



SITE SPECIFIC FLOOD RISK ASSESSMENT for a Mixed-Used Development at Greenfields, Mantua Rd.(L6310), Swords, Co. Dublin



PROJECT: GREENFIELDS LRD, SWORDS - 2412
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1.0 Introduction

- 1.1 This document relates to the Flood Risk Assessment (FRA) for a proposed mixed-use development located on lands at located at Mantua Road (L6310), Swords, Co. Dublin.
- 1.2 We, Roger Mullarkey & Associates, were appointed by Jackie Greene Construction Ltd. to carry out the Site Specific Flood Risk Assessment report to accompany the suite of other drawings and documentation relating to the proposed residential development at the above noted address.
- 1.3 The site application area is c.2.2Ha and the lands are currently greenfield.



Fig.1 - Site Location

- 1.4 The site is bounded to the north and west by an access road serving existing industrial/retail parks, to the east by a heavily vegetated embankment leading to the M1 motorway and to the south by an existing public road (L6310).

- 1.5 The proposed application will consist of a mixed-use residential development of 289No. units plus a c.418m² Creche and c.701m² Commercial area. Please refer to Thornton O'Connor for a full development description.
- 1.6 In accordance with the requirements set out in the DoEHLG and OPW published guidelines *The Planning System and Flood Risk Management 2009* (the Guidelines) and the Strategic Flood Risk Assessment Policy of Appendix 15 of the Fingal County Development Plan 2022 - 2028 a Site Specific Flood Risk Assessment (SSFRA) is carried out for this application.
- 1.7 The purpose of the SSFRA is to scope for possible sources of flooding, assess the types of flood risk for the proposed development and to consider if there are any possible impacts on flood risk elsewhere due to the development. Where appropriate, the SSFRA recommends flood mitigation and management measures and identifies residual risks, if any should remain after the implementation of the identified measures.
- 1.8 The report is intended for the sole use of the applicant, their elected agents and advisors and, further, solely for the purpose for which it was originally commissioned. It may not be assigned or copied to third parties or relied upon by third parties.

2.0 Flood Risk Guidelines and the Planning System

- 2.1 The Planning System and Flood Risk Management, Guidelines for Planning Authorities (the Guidelines) was published in November 2009. The main purpose of the Guidelines is to ensure that sustainable development can be delivered by integrating flood risk management into the planning process.
- 2.2 The core objectives of the guidelines are to;
 - Avoid inappropriate development in areas at risk of flooding;
 - Avoid new developments increasing flooding elsewhere, including that which may arise from surface water runoff;
 - 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;

- Ensure that the requirements of EU and national law in relation to the environment and nature conservation are complied with at all stages of flood risk management.
- 2.3 A staged approach is adopted to the Flood Risk Assessment (FRA) as follows;
- 2.4 *Stage 1 - Flood risk identification* - identify whether there may be any flooding or surface water management issues related to either the area or 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.
- 2.5 *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.
- 2.6 *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.
- 2.7 From the Guidelines Section 3.1, the broad philosophy underpinning the sequential approach in flood risk management is laid out as follows;

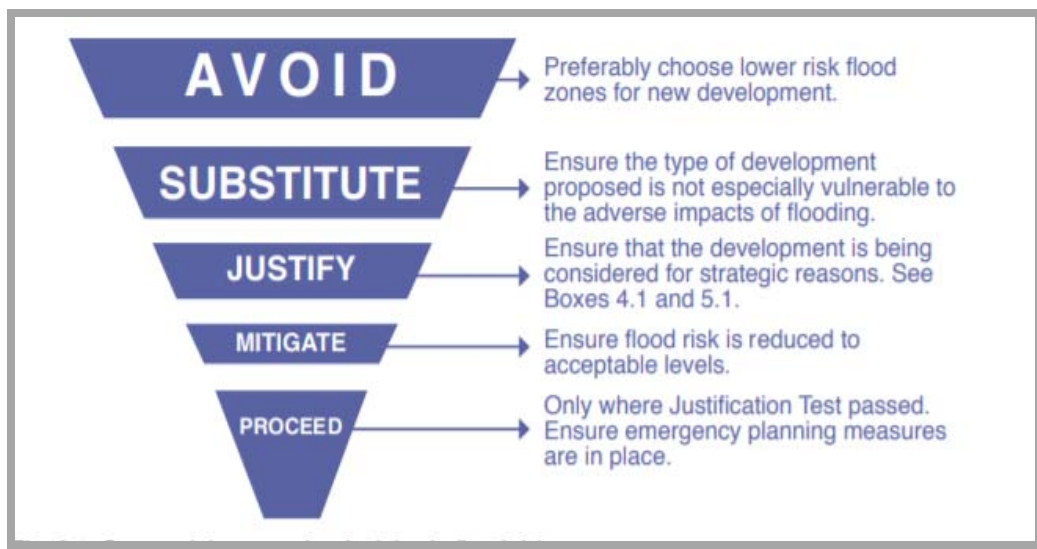


Fig.2 - Extract from Section 3.1 of the Guidelines

- 2.8 The 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.
- 2.9 The sequential approach described in Fig.3 above should be applied to all stages of the planning and development management process and is applicable in the layout and design of development within a specific site at the development management stage.
- 2.10 The following flow chart from Section 3.2 of the Guidelines describes its mechanism for use in the planning process.

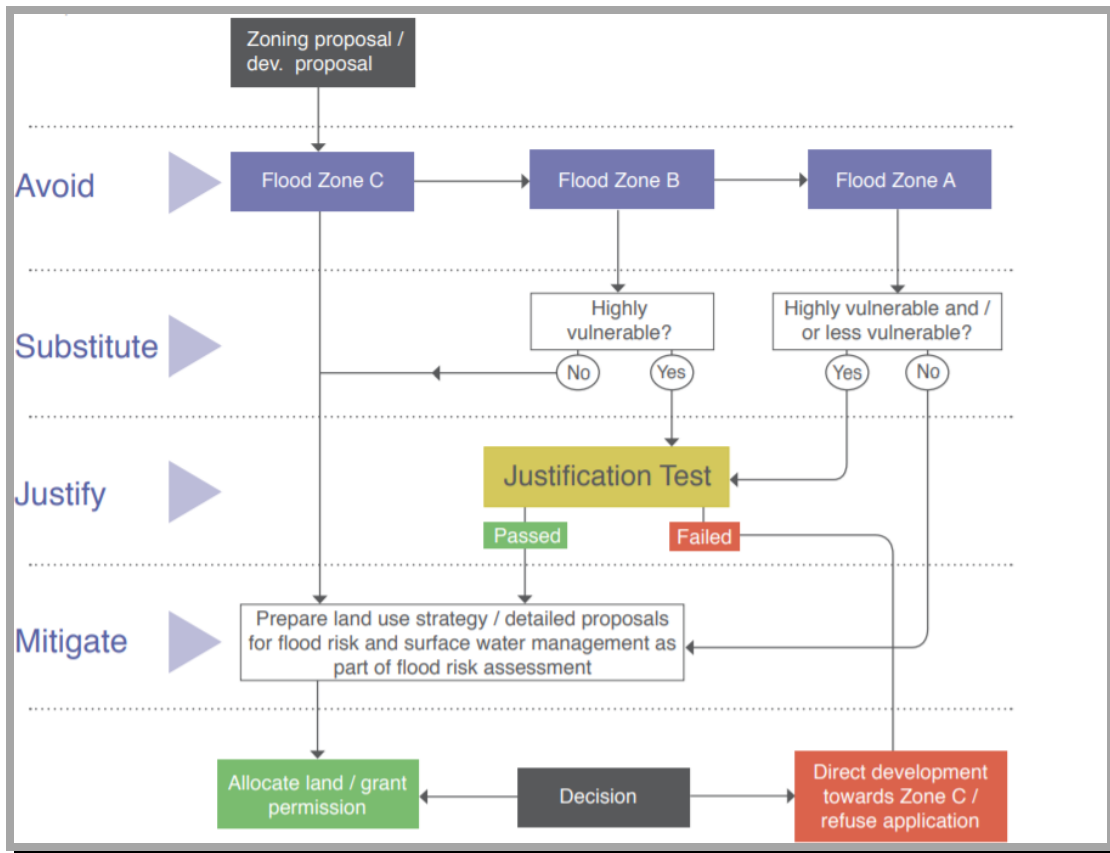


Fig.3 - Extract from Section 3.2 of the Guidelines

- 2.11 There are 3 types or levels of flood zones defined in the Guidelines and are as described in Fig.4 below;

Flood Zone	Description
A	Where 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	Where 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 for coastal flooding)
C	Where the probability of flooding from rivers and 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.

Fig.4 - Flood Zones

2.12 The following table extracted from the Guidelines section 3.5 defines the Vulnerability Classes of various types of development.

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	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	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	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	

Fig.5 - Extract from Section 3.5 of the Guidelines

- 2.13 The vulnerability of class of a development and the identified flood zone are used to determine the appropriateness of the development proposed and which types of development would need to undergo a Justification Test as per the extracted table from section 3.6 of the Guidelines below;

	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

Fig.6 - Extract from Section 3.6 of the Guidelines

- 2.14 Should the review of the sequential approach determine that a Justification test is necessary, i.e., a development lies in a high/moderate risk of flooding and be inappropriate as per the Justification test table as above, the following table extracted from the Guidelines section 5.15 needs to be satisfied;

Box 5.1 Justification Test for development management (to be submitted by the applicant)	
When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must 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.	

Fig.7- Extract from Section 5.15 of the Guidelines

3.0 Site Specific Flood Risk Assessment

3.1 General

- 3.1.1 The site is proposed on greenfield land located at Mantua Road (L6310), Swords, Co. Dublin (see Fig.1)
- 3.1.2 The site application area is c.2.2Ha and the drainage design is discussed in detail in the separate Engineering Infrastructure & Stormwater Impact Assessment report accompanying this LRD Stage 3 submission.
- 3.1.3 The topography generally is gentle sloping towards the centre of the site with downwards gradients ranging between 1/30 to 1/80. A site survey drawing is included in the application and can be viewed as background on the drawing RMA Dwg.No.2412/01 and is summarised in Fig 8 below.



Fig.8- Topography

3.1.4 There is an existing 900mm S/W pipeline laid parallel to the eastern site boundary, refer to Dwg.2412/02 for location of same. This pipe currently drains the Swords Business park to the south of the proposed development and also drains the public road (L6310) between. A remnant alignment of what was the Gaybrook watercourse remains on the site but this has been diverted some c.30 years ago into the above noted 900mm culvert and the ditch remains “dry” with no upstream flows entering the site. This has been confirmed by both topographical, physical observation and CCTV survey. Refer to Dwg.2412/10 for detail of this existing 900mm S/W culvert and to Fig 9 below for an illustration of same.

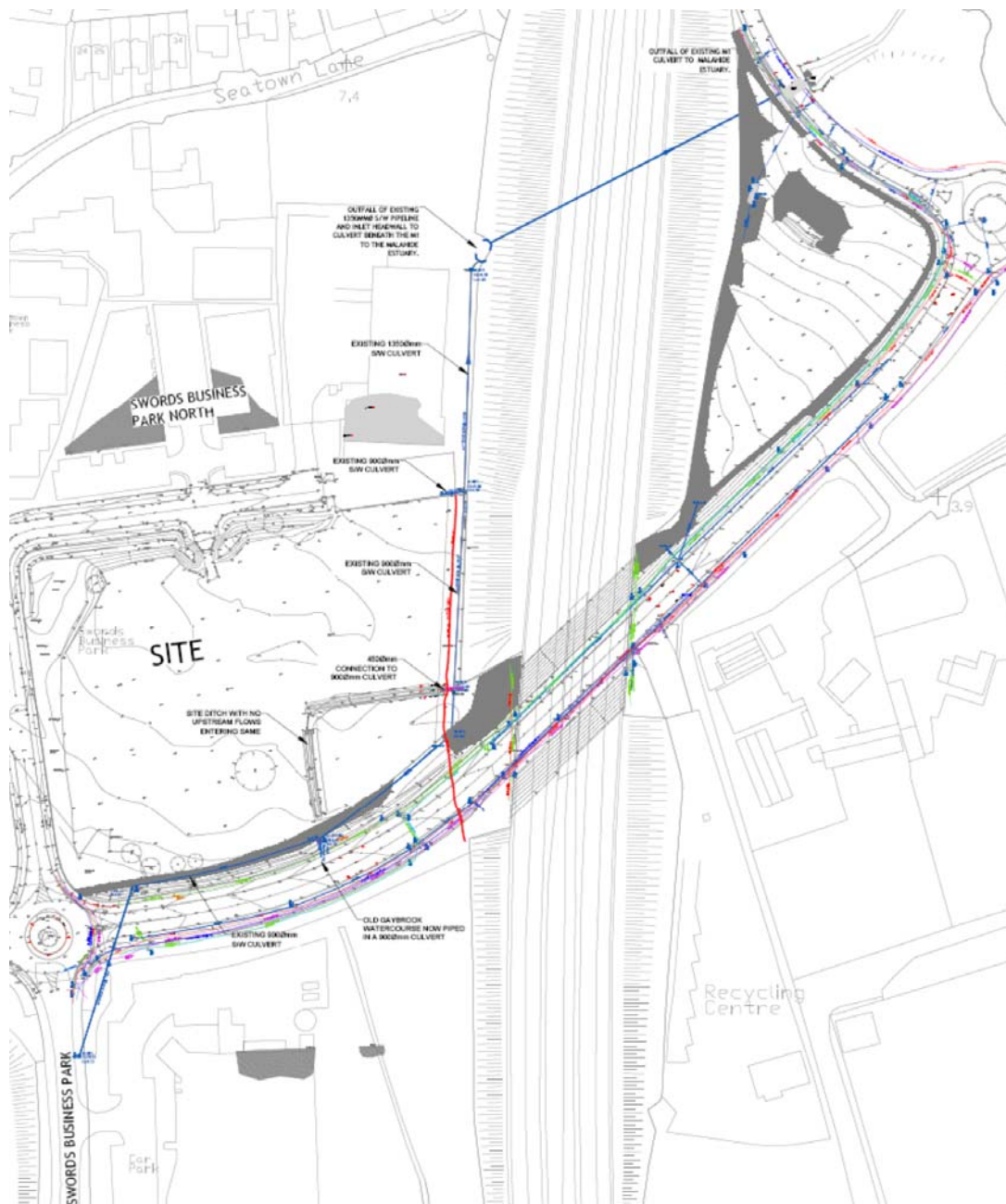


Fig.9- Existing S/W Culvert

3.1.5 A Road & Block levels drawing has been prepared as part of this application and reference should be made to Dwg.No.2412/01 in this regards.

3.1.6 The following assessment will identify the potential sources of flooding and categorise the risk as either very low, low, medium, high, and very high.

- 3.1.7 The risks categorised above are based on the judgement and experience of the Engineer carrying out the assessment and based on the documentation sourced from the Flood Risk Indicator sources as noted in Section 3.3 of this report.
- 3.1.8 The initial assessment process will involve examining the flood risk indicators. Where it is demonstrated that there is a risk of flooding the study will progress to a more detailed flood risk assessment, if required. Each of the below 5 potential sources of flood risk will be assessed in this regards.

3.2 *Potential Sources of Flood Risk*

3.2.1 **Tidal**

Coastal flooding is caused by higher sea levels than normal, largely because of storm surges, resulting in the sea overflowing onto the land.

3.2.2 **Fluvial**

Caused by the overtopping of rivers/streams when the capacity of a watercourse is exceeded or the channel is blocked or restricted, and excess water spills out from the channel onto adjacent low-lying area.

3.2.3 **Pluvial**

Caused when the intensity of rainfall events cannot be absorbed into the ground or urban drainage systems cannot effectively convey the flowrates.

3.2.4 **Groundwater**

Groundwater flooding occurs when the level of water stored in the ground, the water table, rises because of prolonged rainfall. Groundwater flooding tends to be very local and result from interactions of site specific factors such as tidal variations.

3.2.5 **Human/Mechanical Error**

Caused by blockages in piped systems or intervention of/failure of mechanical devices.

3.3 *Flood Risk Indicators*

3.3.1 The initial flood risk identification involves a scoping review of existing available information and datasets. The following source indicators were researched as part of the Stage 1 process;

- UÉ/FCC Drainage Records maps
- Available OPW flood maps and reports (from *floodinfo.ie*)
- OPW Eastern CFRAM study
- Fingal Development Plan 2023-2029
- Strategic Flood Risk Assessment for the Fingal CDP 2023-2029
- OPW PFRM mapping
- ECFRAM Maps
- National Indicative Fluvial Maps (NIFM)
- Geological Survey of Ireland (GSI) website
- Teagasc soils data sets
- Ordnance Survey mapping
- Topographical survey
- Site Investigation report
- Site walkover visits

3.4 *Tidal Flood Risk*

3.4.1 Tidal flooding is caused by higher sea levels than normal, largely because of storm surges, resulting in the sea overflowing onto the land. There are also tidal effects on groundwater levels.

3.5 *Tidal Flood Risk Indicators*

3.5.1 Reference to land mapping websites such as google maps/OSI mapviewer indicate that this site is c.300m the Malahide Estuary. The site topographical survey demonstrates that the land is elevated at between c.6 to 7mOD Malin Head. The Estuary Road is elevated at c.2.5mOD, some 4.5/5m below the site elevation.

3.6 *Initial Tidal Flood Risk Assessment*

3.6.1 Reference was made to the available Fingal East Meath FRAM (FEMFRAM) Study maps, to the Fingal Development Plan Flood Zone Mapping and to the National Coastal Flood Hazard Mapping(NCFHM). Based on review of that mapping it is evident that the Coastal (and Fluvial) flood extents up to and including the 0.1% (1 in 1000 year) AEP (Annual Exceedance Probability) events do not extend to the subject site. See Fig 10 below

extracted from the NCFHM website (floodinfo.ie) for an illustration of the available data;

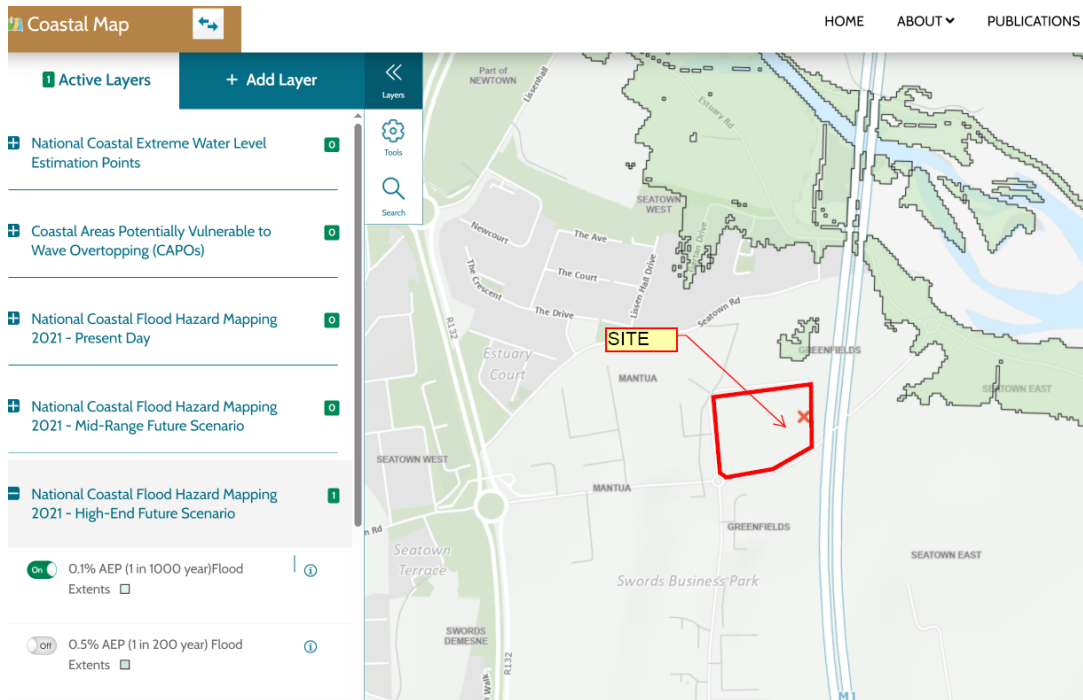


Fig.10- Extract from the NCFHM

3.6.2 Based on the above, in our opinion there is a low risk of Tidal flooding on this site.

3.7 Fluvial Flood Risk

3.7.1 Fluvial river/stream flooding occurs when the capacity of a watercourse is exceeded or the channel is blocked or restricted, and excess water spills out from the channel onto adjacent low-lying area.

3.8 Fluvial Flood Risk Indicators

3.8.1 Reference to the EPA mapping website identifies a historical watercourse crossing the site known as the “Gaybrook”. It is noted that this mapping is inaccurate as the watercourse was diverted c.30 years ago into a 900mm S/W pipeline laid parallel to the eastern site boundary, refer to Dwg.2412/10 for location of same. The existing ditch remains “dry” with no upstream flows entering the site. This has been confirmed by both topographical survey, visual inspection and CCTV survey.

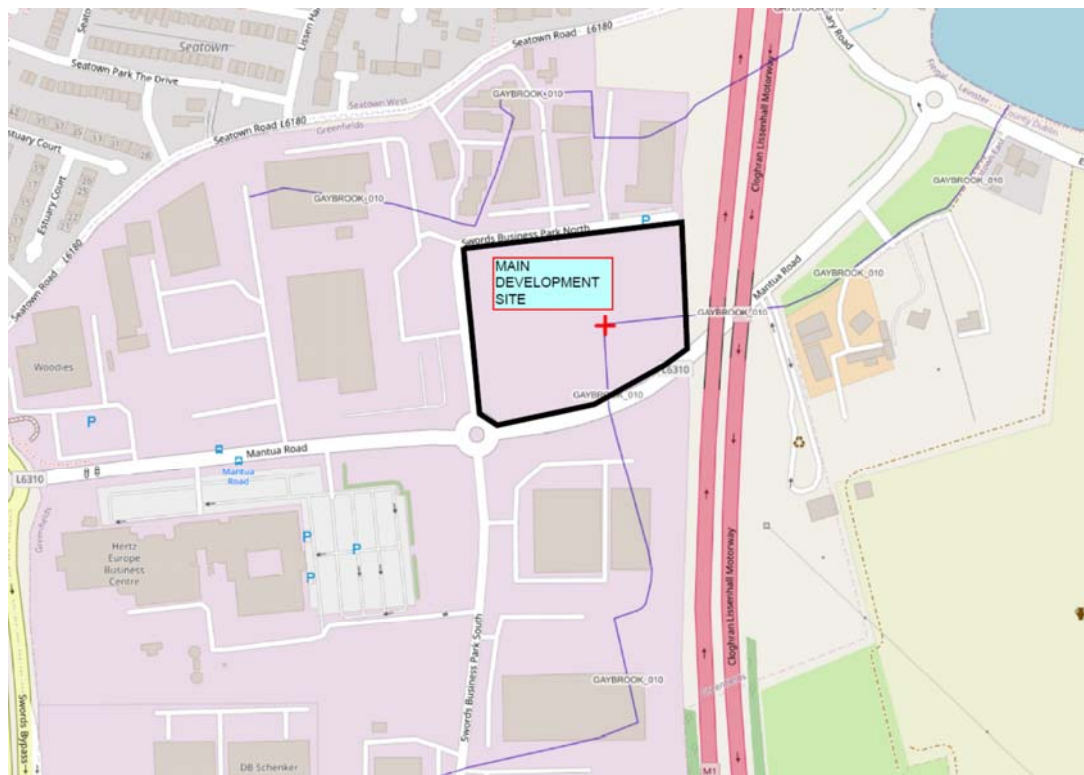


Fig.11- Extract from the EPA mapping website (www.gis.epa.ie)

- 3.8.2 Reference can be made to the application dwg.No.2412/10 for the correct and surveyed culvert location, an extract of which is shown in Fig.9 above.
- 3.8.3 Appendix A of the FCC CDP “Strategic Flood Risk Assessment” has created Flood Zone maps for the Fingal area. Flood Zone Map No.15 published in the CDP identifies the subject site as unaffected by flooding and is therefore in the category of “Flood Zone C”. It is noted that the Map 15 shows the “Gaybrook” watercourse crossing the site in a historical location but given that the watercourse was culverted and diverted c.30 years ago, the mapping should be updated to reflect the correct and accurate type and location of the old watercourse as a piped culvert.

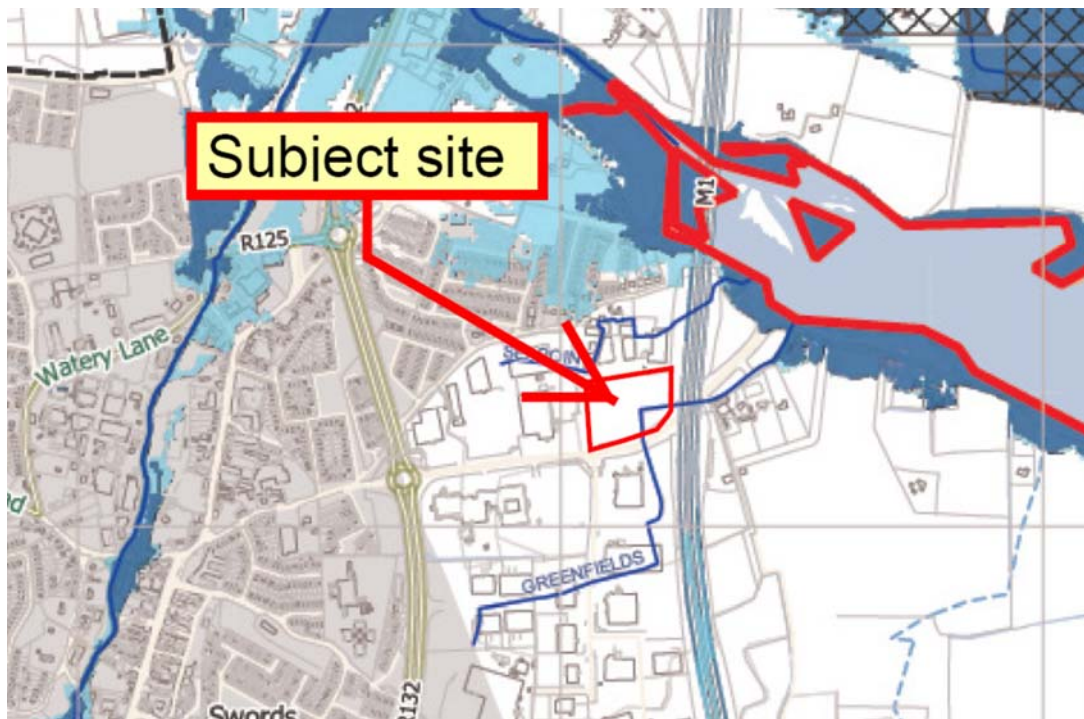


Fig.12- Extract from FCC CDP Flood Zone Map No.15

3.8.4 Appendix B of the FCC CDP “Strategic Flood Risk Assessment” has created the Mid Range Future Scenario Climate Change Flood Extents Maps Zone maps for the Fingal area. Map No.15 published in the CDP identifies the site as unaffected by “mid-range future scenario” flooding. Refer to Fig.13 below extracted from CDP Appendix B Map 15;

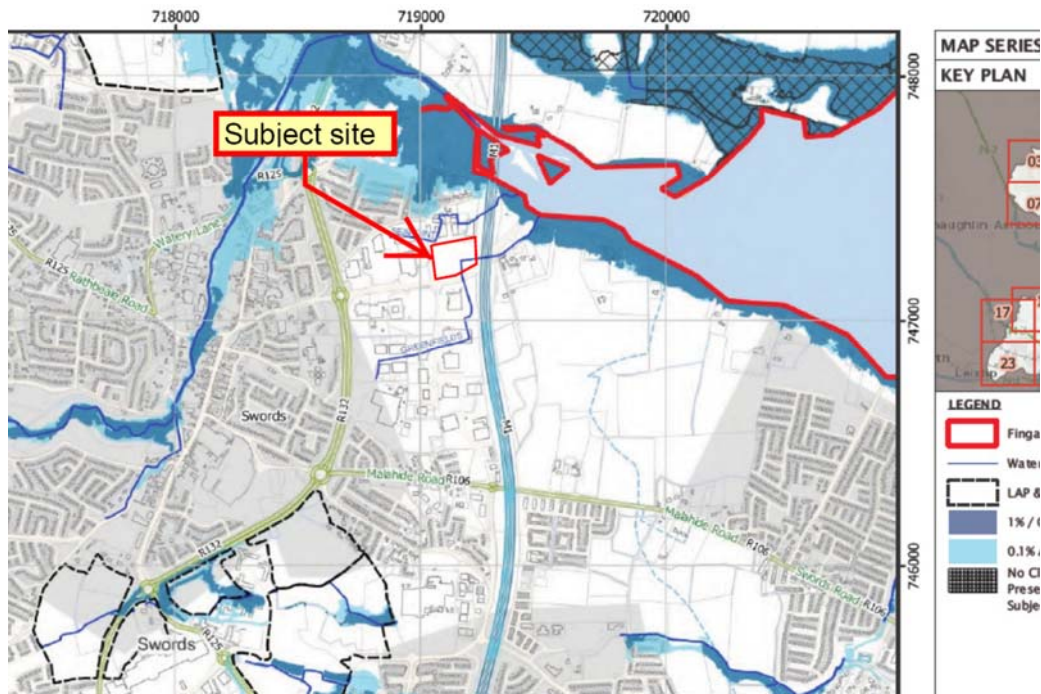


Fig.13 Extract from FCC CDP Appendix B Map No.15

3.8.5 Appendix C of the FCC CDP “Strategic Flood Risk Assessment” has created the High End Future Scenario Climate Change Flood Extents Maps Zone maps for the Fingal area. Map No.15 published in the CDP identifies the site as unaffected by “high end future scenario” flooding. Refer to Fig.14 below extracted from CDP Appendix C Map 15;

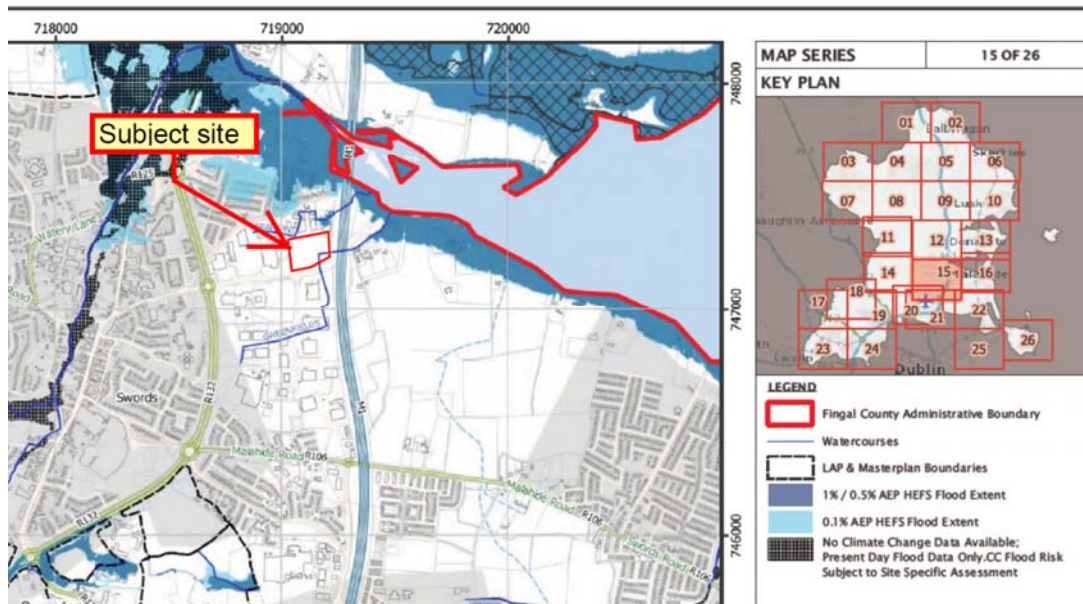


Fig.14 - Extract from FCC CDP Appendix C Map No.15

3.8.6 Appendix D of the FCC CDP “Strategic Flood Risk Assessment” has created the Flood Zone Data Source Maps for the Fingal area. Map No.15 published in appendix D identifies the site as unaffected by flooding. Refer to Fig.15 below extracted from CDP Appendix D Map 15;

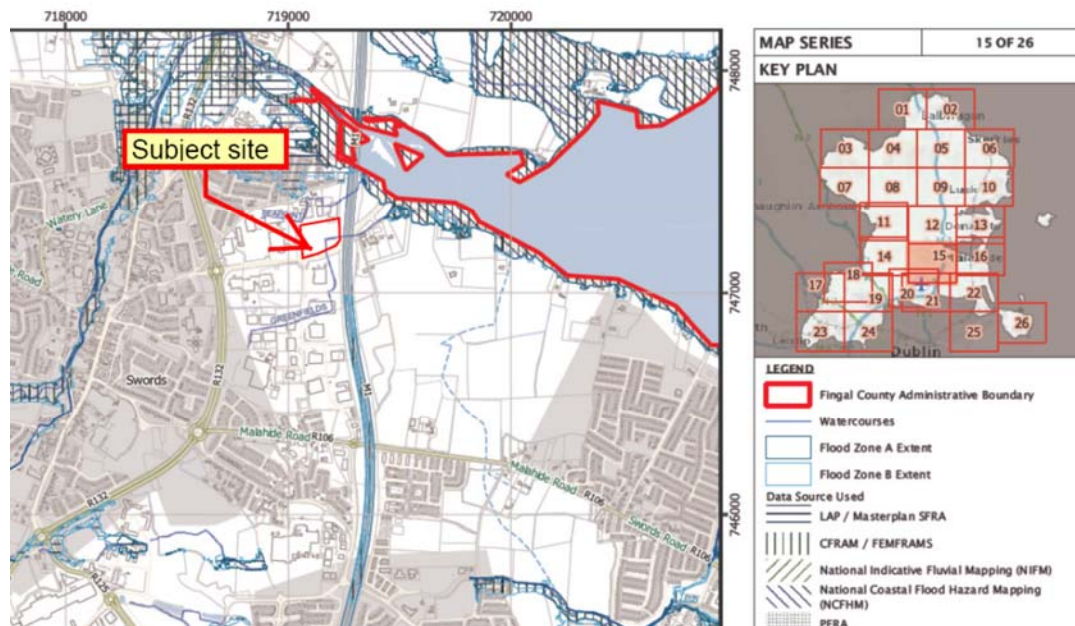


Fig.15- Extract from FCC CDP Appendix D Map No.15

3.8.7 The OPW has published the Catchment Flood Risk Assessment Management Studies and they have created a website portal for accessing the available results and mapping at www.cfram.ie. & www.floodinfo.ie

3.8.8 The mapping published indicates the flood extent boundaries for various return period events. These Annual Exceedance Probability (AEP) events of 10%, 1% and 0.1% (or 1 in 10 year, 1 in 100 year and 1 in 1000 year) were examined as part of the CFRAM mapping. Fig.16 below does not indicate and flooding on the subject site and is therefore deemed as Flood Zone C.

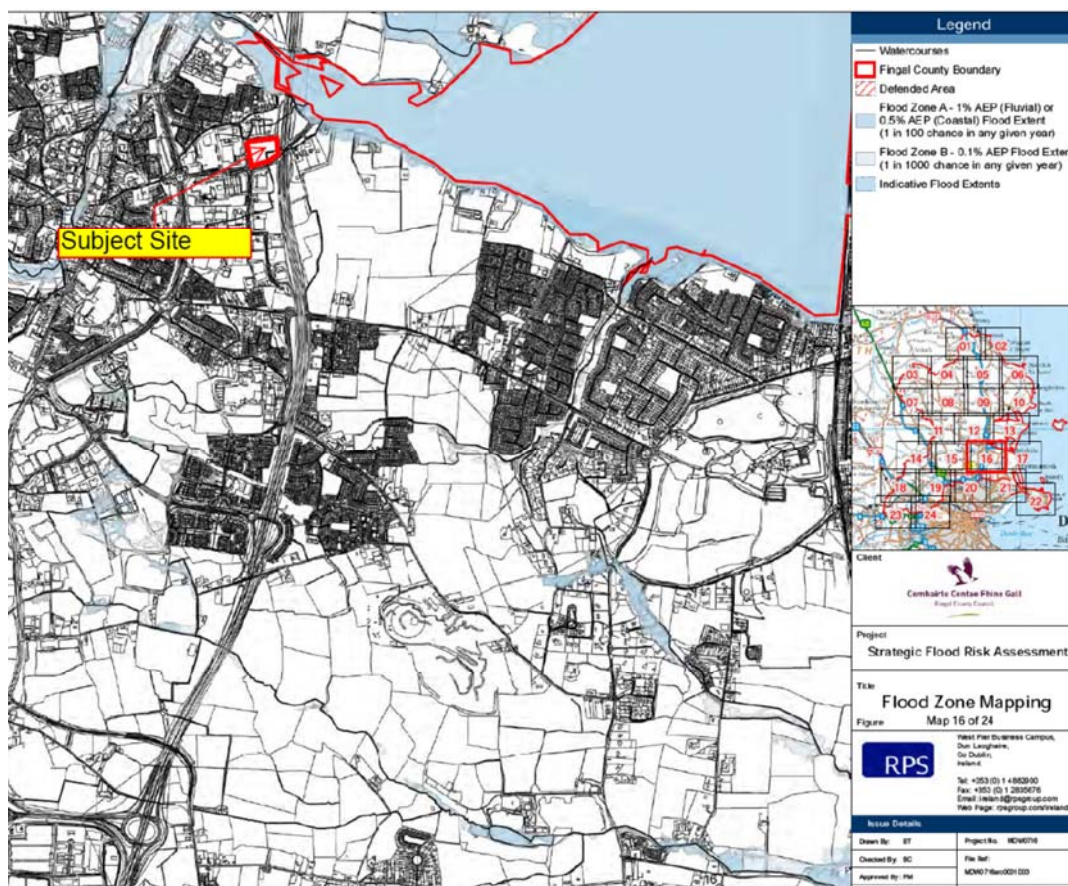


Fig.16 - Extract from CFRAM

3.8.9 Reference was made to the OPW “Past Flood Events” reporting of the floodmaps.ie website. Flood events 1747 & 1749 were recorded as having occurred on 01/02/02 at Gartan Court, some 300m north of the subject site. Flooding was also noted in Broadmeadow House located a further c.100m north again than Gartan Court. Flooding was also noted on Estuary Road, but the location was non-specific. Given that Estuary Road is located some 350m east of the subject site and is an elevation c.5m below the subject site, it is concluded that the application lands remained unaffected by the 2002 event. Refer to Fig.17 below for the Local area Summary OPW report.

Past Flood Event Local Area Summary Report



OPW Óigín na hÉireannach Poiblí
Office of Public Works

Report Produced: 20/10/2025 16:54

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.

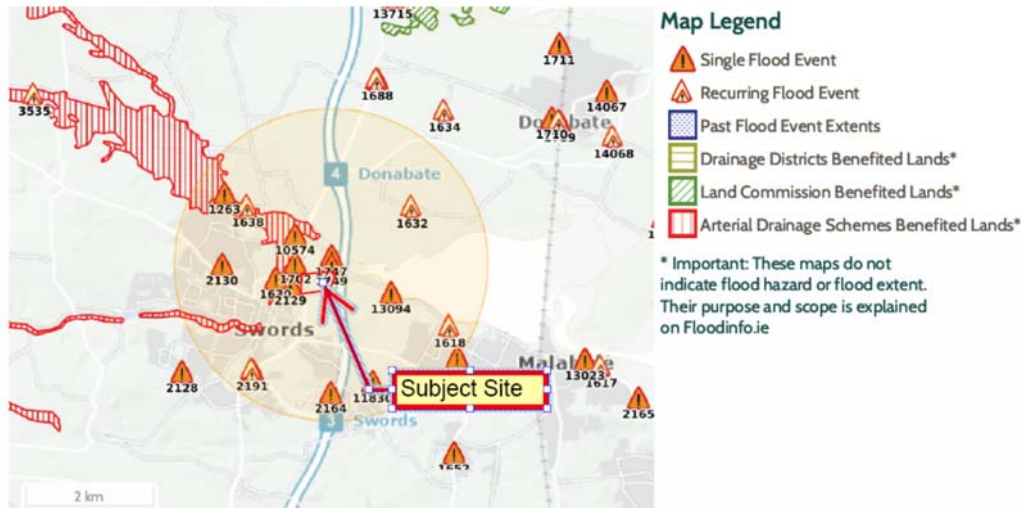


Fig.17 - Extract from the OPW Past Flood Events Mapping (floodinfo.ie)

3.8.10 In preparation of this SSFRA, discussions were held with Fingal County Council Drainage Department staff members and there was no known flooding of the of the subject site identified in those discussions.

3.8.11 Two site visits/walkovers were carried out (Feb & June 2025) in researching for this SSFRA and there was no visible evidence of localised flooding onto the subject site. It is noted that these visits took place in dry weather.

3.9 Initial Fluvial Flood Risk Assessment

3.9.1 Based on the research into the available published reports, desk studies and site walkovers, in our opinion there is a low risk of fluvial flooding onto the development area of the proposed site.

3.10 Pluvial Flood Risk

3.10.1 Pluvial flooding is caused when the intensity of rainfall events cannot be absorbed into the ground or urban drainage systems cannot effectively convey the flowrates.

3.11 Pluvial Flood Risk Indicators

3.11.1 Reference was made to the available drainage records drawings of Irish Water/FCC. There were no noted nearby S/W drainage pipelines noted on the available mapping. However, in preparation of this application, the previously noted 900mm S/W sewer was identified as having intercepted and diverted the historical "Gaybrook" watercourse as discussed in paragraph 3.14 above.

3.11.2 This existing S/W pipe is to remain in position unchanged as part of the subject sites application.

3.11.3 There are no available records of flooding associated with this existing 900mm S/W pipe.

3.11.4 There is no known foul sewer on the site. There are adjacent blanked-off and unused 50mm private rising mains to the north of the site but this application does not seek to use or interface with those pipes.

3.11.5 Also, in reference to the design calculations contained in the appendix of the main Engineering Infrastructure & Stormwater Impact Assessment report accompanying the application, the surface water discharge rate from the site has been restricted to the allowable agricultural greenfield run off rate Q_{bar} (6.24/s) as determined from the recommended HR Wallingford online assessment tool. The Q_{bar} rate was determined based on the site topography, soil conditions and drained site area.

3.12 Initial Pluvial Flood Risk Assessment

3.12.1 As the risk of pluvial flooding from the new infrastructure planned is not deemed as a low risk occurrence and the vulnerability of residential development is deemed as high, it is seen as appropriate that a detailed pluvial flood risk assessment be reviewed.

3.13 Detailed Pluvial Flood Risk assessment

3.13.1 The proposed new drainage surface water infrastructure for the development has been designed to cater for flows generated by all storms up to the Q100+20%(climate change) without flooding occurring.

- 3.13.2 This subject site planning application seeks to outfall the attenuated surface water flows into one outfall location connecting with the existing 900mm diameter S/W sewer at the northeast corner of the site. Refer to the main infrastructural report for details of same.
- 3.13.3 The pipe sizes and gradients are designed to convey the storm water flows to two separate attenuation locations where the storage capacity has been designed in each to exceed the Q100+20% event. Calculations for the critical rainfall events have been included in the appendix of the Engineering Infrastructure & Stormwater Impact Assessment report.
- 3.13.4 The freeboard in the S/W design exceeds the minimum 500mm requirement as specified in the GDRS, as noted main Engineering Infrastructure & Stormwater Impact Assessment report.
- 3.13.5 SuDS elements included in the pluvial design include intensive green roofs, bio-retention areas, filter swales, permeable paving systems, tree pits, and attenuation storage areas.
- 3.13.6 An overflow flood route map was prepared (Dwg.No.2412/11) and is included in the appendix of this assessment report. These extreme event overflows follow the natural grassland ground contours overland to a low point grasslands on the subject site.

3.14 Conclusion of the Detailed Pluvial Flood Risk Assessment

- 3.14.1 In accordance with the sequential assessment approach as per the Guidelines flowchart (section 2.10 above) it is concluded that the requirements have been met and no further assessment is required regarding pluvial flood risk.

3.15 Groundwater Flood Risk

- 3.15.1 Groundwater flooding occurs when the level of water stored in the ground, the water table, rises because of prolonged rainfall. Groundwater flooding tends to be very local and result from interactions of site specific factors such as tidal variations.

3.16 Groundwater Flood Risk Indicators

- 3.16.1 Site investigations have revealed that sub surface soil conditions on this site are known to be sandy gravelly silty CLAY. A soakaway testing report is included in Appendix 6.6 of this report and the result of which determined that the site is not suitable for soakaway design.
- 3.16.2 Reference was also made to the online web portal provided by the Geological Survey of Ireland (GSI) as well as the alluvial maps provided by the Teagasc link on the GSI website.
- 3.16.3 No ground water was noted as encountered during the soakaway trial holes investigations at levels of c.2m but it is noted that ground water levels can vary depending on the time of year.
- 3.16.4 There were no recorded groundwater issues for the subject site/area on the Geological Survey of Ireland online datasets and reference can be made to the summary groundwater map report included in the appendix of this report.
- 3.16.5 Site walkovers were carried out in varying weather conditions and the water table was not evident during the visits.
- 3.16.6 In reference to the Road and Block Levels drawings 2412/01 it is noted that the finished floor levels of buildings on the site are to be constructed above the ground level and above the adjacent roads.

3.17 Initial Groundwater Flood Risk Assessment

- 3.17.1 The indicators described above suggest that the site is not at risk of flooding from groundwater and accordingly a detailed assessment of the flooding mechanism is not required and, in our opinion, there is a low risk of groundwater flooding onto the site

3.18 Human/Mechanical Error Flood Risk

- 3.18.1 There are flood risks associated with misuse, neglect, damage, intervention of or lack of intervention attributable to mechanical failure or human error. Such a risk can be caused by blockages in piped systems or lack of maintenance of mechanical devices.

3.19 Human/Mechanical Error Flood Risk Indicators

- 3.19.1 Based on the experienced professional judgement of the engineering designer and in consultation with the Drainage Department of FCC, it has been considered that blockages can occur with systems for many reasons.

3.20 Initial Human/Mechanical Error Flood Risk Assessment

- 3.20.1 As there is some risk of pluvial flooding from human/mechanical error, the new infrastructure is not deemed as a low risk occurrence and the vulnerability of residential development is classified as high (refer to Section 2.12 of this report), it is seen as appropriate that a more detailed human/mechanical error flood risk assessment be reviewed.

3.21 Detailed Human/Mechanical Error Flood Risk Assessment

- 3.21.1 As part of the assessment for blockages in the system, the MicroDrainage design model was run on the basis that there was a near 100% blockage of the outfall vortex control devices for a 120 minute period. Therefore, the model was run with a reduction in the outfall rates from each Hydrobrake down to 0.1 l/s for a 120min duration in the Q100 + 20% event. These resulting volumes and top water level are contained beneath the ground level in both storage areas and no above ground flooding was evident in the drainage model.
- 3.21.2 Notwithstanding that the above noted blocked outfall model simulation contains the water below ground, in the event of an unprecedented scenario, an above ground flood path/exceedance flow route assessment was carried out to determine and manage the flooding routes across the site and these flow routes are represented on Dwg.No.2412/11. Dropped kerbs and profiling of the local landscape will be constructed to direct the overland flows towards the lowest points of the sites landscaped areas. Refer to Dwg.No.2412/11 and to Appendix 6.9 for these calculation results.

3.22 Conclusion of the Detailed Human/Mechanical Error Risk Assessment

3.22.1 In accordance with the sequential assessment approach as per the Guidelines flowchart (section 2.10 above) it is concluded that the requirements have been met and no further assessment is required regarding human/mechanical error flood risk.

4.0 Source Pathway Receptor Model

4.1 A source-pathway-receptor model as per the Appendix A 1.3 of the Technical Appendices accompanying *the Guidelines* was created and is shown in the Table 2 below. This model indicates the possible sources of flood water and the pathway to the receptors (the buildings/people) and the risks associated based on the findings of the FRA research.

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Site is elevated >6m above sea level	People/property	Remote	N/A	Low
Fluvial	No watercourses	People/property	Remote	Low	Low
Pluvial (Surface water)	Flooding from drainage systems	People/property	Possible	Low	Low
Groundwater	Rising water table	People/property	Possible	Low	Low
Human/Mechanical Error	Blockage of drainage	People/property	Possible	Moderate	Low

Table 2 - Source Pathway Receptor Model

5.0 SSFRA Conclusion

- 5.1 As is required under the Fingal Development Plan 2023 – 2029 and in accordance with the requirements set out in the DoEHLG and OPW published guidelines *The Planning System and Flood Risk Management 2009* (the Guidelines), a Site Specific Flood Risk Assessment (SSFRA) has been carried out for this application.
- 5.2 In accordance with the above noted Guidelines, as sequential staged approach was adopted in assessing the flood risk for the subject development.
- 5.3 It was determined in accordance with the Guidelines that the lands on which the subject development is located is within a **flood Zone C** as defined in the Guidelines.
- 5.4 It is concluded that a mixed-use/residential development is appropriate on the subject lands.
- 5.5 It is concluded that the above level of assessment is sufficient given the nature of the development and the level of flood risk identified for the site.
- 5.6 Based on the information available it is concluded that this site is suitable for development and has an overall low risk of being affected by flooding.

6.0 APPENDIX

Contents:

- 6.1 OPW National Flood Hazard Mapping - Summary Report
- 6.2 FCC Flood Zone Maps - Area 15 (A4)
- 6.3 CFRAM Map No.16
- 6.4 EPA Gaybrook Map
- 6.5 GSI Groundwater and Soils Maps
- 6.6 Soakaway Test Report
- 6.7 Uisce Éireann/FCC Drainage Maps
- 6.8 Dwg.No.2412/11 - Exceedance Flow Route Map (A3)
- 6.9 MicroDrainage Blocked Outfall Calculations

Appendix 6.1

OPW Past Flooding Summary Report

Past Flood Event Local Area Summary Report

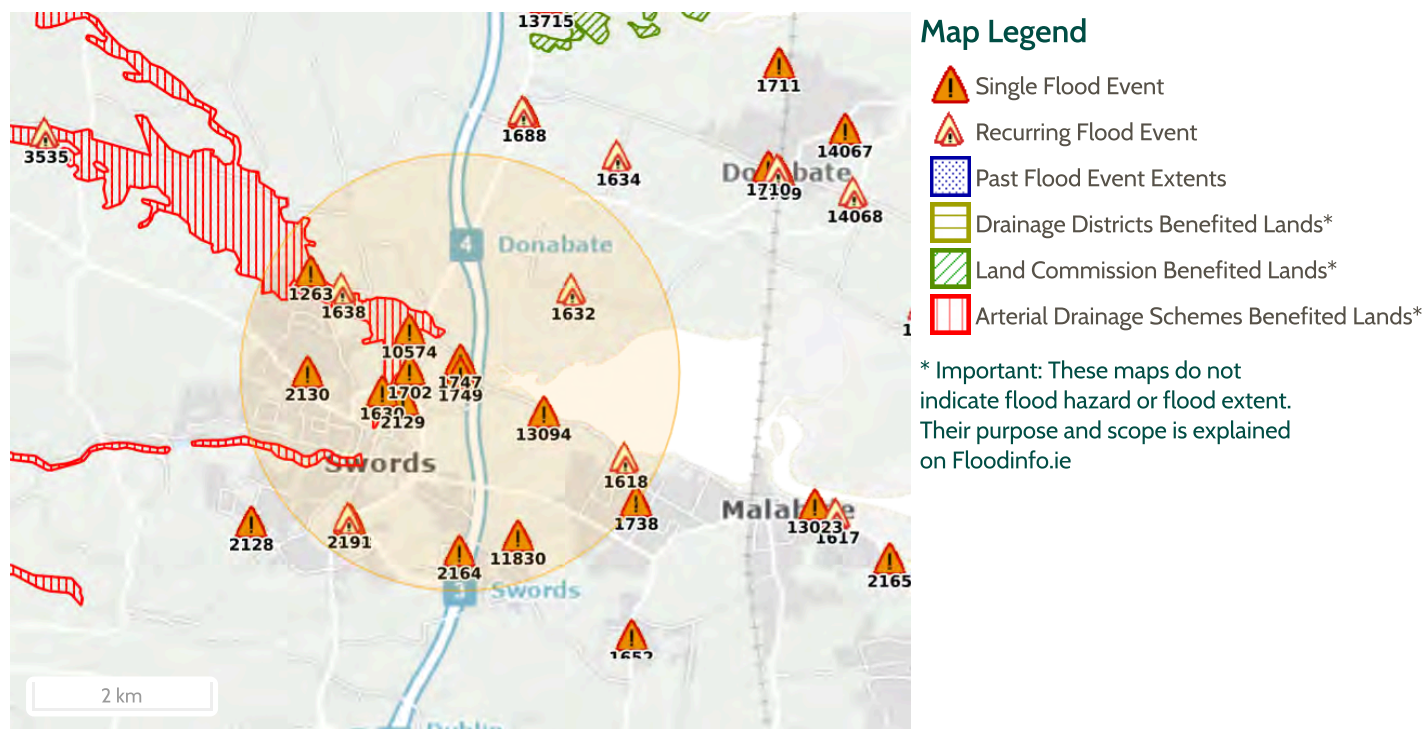


OPW Oifig na
nOibreacha Poiblí
Office of Public Works

Report Produced: 20/10/2025 16:54

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.



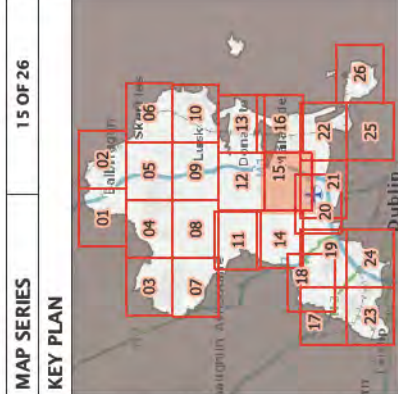
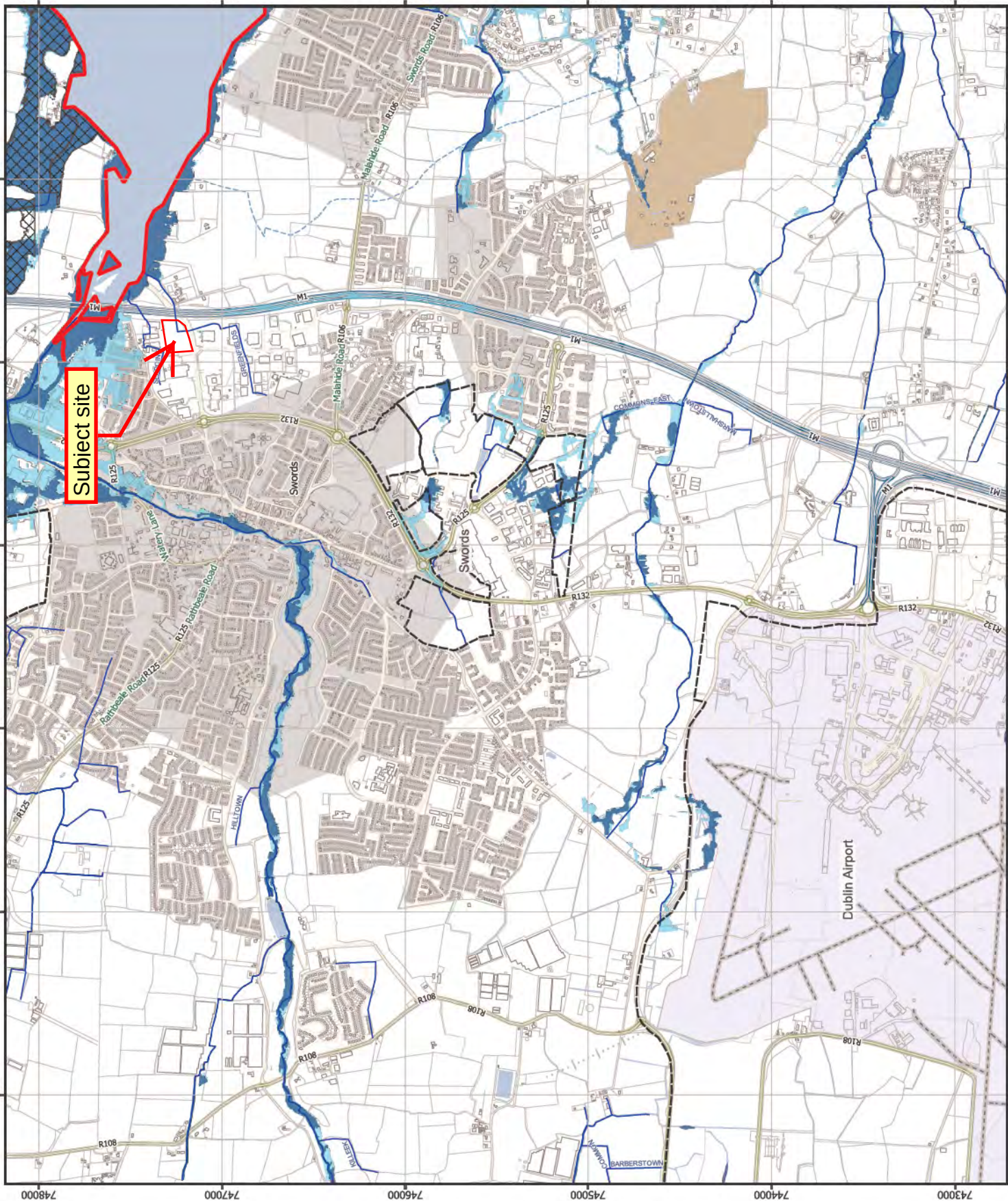
18 Results

Name (Flood_ID)	Start Date	Event Location
1. N1 at Roundabout at Fingallions Nov 2002 (ID-1702) Additional Information: Reports (1) Press Archive (0)	13/11/2002	Exact Point
2. Mill View Lawn Malahide Feb 2002 (ID-1738) Additional Information: Reports (1) Press Archive (0)	01/02/2002	Exact Point
3. Estuary Road Swords Feb 2002 (ID-1747) Additional Information: Reports (1) Press Archive (0)	01/02/2002	Approximate Point
4. Gartan Court Swords Feb 2002 (ID-1749) Additional Information: Reports (1) Press Archive (0)	01/02/2002	Exact Point
5. Seatown Villas Swords Nov 1982 (ID-2129) Additional Information: Reports (1) Press Archive (0)	05/11/1982	Exact Point
6. Pine Grove Park Swords Nov 1982 (ID-2130) Additional Information: Reports (1) Press Archive (0)	05/11/1982	Exact Point

	Name (Flood_ID)	Start Date	Event Location
7.	 Melrose Park Oct 2002 (ID-2164) Additional Information: Reports (1) , Press Archive (0) .	19/10/2002	Exact Point
8.	 Pinnock Hill Nov 2002 (ID-2191) Additional Information: Reports (1) , Press Archive (0) .	14/11/2002	Exact Point
9.	 Pinnock Hill October 2002 (ID-1468) Additional Information: Reports (4) , Press Archive (0) .	19/10/2002	Exact Point
10.	 Pinnock Hill Swords Recurring (ID-1459) Additional Information: Reports (7) , Press Archive (0) .	n/a	Exact Point
11.	 Bisset Strand and Estuary Road Malahide Recurring (ID-1618) Additional Information: Reports (4) , Press Archive (0) .	n/a	Exact Point
12.	 Ballymadrough Donabate Recurring (ID-1632) Additional Information: Reports (2) , Press Archive (0) .	n/a	Approximate Point
13.	 Balheary Road Swords Recurring (ID-1638) Additional Information: Reports (2) , Press Archive (0) .	n/a	Exact Point
14.	 Broadmeadow Swords August 1986 (ID-1263) Additional Information: Reports (1) , Press Archive (0) .	24/08/1986	Approximate Point
15.	 Ward North Street Swords Nov 2002 (ID-1630) Additional Information: Reports (4) , Press Archive (3) .	13/11/2002	Exact Point
16.	 Ward Swords Co.Dublin August 2008 (ID-10574) Additional Information: Reports (1) , Press Archive (0) .	08/08/2008	Approximate Point
17.	 Flooding at Kinsealy Court, Swords, Co. Dublin (ID-11830) Additional Information: Reports (1) , Press Archive (0) .	24/11/2011	Approximate Point
18.	 Flooding at Malahide on 03/02/2014 (ID-13094) Additional Information: Reports (0) , Press Archive (0) .	03/02/2014	Approximate Point

Appendix 6.2

FCC CDP SSFRA Maps



LEGEND

- Fingal County Administrative Boundary
- Watercourses
- LAP & Masterplan Boundaries
- Flood Zone A
- Flood Zone B
- Defended Areas

REV: 05
NOTE: FOR INFORMATION
05/04/2023

**Comhairle Contae
Fine Gall
Fingal County
Council**

McCloy Consulting

Unit 12, The Beat Centre,
Expendown Industrial Estate,
Ballybrigan, Co. Dublin

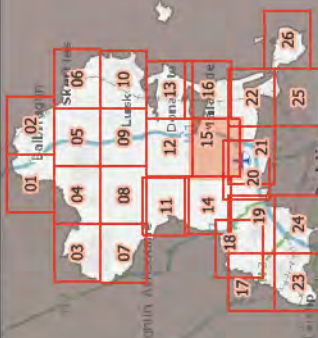
T: +353 (0)1 5138963
E: info@mcclayconsulting.ie
W: www.mcclayconsulting.ie

MAP: FLOOD ZONE MAP	
FLOOD PROBABILITY:	
FLUVIAL: 1% / 0.1%	COASTAL: 0.5% / 0.1%
SOURCE CRS: ITM EPSG:2157	
DRAWN BY: DL	DATE: 05/04/2023
CHECKED BY: PS	DATE: 05/04/2023
APPROVED BY: DKS	DATE: 05/04/2023
DRAWING NUMBER: M02127-06.FIG_FL115	
DRAWING SCALE: 1:20000 @ A3	



MAP SERIES
KEY PLAN

15 OF 26



Fingal County Administrative Boundary

Watercourses

LAP & Masterplan Boundaries

1% / 0.5% AEP MRFS Flood Extent

0.1% AEP MRFS Flood Extent

No Climate Change Data Available;
Present Day Flood Data Only, CC Flood Risk
Subject to Site Specific Assessment

LEGEND

REV: 05

NOTE: FOR INFORMATION

DATE: 05/04/2023

Comhairle Contae
Phine Gall
Fingal County
Council



Unit 12, The Bear Centre,
Swords Industrial Estate,
Ballybrannigan, Co. Dublin

T: +353 (0)1 8138063
E: info@mccloyconsulting.ie
W: www.mccloyconsulting.ie

McCloy

Consulting

MAP: MID RANGE FUTURE SCENARIO FLOOD EXTENT

FLOOD PROBABILITY:

FLUVIAL: 1% / 0.1%

COASTAL: 0.5% / 0.1%

SOURCE CRS: ITM EPSG:2157

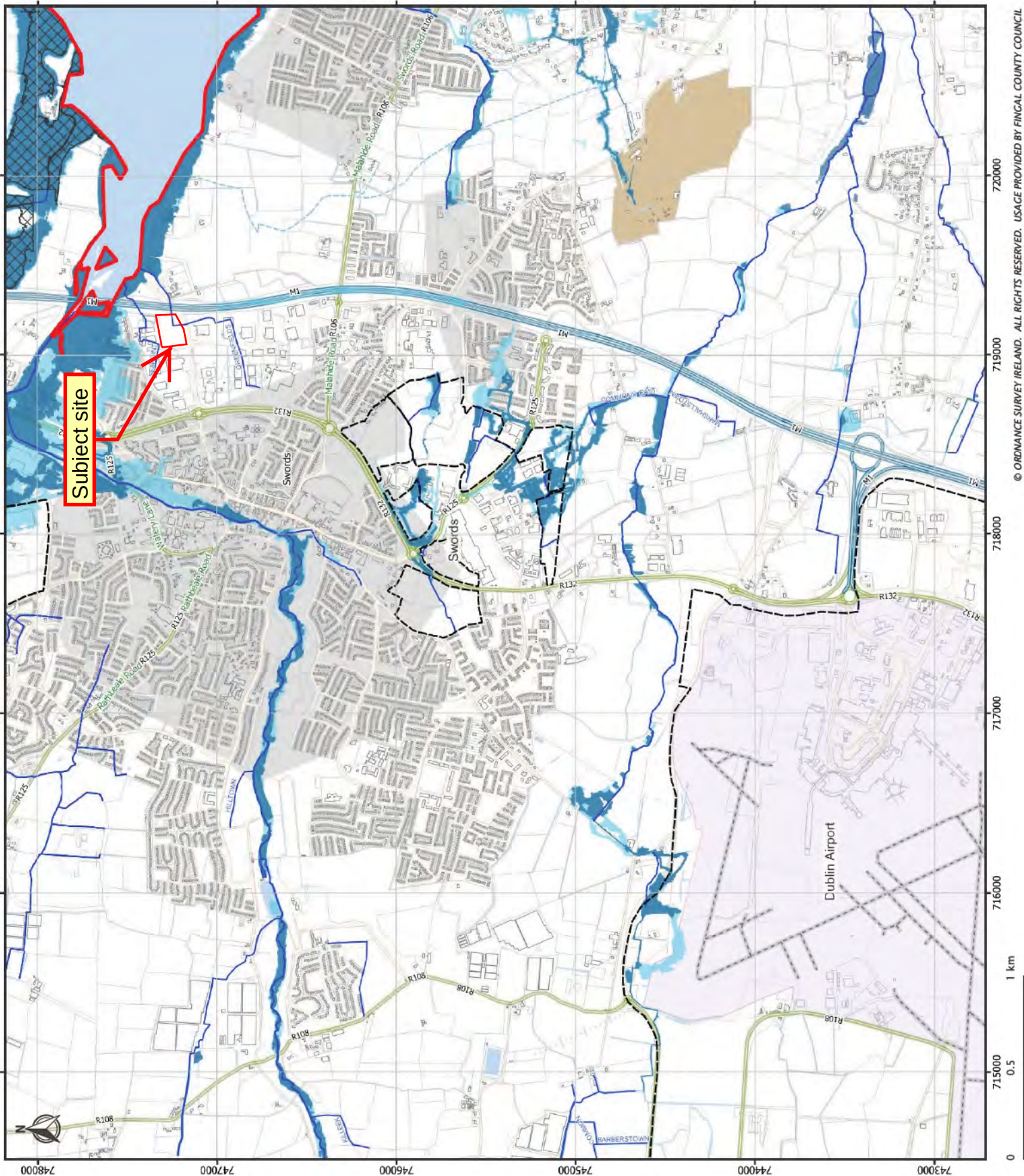
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CHECKED BY: PS DATE: 05/04/2023

APPROVED BY: DKS DATE: 05/04/2023

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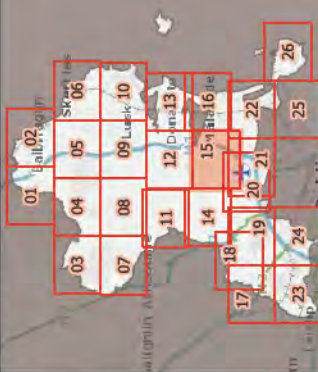
DRAWING SCALE: 1:20000 @ A3



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LICENCE NO. 021/OSL_NMA_057

MAP SERIES
KEY PLAN

15 OF 26



Fingal County Administrative Boundary

Watercourses

LAP & Masterplan Boundaries

1% / 0.5% AEP HEFS Flood Extent

0.1% AEP HEFS Flood Extent

No Climate Change Data Available;
Present Day Flood Data Only, CC Flood Risk
Subject to Site Specific Assessment

REV: 05

NOTE: FOR INFORMATION

05/04/2023

Comhairle Contae
Phine Gall
Fingal County
Council



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Exemplarstown Industrial
Estate,
Ballybrigan, Co. Dublin

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E: info@mccloyconsulting.ie
W: www.mccloyconsulting.ie

MAP: HIGH END FUTURE SCENARIO FLOOD EXTENT

FLOOD PROBABILITY:
FLUVIAL: 1% / 0.1%
COASTAL: 0.5% / 0.1%

SOURCE CRS: ITM EPSG:2157

DRAWN BY: DL DATE: 05/04/2023

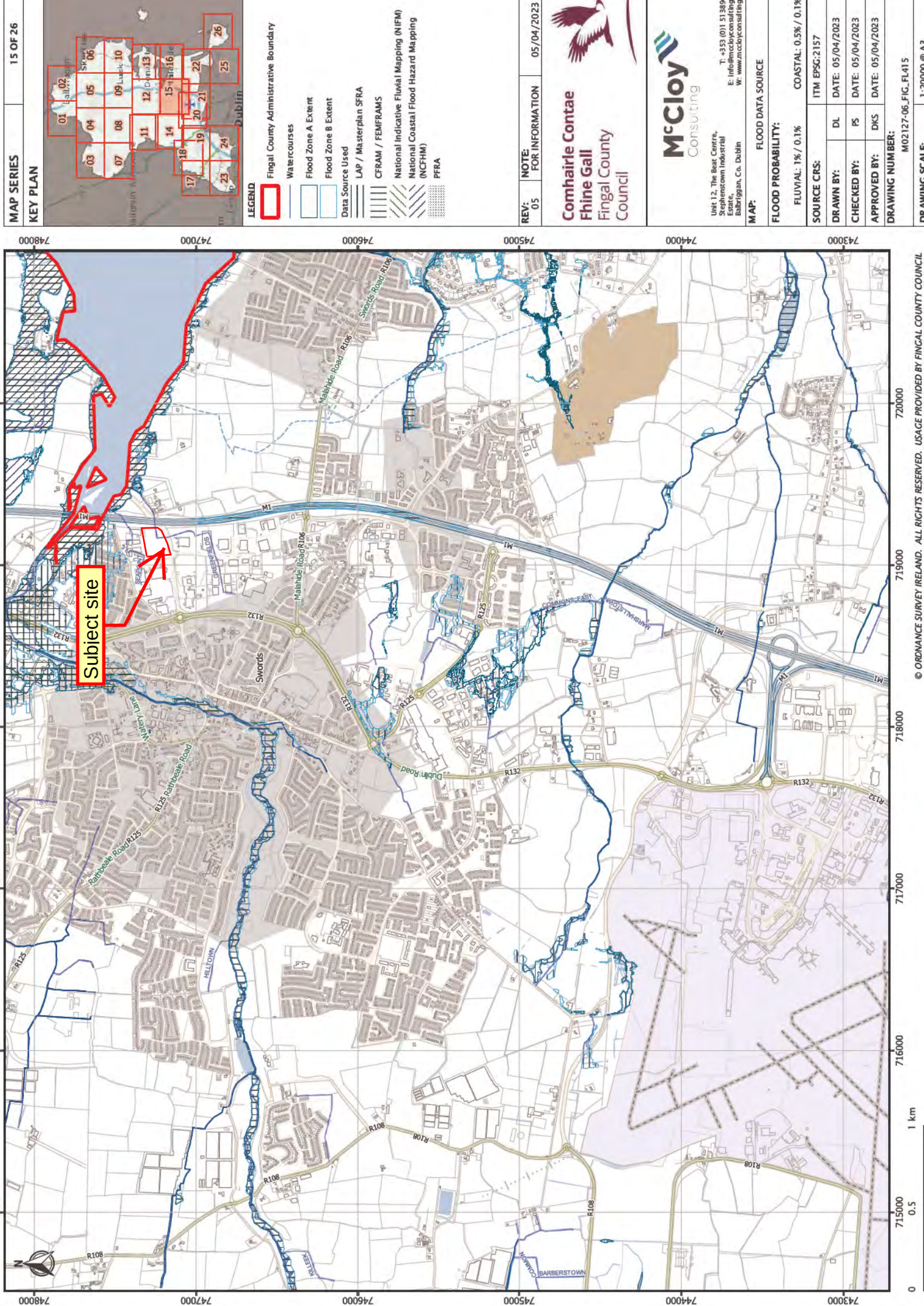
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DRAWING SCALE: 1:20000 @ A3

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LICENCE NO. 021/OSL_NMA_057



Appendix 6.3

CFRAM Map No.16



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



Client
Comharie Cntae Fhine Gall
Fingal County Council

Project
Strategic Flood Risk Assessment

Title
Flood Zone Mapping

Figure
Map 16 of 24

RPS
West Pier Business Campus,
Don Laoghair,
Co. Dublin,
Ireland.
Tel: +353 (0) 1 4822000
Fax: +353 (0) 1 2835976
Email: ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

Issue Details	
Drawn By:	BT
Checked By:	BC
Approved By:	PM
Scale:	1:20,000 @ A3
Date:	06/03/2017
Project No:	MDW0716
File Ref:	MDW0716/c001/000
Drawing No:	Rev /
Ac001	AO1

NOTE: 1. This drawing is the property of RPS Group Ltd. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. This drawing is the property of RPS Group Ltd.
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1 Active Layers

+ Add Layer

☒ National Coastal Extreme Water Level Estimation Points

☒ Coastal Areas Potentially Vulnerable to Wave Overtopping (CAPOs)

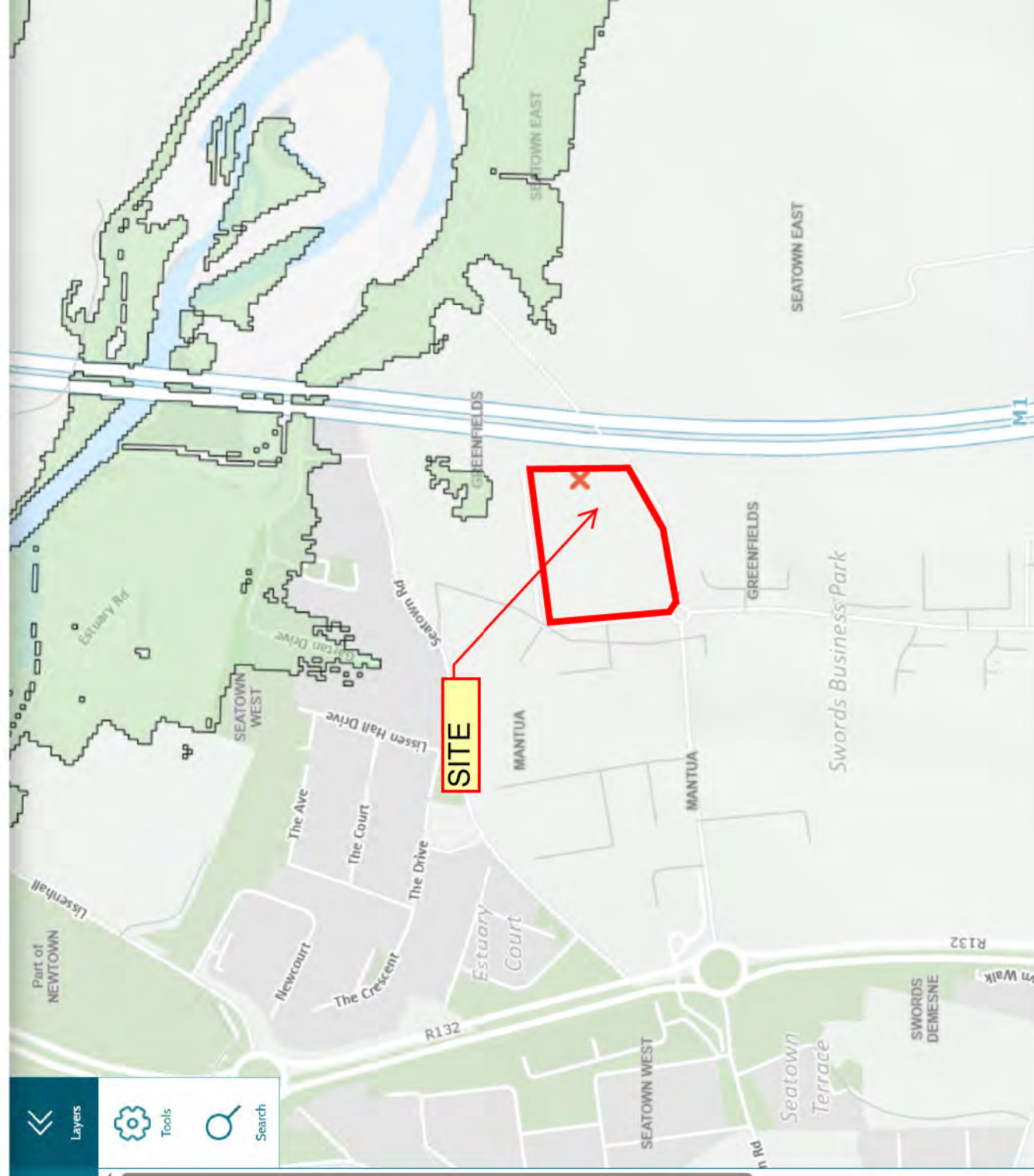
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☒ National Coastal Flood Hazard Mapping 2021 - Mid-Range Future Scenario

☒ National Coastal Flood Hazard Mapping 2021 - High-End Future Scenario

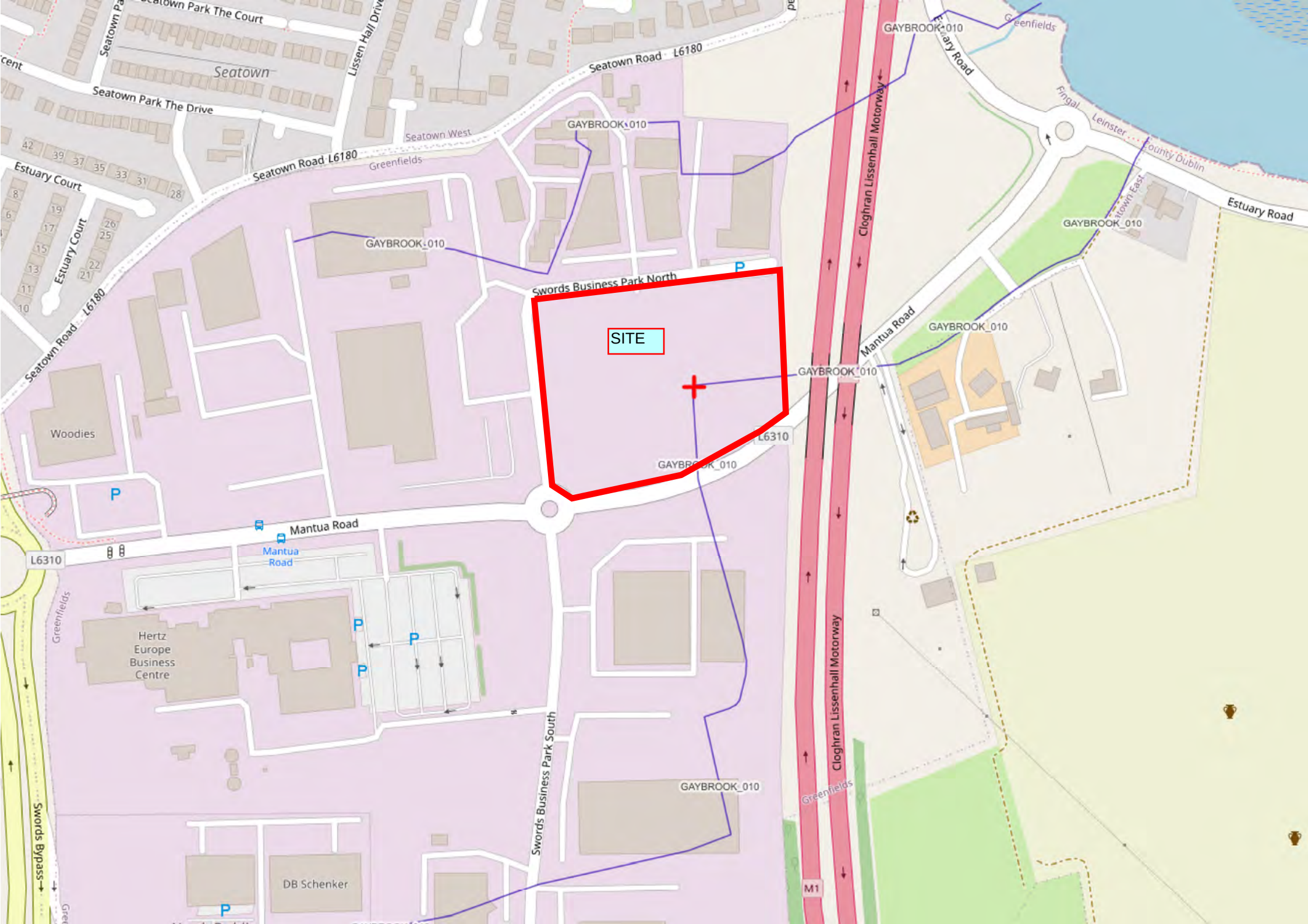
☒ 0.1% AEP (1 in 1000 year) Flood
Extents ☐

☐ 0.5% AEP (1 in 200 year) Flood
Extents ☐



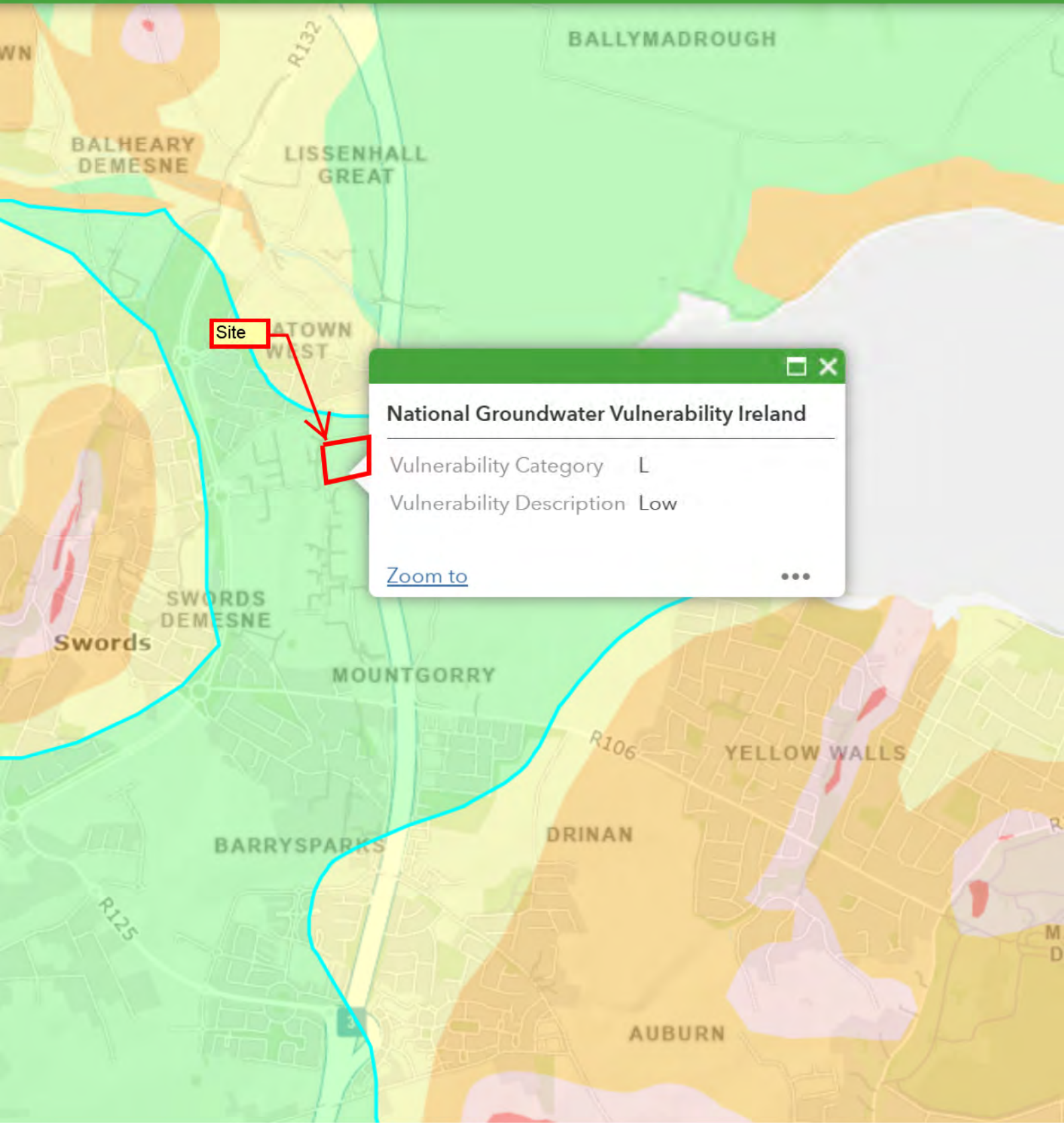
Appendix 6.4

EPA Gaybrook Watercourse Map



Appendix 6.5

GSI Soils and Groundwater Maps



Site

National Groundwater Vulnerability Ireland

Vulnerability Category

L

Vulnerability Description

Low

[Zoom to](#)

...

Results



Keep Previous Results

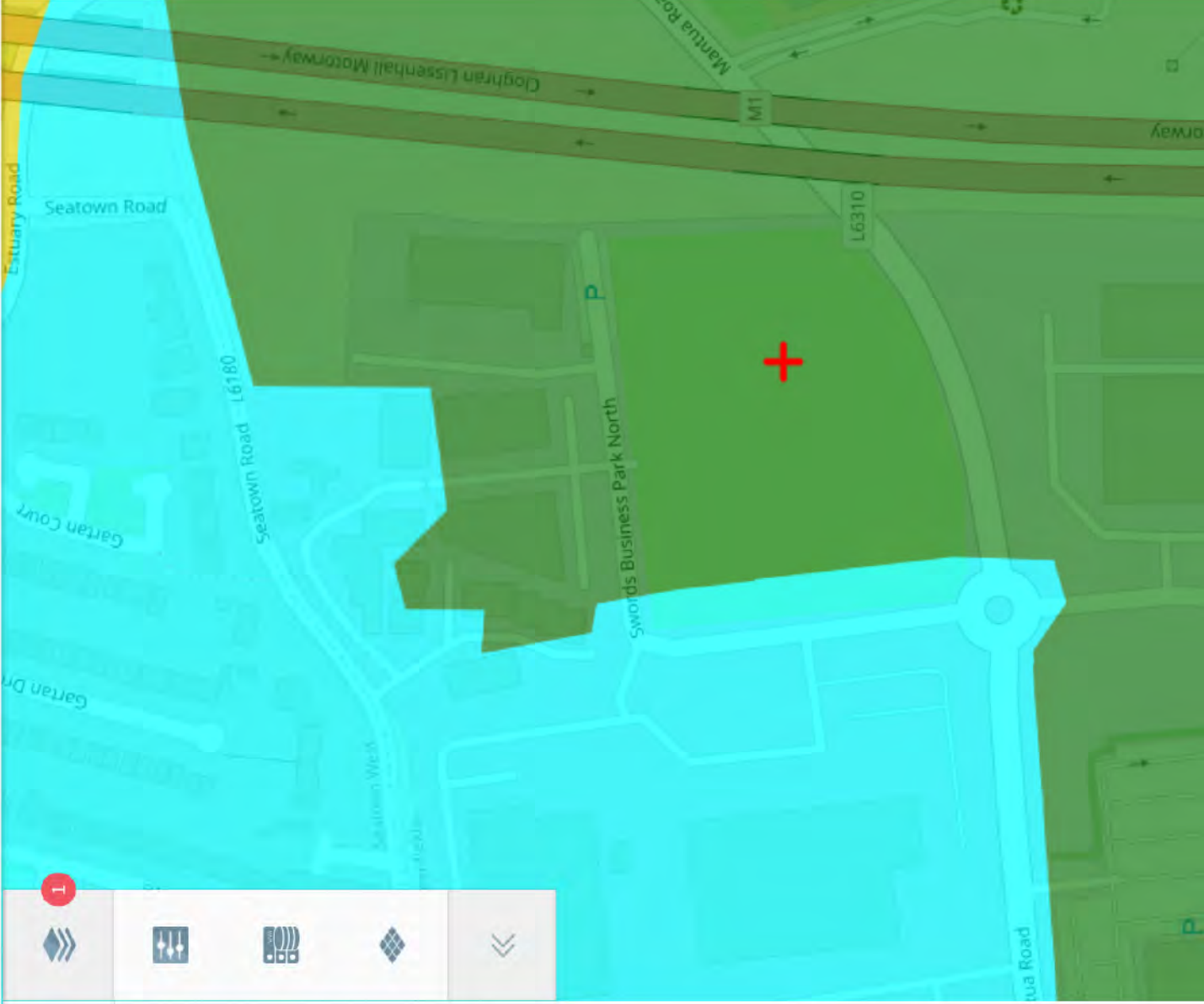
Subsoils

11274.95805

PERIMETER	11274.95805
PAR_MAT	TILs
COUNTY	DUBLIN
CATEGORY	Till type
DESCRIPT	Limestone till (Carboniferous)
TEXTURE	Variable
Class	Tills (diamictons)

PlainEnglish
The subsoil is a till type. Till is sediment deposited by or from glacier ice.

EXPORT



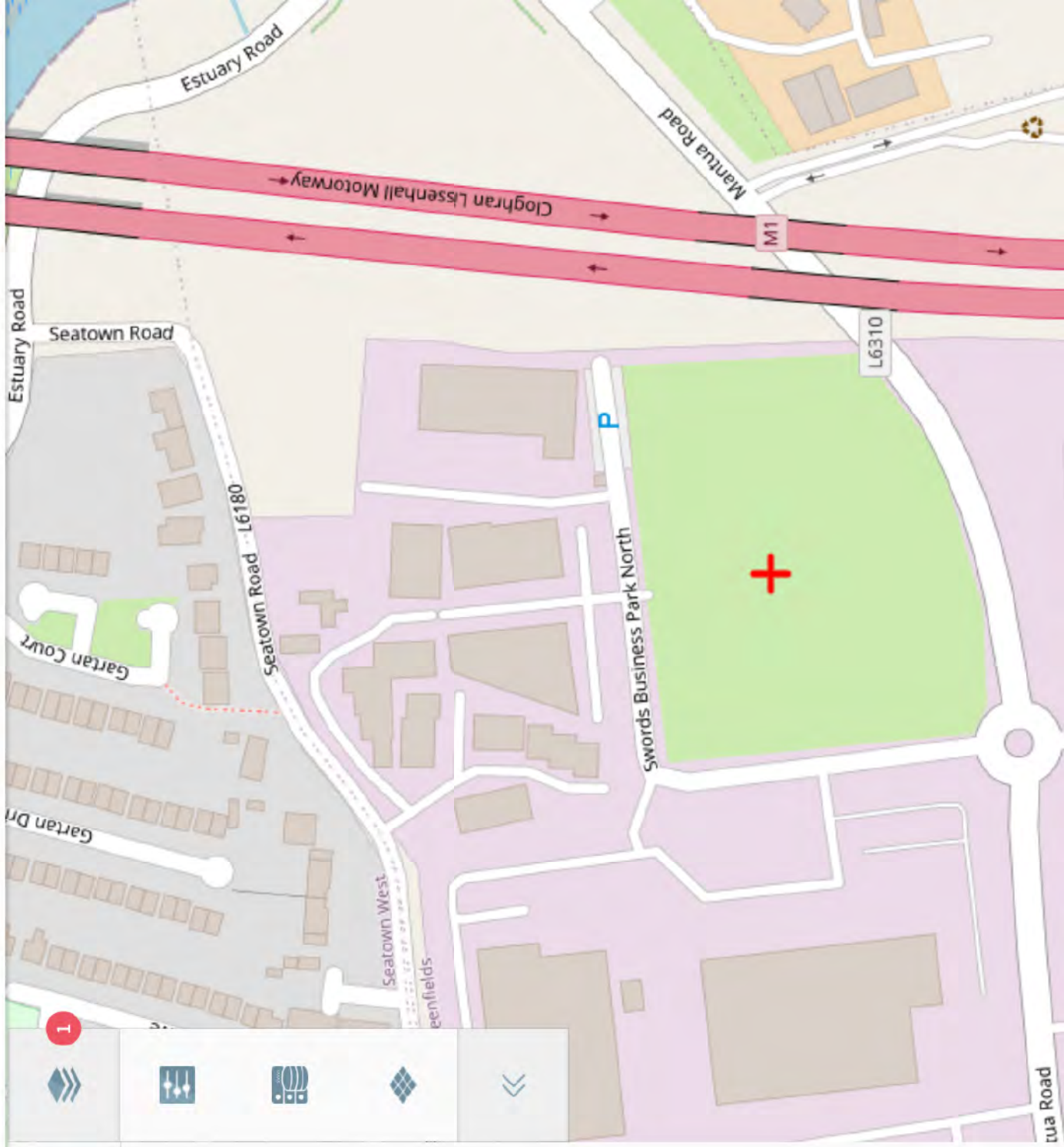
Results



Keep Previous Results

No results found

EXPORT



Results

Keep Previous Results

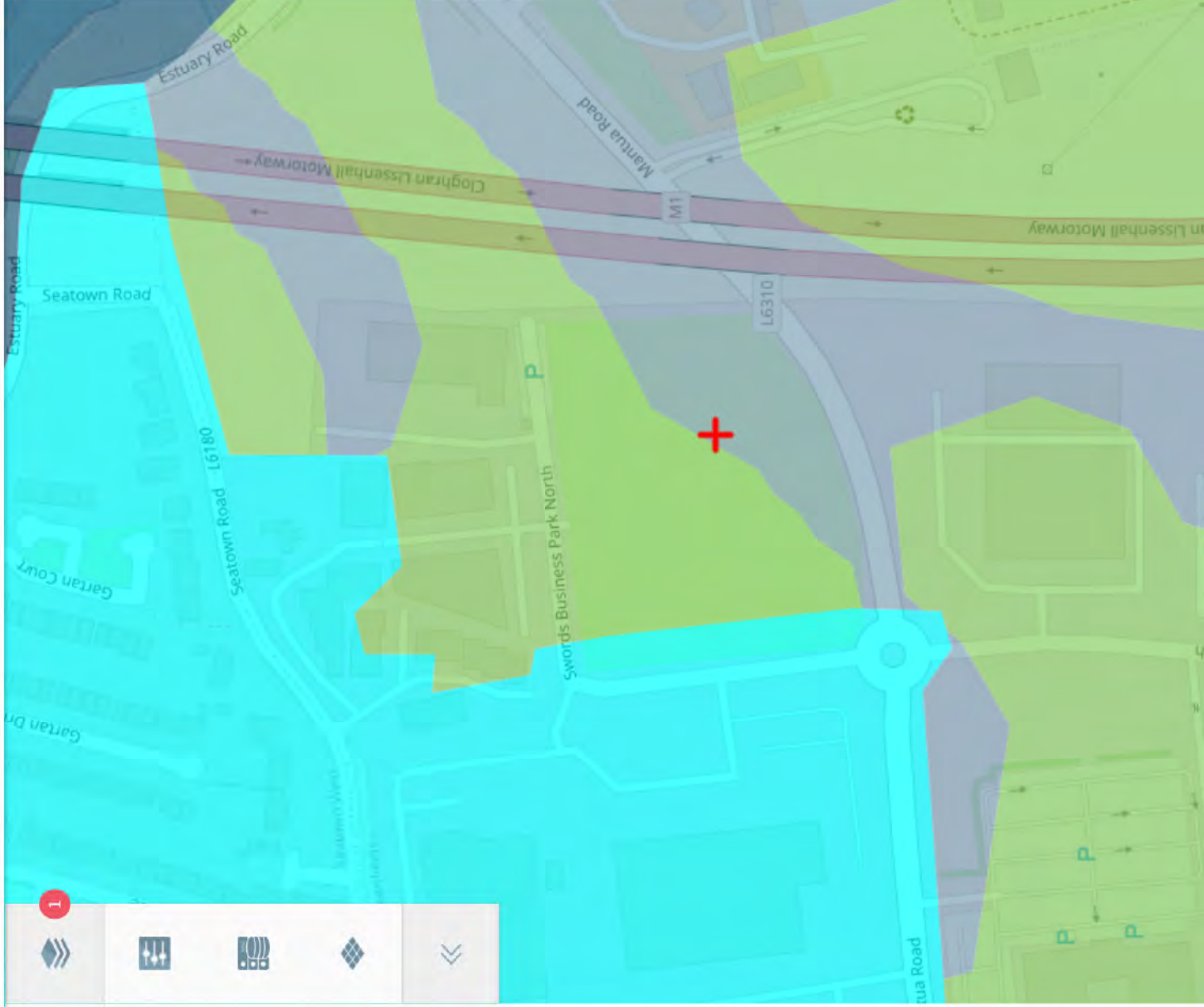
National Soils Hydrology Map
Poorly Drained

CATEGORY	Poorly Drained
SOILDRAINAGECLASS	Poor
PAR_MAT	TLs
IFS_SOIL	BminPD
IFS_CODE	32

National Soils Hydrology Map
Well Drained

CATEGORY	Well Drained
SOILDRAINAGECLASS	Well
PAR_MAT	TLs
IFS_SOIL	BminDW
IFS_CODE	12

EXPORT



Appendix 6.6

Soakaway Test Report

Appendix 6.6

Soakaway Test Report

Appendix 6.7

Uisce Éireann/FCC Drainage Records Maps

SR461-2024 Swords

Print Date: 03/07/2024

Printed by: Uisce Éireann



- [illegible]

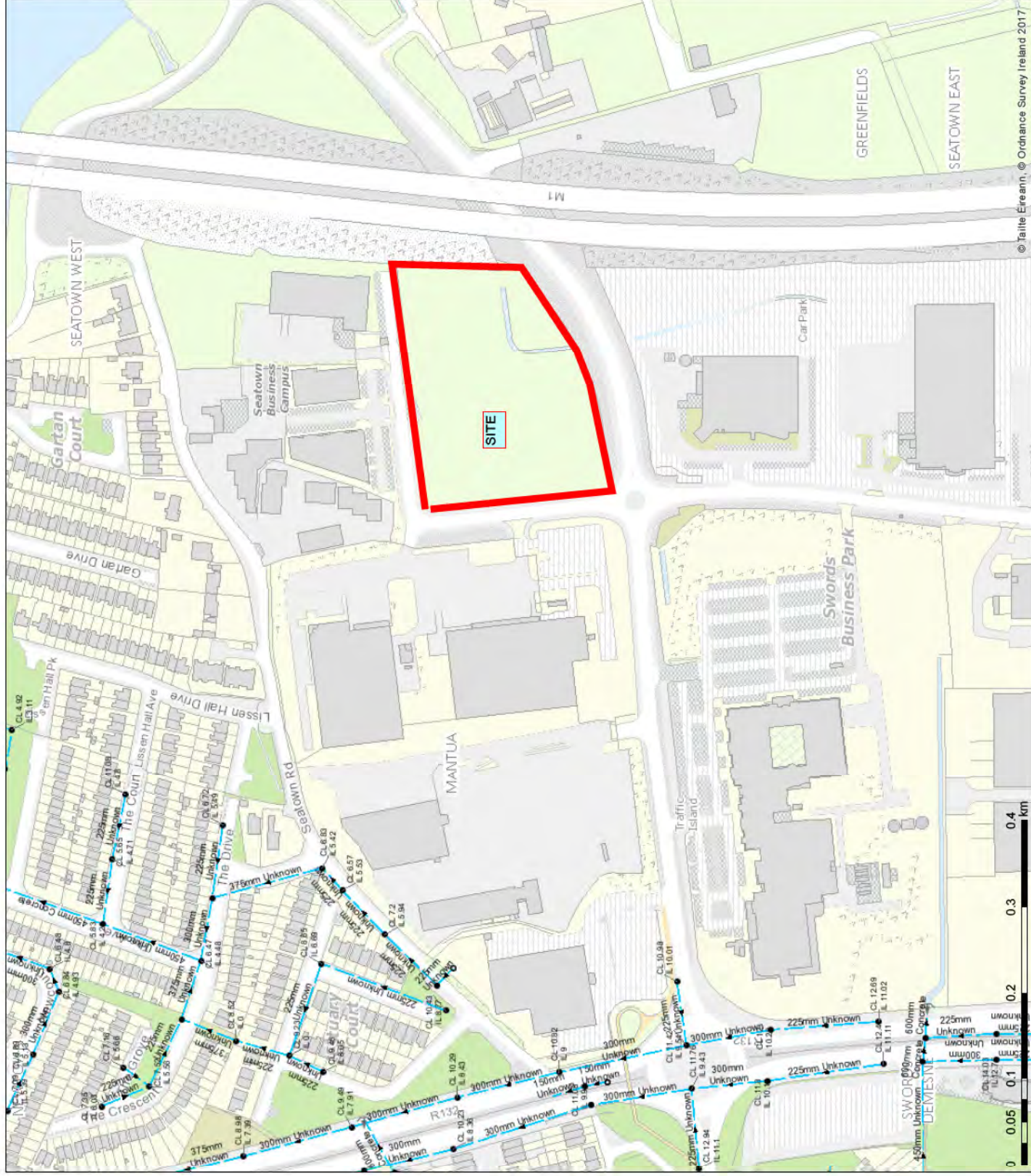
2. Căpota, mai exact pe lângă un grup de copii, un băiețel, în vârstă de șapte ani, din satul Ușcioara, județul Iași, a fost rănit în timpul unui joc de fotbal. În timpul jocului, acesta a fost lovit în cap de o minge. În urma accidentului, copilul a suferit o fractură de craniu și a fost internat în spital. În prezent, copilul se recuperează și este în stare bună.

© Colloque sur l'Alcool Éthanol

[illegible][illegible]

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[illegible]

Appendix 6.8

Overflow Exceedance Route

(RMA Dwg.2412/11)

Appendix 6.9

Blocked Outfall Simulation Calculations

Roger Mullarkey & Associates		Page 1
Duncreevan Kilcock Co. Kildare, Ireland	Greenfields Swords LRD STAGE 3 BLOCKED OUTFALLS	
Date 20/04/2026 11:13	Designed by Roger	
File Swords Stage 3 BLOCKED OUTFALL.MDX	Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	15.300	Add Flow / Climate Change (%)	0
Ratio R	0.277	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	150

Designed with Level Soffits

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	5.100	3.248	0.000	0	0

Roger Mullarkey & Associates		Page 2
Duncreevan Kilcock Co. Kildare, Ireland	Greenfields Swords LRD STAGE 3 BLOCKED OUTFALLS	
Date 20/04/2026 11:13	Designed by Roger	
File Swords Stage 3 BLOCKED OUTFALL.MDX	Checked by	
Innovyze	Network 2020.1.3	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 5, DS/PN: 2.002, Volume (m³): 3.7

Unit Reference	MD-SHE-0014-1000-0750-1000
Design Head (m)	0.750
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	14
Invert Level (m)	4.510
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	0.1	Kick-Flo®	0.128	0.0
Flush-Flo™	0.059	0.1	Mean Flow over Head Range	-	0.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.1	0.800	0.1	2.000	0.1	4.000	0.2	7.000	0.3
0.200	0.1	1.000	0.1	2.200	0.2	4.500	0.2	7.500	0.3
0.300	0.1	1.200	0.1	2.400	0.2	5.000	0.2	8.000	0.3
0.400	0.1	1.400	0.1	2.600	0.2	5.500	0.2	8.500	0.3
0.500	0.1	1.600	0.1	3.000	0.2	6.000	0.2	9.000	0.3
0.600	0.1	1.800	0.1	3.500	0.2	6.500	0.2	9.500	0.3

Hydro-Brake® Optimum Manhole: 10, DS/PN: 3.002, Volume (m³): 3.6

Unit Reference	MD-SHE-0014-1000-0750-1000
Design Head (m)	0.750
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	14
Invert Level (m)	4.270
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	0.1	Kick-Flo®	0.128	0.0
Flush-Flo™	0.059	0.1	Mean Flow over Head Range	-	0.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Roger Mullarkey & Associates		Page 3
Duncreevan Kilcock Co. Kildare, Ireland	Greenfields Swords LRD STAGE 3 BLOCKED OUTFALLS	
Date 20/04/2026 11:13	Designed by Roger	
File Swords Stage 3 BLOCKED OUTFALL.MDX	Checked by	
Innovyze	Network 2020.1.3	

Hydro-Brake® Optimum Manhole: 10, DS/PN: 3.002, Volume (m³): 3.6

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.1	0.800	0.1	2.000	0.1	4.000	0.2	7.000	0.3
0.200	0.1	1.000	0.1	2.200	0.2	4.500	0.2	7.500	0.3
0.300	0.1	1.200	0.1	2.400	0.2	5.000	0.2	8.000	0.3
0.400	0.1	1.400	0.1	2.600	0.2	5.500	0.2	8.500	0.3
0.500	0.1	1.600	0.1	3.000	0.2	6.000	0.2	9.000	0.3
0.600	0.1	1.800	0.1	3.500	0.2	6.500	0.2	9.500	0.3

Hydro-Brake® Optimum Manhole: 16, DS/PN: 1.007, Volume (m³): 4.1

Unit Reference	MD-SHE-0013-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	13
Invert Level (m)	3.510
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	0.1	Kick-Flo®	0.115	0.0
Flush-Flo™	0.050	0.0	Mean Flow over Head Range	-	0.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.0	0.800	0.1	2.000	0.1	4.000	0.2	7.000	0.2
0.200	0.0	1.000	0.1	2.200	0.1	4.500	0.2	7.500	0.2
0.300	0.1	1.200	0.1	2.400	0.1	5.000	0.2	8.000	0.2
0.400	0.1	1.400	0.1	2.600	0.1	5.500	0.2	8.500	0.2
0.500	0.1	1.600	0.1	3.000	0.1	6.000	0.2	9.000	0.2
0.600	0.1	1.800	0.1	3.500	0.2	6.500	0.2	9.500	0.2

Roger Mullarkey & Associates		Page 4
Duncreevan Kilcock Co. Kildare, Ireland	Greenfields Swords LRD STAGE 3 BLOCKED OUTFALLS	
Date 20/04/2026 11:13 File Swords Stage 3 BLOCKED OUTFALL.MDX	Designed by Roger Checked by	
Innovyze	Network 2020.1.3	

Storage Structures for Storm

Tank or Pond Manhole: 5, DS/PN: 2.002

Invert Level (m) 4.550

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	175.0	0.700	175.0	0.710	0.0

Tank or Pond Manhole: 10, DS/PN: 3.002

Invert Level (m) 4.300

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	175.0	0.700	175.0	0.710	0.0

Tank or Pond Manhole: 16, DS/PN: 1.007

Invert Level (m) 4.300

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	300.0	0.250	300.0	1.000	300.0	1.250	350.0

Roger Mullarkey & Associates		Page 5
Duncreevan	Greenfields Swords	
Kilcock	LRD STAGE 3	
Co. Kildare, Ireland	BLOCKED OUTFALLS	
Date 20/04/2026 11:13	Designed by Roger	
File Swords Stage 3 BLOCKED OUTFALL.MDX	Checked by	
Innovyze	Network 2020.1.3	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 15.300 Cv (Summer) 1.000
 Region Scotland and Ireland Ratio R 0.277 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0 DVD Status OFF
 Analysis Timestep Coarse Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 120
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 20, 20, 20

Water Surcharged Flooded

PN	US/MH Name	Event	US/CL (m)	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)
1.000	1	120 minute 2 year Summer I+20%	6.950	4.926	-0.159	0.000	0.19		0.069	0.9
1.001	2	120 minute 2 year Summer I+20%	6.520	4.700	-0.122	0.000	0.35		0.194	1.0
2.000	3	120 minute 2 year Summer I+20%	6.050	5.054	-0.171	0.000	0.14		0.055	0.9
2.001	4	120 minute 2 year Summer I+20%	6.100	4.782	-0.178	0.000	0.20		0.157	0.8
2.002	5	120 minute 2 year Summer I+20%	6.200	4.794	0.059	0.000	0.00		44.183	0.0
1.002	6	120 minute 2 year Summer I+20%	6.050	4.606	0.006	0.000	0.27		1.409	0.7
3.000	8	120 minute 2 year Summer I+20%	6.000	4.801	-0.164	0.000	0.17		0.063	0.9
3.001	9	120 minute 2 year Summer I+20%	6.000	4.471	-0.219	0.000	0.16		0.087	0.8
3.002	10	120 minute 2 year Winter I+20%	6.000	4.471	-0.024	0.000	0.00		30.999	0.0
1.003	11	120 minute 2 year Summer I+20%	6.000	4.608	0.188	0.000	0.38		3.139	0.7
1.004	12	120 minute 2 year Summer I+20%	6.150	4.622	0.382	0.000	0.48		3.024	0.7
1.005	13	120 minute 2 year Summer I+20%	5.950	4.635	0.565	0.000	0.22		3.361	0.3
4.000	14	120 minute 2 year Summer I+20%	6.000	4.615	-0.160	0.000	0.18		0.067	1.0
5.000	15	120 minute 2 year Summer I+20%	5.530	4.601	0.046	0.000	0.03		0.301	0.3
4.001	15	120 minute 2 year Summer I+20%	5.750	4.618	0.173	0.000	0.22		1.819	0.6
6.000	17	120 minute 2 year Summer I+20%	5.670	4.589	-0.056	0.000	0.06		0.185	0.7
6.001	18	120 minute 2 year Summer I+20%	5.550	4.603	0.089	0.000	0.09		0.813	0.3
6.002	19	120 minute 2 year Summer I+20%	5.550	4.615	0.170	0.000	0.08		0.693	0.5
4.002	16	120 minute 2 year Summer I+20%	5.640	4.623	0.373	0.000	0.08		2.325	0.4
1.006	14	120 minute 2 year Summer I+20%	5.850	4.642	0.632	0.000	0.42		7.520	0.3
1.007	16	120 minute 2 year Summer I+20%	5.850	4.655	0.920	0.000	0.00		108.799	0.0
1.008	17	120 minute 2 year Winter I+20%	5.700	3.436	-0.229	0.000	0.00		0.000	0.0
1.009	18	120 minute 2 year Summer I+20%	5.500	3.320	-0.375	0.000	0.00		0.000	0.0

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Name	Pipe		Status
		US/MH	Flow (l/s)	
1.000	1	8.4		OK
1.001	2	15.4		OK
2.000	3	6.3		OK
2.001	4	13.9		OK
2.002	5	0.0		SURCHARGED
1.002	6	20.7		SURCHARGED
3.000	8	7.6		OK
3.001	9	11.2		OK
3.002	10	0.0		OK
1.003	11	29.1		SURCHARGED
1.004	12	36.0		SURCHARGED
1.005	13	36.5		SURCHARGED
4.000	14	9.0		OK
5.000	15	1.4		SURCHARGED
4.001	15	10.1		SURCHARGED
6.000	17	2.5		OK
6.001	18	3.5		SURCHARGED
6.002	19	3.7		SURCHARGED
4.002	16	15.7		SURCHARGED
1.006	14	52.2		SURCHARGED
1.007	16	0.0		SURCHARGED
1.008	17	0.0		OK
1.009	18	0.0		OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 15.300 Cv (Summer) 1.000
 Region Scotland and Ireland Ratio R 0.277 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0 DVD Status OFF
 Analysis Timestep Coarse Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 120
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 20, 20, 20

PN	US/MH Name	Event	Water Surcharged Flooded				Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)
			US/CL (m)	Level (m)	Depth (m)	Volume (m³)				
1.000	1	120 minute 30 year Summer I+20%	6.950	5.096	0.011	0.000	0.31		0.262	1.0
1.001	2	120 minute 30 year Summer I+20%	6.520	5.056	0.234	0.000	0.55		1.695	1.0
2.000	3	120 minute 30 year Summer I+20%	6.050	5.076	-0.149	0.000	0.25		0.080	1.0
2.001	4	120 minute 30 year Summer I+20%	6.100	4.976	0.016	0.000	0.35		0.915	0.8
2.002	5	120 minute 30 year Summer I+20%	6.200	4.985	0.250	0.000	0.00		78.472	0.0
1.002	6	120 minute 30 year Summer I+20%	6.050	4.939	0.339	0.000	0.47		2.466	0.8
3.000	8	120 minute 30 year Summer I+20%	6.000	4.824	-0.141	0.000	0.30		0.089	1.0
3.001	9	120 minute 30 year Summer I+20%	6.000	4.561	-0.129	0.000	0.28		0.274	0.9
3.002	10	120 minute 30 year Summer I+20%	6.000	4.597	0.102	0.000	0.00		53.884	0.0
1.003	11	120 minute 30 year Summer I+20%	6.000	4.917	0.497	0.000	0.65		3.503	0.8
1.004	12	120 minute 30 year Summer I+20%	6.150	4.924	0.684	0.000	0.81		3.366	0.9
1.005	13	120 minute 30 year Summer I+20%	5.950	4.933	0.863	0.000	0.38		3.788	0.4
4.000	14	120 minute 30 year Summer I+20%	6.000	4.910	0.135	0.000	0.32		0.402	1.0
5.000	15	120 minute 30 year Summer I+20%	5.530	4.897	0.342	0.000	0.05		0.636	0.3
4.001	15	120 minute 30 year Summer I+20%	5.750	4.915	0.470	0.000	0.38		2.374	0.7
6.000	17	120 minute 30 year Summer I+20%	5.670	4.884	0.239	0.000	0.08		0.520	0.7
6.001	18	120 minute 30 year Summer I+20%	5.550	4.900	0.386	0.000	0.13		1.164	0.3
6.002	19	120 minute 30 year Summer I+20%	5.550	4.911	0.466	0.000	0.13		1.028	0.5
4.002	16	120 minute 30 year Summer I+20%	5.640	4.920	0.670	0.000	0.14		2.751	0.5
1.006	14	120 minute 30 year Summer I+20%	5.850	4.940	0.930	0.000	0.76		7.946	0.6
1.007	16	120 minute 30 year Summer I+20%	5.850	4.953	1.218	0.000	0.00		198.678	0.0
1.008	17	120 minute 30 year Summer I+20%	5.700	3.436	-0.229	0.000	0.00		0.000	0.0
1.009	18	120 minute 30 year Summer I+20%	5.500	3.320	-0.375	0.000	0.00		0.000	0.0

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Name	Pipe		Status
		US/MH	Flow (l/s)	
1.000	1	13.9	SURCHARGED	
1.001	2	24.4	SURCHARGED	
2.000	3	11.2	OK	
2.001	4	24.9	SURCHARGED	
2.002	5	0.0	SURCHARGED	
1.002	6	35.8	SURCHARGED	
3.000	8	13.5	OK	
3.001	9	19.9	OK	
3.002	10	0.0	SURCHARGED	
1.003	11	49.5	SURCHARGED	
1.004	12	60.8	SURCHARGED	
1.005	13	65.0	SURCHARGED	
4.000	14	15.5	SURCHARGED	
5.000	15	2.1	SURCHARGED	
4.001	15	17.6	SURCHARGED	
6.000	17	3.8	SURCHARGED	
6.001	18	4.8	SURCHARGED	
6.002	19	5.8	SURCHARGED	
4.002	16	26.3	SURCHARGED	
1.006	14	93.2	SURCHARGED	
1.007	16	0.0	SURCHARGED	
1.008	17	0.0	OK	
1.009	18	0.0	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 15.300 Cv (Summer) 1.000
 Region Scotland and Ireland Ratio R 0.277 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0 DVD Status OFF
 Analysis Timestep Coarse Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 120
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 20, 20, 20

			Water Surcharged Flooded						
PN	US/MH Name	Event	US/CL (m)	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
1.000	1	120 minute 100 year Summer I+20%	6.950	5.446	0.361	0.000	0.39		0.657
1.001	2	120 minute 100 year Summer I+20%	6.520	5.387	0.565	0.000	0.73		2.097
2.000	3	120 minute 100 year Summer I+20%	6.050	5.087	-0.138	0.000	0.33		0.093
2.001	4	120 minute 100 year Summer I+20%	6.100	5.105	0.145	0.000	0.45		1.541
2.002	5	120 minute 100 year Summer I+20%	6.200	5.115	0.380	0.000	0.00		101.424
1.002	6	120 minute 100 year Summer I+20%	6.050	5.223	0.623	0.000	0.64		2.787
3.000	8	120 minute 100 year Summer I+20%	6.000	4.837	-0.128	0.000	0.39		0.104
3.001	9	120 minute 100 year Summer I+20%	6.000	4.670	-0.020	0.000	0.37		0.716
3.002	10	120 minute 100 year Summer I+20%	6.000	4.680	0.185	0.000	0.00		68.713
1.003	11	120 minute 100 year Summer I+20%	6.000	5.143	0.723	0.000	0.85		3.759
1.004	12	120 minute 100 year Summer I+20%	6.150	5.136	0.896	0.000	1.07		3.605
1.005	13	120 minute 100 year Summer I+20%	5.950	5.149	1.079	0.000	0.50		4.097
4.000	14	120 minute 100 year Summer I+20%	6.000	5.131	0.356	0.000	0.39		0.652
5.000	15	120 minute 100 year Summer I+20%	5.530	5.108	0.553	0.000	0.06		0.874
4.001	15	120 minute 100 year Summer I+20%	5.750	5.126	0.681	0.000	0.52		2.614
6.000	17	120 minute 100 year Summer I+20%	5.670	5.081	0.436	0.000	0.11		0.742
6.001	18	120 minute 100 year Summer I+20%	5.550	5.099	0.585	0.000	0.19		1.389
6.002	19	120 minute 100 year Summer I+20%	5.550	5.122	0.677	0.000	0.17		1.267
4.002	16	120 minute 100 year Summer I+20%	5.640	5.133	0.883	0.000	0.18		3.055
1.006	14	120 minute 100 year Summer I+20%	5.850	5.154	1.144	0.000	0.99		8.253
1.007	16	120 minute 100 year Summer I+20%	5.850	5.156	1.421	0.000	0.00		259.822
1.008	17	120 minute 100 year Winter I+20%	5.700	3.436	-0.229	0.000	0.00		0.000
1.009	18	120 minute 100 year Summer I+20%	5.500	3.320	-0.375	0.000	0.00		0.000

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Name	Maximum Pipe		Status
		US/MH Velocity (m/s)	Flow (l/s)	
1.000	1	1.0	17.5	SURCHARGED
1.001	2	1.0	32.3	SURCHARGED
2.000	3	1.0	14.5	OK
2.001	4	0.8	31.6	SURCHARGED
2.002	5	0.0	0.0	SURCHARGED
1.002	6	0.8	48.1	SURCHARGED
3.000	8	1.1	17.5	OK
3.001	9	0.8	25.8	OK
3.002	10	0.0	0.0	SURCHARGED
1.003	11	0.9	64.4	SURCHARGED
1.004	12	1.1	80.1	SURCHARGED
1.005	13	0.5	85.0	SURCHARGED
4.000	14	1.0	19.2	SURCHARGED
5.000	15	0.4	2.7	SURCHARGED
4.001	15	0.8	23.8	SURCHARGED
6.000	17	0.7	4.9	SURCHARGED
6.001	18	0.3	7.1	SURCHARGED
6.002	19	0.5	7.9	SURCHARGED
4.002	16	0.5	35.5	SURCHARGED
1.006	14	0.8	122.3	SURCHARGED
1.007	16	0.0	0.0	SURCHARGED
1.008	17	0.0	0.0	OK
1.009	18	0.0	0.0	OK