

The background is a vibrant red color. It features several abstract geometric shapes: a large white circle with a blue border in the upper right; a smaller white circle with a blue border in the lower left; a large teal shape with a white border in the bottom right; and various other shapes in blue, green, and white scattered throughout the corners and edges.

Appendix N

Flood Risk Assessment

National Transport Authority
**Templeogue/Rathfarnham to City
Centre Core Bus Corridor Scheme**
Stage 1 Flood Risk Assessment:

Issue | 06 January 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 268401-00

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Appendices

Appendix A

CFRAM Maps

Executive Summary

Arup was commissioned by the National Transport Authority (NTA) to prepare a Flood Risk Assessment (FRA) along the Templeogue/ Rathfarnham to City Centre Core Bus Corridor Scheme (hereinafter referred to as ‘the Proposed Scheme’) of the BusConnects Core Bus Corridor network.

This report details the Flood Risk Assessment carried out as part of the planning application. It has been undertaken in accordance with the Guidelines for Planning Authorities on ‘The Planning System and Flood Risk Management’ published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG).

The Proposed Scheme consists of four main sections, as outlined below:

- Section 1: Tallaght Road to Rathfarnham Road
- Section 2: Nutgrove avenue to Terenure Road North
- Section 3: Terenure Road North to Charleville Road
- Section 4: Charleville Road to Dame Street.

A Plan-Making Justification test formed part of the Strategic Flood Risk Assessment. The SDZ Planning Scheme as approved notes that all proposed developments must include a site-specific flood risk assessment (SSFA). It is further confirmed that the SSFRA is not required to carry out a justification test, given that this exercise has already been carried out as part of the adopted SDZ Planning Scheme.

Templeogue to Terenure section (Section 1)

Section 1 commences on the R137 Tallaght Road, east of the M50 interchange. From here, the CBC is routed via the R137 along Tallaght Road and Templeogue Road, through Templeogue Village, to Terenure Cross, where it joins the Rathfarnham Core Bus Corridor. Priority for buses is provided along the entire route, consisting primarily of dedicated bus lanes in both directions, with alternative measures proposed at particularly constrained locations.

The proposed route is classified as Flood Zone C as per OPW Guidelines. A Justification Test for the development is therefore not required. It is considered that the proposal is in keeping with the principles of the Flood Risk Guidelines which seeks to located development in appropriate locations.

Rathfarnham to City Centre section (Section 2, 3 & 4)

Sections 2, 3 & 4 commence on the R821 Grange Road at the junction with Nutgrove Avenue, and is routed along the R821 Grange Road, the R115 Rathfarnham Road, the R114 Rathfarnham Road, Terenure Road East, Rathgar Road, Rathmines Road Lower, Richmond Street South, Camden Street Upper and Lower and Wexford Street as far as the junction with the R110 at Kevin Street Lower and Cuffe Street where priority bus lanes end.

From Cuffe Street to Dame Street along Redmond's Hill, Aungier Street, and South Great George's Street the route will involve a traffic lane and a cycle track in both directions where it will join the prevailing traffic management regime in the city centre.

The proposed route is located close to and crosses the River Dodder. A section on Rathfarnham Road where the route crosses the River Dodder falls within the 1 in 1000-year flood extent and therefore is located within Flood Zone B. A section at Nutgrove Avenue falls within in 1 in 100-year flood extent therefore is Flood Zone A. The rest of the route does not fall within any flood extents and is therefore considered to lie in Flood Zone C.

The risk of pluvial flooding along the proposed route is high, however this risk will be reduced as a result of the drainage proposals. It is beyond the scope of the project to mitigate flooding for the existing road network in its entirety however "hotspots" of pluvial flooding have been identified and will be remediated through the design of the Bus Connects drainage infrastructure where feasible.

As areas of the scheme are identified as being within Flood Zone A and Flood Zone B a Justification Test is required. The Plan Making Justification Test and Development Management Justification have been assessed and passed, therefore further investigation of the flood risk in the form of a Stage 2 FRA is not required.

1 Introduction

1.1 Project Background

Arup has been appointed by the National Transport Authority (NTA) to undertake a Stage 1 Flood Risk Assessment (FRA) as part of the planning application process for the Core Bus Corridor (CBC) BusConnects Dublin Programme. This FRA will assess the flood risk for the Templeogue/ Rathfarnham to City Centre Core Bus Corridor Scheme.

The Stage 1 FRA is a high-level study of the scheme to identify flood risks to the project and any potential flooding issues arising due to the project. This report will inform the planning process and identify whether a further Stage 2 FRA is required.

The BusConnects Dublin Programme is a plan to transform Dublin's bus system, with the CBC project providing 230km of dedicated bus lanes and 200km of cycle tracks on sixteen of the busiest bus corridors in and out of the city centre. This project is fundamental to addressing the congestion issues in the Dublin region with the population due to grow by 25% by 2040, bringing it to almost 1.55million.

In June 2018 the National Transport Authority (NTA) published the Core Bus Corridors Project Report. The report was a discussion document outlining proposals for the delivery of a CBC network across Dublin. The aim of the Proposed Project is to transform the bus system to provide better services to more people.

The 'Templeogue/Rathfarnham to City Centre CBC' is identified as forming part of the radial Core Bus Network. The BusConnects radial CBC network is shown in Figure 1.

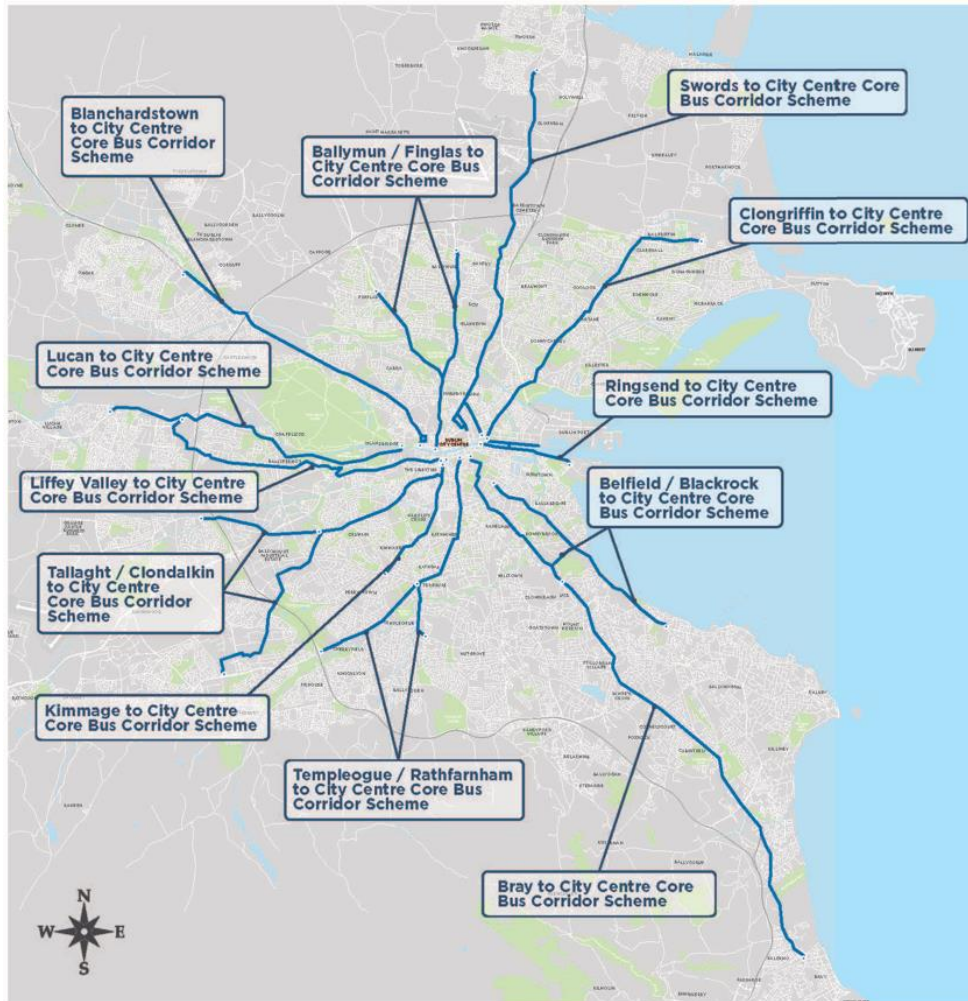


Figure 1: BusConnects CBC Network

The FRA has been undertaken in accordance with the ‘The Planning System and Flood Risk Management Guidelines for Planning Authorities’ published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DoEHLG), herein referred to as ‘The Guidelines’.

1.2 Scope

The Flood Risk Assessment (FRA) will include the following:

- Confirmation of the sources of flooding which may affect the site;
- A qualitative assessment of the risk of flooding to the site and to adjacent sites as a result of construction of the proposed development,
- Review of the availability and adequacy of existing information,
- Identification of possible measures which could mitigate the flood risk to acceptable levels, and;
- Areas for further investigation (Stage 2 FRA) if required.

1.3 Summary of Data Used

Data regarding flood risk relevant to the proposed development and surrounding area has been obtained from the following sources;

- Review of the South Dublin County Council Development Plan (<https://www.sdcc.ie/en/services/planning/development-plan/plan-2016-2022/>)
- Review of Dublin City Development Plan (<http://www.dublincity.ie/main-menu-services-planning-city-development-plan/dublin-city-development-plan-2016-2022>)
- Dodder Catchment Flood Risk Management Plan (OPW);
- Preliminary Flood Risk Assessment (PFRA) Mapping produced by the OPW (www.floodinfo.ie);
- Flood history of the site from the OPW National Flood Hazard Mapping website (www.floodinfo.ie);
- Guidelines for Planning Authorities on ‘The Planning System and Flood Risk Management’ published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG);
- Topographical information received for site surveys.

All Ordnance Datum (OD) levels referred to in this report are to Malin Head Ordnance Datum unless otherwise stated.

1.4 Proposed Scheme Description

The Proposed Scheme consists of two main sections which have been further subdivided into 4 subsections as follows.

- Section 1: Tallaght Road to Rathfarnham Road
- Section 2: Nutgrove avenue to Terenure Road North
- Section 3: Terenure Road North to Charleville Road
- Section 4: Charleville Road to Dame Street

The Templeogue to Terenure section (Section 1) commences on the Tallaght Road, east of the M50 interchange. From here, the CBC is routed via the R137 along Tallaght Road and Templeogue Road, through Templeogue Village, to Terenure Cross, where it joins the Rathfarnham CBC. Priority for buses is provided along the entire route, consisting primarily of dedicated bus lanes in each direction, with alternative measures proposed at particularly constrained locations.

There are no new structures proposed along this section of the Scheme and no watercourse crossings. Kerb protection, some widening of the road and some tree removal will be required.

The Rathfarnham to City Centre section commences on the R821 Grange Road at the junction with Nutgrove Avenue. The CBC is routed along the Grange Road, Rathfarnham Road, Terenure Road East, Rathgar Road, Rathmines Road Lower, Richmond Street South, Camden Street Upper and Lower, and Wexford Street to its junction with Kevin Street Lower and Cuffe Street where priority bus lanes end. From Cuffe Street to Dame Street along Redmond's Hill, Aungier Street and South Great George's Street, the route will involve a traffic lane and a cycle track in both directions where it will join the existing traffic management regime in the city centre.

Land take from private properties will be required to widen the road and provide new bus lanes and cycle tracks.

There are no new structures proposed along these sections of the Scheme. There is one watercourse crossing at Rathfarnham over the River Dodder. There are no significant ground changes proposed that would have impact to the flood regime.

The Proposed Scheme consists of four sections, namely:

- Section 1: Tallaght Road to Rathfarnham Road
- Section 2: Nutgrove avenue to Terenure Road North
- Section 3: Terenure Road North to Charleville Road
- Section 4: Charleville Road to Dame Street

The Proposed Scheme is outlined in the following sections and presented in Figure 2.

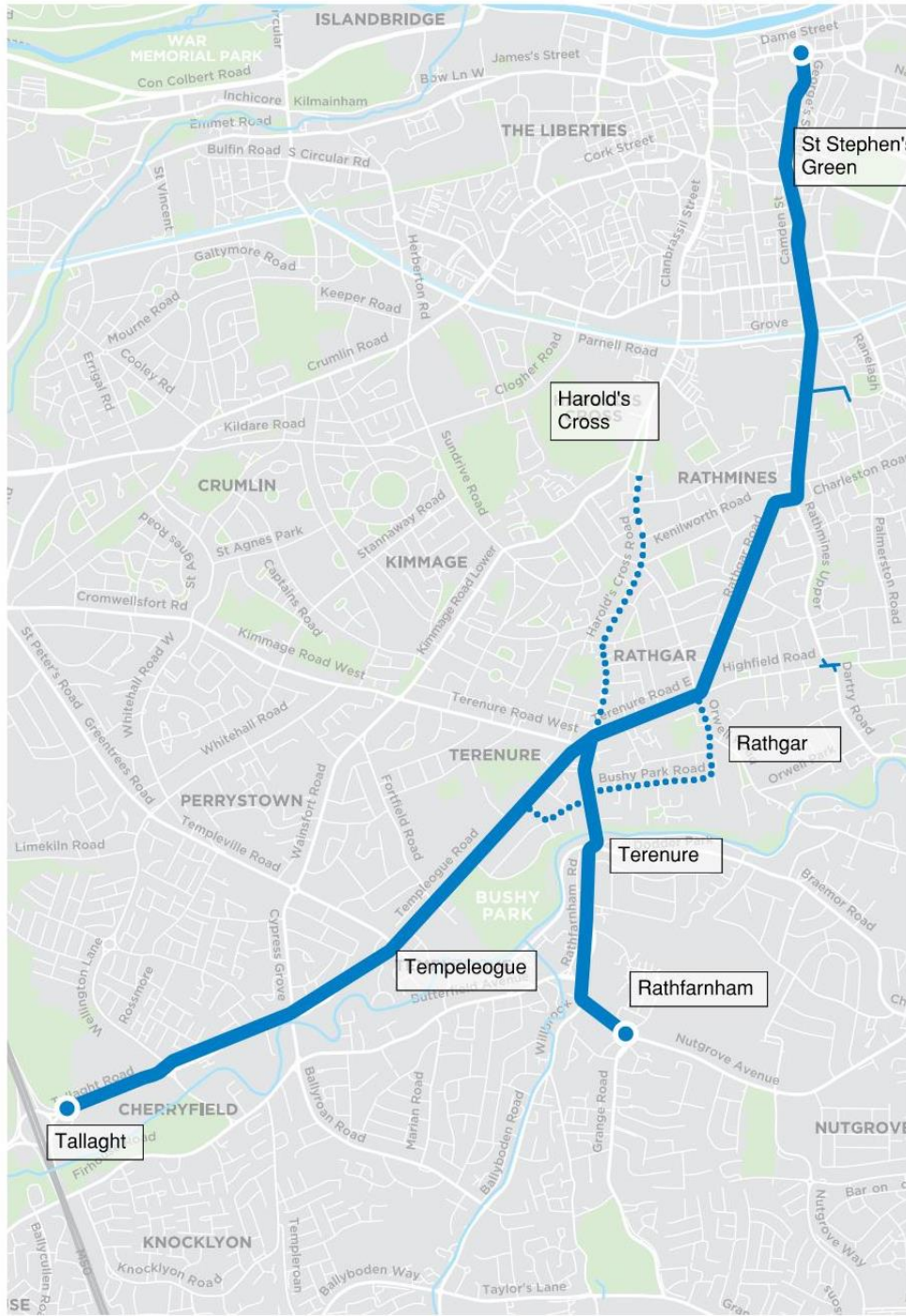


Figure 2: Proposed Scheme Layout

2 The Planning Context

The following policy documents are relevant to the assessment of the proposed development:

- The National Planning Guidelines published by the OPW and the Department of the Environment, Heritage and Local Government in November 2009 entitled ‘The Planning System and Flood Risk Management: Guidelines for Planning Authorities’ are particularly pertinent and are discussed in section 2.1.
- In terms of planning policy context, the provisions contained in the Dublin City Development 2016 - 2022 are relevant.
- South Dublin County Council Development Plan 2016-2022

2.1 The Planning System and Flood Risk Management Guidelines for Planning Authorities

In November 2009, the Department of Environment, Heritage and Local Government and the Office of Public works jointly published a Guidance Document for Planning Authorities entitled “The Planning System and Flood Risk Management”.

The guidelines are issued under Section 28 of the Planning and Development Act 2000 and Planning Authorities. Therefore, An Bord Pleanála are required to implement these Guidelines in carrying out their functions under the Planning Acts.

The aim of the guidelines is to ensure that flood risk is neither created nor increased by inappropriate development.

The guidelines require the planning system to avoid development in areas at risk of flooding, unless they can be justified on wider sustainability grounds, where the risk can be reduced or managed to an acceptable level.

They require the adoption of a Sequential Approach (to Flood Risk Management) of Avoidance, Reduction, Justification and Mitigation and they require the incorporation of Flood Risk Assessment into the process of making decisions on planning applications and planning appeals.

Fundamental to The Guidelines, is the introduction of flood risk zoning and the classifications of different types of development having regard to their vulnerability.

The management of flood risk is now a key element of any development proposal in an area of potential flood risk and should therefore be addressed as early as possible in the site master planning stage.

2.1.1 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range.

There are three types of flood zones defined in the Guidelines as follows:

Table 1: Definition of Flood Zone Categories

Zone Category	Description
Flood Zone A	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).
Flood Zone B	Probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 and 0.5% or 1 in 200 for coastal flooding); and
Flood Zone C	Probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

2.1.2 Definition of Vulnerability Classes

The following Table 2 summarises the Vulnerability Classes defined in the Guidelines and provides a sample of the most common type of development applicable to each class. The Project Scheme is considered Highly Vulnerable development.

Table 2: Definition of Vulnerability Classes

Vulnerability Class	Land uses and types of development which include;
Highly Vulnerable Development	Includes Garda, ambulance and fire stations, hospitals, schools, residential dwellings, residential institutions, essential infrastructure, such as primary transport and utilities distribution and SEVESO and IPPC sites, etc.
Less Vulnerable Development	Includes retail, leisure, warehousing, commercial, industrial and non-residential institutions, etc.
Water Compatible Development	Includes Flood Control Infrastructure, docks, marinas, wharves, navigation facilities, water-based recreation facilities, amenity open spaces and outdoor sport and recreation facilities

2.1.3 Sequential Approach and Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 3. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach.

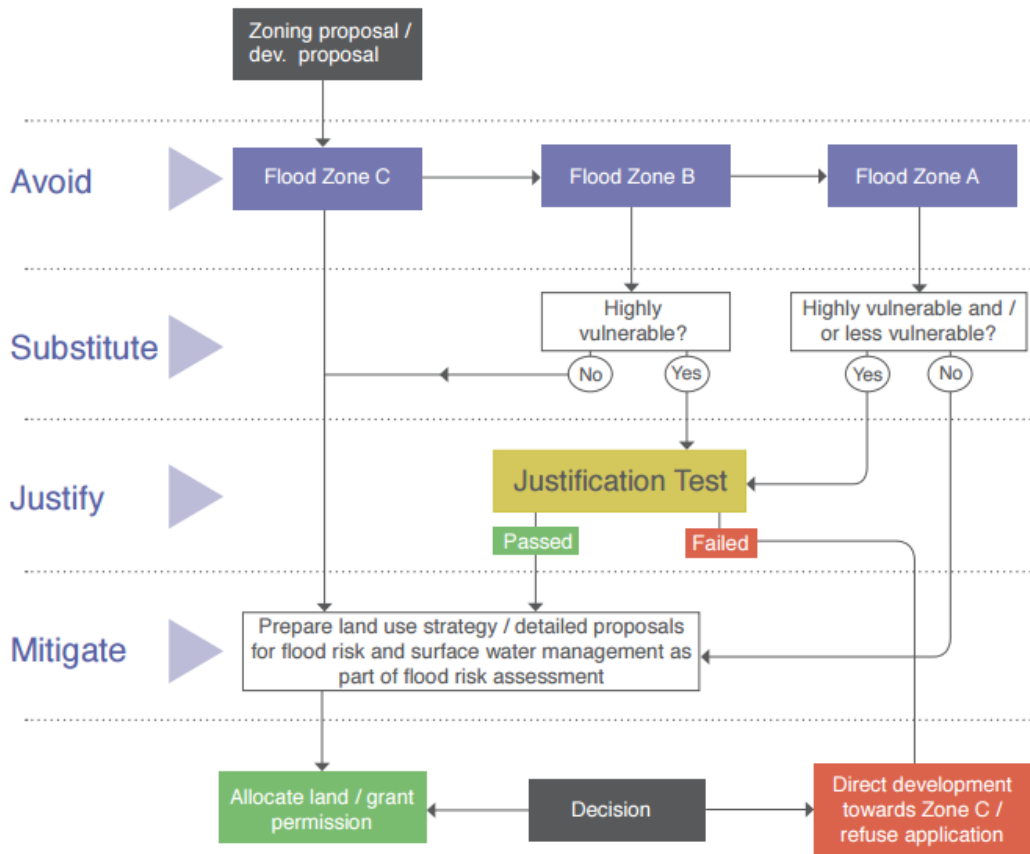


Figure 3: Sequential approach (reproduced from the Guidelines)

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

- The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
- The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

Table 3 illustrates the different types of Vulnerability Class appropriate to each zone and indicates where the Justification Test is required.

Table 3: Vulnerability Class per Zone

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable	Justification Test	Justification Test	Appropriate
Less Vulnerable	Justification Test	Appropriate	Appropriate
Water Compatible	Appropriate	Appropriate	Appropriate

2.2 South Dublin County Council Development Plan 2016-2022

Section 7.3.0 of the South Dublin County Development Plan sets out the Flood Risk Management policies and objectives for the area. It provides guidelines for development within areas at potential risk of flooding, and specifically looks at flood risk and the potential for development across the County. The policy sets out to achieve the following objectives;

- **IE3 Objective 1:** “To support and co-operate with the Office of Public Works in delivering the Catchment-Based Flood Risk Assessment and Management Programme and in particular the Eastern District CFRAMS and associated Flood Risk Management Plan (FRMP), the River Dodder CFRAMS and associated Flood Risk Management Plan (FRMP). The recommendations and outputs arising from the CFRAM study for the Eastern District shall be considered in preparing plans and assessing development proposals.”
- **IE3 Objective 2:** “To support the implementation of the EU Flood Risk Directive (2007/60/EC) on the assessment and management of flood risks and the Flood Risk Regulations (SI No 122 of 2010).”
- **IE3 Objective 3:** “To manage flood risk in the County in accordance with the requirements of The Planning System and Flood Risk Management Guidelines for Planning Authorities, DECLG and OPW (2009) and Circular PL02/2014 (August 2014), in particular when preparing plans and programmes and assessing development proposals. For lands identified as being at risk of flooding in (but not limited to) the Strategic Flood Risk Assessment, a site-specific Flood Risk Assessment to an appropriate level of detail, addressing all potential sources of flood risk, is required, demonstrating compliance with the aforementioned Guidelines or any updated version of these Guidelines, paying particular attention to residual flood risks and any proposed site-specific flood management measures.”
- **IE3 Objective 4:** “To support and facilitate the delivery of flood alleviation schemes in South Dublin County, including the following schemes:
 - Poddle Flood Alleviation Scheme.
 - Ballycullen Flood Alleviation Scheme.
 - Whitechurch River Flood Alleviation Scheme (at Rathfarnham); part of the Dodder CFRAMS.”
- **IE3 SLO 1:** “To require the preparation of a site and catchment specific Flood Risk Assessment and Mitigation Strategy, prepared by a qualified person(s), to be submitted with any proposal for development on the ‘EE’ zoned lands and demonstration that the development satisfies all the criteria of the Development Management Justification Test as set out in Table 2.3 of the document titled ‘Strategic Flood Risk Assessment for SDCC Development Plan - Detailed Report on Flood Risk in the Baldonnell Area’.”

2.3 Proposed Draft Tallaght Town Centre Local Area Plan 2020-2026

A Strategic Flood Risk Assessment (SFRA) was carried out for the Tallaght Town Centre LAP. It has identified the areas of the Plan subject to flood risk. For sites within identified flood risk zones, a site-specific flood risk assessment will be required. The SFRA also examines key sites where flood risk is an issue and provides recommendations for the development of these sites. Applications for development on these sites must adhere to these recommendations.

- **Objective UF7:** To protect, enhance and develop an interconnected green and blue infrastructure network of parks, open spaces, hedgerows, grasslands, rivers and streams for amenity and recreation, biodiversity protection, flood management and adaptation to climate change.
- Flood defences in the wider area have been integrated into the watercourses, for example, the network of pools, ponds and lakes that were constructed along the Poddle.

2.4 Dublin City Development Plan 2016-2022

The Dublin City Development Plan 2016-2022 was adopted by Dublin City Council on 23rd September 2016 and came into effect on 21st October 2016. The Plan sets out policies and objectives to create a sustainable and vibrant city at the heart of the Greater Dublin Region and guides how and where development will take place in the city over the next 6 years.

Section 9.5.3 of the plan deals with Flood Management and outlines the key policies and objectives of Dublin City Council in relation to flood risk. The plan presents a number of Dublin City Council 'Strategic Infrastructure' (SI) policies that state that it is their policy to:

- **SI8:** To mitigate the effects of floods and droughts, subject to Environmental Assessment.
- **SI9:** To assist the Office of Public Works in developing catchment-based Flood Risk Management Plans for rivers, coastlines and estuaries in the Dublin city area and have regard to their provisions/recommendations.
- **SI10:** To have regard to the Guidelines for Planning Authorities on the Planning System and Flood Risk Management and Technical Appendices, November 2009, published by the Department of the Environment, Community, and Local Government as may be revised/updated when assessing planning applications and in the preparation of plans both statutory and non-statutory.
- **SI11:** To put in place adequate measures to protect the integrity of the existing Flood Defence Infrastructure in Dublin City Council's ownership and identified in the Strategic Flood Risk Assessment and to ensure that the new developments do not have the effect of reducing the effectiveness or integrity of any existing or new flood defence infrastructure and that flood defence infrastructure has regard also to nature conservation and amenity issues.

- **SI12:** To implement and comply fully with the recommendations of the Strategic Flood Risk Assessment prepared as part of the Dublin City Development Plan.
- **SI13:** Development of basements or any above ground buildings for residential use below the estimated flood levels for Zone A or Zone B will not be permitted.
- **SI14:** To protect the Dublin City coastline from flooding as far as reasonably practicable, by implementing the recommendations of the Dublin Coastal Flood Protection Project and the Dublin Safer Project.
- **SI15:** To minimise the risk of pluvial (intense rainfall) flooding in the city as far as is reasonably practicable and not to allow any development which would increase this risk.
- **SI16:** To minimise the flood risk in Dublin City from all other sources of flooding, including fluvial, reservoirs and dams and the piped water system.
- **SI17:** To require an environmental assessment of all proposed flood protection or flood alleviation works

Section 9.5.3 of the development plan also outlines the following objectives in relation to Flood Risk Management. The plan presents a number of Dublin City Council ‘Strategic Infrastructure Objectives’ (SIO) objectives that state that it is there objectives for:

- **SIO8:** All development proposals shall carry out, to an appropriate level of detail, a Site-Specific Flood Risk Assessment (SSFRA) that shall demonstrate compliance with:
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities, Department of the Environment, Community and Local Government, November 2009, as may be revised/updated and the Strategic Flood Risk Assessment (SFRA) as prepared by this Development Plan.
- The site-specific flood risk assessment (SSFRA) shall pay particular emphasis to residual flood risks, site-specific mitigation measures, flood-resilient design and construction, and any necessary management measures (the SFRA and Appendix B4 of the above-mentioned national guidelines refer). Attention shall be given in the site-specific flood risk assessment to building design and creating a successful interface with the public realm through good design that addresses flood concerns but also maintains appealing functional streetscapes. All potential sources of flood risk must be addressed in the SSFRA.

- **SIO9:** Proposals which may be classed as ‘minor development’, for example small-scale infill, small extensions to houses or the rebuilding of houses or paving of front gardens to existing houses, most changes of use and small-scale extensions to existing commercial and industrial enterprises in Flood Zone A or B, should be assessed in accordance with the Guidelines for Planning Authorities on the Planning System and Flood Risk Management & Technical Appendices, November 2009 as may be revised/updated, with specific reference to Section 5.28 and in relation to the specific requirements of the Strategic Flood Risk Assessment. The policy shall be not to increase the risk of flooding and to ensure risk to the development is managed.
- **SIO10:** That recommendations and flood maps arising from the Fingal-East Meath CFRAM Study, the Dodder CFRAM Study and the Eastern CFRAM Study are taken into account in relation to the preparation of statutory plans and development proposals. This will include undertaking a review of the Strategic Flood Risk Assessment for Dublin city following the publication of the Final Eastern CFRAM Study, currently being produced by the OPW.
- **SIO11:** To work with neighbouring Local Authorities when developing cross-boundary flood management work programmes and when considering cross-boundary development.
- **SIO12:** To ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the Dublin City Council climate change adaption policy and in the OPW Climate Change Sectorial Adaptation Plan Flood Risk Management applicable at the time.

2.5 Dublin Strategic Flood Risk Assessment

A Regional Flood Risk Assessment (RFRA) was carried out for the Regional Planning Guidelines (RPG) for the Greater Dublin Area 2010-2022. Chapter 9 of the RFRA sets out the key policy with regards to avoiding and managing flood risk within the Greater Dublin Area (GDA). The Guidelines set out a number of strategic recommendations including:

- **FR1:** New development should be avoided in areas at risk of significant flooding. Alongside this, the Regional Flood Risk Appraisal recognises the need for continuing investment and development within the urban centres of flood vulnerable designated growth towns and the City and for this to take place in tandem with the completion of CFRAM Studies and investment in comprehensive flood protection and management.
- **FR2:** Development and Local Area Plans should include a Strategic Flood Risk Assessment and all future zoning of land for development in areas at risk of flooding should follow the sequential approach set out in the Departmental Guidance on Flood Risk Management. All Flood Risk Assessments and CFRAM studies should take place in coordination and consultation with adjoining local authorities and regions and in coordination with the relevant River Basin Management Plans.

- **FR3:** Local authorities should take the opportunities presented to optimise improvements in biodiversity and amenity when including policies and actions in development plans/local area plans (such as flood plain protection and SuDS) for existing and future developments.
- **FR4:** Plans and projects associated with flood risk management that have the potential to negatively impact on Natura 2000 sites will be subject to a Habitats Directive Assessment (HDA) according to Article 6 of the habitats directive and in accordance with best practice and guidance.

3 Flood Mechanisms and Historic Flooding at the Site

3.1 Potential Flood Mechanisms at the Site

The potential sources of flooding to the subject site can be categorised as follows:

- **Fluvial (river) Flooding:** flooding of watercourses occurs when the capacity a river is exceeded during periods of intense rainfall.
- **Tidal Flooding:** is the temporary inundation of low-lying areas, during exceptionally high tide events.
- **Pluvial Flooding/Urban Drainage:** pluvial flooding occurs when the capacity of the local urban drainage network is exceeded during periods of intense rainfall. At these times, water can collect at low points in the topography and cause flooding.
- **Groundwater Flooding:** can occur during lengthy periods of heavy rainfall, typically during late winter/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding.

3.2 Historic Flood Data

Reports and maps from the OPW's Flood Hazard Mapping website (www.floodinfo.ie) have been examined as part of this flood risk assessment.

3.2.1 Historic Flood Data: Templeogue to Terenure

Figure 4 presents the flood record for the site and its immediate vicinity. It can be seen there are no historical flood events recorded along the proposed route. Table 4 shows a summary of the flood events that have occurred along the proposed route.

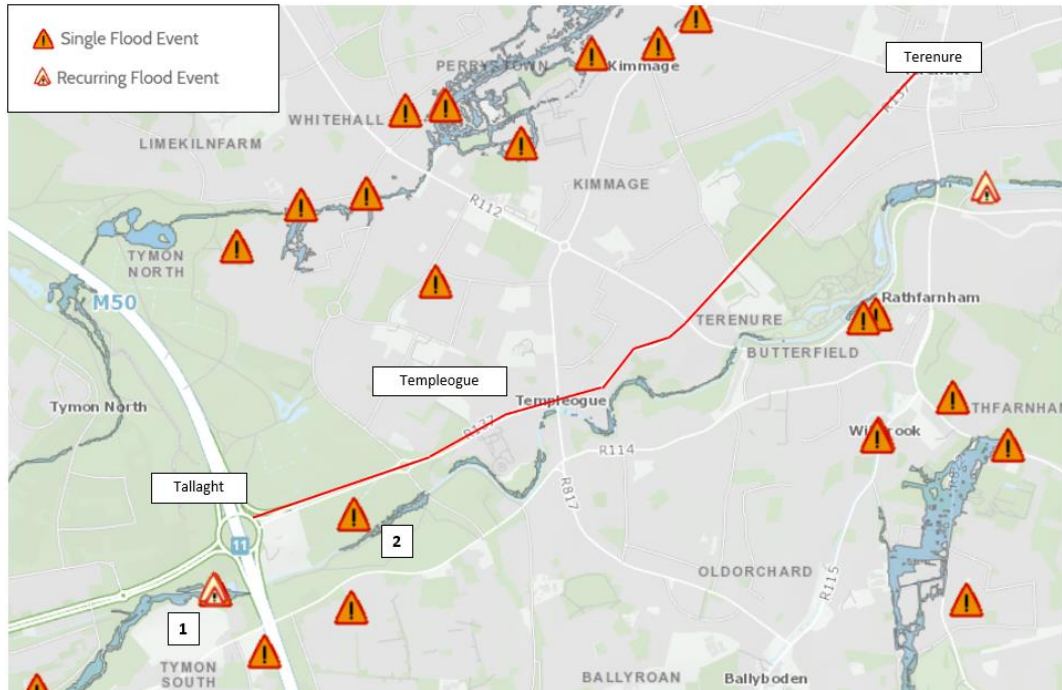


Figure 4: Tallaght to Terenure Historic Flood Event Locations

Table 4: Historic Flood Events; Section 1

Flood Point No.	Date	Catchment	Flood Source	Details
1	November 2000, recurring	River Liffey	-	Mount Carmel Park Firhouse
2	February 1994	River Liffey	River	Spawell House, Garden flooding

Flood point 1 is approximately 1km south west to the start of the proposed route, however this flooding occurs in parkland there the flood risk to the proposed route is considered low risk. Flood point 2 is considered low risk as the flooding event occurred in 1994 due to the old city water course bursting its banks.

3.2.2 Historic Flood Data: Rathfarnham to City Centre

Rathfarnham to Rathmines

Figure 5 presents the flood record for the site and its immediate vicinity. It can be seen that there are a number of historical flood events recorded along the proposed route and these are summarised in Table 5.

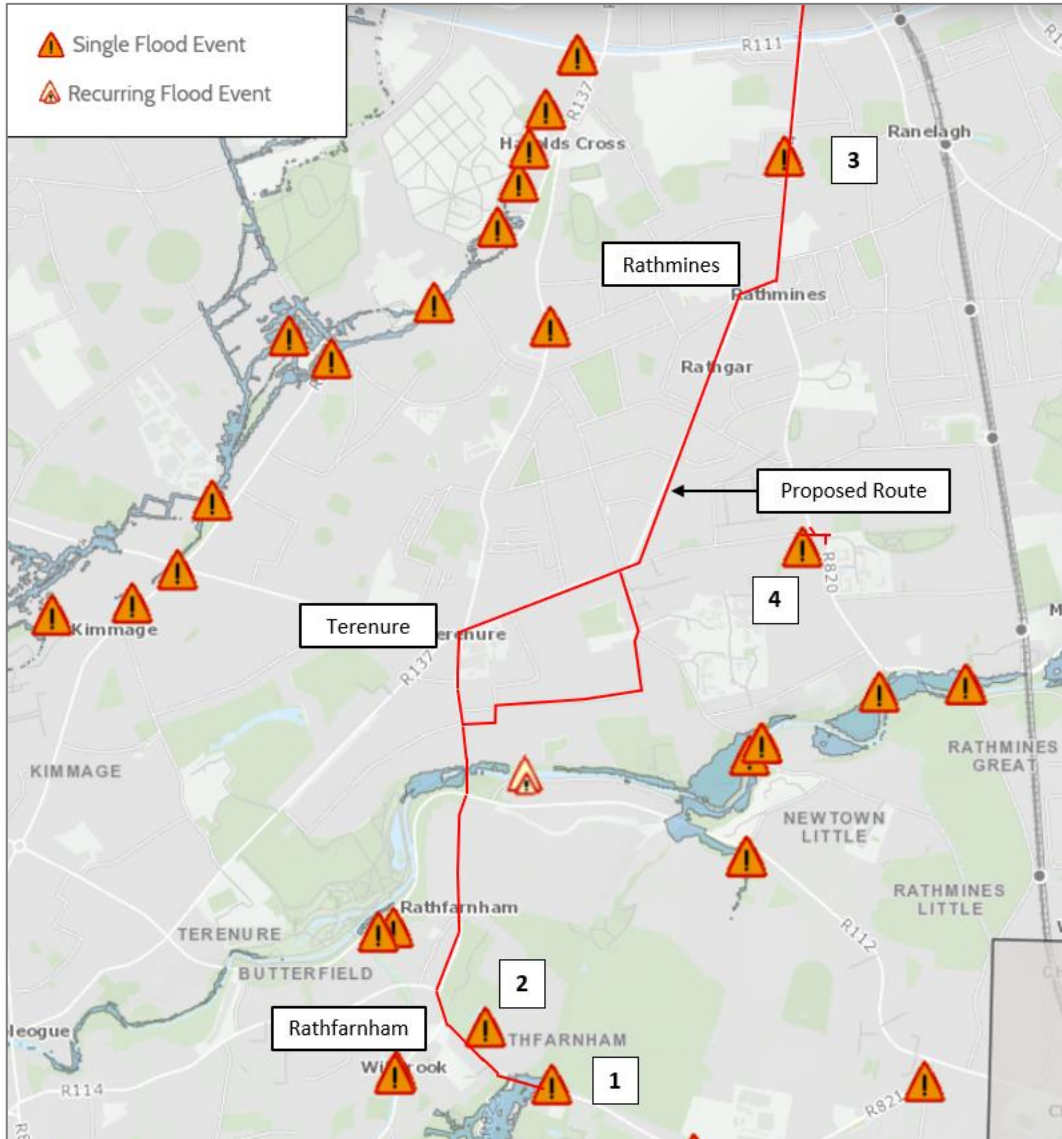


Figure 5: Rathfarnham to Rathmines Historic Flood Event Locations

Table 5: Historic Flood Events, Section 2

Flood Point No.	Date	Catchment	Flood Source	Details
1	October 2011	-	-	Flooding at Nutgrove Avenue
2	December 1958	River Liffey	River	Willbrook Rathfarnham A number of defence assets were put in place since one or more of the flood events.
3 & 4	June 1963	River Liffey	-	Multiple locations effected. A number of defence assets were put in place since one or more of the flood events. Rathmines Lower

There have been a number of flood defence assets put in place since one or more of the noted flood events took place.

Rathmines to City Centre CBC

Figure 6 presents the flood record for the site and its immediate vicinity. It can be seen that there is a historical flood event recorded along the proposed route, details of which are summarised in Table 6.



Figure 6: Rathmines to City Centre Historic Flood Event Locations

Table 6: Historic Flood Events, Section 3 & 4

Flood Point No.	Date	Catchment	Flood Source	Details
5	July 2013	-	Pluvial runoff	Flooding on Wexford Street, Dublin 2

Terenure to Harold's Cross

Figure 7 presents the flood record for the site and its immediate vicinity. It can be seen that there are a number of historical flood events recorded along the proposed route and these are summarised in Table 7.

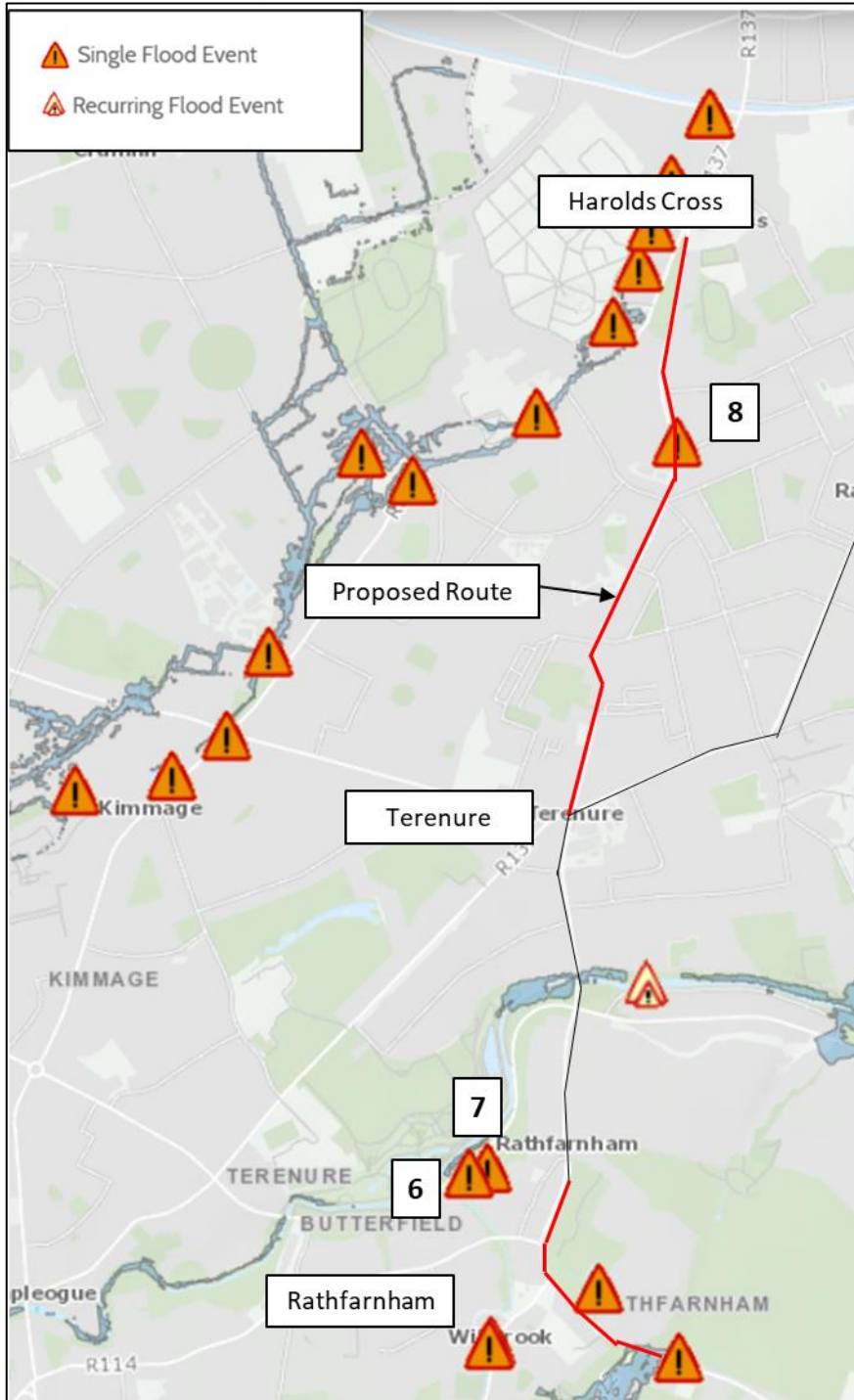


Figure 7: Rathfarnham to Harold's Cross Historic Flood Event Locations

Table 7: Historic Flood Events, Section 4

Flood Point No.	Date	Catchment	Flood Source	Details
6 & 7	November 2000	River Liffey	River	Dodder Woodview Cottages, Rathfarnham
8	June 1963	River Liffey	River	Multiple locations effected. Number of defence assets were put in place since one or more of the flood events. Harold's Cross

As identified in the proceeding sections, there have been seven recorded historical floods along the proposed routes.

In addition, during flooding caused by Hurricane Charlie on 25th August 1986, both Rathfarnham (Pearse) Bridge and Ballsbridge on the River Dodder were closed during the peak of the flood and required certification for structural stability after the event, before traffic was allowed to cross. While not noted in the historic flood record, there have been a number of flood defence assets put in place since one or more of the noted flood events.

4 Existing Flood Risk: Templeogue to Terenure

4.1 Fluvial Flooding

4.1.1 Significant Water Course in the vicinity of the site

An extract from the Eastern CFRAMS fluvial flood extent map is displayed in Figure 8 and Figure 9.

The predicted fluvial flood extents for three separate return period events are presented on the map for the 1 in 10, 100 and 1000-year fluvial flood extents).

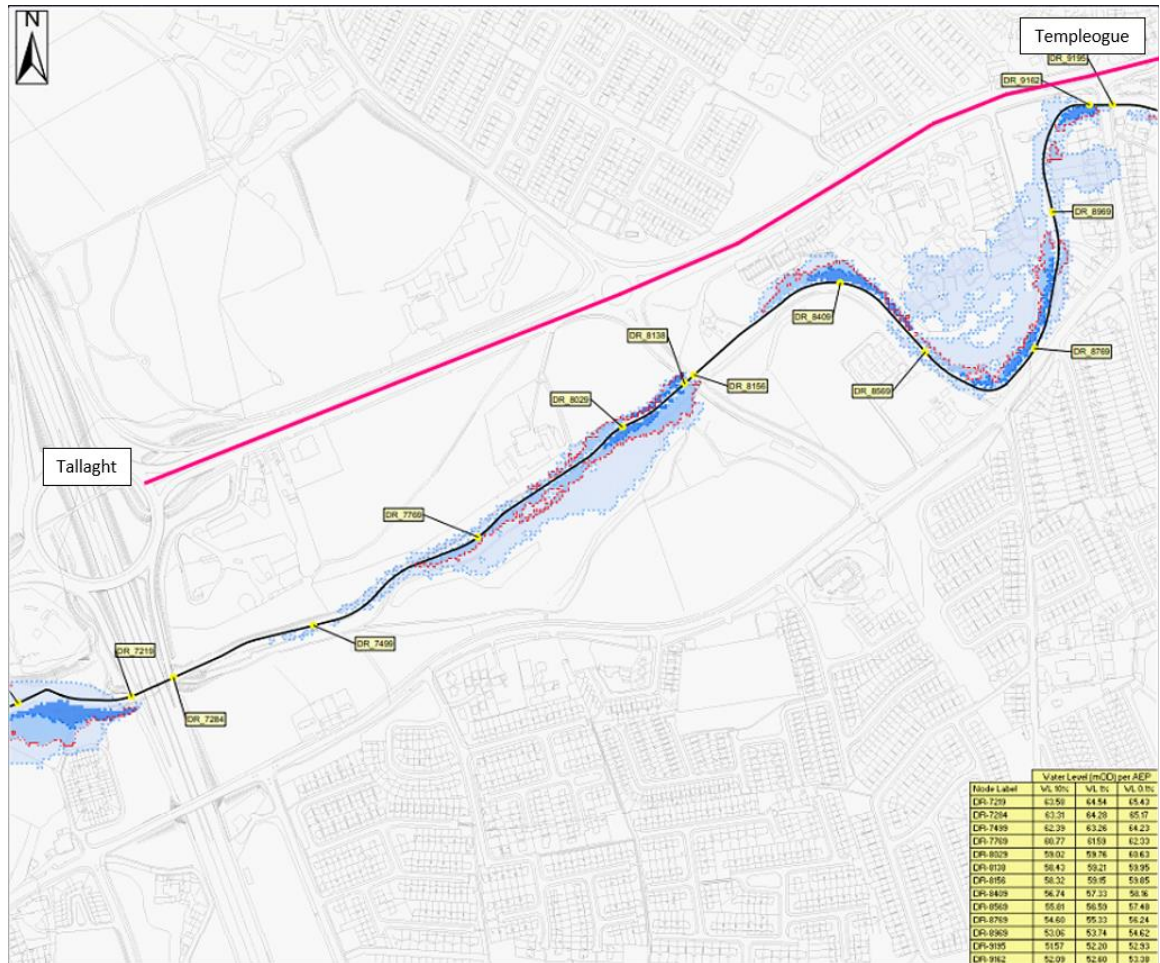


Figure 8: Flood risk extents between Tallaght to Templeogue

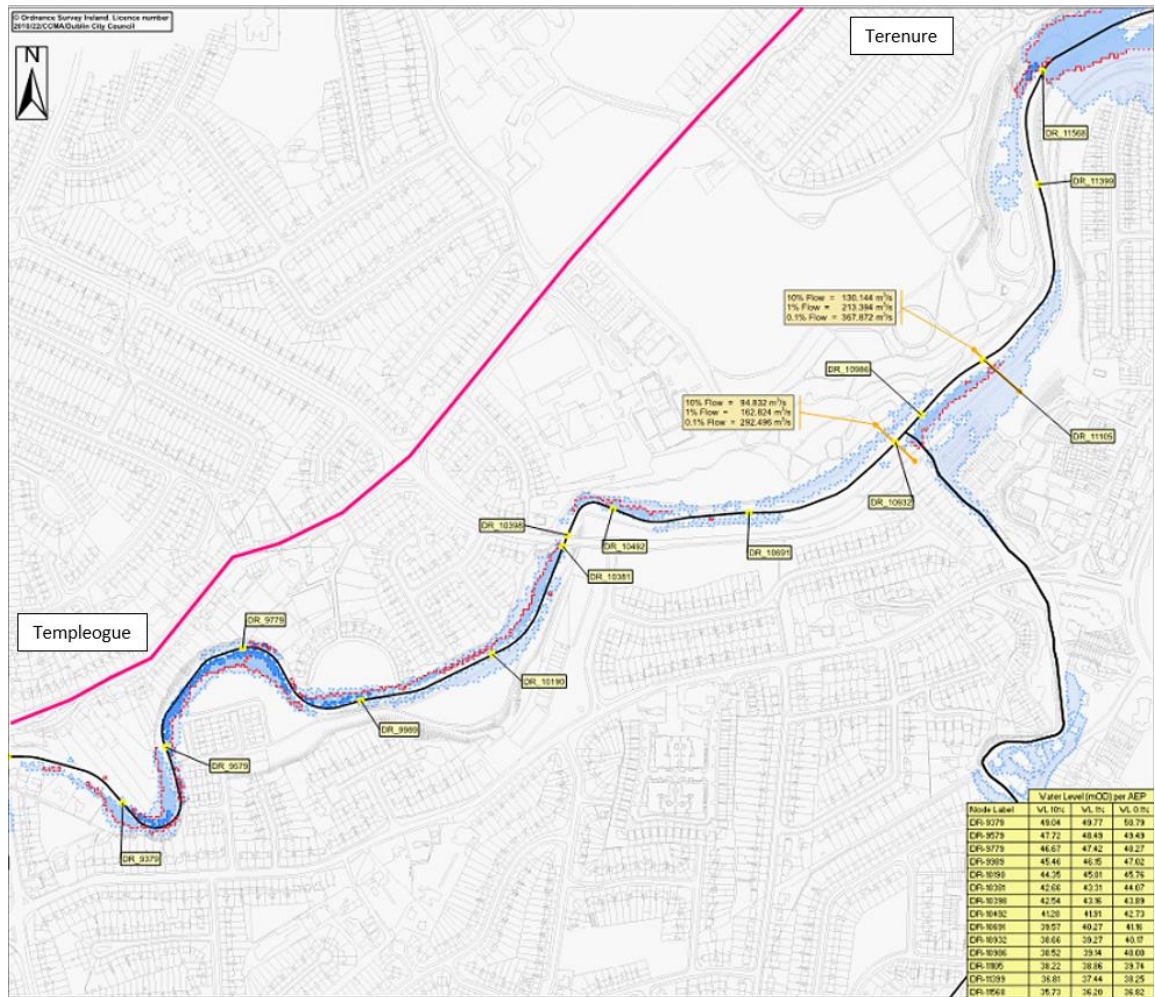


Figure 9: Flood risk between Templeogue to Terenure

As the subject site does not lie in a mapped flood extent and there is no records of flooding along the route, the risk to the site from fluvial flooding due to the River Dodder is considered to be low. The site for the proposed route therefore lies within Flood Zone C.

We note that the fluvial flood risk to the project extents will also be low in a future climate change scenario.

4.2 Coastal Flood Risk

The site is located approximately 10 km from the nearest coastal boundary and elevated high above sea level. There is therefore no risk of coastal flooding to the site in the present, or future climate change scenario.

4.3 Pluvial Flooding/Urban Drainage

Pluvial flooding occurs when extreme rainfall overwhelms drainage systems or soil infiltration capacity, causing excess rainwater to pond above ground at low point in the topography.

The risk of pluvial flooding for Dublin City has been assessed in detail by OPW and Dublin City Council. This is shown in Figure 10.

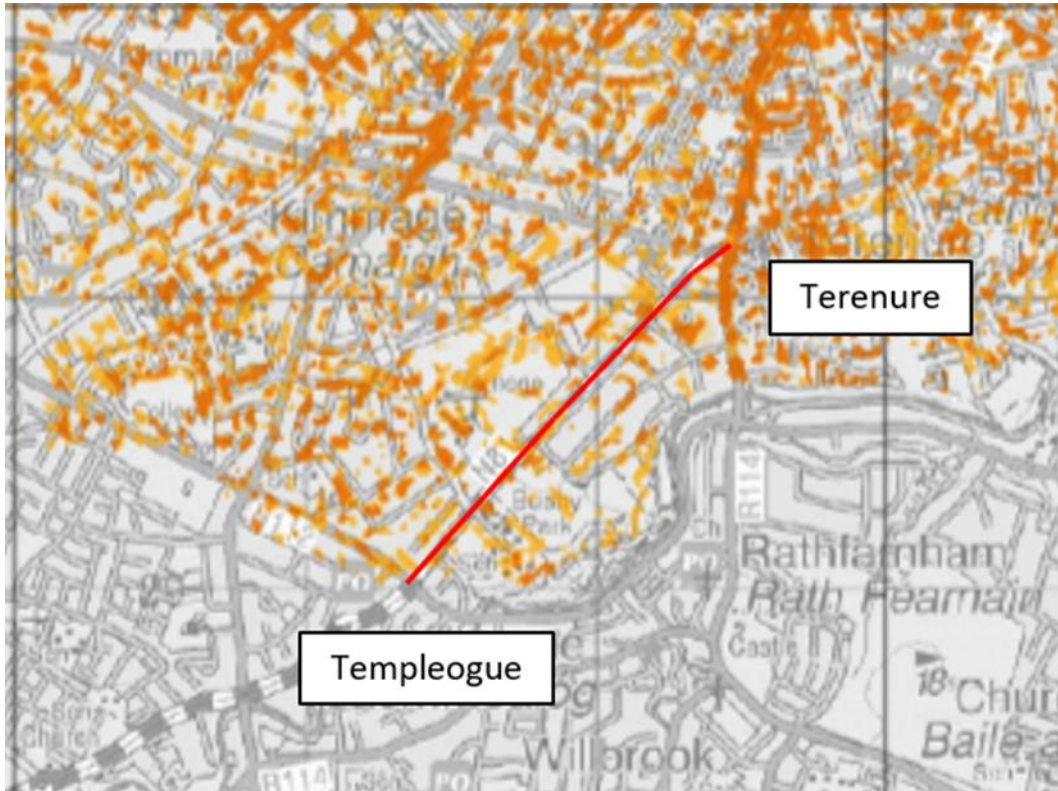


Figure 10: Extract from OPW Predictive Pluvial Flood Maps; Templeogue to Terenure

The Predictive Pluvial maps indicate that there are areas at risk of pluvial flooding along the route especially within the urban centre, largely within the 10% AEP; therefore, there is a high risk of pluvial flooding along the route.

It is beyond the scope of the project to mitigate flooding for the existing road network in its entirety however “hotspots” of pluvial flooding have been identified and will be remediated through the design of the Bus Connects drainage infrastructure where feasible. These areas are:

1. areas where the PFRA mapping has highlighted pluvial flood risk for continuous lengths of road in excess of 150m;
2. where historical flood mapping has highlighted a past pluvial flood events, and
3. where topographical survey has indicated a low-point in the road alignment adjacent to or alongside the Bus Connects route without drainage inlets (i.e. undrained sag points)

The above pluvial flooding areas will be mitigated through provision of additional drainage inlets, upsizing of the pipe network and/or localised regrading of the existing road alignment. This will reduce the risk of ponding and surface water collecting at localised low points.

All new surface water sewers provided as part of the scheme shall be designed so that no flooding will occur for a return period up to 30 years.

This is an improvement when compared to some of the existing historical drainage infrastructure to be replaced and will reduce the risk of pluvial flooding.

Also, as part of the scheme new drainage infrastructure will be provided which will include new Sustainable (Urban) Drainage Systems (SuDS) such as rain gardens, swales and tree pits. These SuDS features will provide some surface water storage and thus reduce the risk of pluvial flooding.

In summary, there is a risk of pluvial flooding along the proposed route from Templeogue to Terenure however this risk exists in the present scenario and overall the flood risk profile will be reduced as a result of the Bus Connects project.

4.4 Groundwater Flooding

Groundwater flooding can occur during lengthy period of heavy rainfall, typically during later winter/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding.

The OPW Preliminary Flood Risk Assessments Groundwater Flooding Report concludes that groundwater flooding is largely confined to the West Coast of Ireland due to the hydrogeology of the area.

Groundwater vulnerability maps, while intended to show the vulnerability of groundwater to contamination, can also provide an indication of risk of groundwater flooding, see below. Figure 11 indicates that the groundwater vulnerability varies across the site. Most of the site falls into the “Low” and “Moderate” groundwater vulnerability categories with a portion of the site around Templeogue having a “High to Extreme” groundwater vulnerability classification.

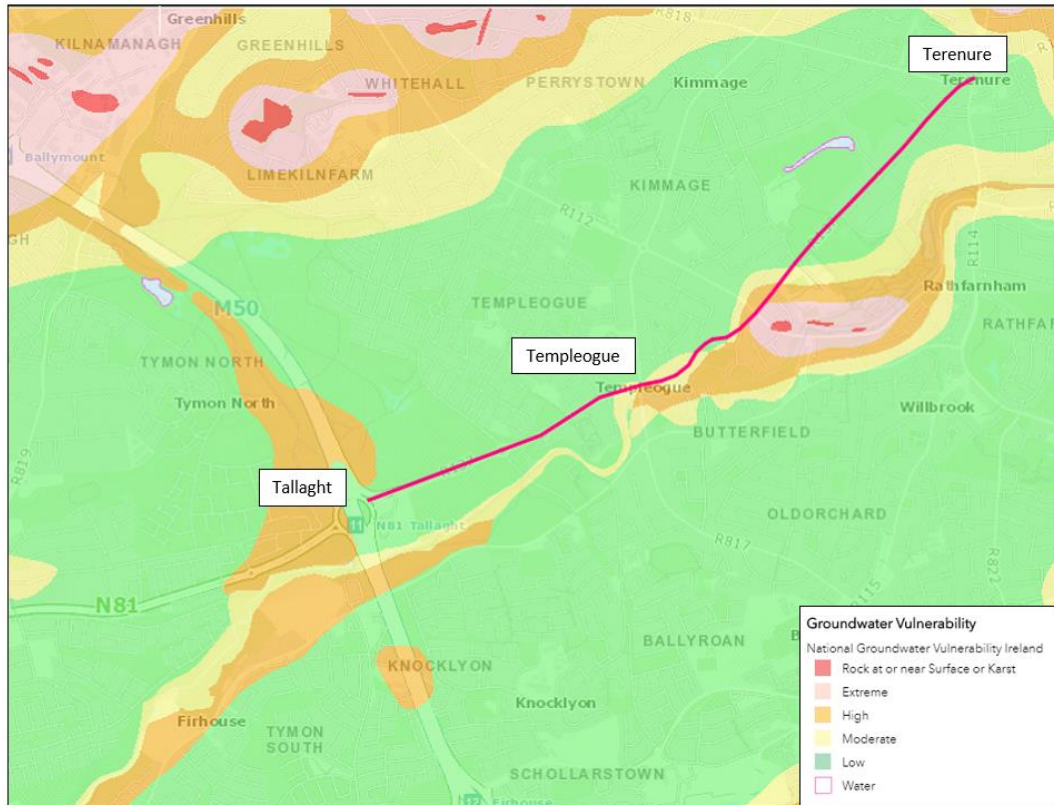


Figure 11: GSI Groundwater Vulnerability Mapping

The majority of the proposed route is at low risk of groundwater flooding, with areas around Templeogue Village being high risk of ground water flooding. As most of the scheme is on existing roads with no known flooding specifically due to groundwater it is not expected that this risk will increase with the construction of the scheme.

5 Existing Flood Risk: Rathfarnham to City Centre

5.1 Fluvial Flooding

5.1.1 Significant Watercourse in the Vicinity of the Site

The proposed site extents cross over the River Dodder and the Grand Canal. Extracts from the Dodder CFRAMS fluvial flood extent map is displayed in Figure 12 and Figure 13. The predicted fluvial flood extents and levels for three return period events are presented on the map for the 1 in 10, 1 in 100 and 1 in 1000-year events.

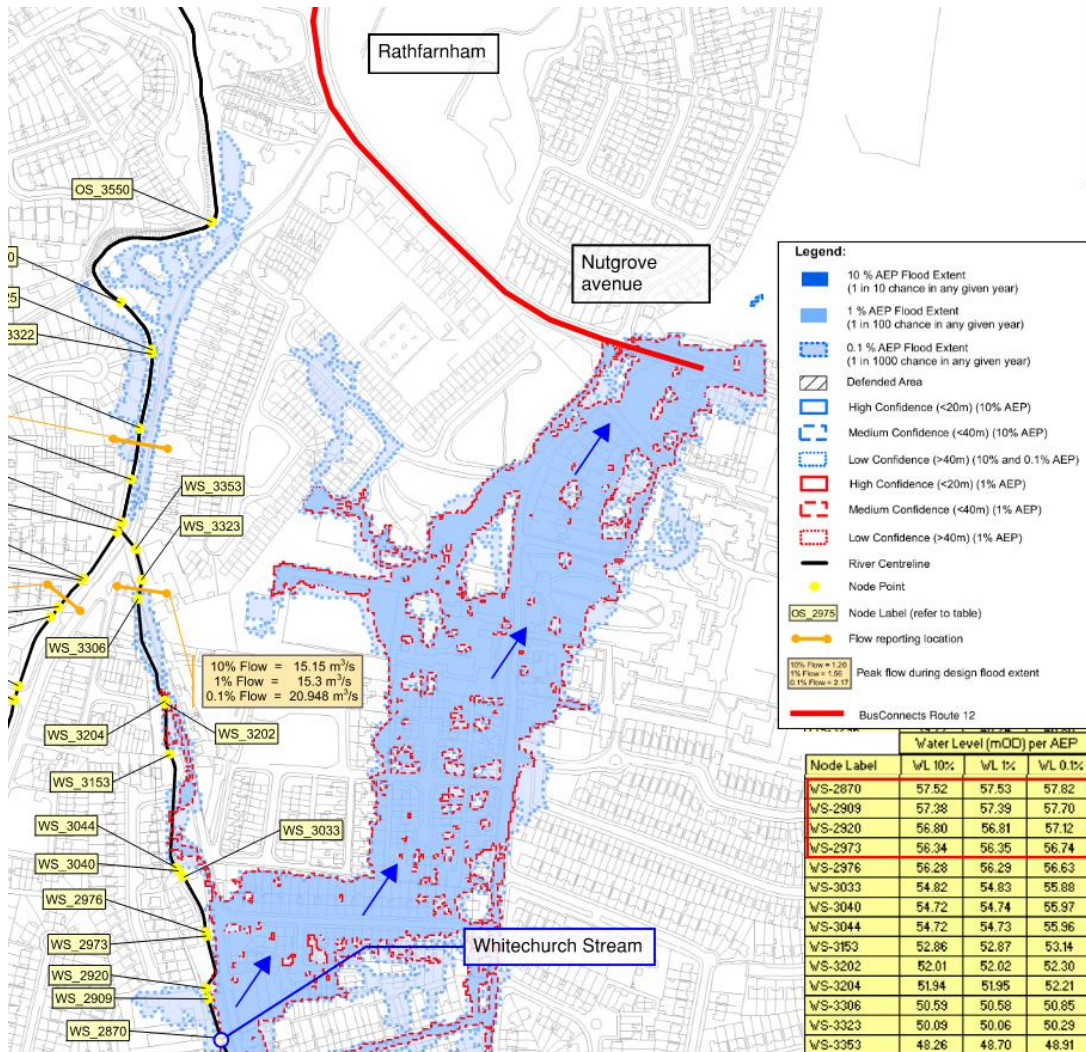


Figure 12: Flood extents at Nutgrove Avenue, Rathfarnham (Dodder CFRAM, 26/10/2010)

As shown in Figure 12, parts of Nutgrove Avenue are within the 1 in 100-year flood extents (Flood Zone A). Flooding of this area is a result of overtopping of the Whitechurch stream on Whitechurch road 750m southwest of the Avenue.

The flood water flows overland across the residential areas towards Nutgrove Avenue in a north-easterly direction, as shown by the blue arrows. A portion of the Proposed Scheme is shown in thick red line. Only a very small part of the works falls in an area at risk of flooding, where the project ties onto the existing levels.

As illustrated in Figure 13, there is a section of the route on Rathfarnham Road near Dodder Road Lower which falls within the 1 in 1000 year flood extent (Flood Zone B).

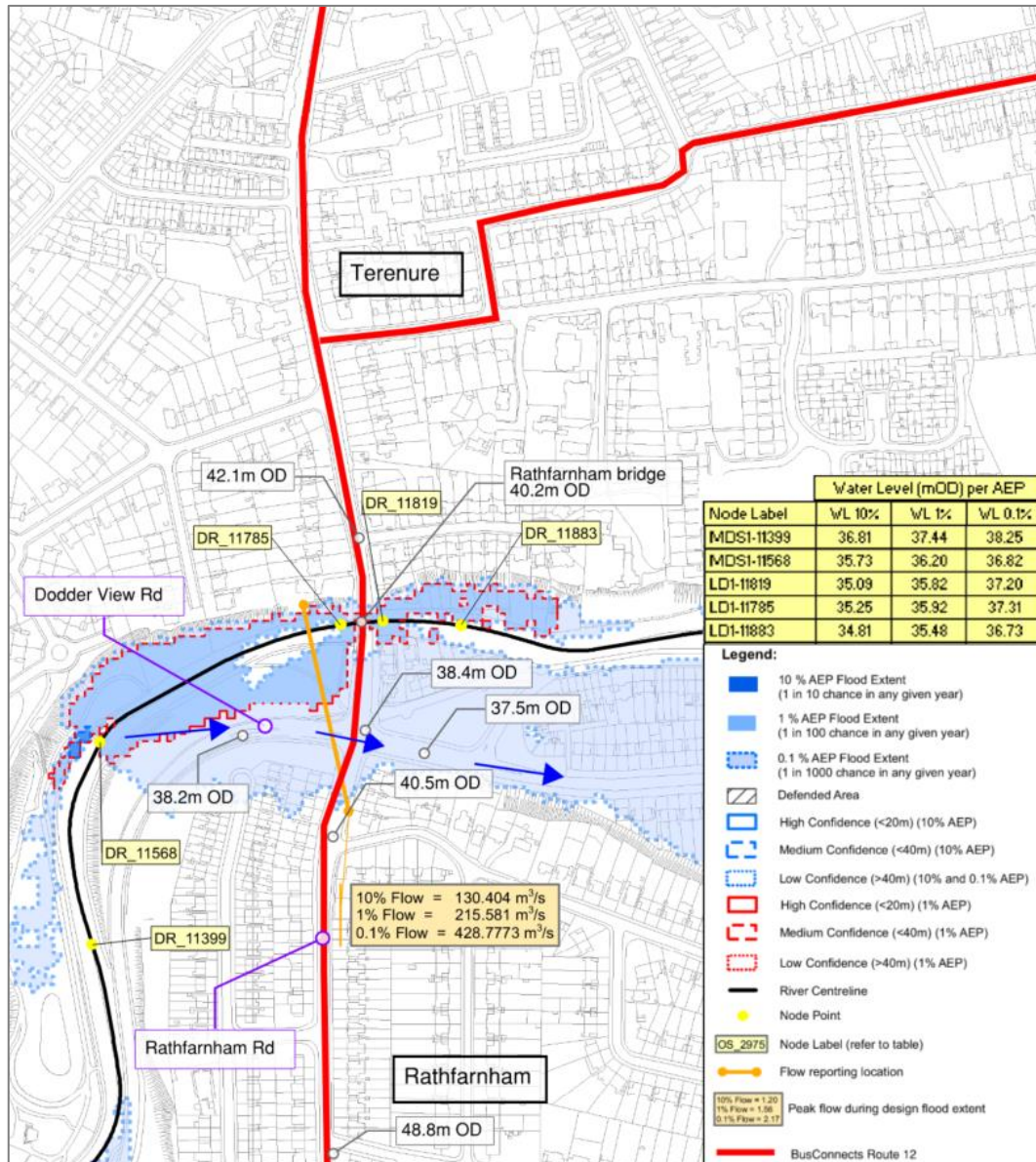


Figure 13: Flood extents between Rathfarnham and Terenure (Dodder CFRAM, 26/10/2010)

Figure 13 includes the modelled water levels on the River Dodder for the nodes displayed.

The node closest to the Rathfarnham Road Bridge over the Dodder is DR_11785/LD1_11785 with modelled water levels estimated at 35.92m OD during the 1 in 100-year flood event and 37.31m OD during the 1 in 1000 year flood event.

Rathfarnham road slopes from south to north, from 48.8m OD at the junction with Crannagh Road down to 38.4m OD at the junction with Dodder View road. Immediately after the junction., the road rises again to 40.2m OD at the Rathfarnham bridge location. Due to the high deck levels, Rathfarnham bridge over the Dodder is not at risk of flooding during the 1 in 100 or 1 in 1000 year events.

Existing topographic levels of the site are available following a topographic survey. While the flood levels provided as part of CFRAM are lower than the Dodder View Road topographic levels, it is understood that the Dodder overtops its banks as marked in blue arrows Figure 13, causing overland flooding along Dodder View Road and subsequently Rathfarnham Road.

There are no watercourses at the vicinity of the project extents between Terenure and the City Centre. The risk of fluvial flooding in this area is low.

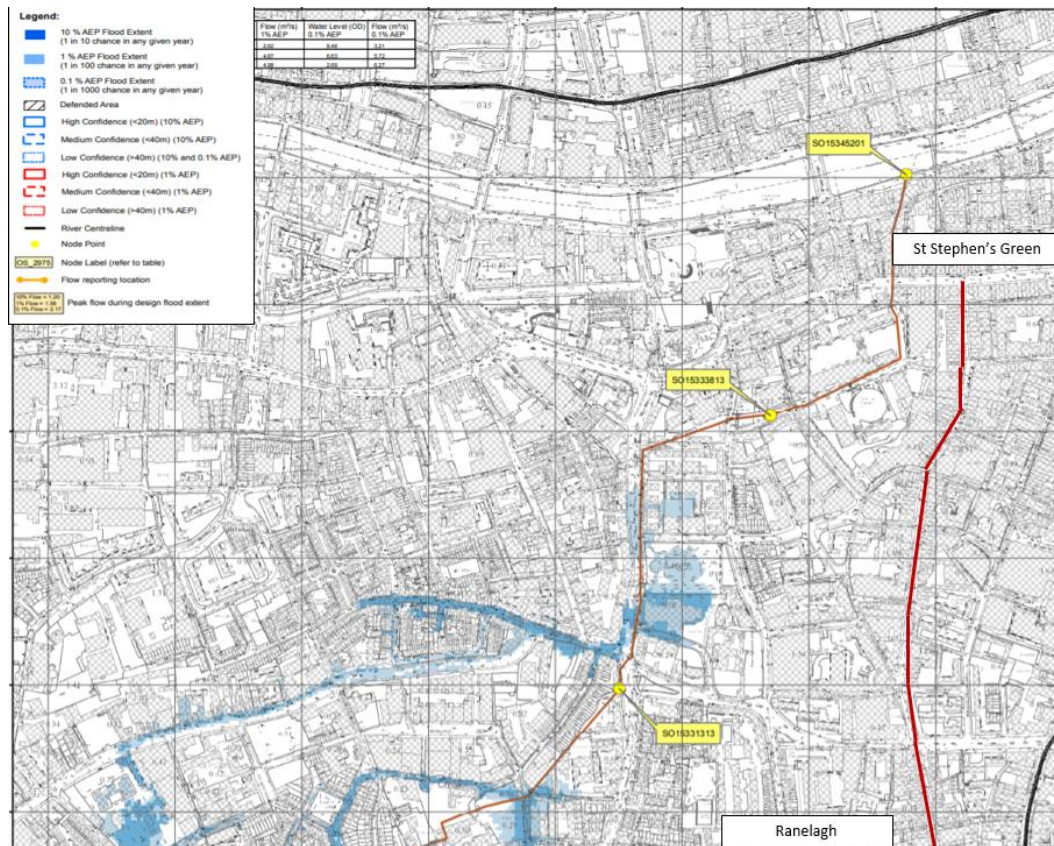


Figure 14: Ranelagh to St Stephen's Green fluvial flood extents

The mid-range future scenario of modelled extents that take in the potential effects of climate change (increase in rainfall of 20% and sea level rise of 500mm) has been assessed and the proposed route is not identified as having any potential flood risk.

In summary, sections of the Proposed Scheme at Rathfarnham Road where the route crosses the River Dodder are at medium risk of flooding. The rest of the proposed route is at low risk of fluvial flooding.

5.2 Tidal Flood Risk

The Eastern CFRAM assess the tidal flood risk of the River Liffey. The River Liffey at Aston Quay which is approximately 1km from St Stephen's Green is the closest tidal point to the proposed route. The modelled water levels for 1 in 200-year tidal event are between 3.14m OD and 3.16m OD.

The road levels near St Stephen's Green which is the closet point are between 6.80m and 7.20m therefore there is no risk of the road flooding in this area in the present, or future climate change scenario from tidal flooding.

5.3 Pluvial Flooding/Urban Drainage

The risk of pluvial flooding for Dublin City Centre has been assessed in detail by OPW and Dublin City Council. This is shown in Figure 15.

It is noted that the modelling and mapping is not available for the entirety of the route and as such a portion of the route, from south of Terenure to Rathfarnham, cannot be assessed for pluvial drainage via the Predictive

The Predictive Pluvial maps indicate that there is an extensive risk of pluvial flooding along the route which is largely within the 10% AEP. Historic flooding from pluvial sources was noted along Wexford Street, Rathmines. There is therefore a high risk of pluvial flooding along the route.

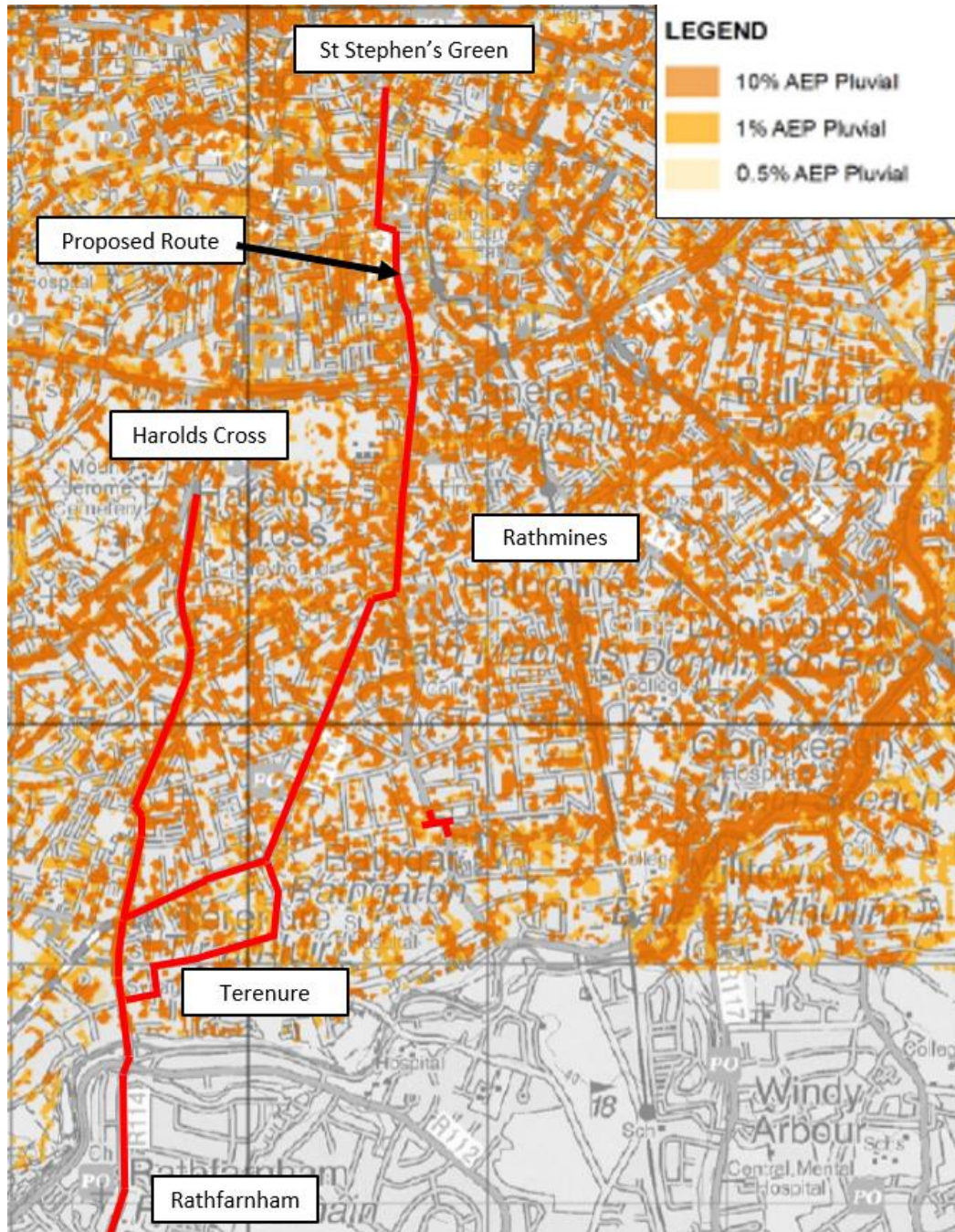


Figure 15: Extract from OPW OPW Predictive Pluvial Flood Maps; Rathfarnham to City Centre

The *Dublin City Council Flood Resilient City Project* was carried out in conjunction with Jacobs in 2012. This study was carried out to detail pluvial flood risk assessment of pilot areas in Dublin City. Dublin Central (East Wall) and Dublin South East (Georges Quay and South Inner City) areas were reviewed for the proposed development however the site boundary lies outside the study extent.

It is beyond the scope of the project to mitigate flooding for the existing road network in its entirety however “hotspots” of pluvial flooding have been identified and will be remediated through the design of the Bus Connects drainage infrastructure where feasible. These areas are:

1. areas where the PFRA mapping has highlighted pluvial flood risk for continuous lengths of road in excess of 150m;
2. where historical flood mapping has highlighted a past pluvial flood events, and
3. where topographical survey has indicated a low-point in the road alignment adjacent to or alongside the Bus Connects route without drainage inlets (i.e. undrained sag points)

The above pluvial flooding areas will be mitigated through provision of additional drainage inlets, upsizing of the pipe network and/or localised regrading of the existing road alignment. This will reduce the risk of ponding and surface water collecting at localised low points.

All new surface water sewers provided as part of the scheme shall be designed so that no flooding will occur for a return period up to 30-year storm return period. This is an improvement when compared to some of the existing historical drainage infrastructure to be replaced and will reduce the risk of pluvial flooding.

As part of the scheme new drainage infrastructure will be provided which will include Sustainable (Urban) Drainage Systems (SuDS) such as rain gardens, swales and tree pits. These SuDS features will provide some surface water storage and thus reduce the risk of pluvial flooding.

In summary, there is a high risk of pluvial flooding along the proposed route. The pluvial flood risk will be reduced as a result of the Bus Connects project.

5.4 Groundwater Flooding

The OPW Preliminary Flood Risk Assessments Groundwater Flooding Report concludes that groundwater flooding is largely confined to the West Coast of Ireland due to the hydrogeology of the area.

Groundwater vulnerability maps, while intended to show the vulnerability of groundwater to contamination, can also provide an indication of risk of groundwater flooding, see below. Figure 16 indicates that the groundwater vulnerability varies across the site. Most of the site falls into the “Moderate” groundwater vulnerability categories with a portion of the site around Rathfarnham having a “High” groundwater vulnerability classification.

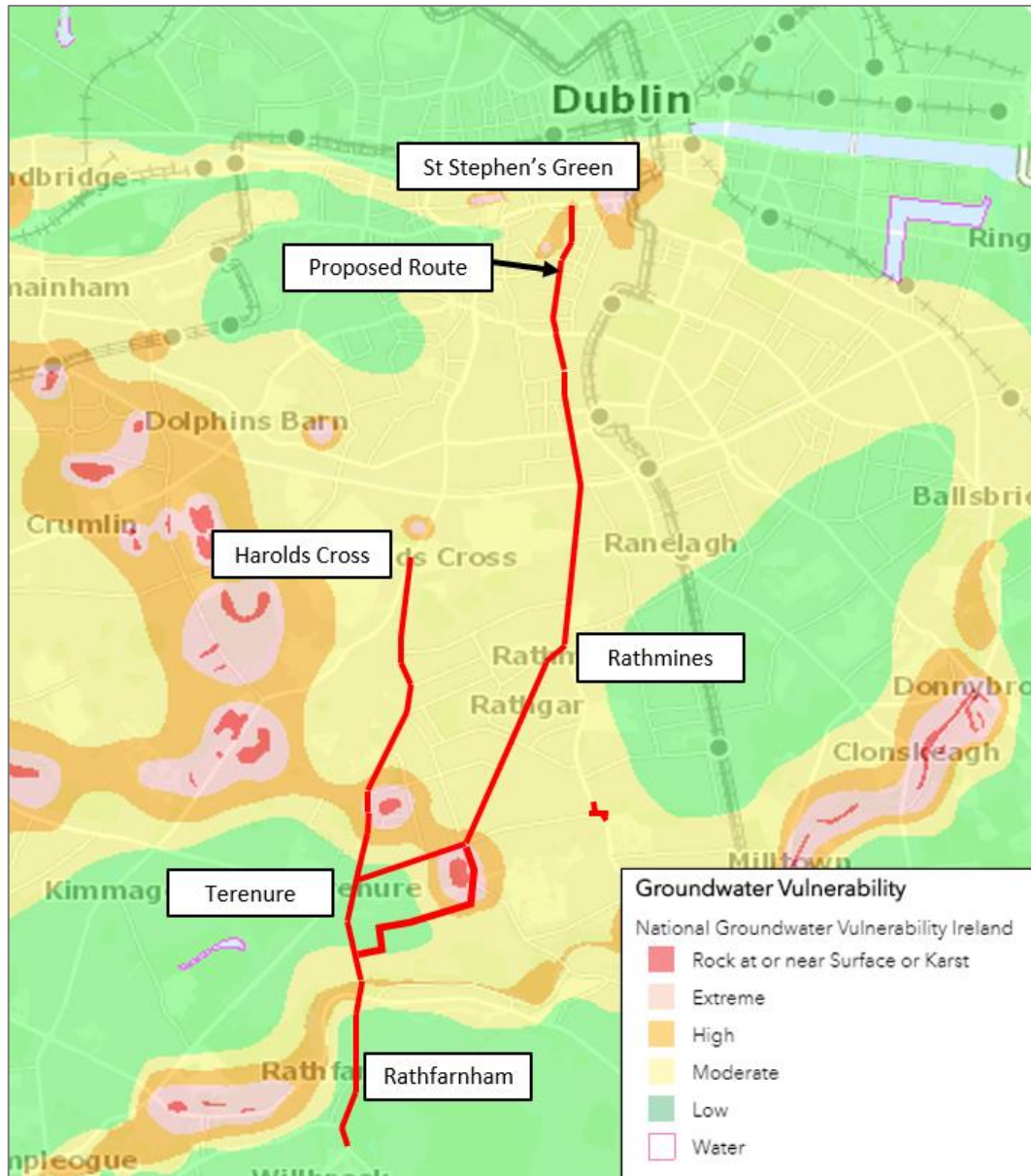


Figure 16: GSI Groundwater Vulnerability Mapping

Ground investigations have been undertaken at two locations for the Proposed Scheme. Standpipes were installed to record the groundwater levels. These are at close proximity to the River Dodder (R12-CP02 adjacent to Rathfarnham road bridge over the Dodder and R13-CP03 100m west of the Rathfarnham road and 15m from the River Dodder). The standpipes recorded the groundwater level at 2.13m and 3.15m bgl respectively.

The majority of the proposed route is at medium risk of groundwater flooding, with areas in Terenure at high risk of groundwater flooding. As most of the scheme is on existing roads with no known flooding specifically due to groundwater it is not expected that this risk will increase with the construction of the scheme.

6 Summary of Existing Flood Risk

The risk of flooding to the existing site from fluvial, tidal, pluvial and groundwater sources has been assessed and is summarised below.

Tallaght to Templeogue:

- The proposed route from Tallaght to Templeogue does not fall within any flood extents there is located in Flood Zone C.
- The route is deemed to be of low risk tidal flooding from the River Liffey.
- The risk of pluvial flooding to the route is considered medium.
- The risk of groundwater flooding to the route is considered low, with area around Templeogue being considered high risk.

Rathfarnham to City Centre:

- The majority of the route from Rathfarnham to City Centre is at low risk of fluvial flooding. The majority of the route is therefore in Flood Zone C.
- The sections either side of the river Dodder crossing on Rathfarnham Road falls within the 1 in 1000-year flood extent. Therefore, this section is located within Flood Zone B.
- The section of the route at Nutgrove Avenue where the route ties into the existing road is in the 1 in 100-year flood extent of the Whitechurch stream. The section is located in Flood Zone A.
- The route is deemed to be of low risk tidal flooding from the River Liffey.
- The risk of pluvial flooding to the route is considered high.
- The risk of groundwater flooding to the route is considered medium to high.

7 Application of “The Planning System and Flood Risk Management” Guidelines

7.1 Flood Zones

There are a number of flood zones identified along the Proposed Scheme area.

- Area 1: Rathfarnham Road near Dodder View Road lies within flood zone B (1 in 1000-year flood extents) – see Figure 17.
- Area 2: Nutgrove Avenue lies within flood zone A (1 in 100-year flood extents) see Figure 18.
- The rest of the route does not fall within any flood extents therefore is Flood Zone C.

- The risk of pluvial flooding along the majority of the proposed route is high, however the risk will be reduced as a result of the Proposed Scheme.

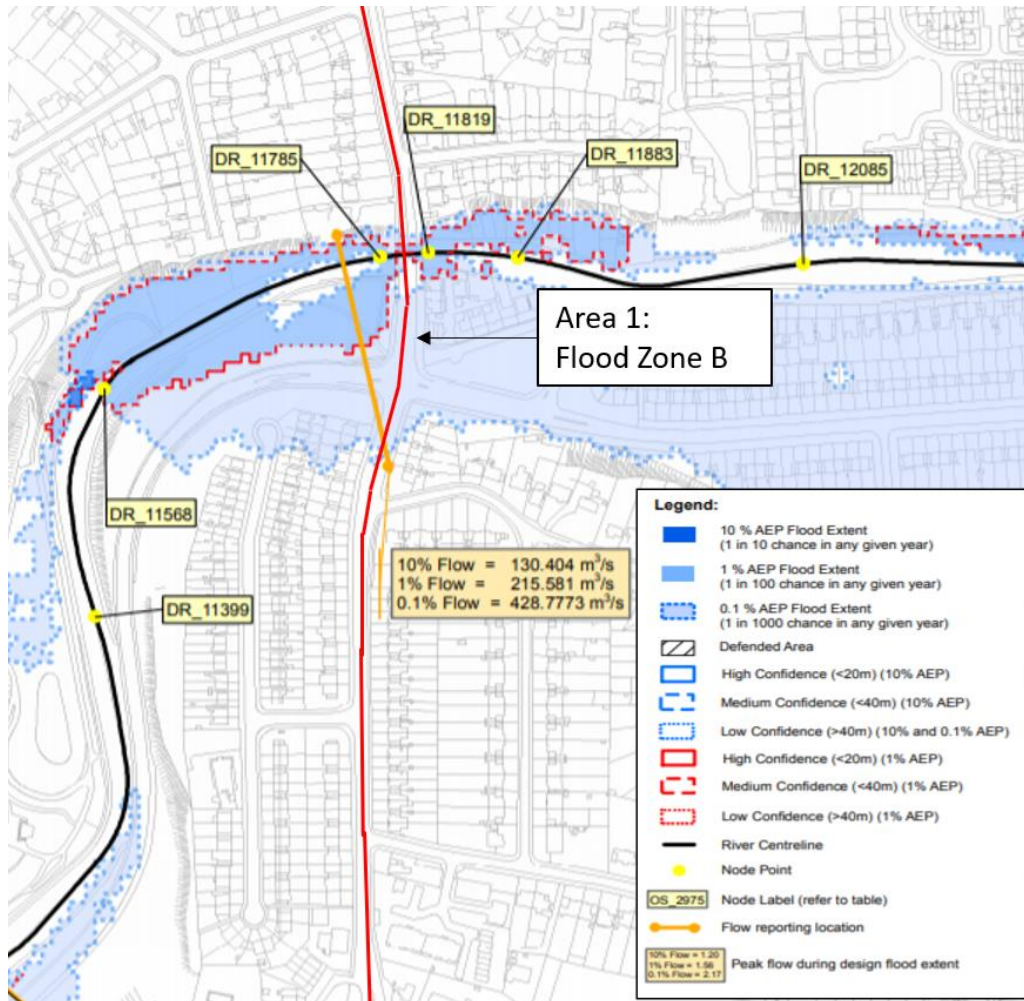


Figure 17: Area 1 & 2 Flood Zone Identification

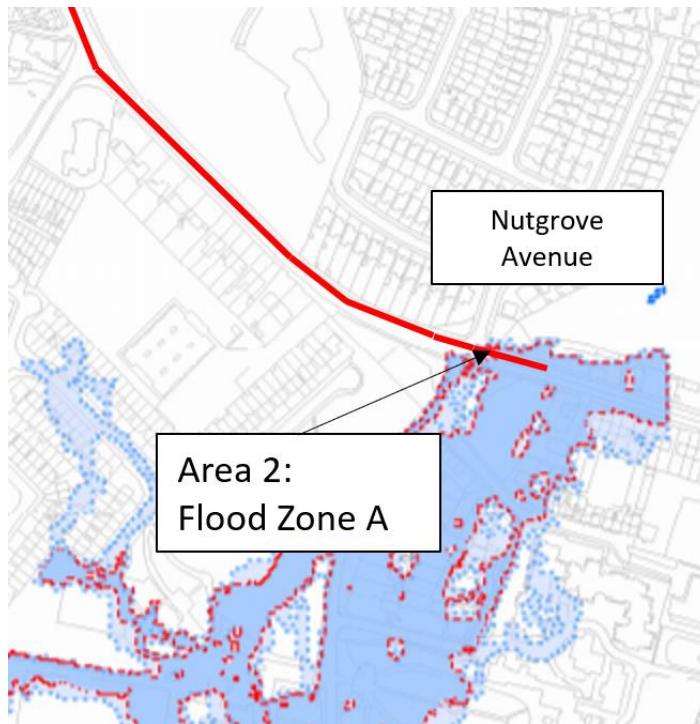


Figure 18: Area 3 Flood Zone Identification

7.2 Sequential Approach

Figure 3 in Section 2.1.3 illustrates the sequential approach to be adopted under the ‘Planning System and Flood Risk Management’ guidelines.

The proposed development is classified as a ‘highly vulnerable development’ as per the vulnerability classification. As such, a Justification Test is required for those sections of the route which are within Flood Zones A and B.

7.3 Justification Test

The Justification Test is comprised of two processes:

1. The first is the Plan-making Justification Test (described in Chapter 4 of ‘The Planning System and Flood Risk Management’ guidelines) and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
2. The second is the Development Management Justification Test (described in Chapter 5 of ‘The Planning System and Flood Risk Management’ guidelines) and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

7.4 Plan-making Justification Test

A Plan-Making Justification test formed part of the Strategic Flood Risk Assessment.

The Strategic Development Zone (SDZ) Planning Scheme as approved notes that all proposed developments must include a site-specific flood risk assessment (SSFRA). It is further confirmed that the SSFRA is not required to carry out a justification test, given that this exercise has already been carried out as part of the adopted SDZ Planning Scheme.

7.5 Development Management Justification Test

Box 5.1 of the Justification Test in the Planning Guidelines requires that two criteria to be met:

- The subject lands have been zoned or otherwise designated for the particular use of form of development in an operative development plan, which has been adopted or varied taking account of these guidelines.
- 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.

7.5.1 Chapter 5 Justification Test – Item 1

With regards to Item 1, we consider that this criterion has been met as follows:

- *The subject lands have been zoned or otherwise designated for the particular use of form of development in an operative development plan, which has been adopted or varied taking account of these guidelines.*

As shown in Figure 19 the Proposed Scheme lies adjacent to a number of GZT zones, predominately R2 existing residential, R3 residential, mixed residential and other uses and O1 strategic reserve, white land. Strategic Reserve, white land (O1) is to cater for those cases where land is zoned for development at some time in the future, but no objectives or specific controls are indicated.

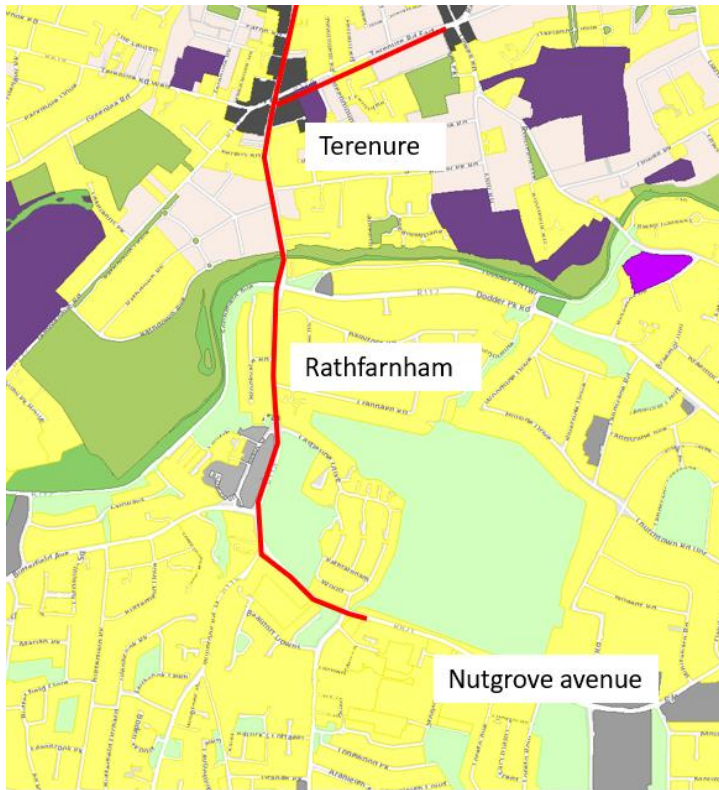


Figure 19: Dublin City Council 2016-2022: Current Development Plan

7.5.2 Chapter 5 Justification Test – Item 2

With regards to Item 2, we consider that these criteria have been met as follows:

- *The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk.*

Area 1: This is an existing roadway; it is not proposed to alter the extents of hardstanding area or raise the road level in this area. Therefore, development of the Bus Connects route in this area will not increase flood risk elsewhere. This area meets the criteria for Part 2(i).

Area 2: This is an existing roadway; It is not proposed to alter the extents of hardstanding area or raise the road level in this area. Therefore, development of the Bus Connects route in this area will not increase flood risk elsewhere. This area meets the criteria for Part 2(i).

- *The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonable possible.*

The areas along the route which are within a predicted flood extents zone are existing roads and will not increase flood risk compared to the existing scenario.

Any new roads, cycleways etc. constructed as part of the scheme will have appropriate mitigation measures to reduce the risk of flooding included at detailed design stage. These measures may include raising the road level to above the predicted flood extents level, or the incorporation of flood defences.

Pluvial flood risk will be mitigated by the incorporation of SuDS features into the drainage system where necessary. This will reduce the risk of ponding and surface water collecting at localised low points.

The mitigation measures proposed will minimise the flood risk to people, property, the economy and the environment.

It is therefore considered that the proposed development satisfies the criteria of Part 2(ii) of the development management Justification Test.

- *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.*

The measures outlined in Sections 4.3 and 5.3 ensure that residual risks to the area and/or development will 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.

It is not within the scope of this project to significantly alter the existing levels of the roads and prevent flood inundation from the Dodder in Rathfarnham.

It is considered that the proposed development satisfies the criteria of Part 2(iii) of the development management Justification Test.

- *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 scheme has been designed to the highest standards and creates a connection of Bus services along core routes of Dublin. Measures to address the flood risk have been incorporated into the design without compromising the streetscape and functioning of the development.

Therefore, it is considered that the proposed development satisfies the criteria of Part 2 (iv) of the development management Justification Test.

7.6 Justification Test – Conclusion

Two areas have been identified as requiring a Justification test. These areas satisfy the requirements of the Plan Making Justification Test and the Development Justification Test and are therefore acceptable development.

8 Conclusion

This Flood Risk Assessment (FRA) has been carried out as part of the Planning Application for the proposed routes from Tallaght to Terenure and Rathfarnham to City Centre under the Bus Connects scheme.

Section 1

There are no recorded historic flood events along this section of the Proposed Scheme. Two historic flood events within a 1km proximity of the Proposed Scheme have been identified, however these are deemed low risk due to their location.

There is no risk of fluvial flooding to Section 1 of the Proposed Scheme in the present, or future climate change scenario.

The site is located approximately 10 km from the nearest coastal boundary and elevated high above sea level. There is therefore no risk of coastal flooding to the site in the present, or future climate change scenario.

The groundwater vulnerability varies along Section 1, with the majority lying in areas at low vulnerability, but with some areas at moderate or high. As most of the scheme is on existing roads with no known flooding specifically due to groundwater it is not expected that this risk will increase with the construction of the scheme.

The risk of pluvial flooding along the majority of the proposed route is medium, however this risk exists in the current scenario and will be reduced as a result of the Proposed Scheme.

All new surface water sewers provided as part of the scheme shall be designed so that no flooding will occur for a return period up to 30 years. This is an improvement when compared to some of the existing historical drainage infrastructure to be replaced and will reduce the risk of pluvial flooding. Also, as part of the scheme new drainage infrastructure will be provided which will include new Sustainable (Urban) Drainage Systems (SuDS) such as rain gardens, swales and tree pits. These SuDS features will provide some surface water storage and thus reduce the risk of pluvial flooding.

The site is classified as Flood Zone C as per OPW Guidelines. A Justification Test for the development is therefore not required. It is considered that the proposal is in keeping with the principles of the Flood Risk Guidelines which seeks to locate development in appropriate locations.

Sections 2, 3 & 4

There are a number of historic flood events at different locations along or near to the Proposed Scheme. The Proposed Scheme is largely on existing roads and will result in minimal additional paved areas and will therefore not increase the risk of these events reoccurring compared to the current scenario.

Two areas in Rathfarnham are at medium (1 in 100 year) and high risk (1 in 100 year) of flooding from the River Dodder and Whitechurch stream respectively.

The areas consist of Area 1 on Rathfarnham Road near Dodder View Road which falls within flood zone B and Area 2 at Nutgrove Avenue falls within flood zone A. The rest of the route does not fall within any flood extents therefore is within Flood Zone C.

There is no risk of coastal flooding to the site in the present, or future climate change scenario.

The groundwater vulnerability varies along the Proposed Scheme, with many areas shown to be in areas of moderate groundwater vulnerability. Groundwater level measurements have shown the levels to be 2.13-3.15m bgl. As most of the scheme is on existing roads with no known flooding specifically due to groundwater it is not expected that this risk will increase with the construction of the scheme.

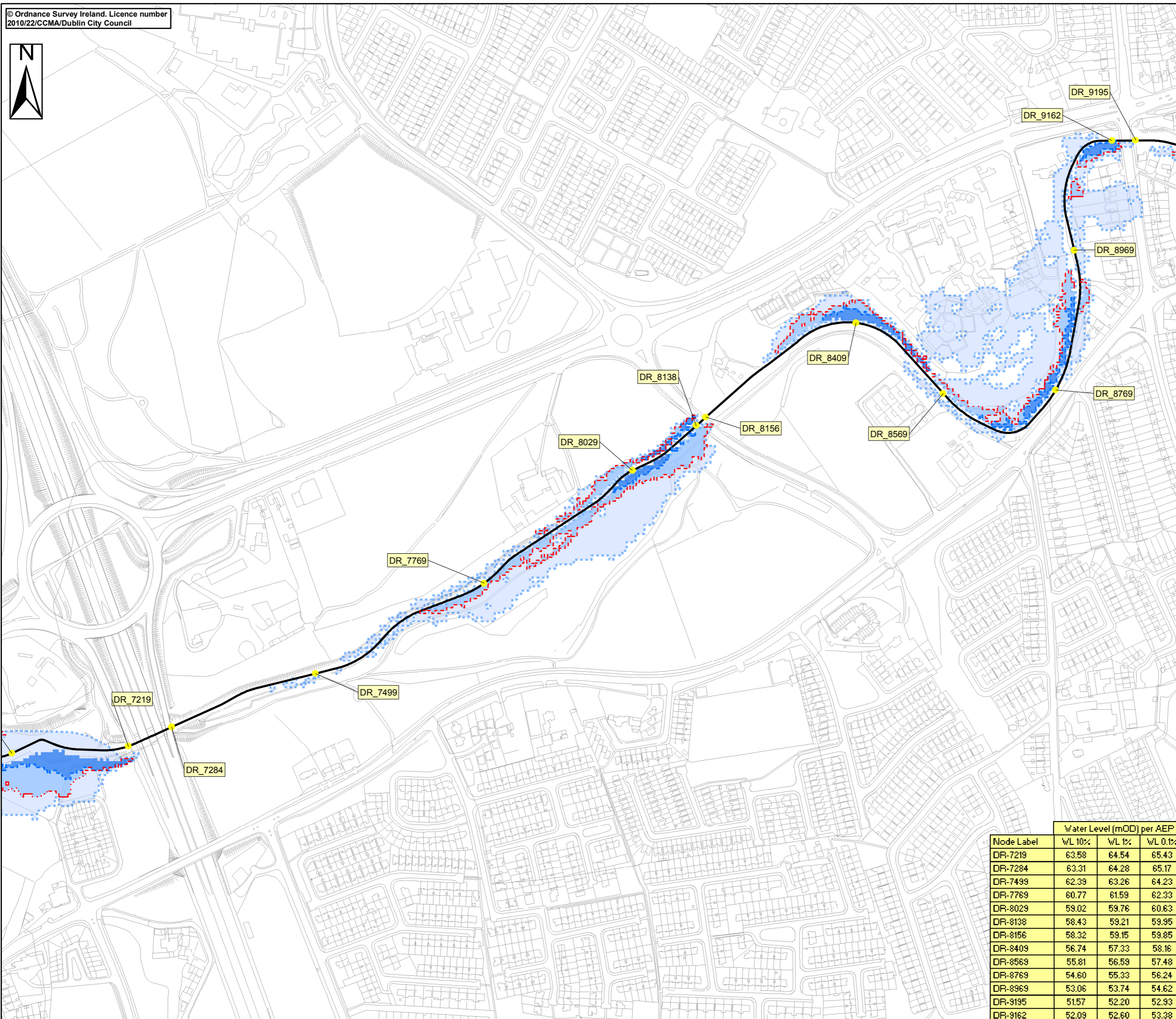
The risk of pluvial flooding along the majority of the proposed route is high, however this risk will be reduced as a result of the Proposed Scheme.

As areas of the scheme are identified as being within Flood Zone A and Flood Zone B a Justification Test is required. The Plan Making Justification Test and Development Management Justification have been assessed and passed, therefore further investigation of the flood risk in the form of a Stage 2 FRA is not required.

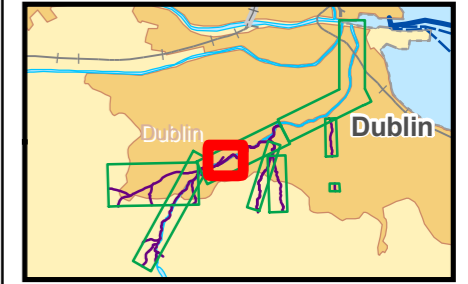
Appendix A

CFRAM Maps

A1



Location Plan:



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- OS_2975 Node Label (refer to table)
- Flow reporting location
- 10% Flow = 1.20
1% Flow = 1.56
0.1% Flow = 2.17 Peak flow during design flood extent

USER NOTE:

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:



Project:

DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:

PRESENT DAY DODDER

Map Type: FLOOD EXTENT

Source: FLUVIAL FLOODING

Map Area: URBAN AREA

Scenario: CURRENT

Drawn By: A.A.B Date: 26 November 2010

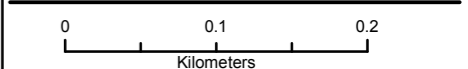
Checked By: A.J. Date: 26 November 2010

Approved By: A.G.B Date: 26 November 2010

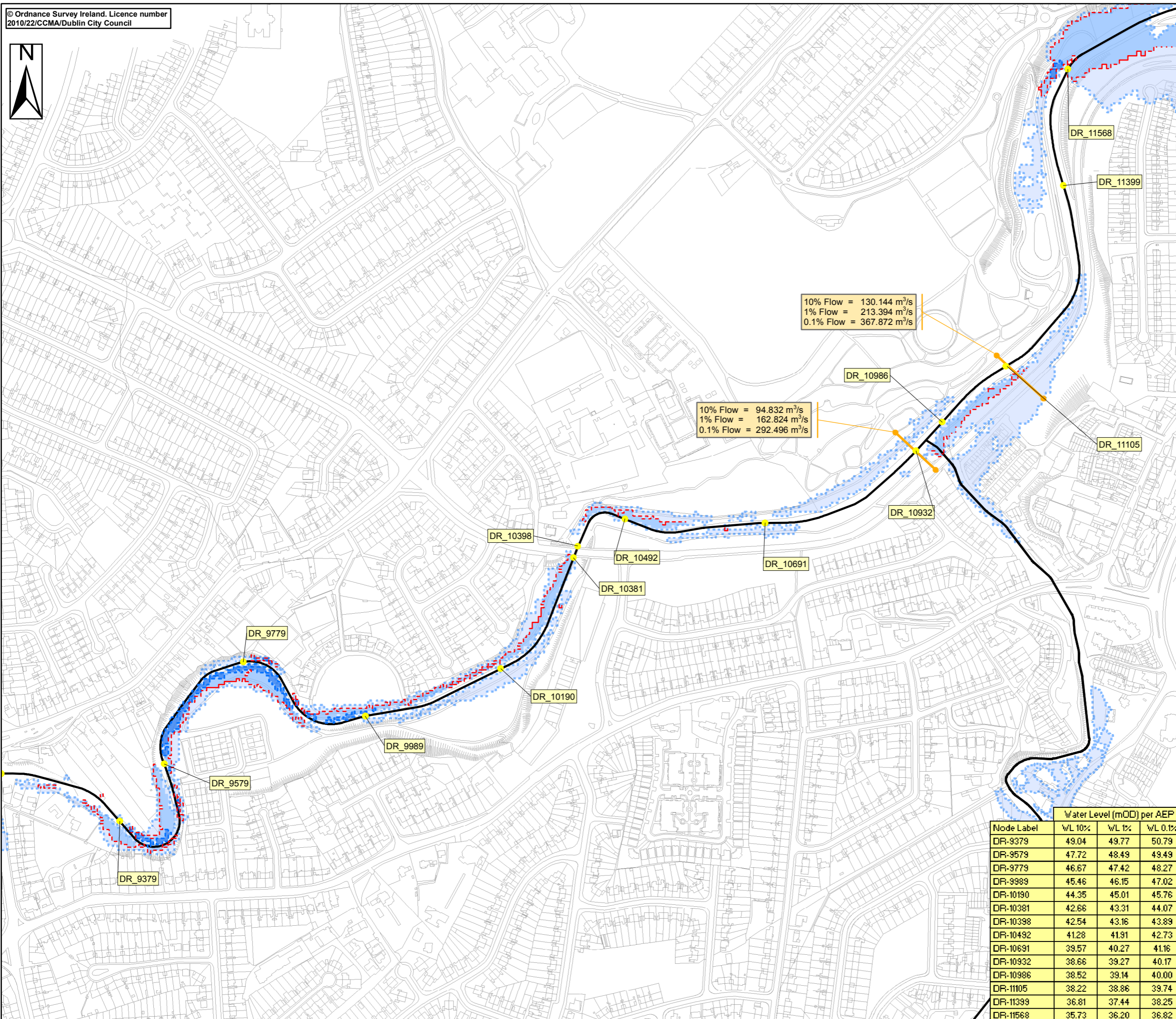
Figure No.: **DR/EXT/UA/CURS/101**

Map Series: Page 4 of 12

Drawing Scale: 1: 5,000 Plot Scale: 1:1 @ A3



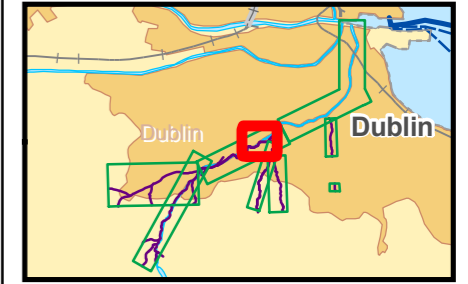
Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
DR-7219	63.58	64.54	65.43
DR-7284	63.31	64.28	65.17
DR-7499	62.39	63.26	64.23
DR-7769	60.77	61.59	62.33
DR-8029	59.02	59.76	60.63
DR-8138	58.43	59.21	59.95
DR-8156	58.32	59.15	59.85
DR-8409	56.74	57.33	58.16
DR-8569	55.81	56.59	57.48
DR-8769	54.60	55.33	56.24
DR-8969	53.06	53.74	54.62
DR-9195	51.57	52.20	52.93
DR-9162	52.09	52.60	53.38



10% Flow = 130.144 m³/s
 1% Flow = 213.394 m³/s
 0.1% Flow = 367.872 m³/s

10% Flow = 94.832 m³/s
 1% Flow = 162.824 m³/s
 0.1% Flow = 292.496 m³/s

Location Plan:



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
 - 1 % AEP Flood Extent (1 in 100 chance in any given year)
 - 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
 - Defended Area
 - High Confidence (<20m) (10% AEP)
 - Medium Confidence (<40m) (10% AEP)
 - Low Confidence (>40m) (10% and 0.1% AEP)
 - High Confidence (<20m) (1% AEP)
 - Medium Confidence (<40m) (1% AEP)
 - Low Confidence (>40m) (1% AEP)
 - River Centreline
 - Node Point
 - OS_2975 Node Label (refer to table)
 - Flow reporting location
- 10% Flow = 1.20
 1% Flow = 1.56
 0.1% Flow = 2.17
- Peak flow during design flood extent

USER NOTE:

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:



Project:

DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:

PRESENT DAY DODDER

Map Type: FLOOD EXTENT

Source: FLUVIAL FLOODING

Map Area: URBAN AREA

Scenario: CURRENT

Drawn By: A.A.B Date: 26 November 2010

Checked By: A.J. Date: 26 November 2010

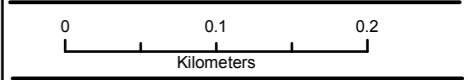
Approved By: A.G.B Date: 26 November 2010

Figure No.:

DR/EXT/UA/CURS/101

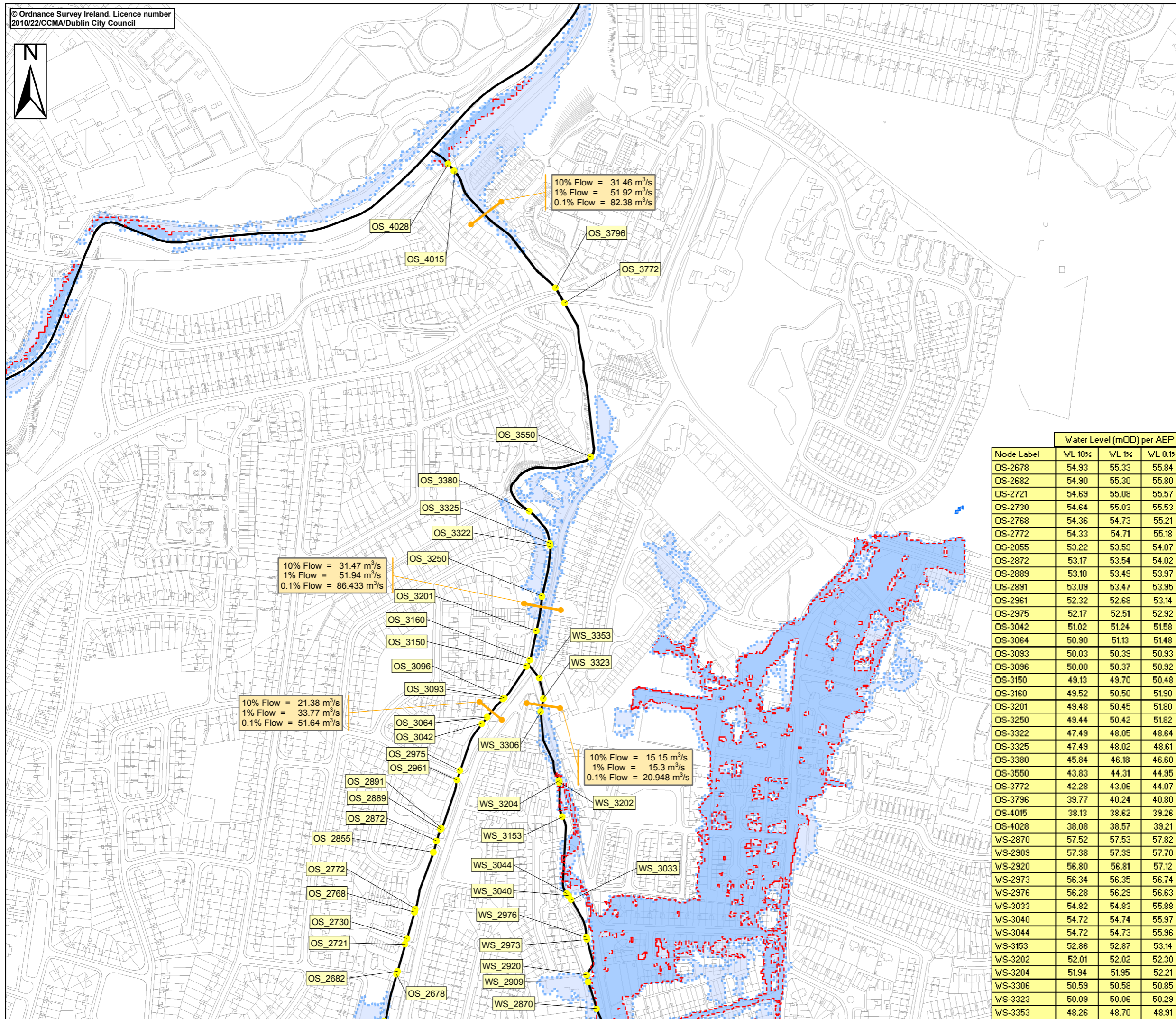
Map Series: Page 5 of 12

Drawing Scale: 1: 5,000 Plot Scale: 1:1 @ A3



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Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
DR-9379	49.04	49.77	50.79
DR-9579	47.72	48.49	49.49
DR-9779	46.67	47.42	48.27
DR-9989	45.46	46.15	47.02
DR-10190	44.35	45.01	45.76
DR-10381	42.66	43.31	44.07
DR-10398	42.54	43.16	43.89
DR-10492	41.28	41.91	42.73
DR-10691	39.57	40.27	41.16
DR-10932	38.66	39.27	40.17
DR-10986	38.52	39.14	40.00
DR-11105	38.22	38.86	39.74
DR-11399	36.81	37.44	38.25
DR-11568	35.73	36.20	36.82

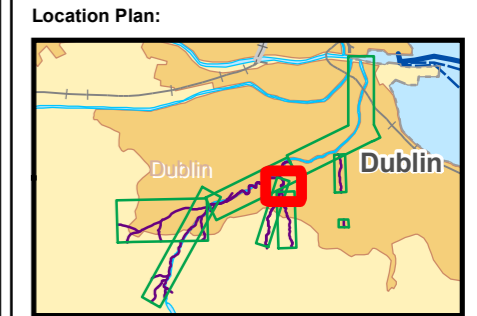


10% Flow = 31.46 m³/s
 1% Flow = 51.92 m³/s
 0.1% Flow = 82.38 m³/s

10% Flow = 31.47 m³/s
 1% Flow = 51.94 m³/s
 0.1% Flow = 86.433 m³/s

10% Flow = 21.38 m³/s
 1% Flow = 33.77 m³/s
 0.1% Flow = 51.64 m³/s

10% Flow = 15.15 m³/s
 1% Flow = 15.3 m³/s
 0.1% Flow = 20.948 m³/s



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- Node Label (refer to table)
- Flow reporting location

10% Flow = 1.20
 1% Flow = 1.56
 0.1% Flow = 2.17
 Peak flow during design flood extent

USER NOTE:
 USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:

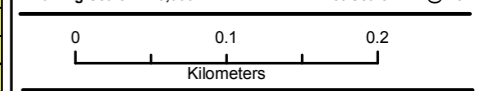
Project:
DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:
PRESENT DAY OWENDOHER & WHITECHURCH

Map Type: FLOOD EXTENT
Source: FLUVIAL FLOODING
Map Area: URBAN AREA
Scenario: CURRENT
Drawn By: A.A.B Date: 26 November 2010
Checked By: A.J. Date: 26 November 2010
Approved By: A.G.B Date: 26 November 2010

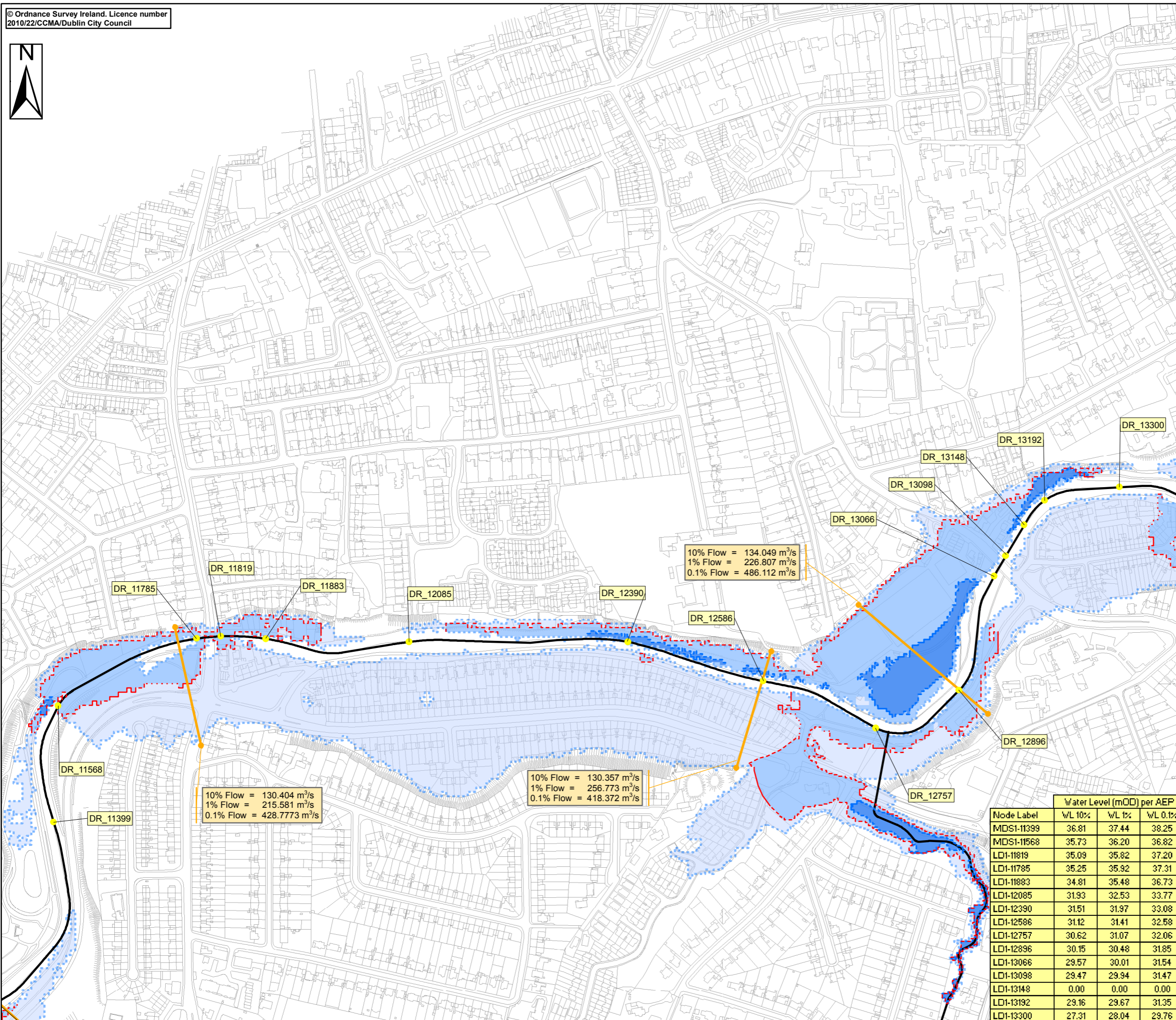
Figure No.:
OSWS/EXT/UA/CURS/103

Map Series : Page 3 of 3
 Drawing Scale : 1 : 5,000 Plot Scale : 1:1 @ A3

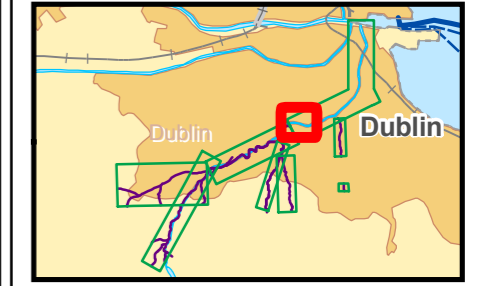


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Node Label	WL 10%	WL 1%	WL 0.1%
OS-2678	54.93	55.33	55.84
OS-2682	54.90	55.30	55.80
OS-2721	54.69	55.08	55.57
OS-2730	54.64	55.03	55.53
OS-2768	54.36	54.73	55.21
OS-2772	54.33	54.71	55.18
OS-2855	53.22	53.59	54.07
OS-2872	53.17	53.54	54.02
OS-2889	53.10	53.49	53.97
OS-2891	53.09	53.47	53.95
OS-2961	52.32	52.68	53.14
OS-2975	52.17	52.51	52.92
OS-3042	51.02	51.24	51.58
OS-3064	50.90	51.13	51.48
OS-3093	50.03	50.39	50.93
OS-3096	50.00	50.37	50.92
OS-3150	49.13	49.70	50.48
OS-3160	49.52	50.50	51.90
OS-3201	49.48	50.45	51.80
OS-3250	49.44	50.42	51.82
OS-3322	47.49	48.05	48.64
OS-3325	47.49	48.02	48.61
OS-3380	45.84	46.18	46.60
OS-3550	43.83	44.31	44.95
OS-3772	42.28	43.06	44.07
OS-3796	39.77	40.24	40.80
OS-4015	38.13	38.62	39.26
OS-4028	38.08	38.57	39.21
WS-2870	57.52	57.53	57.82
WS-2909	57.38	57.39	57.70
WS-2920	56.80	56.81	57.12
WS-2973	56.34	56.35	56.74
WS-2976	56.28	56.29	56.63
WS-3033	54.82	54.83	55.88
WS-3040	54.72	54.74	55.97
WS-3044	54.72	54.73	55.96
WS-3153	52.86	52.87	53.14
WS-3202	52.01	52.02	52.30
WS-3204	51.94	51.95	52.21
WS-3306	50.59	50.58	50.85
WS-3323	50.09	50.06	50.29
WS-3353	48.26	48.70	48.91



Location Plan:



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- OS_2975 Node Label (refer to table)
- Flow reporting location
- Peak flow during design flood extent

USER NOTE:

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Client:



Project:

DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:

PRESENT DAY DODDER

Map Type: FLOOD EXTENT

Source: FLUVIAL FLOODING

Map Area: URBAN AREA

Scenario: CURRENT

Drawn By: A.A.B Date: 26 November 2010

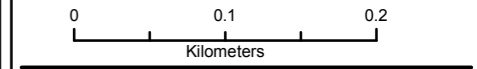
Checked By: A.J. Date: 26 November 2010

Approved By: A.G.B Date: 26 November 2010

Figure No.: **DR/EXT/UA/CURS/101**

Map Series: Page 6 of 12

Drawing Scale: 1: 5,000 Plot Scale: 1:1 @ A3



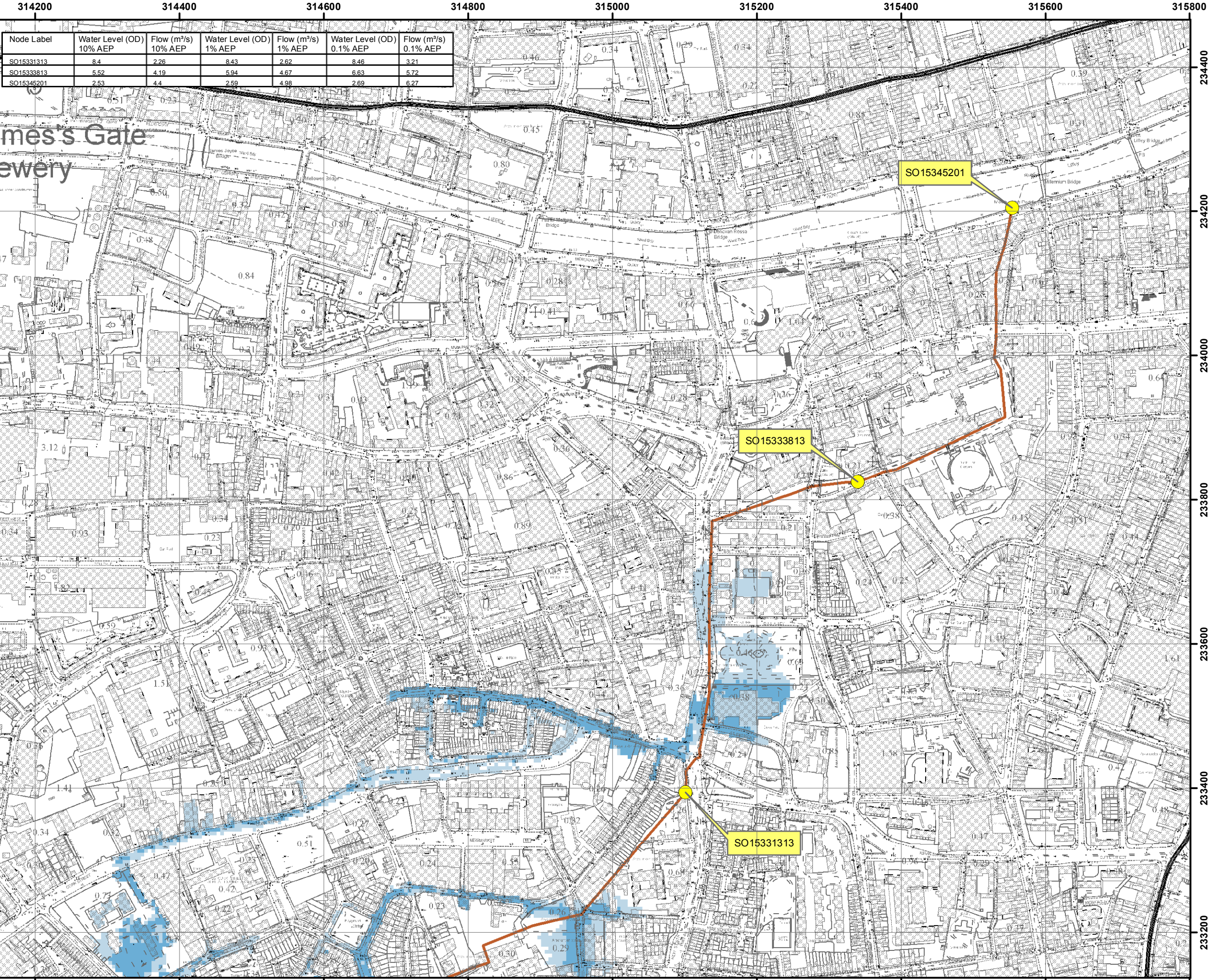
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 BELFAST BT12 6RZ www.rpsgroup.com/Ireland

Node Label	Water Level (mOD) per AEP		
	W/L 10%	W/L 1%	W/L 0.1%
MDS1-11399	36.81	37.44	38.25
MDS1-11568	35.73	36.20	36.82
LD1-11819	35.09	35.82	37.20
LD1-11785	35.25	35.92	37.31
LD1-11883	34.81	35.48	36.73
LD1-12085	31.93	32.53	33.77
LD1-12390	31.51	31.97	33.08
LD1-12586	31.12	31.41	32.58
LD1-12757	30.62	31.07	32.06
LD1-12896	30.15	30.48	31.85
LD1-13066	29.57	30.01	31.54
LD1-13098	29.47	29.94	31.47
LD1-13148	0.00	0.00	0.00
LD1-13192	29.16	29.67	31.35
LD1-13300	27.31	28.04	29.76

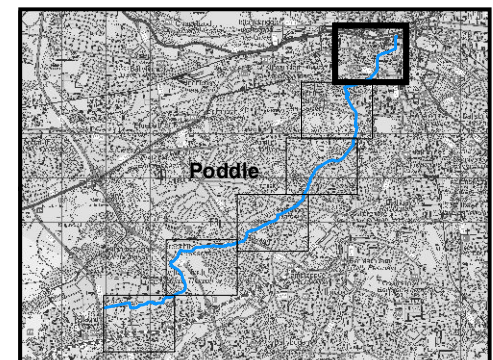
10% Flow = 134.049 m³/s
 1% Flow = 226.807 m³/s
 0.1% Flow = 486.112 m³/s

10% Flow = 130.357 m³/s
 1% Flow = 256.773 m³/s
 0.1% Flow = 418.372 m³/s

10% Flow = 130.404 m³/s
 1% Flow = 215.581 m³/s
 0.1% Flow = 428.7773 m³/s



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
SO15331313	8.4	226	8.43	2.62	8.46	3.21
SO15333813	5.52	4.19	5.94	4.67	6.63	5.72
SO15345201	2.53	4.4	2.59	4.98	2.69	6.27



IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Node Point
 - Node ID Node Label

FINAL

REV:	NOTE:	DATE:
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Map:	
Poddle River Fluvial Flood Extents	
Map Type: EXTENT	
Source: FLUVIAL	
Map Area: HPW	
Scenario: CURRENT	
Drawn By: F.M.C.	Date: 11 August 2016
Checked By: A.S.	Date: 11 August 2016
Approved By: S.P.	Date: 11 August 2016
Drawing No.:	
E09POD_EXFCD_F0_06	
Map Series: Page 6 of 6	
Drawing Scale: 1:5,000 @A3	

