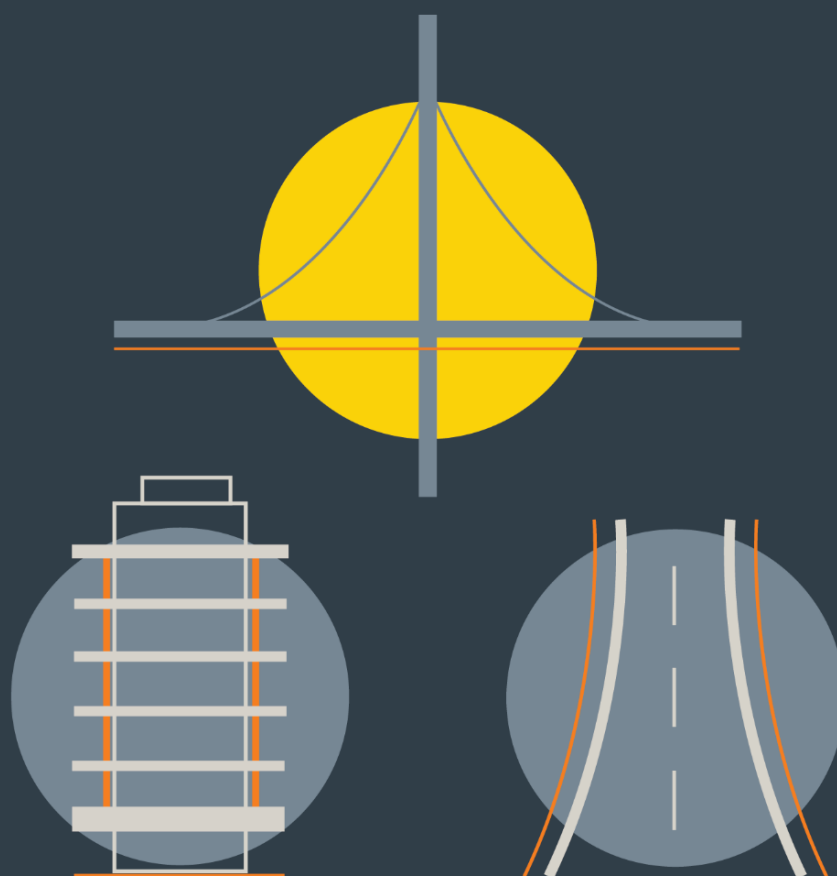


INFRASTRUCTURE

Project
Residential Development at Hacketstown, Skerries, Co. Dublin

Report Title
Site Specific Flood Risk Assessment

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DBFL CONSULTING ENGINEERS

Site Specific Flood Risk Assessment

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Site Specific Flood Risk Assessment

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Appendix A – OPW Flood Reports, Fingal SFRA Fluvial Flood Map and ECFRAMS Mapping

Site Specific Flood Risk Assessment

1 Introduction

1.1 Background

DBFL Consulting Engineers were commissioned by the Applicant to prepare a Site Specific Flood Risk Assessment (SSFRA) for the proposed residential development at Hacketstown, Skerries, Co. Dublin. The application site comprises approximately 6.7 hectares – see Figure 1 below.

The subject lands are accessed via Golf Links Road to the southeast and Ballygossan Park to the north. The site is bound by the Dublin – Belfast trainline to the west, the Golf Links Road to the east and south, and by individual houses to the east and south. The application site is c. 6.7 hectares. The site slopes at an approximate gradient of 1:20 from south to north.



Figure 1: Site Location, Hacketstown, Skerries, Co. Dublin (Site Boundary Indicative only)

The development entails 345 no. residential units comprising of 84 no. 1-bed units, 93 no. 2-bed units (66 no. 2-bed apartments and 27 no. 2-bed duplexes), 167 no. 3-bed units (128 no. 3-bed duplexes and 39 no. 3 - bed houses) ranging in height from 2 no. – 4 no. storeys on a site of 6.7 ha. located at Hacketstown in the townlands of Milverton, Townparks and Hacketstown, Skerries, Co. Dublin.

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The proposed development is set out in 8 blocks which comprise the following:

- Block A1 comprises 36 No. units at 4 storeys in height (Comprising a mix of 24 No. apartments & 12 No. Duplexes)
- Block A2 comprises 36 No. units at 4 storeys in height (Comprising a mix of 24 No. apartments & 12 No. Duplexes)
- Block B1 comprises 16 No. units at 3 storeys in height (Comprising all 3 bed Duplexes)
- Block B2 comprises 16 No. units at 3 storeys in height (Comprising all 3 bed Duplexes)
- Block C comprises 42 No. units at 2-3 storeys in height (Comprising 15 No. apartments & 27 No. Duplexes)
- Block D comprises 32 No. units at 2-3 storeys in height (Comprising 12 No. apartments, 2 No. Duplexes and 20 No. houses)
- Block E comprises 61 No. units at 2-3 storeys in height (Comprising 36 No. apartments & 25 No. Duplexes)
- Block F comprises 66 No. units at 2-3 storeys in height (Comprising 39 No. apartments & 27 No. Duplexes)
- Block G comprises 25 No units at 2-3 storeys in height. (Comprising 20 No. Duplexes and 5 No. houses)
- Block H comprises 14 No units at 2-3 storeys in height. (Comprising 14 No. houses)
- Public Open Space of c.16,670 sqm (25% of net developable area) is proposed including the parkland and main public square, in addition to the linear park of c.2,427 sqm;
- c.2,272 sqm communal open space is proposed to serve the apartments;
- 414 car parking spaces in total are proposed including 70 visitor spaces, creche set down and 3 for creche staff parking within undercroft and at surface level.
- 802 No. bicycle parking spaces comprising including 128 No. visitor spaces and 10 No. to serve the creche;
- Childcare and community facility of c.377 sqm. located in Block C;
- Upgrades to the Golf Links Road including new pedestrian and cycle infrastructure with frontage on Golf Links Road;
- Vehicular access off the Golf Links Road is to be provided to the southeast of the subject site;

In addition the proposal will provide a new internal link road which will connect to the adjacent lands to the north, for which a separate planning application has been made to Fingal County Council under Reg. Ref. F21A/0287. This application is currently under appeal to An Bord Pleanála (ABP Reg. Ref. 312189-21);

All associated site development and infrastructural works including amenity spaces, landscaping, open space, boundary treatments, vehicular parking, bicycle parking, utilities, internal roads, footpaths and shared surfaces, playground, site clearance and temporary construction development.

Site Specific Flood Risk Assessment

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

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”.

In addition Objective SW07 of the Fingal Development Plan requires:

“Implement the Planning System and Flood Risk Management-Guidelines for Planning Authorities (DoEHLG/OPW 2009) or any updated version of these guidelines. A site-specific Flood Risk Assessment to an appropriate level of detail, addressing all potential sources of flood risk, is required for lands identified in the SFRA, located in the following areas: Courtlough; Ballymadun; Rowlestown; Ballyboghil; Coolatrath; Milverton, Skerries; Channell Road, Rush; Blakescross; Lanestown/Turvey; Lissenhall, Swords; Balheary, Swords; Village/Marina Area, Malahide; Streamstown, Malahide; Balgriffin; Damastown, Macetown and Clonee, Blanchardstown; Mulhuddart, Blanchardstown; Portrane; Sutton; and Howth, demonstrating compliance with the aforementioned Guidelines or any updated version of these guidelines, paying particular attention to residual flood risks and any proposed site specific flood management measures.”

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.

The site is part of the “Nanny-Devlin” river catchment as identified in the Strategic Flood Risk Assessment. The coast is approximately 1.0km to the east of the proposed site.

2 Planning System & 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 A or B.

2.2 Flood Risk Assessment Stages

This site specific risk assessment will initially use 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 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.

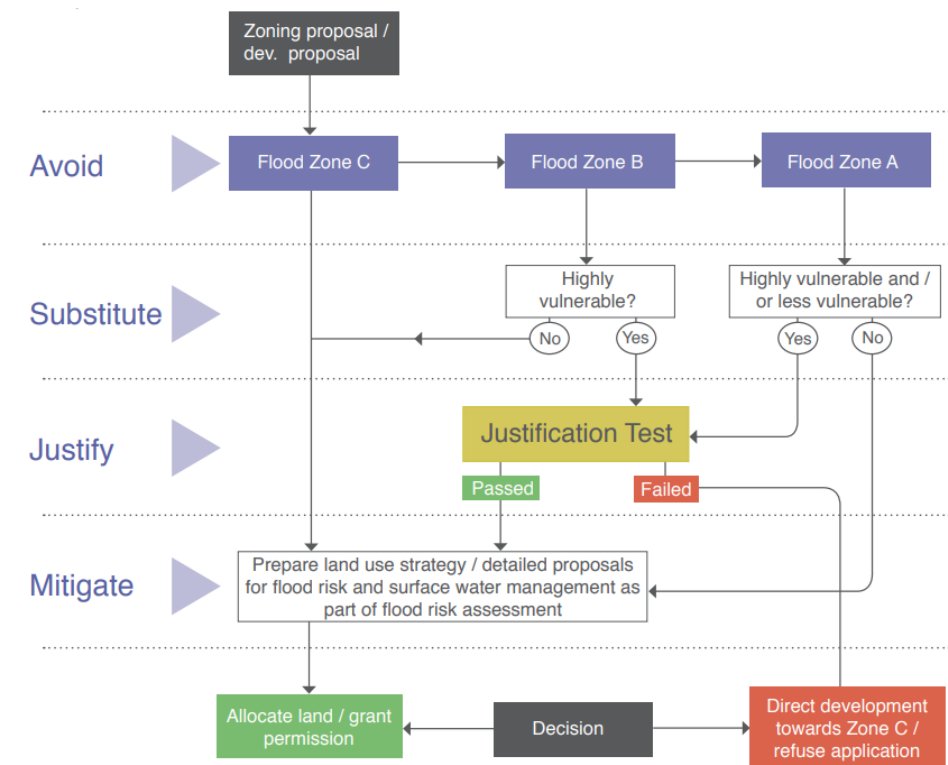


Figure 2: Sequential Approach mechanism in the Planning Process

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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 Resources Consulted

Information sources consulted for the identification exercise are outlined in:

Table 1: Information Sources Consulted

Information	Source
Predictive and historic flood maps, and benefiting lands maps	OPW www.floodmaps.ie and www.floodinfo.ie/map/drainage_map websites consulted.
Predictive fluvial, coastal, pluvial and groundwater flood maps.	ECFRAMS (refer to Appendix A included as part of this report), Fingal County Council Development Plan 2017-2023 Strategic Flood Risk Assessment consulted.
Previous Flood Risk Assessments;	Fingal County Council Planning, www.myplan.ie/national-planning-application-map-viewer/ . Planning Application Reference F11A0309. Fingal County Council Development Plan 2017-2023 Strategic Flood Risk Assessment consulted.
Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques;	OSI Maps consulted, site topographic survey undertaken and analysed. EPA gis.epa.ie/EPAMaps/
Information on flood defence condition and performance;	OPW www.floodmaps.ie and www.floodinfo.ie/map/drainage_map websites consulted.
Information on existing public sewerage condition and performance;	Greater Dublin Strategic Drainage Study Final Strategy (GSDSDS) Report, S3009 and F017, for existing sewerage in the vicinity of the subject site examined.
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. https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx
National, regional & local spatial plans, such as the National Spatial Strategy, regional planning guidelines, development plans & local area plans provide key information on existing and potential future receptors.	Fingal County Council Development Plan 2017-2023 Strategic Flood Risk Assessment consulted.

3.2.1 OPW Predictive, Historic, Benefitting Lands Maps, Flood Hazard Information Resources

Information source; the OPW website: www.floodinfo.ie indicates that there were no OPW land commission schemes or benefiting land zones within the boundary of the subject site.

Two flood events were recorded in 1982 and 1986. The flood event in 1986 was during the storm event named Hurricane Charlie and a recurring flood at the Brook Stream at Millers Lane was also recorded between 2001 and 2005. These recorded historical flood events are not considered as being in close proximity to the subject site.

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These events are hence adjudged to have not been influence by the subject site, and that the subject site was not affected by these events.

Please refer to Appendix A for the OPW ECFRAMS maps and Historic Flood Reports.

3.2.2 Previous Flood Risk Assessments & Predictive Flood Maps

The OPW recently completed the Eastern Catchment Flood Risk and Management Study (ECFRAMS) to fulfil the requirements of the EU Floods Directive (2007/60/EC). The ECFRAMS was commissioned in June 2011 with the aim of the study to identify areas at risk from flooding and hence develop flood risk management options for 'at risk' areas. The ECFRAM Programme included three main stages; the Preliminary Flood Risk Assessment (2011), Flood Risk and Hazard Mapping (late 2014) and flood Risk Management Plans (2016).

The Strategic Flood Risk Assessment for the Draft Fingal Development Plan (FDP) 2017 – 2023 includes the fluvial flood zone mapping for the Hacketstown Lands as Map 06 of 24, produced in December 2015. The draft flood map, which includes the development site, is currently under review following an objection, submission and/or further information received (as noted on OPW Floodinfo.ie). However DBFL considers this fluvial flood zone mapping to be accurate insofar as it concerns the proposed development site. The proposed site is not in the vicinity of Zone A or B floodzones, and that any amendment will not affect its classification as Zone C.

The proposed development is located outside the extents of the 1 in 1000 year (0.1% AEP) of the "Nanny-Devlin" river catchment identified in Map 06 of 24 of the SFRA of the FDP

Please refer to Appendix A for the FDP mapping, OPW ECFRAMS mapping and Historic Flood Reports.

O'Connor Sutton Cronin Multidisciplinary Consulting Engineers (OCSC) were previously involved with the planning application (ref. F11A/0309) for the adjacent Ballygossan Park Development. The OCSC Surface Water Management report concluded that the small watercourse, along the northern boundary of the subject site, does not receive any flood water from the lands to the west, that there was no report of flooding in the immediate vicinity of the site. In the unlikely event of nearby streams flooding there is no hydraulic pathway for any floodwater to enter the small watercourse due to the land topography. The highest 1000-year return flood level at the closest recorded ECFRAMS hydraulic node (15Maa207) was well below the lowest design level within the subject site. This watercourse drains only the lands surrounding it included in the now expired LAP and as these lands will be designed to discharge greenfield run-off rates, there will be no increase to the current volumes of water entering it. OCSC concluded there is no risk of flooding from this small watercourse.

The OCSC Surface Water Management report confirmed the provision of a Regional Drainage Facility (RDF), comprising swale, interception storage and detention basin in the linear open space on the northern boundary of the subject site, designed to accommodate run off from development in both the subject land holding and the Noonan Construction lands to the north. The completion of this RDF, and associated infrastructure was included as part of the Advanced Infrastructure, subject of a Section 34

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application to Fingal County Council (FCC F21A/0287) as required. This application is currently on appeal to An Bord Pleanála (ABP Reg. Ref. 312189).

Refer to the DBFL Engineering Services Report, 190170-DBFL-XX-XX-RP-C-001, for further details on the design of the RDF to service the Hacketstown lands.

3.2.3 Tidal Flood Maps

The subject site is located approximately 1.0km west of the coast and therefore is not at risk of tidal flooding.

3.2.4 Other Sources

Other information sources were consulted to determine if there was any additional flood risk to the site, these included;

- Topographical surveys of the area -

No evidence of flooding was found within the proposed bounds of the proposed development. The existing small watercourse has not been defined on the OSI Maps, OPW or EPA websites. The Surface Water Management Report compiled by OCSC concludes that this small watercourse acts as a land drain only to the subject lands and lands to the north. Figure 3 below indicates the location of the aforementioned small watercourse. An existing railway culvert connects the lands to the west of the railway to the subject lands however, the report by OCSC and the topographical survey confirms that no floodwater passes through the railway culvert during extreme flood events. The topographical survey data shows that the land gradients within the catchment of the small watercourse are in excess of 8%.



Figure 3: Minor Watercourse on Site

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- Flood defence information -
No defences are present within the subject site or in the vicinity of the site.
- Ground Investigation data -
No karst features are located in this area. The site consists primarily of till derived from granites. The Subsoil Permeability is High. The Groundwater vulnerability is High. Locally Important Aquifer, Bedrock which is Generally Unproductive except for Local Zones. A site investigation was concluded by Ground Investigations Ireland (GII) in July 2020. Groundwater levels across the site was determined as varying between 1m and 1.5m below ground level. Infiltration rates on site were considered low to no infiltration.
- Existing Local Authority Drainage Records -
The Greater Dublin Strategic Drainage Study (GSDS) Report concludes that the hydraulic performance and future needs of the subject lands and surrounds were not included in the scope of the GSDS. The site is part of the “Nanny-Delvin” river catchments as identified in the Strategic Flood Risk Assessment

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 2 below. This table 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.

Table 2: Source-Pathway-Receptor Analysis

Source	Pathway	Receptor	Likelihood	Impact	Risk
Tidal	Tidal flooding from coast 1.0km away.	Residents (people) development, visitors and the buildings themselves and other property such as vehicles located in car park areas.	Remote	High	Very Low
Fluvial	Flooding from Mill Stream located to the north of the site.	Residents (people) development, visitors , Road Bridge and the buildings themselves and other property such as vehicles located in car park areas.	Remote	High	Very Low
Surface Water - Pluvial	Flooding from existing minor ditches running through the site.	Residents (people) development, visitors and the buildings themselves and other property such as vehicles located in car park areas.	Remote	High	Moderate
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 – overland flows	Residents (people) development, visitors and the buildings themselves and other	Possible	High	Moderate

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Source	Pathway	Receptor	Likelihood	Impact	Risk
		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

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.

However, there is a moderate risk of pluvial and groundwater flooding of the drainage infrastructure and basements and moderate risk of flooding of the site due to the potential surcharging and blockage of the new drainage network.

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

4 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified that there is a possible pluvial flood risk within the development site. This risk is related to the potential local flooding caused by the proposed drainage system. This risk can be mitigated by designing the drainage system in accordance with the regulations e.g. Greater Dublin Strategic Drainage Study (GDSDS) and considering the flood exceedance for storms 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.

In addition, the Source-Pathway-Receptor model identified that there could be potential for pluvial flood risk within the development site related to the existing open drainage ditches within the site.

The proposed development will utilise the Regional Drainage Facility comprising swale, interception storage and detention basin proposed in the linear open space on the northern boundary, as part of its surface water management strategy. This Regional Drainage Facility and associated infrastructure was included as part of an Advanced Infrastructure Application, currently on appeal to An Bord Pleanála (ABP Reg. Ref. 312189) following submission for planning to Fingal County Council under planning reference number F21A/0287. 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 is a moderate potential for groundwater flood risk within the development site.

4.1 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 and FDP SFRA mapping – refer to Appendix A.

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 a Sustainable Drainage System (SuDS) with roof downpipes, gullies, pipes, manholes, attenuation systems and discharge control at outlets;
- SuDS systems will be provided including green roofs, swales, tree pits, permeable paving and petrol interceptors.
- Attenuation and interception by means of a Regional Drainage Facility comprising of a central swale.
- 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.

Details of these measures and the locations they are employed can be found in the DBFL suite of civil engineering drawings and reports.

5.3 Assessment of Flood Risk

The following sections provide a summary of the flood risks and how they have been effectively managed for occupants of the site and its infrastructure.

5.3.1 Flood Exceedance – Pluvial

Flooding from existing open ditches

There are minor surface water drainage ditches and hedgerows within the site draining to the small watercourse noted above. These ditches serve as land drains only and are not considered to be watercourses. Upon development of the site, these ditches will serve no drainage function since a positive drainage system will be constructed in lieu, therefore, their removal poses no flood risk post-

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development. In addition, as noted above, there will be no risk of flooding from the small receiving watercourse.

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, apartment ramps or footpaths. See DBFL drawing 190170-DBFL-RD-SP-DR-C-1001 for proposed site levels.

Flooding from surcharging of the development's drainage systems

The surface water pipe system has been designed using MICRODRAINAGE Simulation modelling. The 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.

As no flooding occurs throughout the site for the design return period of 1 in 100 years, the pipe system is considered to exceed the requirements of the GSDSDS for a 1 in 30-year return period surcharge check.

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

In order to assess the likelihood of pluvial flooding occurring, a surface water drainage simulation model has been carried out using MICRODRAINAGE for the entire site. This model has been used to highlight individual manholes at risk of flooding in a 1 in 30 and 100 year storm events and mitigation measures to be put in place to prevent any damage to persons or property. These mitigation measures consist of overland flow routes to direct any floodwater away from buildings, either keeping it within the carriageway or directing the surface water to designated green areas within the site. The finished floor levels for all buildings in the vicinity are designed to be above the surcharged level for any manhole in danger of flooding. Furthermore, finished floor levels for all buildings will be a minimum of 500mm above the maximum flood levels (including 20% climate change) in nearby surface water attenuation systems.

Refer to the DBFL Engineering Services Report, 190170-DBFL-XX-XX-RP-C-001, for further clarification and details on the design of the surface water network to service the development.

5.3.2 Flood Exceedance – Groundwater

The initial site investigations noted groundwater levels to vary between 1m and 1.5m below ground level. Basements, under crofts and buildings located in areas where the existing ground level is to be cut/lowered have been designed to resist hydrostatic uplift and will be watertight and avoid any ingress of groundwater, in addition a permeable vertical gravel/stone layer will be installed around the basement to minimise any 'back-up' of groundwater levels up-gradient of the basement.

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5.3.3 Impacts on Adjacent Areas

If there are any floodwaters generated within the development there may be a risk of flooding to the adjacent areas. This risk is considered minimal due to the site topography and layout.

5.3.4 Human or Mechanical Error – Pluvial

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

5.4 Access & Egress During Flood Events

During flood events, access and egress shall be maintained and overland flow routes and extents carefully planned. All habitable spaces are located more than 500mm above the top water levels for attenuation systems for the 1 in 100 year event and are at no perceivable risk of flooding. The design of the proposed ground levels are high enough above the 1 in 100 year flood event (plus climate change) that any floodwater present will not be of a great enough volume to prevent access or egress, thus maintaining safe routes.

5.5 Mitigation Measures

Proposed mitigation measures to address residual flood risks are set out below;

Mitigating Measure M1: The proposed drainage system including the Regional Drainage Facility will be maintained on a regular basis to reduce the risk of a blockage. A maintenance contract for the petrol interceptor will be entered into with a specialist maintenance company.

Mitigating Measure M2: The drainage network is designed in accordance with the recommendations of the GSDSDS and provides attenuated outlets and associated storage up to the 100 year event. The drainage network for the site has been designed to ensure that it can accommodate the 1 in 100 year rainfall event in surcharged conditions. Refer to DBFL Engineering Services Report and drawing 190170-DBFL-SW-SP-DR-C-1011 for further details.

Mitigating Measure M3: Overland flow routes for pluvial events will not be built on or become blocked off. Overland flow routes have been designed to direct water to compatible development areas and to other open space areas away from dwellings.

Mitigating Measure M4: At detailed design stage, the location of all dropped kerbs and side inlet gullies to be fully reviewed to ensure all overland flow paths are not impeded.

Mitigating Measure M5: Sustainable Urban Infrastructure: the proposed development includes SUDS features, specifically green roofs, permeable paving, swales, tree pits and filter drains, incorporating interception, infiltration and storage at source. Refer to DBFL Engineering Services Report and drawing 190170-DBFL-SW-SP-DR-C-1011 for further details.

These mitigation measures are considered to be effective in addressing any flood risks to the proposed development as requested in “*The Planning System and Flood Risk Management Guidelines for Planning Authorities*” . Details of these measures can be found in DBFL’s suite of civil engineering drawings.

6 Residual Risks

Remaining residual flood risks, following the detailed assessment and mitigation measures include the following;

- Pluvial flooding from the drainage system related to a pipe/culvert blockage or from flood exceedance.
- Pluvial flooding from the development's drainage system for storms in excess of the 100 year design capacity.

These residual risks cannot be designed out as blockages etc. are a result of foreign objects entering the drainage networks via human action. With regards a storm event in excess of the 100year design capacity, this has a very low probability of occurring. It is not required under the GDSDS, however, measures as noted above have been employed to mitigate such occurrences to direct any flood waters from residential units.

7 Conclusion

This Site Specific Flood Risk Assessment for the proposed residential development was undertaken in accordance with the requirements of the "Planning System and Flood Risk Management Guidelines for Planning Authorities", November 2009. Following the flood risk assessment stages, it was determined that the site is within Flood Zone C as defined by the Guidelines and based on FDP SFRA mapping and the ECFRAMS mapping. Therefore, the development of housing on the subject site is appropriate for the site's flood zone category and a justification test as outlined in the Guidelines is not required. The Guidelines' sequential approach is met with the 'Justify' & 'Mitigate' principles being achieved.

The proposed flood mitigation measure(s) outlined in Section 5.5 will be implemented as part of the proposed development as illustrated in the DBFL suite of civil engineering drawings. 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 or to the downstream watercourse.

Regular maintenance of the 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 would direct water towards the open space areas and Regional Drainage Facility.

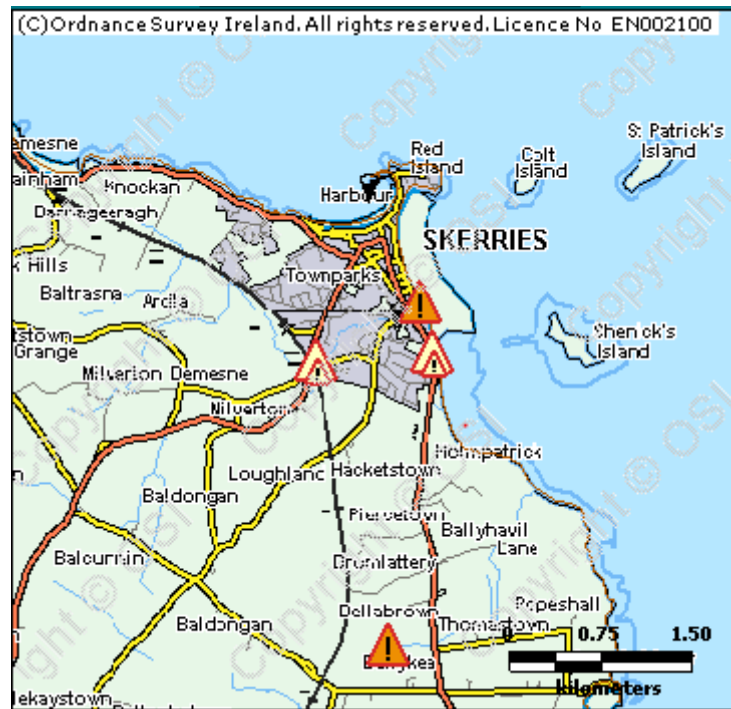
Should extreme pluvial flooding occur in excess of the development's drainage capacity i.e. exceeding 1%AEP, then overland flood routes towards the on-site open spaces and Regional Drainage Facility will protect the development and houses with lowest proposed floor levels.

While the development constitutes 'highly vulnerable' development, it is appropriate for this flood zone (Flood Zone C) and the scheme has been designed to ensure that the risk of flooding of the development is reduced as far as is reasonably practicable (residual risks noted in chapter 6) . The development does not increase the risk of flooding to adjacent areas and roads once mitigation measures are implemented.

APPENDIX A

OPW Flood Reports, Fingal SFRA Fluvial Flood Map and ECFRAMS Mapping.

Site Specific Flood Risk Assessment

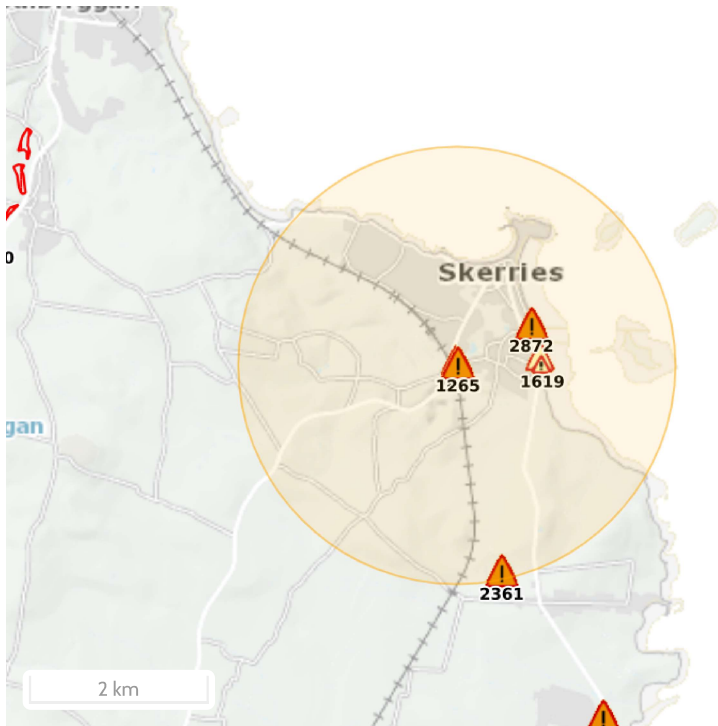




Report Produced: 21/3/2022 17:59

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

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



Map Legend

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

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

6 Results

Name (Flood_ID)	Start Date	Event Location
1. Mill Skerries August 1986 (ID-1265) Additional Information: Reports (1) , Press Archive (0)	25/08/1986	Approximate Point
2. Holmpatrick Skerries Recurring (ID-1619) Additional Information: Reports (5) , Press Archive (0)	n/a	Exact Point
3. Brooke Stream Millers Lane Skerries Recurring (ID-1629) Additional Information: Reports (5) , Press Archive (0)	n/a	Exact Point
4. Mill Stream Skerries Nov 1982 (ID-2131) Additional Information: Reports (1) , Press Archive (0)	05/11/1982	Approximate Point
5. Ballykea Lusk Autumn 2000 (ID-2361) Additional Information: Reports (1) , Press Archive (0)	01/09/2000	Approximate Point
6. Skerries South Beach Holmpatrick Feb 2002 (ID-2872) Additional Information: Reports (2) , Press Archive (0)	01/02/2002	Approximate Point

Senior Executive Engineer,
Environmental Services.

12/02/02

RE: Flooding on Friday 1st Feburary, 2002 – Lunchtime.

Sutton

The tide flooded Greenfield Road & Strand Road. Most of the drive's fall away from the road on Strand Road therefore most of the gardens were flooded.

No.1 Strand Road

- House & front garden flooded. The resident had to move out of the house as water entered air vents at ground level.

No.2 – 6 Strand Road

- Front garden & drive flooded. Water was a few inches from the front doors. Drainage Section arrived at approximately 8:00pm and sandbagged all the houses. The water in the front gardens was pumped down, to protect in event of further flooding. The pumps were kept running until the high tide at 2:00am subsided.

No.6 – 18 Strand Road

- These houses requested and were provided with sandbags at 11:00pm to prevent flooding.
- *Opposite church on Greenfield Road*
- Sea wall at rear of house destroyed and water entered house. The water entered the house under the seal of the windows. Drainage provided sandbags at 12:00am to prevent further flooding.

No.12 Santa Sabina Manor

- This housing estate was provided with a pallet of sandbags at 1:30am.

No.16, 17 Dublin Road, Bayside/Sutton

No.37, 40 Dublin Road, Sutton

- These houses here were flooded in the drive and garden and this Section provided a clean up.

Malahide

Mill View Lawn

- Flooding in drive, no water in any of the houses.

Memory Shop, Strand Road

- Flooding in shop, a crew was down to mop up and provide sandbags.

Baldovle

No.1 & No.2 Coast Road

- These two houses were completely flooded in the space of 10min on Friday. The tide came in and partially flooded the house, it also flooded the septic tank which resulted in the sewerage backing up into the houses. The Drainage Section has provided skips, heaters and labour to remove the damaged material from the houses.

Swords

Estuary Road was flooded and the only means of getting to the following houses was via a JCB.

Broadmedow House, Estuary Road

- The tide had entered the house to a level of approximately 150mm. All rooms in this bungalow were flooded. Sandbags were provided to prevent further flooding.

Estuary Road

- Garden flooded. Sandbags provided.

No.1 Gartan Court

- Driveway flooded but no damage. Sandbags provided to prevent flooding.

Rogerstown, Rush

The Crescent Road

- Two houses on The Crescent Road were flooded with water as a result of the tide covering this road as well as Spout Road, making access impossible.

Junction of Crescent Road/South Shore Road

- The house was flooded as well as the garden and greenhouses on South Shore Road. This Section provided a 4" pump to remove the water from his greenhouse, all day Friday. Sandbags were also provided.

South Shore Road

- Two houses opposite the Pump Station in Rogerstown had their drives flooded. A 6" pump was provided to remove water from gardens.

The Pump Station

- The station was flooded with the tide, but at no stage did the pump cut out. The pumps were unable to keep the tide out.

Portrane

The Burrow

- There were two houses at the edge of the Estuary, where the tide entered the house.

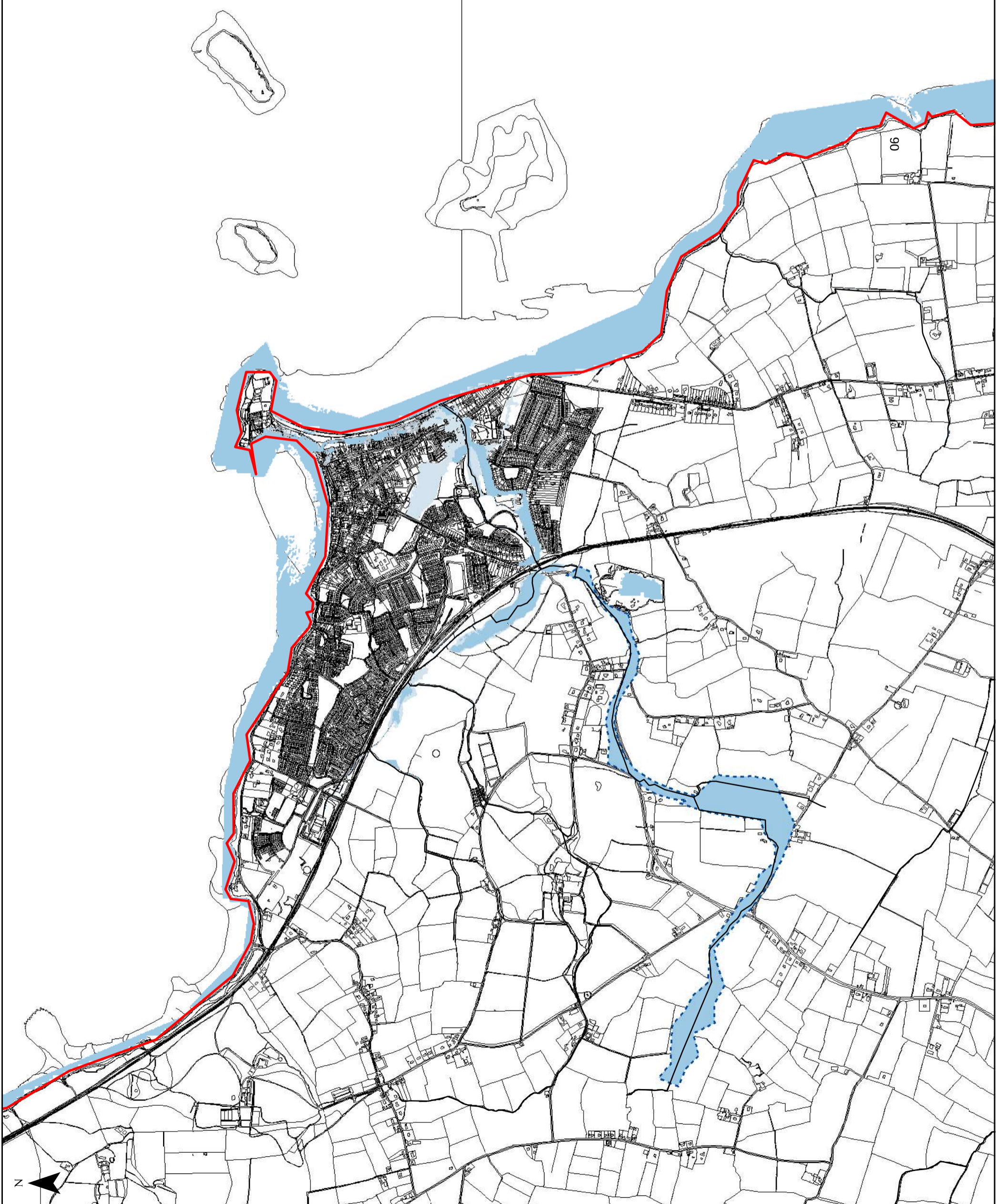
Skerries

The flooding was as a direct result of the tide coming in.

10 No. houses, South beach/Weldons Lane, Holmpatrick

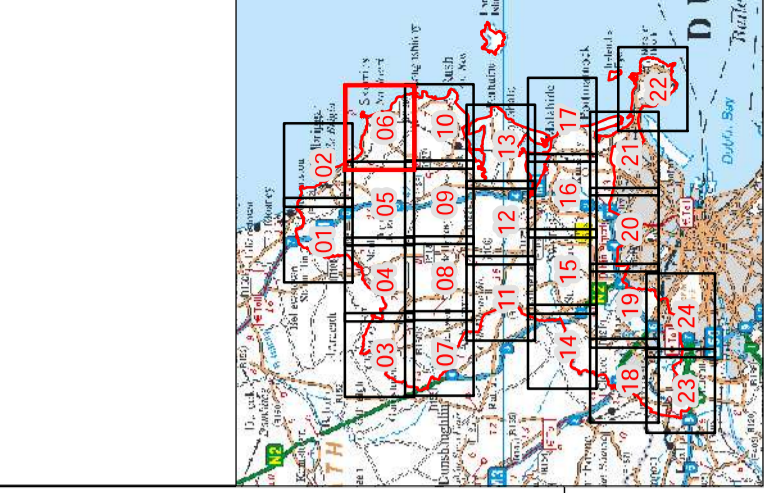
- 4No. houses were flooded inside the house and of these two has basements.
- 6No. houses were flooded outside the house in the garden & drive.

AREA ENGINEER,
DRAINAGE



Legend

- Fingal County Boundary
- Watercourse Centreline
- Defended Area
- Flood Zone A - 1% AEP Flood Extent (1 in 100 chance in any given year)
- Flood Zone B - 1% AEP Flood Extent (1 in 1000 chance in any given year)
- Indicative Flood Extents



Client
Comhairle Contae Fhine Gall
 Fingal County Council

Project
Strategic Flood Risk Assessment

Title
Fluvial Flood Zone Mapping

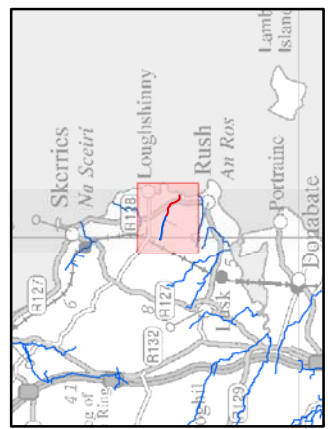
Figure
 Map 06 of 24

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Issue Details	
Drawn By: HF	Project No. MDW0716
Checked By: BT	File Ref: MDW0716arc001D02
Approved By: SK	Drawing No. Rev:
Scale: 1:20,000 @ A3	Arc001 D01
Date: 02/12/2015	

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 2. Our services are provided on a non-warranted basis.
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Location Plan :



EXTENT MAP

- Legend:
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
 - 1 % AEP Flood Extent (1 in 100 chance in any given year)
 - 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
 - Defended area
 - High Confidence (<20m) (10% AEP)
 - Medium Confidence (<40m) (10% AEP)
 - Low Confidence (>40m) (10% and 0.1% AEP)
 - High Confidence (<20m) (1% AEP)
 - Medium Confidence (<40m) (1% AEP)
 - Low Confidence (>40m) (1% AEP)
 - Modelled River Centreline
 - Node Point
 - Node label with level data (refer to table)
 - Node level with flow & level data (refer to table)
 - High confidence refer to table
 - Medium confidence refer to table
 - Low confidence refer to table

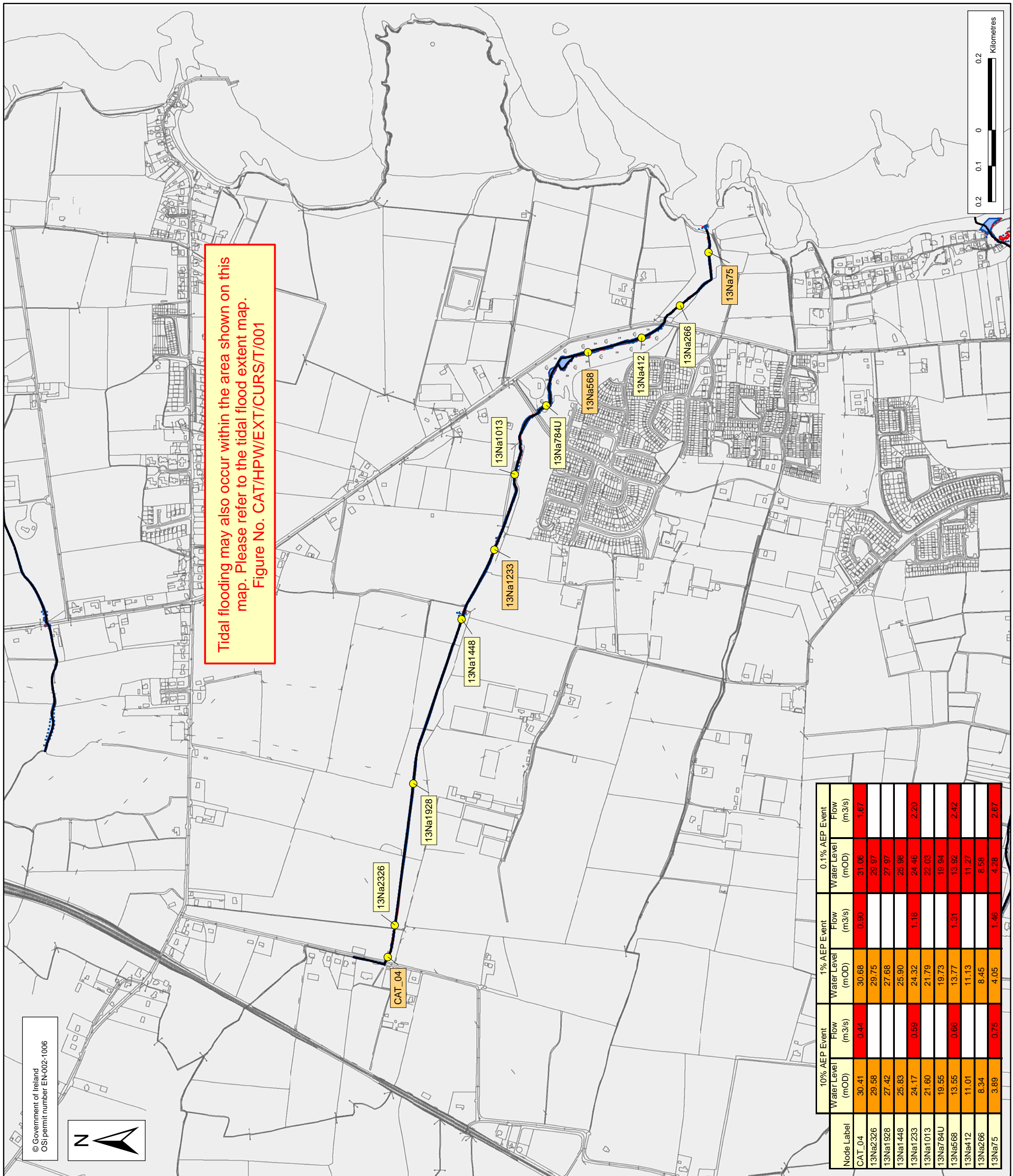
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HalcrowBarry
 Tramway House
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Clients :
 Project : FEM FRAMS
 Map : ST. CATHERINE'S MODEL FLOOD EXTENT MAP
 Map Type : FLOOD EXTENT
 Source : FLUVIAL FLOODING
 Map area : HIGH PRIORITY WATERCOURSE
 Scenario : CURRENT
 Figure By : Mara Ruiz Date : 8 August 2010
 Checked By : Sergio Herbon Date : 8 August 2010
 Approved By : Clare Dewar Date : 8 August 2010
 Figure No. : CAT/HPW/EXT/CURS/001 Revision : 0
 Drawing Scale : 1:10,000 Plot Scale : 1:1 @ A3

Tidal flooding may also occur within the area shown on this map. Please refer to the tidal flood extent map. Figure No. CAT/HPW/EXT/CURS/T/001



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Node Label	10% AEP Event		1% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
CAT_04	30.41	0.44	30.68	0.80	31.06	1.67
13Na2326	29.58		29.75		29.97	
13Na1928	27.42		27.68		27.97	
13Na1448	25.83		25.90		25.98	
13Na1233	24.17	0.59	24.32	1.18	24.46	2.20
13Na1013	21.60		21.79		22.03	
13Na784U	19.55		19.73		19.94	
13Na568	13.55	0.66	13.77	1.31	13.92	2.42
13Na412	11.01		11.13		11.27	
13Na266	8.34		8.45		8.58	
13Na75	3.89	0.75	4.05	1.46	4.28	2.67