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SITE SPECIFIC FLOOD RISK ASSESSMENT for a Residential/Commercial Development at Kilternan Village, Kilternan, Dublin 18.

PROJECT: **KILTERNAN VILLAGE SHD - 2104**
CLIENT: **LISCOVE LTD**
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1.0 Introduction

1.1 This document relates to the Flood Risk Assessment (FRA) for a proposed mixed residential/commercial development located on lands at Wayside, Enniskerry Road, Kilternan, Dublin 18.

1.2 We, Roger Mullarkey & Associates, were appointed by Liscove Ltd. to carry out the Site Specific Flood Risk Assessment report to accompany the suite of other drawings and documentation relating to a proposed residential and commercial development at the above noted address.

1.3 The application area c.10.8Ha, is currently predominately greenfield and includes a derelict house & outbuildings.

Fig.1 – Site Location

1.4 The development will principally consist of a mixed-use development consisting of 383 No. residential units and a Neighbourhood Centre incorporating a creche/office/medical/retail/community use. Please refer to Thornton O'Connor Planning Consultants for a full development description.

Fig.2 – Architectural Site Layout (Not to Scale)

1.5 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 Dun Laoghaire Rathdown County Development Plan 2022 – 2028 a Site Specific Flood Risk Assessment (SSFRA) is carried out for this application.

1.6 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.

1.7 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.

1.8 The criteria under which this Site Specific Flood Risk Assessment is carried out is in accordance with the DoEHLG and OPW requirements and the parameters ascertained by consultation with Drainage Department of Dun Laoghaire Rathdown County Council.

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;

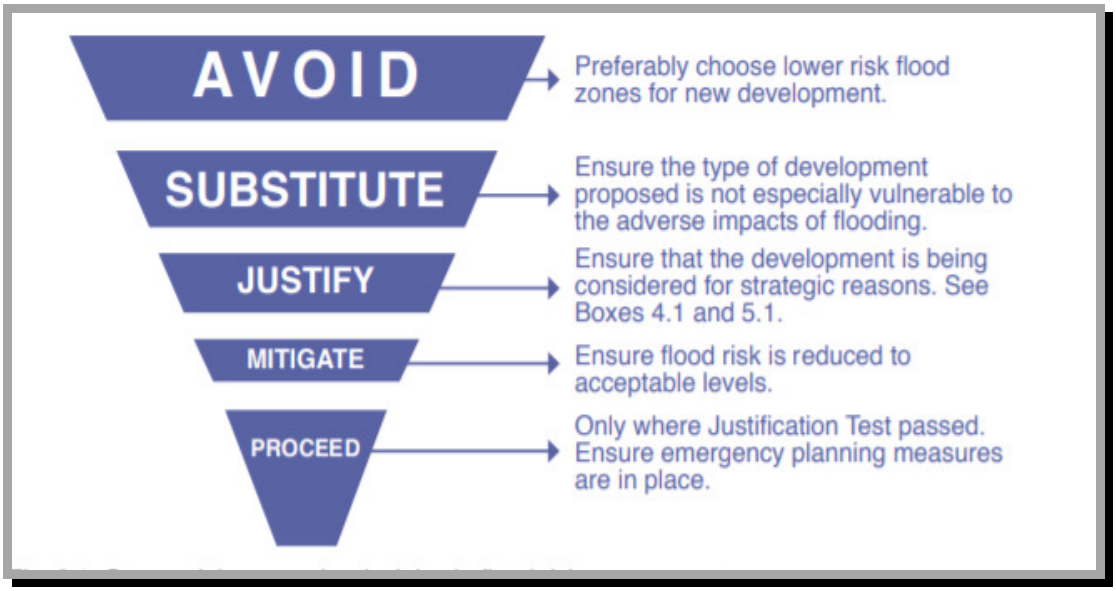


Fig.3 – Extract from *Section 3.1* of the *Guidelines*

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.

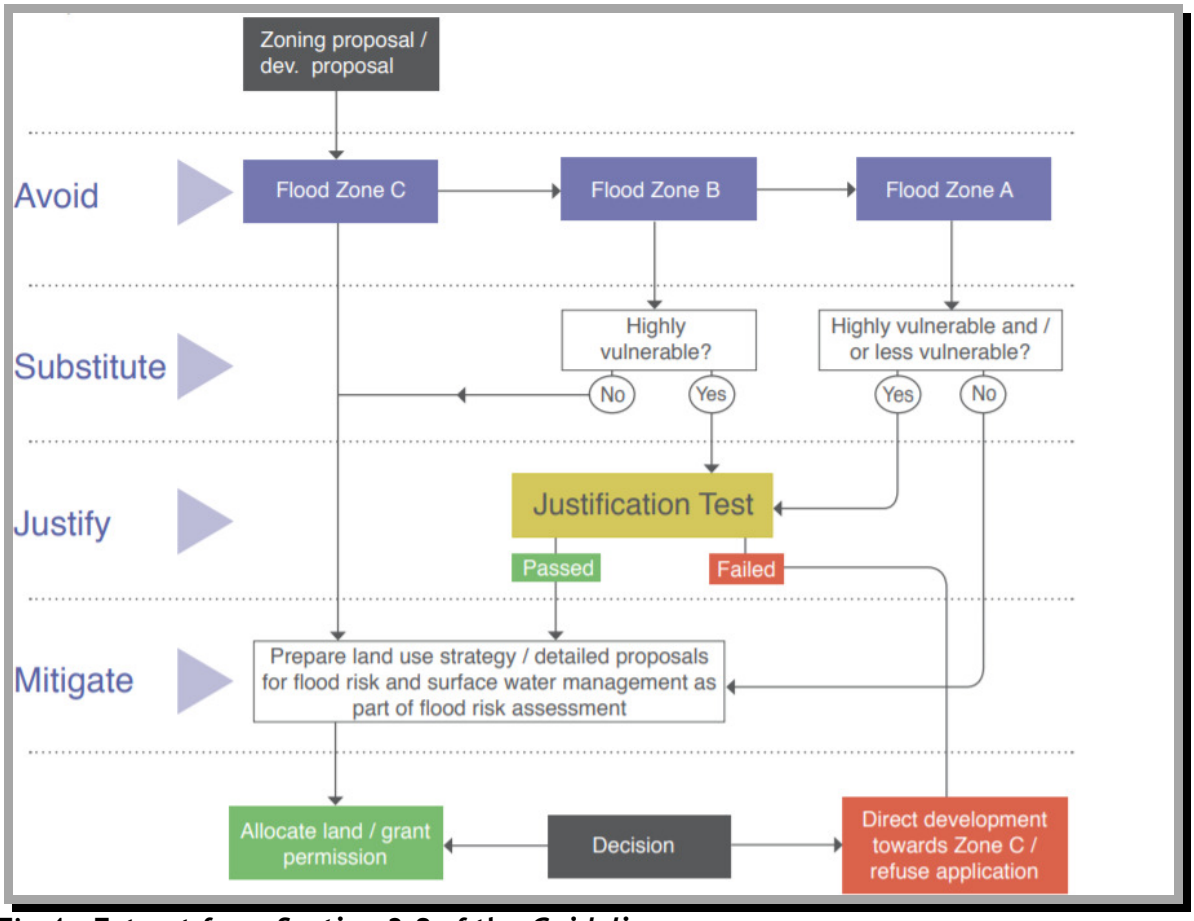


Fig.4 - Extract from *Section 3.2* of the *Guidelines*

2.11 There are 3 types or levels of flood zones defined in the Guidelines and are as described in Table 1 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.

Table 1 - 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 able 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 lands are located just east of the Enniskerry Road and south of the Glenamuck Road in Kilternan, Dublin 18.

Fig.8 – Site Location from Google Maps

3.1.2 The application area c.10.8Ha, is currently predominately greenfield and includes a derelict house & outbuildings. The drained area of the site is 9.92Ha as discussed in detail in the Engineering Infrastructure & Stormwater Impact Assessment report accompanying this application.

3.1.3 The topography is generally a gradually increasing slope downwards from the Enniskerry Road (western boundary) in a North-easterly direction and

then falls off sharply (c. 1/10 gradient) towards the eastern boundary. A site survey drawing is included in the application and can be viewed as background on the Road & Block Levels drawing Dwg.No.2104/01 & 02.

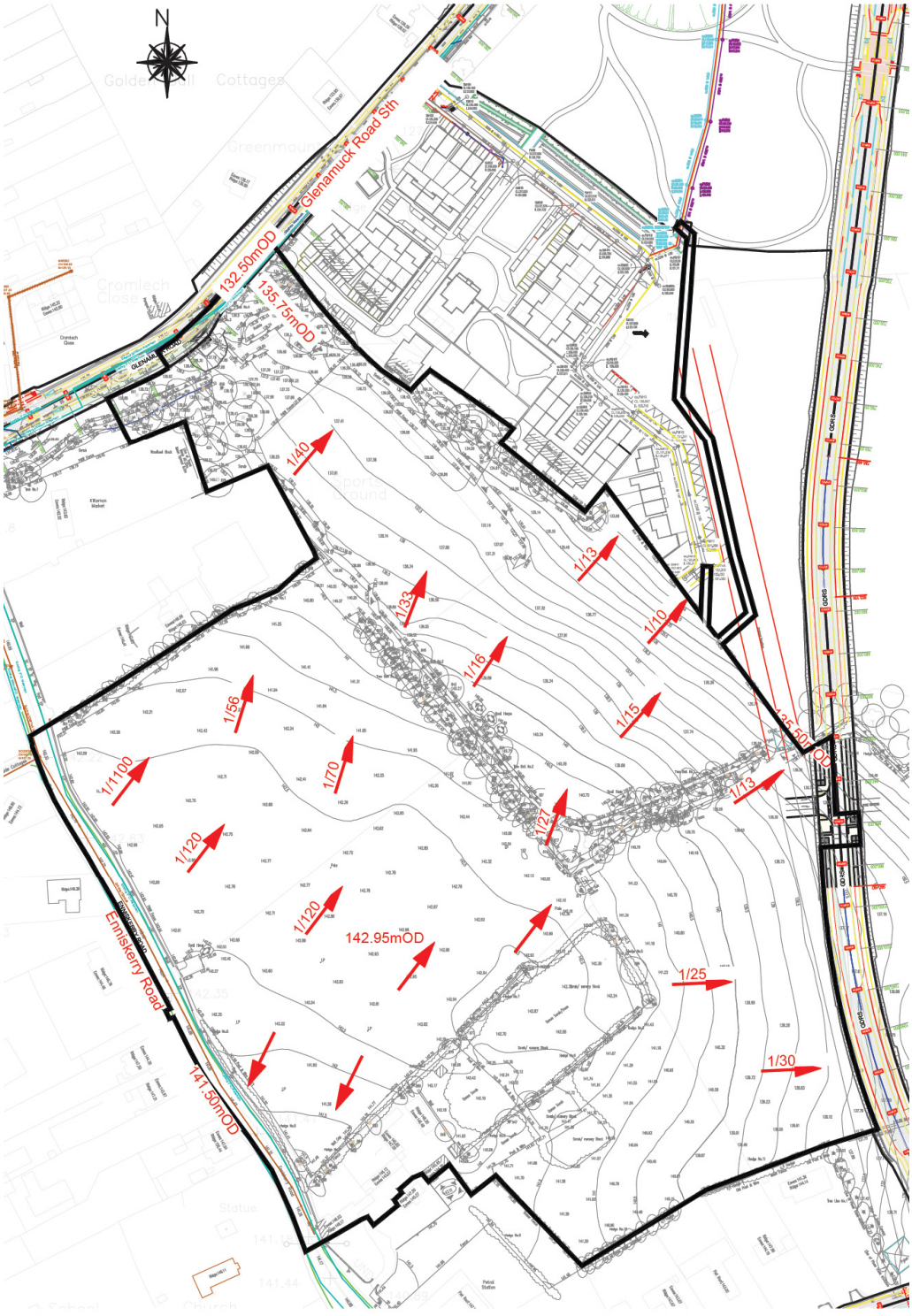


Fig.9 – Topography

3.1.4 The site is bounded by a c.1.2m high existing stone wall to the west (Enniskerry Rd), by hedgerows/trees to the northwest and north, by the Glenamuck Road to the far north, by an existing stone wall onto the

Rockville development (Reg.Ref.D17A/0793 & D18A/0566 & D20A/0015) to the northeast, by open green field and the future Glenamuck Link Distributor Road (GLDR) as part of the Glenamuck District Roads Scheme (GDRS) to the east and by hedgerow and a petrol station and detached house rear gardens along the southern boundary.

3.1.5 A Road & Block levels drawing has been prepared as part of this application and reference should be made to Dwg.No.2014/01 & 02 in this regards. Generally, the proposed road levels and house levels follow the existing contours of the site topography.

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.

3.1.9 A Hydrological and Hydrological Risk Assessment report prepared by Enviroguide Consulting has been completed and is included with the planning application – refer to that report for further detail. That report details the risk based assessment carried out to determine any potential impacts on the receiving water environment.

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;

- IW/DLRCC Drainage Records maps
- Available OPW flood maps and reports (from *floodmaps.ie*)
- DLRCC Carrickmines/Shanganagh River Catchment Study
- OPW Eastern CFRAM study
- OPW PFRM mapping
- Geological Survey of Ireland (GSI) website
- Teagasc soils data sets
- Ordnance Survey mapping
- Topographical survey
- Site Investigation reports
- Site walkover visits
- Discussions with DLRCC Drainage Department
- DLRCC Development Plan- Appendix 15-Strategic Flood Risk assessment
- Hydrological and Hydrological Risk Assessment report prepared by Enviroguide Consulting

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 more than 5.5km from the coast. The site topographical survey demonstrates that the land is elevated at c.142mOD Malin Head.

3.6 Initial Tidal Flood Risk Assessment

3.6.1 Based on the remote distance from the coastline and the elevated nature of the site, in our opinion there is no 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 site topographical survey and the OSI mapping website determined that there is no known watercourse or stream on the subject lands. Similarly, there are no known watercourses along the Enniskerry Road that could overspill onto the subject lands.

3.8.2 Reference to the topographical survey of the subject site shown that the ground slightly higher (200-300mm) than the Enniskerry Road along the site frontage and the site slopes easterly away from the Enniskerry Road thereafter.

3.8.3 Reference to survey mapping and site visits indicate that there is a roadside drainage channel along the northern side of the Glenamuck Road to the north of the site. This roadside drainage channel currently serves as the S/W drainage for the Glenamuck Road.

3.8.4 As part of the Glenamuck District Roads Scheme (GDRS) this roadside drainage channel will be incorporated into drainage infrastructure for that project. This surface water drainage infrastructure will involve the construction of new regional attenuation ponds.

3.8.5 During pre-planning consultations with DLRCC and their GDRS design consultants (DBFL Consulting Engineers), it was confirmed that the attenuated surface water outfall from the subject application lands have been allowed for and are incorporated into the GDRS infrastructure design.

3.8.6 This subject planning application seeks to outfall the majority (c.9.63Ha of drained area) of the attenuated surface water flows into the existing piped S/W infrastructure recently constructed as part of the Rockville housing development (Reg.Ref.D17A/0793) located to the NE of the subject site. This existing 300mm S/W infrastructure currently drains the attenuated flows from the Rockville development and outfalls to the Glenamuck Road roadside drainage channel. This existing 300mm S/W pipe is to be diverted into the GLDR/GDRS regional attenuation ponds as part of the roads project and as part of the approved DLRCC Part 8 *Glenamuck Park* project. Refer to Dwg.2104/04 & 05 for further detail.

3.8.7 A smaller portion (0.29Ha drained area) of the subject planning application seeks to outfall attenuated surface water flow into the S/W infrastructure that is included in the GDRS project. A spur connection facilitating same has been agreed with the applicant and connection into

same is subject to a successful grant of planning for the subject site. Refer to Dwg.2104/04 for further detail.

3.8.8 As is recommended in the DLRCC Stormwater Management Policy, the HR Wallingford UKSuDS Greenfield runoff rate estimation tool was used to calculate the Qbar for the site. The overall S/W outfall rate from the proposed development has been calculated using the drained site area of 9.92Ha (not the application "redline" area). **Qbar** was determined to be **= 44.2l/s** . The outfall flowrates are proportioned as 42.4l/s and 1.8 l/s between the two above noted outfall points. Refer to the main application submission Dwg.No.'s 2104/02-05 for the layout and detail of the proposed S/W infrastructure.

3.8.9 The regional attenuation ponds included in the GDRS project local to the Glenamuck Road ultimately drains downstream to a watercourse known as the Glenamuck Stream & Golf/Golfcourse Stream, see Fig.10 below for context;

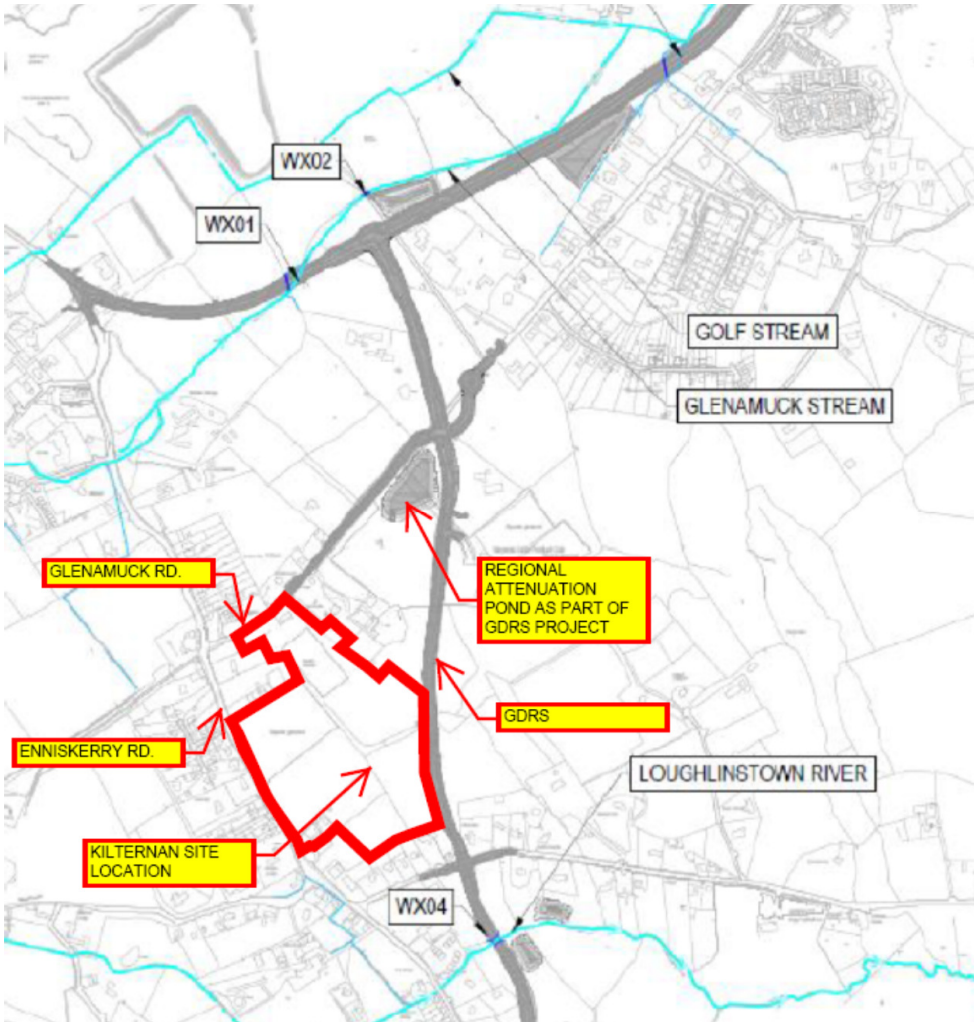
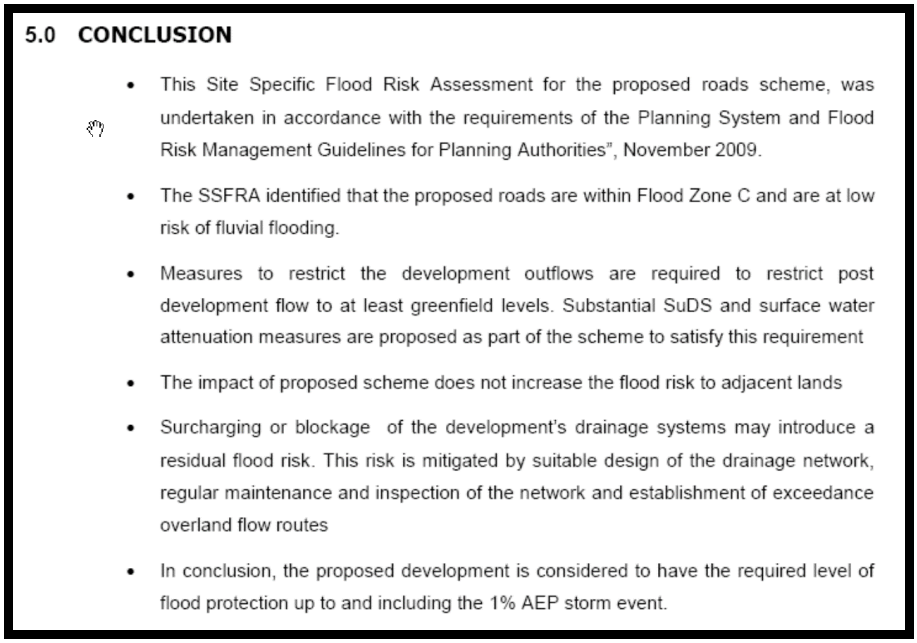


Fig.10 - Extract from GDRS SSFRA (fig.1-4)

3.8.10 A Site Specific Flood Risk Assessment was carried out by DLRCC as part of their approved GDRS project and was included in the appendix of the Environmental Impact Assessment Report (EIAR) for that project. Review of that documentation is beyond the scope of this subject SSFRA relating to the Kilternan Village application but Fig.11 below is an extract from the GDRS SSFRA conclusion chapter. The reader is referred to the GDRS EIAR for further detail (Ref.ABP303945-19).

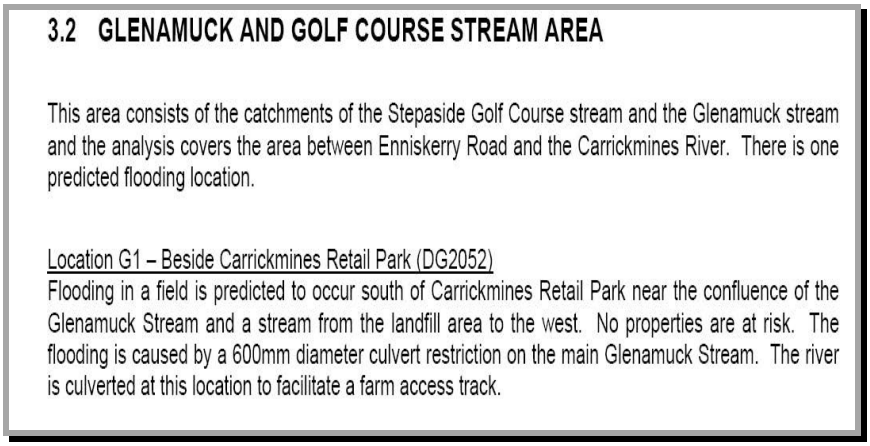


5.0 CONCLUSION

- This Site Specific Flood Risk Assessment for the proposed roads scheme, was undertaken in accordance with the requirements of the Planning System and Flood Risk Management Guidelines for Planning Authorities", November 2009.
- The SSFRA identified that the proposed roads are within Flood Zone C and are at low risk of fluvial flooding.
- Measures to restrict the development outflows are required to restrict post development flow to at least greenfield levels. Substantial SuDS and surface water attenuation measures are proposed as part of the scheme to satisfy this requirement
- The impact of proposed scheme does not increase the flood risk to adjacent lands
- Surcharging or blockage of the development's drainage systems may introduce a residual flood risk. This risk is mitigated by suitable design of the drainage network, regular maintenance and inspection of the network and establishment of exceedance overland flow routes
- In conclusion, the proposed development is considered to have the required level of flood protection up to and including the 1% AEP storm event.

Fig.11 – Extract from GDRS SSFRA (page 23)

3.8.11 DLRCC commissioned RPS Consulting Engineers to carry out the Fluvial Flooding Report for Carrickmines/Shanganagh River Catchment Stage 1 Final Report 2008. Review of that report determined that there is no risk to flooding of property along the Golfcourse Stream between Enniskerry Road and Carrickmines River. The following Fig.12 is an extract taken from the DLRCC/RPS report.



3.2 GLENAMUCK AND GOLF COURSE STREAM AREA

This area consists of the catchments of the Stepaside Golf Course stream and the Glenamuck stream and the analysis covers the area between Enniskerry Road and the Carrickmines River. There is one predicted flooding location.

Location G1 – Beside Carrickmines Retail Park (DG2052)
Flooding in a field is predicted to occur south of Carrickmines Retail Park near the confluence of the Glenamuck Stream and a stream from the landfill area to the west. No properties are at risk. The flooding is caused by a 600mm diameter culvert restriction on the main Glenamuck Stream. The river is culverted at this location to facilitate a farm access track.

Fig.12 – Extract from DLRCC/RPS Carrickmines/Shanganagh River Catchment Study

3.8.12 Research into the flooding history of the area on *floodmaps.ie* website determined that there was no flooding in the immediate area of the site. Refer to the absence of any flood point markers on the OPW National Flood Hazard map extract shown below in Fig.13 and the OPW summary report in the appendix of this document.

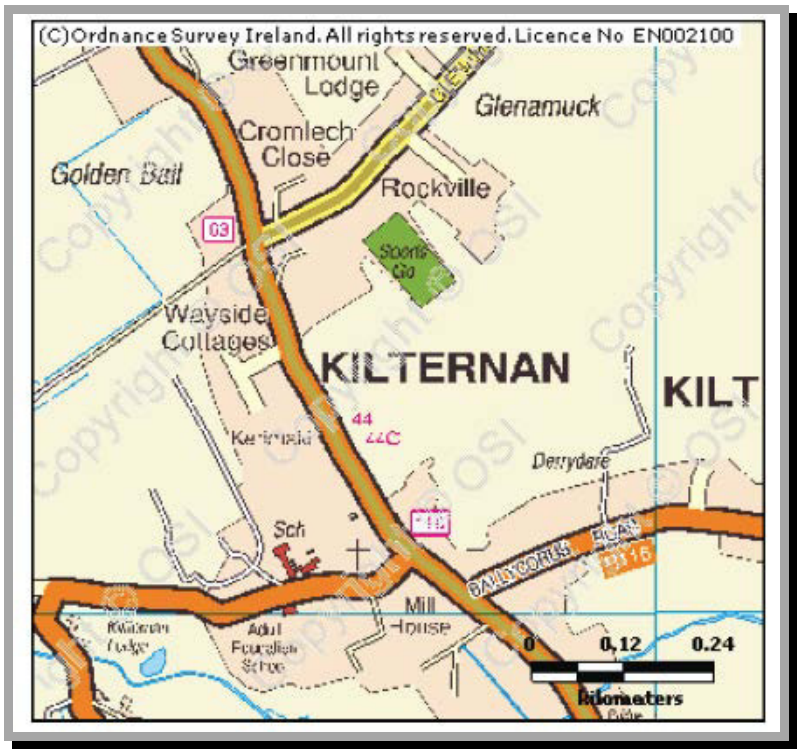


Fig.13 – Extract from the OPW National Flood Hazard Map (*floodmaps.ie*)

3.8.13 Reference to the topographical survey shows that the subject lands are elevated above the Glenamuck Road by a minimum of c.2.5m and the road falls away from the site.

3.8.14 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*

3.8.15 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.14 below indicates the studied areas as shown in shaded blue.

Fig.14 – Extract from CFRAM

3.8.16 It is apparent the CFRAM study (as shown in Fig.14 above in blue shading) has not been carried out in the immediate vicinity of Kilternan and is concentrated on the known Shanganagh-Carrickmines River Fluvial Extents area. Therefore, in accordance with the definition specified in the Guidelines, and as outlined in Section 2.11 above, it has been concluded that the **subject site location is within a Zone C**.

3.8.17 The draft Preliminary Flood Risk Assessment maps (No.2019/MAP/221/A) available from the OPW were also reviewed and the Kilternan Village site and general area is noted as having "*no fluvial data available*". Refer to appendix for an A3 not to scale map of same.

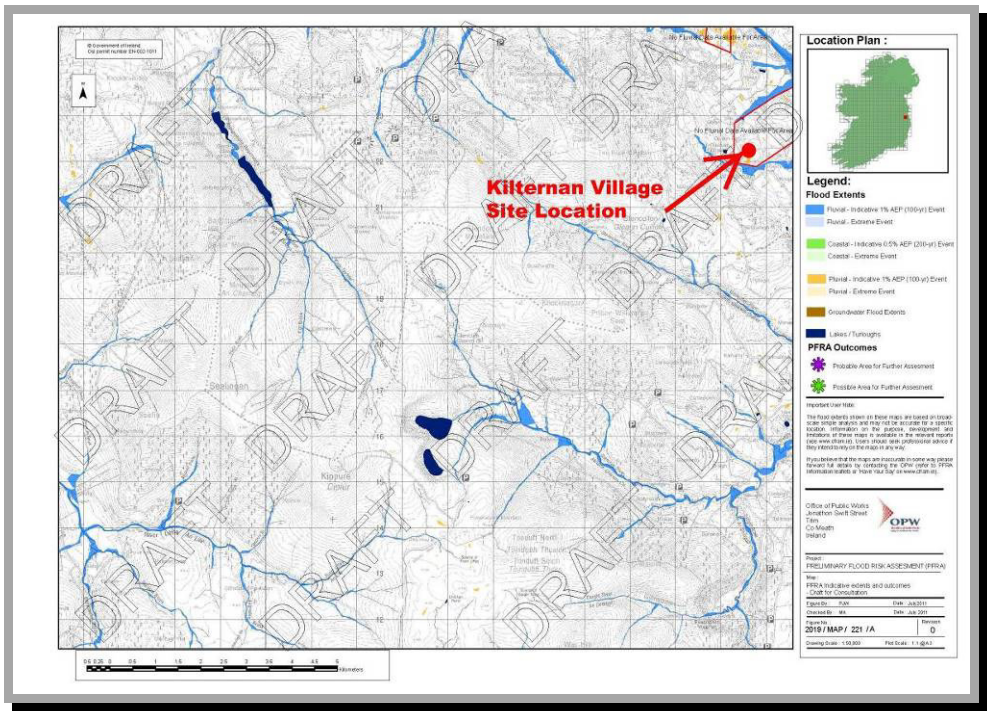


Fig.15 – OPW Preliminary Flood Risk Assessment maps (No.2019/MAP/221/A) *(Not to scale)*

3.8.18 Review of available DLRCC flood zone map No.9 was carried out and it was determined from the DLRCC map that there was no recorded Fluvial flooding at/adjacent to the subject site. Refer to appendix for a not to scale A3 map of same.

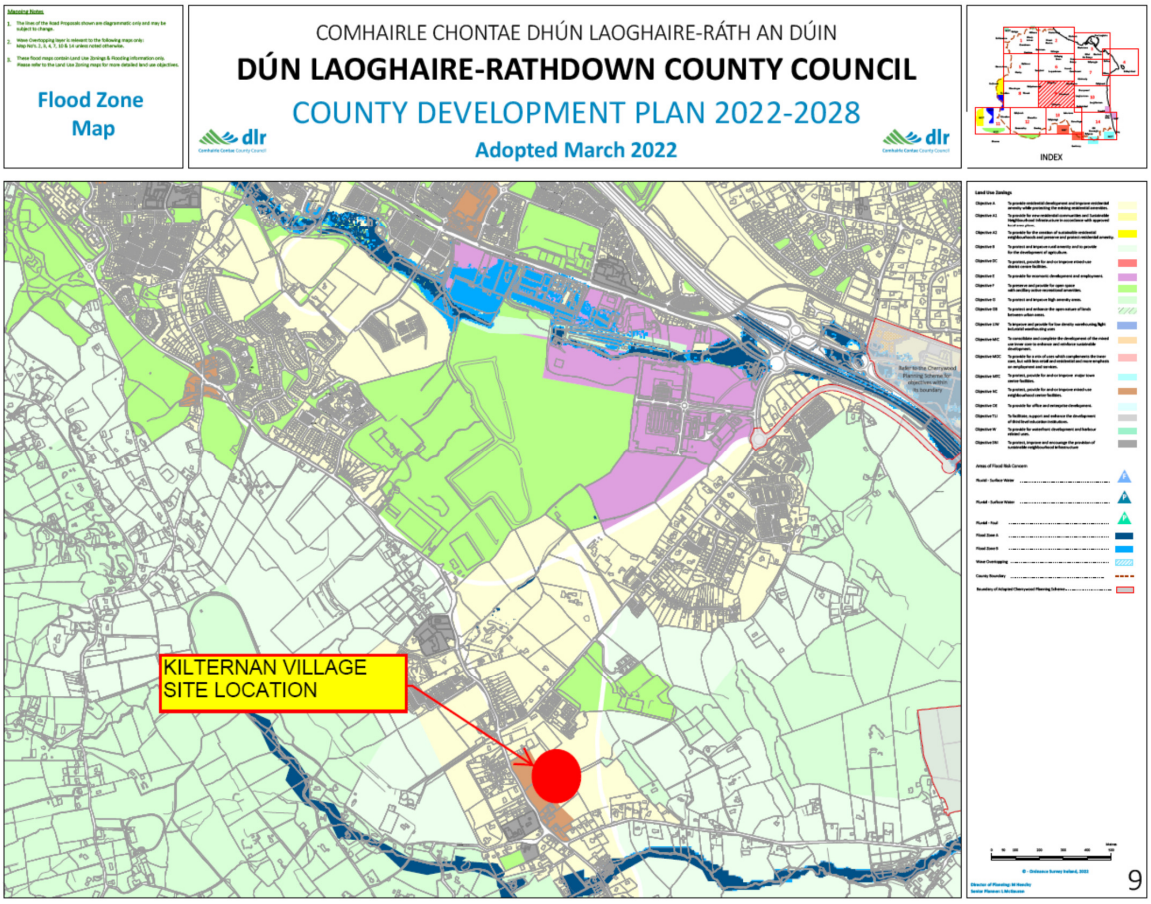


Fig.16 – DLRCC Flood Zone Map No.9 *(Not to scale)*

3.9 Initial Fluvial Flood Risk Assessment

3.9.1 As there are no known watercourses either on or upstream of the subject lands, and the roadside drainage channel along the Glenamuck Road is several meters below the subject lands, in our opinion there is a low risk fluvial of flooding onto the 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/DLRCC. There is no known surface water drainage infrastructure system existing on the site. Refer to main Engineering Infrastructure & Stormwater Impact Assessment Report for copies of same.

3.11.2 Review of the drainage records drawings displayed no surface water pipelines along the Enniskerry Road fronting the site.

3.11.3 There is a noted 300mm diameter S/W pipeline in Glenamuck Road South some 500m northeast of the subject site.

3.11.4 As noted in 3.8.3 above, along the northern side of Glenamuck Road there is an existing roadside drainage channel. This drainage channel has a varying cross-section and is restricted by several different small diameter (c.300mm) pipes beneath road access points.

3.11.5 There is no known foul sewer network on the subject site but there 2No. old disused septic tanks on the site. One to the northeast corner of the site that once served the old Wayside Celtic football club changing rooms (now since demolished) and the other as part of the derelict house to the southwest of the site.

3.11.6 In discussing the local drainage with the DLRCC Drainage Department staff, it was noted that rainfall flows along the surface of the Glenamuck Road from the Enniskerry Road downhill in an easterly direction. This is because there is no real existing piped infrastructure other than occasional road gullies that discharge directly into the northern side roadside drainage channel.

3.11.7 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 agricultural greenfield run off rate, Qbar (44.2l/s), as determined from the DLRCC recommended HR Wallingford online assessment tool. The Qbar 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. The drainage design has also allowed for more than the min.10% Urban Creep allowance as required in the DLRCC Stormwater Management Policy document

3.13.2 The pipe sizes and gradients are designed to convey the storm water flows to a singular attenuation location where the storage capacity has been designed 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.

3.13.3 The **required Q30+20% Climate Change** storm water storage volume for total site is **c.3,078m^3** as determined from the MicroDrainage simulation modelling software. This volume will be stored below ground within the 6No. voided arch MC 4500 systems.

3.13.4 The **required volume for the Q100 +20% Climate Change event** is **c.3,972m^3** as determined from the MicroDrainage simulation modelling software results.

3.13.5 The freeboard achieved in the S/W design exceeds the minimum 500mm requirement as specified in the GDRS as noted in Section 6.36 of the main Engineering Infrastructure & Stormwater Impact Assessment report.

3.13.6 In reference to Tables 5 & 6 Section 6.39, of the main infrastructural report accompanying the application, it is noted that there is additional **interception storage** volume of **c.1,102m^3** has not been subtracted from the required attenuation volume nor has it been added to the available storage volume and is therefore considered to be a safer and more conservative approach to attenuation storage estimation.

3.13.7 SuDS elements included in the pluvial design include rear garden filter drains, roadside filter swales, house rainwater butts, permeable paving systems, catchpits, filter drains, roadside swales, tree pits, bio-retention areas, void arch attenuation storage and petrol interceptors.

3.13.8 An overflow flood route map was prepared (Dwg.No.2104/12) and is included in the appendix of this assessment report. These extreme event overflow 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.

3.15.2 A Hydrological and Hydrological Risk Assessment report prepared by Enviroguide Consulting has been completed and is included with the planning application – refer to that report for further detail.

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 CLAY and SILTs overlying broken granite and bedrock. Soakaway testing & site investigations reports are included in the Appendix 12.8 of the main infrastructure report.

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. Reference is also made to the Hydrological and Hydrological Risk Assessment included with the planning application – refer to that report for further detail.

3.16.3 No ground water was noted as encountered during the soakaway trial holes investigations but it is noted that ground water levels can vary depending on the time of year. Borehole testing carried out in 2006 noted ground water encountered between c.2.6-2.8m. Refer to soakaway report in Appendix 12.8 of the main infrastructure report for more detail.

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 2104/01 & 02 it is noted that all finished floor levels of buildings on the site are to be constructed above the ground level and above the adjacent roads.

3.16.7 In reference to the architectural design layouts it is noted that there are 2No. covered/undercroft car-parking areas but these are at ground level and are not deemed as basement construction.

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 DLRCC, 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 30minute period. Therefore, the model was run with a reduction in the outfall rates from each of the 6No. Hydrobrakes down to 0.1 l/s for a 30min duration in the Q100 + 20% event. These resulting volumes and top water level are contained beneath the ground level and no flooding was noted. Refer to the appendix of this report of the 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	>5.5km from coast and elevated >142m above sea level	People/ property	Remote	N/A	Very Low
Fluvial	Overtopping of drainage channel on Glenamuck Road	People/ property	Remote	N/A	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

5.0 SSFRA Conclusion

5.1 As is required under the Dun Laoghaire Rathdown County Development Plan 2022 – 2028 Appendix 15 – Strategic Flood Risk assessment 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 residential and commercial 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 MicroDrainage Blocked Outfall Calculations

6.2 Dwg.No.2104/12 - Exceedance Flow Route Map (A3)

6.3 DLRCC Local Area Plan Map.NoPL-13-402 (A4)

6.4 DLRCC Flood Zone Map No.9 (A4)

6.5 OPW PFRA Map No.2019/MAP/221/A (A4)

6.6 OPW National Flood Hazard Mapping – Summary Report

6.7 IW/DLRCC Drainage Records Drawings (A4)

Appendix 6.1

Micro Drainage Calculations - Blocked Outfalls

BLOCKED OUTFALLS SIMULATION

STORM SEWER DESIGN by the Modified Rational Meth

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)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.271	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	90	Maximum Backdrop Height (m)	3.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.500
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	180

Designed with Level Soffits

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.018	SExisting Mh	123.210	122.267	122.180	1200	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S17.004	SGlenamuck Rd	132.800	131.186	130.150	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	1.000
Region	Scotland and Ireland	Cv (Winter)	1.000
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.271		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S44, DS/PN: S9.003, Volume (m³): 8.7

Unit Reference	MD-SHE-0012-1000-1450-1000
Design Head (m)	1.450
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	12
Invert Level (m)	139.920
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)	1.450	0.1	Kick-Flo®	0.110	0.0
Flush-Flo™	0.048	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	0.1	6.500	0.2	9.500	0.2

Hydro-Brake® Optimum Manhole: S48, DS/PN: S6.005, Volume (m³): 17.9

Unit Reference	MD-SHE-0012-1000-1850-1000
Design Head (m)	1.850
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	12
Invert Level (m)	138.708
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)	1.850	0.1	Kick-Flo®	0.105	0.0
Flush-Flo™	0.040	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	0.1	7.000	0.2
0.200	0.0	1.000	0.1	2.200	0.1	4.500	0.1	7.500	0.2
0.300	0.0	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	0.1	6.500	0.2	9.500	0.2

Hydro-Brake® Optimum Manhole: S57, DS/PN: S12.004, Volume (m³): 5.8

Unit Reference	MD-SHE-0012-1000-1850-1000
Design Head (m)	1.850
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	12
Invert Level (m)	139.532
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)	1.850	0.1	Kick-Flo®	0.105	0.0
Flush-Flo™	0.040	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	0.1	7.000	0.2
0.200	0.0	1.000	0.1	2.200	0.1	4.500	0.1	7.500	0.2
0.300	0.0	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	0.1	6.500	0.2	9.500	0.2

Hydro-Brake® Optimum Manhole: S72, DS/PN: S12.012, Volume (m³): 26.0

Unit Reference	MD-SHE-0012-1000-1850-1000
Design Head (m)	1.850
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	12
Invert Level (m)	134.897
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)	1.850	0.1	Kick-Flo®	0.105	0.0
Flush-Flo™	0.040	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	0.1	7.000	0.2
0.200	0.0	1.000	0.1	2.200	0.1	4.500	0.1	7.500	0.2
0.300	0.0	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	0.1	6.500	0.2	9.500	0.2

Hydro-Brake® Optimum Manhole: S77, DS/PN: S1.012, Volume (m³): 21.9

Unit Reference	MD-SHE-0012-1000-1850-1000
Design Head (m)	1.850
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	12
Invert Level (m)	131.650
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)	1.850	0.1	Kick-Flo®	0.105	0.0
Flush-Flo™	0.040	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	0.1	7.000	0.2
0.200	0.0	1.000	0.1	2.200	0.1	4.500	0.1	7.500	0.2
0.300	0.0	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	0.1	6.500	0.2	9.500	0.2

Hydro-Brake® Optimum Manhole: S89, DS/PN: S17.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0012-1000-1850-1000
Design Head (m)	1.850
Design Flow (l/s)	0.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	12
Invert Level (m)	131.350
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)	1.850	0.1	Kick-Flo®	0.105	0.0
Flush-Flo™	0.040	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	0.1	7.000	0.2
0.200	0.0	1.000	0.1	2.200	0.1	4.500	0.1	7.500	0.2
0.300	0.0	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	0.1	6.500	0.2	9.500	0.2

Storage Structures for Storm

Cellular Storage Manhole: S44, DS/PN: S9.003

Invert Level (m) 139.950 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	250.0	0.0	1.850	250.0	0.0	1.851	0.0	0.0

Cellular Storage Manhole: S48, DS/PN: S6.005

Invert Level (m) 138.750 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	350.0	0.0	1.850	350.0	0.0	1.851	0.0	0.0

Cellular Storage Manhole: S57, DS/PN: S12.004

Invert Level (m) 139.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	80.0	0.0	1.850	80.0	0.0	1.851	0.0	0.0

Cellular Storage Manhole: S72, DS/PN: S12.012

Invert Level (m) 134.950 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	750.0	0.0	1.850	750.0	0.0	1.851	0.0	0.0

Cellular Storage Manhole: S77, DS/PN: S1.012

Invert Level (m) 131.750 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1000.0	0.0	1.850	1000.0	0.0	1.851	0.0	0.0

Cellular Storage Manhole: S89, DS/PN: S17.004

Invert Level (m) 131.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	72.0	0.0	1.850	72.0	0.0	1.851	0.0	0.0

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 Coeffiecient	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 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000
Region	Scotland and Ireland	Ratio R	0.271
Cv (Summer)	1.000		
Cv (Winter)	1.000		

Margin for Flood Risk Warning (mm)	150.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	30 minute 2 year Summer I+20%	142.350	141.003	0.21	0.100	21.7	OK
S1.001	S2	30 minute 2 year Summer I+20%	142.020	140.632	0.46	0.368	43.8	OK
S1.002	S3	30 minute 2 year Summer I+20%	141.630	140.246	0.34	0.300	66.5	OK
S1.003	S4	30 minute 2 year Summer I+20%	139.700	138.347	0.47	0.222	84.8	OK
S2.000	S5	30 minute 2 year Summer I+20%	140.710	139.291	0.27	0.086	17.9	OK
S2.001	S6	30 minute 2 year Summer I+20%	139.880	138.475	0.22	0.106	34.2	OK
S2.002	S7	30 minute 2 year Summer I+20%	139.160	137.657	0.54	0.175	56.5	OK
S1.004	S8	30 minute 2 year Summer I+20%	138.950	136.899	0.55	0.278	153.0	OK
S1.005	S9	30 minute 2 year Summer I+20%	137.580	136.098	0.54	0.423	174.2	OK
S3.000	S10	30 minute 2 year Summer I+20%	136.510	135.141	0.09	0.063	7.7	OK
S3.001	S11	30 minute 2 year Summer I+20%	137.730	134.863	0.12	0.141	9.1	OK
S3.002	S12	30 minute 2 year Summer I+20%	137.800	134.828	0.38	0.316	30.1	OK
S3.003	S13	30 minute 2 year Summer I+20%	137.330	134.618	0.29	0.272	41.9	OK
S3.004	S14	30 minute 2 year Summer I+20%	136.650	134.427	0.45	0.688	56.4	OK
S3.005	S15	30 minute 2 year Summer I+20%	136.500	134.321	0.42	0.957	56.4	OK
S1.006	S16	30 minute 2 year Summer I+20%	136.880	134.287	0.61	1.466	234.9	OK
S1.007	S17	30 minute 2 year Summer I+20%	136.650	134.158	0.66	3.110	239.6	OK
S1.008	S18	30 minute 2 year Summer I+20%	136.530	133.974	0.56	2.378	270.8	OK
S4.000	S19	30 minute 2 year Summer I+20%	138.100	136.141	0.08	0.041	8.3	OK
S1.009	S20	30 minute 2 year Summer I+20%	135.920	133.609	0.63	4.766	302.5	OK
S5.000	S21	30 minute 2 year Summer I+20%	140.610	139.190	0.33	0.096	26.8	OK
S5.001	S22	30 minute 2 year Summer I+20%	139.230	136.944	0.36	0.101	34.9	OK
S5.002	S23	30 minute 2 year Summer I+20%	137.520	136.132	0.29	0.122	46.9	OK
S1.010	S24	30 minute 2 year Summer I+20%	136.850	133.278	0.49	2.960	352.4	OK
S1.011	S25	30 minute 2 year Summer I+20%	136.550	132.851	1.02	1.500	354.1	SURCHARGED
S6.000	S26	30 minute 2 year Summer I+20%	142.240	140.805	0.26	0.143	28.4	OK
S7.000	S27	30 minute 2 year Summer I+20%	142.000	140.891	0.20	0.097	15.8	OK
S7.001	S28	30 minute 2 year Summer I+20%	142.350	140.762	0.29	0.274	28.1	OK
S8.000	S29	30 minute 2 year Summer I+20%	142.000	140.663	0.17	0.088	15.8	OK
S8.001	S30	30 minute 2 year Summer I+20%	142.500	140.381	0.22	0.192	17.8	OK
S6.001	S31	30 minute 2 year Summer I+20%	142.810	140.226	0.37	0.378	98.4	OK
S6.002	S32	30 minute 2 year Summer I+20%	142.810	139.883	0.66	1.717	170.9	OK
S6.003	S33	30 minute 2 year Summer I+20%	142.500	139.634	0.90	2.609	180.9	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S6.004	S34	30 minute 2 year Summer I+20%	142.400	139.321	1.07	0.955	181.4	SURCHARGED
S9.000	S35	30 minute 2 year Summer I+20%	141.960	140.720	0.12	0.074	12.1	OK
S9.001	S36	30 minute 2 year Summer I+20%	142.200	140.474	0.14	0.137	14.8	OK
S9.002	S37	30 minute 2 year Winter I+20%	142.390	140.302	0.16	0.449	26.4	OK
S10.000	S38	30 minute 2 year Summer I+20%	143.000	141.606	0.26	0.114	26.8	OK
S10.001	S39	30 minute 2 year Summer I+20%	142.730	141.304	0.61	0.490	56.9	OK
S10.002	S40	30 minute 2 year Winter I+20%	142.750	140.302	0.31	0.339	60.1	OK
S11.000	S41	30 minute 2 year Summer I+20%	142.630	141.220	0.33	0.096	16.1	OK
S11.001	S42	30 minute 2 year Summer I+20%	142.380	140.830	0.39	0.153	26.1	OK
S11.002	S43	30 minute 2 year Winter I+20%	142.600	140.302	0.16	0.282	21.9	OK
S9.003	S44	30 minute 2 year Winter I+20%	142.350	140.302	0.00	87.566	0.1	SURCHARGED
S9.004	S45	30 minute 2 year Summer I+20%	141.940	139.893	0.25	0.193	24.0	OK
S9.005	S46	30 minute 2 year Summer I+20%	141.350	139.399	0.15	0.201	36.9	OK
S9.006	S47	30 minute 2 year Winter I+20%	142.000	139.242	0.22	2.540	43.3	OK
S6.005	S48	30 minute 2 year Winter I+20%	142.100	139.242	0.00	176.518	0.1	SURCHARGED
S6.006	S49	30 minute 2 year Summer I+20%	142.030	138.685	0.37	0.185	14.8	OK
S6.007	S50	30 minute 2 year Summer I+20%	141.290	138.531	0.59	0.313	34.8	OK
S6.008	S51	30 minute 2 year Summer I+20%	139.150	137.783	0.49	0.183	52.5	OK
S6.009	S52	30 minute 2 year Summer I+20%	138.060	136.384	0.59	0.136	56.4	OK
S12.000	S53	30 minute 2 year Summer I+20%	141.650	140.417	0.22	0.104	23.6	OK
S12.001	S54	30 minute 2 year Summer I+20%	141.640	140.022	0.27	0.199	28.3	OK
S12.002	S55	30 minute 2 year Winter I+20%	142.080	139.923	0.43	0.500	29.8	OK
S12.003	S56	30 minute 2 year Winter I+20%	142.110	139.923	0.15	0.867	29.6	OK
S12.004	S57	30 minute 2 year Winter I+20%	141.750	139.923	0.00	27.183	0.1	SURCHARGED
S13.000	S58	30 minute 2 year Summer I+20%	142.650	141.126	0.59	0.137	36.1	OK
S12.005	S59	30 minute 2 year Summer I+20%	141.700	139.544	0.48	0.206	48.2	OK
S12.006	S60	30 minute 2 year Summer I+20%	141.500	139.318	0.55	0.526	56.0	OK
S12.007	S61	30 minute 2 year Summer I+20%	141.000	138.905	0.46	0.412	82.3	OK
S14.000	S62	30 minute 2 year Summer I+20%	141.530	140.115	0.30	0.090	26.0	OK
S12.008	S63	30 minute 2 year Summer I+20%	140.500	138.600	0.69	1.086	138.7	OK
S12.009	S64	30 minute 2 year Summer I+20%	139.520	138.080	0.63	0.853	165.9	OK
S12.010	S65	30 minute 2 year Summer I+20%	138.600	137.246	0.60	0.612	173.9	OK
S12.011	S66	30 minute 2 year Summer I+20%	138.250	135.687	1.00	0.799	164.4	SURCHARGED
S15.000	S67	30 minute 2 year Summer I+20%	142.680	141.175	0.58	0.136	27.8	OK
S15.001	S68	30 minute 2 year Summer I+20%	142.440	140.813	0.29	0.129	52.4	OK
S15.002	S69	30 minute 2 year Summer I+20%	141.180	139.605	0.39	0.196	72.8	OK
S15.003	S70	30 minute 2 year Summer I+20%	140.230	138.679	0.47	0.218	89.5	OK
S15.004	S71	30 minute 2 year Summer I+20%	138.780	135.396	0.53	0.331	108.5	OK
S12.012	S72	30 minute 2 year Winter I+20%	137.250	135.227	0.00	204.912	0.1	SURCHARGED
S6.010	S73	30 minute 2 year Summer I+20%	137.750	134.957	0.65	0.608	59.8	OK
S6.011	S74	30 minute 2 year Summer I+20%	136.750	132.696	0.40	0.274	67.4	OK
S16.000	S75	30 minute 2 year Summer I+20%	134.250	133.141	0.09	0.123	21.1	OK
S16.001	S76	30 minute 2 year Summer I+20%	134.250	132.828	0.13	0.332	26.1	OK
S1.012	S77	30 minute 2 year Summer I+20%	134.500	132.114	0.00	346.826	0.1	SURCHARGED
S1.013	S78	30 minute 2 year Summer I+20%	132.500	130.530	0.00	0.000	0.1	OK
S1.014	S79	30 minute 2 year Summer I+20%	130.850	128.400	0.00	0.000	0.1	OK
S1.015	S80	30 minute 2 year Summer I+20%	127.750	126.150	0.00	0.000	0.1	OK
S1.016	S81	30 minute 2 year Summer I+20%	127.000	125.390	0.00	0.000	0.1	OK
S1.017	S82	30 minute 2 year Summer I+20%	125.700	122.711	0.00	0.000	0.1	OK
S1.018	S83	30 minute 2 year Summer I+20%	123.500	122.321	0.00	0.000	0.1	OK
S17.000	S84	30 minute 2 year Summer I+20%	136.750	135.250	0.00	0.000	0.0	OK
S17.001	S85	30 minute 2 year Summer I+20%	136.750	134.836	0.01	0.002	0.4	OK
S17.002	S86	30 minute 2 year Summer I+20%	135.750	132.257	0.54	0.172	33.0	OK
S17.003	S87	30 minute 2 year Winter I+20%	134.750	131.904	0.45	0.451	27.4	SURCHARGED
S18.000	S88	30 minute 2 year Summer I+20%	135.500	134.065	0.18	0.068	7.0	OK
S17.004	S89	30 minute 2 year Winter I+20%	134.750	131.904	0.00	28.879	0.1	SURCHARGED

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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 Coeffiecient	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 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000
Region	Scotland and Ireland	Ratio R	0.271
Cv (Summer)	1.000		
Cv (Winter)	1.000		

Margin for Flood Risk Warning (mm)	150.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	30 minute 30 year Summer I+20%	142.350	141.040	0.38	0.141	39.9	OK
S1.001	S2	30 minute 30 year Summer I+20%	142.020	140.722	0.95	0.847	89.7	OK
S1.002	S3	30 minute 30 year Summer I+20%	141.630	140.314	0.71	0.659	139.8	OK
S1.003	S4	30 minute 30 year Summer I+20%	139.700	138.441	0.99	0.449	179.8	OK
S2.000	S5	30 minute 30 year Summer I+20%	140.710	139.325	0.50	0.124	33.0	OK
S2.001	S6	30 minute 30 year Summer I+20%	139.880	138.521	0.44	0.189	68.6	OK
S2.002	S7	30 minute 30 year Summer I+20%	139.160	137.935	1.08	0.863	113.7	SURCHARGED
S1.004	S8	30 minute 30 year Summer I+20%	138.950	137.323	1.09	2.397	304.9	SURCHARGED
S1.005	S9	30 minute 30 year Summer I+20%	137.580	136.398	1.06	1.932	342.1	SURCHARGED
S3.000	S10	30 minute 30 year Summer I+20%	136.510	135.184	0.16	0.112	14.2	OK
S3.001	S11	30 minute 30 year Summer I+20%	137.730	135.172	0.31	2.352	22.8	SURCHARGED
S3.002	S12	30 minute 30 year Summer I+20%	137.800	135.163	0.77	1.342	61.2	SURCHARGED
S3.003	S13	30 minute 30 year Summer I+20%	137.330	135.062	0.52	2.341	75.3	SURCHARGED
S3.004	S14	30 minute 30 year Summer I+20%	136.650	134.939	0.83	4.319	103.6	SURCHARGED
S3.005	S15	30 minute 30 year Summer I+20%	136.500	134.831	0.80	3.267	107.5	SURCHARGED
S1.006	S16	30 minute 30 year Summer I+20%	136.880	134.718	1.12	2.888	433.5	SURCHARGED
S1.007	S17	30 minute 30 year Summer I+20%	136.650	134.536	1.21	6.736	441.3	SURCHARGED
S1.008	S18	30 minute 30 year Summer I+20%	136.530	134.342	1.01	6.104	492.1	SURCHARGED
S4.000	S19	30 minute 30 year Summer I+20%	138.100	136.156	0.14	0.058	15.3	OK
S1.009	S20	30 minute 30 year Summer I+20%	135.920	133.922	1.14	15.031	546.2	SURCHARGED
S5.000	S21	30 minute 30 year Summer I+20%	140.610	139.228	0.60	0.139	49.4	OK
S5.001	S22	30 minute 30 year Summer I+20%	139.230	136.991	0.69	0.154	66.9	OK
S5.002	S23	30 minute 30 year Summer I+20%	137.520	136.189	0.58	0.202	93.0	OK
S1.010	S24	30 minute 30 year Summer I+20%	136.850	133.498	0.87	8.266	625.6	OK
S1.011	S25	30 minute 30 year Summer I+20%	136.550	133.103	1.82	2.798	632.4	SURCHARGED
S6.000	S26	30 minute 30 year Summer I+20%	142.240	140.848	0.47	0.205	52.3	OK
S7.000	S27	30 minute 30 year Summer I+20%	142.000	140.926	0.37	0.137	29.0	OK
S7.001	S28	30 minute 30 year Summer I+20%	142.350	140.817	0.57	0.590	55.1	OK
S8.000	S29	30 minute 30 year Summer I+20%	142.000	140.701	0.31	0.131	28.9	OK
S8.001	S30	30 minute 30 year Summer I+20%	142.500	140.650	0.52	2.048	42.2	SURCHARGED
S6.001	S31	30 minute 30 year Summer I+20%	142.810	140.546	0.63	4.871	169.0	SURCHARGED
S6.002	S32	30 minute 30 year Summer I+20%	142.810	140.401	1.14	8.788	297.8	SURCHARGED
S6.003	S33	30 minute 30 year Summer I+20%	142.500	139.975	1.59	6.606	318.9	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S6.004	S34	30 minute 30 year Winter I+20%	142.400	139.736	1.66	3.412	282.4	SURCHARGED
S9.000	S35	30 minute 30 year Summer I+20%	141.960	140.747	0.22	0.104	22.3	OK
S9.001	S36	30 minute 30 year Winter I+20%	142.200	140.596	0.21	0.607	22.0	OK
S9.002	S37	30 minute 30 year Winter I+20%	142.390	140.596	0.30	1.491	50.8	SURCHARGED
S10.000	S38	30 minute 30 year Summer I+20%	143.000	141.649	0.48	0.163	49.4	OK
S10.001	S39	30 minute 30 year Summer I+20%	142.730	141.513	1.22	1.949	112.9	SURCHARGED
S10.002	S40	30 minute 30 year Winter I+20%	142.750	140.640	0.60	0.823	117.4	SURCHARGED
S11.000	S41	30 minute 30 year Summer I+20%	142.630	141.259	0.60	0.140	29.4	OK
S11.001	S42	30 minute 30 year Summer I+20%	142.380	140.901	0.76	0.268	51.2	OK
S11.002	S43	30 minute 30 year Summer I+20%	142.600	140.596	0.39	0.702	52.9	SURCHARGED
S9.003	S44	30 minute 30 year Winter I+20%	142.350	140.596	0.00	159.491	0.1	SURCHARGE
S9.004	S45	30 minute 30 year Summer I+20%	141.940	139.955	0.57	0.434	54.1	OK
S9.005	S46	30 minute 30 year Summer I+20%	141.350	139.649	0.34	1.809	82.0	OK
S9.006	S47	30 minute 30 year Summer I+20%	142.000	139.649	0.53	8.783	105.1	SURCHARGED
S6.005	S48	30 minute 30 year Summer I+20%	142.100	139.649	0.00	313.378	0.1	SURCHARGE
S6.006	S49	30 minute 30 year Summer I+20%	142.030	139.016	0.72	1.074	28.9	SURCHARGED
S6.007	S50	30 minute 30 year Summer I+20%	141.290	138.916	1.16	1.577	68.7	SURCHARGED
S6.008	S51	30 minute 30 year Summer I+20%	139.150	137.853	0.99	0.394	105.4	OK
S6.009	S52	30 minute 30 year Summer I+20%	138.060	136.693	1.19	0.514	113.1	SURCHARGED
S12.000	S53	30 minute 30 year Summer I+20%	141.650	140.456	0.41	0.148	43.5	OK
S12.001	S54	30 minute 30 year Winter I+20%	141.640	140.259	0.40	1.606	41.8	SURCHARGED
S12.002	S55	30 minute 30 year Winter I+20%	142.080	140.241	0.80	1.526	55.3	SURCHARGED
S12.003	S56	30 minute 30 year Summer I+20%	142.110	140.192	0.34	1.382	66.7	SURCHARGED
S12.004	S57	30 minute 30 year Winter I+20%	141.750	140.192	0.00	48.558	0.1	SURCHARGE
S13.000	S58	30 minute 30 year Summer I+20%	142.650	141.303	1.05	0.337	63.8	SURCHARGED
S12.005	S59	30 minute 30 year Summer I+20%	141.700	139.791	0.87	0.696	86.9	SURCHARGED
S12.006	S60	30 minute 30 year Summer I+20%	141.500	139.629	0.96	2.291	98.0	SURCHARGED
S12.007	S61	30 minute 30 year Summer I+20%	141.000	139.300	0.81	3.126	146.1	SURCHARGED
S14.000	S62	30 minute 30 year Summer I+20%	141.530	140.150	0.55	0.131	47.9	OK
S12.008	S63	30 minute 30 year Summer I+20%	140.500	139.104	1.19	5.094	239.4	SURCHARGED
S12.009	S64	30 minute 30 year Summer I+20%	139.520	138.387	1.08	3.796	285.1	SURCHARGED
S12.010	S65	30 minute 30 year Summer I+20%	138.600	137.428	1.02	1.692	295.4	SURCHARGED
S12.011	S66	30 minute 30 year Summer I+20%	138.250	136.225	1.76	1.750	289.5	SURCHARGED
S15.000	S67	30 minute 30 year Summer I+20%	142.680	141.308	1.06	0.286	51.1	SURCHARGED
S15.001	S68	30 minute 30 year Summer I+20%	142.440	140.869	0.59	0.256	104.2	OK
S15.002	S69	30 minute 30 year Summer I+20%	141.180	139.682	0.79	0.371	148.8	OK
S15.003	S70	30 minute 30 year Summer I+20%	140.230	138.773	0.97	0.438	186.3	OK
S15.004	S71	30 minute 30 year Summer I+20%	138.780	135.672	1.11	0.726	227.2	SURCHARGED
S12.012	S72	30 minute 30 year Winter I+20%	137.250	135.452	0.00	376.430	0.1	SURCHARGE
S6.010	S73	30 minute 30 year Summer I+20%	137.750	135.191	1.30	1.105	119.7	SURCHARGED
S6.011	S74	30 minute 30 year Summer I+20%	136.750	132.809	0.81	0.435	137.2	OK
S16.000	S75	30 minute 30 year Summer I+20%	134.250	133.173	0.16	0.168	38.8	OK
S16.001	S76	30 minute 30 year Summer I+20%	134.250	132.874	0.26	0.712	49.8	OK
S1.012	S77	30 minute 30 year Summer I+20%	134.500	132.418	0.00	638.117	0.1	SURCHARGED
S1.013	S78	30 minute 30 year Summer I+20%	132.500	130.531	0.00	0.000	0.1	OK
S1.014	S79	30 minute 30 year Summer I+20%	130.850	128.400	0.00	0.000	0.1	OK
S1.015	S80	30 minute 30 year Summer I+20%	127.750	126.151	0.00	0.000	0.1	OK
S1.016	S81	30 minute 30 year Summer I+20%	127.000	125.390	0.00	0.000	0.1	OK
S1.017	S82	30 minute 30 year Summer I+20%	125.700	122.711	0.00	0.000	0.1	OK
S1.018	S83	30 minute 30 year Summer I+20%	123.500	122.322	0.00	0.000	0.1	OK
S17.000	S84	30 minute 30 year Summer I+20%	136.750	135.250	0.00	0.000	0.0	OK
S17.001	S85	30 minute 30 year Summer I+20%	136.750	134.844	0.01	0.014	0.8	OK
S17.002	S86	30 minute 30 year Summer I+20%	135.750	132.416	1.21	0.351	74.3	SURCHARGED
S17.003	S87	30 minute 30 year Summer I+20%	134.750	132.245	1.18	1.209	72.5	SURCHARGED
S18.000	S88	30 minute 30 year Summer I+20%	135.500	134.090	0.33	0.096	12.9	OK
S17.004	S89	30 minute 30 year Winter I+20%	134.750	132.244	0.00	52.559	0.1	SURCHARGED

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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 Coeffiecient	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 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000
Region	Scotland and Ireland	Ratio R	0.271
Cv (Summer)	1.000		
Cv (Winter)	1.000		

Margin for Flood Risk Warning (mm)	150.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	30 minute 100 year Summer I+20%	142.350	141.062	0.49	0.166	52.1	OK
S1.001	S2	30 minute 100 year Summer I+20%	142.020	140.929	1.17	2.370	110.8	SURCHARGED
S1.002	S3	30 minute 100 year Summer I+20%	141.630	140.357	0.87	0.974	171.0	OK
S1.003	S4	30 minute 100 year Summer I+20%	139.700	138.996	1.17	2.172	211.4	SURCHARGED
S2.000	S5	30 minute 100 year Summer I+20%	140.710	139.346	0.65	0.148	43.0	OK
S2.001	S6	30 minute 100 year Summer I+20%	139.880	138.889	0.57	1.299	88.9	SURCHARGED
S2.002	S7	30 minute 100 year Summer I+20%	139.160	138.686	1.17	3.426	123.0	SURCHARGED
S1.004	S8	30 minute 100 year Summer I+20%	138.950	138.020	1.25	6.515	348.8	SURCHARGED
S1.005	S9	30 minute 100 year Summer I+20%	137.580	136.854	1.19	4.420	384.9	SURCHARGED
S3.000	S10	30 minute 100 year Summer I+20%	136.510	135.885	0.20	0.904	17.4	SURCHARGED
S3.001	S11	30 minute 100 year Summer I+20%	137.730	135.865	0.47	3.829	34.4	SURCHARGED
S3.002	S12	30 minute 100 year Summer I+20%	137.800	135.849	0.83	2.119	66.0	SURCHARGED
S3.003	S13	30 minute 100 year Summer I+20%	137.330	135.733	0.54	3.303	78.9	SURCHARGED
S3.004	S14	30 minute 100 year Summer I+20%	136.650	135.623	0.83	5.299	103.8	SURCHARGED
S3.005	S15	30 minute 100 year Summer I+20%	136.500	135.524	0.82	4.259	110.8	SURCHARGED
S1.006	S16	30 minute 100 year Summer I+20%	136.880	135.413	1.28	5.267	496.7	SURCHARGED
S1.007	S17	30 minute 100 year Summer I+20%	136.650	135.181	1.40	7.897	510.5	SURCHARGED
S1.008	S18	30 minute 100 year Summer I+20%	136.530	134.938	1.16	7.241	563.7	SURCHARGED
S4.000	S19	30 minute 100 year Summer I+20%	138.100	136.165	0.18	0.068	20.0	OK
S1.009	S20	30 minute 100 year Summer I+20%	135.920	134.410	1.33	19.627	634.0	SURCHARGED
S5.000	S21	30 minute 100 year Summer I+20%	140.610	139.254	0.79	0.168	64.5	OK
S5.001	S22	30 minute 100 year Summer I+20%	139.230	137.021	0.90	0.188	87.3	OK
S5.002	S23	30 minute 100 year Summer I+20%	137.520	136.222	0.76	0.248	121.5	OK
S1.010	S24	30 minute 100 year Summer I+20%	136.850	133.908	1.06	13.088	759.4	SURCHARGED
S1.011	S25	30 minute 100 year Summer I+20%	136.550	133.311	2.23	3.690	774.2	SURCHARGED
S6.000	S26	30 minute 100 year Summer I+20%	142.240	141.357	0.59	0.934	64.8	SURCHARGED
S7.000	S27	30 minute 100 year Summer I+20%	142.000	141.478	0.46	0.761	36.8	SURCHARGED
S7.001	S28	30 minute 100 year Summer I+20%	142.350	141.398	0.64	2.452	61.4	SURCHARGED
S8.000	S29	30 minute 100 year Summer I+20%	142.000	141.457	0.41	0.986	37.9	SURCHARGED
S8.001	S30	30 minute 100 year Summer I+20%	142.500	141.348	0.55	3.601	44.8	SURCHARGED
S6.001	S31	30 minute 100 year Summer I+20%	142.810	141.231	0.73	9.921	197.1	SURCHARGED
S6.002	S32	30 minute 100 year Summer I+20%	142.810	141.008	1.36	9.789	353.4	SURCHARGED
S6.003	S33	30 minute 100 year Summer I+20%	142.500	140.434	1.89	7.419	378.8	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S6.004	S34	30 minute 100 year Winter I+20%	142.400	140.005	1.94	3.823	329.8	SURCHARGED
S9.000	S35	30 minute 100 year Summer I+20%	141.960	140.792	0.29	0.155	29.1	OK
S9.001	S36	30 minute 100 year Summer I+20%	142.200	140.792	0.35	1.855	36.7	SURCHARGED
S9.002	S37	30 minute 100 year Summer I+20%	142.390	140.792	0.50	1.839	84.1	SURCHARGED
S10.000	S38	30 minute 100 year Summer I+20%	143.000	141.838	0.61	0.377	62.1	SURCHARGED
S10.001	S39	30 minute 100 year Summer I+20%	142.730	141.699	1.56	3.007	144.4	SURCHARGED
S10.002	S40	30 minute 100 year Winter I+20%	142.750	140.847	0.76	1.119	148.6	SURCHARGED
S11.000	S41	30 minute 100 year Summer I+20%	142.630	141.285	0.79	0.170	38.4	OK
S11.001	S42	30 minute 100 year Summer I+20%	142.380	140.950	1.00	0.432	67.1	OK
S11.002	S43	30 minute 100 year Summer I+20%	142.600	140.792	0.50	1.160	68.0	SURCHARGED
S9.003	S44	30 minute 100 year Summer I+20%	142.350	140.792	0.00	206.389	0.1	SURCHARGED
S9.004	S45	30 minute 100 year Summer I+20%	141.940	139.987	0.74	0.560	70.5	OK
S9.005	S46	30 minute 100 year Winter I+20%	141.350	139.919	0.35	4.234	84.6	SURCHARGED
S9.006	S47	30 minute 100 year Winter I+20%	142.000	139.919	0.50	9.308	100.0	SURCHARGED
S6.005	S48	30 minute 100 year Winter I+20%	142.100	139.919	0.00	403.448	0.1	SURCHARGED
S6.006	S49	30 minute 100 year Summer I+20%	142.030	139.863	0.86	2.033	34.7	SURCHARGED
S6.007	S50	30 minute 100 year Summer I+20%	141.290	139.725	1.39	2.492	82.5	SURCHARGED
S6.008	S51	30 minute 100 year Summer I+20%	139.150	138.311	1.13	2.158	120.1	SURCHARGED
S6.009	S52	30 minute 100 year Summer I+20%	138.060	136.890	1.34	0.868	128.2	SURCHARGED
S12.000	S53	30 minute 100 year Winter I+20%	141.650	140.492	0.42	0.189	44.5	OK
S12.001	S54	30 minute 100 year Winter I+20%	141.640	140.455	0.48	2.918	50.4	SURCHARGED
S12.002	S55	30 minute 100 year Winter I+20%	142.080	140.427	0.92	1.736	64.2	SURCHARGED
S12.003	S56	30 minute 100 year Summer I+20%	142.110	140.374	0.41	1.643	81.6	SURCHARGED
S12.004	S57	30 minute 100 year Summer I+20%	141.750	140.374	0.00	62.633	0.1	SURCHARGED
S13.000	S58	30 minute 100 year Summer I+20%	142.650	141.846	1.27	0.951	77.4	SURCHARGED
S12.005	S59	30 minute 100 year Summer I+20%	141.700	140.837	0.94	3.258	94.4	SURCHARGED
S12.006	S60	30 minute 100 year Summer I+20%	141.500	140.643	1.13	4.147	116.0	SURCHARGED
S12.007	S61	30 minute 100 year Summer I+20%	141.000	140.264	0.90	5.119	162.8	SURCHARGED
S14.000	S62	30 minute 100 year Summer I+20%	141.530	140.270	0.72	0.265	62.5	SURCHARGED
S12.008	S63	30 minute 100 year Summer I+20%	140.500	139.989	1.35	7.727	272.2	SURCHARGED
S12.009	S64	30 minute 100 year Summer I+20%	139.520	139.065	1.26	6.526	331.0	SURCHARGED
S12.010	S65	30 minute 100 year Summer I+20%	138.600	137.753	1.19	3.910	346.7	SURCHARGED
S12.011	S66	30 minute 100 year Summer I+20%	138.250	136.526	2.04	2.807	336.2	SURCHARGED
S15.000	S67	30 minute 100 year Summer I+20%	142.680	141.521	1.37	0.527	66.3	SURCHARGED
S15.001	S68	30 minute 100 year Summer I+20%	142.440	140.901	0.76	0.329	135.4	OK
S15.002	S69	30 minute 100 year Summer I+20%	141.180	140.165	0.96	2.020	180.8	SURCHARGED
S15.003	S70	30 minute 100 year Summer I+20%	140.230	139.278	1.16	1.963	221.6	SURCHARGED
S15.004	S71	30 minute 100 year Summer I+20%	138.780	135.806	1.33	0.917	271.3	SURCHARGED
S12.012	S72	30 minute 100 year Winter I+20%	137.250	135.607	0.00	490.973	0.1	SURCHARGED
S6.010	S73	30 minute 100 year Summer I+20%	137.750	135.269	1.47	1.194	135.3	SURCHARGED
S6.011	S74	30 minute 100 year Summer I+20%	136.750	132.839	0.91	0.479	155.5	OK
S16.000	S75	30 minute 100 year Summer I+20%	134.250	133.192	0.21	0.196	50.6	OK
S16.001	S76	30 minute 100 year Summer I+20%	134.250	132.899	0.33	0.921	65.0	OK
S1.012	S77	30 minute 100 year Winter I+20%	134.500	132.615	0.00	832.259	0.1	SURCHARGED
S1.013	S78	30 minute 100 year Winter I+20%	132.500	130.531	0.00	0.000	0.1	OK
S1.014	S79	30 minute 100 year Winter I+20%	130.850	128.400	0.00	0.000	0.1	OK
S1.015	S80	30 minute 100 year Summer I+20%	127.750	126.151	0.00	0.000	0.1	OK
S1.016	S81	30 minute 100 year Summer I+20%	127.000	125.390	0.00	0.000	0.1	OK
S1.017	S82	30 minute 100 year Summer I+20%	125.700	122.711	0.00	0.000	0.1	OK
S1.018	S83	30 minute 100 year Summer I+20%	123.500	122.322	0.00	0.000	0.1	OK
S17.000	S84	30 minute 100 year Summer I+20%	136.750	135.250	0.00	0.000	0.0	OK
S17.001	S85	30 minute 100 year Summer I+20%	136.750	134.849	0.02	0.021	1.1	OK
S17.002	S86	30 minute 100 year Summer I+20%	135.750	132.480	1.58	0.424	96.7	SURCHARGED
S17.003	S87	30 minute 100 year Summer I+20%	134.750	132.468	1.52	1.739	93.1	SURCHARGED
S18.000	S88	30 minute 100 year Summer I+20%	135.500	134.104	0.43	0.112	16.8	OK
S17.004	S89	30 minute 100 year Winter I+20%	134.750	132.467	0.00	68.045	0.1	SURCHARGED

TANK 4

TANK 3

TANK 5

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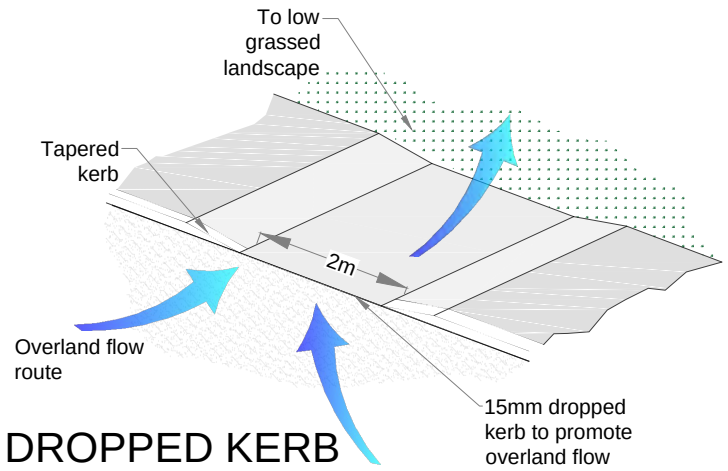
Appendix 6.2

RMA Exceedance Flow Route Map Dwg.No.2104/12



DROPPED KERB

Scale 1:100

Notes:

1. Read this drawing in conjunction with all other relevant Engineers and Architects drawings.
2. Do not scale this drawing, use only written dimensions.
3. This drawing is relevant to flood exceedence routing of storm events greater than the Q100 + 20% climate change as outlined in the RMA Drainage Infrastructure Report prepared as part of the planning application - refer to that document for further information.

KERB LOWERED LOCALLY AND LANDSCAPED TO ALLOW OVERLAND FLOW TO GREEN AREA LOWPOINTS

KERB LOWERED LOCALLY AND LANDSCAPED TO ALLOW OVERLAND FLOW TO GREEN AREA LOWPOINTS

GRASSED LANDSCAPED BERM AT LOWPOINT

KERB LOWERED LOCALLY AND LANDSCAPED TO ALLOW OVERLAND FLOW TO GREEN AREA LOWPOINTS

Overland Flow Routing

Scale 1:2000

A3 Scale 1:2000

0m 50m 100m 150m 200m

REV	DATE	DESCRIPTION

ROGER MULLARKEY & ASSOCIATES
Consulting Structural and Civil Engineers

Duncreevan, Kilcock, Co.Kildare
Tel: +353 1 610 3755 Mob: +353 87 232 4917
E-mail. info@rmullarkey.ie www.rmullarkey.ie

Project: KILTERNAN VILLAGE SHD

Architect: MCORM Architects

Stage: PLANNING

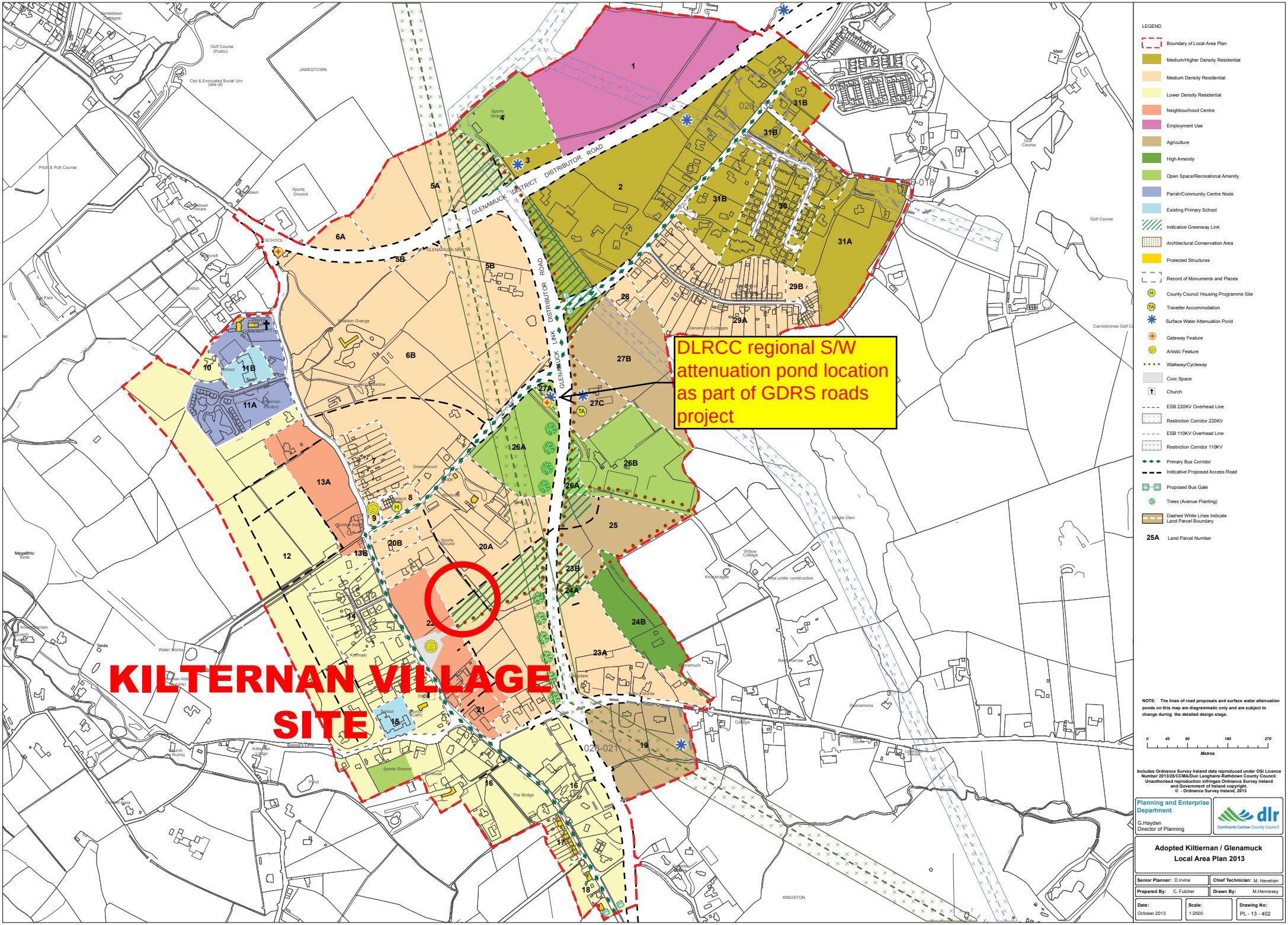
Drawing Title: EXCEEDANCE OVERFLOW ROUTE

Date	Drawn By	Scales	Dwg.No.	Rev.
May'22	RM	1:2000 @A3	2104/12	

Appendix 6.3

DLRCC Local Area Plan Map Np. PL-13-402

(Not to scale at A4)


DLRCC regional S/W attenuation pond location as part of GDRS roads project
KILTERNAN VILLAGE SITE
GLENAMUCK DISTRICT DISTRIBUTOR ROAD
GLENAMUCK DISTRICT DISTRIBUTOR ROAD LINK
GLENAMUCK NORTH
JAMESTOWN
KINGSTON
LEGEND
Boundary of Local Area Plan
Medium/Higher Density Residential
Medium Density Residential
Lower Density Residential
Neighbourhood Centre
Employment Use
Agriculture
High Amenity
Open Space/Recreational Amenity
Parish/Community Centre Node
Existing Primary School
Indicative Greenway Link
Architectural Conservation Area
Protected Structures
Record of Monuments and Places
County Council Housing Programme Site
Traveller Accommodation
Surface Water Attenuation Pond
Gateway Feature
Artistic Feature
Walkway/Cycleway
Civic Space
Church
ESB 220KV Overhead Line
Restriction Corridor 220KV
ESB 110KV Overhead Line
Restriction Corridor 110KV
Primary Bus Corridor
Indicative Proposed Access Road
Proposed Bus Gate
Trees (Avenue Planting)
Dashed White Lines Indicate Land Parcel Boundary
25A Land Parcel Number
NOTE: The lines of road proposals and surface water attenuation ponds on this map are diagrammatic only and are subject to change during the detailed design stage.
0 45 90 180 270
Metres
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Planning and Enterprise Department
G.Hayden
Director of Planning
dlr
Comhairle Contae County Council
Adopted Kiltiernan / Glenamuck Local Area Plan 2013
Senior Planner: D.Irvine
Chief Technician: M. Hevehan
Prepared By: C. Fulcher
Drawn By: M.Hennessy
Date: October 2013
Scale: 1:2500
Drawing No: PL - 13 - 402

Appendix 6.4

DLRCC Flood Zone Map No.9

(Not to scale at A4)

Mapping Notes:

1. The lines of the Road Proposals shown are diagrammatic only and may be subject to change.
2. Wave Overtopping layer is relevant to the following maps only: Map No's. 2, 3, 4, 7, 10 & 14 unless noted otherwise.
3. These flood maps contain Land Use Zonings & Flooding information only. Please refer to the Land Use Zoning maps for more detailed land use objectives.

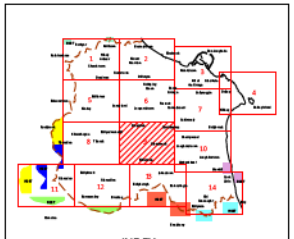
Flood Zone Map

COMHAIRLE CHONTAE DHÚN LAOGHAIRE-RÁTH AN DÚIN

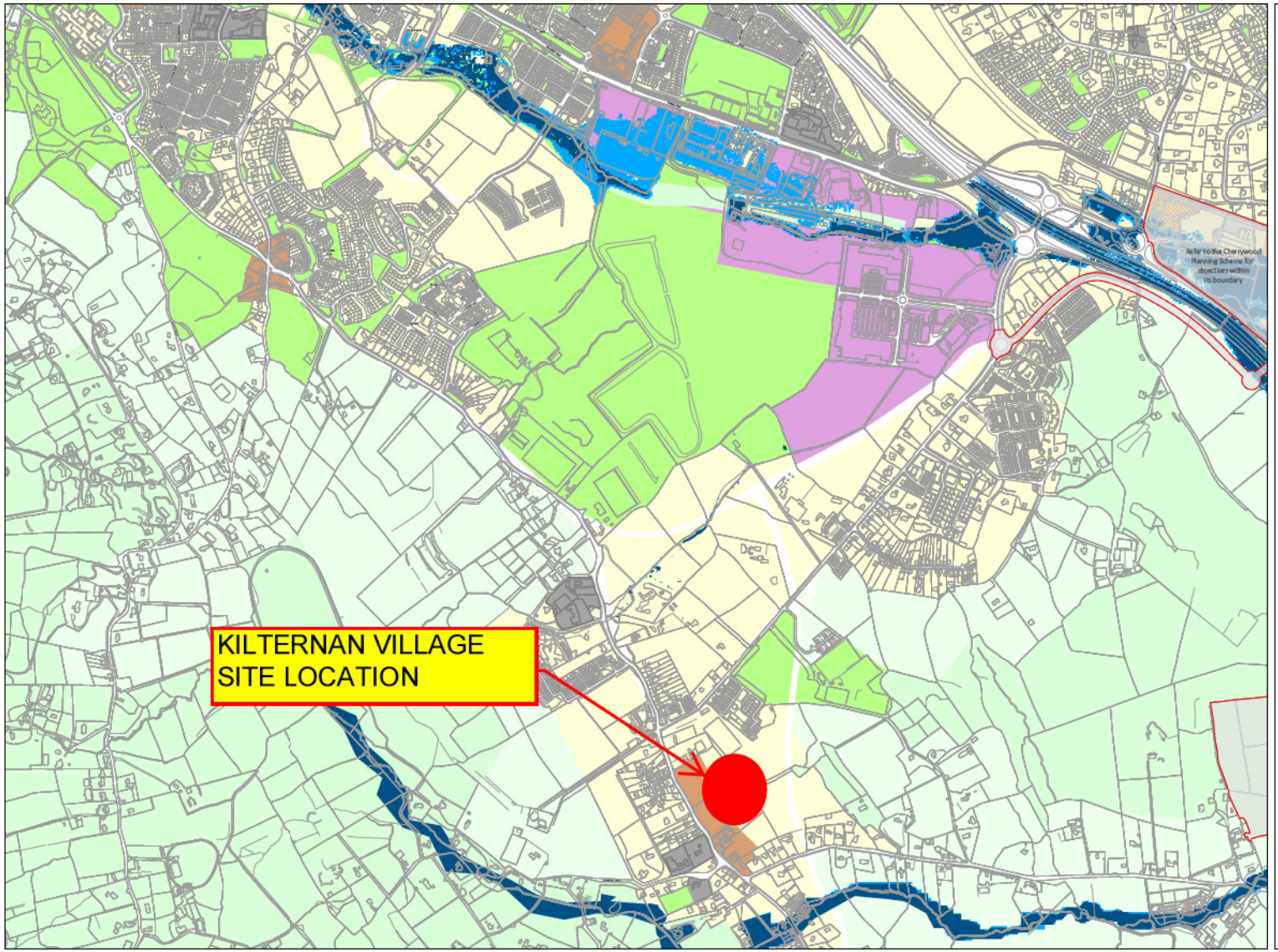
DÚN LAOGHAIRE-RATHDOWN COUNTY COUNCIL

COUNTY DEVELOPMENT PLAN 2022-2028

Adopted March 2022



INDEX



Land Use Zonings

Objective A — To provide residential development and improve residential amenity while protecting the existing residential amenities.

Objective A1 — To provide for new residential communities and Sustainable Neighbourhood Infrastructure in accordance with approved local area plans.

Objective A2 — To provide for the creation of sustainable residential neighbourhoods and preserve and protect residential amenity.

Objective B — To protect and improve rural amenity and to provide for the development of agriculture.

Objective DC — To protect, provide for and/or improve mixed use district centre facilities.

Objective E — To provide for economic development and employment.

Objective F — To preserve and provide for open space with active recreational amenities.

Objective G — To protect and improve high amenity areas.

Objective GB — To protect and enhance the open nature of lands between urban areas.

Objective LW — To improve and provide for low density warehousing/light industrial warehousing uses

Objective MIC — To consolidate and complete the development of the mixed use inner core to enhance and reinforce urban style development.

Objective MOC — To provide for a mix of uses which complements the inner core, but with less retail and residential and more emphasis on employment and services.

Objective MTC — To protect, provide for and/or improve major town centre facilities.

Objective NC — To protect, provide for and/or improve mixed use neighbourhood centre facilities.

Objective OE — To provide for office and enterprise development.

Objective TLI — To facilitate, support and enhance the development of third level education institutions.

Objective W — To provide for waterfront development and harbour related uses.

Objective SNI — To protect, improve and encourage the provision of sustainable neighbourhood infrastructure

Areas of Flood Risk Concern

Fluvial - Surface Water ..... F

Fluvial - Surface Water ..... P

Fluvial - Foul ..... P

Flood Zone A .....

Flood Zone B .....

Wave Overtopping .....

County Boundary .....

Boundary of Adopted Cherrywood Planning Scheme .....

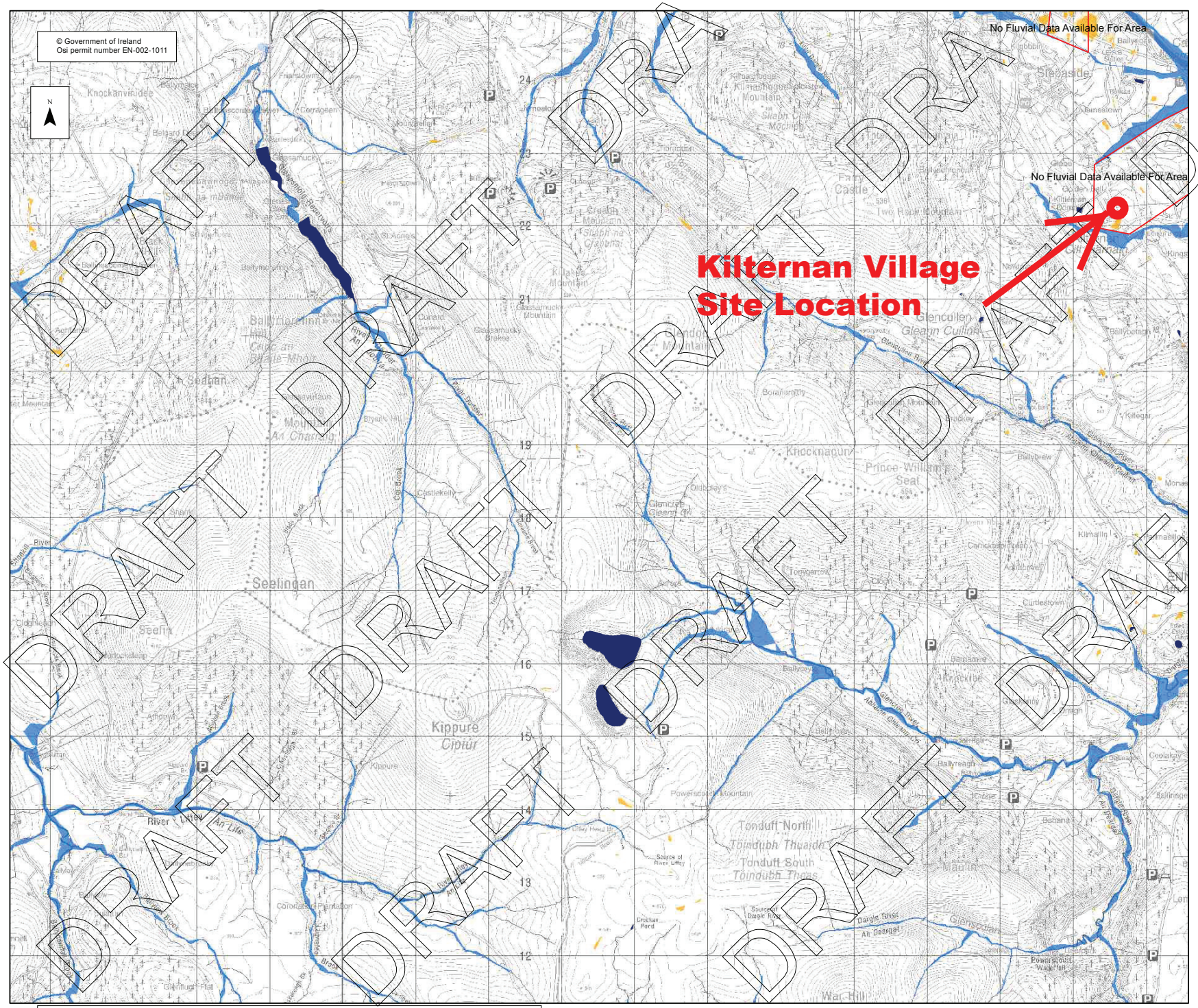
0 50 100 200 300 400 500 Metres

Director of Planning: M Hanchy
Senior Planner: L McGauran

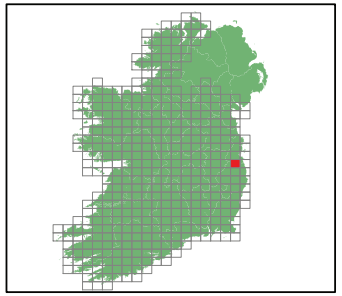
Appendix 6.5

OPW PRFA map No.2019/MAP/221A

(Not to scale at A4)



Location Plan :



Legend:

Flood Extents

- Fluvial - Indicative 1% AEP (100-yr) Event
- Fluvial - Extreme Event
- Coastal - Indicative 0.5% AEP (200-yr) Event
- Coastal - Extreme Event
- Pluvial - Indicative 1% AEP (100-yr) Event
- Pluvial - Extreme Event
- Groundwater Flood Extents
- Lakes / Turloughs

PFRA Outcomes

- Probable Area for Further Assesment
- Possible Area for Further Assesment

Important User Note:

The flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location. Information on the purpose, development and limitations of these maps is available in the relevant reports (see www.cfram.ie). Users should seek professional advice if they intend to rely on the maps in any way.

If you believe that the maps are inaccurate in some way please forward full details by contacting the OPW (refer to PFRA Information leaflets or 'Have Your Say' on www.cfram.ie).

Office of Public Works
Jonathon Swift Street
Trim
Co Meath
Ireland

Project :
PRELIMINARY FLOOD RISK ASSESMENT (PFRA)

Map :
PFRA Indicative extents and outcomes
- Draft for Consultation

Figure By : PJW Date : July2011

Checked By : MA Date : July 2011

Figure No. : 2019 / MAP / 221 / A

Revision 0

Drawing Scale : 1:50,000 Plot Scale : 1:1 @ A3

Appendix 6.6

OPW National Flood Hazard Mapping – Summary Report

OPW National Flood Hazard Mapping

Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Dublin

NGR: O 206 223

Map Scale 1:10,112

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Thier purpose and scope is explained in the Glossary.

7 Results

1. Shanganagh Carrickmines Nov 2002
County: Dublin
Start Date: 26/Nov/2002
Flood Quality Code: 3
Additional Information: Reports (1) More Mapped Information

2. Shanganagh Carrickmines Dec 1997
County: Dublin
Start Date: 18/Dec/1997
Flood Quality Code: 3
Additional Information: Reports (1) More Mapped Information

3. Shanganagh Carrickmines May 1993
County: Dublin
Start Date: 26/May/1993
Flood Quality Code: 1
Additional Information: Photos (3) Reports (4) More Mapped Information

4. Shanganagh Carrickmines Nov 1982
County: Dublin
Start Date: 06/Nov/1982
Flood Quality Code: 3
Additional Information: Reports (3) More Mapped Information

5. Kilternan Glencullen Road Nov 1982
County: Dublin
Start Date: 05/Nov/1982
Flood Quality Code: 3

Additional Information: Reports (1) More Mapped Information

6. Glenamuck Stream Glenamuck Road Recurring

Start Date:

County: Dublin

Flood Quality Code:4

Additional Information: Reports (2) More Mapped Information

7. Enniskerry Road Recurring

Start Date:

County: Dublin

Flood Quality Code:4

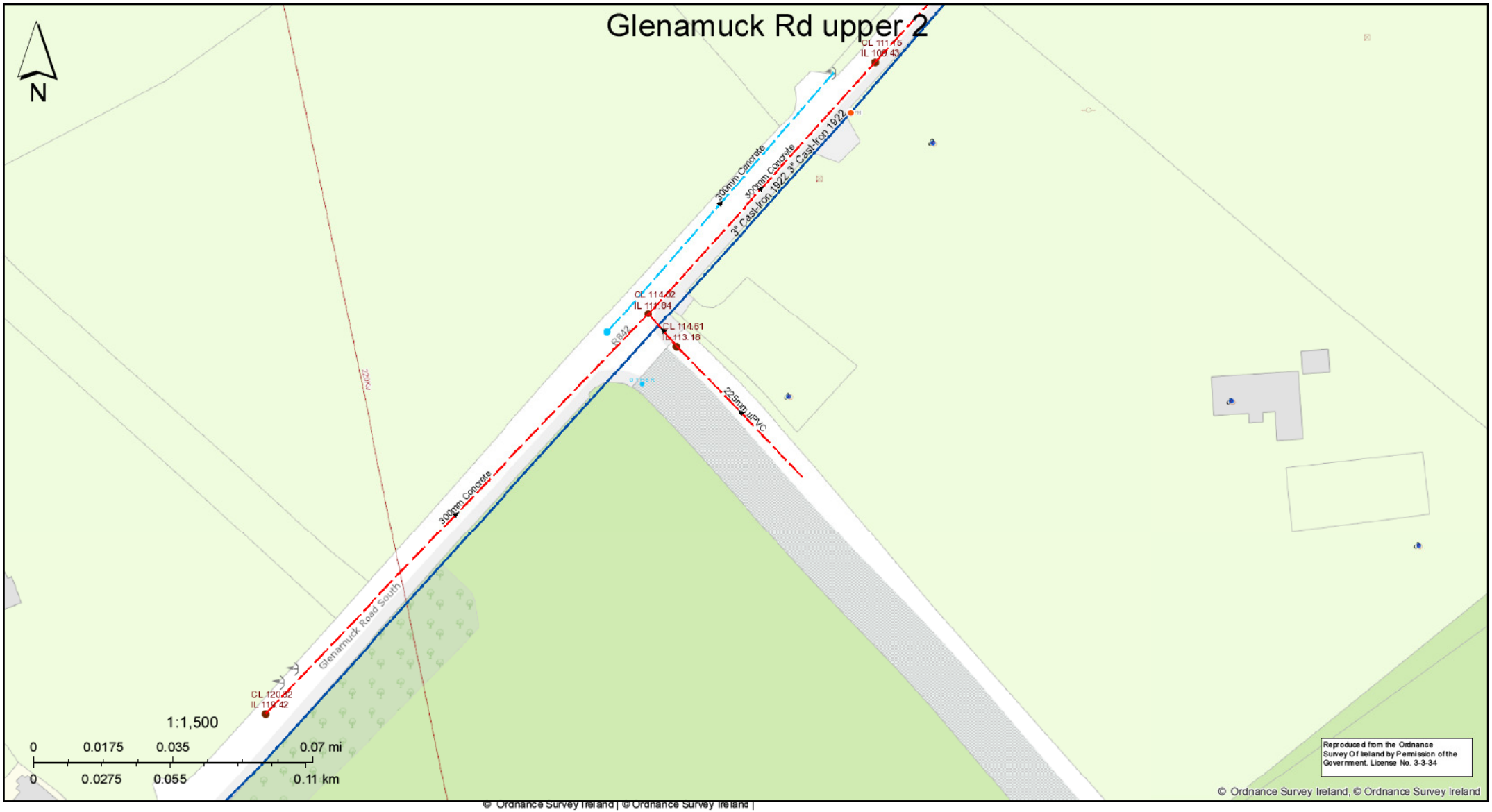
Additional Information: Reports (2) More Mapped Information

Appendix 6.7

IW/DLRCC Drainage Records drawings

(Not to scale at A4)

Glenamuck Rd upper 2



July 11, 2017

Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown

- Storm Culverts
- Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated. © Irish Water

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Glenamuck Rd upper

July 11, 2017

Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Storm Culverts

Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

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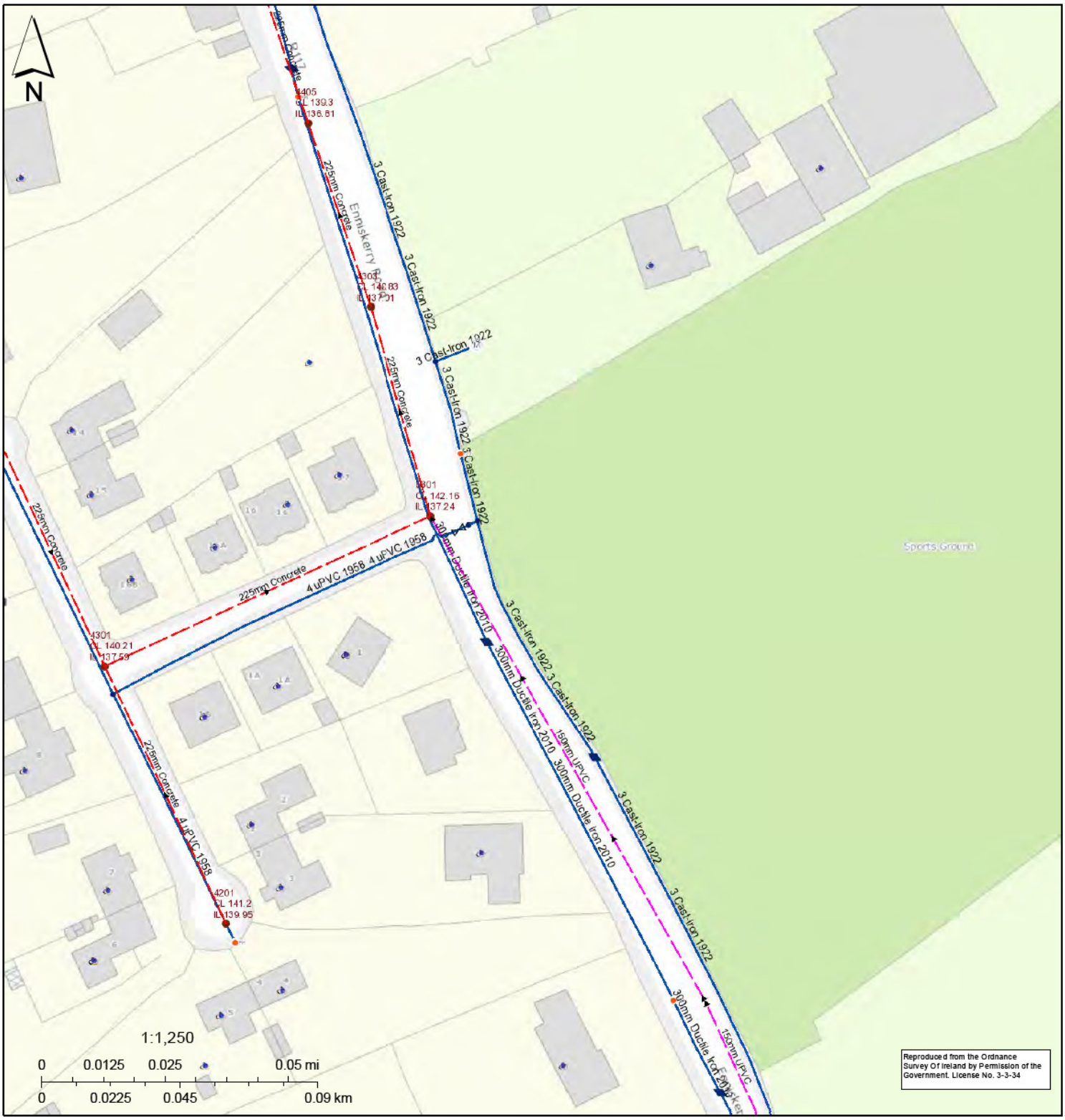
Kilternan Village



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Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown
- Storm Culverts
- Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Pressurized Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Pressurized Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

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