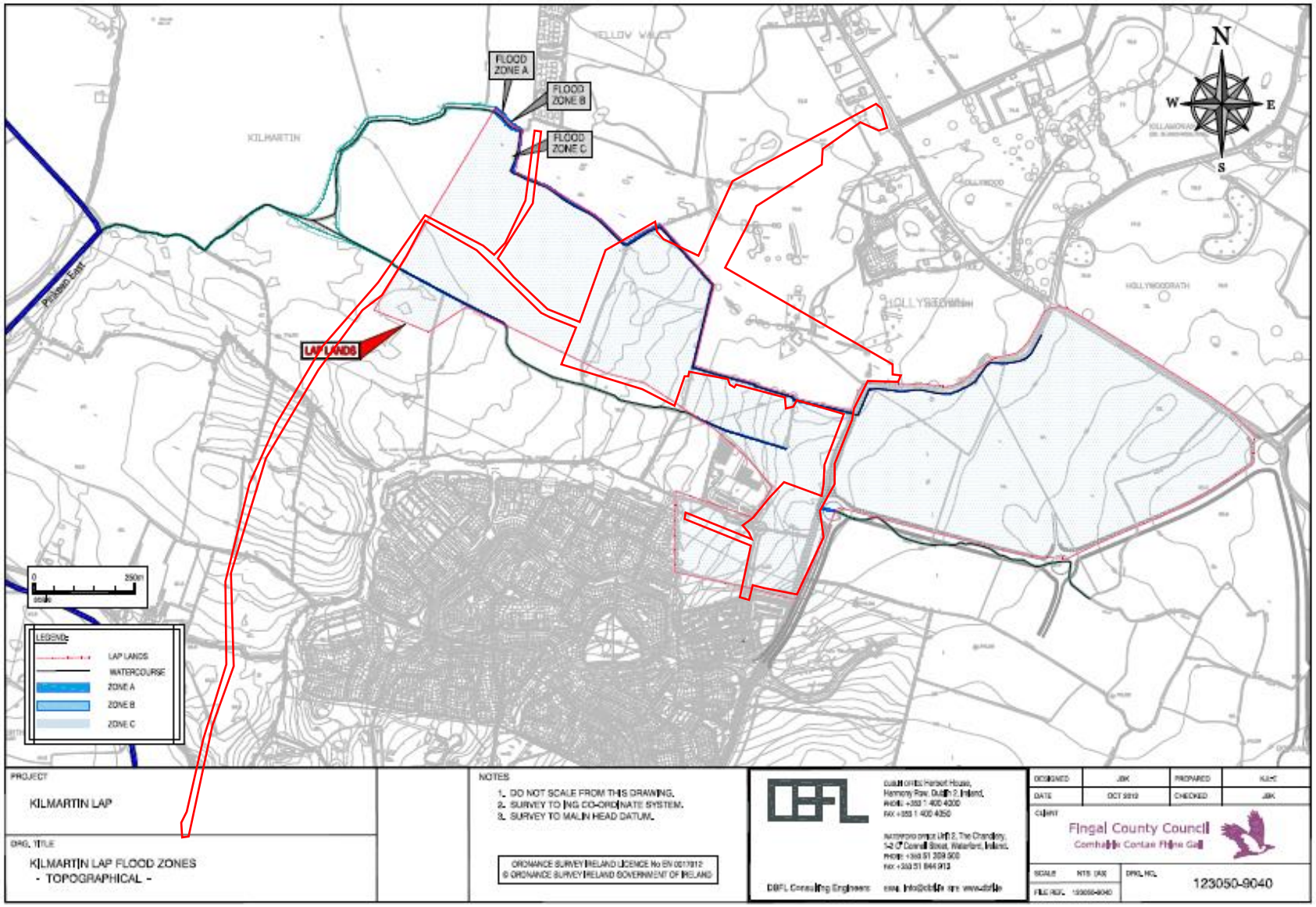
FLOOD ZONE A
FLOOD ZONE B
FLOOD ZONE C
LAP LANDS
KILMARTIN
HOLLYWOOD
HOLLYWOODRATH
Pinnock East
N
W
E
S
0
250m
LEGEND:
LAP LANDS
WATERCOURSE
ZONE A
ZONE B
ZONE C
PROJECT
KILMARTIN LAP
DRG. TITLE
KILMARTIN LAP FLOOD ZONES
- TOPOGRAPHICAL -
NOTES
1. DO NOT SCALE FROM THIS DRAWING.
2. SURVEY TO ING CO-ORDINATE SYSTEM.
3. SURVEY TO MALIN HEAD DATUM.
ORDNANCE SURVEY IRELAND LICENCE No EN 0017812
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DBFL Consulting Engineers
DESIGNED
JBK
PREPARED
KJHC
DATE
OCT 2012
CHECKED
JBK
CLIENT
Fingal County Council
SCALE
NTS (A3)
DRG. NO.
123050-9040
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