

VICTORIA CROSS ROAD
STUDENT ACCOMMODATION SHD

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4539/RM/07-22

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DOCUMENT CONTROL			
REVISION	STATUS	DATE	AUTHOR
-	Issue for Planning	19.07.22	R.M

1. Introduction

JODA Engineering Consultants were commissioned to prepare a Flood Risk Assessment (FRA) to accompany a SHD application for Student accommodation at Wilton Road, Victoria Cross, Cork City.

1.1. Relevant Guidance

This FRA has been undertaken in consideration with 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' DOEHLG November 2009, which is the latest guidance document. The guidance has been issued to ensure that flood risk is a key consideration for developers, planning & regional authorities and the public in preparing and submitting development proposals. The principles of the guidance are as follows:

- Avoid the risk, where possible
- Substitute less vulnerable users, where avoidance is not possible, and
- Mitigate and manage the risk, where avoidance and substitution are not possible

1.2. Flood Risk

Flood risk can be quantified by relating the probability of the flood event occurring to the consequence of the flood. Probability, in flood event terms, is gauged by potential annual occurrence/return period and flood consequence is dependent on the nature of the flood hazard and the vulnerability of the inundated area. The source-pathway-receptor model considers the components of flood risk.



Figure 1: Flood Risk Components

The source is the hazard with the potential to cause harm through flooding (e.g., rainfall, high sea levels). The pathway is the mechanism by which the source can affect the receptor (e.g., inadequate drainage, overtopping of coastal defences) and finally, the receptor is anything which is affected by the flood event (e.g., people, infrastructure, property).

1.3. Causes of Flooding

The Planning System and Flood Risk Management Guidelines requires an FRA to consider all potential causes of flooding including the following:

- Coastal flooding
- Inland flooding
 - Overland flow
 - River flooding
 - Flooding from artificial drainage systems
 - Groundwater flooding
 - Estuarial flooding
- Failure of infrastructure

1.4. Assessing Flood Risk

In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' three flood zones are designated in the consideration of flood risk to a particular site. The three flood zones are described in Table 1 below.

Table 1: Flood Zones

Flood Zone	Description
Flood 'Zone A'	where the probability of flooding from watercourses is the highest (greater than 1% or 1 in 100 year for watercourse flooding or 0.5% or 1 in 200 for coastal flooding).
Flood 'Zone B'	where the probability of flooding from watercourses is moderate (between 0.1% or 1 in 1000 year and 1% or 1 in 100 year for watercourse flooding, and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).
Flood 'Zone C'	where the probability of flooding from watercourses and the sea is low or negligible (less than 0.1% or 1 in 1000 year for both watercourse and coastal flooding). Flood Zone 'C' covers all areas which are not in Zones 'A' or 'B'.

The planning implications for each of the flood zones are:

Zone A - High probability of flooding. Most types of development would be considered inappropriate in this zone. Development in this zone should be avoided and/or only considered in exceptional circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the Justification Test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation, would be considered appropriate in this zone.

Zone B - Moderate probability of flooding. Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met. Less vulnerable development, such as retail, commercial and industrial uses, sites used for short-let for caravans and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone. In general, however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to and from the development can or will adequately be managed.

Zone C - Low probability of flooding. Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations.

1.5 Vulnerability Class

The Guidelines classify potential development in terms of its vulnerability to flooding. The types of development falling within each vulnerability class are described in Table 3.1 of the Guidelines, which is reproduced in Table 2

Table 2: Vulnerability Class

Highly vulnerable development (including	<ul style="list-style-type: none"> Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points;
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essential infrastructure)	<ul style="list-style-type: none"> • 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; • 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	<ul style="list-style-type: none"> • 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; • Local transport infrastructure.
Water-compatible development	<ul style="list-style-type: none"> • 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; • Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

The Guidelines define the zones in which each class of development is appropriate – this is summarised in Table 3

Table 3: "Appropriateness" Matrix

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

The proposed development consists of student halls of residence and therefore, the development can be classed as a "highly vulnerable development" in accordance with the Guidelines.

2. Site Description

2.1. General Description

The site for the proposed development is located on the R641 Victoria Cross/Wilton Road and just north of the junction of Orchard Road. The site location is shown the figure below.



Figure 2: Victoria Cross Development Site

The site for the proposed development is in proximity to the confluence of the River Lee and the Curragheen River.

The site is bounded by:

- to the West by the Wilton Road;
- to the North by the Orchard Road;
- to the East and by Glasheen River;
- to the South by a Tyres shop and service centre.

The site is currently comprised of a disused structure.

2.2. Topography

The drawings confirm that the existing topographical levels within the proposed development site range from 5.00 m OD to 4.90m OD. The existing ground profile is generally flat

2.3 Proposed Development

The proposed development is for a Student Accommodation Development at Victoria Cross Road, Bishopstown, Cork comprising:

- *The demolition of existing structures on site; and*
- *The construction of 78 no. student accommodation apartments (ranging in size from single bed studio apartments to 8-bed apartments) comprising a total of 206 no. bed spaces in 1 no. 6 storey block;*
- *Student amenity facilities including a study area, games room, lounge space, laundry room and server/ICT room;*
- *The provision of landscaping and amenity areas including a courtyard space (including modifications to the external amenity area of the student accommodation scheme permitted under An Bord Pleanála Ref. 19/38385), 1 no. rooftop terrace and a riverfront amenity incorporating a pedestrian and cycle path accessing onto Ashbrook Heights and Orchard Road;*
- *The provision of a set down area, 1 no. access point (for emergency vehicles only), footpaths and repositioned pedestrian crossing and associated tactile paving on Orchard Road;*
- *The provision of a new junction build out at the junction of Orchard Road and Victoria Cross Road;*
- *The provision of footpaths and landscaped areas along Victoria Cross Road; and*
- *All associated ancillary development including pedestrian/cyclist facilities, lighting, drainage, boundary treatments, bin and bicycle storage and plant at ground and roof top levels.*

3.0 Flood Risk Identification

Flood risk identification is required to be undertaken to identify if there are any flooding or surface water management issues related to the proposed development site

Table 4: Possible Flooding Mechanisms

Sources/Pathway	Investigation Required?	Comment/Reason
Fluvial - River Flooding	YES	The site is located close to the confluence of the River Lee and the Curragheen River. There is a history of Fluvial flooding in this area
Tidal - Estuarine flooding	YES	Tidal flooding is possible due to the Lee Estuary downstream
Pluvial - Overland Flow	YES	The surrounding topography consists largely of hardstanding areas. The predominant route for any overland flow needs investigating
Hydraulic Infrastructure Influence	YES	Significant hydraulic infrastructure exists on both rivers. There are also flow control structures and flood relief proposals in place for the lower reaches of the River Lee, known as the Lower Lee (Cork City) Drainage scheme.
Groundwater flooding	NO	There are no significant springs or groundwater discharges recorded on the immediate vicinity of the site

Table 4 above demonstrates that the site is needs to be investigated with respect to fluvial, tidal, pluvial and the influence of hydraulic infrastructure.

3.1. Flood Risk Investigation

3.1.1 Historical Flood Events

The site is located close to the confluence of the River Lee and the Curragheen River. There is a history of flooding in this area and a review of the Office of Public Works National Flood Hazard Mapping portal (www.floodmaps.ie) has identified several flood events within 2.5km of the site area. A full output from this portal is included in Appendix A of this report.

The most significant of these events occurred on the 19th/20th November 2009, with widespread flooding of the city. This flooding event was attributed to a combination of heavy rainfall, high tides affecting the River Lee and a quantity of retained water discharged at the upstream Inniscarra Dam. This flooding scenario is sought to be remediated with the proposed flood defence scheme for Cork City.

3.1.2. Office of Public Works Flood Maps

The Lee Catchment Flood Risk Assessment and Management Study (Lee CFRAMS), a catchment-based flood risk assessment and management study of the entire Lee Catchment, including the River Lee, its tributaries and Cork Harbour, has being undertaken by The OPW and Cork City and County Council. The Office of Public Works (OPW) has recently launched an interactive map viewer (<http://www.floodinfo.ie/map/floodmaps/>) which displays the predicted flood extents for both rivers

and coastal areas over various return periods. The viewer was consulted in relation to the proposed site and the adjacent waterbodies. Detailed flood maps are available for the area and the maps specific to the site, for both fluvial and Estuarine flooding events, are included in Appendix B of this report.

- M8/UA/EXT/CURS/009-Fluvial Flooding Current Scenario
- M8/UA/EXT/MRFS/009-Fluvial Flooding Mid-Range Future Scenario
- M9/UA/EXT/CURS/002-Tidal Flooding Current Scenario
- M9/UA/EXT/MRFS/002-Tidal Flooding Mid-Range Future Scenario

These drawings provide a predicted water level for several node points along the River Lee and its tributaries. The closest node point to the site of the proposed development is:

- 8GLA_86 (Fluvial Flooding)
- 8GLA_156 and CUR_327 (Tidal Flooding)

The predicted flood levels associated with the above node points for each scenario are shown in Table 5 below

Table 5: Predicted Flood Levels for Fluvial and Tidal scenarios

Flood Event	Map Reference	AEP	Node Point (8GLA_86)
-	-	%	
Fluvial (Current)	M8/UA/EXT/CURS/009	10	4.67m OD
		1	4.97m OD
		0.1	5.13m OD
Fluvial (Mid-Range Future Scenario)	M8/UA/EXT/MRFS/009	10	4.87m OD
		1	5.20m OD
		0.1	5.79m OD

Flood Event	Map Reference	AEP	Node Point (8GLA_156)	Node Point (8CUR_327)
-	-	%		
Tidal (Current)	M9/UA/EXT/CURS/002	10	4.30m OD	3.46m OD
		0.5	4.55m OD	4.20m OD
		0.1	4.70m OD	4.54m OD
Tidal (Mid-Range future scenario)	M9/UA/EXT/MRFS/002	10	4.35m OD	4.07m OD
		0.5	5.17m OD	4.73m OD
		0.1	5.36m OD	4.92m OD

As can be seen from Table 5, the predicted levels for the fluvial flood events are generally higher than the tidal level and will govern the selection of the ground floor level.

Node Point (8GLA_86) is deemed to be the most critical node point for the proposed Wilton Road site. A Fluvial mid-range future scenario for 1% AEP indicates a level of 5.20m OD.

3.1.3. Lower Lee Flood Relief Scheme

Arising out of the Lee CFRAMS, the OPW commissioned the development of a Flood Relief Scheme for the lower reaches of the River Lee, known as the Lower Lee (Cork City) Flood Relief Scheme. Details of the proposed scheme are currently available on the website www.lowerleefrs.ie. The Scheme is

designed to cater for the 1% Annual Exceedance Probability (AEP) fluvial flood event (also known as the 100-year fluvial flood event) and the 0.5% AEP tidal flood event (also known as the 1 in 200-year tidal flood event).

The proposals in the vicinity of the Victoria Cross site are included in Appendix C of this report. These proposals identify a flow regulation structure to be provided in the south channel of the River Lee close to the site with the narrowing of the channel to 15m. The structure will be closed during extreme flood events to reduce flow in the south channel. The existing footbridge is also proposed to be removed and replaced with a vehicular bridge. A proposed flood defence level of 5.80m OD is indicated at this point.



Figure 3: Location of Proposed flow regulation in close proximity to the site

The subject site at Wilton Road benefits from enhanced flood protection measures for the lower lee defence scheme. Once implemented, the site will be defended from the extreme Lee Flood events. Appendix C includes drawing number LL_126 - Flood Extents and Benefitting Areas. The proposed site falls into the following category 'Lands defended against River Lee events up to the 1% AEP Fluvial / 0.5% AEP Tidal.

4.0 Flood Risk Assessment – Selection of Ground Floor Level

The DEHLG/OPW Guidelines recommend that floor levels for a new development should be set above the anticipated 1%AEP (1 in 100 river) flood level and 0.5%AEP (1 in 200) coastal flood level, including an allowance for climate change, with appropriate freeboard, to adequately mitigate the risk of flooding.

As discussed above, the outputs from the Lee CFRAMS have been assessed in detail in determining an appropriate ground floor level to achieve an adequate protection against the risk of flooding. In addition, the proposals for Lower Lee (Cork City) Drainage Scheme have also been reviewed.

The ground floor level has been determined based on the 1% AEP for the Fluvial mid-range future scenario of 5.20m OD for the River Glasheen and applying a freeboard of 0.3m giving a final level of 5.50m OD. This level is below the proposed flood defence level of 5.80m OD for the Lower Lee (Cork City) Drainage Scheme in the vicinity of the site.

In turn and in advance of the implementation of the lower Lee Flood Defence scheme, a floor level of 5.90m is deemed appropriate for the Wilton Road, Victoria Cross site.

If a sprinkler system is required as part of a fire cert for this development, all associated pumps will be either submersible or alternatively at or above the indicated floor level 5.90m OD. Substations, switch rooms and Plant rooms associated with the Victoria Cross development will also be at or above the indicated floor level of 5.90m OD.

The following flood risks are satisfied by specifying a floor level of 5.9m OD for the site

4.1 Fluvial Flooding Mitigation

The Lee CFRAMS study indicates that predicted flood extents for the 0.1% AEP and the 1% AEP will include the site of the proposed development. Please refer to drawing M8/UA/EXT/CURS/009 included in Appendix B of this report, with an extract portion of this drawing included in Figure 4 below.

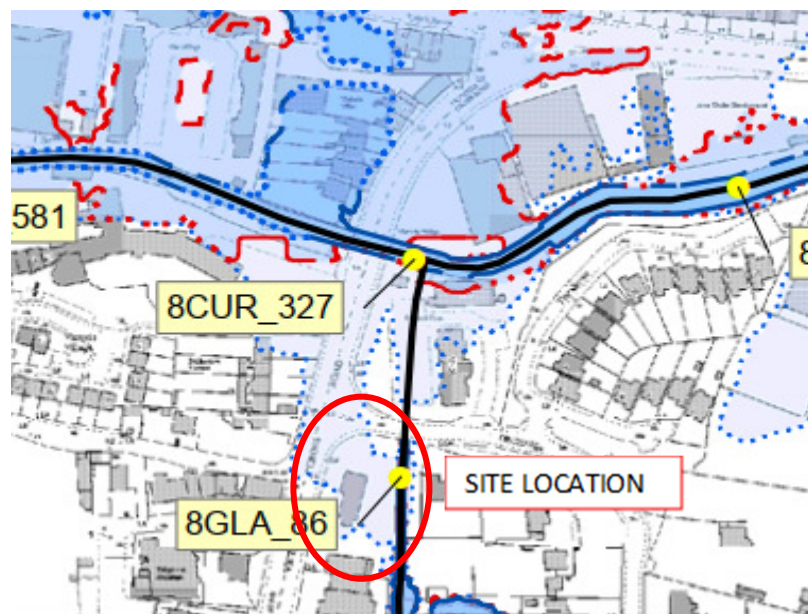


Figure 4: Extract from current Fluvial Flood Scenario

Based on the above, it is concluded that the site of the proposed development is within **Flood Zone B** for fluvial flooding. However, as discussed previously in this report, the ground floor level of the proposed development has been determined based on the 1% AEP for the mid-range future scenario of 5.20m OD for the River Lee and applying a freeboard giving a proposed floor level of 5.90m OD. This level is also more than the proposed flood defence level of 5.8m OD for the Lower Lee (Cork City) Drainage Scheme in the vicinity of the site.

Fluvial flood risks are satisfied by specifying a floor level of 5.90m OD for the site

4.2 Tidal Flooding Mitigation

The Lee CFRAMS study indicates that predicted flood extents for the 0.1% AEP will not include the site of the proposed development. Please refer to drawing M9/UA/EXT/CURS/002 included in Appendix B of this report, with a portion of this drawing included as Figure 5 below.

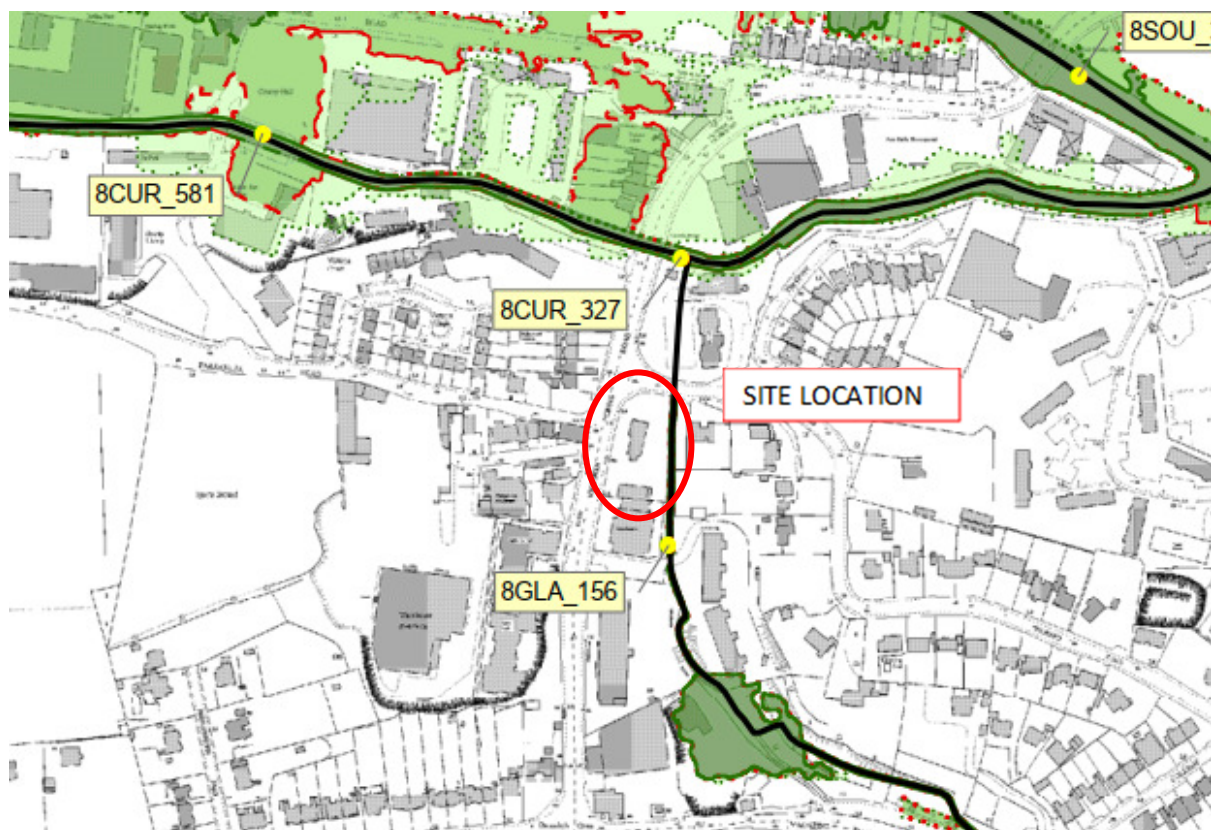


Figure 5: Tidal Flooding

Based on the above, it is concluded that the site of the proposed development is within Flood Zone C for tidal flooding. It is noted that based on Table 5, the predicted levels for the fluvial flood events are generally higher than the tidal level and will govern the selection of the ground floor level. Tidal flooding is not the critical case.

Tidal flood risks are satisfied by specifying a floor level of 5.9m OD for the site

4.3 Pluvial Flooding Mitigation (Existing and Proposed Drainage)

The option of defending the entire site from inundation from the River Lee was considered. This was deemed impractical due to the following:

- A need to maintain courtyard access for fire tenders, refuse trucks and service vehicles.

- The potential complete severing of local flood flow paths to / from the Curraheen river to the adjacent flood plain

An alternative partial defence strategy was chosen which provides protection to vulnerable receptors (i.e people and property) by increasing the floor levels of the proposed occupiable building footprint on the site, whilst maintaining existing ground levels elsewhere on site.

The overall flooding protection strategy is designed to maintain potential overland flow paths for the Glasheen river with the minimal possible intervention to the existing operation of the floodplain. Please refer to attached sketches in Appendix D-E for more information. The following summarises the proposed key flooding parameters:

Proposed site levels:

Existing retained average Ground level at the site	= 4.93 m
1% AEP Flood level (Current scenario) at node point (8GLA_86) on the River Lee	= 4.97 m
The proposed occupiable building ground floor level	= 5.90 m

Proposed site areas:

Overall site area	= 2000 m² (100% of total site area)
Area of proposed raised building footprint ground floor level	= 1100 m² (55% of total site area)
Area of existing ground levels and external courtyard level	= 900 m² (45% of total site area)

Rainwater collected from the roof of the proposed building will be discharged directly to the Glasheen river. This discharge can be maintained during flood events, as the floor level of 5.90m will be above the flood level of and will have minimal impact on the original discharge rates.

There will be a decrease in surface water run-off from the site due to the proposed development, because in the surface water strategy is provided to limit the run-off discharge rate. Rainwater runoff from the development will be controlled by the installation of new building drainage systems discharging directly to the Glasheen river.

Pluvial flood risks are satisfied by specifying a floor level of 5.90m OD for the site.

5.0 Justification Test

Planning guidelines on The Planning System and Flood Risk Management were published by the Department of the Environment, Heritage and Local Government (DOEHLG) in November 2009.

Given the Flood Zone (B) of the site and the proposed development, being residential in nature, is classed as a highly vulnerable development in accordance with Table 3.1 of the Guidelines. The sequential approach to a planning assessment of the site as shown in Figure 3.2 of the Guidelines indicates that a Justification Test for development management is required for the proposed development.

The justification test is divided in two parts in line with the DOEHLG Guidelines:

1. Box 4.1 of DOEHLG- Justification Test for Development Plans

The Justification Test for Development Plans is undertaken and included in Appendix F of this report

2. Box 5.1 of DOEHLG- Development Management Justification Test

Table 6: Development Management Justification Test

1)	The subject lands have been zoned for the particular use?
	The site has been zoned as ZO 01 'Sustainable Residential Neighbourhoods' within the Cork City Development Plan 2022-2028. Documentation provided by the design team to support the SHD Application for the development, show that the proposed development is consistent with the form of development envisaged for such zoned lands.
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
	The preceding sections of this report demonstrate that the permitted development will not increase 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;
	The preceding sections of this report describe how raising the finished floor level of the building to a level of 5.90m OD is used as a mitigation measure to minimise flood risk to vulnerable receptors
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
	The preceding sections of this report describe how residual risks are managed
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
	Refer to documentation provided by the design team in support of the planning application that demonstrate the proposed development is consistent with the requirements of the current Development Plan and will maintain the visual character of the surrounding area.

Conclusion: The subject site passes the Justification Test for Development Management.

6.0 Conclusion and Recommendations

This report has been prepared to provide a site-specific flood risk assessment for a proposed Student Accommodation development at Wilton Road, Victoria Cross, Cork City.

The proposed student residence is classified as a highly vulnerable development in accordance with *the Planning System and Flood Risk Management Guidelines for Planning Authorities*.

The site is deemed to be within Flood Zone B for Fluvial Flooding.

The ground floor level for the proposed building has been determined based on the 1% AEP for the mid-range future scenario of 5.20m OD for the River Lee and applying a freeboard of 0.3m giving a final level of 5.50m OD. This level is below the proposed flood defence level of 5.80m OD for the Lower Lee Drainage Scheme in the vicinity of the site. **A finished floor level of 5.90m OD is deemed acceptable for the proposed development**

The proposed drainage system has been designed in accordance with the relevant standards and regulations. Therefore, the flood risk arising from the proposed drainage infrastructure will be negligible and no further mitigation is proposed.

The available data shows that the site is within Flood Zone B for Fluvial and Zone C for Tidal Flooding. Given that the proposed development is classified as highly vulnerable, a justification Test has been carried out in accordance with *The Planning System and Flood Risk Management Guidelines for Planning Authorities*. The results show that the subject development passes the Justification Test.

APPENDIX A- REPORT FROM OPW NATIONAL FLOOD HAZARD MAPPING

Past Flood Event Local Area Summary Report

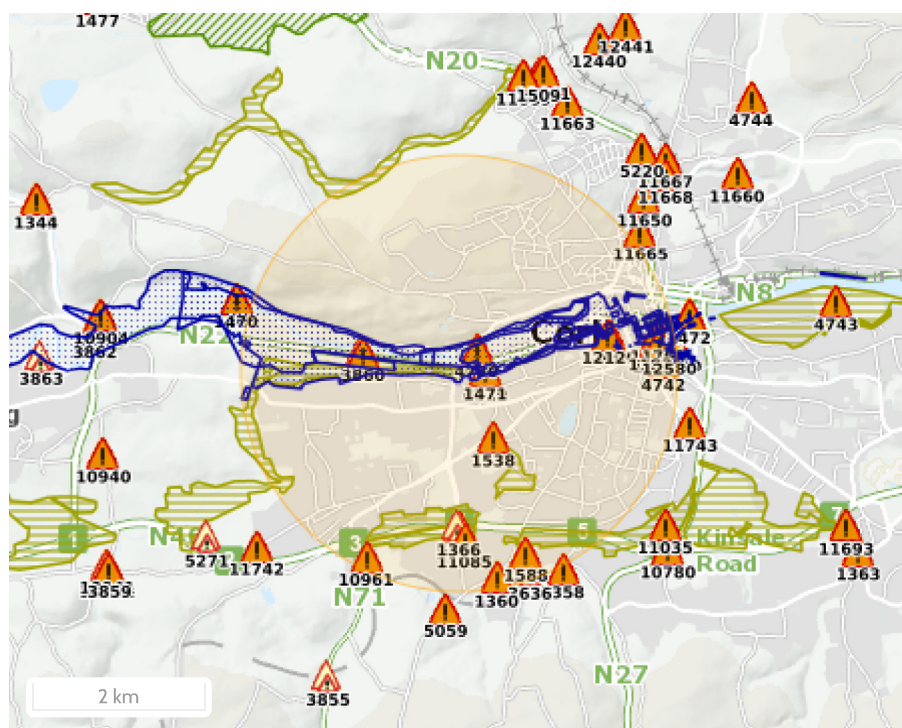


OPW Oifig na nOibreacha Poiblí
Office of Public Works

Report Produced: 16/12/2020 16:16

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

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




















Map Legend

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

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

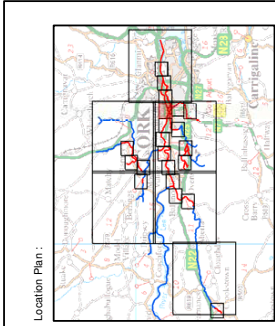
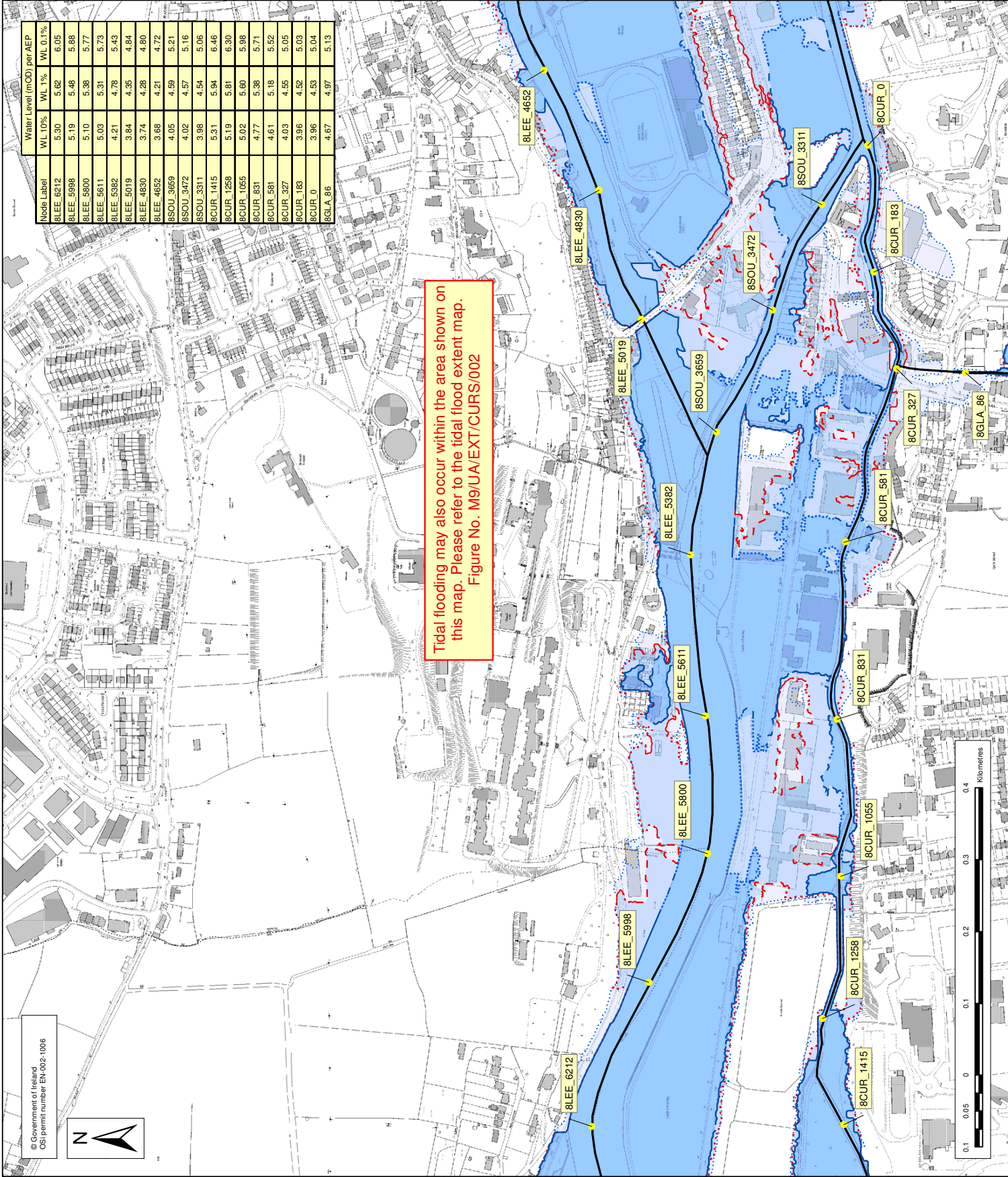
28 Results

Name (Flood_ID)	Start Date	Event Location
1. Cork City from 26th. To 29th.October 2015 (ID-12580) Additional Information: Reports (1) Press Archive (0)	26/10/2015	Approximate Point
2. Cork City October 2004 (ID-4731) Additional Information: Reports (1) Press Archive (0)	27/10/2004	Area
3. Carrigrohane Road, Co. Cork Recurring (ID-3860) Additional Information: Reports (11) Press Archive (2)	n/a	Approximate Point
4. Lee Cork City Jan 1996 (ID-455) Additional Information: Reports (10) Press Archive (1)	06/01/1996	Area
5. Lee Cork City August 1986 (ID-6) Additional Information: Reports (2) Press Archive (3)	05/08/1986	Area
6. Doughcloyne, Togher Cork City Nov 2002 (ID-1360) Additional Information: Reports (3) Press Archive (0)	21/11/2002	Approximate Point

	Name (Flood_ID)	Start Date	Event Location
7.	 Sarsfield Road Wilton Cork City Jan 1993 (ID-1366) Additional Information: Reports (3) Press Archive (0)	08/08/1993	Approximate Point
8.	 Lee Victoria Cross November 2000 (ID-1471) Additional Information: Reports (2) Press Archive (0)	28/11/2000	Approximate Point
9.	 Glasheen river, Cork City Feb 1994 (ID-1538) Additional Information: Reports (1) Press Archive (0)	22/02/1994	Approximate Point
10.	 Togher Cork City November 2000 (ID-1588) Additional Information: Reports (4) Press Archive (0)	05/11/2000	Approximate Point
11.	 Palmbury Estate Flooding, Togher, recurring (ID-3636) Additional Information: Reports (3) Press Archive (0)	n/a	Approximate Point
12.	 Greenwood Estate, Togher, Co. Cork Nov 2002 (ID-3637) Additional Information: Reports (3) Press Archive (0)	21/11/2002	Approximate Point
13.	 Lee Inniscarra to Cork City Aug 1986 (ID-492) Additional Information: Reports (8) Press Archive (3)	05/08/1986	Area
14.	 Lee Carrigrohane Road Feb 1990 (ID-4728) Additional Information: Reports (3) Press Archive (3)	03/02/1990	Exact Point
15.	 Lee Victoria Cross Feb 1990 (ID-4729) Additional Information: Reports (1) Press Archive (1)	03/02/1990	Exact Point
16.	 Lee University Athletic Grounds Feb 1990 (ID-4730) Additional Information: Reports (1) Press Archive (0)	06/02/1990	Exact Point
17.	 Douglas St Cork Jan 1988 (ID-4742) Additional Information: Reports (1) Press Archive (0)	12/01/1988	Approximate Point
18.	 Togher Upper Nov 2000 (ID-5234) Additional Information: Reports (2) Press Archive (3)	05/11/2000	Approximate Point
19.	 Sarsfield Road, Wilton, Cork City recurring (ID-5325) Additional Information: Reports (2) Press Archive (0)	n/a	Approximate Point
20.	 Cork City 17th.December 2012 (ID-11831) Additional Information: Reports (1) Press Archive (0)	17/12/2012	Approximate Point
21.	 Cork City on 17th October 2012 (ID-11760) Additional Information: Reports (1) Press Archive (0)	17/10/2012	Approximate Point
22.	 Flooding in Cork City Centre 2nd January 2014 (ID-12120) Additional Information: Reports (1) Press Archive (0)	02/01/2014	Approximate Point
23.	 Cork City 16th and 17th October 2012 (ID-11825) Additional Information: Reports (2) Press Archive (0)	16/10/2012	Approximate Point
24.	 Flooding in Cork City Centre, 3rd February 2014 (ID-12095)	03/02/2014	Approximate Point

Name (Flood_ID)		Start Date	Event Location
Additional Information: Reports (1) Press Archive (0)			
25.	 Lee Carrigrohane Nov 1997 (ID-1466)	18/11/1997	Approximate Point
Additional Information: Reports (3) Press Archive (0)			
26.	 Cork City Flooding 19th.Nov. 2009 (ID-10820)	19/11/2009	Area
Additional Information: Reports (4) Press Archive (0)			
27.	 Flooding at Bishopstown Co Cork Nov 2009 (ID-10961)	19/11/2009	Approximate Point
Additional Information: Reports (1) Press Archive (0)			
28.	 Sarsfield Road Roundabout N22 Cork 12th January 2010 (ID-11085)	12/01/2010	Approximate Point
Additional Information: Reports (1) Press Archive (0)			

APPENDIX B- LEE CFRAMS EXTRACTS



EXTENT MAP

Legend:

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

USER NOTE:
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halcrow **OPW**

Office of Public Works
17-19 Lower Hatch Street
Dublin 2
Ireland

Project: LEE CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY
Map: CORK CITY

Map Type: FLOOD EXTENT
Source: FLUVIAL FLOODING
Map area: URBAN AREA
Scenario: CURRENT

Figure By: Valeria Medina Date: 10 March 2014
Checked By: Ricardo Santalla Date: 10 March 2014
Approved By: Claire Dewar Date: 10 March 2014

Figure No: M9/UA/EXT/CURS/009
Revision: 2

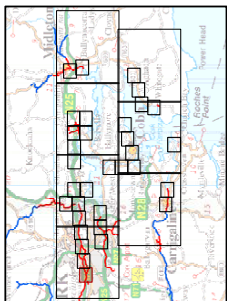
Drawing Scale: 1:5,000 Plot Scale: 1:1 @ A3



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CSI permit number EN-002-1006

Fluvial flooding may also occur within the area shown on this map. Please refer to the fluvial flood extent map. Figure No. M8/UA/EXT/CURS/009

Location Plan:



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 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) (0.5% AEP)
- Medium Confidence (<40m) (0.5% AEP)
- Low Confidence (>40m) (0.5% AEP)
- River Centreline
- Node Point
- Node Label (refer to table)

USER NOTE:

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Dublin 2
Ireland

Office of Public Works
17-19 Earlsfort Terrace
Dublin 2
Ireland

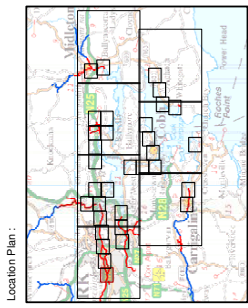
Project:	LEE CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY
Map:	CORK CITY
Map Type:	FLOOD EXTENT
Source:	TIDAL FLOODING
Map area:	URBAN AREA
Scenario:	CURRENT
Figure By:	Valeria Medina
Figure Date:	10 March 2014
Checked By:	Ricardo Santalla
Check Date:	10 March 2014
Approved By:	Claire Dewar
Approve Date:	10 March 2014
Figure No:	M9/UA/EXT/CURS/002
Revision:	2
Drawing Scale:	1:1 @ A3



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Node Label	Water Level (mOD) per AEP			
	WL 10%	WL 0.5%	WL 0.1%	WL 0.1%
8LEE_5611	4.92	5.28	5.55	5.55
8LEE_5382	4.22	4.92	5.16	5.16
8LEE_5019	4.03	4.57	4.76	4.76
8LEE_4830	3.98	4.53	4.73	4.73
8LEE_4652	3.94	4.48	4.67	4.67
8CUR_831	4.46	5.35	5.58	5.58
8CUR_581	4.35	5.17	5.36	5.36
8CUR_327	4.07	4.73	4.92	4.92
8CUR_0	4.04	4.72	4.92	4.92
8GLA_156	4.42	4.76	4.98	4.98
8GLA_478	7.76	7.95	8.05	8.05
8SOU_3659	4.10	4.77	4.99	4.99
8SOU_3472	4.08	4.75	4.97	4.97
8SOU_3311	4.05	4.73	4.93	4.93



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 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) (0.5% AEP)
- Medium Confidence (<40m) (0.5% AEP)
- Low Confidence (>40m) (0.5% AEP)
- River Centreline
- Node Point
- Node Label (refer to table)

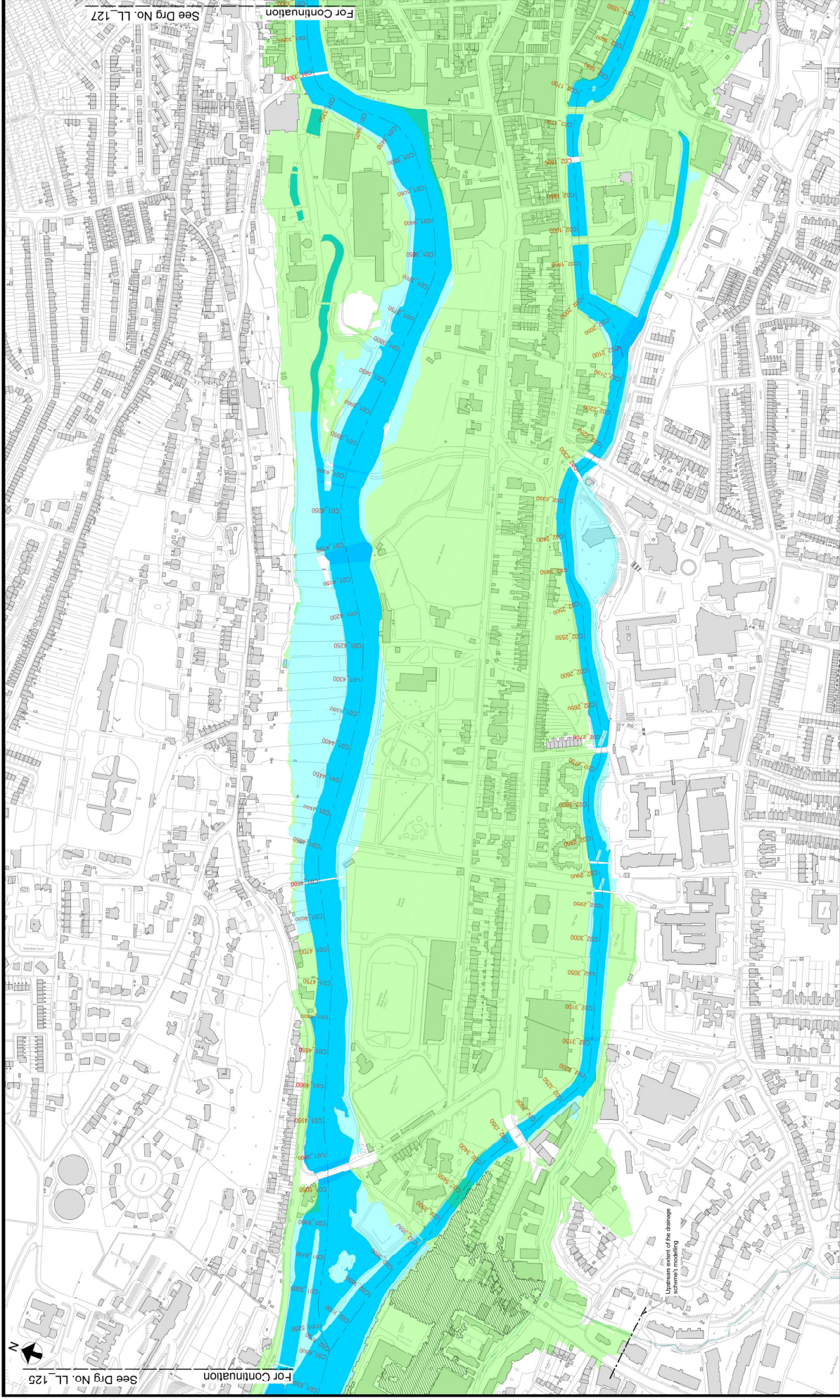
USER NOTE:

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Office of Public Works
17-18 Usher's Quay
Dublin 2
Ireland

Project:	LEE CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY
Map:	CORK CITY
Map Type:	FLOOD EXTENT
Source:	TIDAL FLOODING
Map area:	URBAN AREA
Scenario:	MID RANGE FUTURE SCENARIO
Figure By:	Valeria Medina
Figure Date:	10 March 2014
Approved By:	Claire Dewar
Approved Date:	10 March 2014
Figure No:	M9/UA/EXT/MRFS/002
Revision:	2
Plot Scale:	1:1 @ A3
Drawing Scale:	1:5,000

APPENDIX C- LOWER LEE (CORK CITY) FLOOD RELIEF EXTRACTS



Location Plan

Scale 1:2,500 at A1
Scale 1:5,000 at A3

- Legend:**
- 1% AEP Fluvial (River Lee) / 0.5% AEP Tidal Flood Extent (1 in 100 year fluvial / 1 in 200 year tidal flood extent)
 - 1% AEP Fluvial / 0.5% AEP Tidal
 - Deferred Lands
 - Lands defended against River Lee events up to the 1% AEP Fluvial / 0.5% AEP Tidal, but retaining a residual risk of flooding from extreme Cunningham flood events
 - Watercourse
 - Channel Centerline Reference (C01) and Channel Change (1250)

0 50 100 Meters

Upstream extent of the drainage scheme's modelling

Notes:

- Do not scale from drawing.
- The channels on this drawing have been assigned colours for the purpose of assigning identification labels and interference references.
- This drawing should be read in conjunction with all other Lower Lee (Cork City) Drainage Scheme Exhibition Drawings and Schedules.

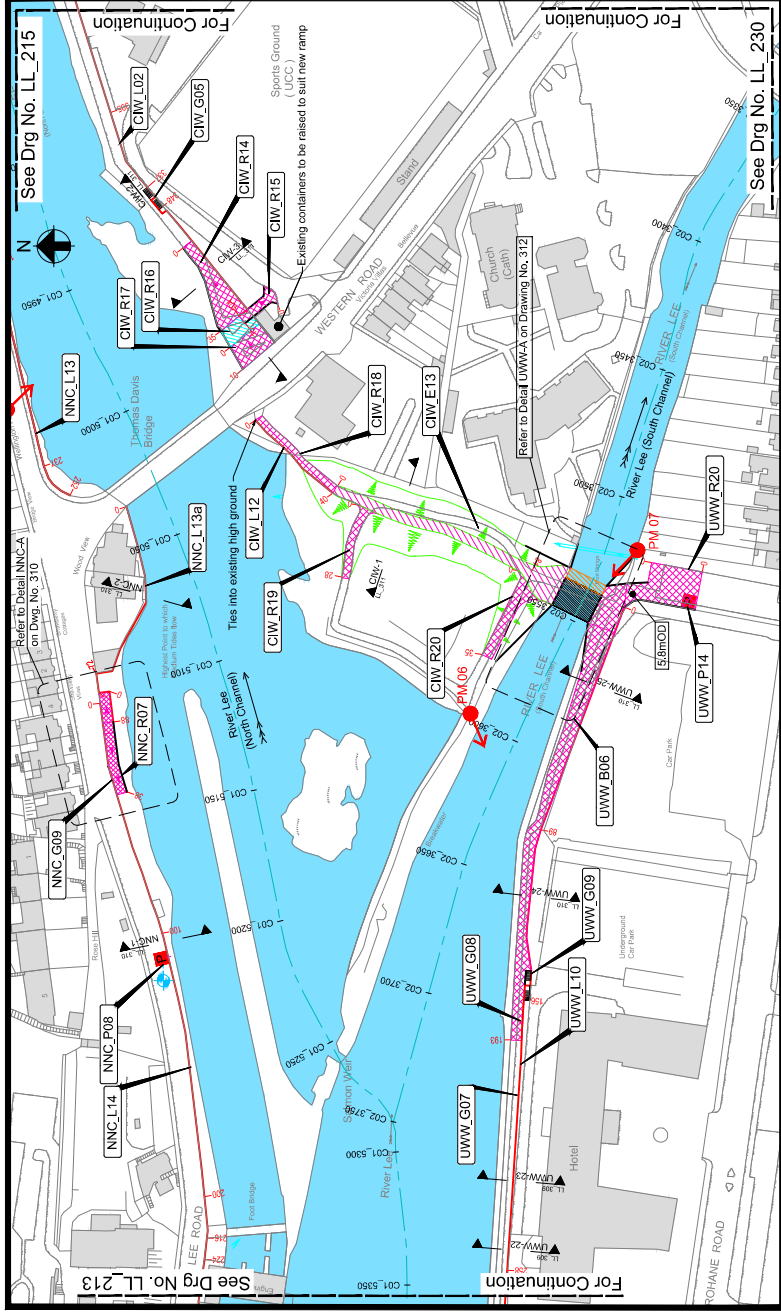
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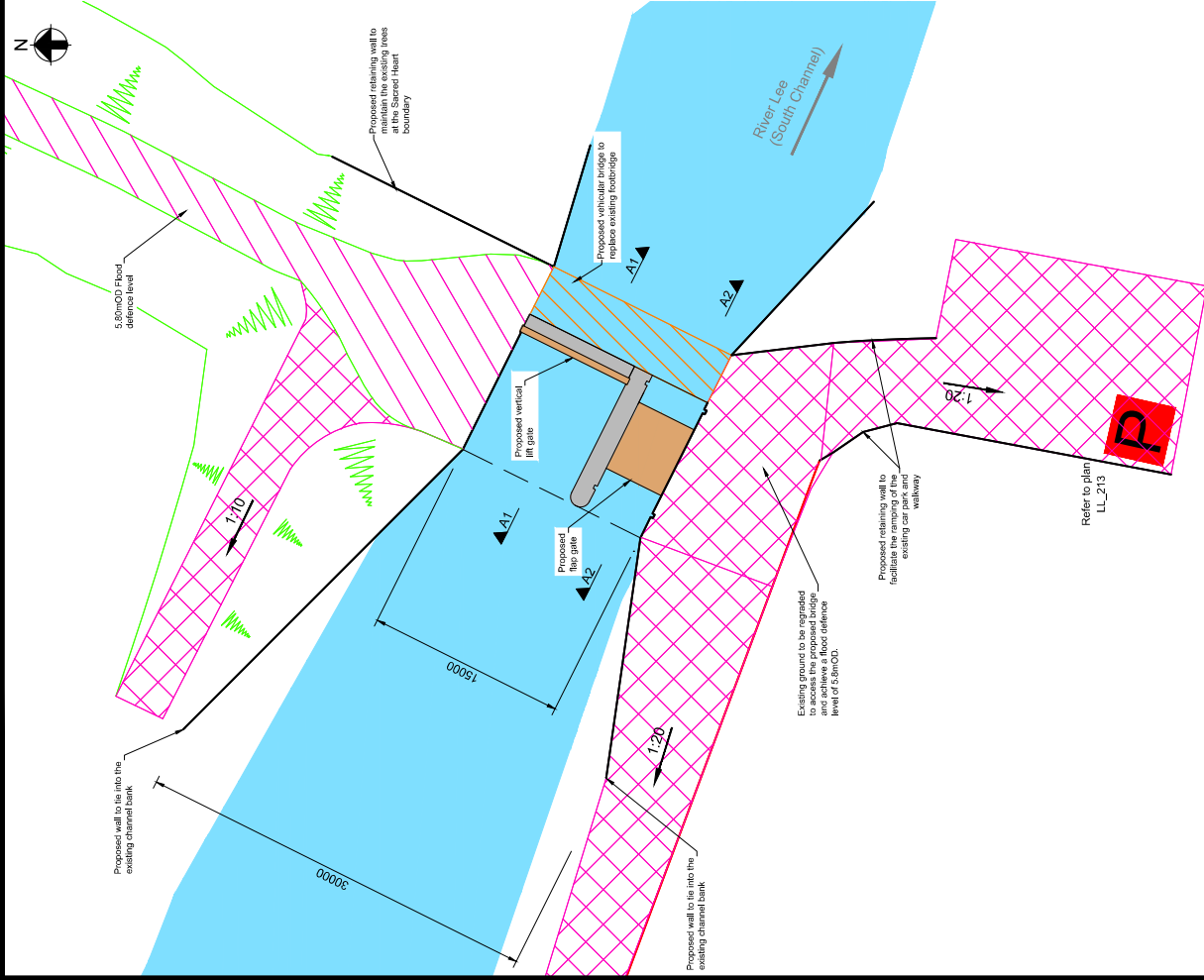
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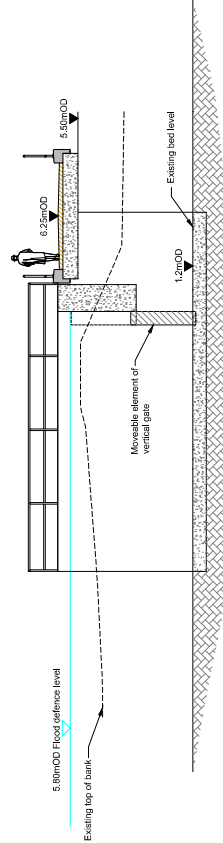
Interference Reference	Scheme Element (m) (DS-US)	Channel Chaiange (m)	General Description of New Works
NNC_L13	168 to 252	C01_4831 to C01_5019	Proposed sheet pile flood defence wall to be constructed to design flood level of 4.80mOD, up to 1.2m above existing ground levels. Wall to tie into existing wall at western end. All drainage outfalls to be fitted with non-return valves.
NNC_L13a	0 to 72	C01_5030 to C01_5092	Proposed sheet pile flood defence wall to be constructed in channel to flood defence level of 5.80mOD, typically 2.0m above existing ground levels on the dry side and 0.5m above floor levels. Proposed wall to tie into bridge abutment at eastern end and the proposed wall at the western end. All drainage outfalls to be fitted with non-return valves.
NNC_L13a	72 to 88	C01_5092 to C01_5110	Proposed reinforced concrete flood defence wall to be constructed to flood defence level of 5.80mOD, typically 1.2m above existing ground levels. Wall to tie into the proposed wall at the eastern end and the proposed existing at the western end. All drainage outfalls to be fitted with non-return valves.
NNC_R07	0 to 38	C01_5100 to C01_5139	Proposed vehicular access ramp to maintain access to the river bank. Ramp to have a maximum gradient of 1 in 10. Reinforced concrete retaining wall to be constructed to support the proposed ramp.
NNC_L14	0 to 216	C01_5102 to C01_5330	Proposed reinforced concrete flood defence wall to be constructed to flood defence level of 5.80mOD, up to 1.50m above existing ground levels.
NNC_L14	216 to 224	C01_5330 to C01_5340	Proposed sheet pile wall to be constructed to flood defence level of 5.80mOD, up to 1.3m above existing ground levels. Wall to tie into the proposed reinforced concrete flood defence wall at both ends. The wall is to be designed to allow for infrequent and controlled short term dismantling to access the adjacent site for maintenance.
NNC_G09	-	C01_5131 to C01_5135	Existing access to be extinguished.
NNC_P08	-	C01_5200	Proposed surface water pumping station and rising main to operate during a flood event. All outfalls to be fitted with non-return valves.
CIW_L02	61 to 305	C01_4852 to C01_4860	Existing concrete kerb and railing to be demolished and replaced with a reinforced concrete flood defence wall to flood defence level of 5.2mOD, typically 1.4m above existing wall level. All drainage outfalls to be fitted with non-return valves.
CIW_L02	305 to 406	C01_4860 to C01_4993	Existing concrete kerb and railing to be demolished and replaced with a reinforced concrete flood defence wall to flood defence level of 5.30mOD, typically 1.4m above existing wall level. All drainage outfalls to be fitted with non-return valves.
CIW_G05	-	C01_4926 to C01_4934	Proposed steps to be provided over the proposed flood defence wall to maintain access from Manbyke Avenue to the existing walkway.
CIW_R14	0 to 35	C01_4943 to C01_4987	Proposed pedestrian maintenance vehicle access ramp. Ramp to incorporate switchbacks to achieve a maximum gradient of 1 in 20.
CIW_R16	-	C01_4987 to C01_4994	Proposed landing at flood defence level (5.55mOD)
CIW_R15	0 to 15	C01_4987 to C01_4990	Proposed vehicular access ramp at 1 in 10 gradient. Security gate to be provided on ramp.
CIW_R17	0 to 10	C01_4994 to C01_5004	Proposed pedestrian maintenance vehicle access ramp with maximum gradient of 1 in 20. Access to be provided from Western Road.
CIW_R18	0 to 40	C01_5004 to C01_5085	Existing walkway to be upgraded to tie in to proposed flood defence embankment at flood defence level of 6.0mOD. Walkway to have a maximum gradient of 1 in 10 with landings provided as required.
CIW_L12	0 to 40	C01_5000 to C01_5060	Existing wall to be replaced with a reinforced concrete flood defence wall to flood defence level of 5.80mOD, up to 1.2m above existing ground levels. Wall to tie into high ground at the eastern end and the proposed embankment at the western end.
CIW_R19	0 to 28	C01_5065 to C01_5085	Proposed regrading of the existing walkway to ramp up to the proposed flood defence embankment. Regrading to have a maximum gradient of 1 in 10 with landings provided as required.
CIW_F13	0 to 84	C01_5050 to C01_5102	Proposed flood defence embankment to flood defence level of 6.0mOD, typically 1.8m above existing ground levels. Embankment to tie into flow control structure at southern end and the proposed ramped walkway at the eastern end.
CIW_R20	0 to 35	C02_3525 to C02_3576	Existing walkway to be upgraded to tie in to the proposed flood defence embankment at flood defence level of 6.0mOD. Walkway to have a maximum gradient of 1 in 10 with landings provided as required.
UWW_B06	-	C02_3540	Proposed flow regulation structure. The width of the channel is to be reduced to 15m. The structure will be placed during extreme flood events to reduce flow in the south channel. The existing footbridge is to be removed and replaced with a vehicular bridge.
UWW_F20	0 to 201	C02_3518 to C02_3706	Proposed regrading of the existing car park, access road and riverside walkway to achieve a crest at flood defence level of 5.80mOD at the proposed flow control structure. Proposed levels will be up to 1m above existing ground levels.
UWW_P14	-	C02_3525	Proposed surface water pumping station and rising main to operate during a flood event. All outfalls to be fitted with non-return valves.
UWW_U10	0 to 156	C02_3537 to C02_3893	Proposed reinforced concrete flood defence wall to be constructed on the south side of the existing public footpath to a flood defence level of 5.80mOD, up to 1.2m above existing footpath levels and 1.5m above the existing car park / Kingsley Hotel levels. The existing river wall and safety railing are to be retained (safety railing may be temporarily removed and reinstated to facilitate the works).
UWW_G09	-	C02_3682 to C01_3682	Proposed steps to maintain access from the Kingsley Hotel to the existing walkway.
UWW_U10	156 to 258	C02_3692 to C01_5280 to C01_5340	Proposed flood defence wall to be constructed at top of the proposed reinforced concrete flood defence wall to flood defence level of 5.80mOD. The existing wall is to be constructed to a height of 1.2m above the existing ground levels at the Kingsley Hotel and typically 1.5m above the existing footpath levels. The existing river wall and safety railing are to be retained (safety railing may be temporarily removed and reinstated to facilitate the works). The existing steel fence between the public footpath and Kingsley Hotel is to be removed.
UWW_G08	-	C02_3700	Existing steps and access to the public footpath to be extinguished.
UWW_U07	-	C02_38	Existing steps and access to the public footpath to be extinguished.



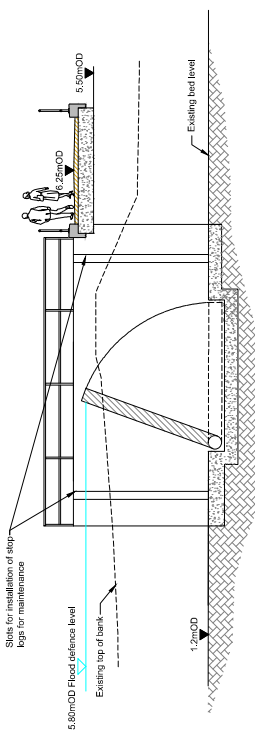
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(Drg.No.LL-214)
Scale 1:200 @ A1, 1:400 @ A3

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- Notes:
1. Do not scale from drawing.
 2. Proposed works geometry and extents are subject to detailed design.
 3. This drawing should be read in conjunction with all other Lower Lee (Cork City) Drainage Scheme Exhibition Drawings and Schedules.



Section A1
Scale 1:100 @ A1, 1:200 @ A3



Section B-B
Scale 1:100 @ A1, 1:200 @ A3

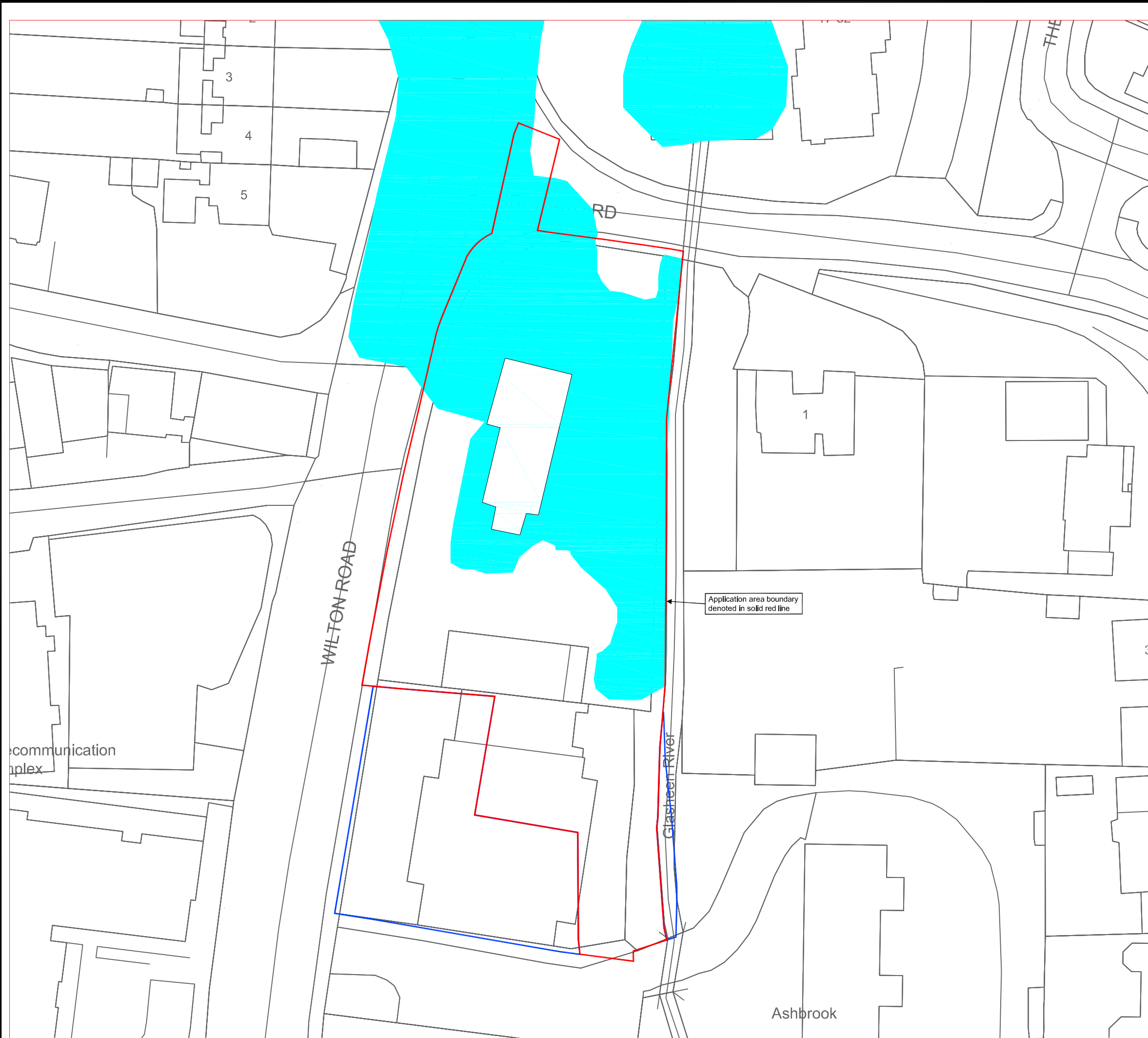
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APPENDIX D- FLOOD MAP FOR EXISTING SITE.



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NOTES.

**Flooded Area,
1% AEP Flood Extent
Water level = 4.97mOD**
(Ref. Halcrow OPW Figure No -
M8/UA/EXT/CURS/009, Node 8GLA_86)

**In the flooded area as shown in Cyan the average
current ground level on the site is 4.93 mOD.
The flooded area on the site is 1120m²
Therefore the flood volume on the site is 44.8m³**

C	Site boundary amended	PM	TON	18.07.22
B	ISSUED FOR PLANNING	RM	TON	01.07.22
A	ISSUED FOR PLANNING	RM	TON	09.12.21
REV.	REVISION DETAILS	REV. BY	COORD.	DATE

I = Issued for Information Only; P = Issued for Planning Application Only; F = Issued for Fire Safety Certificate Only; D = Issued for Disabled Access Certificate Only;
T = Issued for Tender Only; C = Issued for Construction; BC = Issued for Building Control Regulations Only.

JODA Engineering Consultants
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STUDENT ACCOMMODATION IN WILTON ROAD, VICTORIA CROSS, CORK	4539-SK001
DATE: 18.07.22 CHECK SCALE: 1:500 Flood map for Existing Site	A3

APPENDIX E – FLOOD MAP FOR PROPOSED DEVELOPMENT

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NOTES.

**Flooded Area,
1% AEP Flood Extent**
Ref. Halcrow OPW Figure No -
M8/UA/EXT/CURS/009, Node 8GLA_86)
Modified within the site Area to account
for the Site Development

 **Flow Path direction**

In 1% flood event, flood water will be stored in the
Stormater retention Tank as Shown on Drawing
4539-004, entering via gulleys as shown.

 **Gulley, new.**

C	Site boundary amended	PM	TON	18.07.22
B	ISSUED FOR PLANNING	RM	TON	01.07.22
A	ISSUED FOR PLANNING	RM	TON	09.12.21
REV.	REVISION DETAILS	REV. BY	CHKD.	DATE

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T = Issued for Tender Only; C = Issued for Construction; BC = Issued for Building Control Regulations Only;

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JODA
ENGINEERING CONSULTANTS

STUDENT ACCOMMODATION IN WILTON ROAD,
VICTORIA CROSS, CORK

4539-SK002

Flood map - Future Flood Scenario

1:250 A3

Application area boundary
denoted in solid red line

APPENDIX F - JUSTIFICATION TEST FOR DEVELOPMENT PLAN

1)		Is the Urban Settlement is targeted for growth?
		The proposed site is within Cork City, which is targeted for growth in the National Planning framework and in the Cork City Development Plan
2)		The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:
	i)	Essential to facilitate regeneration and / or expansion of the centre of the urban settlement
		The proposed student accommodation development will provide high-density student accommodation space in the urban centre of Cork City.
	ii)	Comprises significant previously developed and / or underutilised lands
		The existing Auto centre represents low-density commercial use in an area designated for 'Local Centres' in the Cork City Development Plan 2022-2028. The proposed development provides land-use is consistent with the surrounding area and the Cork City Development Plan 2022-2028.
	iii)	Is within or adjoining the core of an established or designated urban settlement
		The subject site is within the urban core of Cork City.
	iv)	Will be essential in achieving compact and sustainable urban growth
		The proposed student accommodation development will provide high-density student accommodation space in the urban centre of Cork City. The site is within easy walking distance of the UCC main campus; high density development of the site will contribute to sustainable travel patterns. The surrounding area is serviced by existing utilities and water services infrastructure, so a minimum of new infrastructure will be required
	v)	There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement
		There are no suitable alternative lands available for this development at lower risk of flooding within or adjoining the core of the urban settlement.
3)		A flood risk assessment to an appropriate level has been carried out?
		The current report comprises a detailed site-specific flood risk assessment for the subject site that identifies and recommends mitigation measures.