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O'CONNOR · SUTTON · CRONIN  
MULTIDISCIPLINARY CONSULTING ENGINEERS

**C1058: DISTILLERY WALK APARTMENTS - MIDLETON**

# **FLOOD RISK ASSESSMENT REPORT**

For  
**CORK COUNTY COUNCIL**

**3 May 2024**

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# DOCUMENT CONTROL & HISTORY

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# 1 INTRODUCTION

OCSC & Associates Ltd have been commissioned by the Cork County Council to prepare a Site-Specific Flood Risk Assessment (SSFRA) report for a proposed new multi-storey apartment block, at Distillery Walk, Midleton, Co Cork.

The project involves the construction of a proposed 16no. unit multi-storey scheme including community room and associated site works at Distillery Walk, Midleton, Co Cork. The subject site is located on Distillery Walk in Midleton town centre. It is rectangular in shape and enclosed on all sides by an old stone wall. It measures 0.109Ha (0.27 acres) in area and is relatively flat. It is located less than 50m from Main Street and circa 25km east of Cork City centre.

The subject site is in the ownership of Midleton Lions Club. It is bounded to the north by a private apartment development and by public lanes / access ways on the remaining 3no. sides.

## 1.1 SCOPE

### 1.1.1 OBJECTIVES

The objectives of this report are to inform the planning process regarding flood risk for the potential development of the lands. The report will assess the site and development proposal in accordance the requirements of "The Planning System and Flood Risk Management - Guidelines for Planning Authorities" by the Department of Housing, Local Government and Heritage (referred to as 'The Guidelines' in the remainder of this report).

The report will provide the following;

- The site's flood zone category.
- Information to allow an informed decision of the planning application in the context of flood risk.
- Appropriate flood risk mitigation and management measures for any residual flood risk.

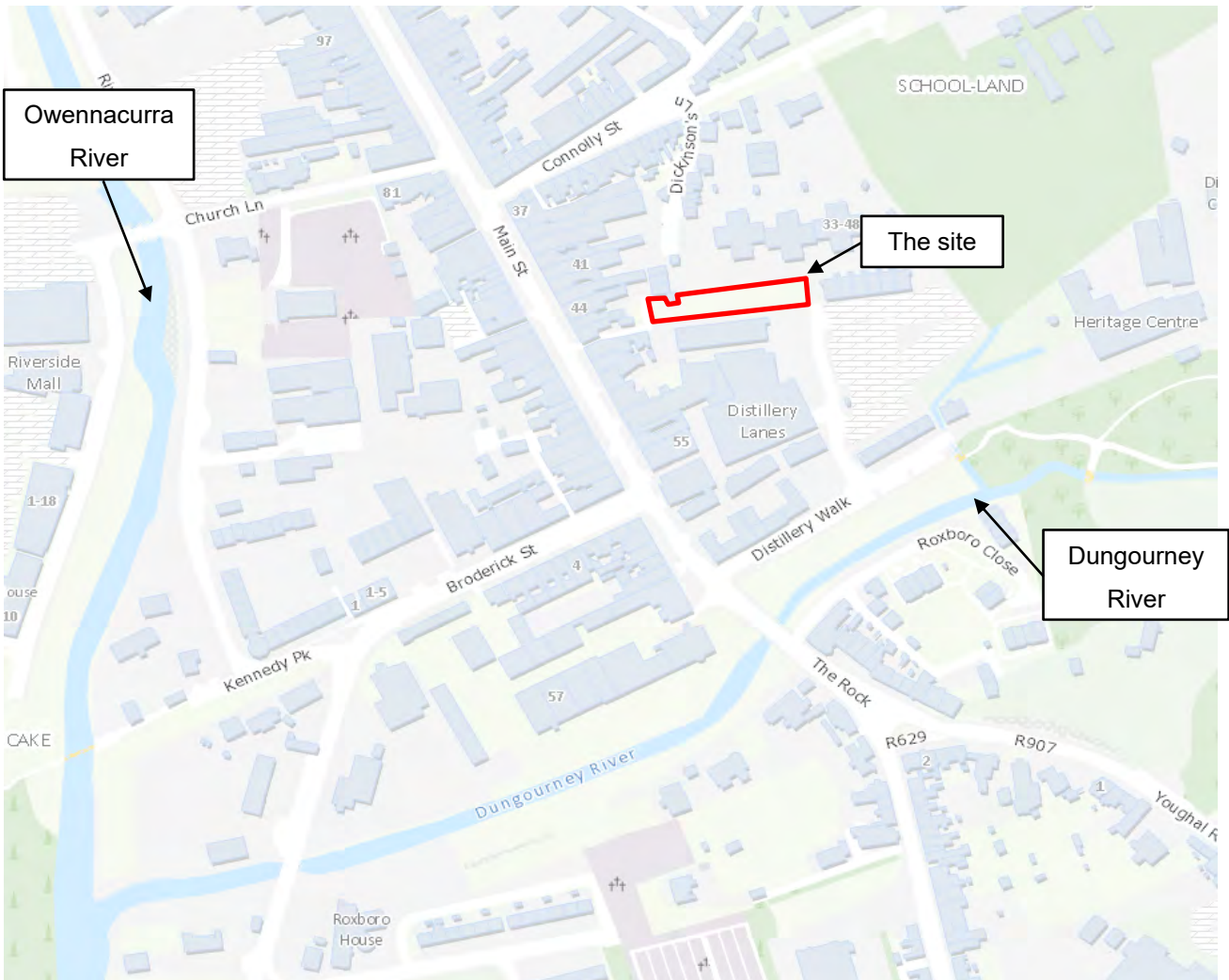
### 1.1.2 FLOOD RISK ASSESSMENT SCOPE

This SSFRA relates only to the proposed development site and its immediate surroundings. This report uses information obtained from various sources, together with an assessment of flood risk for the existing land and proposed development. The report follows the requirements of The Guidelines.

### 1.1.3 EXISTING SITE

The existing site is located in Distillery Lane in Midleton, approximately 140m north of the Dungourney River, which flows east-west to the south of the site. The site is approximately 250m east of the Owennacurra River which runs north-south to the west of the site. The site is relatively flat brownfield site at approximately 3.4m OD, typically varying from a lowest level of 3.29m OD in the middle of the eastern part of the site to 3.61m OD on the slightly higher western side of the site.

There is a 3.5-4m high wall surrounding the site. Distillery Walk runs south-west north-east to the south of the site, and continues from the site to the west, connecting to Main St. There is a lane parallel to the south of Distillery Walk and is approximately 500-600mm lower. There is a car park to the southeast of the site which gradually drops in elevation going south towards the Dungourney River. As Distillery Walk goes west from the site (3.6mOD) it also drops in elevation until it meets Main St (3.11mOD).



**Figure 1.1: Site location**

The Dungourney River joins the Owennacurra River approximately 450m to the southwest of the site; the river runs south from here and discharges to Cork Harbour. The Owennacurra River flows from the north of Midleton, where a number of tributaries join it prior to Midleton town. From Midleton town, the Owennacurra River is estuarine discharging south of Midleton, to Cork Harbour.

The Dungourney River rises to the north of Midleton, near Ardglass, flowing south and then east, joining the Owennacurra River just upstream of the estuary, in Midleton town.

The northern boundary of the site is with a residential development, Corabbey Court. This area is also relatively flat, rising slightly going north from the site. Further to the north ground levels drop slightly again towards Connolly St.

It is to be noted, that while the surrounding area of the site is relatively flat, it is elevated locally in relation to its surroundings. This is evident from walking the site and is also evident from inspection of the fluvial and pluvial flood maps. The site level varies from approximately 3.3 to 3.6mOD. This compares with a datum of 2.6m OD at the intersection of Distillery Walk and Main Street- near the intersection of the Dungourney and Owennacurra Rivers. The datum is 3.1m OD where Distillery Walk meets Main Street to the west of the site. Therefore, the site is demonstrated to be locally elevated compared to surrounding areas which have been subject to flooding in the past and recently.

The following is an aerial image of the area of the site, the site is outlined in red and the Dungourney River is identified.



*Figure 1.2: Site location (satellite view)*

With reference to the existing CFRAM maps and the Arup Flood Maps (refer to maps in Appendix B) – Midleton Flood Relief Scheme the area around the proposed site is subject to fluvial, tidal and pluvial



flooding events and combinations of same where the rainfall events, high water table and high tides combine to cause flooding. (It is noted that this report will also take into consideration the impact of Storm Babet - Storm Babet was a major low pressure weather system that impacted the South of Ireland on the 17<sup>th</sup> and 18<sup>th</sup> of October 2023. Significant amounts of rainfall fell over the course of the storm which led to fluvial flooding in a number of towns in County Cork and specifically in Midleton).

#### 1.1.4 LEE CFRAM & MIDLETON FLOOD RELIEF SCHEME

The Lee Catchment Flood Risk Assessment and Management Study (CFRAMS) was commissioned by OPW in August 2006. The Lee CFRAMS covered the River Lee catchment and included the Owennacurra and Dungourney River catchments. The study was commissioned as a means of understanding the flooding problem and managing the flood risk through the development of a Catchment Flood Risk Management Plan (CFRMP). The outputs from the Lee CFRAMS are available for download at [www.leecframs.ie](http://www.leecframs.ie). Of particular importance in the context of this study is the Lee CFRAMS analysis of the flooding issue at Midleton. This analysis recommended the option of a:-

- Fluvial and tidal forecasting system, combined with a targeted public awareness and education campaign and individual property protection/flood proofing; and
- Permanent flood walls/sea walls/revetments/embankments (to manage both tidal and fluvial risk).

In 2016 Arup was commissioned by Cork County Council (CCC), acting as agents for the OPW, to assess the flood risk within the Owennacurra and Dungourney River Catchment and develop a flood relief scheme and associated measures to manage this risk. The project will comprise five stages:

- Stage 1 – Development of a number of flood defence options and the identification of a preferred Scheme.
- Stage 2 – Outline Design and Public Exhibition, or Planning, including an Appropriate Assessment (AA), Environmental Impact Statement (EIS) and Final Flood Risk Management Plan – (current status).
- Stage 3 – Detailed design, confirmation, and tender.
- Stage 4 – Construction.
- Stage 5 – Handover of works

For the design and implementation of flood relief schemes, OPW's preferred approach is to adopt a "Managed Adaptive Approach".

This means that provision is made in the design of the scheme in the present day to allow it to be adapted or enhanced in the future to address climate change. The advantage of the "managed adaptive approach" is that it allows for future learning about the climate to inform on the design of flood mitigation measures for future climate scenarios. The most technically, environmentally, and economically viable flood

protection scheme that addresses future flood risk can therefore be implemented at the appropriate point in time in the future.

The scheme will defend against the present-day flood risk and will be built to be adaptable to future climate change. This means that the fluvial and tidal direct defences will be constructed to be extendable (demountable or permanent), depending on the increase in levels/flow that may arise in future. Should upstream storage be the part of the final scheme, the storage will be designed to be extendable in the future.

Also being developed as part of the scheme is a project specific Climate Change Adaptability Plan, which will consider how climate change will impact future flood events and how the scheme will be adapted to meet the required standard in the future.

This will be a live document and updated throughout the project lifespan.

### 1.1.5 FLOOD RISK & HISTORICAL DATA

Information on historical floods is available online at [www.floodinfo.ie](http://www.floodinfo.ie). A past flood event local area summary report extracted from [www.floodinfo.ie](http://www.floodinfo.ie) is appended to this report (refer to Appendix D). The report identifies that 17 flood events have been recorded within 3.0 km of the subject site between the year 2000 and 2023.

The following flood history (refer to Table 1.1) is extracted from the Hydrology Report for Cork County Council carried out for the Midleton Flood relief scheme:

*Table 1.1: Timeline of major flood events in the study area*

Date of Flood Event	Mechanism	Areas Affected
February 1993	Fluvial	Water Rock
March 1995	Fluvial	Water Rock
November 2000	Fluvial	Water Rock, Bilburry Road, Bloomfield West
October 2004	Tidal	Bailick Road
May 2005	Tidal	Bailick Road
June 2012	Pluvial/ Tidal	14 residential and 14 commercials in areas of: Distillery Walk/Lower Main Street/Woodlands
July 2013	Pluvial	8 residential, 10 commercials in areas of: New Cork Road, Mill Road, Beechwood Estate, Youghal Road

Jan and Feb 2014	Tidal	Lower Main Street and Bailick Road
Oct 2014	Tidal	Bailick Road
Dec 2015-Jan 2016	Fluvial/ Groundwater	50 businesses and 20 houses in areas of Tir Cluain/ Willow Bank/ Mill Road/ Woodlands/ Riverside Walk /Lower Main Street/ Broderick Street/ Distillery Walk/ Coolbawn/ Riversfield Estate/ Lauriston/ Midleton Rugby Club/ IDL/ Water Rock
Dec 2018	Fluvial	Flooding of agricultural lands and local roads. No property flooding.
Oct 17/18 <sup>th</sup> Oct 2023	Fluvial	Tir Cluain to Riverside Way North– Cork Road Bridge to the N25 (i.e. the town centre) South–Bailick Road South of the N25 Lauriston Estate, Rugby Club and the East of the IDL site Ballinacurra & Water rock

The following section outlines the flood mechanism in more detail.

- November 2000

Cork County Council memo listing flood locations in November 2000: Extensive flooding occurred over the weekend 5th November 2000. The most affected areas in Midleton were Water Rock, Bilburry Road and Bloomfield West.

- October 2004

The Area Engineer outlined areas that are prone to flooding as follows:

- Bailick Road, Midleton. Flooding resulting from periods of heavy rainfall frequency once a year – recurring. Flood ID 5193.
- Road flooding 96303 on a regular basis including October 2004 – near Midleton. Occurs 3 times every 2 years approximately. Flood ID 5194 & 5195.

- Rostellan road flooding on October 2004 due to the extreme tides and wind direction. Occurs infrequently. Flood ID 5196 & 5197.
- R630 at Whitegate during October 2004 very infrequent. Flood ID 5199.
- Ballycotton pier flooded due to tides and waves during October 2004 event but also on regular basis. – Recurring Flood ID 5200 & 5201.
- Road flooding in Jamesbrook area - recurring Flood ID 5202.
- Road flooding east ferry road L3629 – recurring Flood ID 5203.

- June 2012

The flooding event occurred on 5th June 2012 occurring predominantly at the Distillery Walk/Lower Main Street area. The event occurred as a result of pluvial/tidal flooding. The flood event affected 14 residential and 14 commercial properties.

The source and cause of the flooding was described in the OPW Flood Event Report as follows: “The cause of the flooding seems to have been unusually heavy rainfall coinciding with high tide levels which would have prevented discharge from the surface water drainage system in some parts of the town.”

The OPW Flood Event Report also stated that the flooding “was due to a very significant rainfall event which may have been exacerbated by the combined stormwater system being blocked or at capacity. Spring high tides may also have affected capacity of the stormwater system.”

The report also mentions that “after discussions with residents, wave action caused by vehicles continuing to drive through flood may have increased severity of flooding in properties.”

The maximum flood depth was recorded as 350mm.

- July 2013

The flooding event started on 24th July 2013 and ended 25th July 2013 occurring at Main Street. The event occurred as a result of pluvial flooding. The flood event affected 8 residential and 10 commercial properties.

Rainfall started at 11:30 on 24th July with torrential downpours until 02:00 on 25th July. Surface water sewers became overwhelmed by intensity of rainfall. Combined sewers also surcharged in the same area. The maximum flood depth was recorded as 150mm.

- January 2014

The flooding event started on 2nd January 2014 and ended on 6th January 2014 occurring at Bailick Road and Baby Walk. Flooding also affected the junction of Distillery Road and Main Street. The event occurred as a result of tidal flooding. No properties were impacted by this flooding event. The source of the flood waters was high tide driven by strong winds. Flooding was caused by a combination of south-easterly

winds and high tides. Bailick Road was closed to traffic. The OPW Flood Event Report stated that “the river was at street level therefore there was no positive outfall from storm water drainage system.”

The maximum flood depth was recorded as 450mm.

- February 2014

The flooding event started on 3rd February 2014 and ended on 5th February 2014 occurring at Lower Main Street and Bailick Road. The event occurred as a result of tidal flooding. No properties were impacted by this flooding event. The OPW Flood Event Report stated that the flood event was caused “by a combination of south-easterly winds and high tides.” As a result, the drains from Distillery Walk were backed up from the Dungourney River and came out of manholes causing water to flow towards Main Street. Furthermore, the Ballinacurra River also burst its banks at Kennedy Park and flowed onto Broderick Street and onto Main Street. Consequently, Bailick Road was closed to traffic.

The report states that “Access was prevented to Ballinacurra No.1 Pumping Station during the flooding event.” The maximum flood depth was recorded as 450mm.

- October 2014

The flooding event occurred on 8th October 2014 at Bailick Road as a result of tidal flooding.

- Winter 2015/2016

A Flood Review Report was undertaken by Arup after the Winter 2015-2016 event. The Flood Review Report states that the “two areas worst affected in Cork were Midleton and Bandon with flooding to a significant number of properties. Heavy rainfall elevated the groundwater levels until the system became saturated in some areas. The extremely high groundwater levels resulted in a high rate of runoff from the surrounding lands. Analysis of the cumulative rainfall suggests that monthly rainfall was equivalent to a return period of circa 1 in 200 years. Flooding started at the end of December until the 2nd January 2016 and the cause of flooding a result of the interaction of groundwater, fluvial and pluvial sources.

- December 2018

The December 2018 event was a fluvial event following a relatively wet period. Flooding occurred of a number of agricultural lands and local roads. There was no property flooding reported and peak flows at Ballyesmond reached circa 27.5m<sup>3</sup>/s, which is slightly above the annual flood flow.

- October 2023

With reference to the Arup - Midleton Flood Relief Scheme Storm Babet Flood Event Report; Reference: 252803-71; Draft 2 | 22 December 2023. As part of the Midleton FRS project, Arup has been asked by Cork County Council (CCC) to prepare a post-flood event review report that considers the impact of the event in Midleton.

As referenced, Storm Babet was a major low pressure weather system that impacted the South of Ireland on the 17<sup>th</sup> and 18<sup>th</sup> of October 2023. Significant amounts of rainfall fell over the course of the storm which led to fluvial flooding in a number of towns in County Cork. One of the worst affected towns was Midleton, Co. Cork.

From current aerial photographic evidence (<https://www.irishtimes.com/environment/2023/10/19/in-pictures-the-clean-up-begins-in-midleton-after-storm-babet/>), it appears that the lower parts of Main Street and the surrounding area was flooded, but the area of the proposed development seems to have avoided flooding (proposed development area marked in red in Figure 1.3).



*Figure 1.3: Aerial view of the flood on the Main Street and its surroundings.*

### 1.1.6 FLOOD RISK

There have been numerous flood events described which have mainly occurred to the south of the site on areas of lower elevation between the site and the Dungourney River at Bailick Road, Distillery Walk and Lower Main St. It is noted that in February 2014 flood the drains backed up into Distillery Walk. When the drains backed up in Distillery Walk it was reported that the overflow ran towards Main St., which is lower than the subject site. All these surrounding areas are noted to be lower in elevation than the subject site.

Storm Babet, as detailed in the Arup report, the area of concern, (within the area of the proposed development in the centre of Midleton) was impacted by flooding. The report details that the flood event that occurred within this area, corresponded to the 1 in a 1000-year flood event. Interpretation of the report and viewing associated photographs, Figure 2 would indicate that the flood waters within this area of Midleton were approximately 300mm greater than that modelled for the 1:1000-year flood event. The flood maps (in Appendix B) published by Arup for estimated flood extent due to Storm Babet shows that the site was affected by the storm.

The reference nodes on the maps (in Appendix B) closest to the proposed site are 3DUN\_422, approx. 140m to the south east of the site; 3DUN\_0 at the Bailick road bridge over the Dungourney River approx. 350m to the southwest of the site; 3DUN\_47 at the intersection of the Dungourney and Owennacurra Rivers approximately 450m to the southwest of the site; 3OWE\_2281 on the Church Lane bridge approximately 250m west, north west of the site.

- **Tidal flood**

The tidal flood levels in these nodes (refer to 'Tidal Flood Extent' map (2020) in Appendix B) are as follows in Table 1.2.:

*Table 1.2: Tidal flood levels*

<b>Node</b>	<b>10% AEP mOD</b>	<b>0.5% AEP mOD</b>	<b>0.1% AEP mOD</b>
3DUN_422	2.91	3.32	3.39
3DUN_0	2.6	2.92	3.07
3DUN_47	2.6	2.91	3.06
3OWE_2281	2.84	3.22	3.32

The flood study maps from 2020 show that the 0.1% tidal flood level does not reach the site. The 0.5% tidal flood depth (2020) does not reach the subject site, it reaches the Distillery Walk and the carpark to the south of the site.

Recent flood map from 2022 (refer to 'Tidal Flood Extent' map (2022) in Appendix B) shows that the current 0.5% tidal flood level does reach both the west and the east parts of the side leaving the middle part untouched.

- **Fluvial flood**

The fluvial flood levels at these nodes (refer to 'Fluvial Flood Depth' map (2022) in Appendix B) are as follows:

*Table 1.3: Fluvial flood levels*

<b>Node</b>	<b>10% AEP mOD</b>	<b>1% AEP mOD</b>	<b>0.1% AEP mOD</b>
3DUN_422	3.13	3.42	3.77
3DUN_0	2.5	2.71	3.17
3DUN_47	2.48	2.68	3.04
3OWE_2281	3.03	3.48	3.95

Recent flood study maps (2022) show that both the western and the eastern half of the site is within the 1% flood zone. The 1% fluvial depth (0.25m) does reach the western and the eastern parts of the site.

- **Pluvial flood**

The pluvial flood mapping (refer to 'Pluvial Flood Depth' map (2020) in Appendix B) shows a small amount of pluvial flooding (max depth of 0.01-0.25m) in a depression in the middle of the site; however, this depression will be removed during the development, a wet conveyance channel is also proposed in the middle of the landscaping area. The site is locally elevated in its surroundings and the development is not in a risk from pluvial flooding.

### 1.1.7 PROPOSED DEVELOPMENT

This proposal relates to the construction of 16no. housing units and a community room on an existing walled garden site off Distillery Lane, in Midleton's town centre. The housing scheme has been designed as a 6no. storey apartment building with 3no. one bed units on each floor except the ground floor which contains a community room and a single one bed apartment. The intention is that this housing scheme would be allocated to accommodate elderly residents specifically. The remainder of the site is designed as a public garden space that also allows for management of storm water drainage on the site. The project is being developed in collaboration with the local Lions Club.

This subject site has been identified by Cork County Council's Housing Directorate as a key site within the town suitable for redevelopment. It is rectangular in shape and enclosed on all sides by a tall stone wall, approximately 6m. high. It measures 0.109Ha (0.27 acres) in area and is relatively flat. It is located less than 50m. from Main Street and circa 25km. east of Cork City centre.

The site is bounded to the north by a private apartment development and by public lanes / access ways on the remaining 3no. sides.

The actual footprint of the development building is approximately, 20m by 14.5m; approximately 250m<sup>2</sup> floor plan at each level. The proposed finished floor level at ground floor for the development has been set at 4.22 OD m.

## 1.2 METHODOLOGY

The methodology adopted for the Flood Risk Assessment is to apply the sequential approach as identified in 'The Planning System and Flood Risk Management Guidelines' by OPW (later referred as 'The Guidelines'). This approach is outlined in Figure 1.4.

The sequential approach to planning is important in ensuring that the development is directed towards land that is at low risk of flooding.



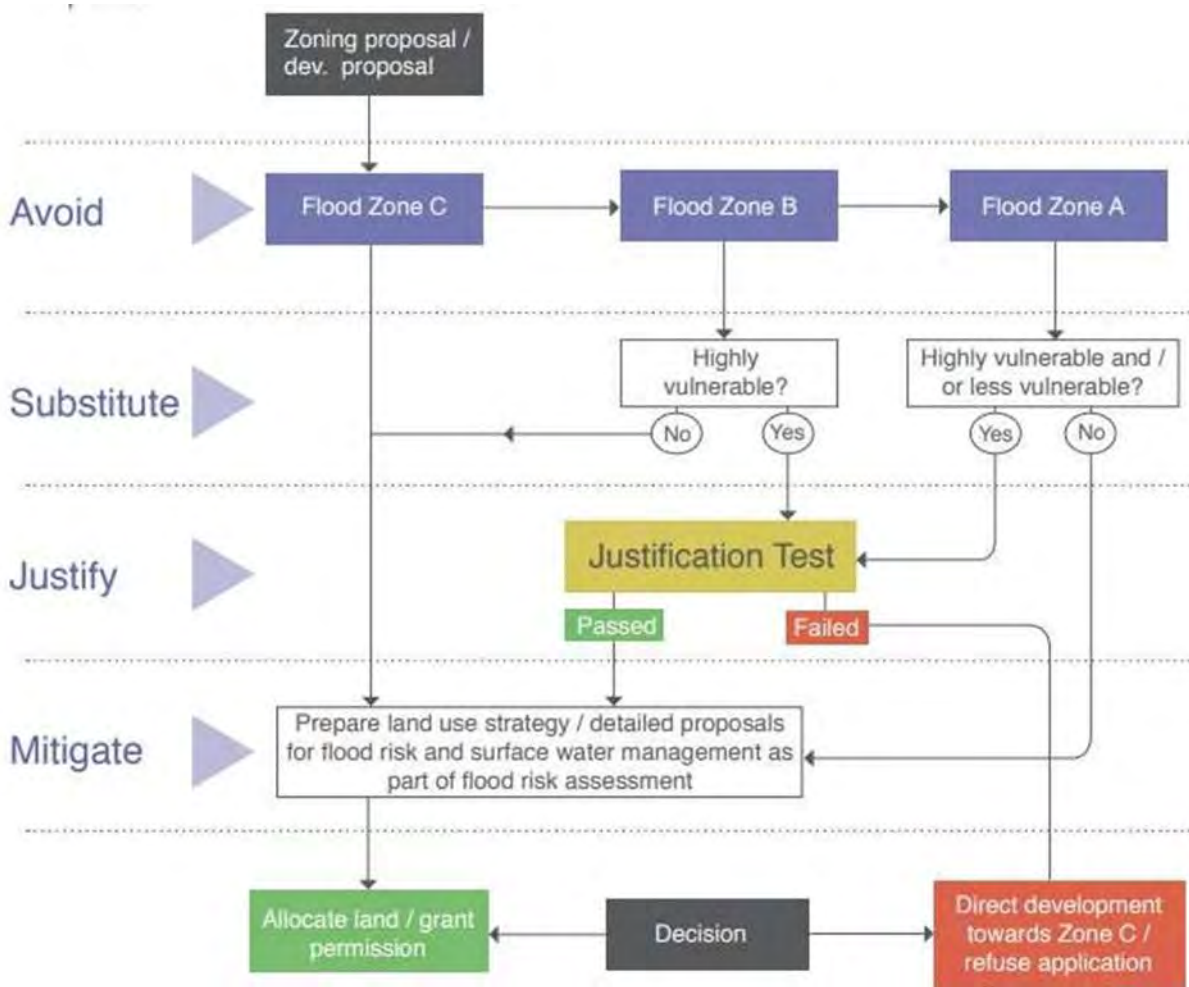


Figure 1.4: Sequential approach mechanism

The process involves carrying out an Initial Stage Flood Risk Identification. This is followed by an Initial Flood risk Assessment Stage. The results of the Initial Flood Risk Assessment Stage will determine whether a justification test is required for the site.

The principals of the sequential test are outlined in Figure 1.5 overleaf. This filtering process provides a holistic approach to addressing Flood Risk Assessments. Figure 1.5 sets out the broad philosophy underpinning the sequential approach in flood risk management.



*Figure 1.5: Sequential approach principles in flood risk management*

## 2 STAGE 1 FLOOD RISK IDENTIFICATION

The available flood risk information mapping for the site includes:

- Cork County Council/Arup mapping for fluvial & tidal flood risks
- Latest information from Midleton Flood Relief Scheme website
- Cork County Council Hydraulic model results from Midleton FRS
- floodmaps.ie & floodinfo.ie
- Cork County Development Plan
- Topographic Survey Plans

See Appendices for details.

### 3 STAGE 2 INITIAL FLOOD RISK ASSESSMENT

#### 3.1 SOURCES OF FLOODING

When carrying out a flood risk assessment, one should consider all the potential flood risks and sources of flood water at the site. In general, the relevant flood sources are:

- Fluvial

Fluvial Flooding is the result of a river exceeding its capacity and excess water spilling out onto the adjacent floodplain. Fluvial flooding associated with the Owennacurra -and Dungourney River poses a risk to the proposed development. The exceptionally high tides coming in from the sea, as well as a strong wind can all contribute to the conditions for a storm leading to a flood.

- Pluvial

Pluvial flooding is the result of rainfall-generated overland flows which arise before run-off can enter any watercourse or sewer. It is usually associated with high intensity rainfall. Groundwater and pluvial flooding are also very significant sources of flood risk in Midleton.

- Coastal

Coastal flooding is the result of sea levels which are higher than normal and result in sea water overflowing onto the land. The high tides coming from the sea through the rivers can lead to flooding. The proposed development site is subject to tidal flooding.

#### 3.2 FLOOD ZONE

Based upon the information identified above an assessment has been carried out to determine if the site falls within Flood Zone A, Flood Zone B or Flood Zone C. The definition of Flood Zones A, B and C are identified in Figure 3.1 below.

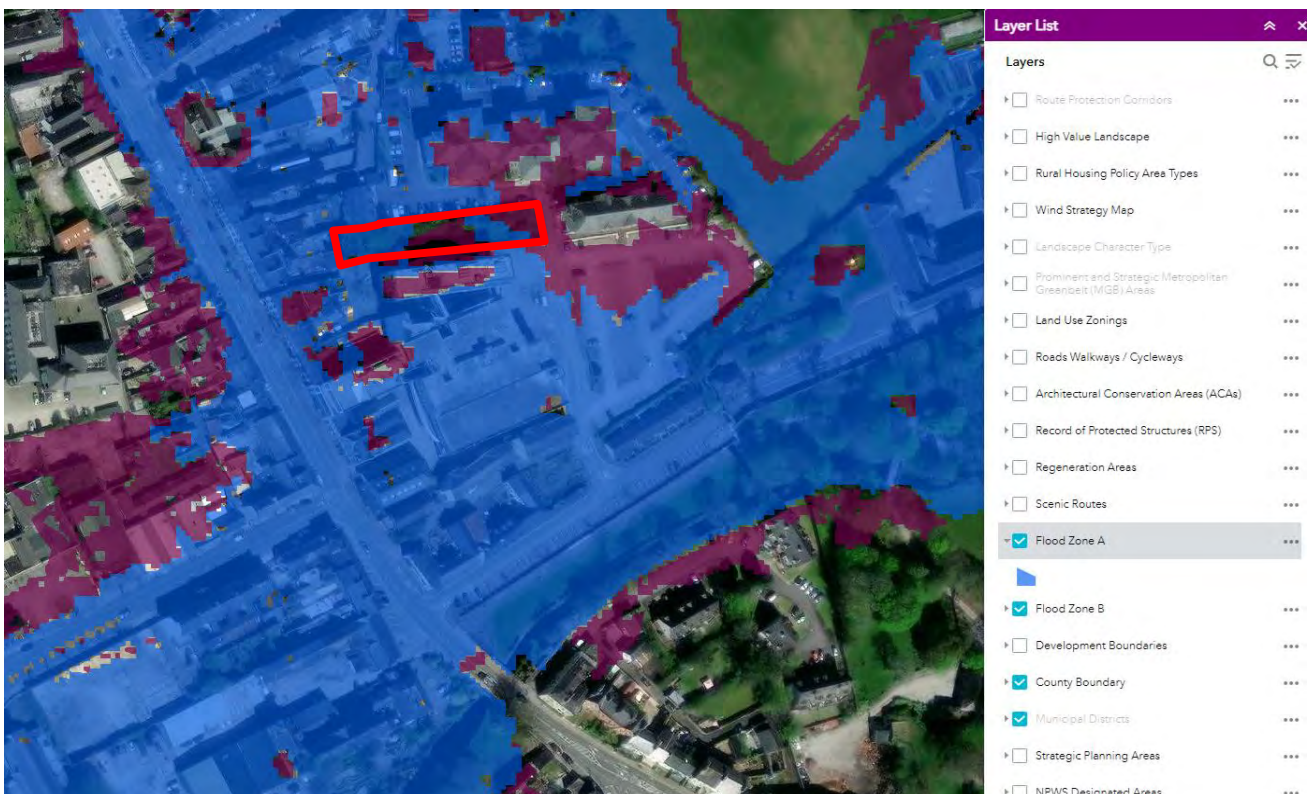
Zone A High probability of flooding.	This zone defines areas with the highest risk of flooding from rivers (i.e. more than 1% probability or more than 1 in 100) and the coast (i.e. more than 0.5% probability or more than 1 in 200).
Zone B Moderate probability of flooding.	This zone defines areas with a moderate risk of flooding from rivers (i.e. 0.1% to 1% probability or between 1 in 100 and 1 in 1000) and the coast (i.e. 0.1% to 0.5% probability or between 1 in 200 and 1 in 1000).
Zone C Low probability of flooding.	This zone defines areas with a low risk of flooding from rivers and the coast (i.e. less than 0.1% probability or less than 1 in 1000).

*Figure 3.1: Flood zone categories*

Based on the Cork County Development Plan 2022 flood map viewer, the subject site falls within both Zone A (depicted in blue on Figure 7) and Zone B (depicted in purple on Figure 3.2). Figure 3.2 displays a screenshot of the flood zones, with the subject site is marked in red.

It is evident that the central and the eastern part of the site is located in Flood Zone B, whereas Zone A encompasses a strip of the mid-eastern area and the western area, taking up a greater portion of the site. The proposed multi-storey building is intended to be built on the eastern side, in very close proximity to the eastern boundary, hence it is more likely to be affected by Zone B.

As per to Figure 3.1, the risk of fluvial flooding is to be assessed for a 1 in 100-year of event, while coastal flooding is to be assessed for a 1 in 200-year event, representing a worst-case scenario.



*Figure 3.2: Cork County Development Plan 2022 map viewer*

### 3.3 FLUVIAL FLOOD RISK

The mapping in Appendix B and the information received from the Midleton FRS has identified that there is a fluvial risk in the eastern part of the site where the levels on the survey vary from 3.26m OD to 3.46m OD with 0.1% fluvial AEP. The very western portion of the site close to the western boundary is within 1% fluvial AEP. The central parts of the site, where the survey levels vary from 3.4m OD to 3.64m OD, are outside the 0.1% flood level data.

The floor level of the proposed ground floor is set to be 4.22 m OD which is based on the 1% fluvial flood level as per node 3DUN\_422 (3.42m OD). The proposed design accounts for a 0.5m tidal climate change allowance and a 300mm freeboard allowance. This additional 0.8m brings the proposed FFL to 4.22mOD. This aligning with the Recommended finished floor levels set out in the Cork County SFRA.

Although the proposed finished floor level is above the 0.1% fluvial AEP flood level including the climate change factor and the freeboard, the site itself is partially within Zone A & B and a justification test is required.

There is no other identifiable risk to other sites from this development. This is because there are no water pathways affected by the proposed development and the works are taking place on a locally elevated area within relatively flat surroundings, which reduce in elevation to the south towards the Dungourney River, to the west towards the Main Street and to the north towards Connolly Street.

The road on the southern side of the site, Distillery Walk, and the lower parts of the new footpaths which will serve the site and provide access to the apartments will remain within the 1% fluvial flood zone, Zone A and Zone B. In section 3 of the Guidelines local transport infrastructure is deemed "less vulnerable development" and as shown in table 3.2 of the Guidelines it is deemed appropriate development and does not require a justification test.

### **3.4 TIDAL FLOOD RISK**

The 1% tidal flood on the recent flood maps does not reach Distillery Walk and the proposed site.

### **3.5 PLUVIAL FLOOD RISK**

Pluvial flooding is possible in the site but will not be of any consequence to the new apartments or the surrounding area. There is localised pluvial flooding indicated on the pluvial flood maps on the lowest part of the site (3.43mOD). However, the proposed building (4.22mOD) will be located higher than the max. pluvial flood depths (0.25mOD).

### **3.6 DRAINAGE SYSTEMS**

Flooding from drainage systems is remote as the underground drainage and water supplies are well below the FFL's of the proposed houses. The invert level of the closest existing storm manhole is 1.87m OD. As noted in previous flooding, drains did back up in Distillery Walk in 2014; however, the overflow flowed away from the subject site towards lower Main St which is at a lower level than the subject site.

### 3.7 VULNERABILITY

According to Table 3.1 of the Guideline document (refer to Figure 3.3 below), the proposed new apartment block is a residential unit adapted for elderly/ impaired mobility people, the development is classified as highly vulnerable.

Vulnerability class	Land uses and types of development which include*:
<b>Highly vulnerable development (including essential infrastructure)</b>	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
<b>Less vulnerable development</b>	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
<b>Water-compatible development</b>	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

\*Uses not listed here should be considered on their own merits

**Figure 3.3: Classification of vulnerability**

Table 3.2 of the Guidelines (refer to Figure 3.4 overleaf) illustrates those type of development would be appropriate to each flood zone and those that would be required to meet the justification test.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

*Figure 3.4: Matrix of vulnerability vs flood zone*

As the proposed new apartment block is partially within both Flood Zone A and B and it is classified as highly vulnerable (residential building), a justification test is required to be undertaken.

Parts of the existing road to the front of the site, Distillery Lane, and the local roads serving the proposed site will remain within the 1% flood level at least until the Midleton FRS is completed.

As the access to the site is affected by flooding it could be deemed necessary to carry out a justification test on the access to the site as well. The following is a justification test following the guidelines.

### 3.8 POTENTIAL IMPACT OF DEVELOPMENT ON FLOODING ELSEWHERE

It is not considered that the construction of the proposed development will impact on flooding elsewhere. There is no other identifiable risk to other sites from this development. This is because there are no water pathways affected by the proposed development and the works are taking place on a locally elevated area within relatively flat surroundings. It is proposed that the main storm drainage from the proposed building will discharge to the existing a storm sewer crossing the site via an attenuation tank and will have no impact on the risk of flooding within the surrounding buildings. Currently the site is bounded by an old stone wall, which is proposed to be retained, potentially reducing the damage to the site due to flooding.

### 3.9 FLOOD RISK MANAGEMENT

Flood risk management under the EU Floods Directive aims to minimise the risks arising from flooding to people, property and the environment. Cork County Development Plan 2022 SSFRA sets out various mitigation measures that can be put in place and that residual risks can be managed to acceptable levels. Minimising the risk can be achieved through structural measures that block or restrict the pathways of floodwaters, such as flood barriers or non-structural measures such as green infrastructures/ nature-based solutions that can retain the magnitude of flood event, as well as modifying ground levels, raising finished floor levels, flood warning, or resilience measures for communities or individual properties. Mitigation measures to reduce flood risk are discussed in section 6 of this document.



## 4 JUSTIFICATION TEST

The Planning System and Flood Risk Management Guidelines state that “The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk.” The justification test is based on two processes:

1. The Plan-Making Justification Test and
2. The Development Management Justification Test.

### 4.1 THE PLAN-MAKING JUSTIFICATION TEST

Chapter 4, Box 4.1 of the Planning System Flood Risk Management Guidelines for Planning Authorities sets out that all the following criteria must be satisfied in order to meet the Justification Test:

#### Item 1

*“The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.”*

#### Response:

The National Spatial Strategy identifies that towns close to Cork City, such as Midleton, plays an important role in the public transport link and need to be promoted and developed as self-sustaining, metropolitan town. They will benefit from proximity to Cork and at the same time build up their employment and services functions through the implementation of the Cork Area Strategic Plan, especially through enhancing the existing road, rail corridor and bus links to Cork City.

#### Item 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.”*

#### Response:

The Council’s Housing Strategy states that on zoned lands, it will be a requirement that 10% of all land zoned for residential uses (or for a mix of residential and other uses) be reserved for the purpose of social and affordable housing. Based on Zoning Objectives-Map 1A of the Midleton Town Development Plan 2013, the proposed development is located in town centre/mixed use zone, marked in red. Refer to Appendix E.

#### Item 2.1

2.1 *“Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement.”*

**Response:**

The proposed development will make use of an existing disused site within the town centre. The planning strategy for Midleton, as set out in the Cork County Development Plan 2022, sets out the provisional population growth of the town and environs.

The priority for Midleton over the life of the new Local Area Plan is to optimise the amount of land available for development for housing in the long term. The subject development area is located in the town centre with surrounding built infrastructure and with good quality pedestrian / cycle connectivity through the town.

**Item 2.2**

2.2 *“Comprises significant previously developed and/or under-utilized lands;”*

**Response:**

The site of the proposed development is bounded by Corabbey Ct, Townparks, opens from Distillery Walk, in close proximity to Main Street in Midleton Town Centre. Development of this unused, non-utilised site in the town centre rather than a greenfield site is in keeping with Item 2.2.

**Item 2.3**

2.3 *“Is within or adjoining the core of an established or designated urban settlement.”*

**Response:**

Given the location of the proposed development in the heart of Midleton town centre and its close proximity to the main shopping and business areas, we argue that the proposed development is in compliance with Item 2.3.

**Item 2.4**

2.4 *“Will be essential in achieving compact and sustainable urban growth.”*

**Response:**

According to Cork County Development Plan 2022, an Urban Capacity Study of the town centre areas of the nine former town council towns such as, Midleton. The study identified that approximately 2,000 additional units could be delivered in the heart of these towns through a combination of Living Over the Shop initiatives, targeting vacancy, providing infill units within the fabric of our towns and rejuvenating under-utilised and derelict brownfield land.

This development is tapped into in the context of achieving the compact growth and higher density development objectives of the National Planning Framework and delivering the proposed new homes within the existing built footprint of our settlements. OCSC Consulting Engineers would therefore argue that the development is in compliance with Item 2.4 as well as the spirit of the current Cork County Development Plan.

**Item 2.5**

2.5 *“There are no suitable alternative lands for the particular use or development type, in areas at a lower risk of flooding within or adjoining the core of the urban settlement”*

**Response:**

The nature of Midletown centre is such that sites such as this are very rarely available for development in such close distance to the businesses and the town centre. Relocation of the development to another site with a lower flood risk within Midleton would be against the rejuvenation of the under-utilised and derelict sites within the town centre and therefore contravene item 2.4.

**4.2 THE DEVELOPMENT MANAGEMENT JUSTIFICATION TEST**

Chapter 5, Box 5.1 of the Planning System Flood Risk Management Guidelines for Planning Authorities sets out that all of the following criteria must be satisfied in order to meet the development management Justification Test.

**Item 1**

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

**Response:**

The proposed site is within the development boundary Midleton Town Council Town Development Plan. The zoning of the site within this plan is “town center mixed uses”. The permitted uses within this zone are described as being quite broad with retail recommended to be within the core shopping area. This site which is outside the core shopping area would be deemed suitable for residential development.

**Item 2**

*“The proposal has been subject to an appropriate flood risk assessment that demonstrates:*

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

**Response:**

The proposed development will not increase flood risk elsewhere. The proposed building is located in Zone B and to a lesser extent of Zone A with less vulnerable local infrastructure works taking place within Zone A. The existing “floodplain” is unaffected and no water pathways within the flood zone are affected.

2.2 *“The development proposal includes measures to minimize flood risk to people, property, the economy and the environment as far as reasonably possible.”*

**Response:**

The proposal includes additional measures to minimise flood risk to people and property by setting floor levels of the proposed houses at a level that is comfortably above the predicted flood levels on the site. The floor levels have been set as high as is reasonably possible without affecting the streetscape negatively. The building is being built above the 0.1% AEP flood level on the site.

2.3 *“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.”*

**Response:**

Ensure the residual risk on the site is low as the proposed development is being done above the 0.1% AEP level. The access to the site is via the local road network of which parts are in the 1% and 10% flood zone. The risk to the road network is not increased by this development. The flooding of the adjacent areas is being dealt with by the proposed defences in the Midleton FRS. The flood depths on the access roads to the site are not deep enough to restrict access to the site by the Emergency services during a flood event, (Storm Babet – 300mm around the site). Which corresponds to slightly above the 1% flood depth on the roads around the site predicted at 0.25m.

Mitigation measures have been proposed in section 6.0, which ensure that the residual risks to the proposed development can be managed to an acceptable level.

2.1 *“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.”*

**Response:**

There are measures being put in place to address future flood risk management of the surrounding areas including the access to the site. The development of the site is compatible with the achievement of wider planning objectives for the area. The Midleton Flood Relief scheme based on using a “managed adaptive approach” which will allow the scheme to be adapted or enhanced to adapt to climate change and future factors that may arise.

## 4.3 CONCLUSION

It is deemed that the proposed development complies with the requirements of the justification test as set out in chapter 5, box 5.1 of the Planning System Flood Risk Management Guidelines for Planning Authorities.

In assessing this development, one must have regard to the nature of the development, the measures taken to prevent increasing flood risk and the ability of the raised finished floor levels of the building to provide safe shelter during a flood. One must also consider the alternatives. Re-location of the proposed development to another site would result in a derelict site within in the town and contravene many items in the Justification test.

## 5 SURFACE WATER MANAGEMENT

The objectives of Cork County Development Plan are to develop and strengthen the use of the green and blue infrastructure in a town / village setting including the retention and enhancement of existing trees and landscape features, the use of SUDs and permeable paving to achieve climate adaptable places. The use of permeable paving in hard landscaping design also has a role to play in creating more sustainable places. The design of the built environment and public realm, therefore, needs to ensure opportunities for retention and introduction of soft and green landscaping which could also enhance local biodiversity, are enshrined in the design process from the outset.

### 5.1 SURFACE WATER SEWER

In most towns, surface water is usually disposed to the sewer network which can become overloaded in periods of high rainfall and/or high tides.

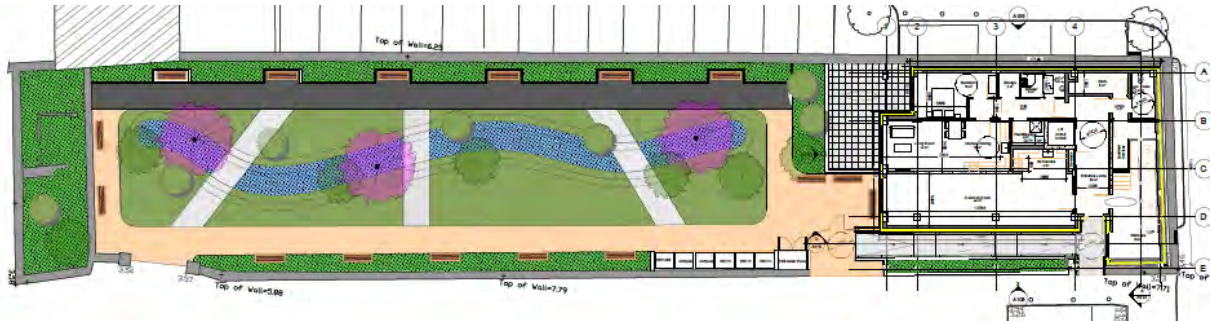
It is evident from existing utility survey that there is an existing storm sewer crossing the subject site. The proposed storm water sewer network is designed to consist of 225mm diameter uPVC pipes that are collecting the storm water via gullies and channel drains from the building and discharging into the existing sewer via an underground reinforced concrete attenuation tank. The overall increase in hardstanding area is relatively minor for the proposed development, with the building footprint to the east resulting in the most significant increase in impervious surfacing, however in line with Local Authority guidelines the additional discharge from the site to the public system will need to be restricted to green field run off rate by means of a hydro break and attenuated storage.

Sustainable Drainage Systems (SuDS) can play a role in reducing and managing runoff to surface water drainage systems as well as improving water quality and contributing to local amenity.

### 5.2 SUSTAINABLE DRAINAGE SYSTEMS (SUDS)

Cork County Development Plan require that all new developments incorporate sustainable urban drainage systems (SuDS). Efforts should be taken to limit the extent of hard surfacing and impermeable paving. By optimising and maximising the application of SuDS, flood risk can be mitigated, biodiversity can be enhanced, protected and visual and recreational amenity can be created. The proposal should demonstrate that due consideration has been given to nature-based solutions in the first instance in arriving at the preferred SuDS solution for any development.

The area of the subject site is 0.109Ha, with the proposed building at ground floor level being only 0.031ha in footprint, taking up only the 28% of the overall site area. Hence, there is sufficient green space available for implementing SuDS measures. Refer to Figure 5.1 below for the proposed site layout.



*Figure 5.1: Proposed site layout*

To meet the SuDS objectives, the following measures were considered for the subject development:

- Construction of a vegetated swale (conveyance channel) horizontally placed in the middle part of the landscaping area. It is proposed that the swale will collect runoff from the hard surface areas (part of the paths) with filter strip being constructed along these paths for pre-treatment. Wetland planting in the swales and sufficient trees, shrubs are proposed around that will enhance the biodiversity of the area and will provide a visual experience to the amenity space for the community. Initial calculations were carried out for the hydraulic resistance and capacity of the swale for a 1-100year event. To mitigate flood risk, an outflow is proposed at the end of the swale which will be connected to the proposed storm sewer. The attenuation tank will be able to control any excess water that would cause the swale to flood.
- Impermeable pavement with porous surface materials is considered for a section of the paths around the inner landscape area. A perforated drain is proposed to be laid under the permeable pavement that will collect the water and discharge it into the swale.

It can be seen that the proposed SuDS solutions are considered as an interconnected system rather than reliance on a single component or measure. While engineered attenuation in underground is required, a range of nature-based solution have been considered in a SuDS scheme which are designed to manage, treat and make best use of surface water, prioritising nature-based solutions and embracing opportunities to enhance green infrastructure and create attractive, a nature rich open space.

### 5.3 GREEN ROOF

While the use of a green roof on an apartment, commercial, industrial, leisure and on educational buildings are encouraged by the Cork County Development Plan, the area of the roof of the proposed building is only a small portion of the area of the site.

It is OCSC's opinion that the application of a green roof is economically not viable for this development. Therefore, discharge of stormwater run-off from the roof will require connecting to the existing sewer via a new storm sewer network and attenuation tank.



## 6 IMPACTS AND MITIGATION MEASURES

Understanding flood risk and identifying the potential impacts is a key step in managing flood risk. This is highlighted in Chapter 2 of the Planning System and Flood Risk Management Guidelines for Planning Authorities.

When assessing the elements of flood risk at the site, the potential impacts of the development on flooding in the surrounding area must be taken into account. Consideration must also be made of how flooding will impact on the development and based on the likelihood or level of risk involved, recommend appropriate mitigation measures.

This Flood Risk Assessment report seeks to demonstrate that the flood risk to the development can be adequately managed and the use of the development of the lands will not cause adverse impacts elsewhere. Flooding can cause physical damage to properties and infrastructure, impact on the environment, local or regional economies and cause hardship amongst people and their communities. This section identifies the impacts associated with flooding and outlines mitigation measures that can be implemented to minimise and manage flood risk.

### 6.1. HYDROLOGICAL

#### 6.1.1. HYDROLOGICAL IMPACTS

The potential hydrological impacts are outlined as follows:

***“Impact on flood levels in the river, drains and surrounding land due to interference with channel, over bank conveyance and loss of storage.”***

This development does not contain any proposals to alter any channels or over bank conveyance. It will also not have a negative impact on the surrounding land as the proposed development and the works are taking place on a locally elevated area within relatively flat surroundings.

***“Increase flow rate into the receiving river/stream/drain as a result of an increased rate of runoff from the developed site.”***

There is increase in the impermeable hard standing area which is relatively minor compared to the overall site area; however SuDS measures including attenuation tank with hydro-brake, is proposed to limit and maintain the runoff rate to the green field runoff rate.

## 6.1.2. HYDROLOGICAL IMPACT MITIGATION

As there will be no hydrological impacts, mitigation was not considered.

## 6.2. INFRASTRUCTURE

### 6.2.1. IMPACT ON FLOODING

Flooding from drainage systems is remote as the underground drainage and water supplies are well below the FFL's of the proposed houses. The proposed ground floor level is set to 4.15mOD and the invert level of the closest existing storm manhole is 1.87m OD.

### 6.2.2. MITIGATION

Ducting and conduits into the building must be sealed and non-return valves are to be placed on sewers exiting the building at a level below 4.15 m. The concrete slab that the finished floor will be placed on will be at an elevation of 4.15 m. This slab will be connected to the reinforced concrete columns and walls around the perimeter of the building, constructed in a manner to ensure that no flood waters will be permitted to enter under the building through the structure.

In certain areas of the proposed development, such as the access ramp to the building, the middle landscaping areas and paths around it, the ground level will remain at around 3.4mOD. In some sections of the boundary, access from the street dictates the ground levels. In these areas, additional flood protection measures should be introduced such as proprietary demountable flood barriers.

To mitigate flood risk, an outflow is proposed at the end of the swale which will be connected to the proposed storm sewer. The attenuation tank will be able to control any excess water that would cause the swale to flood.

OCSC Consulting Engineers recommends that, due to the residual risk of flooding at the site, the proposed development should also have the following in place, kept up to date and implemented: a Flood Awareness Plan, and a Flood Emergency Plan. In the preparation of these documents, the developer should take cognizance of the contents of Section 5.8.11 and 5.8.12 of Cork County Council Strategic Flood Risk Assessment (June 2022), which forms part of the Cork County Development Plan 2022, in particular the arrangements for access and egress during both frequent and extreme flood events. These should be live documents and updated as required. OCSC Consulting Engineers also recommend that consideration be given to an evacuation of occupants, placing of demountable flood barriers and the shutting down of services such as gas and electricity prior to the onset of a flood. Flood warning schemes are discussed in Section 6.3.

It should be noted that the building is multi-storey with a raised ground floor which will provide safe refuge for residents until evacuated.

## **6.3. SOCIAL**

### **6.3.1. IMPACTS OF FLOODING**

Another impact of flooding is the social impact on people and communities. Severe flooding can cause physical injury and loss of life. On a lesser scale, floods can cause trauma and stress, and the ability of individuals to recover can vary depending on their circumstances including age and health (both physical and mental). Undue stress can be avoided by careful planning, early warning systems and evacuation procedures.

In addition, consideration must be given to egress from the building in the event of flood waters entering the property.

### **6.3.2. MITIGATION**

As mentioned, there is a flood risk to the site and site-specific flood management plans should be drawn up for a flood impacting the development.

Advanced warning of a potential flood event will significantly lessen the impacts of a flood. Tidal floods can be considered predictable and advance warnings can be given based on the weather warnings that are issued on Local Authority websites. OCSC Consulting Engineers recommend that the proprietors of the proposed development review all flood warnings from Local Authorities and other organisation's such as local media and Met Éireann.

## 7 CONCLUSIONS

O'Connor Sutton Cronin (OCSC) Consulting Engineers were appointed by the Cork County Council to carry out a Site-Specific Flood Risk Assessment (FRA) for this new apartment block development.

This FRA has been carried out in full compliance with the requirements of "The Planning System & Flood Management Guidelines" published by the Department of Environment in November 2009.

As part of this assessment OCSC Consulting Engineers investigated the publicly available information in relation to flooding in the area of this site. The Arup Floods Maps developed for the Midleton Flood Relief Scheme were consulted along with previous flood information, also the draft report by Arup regarding Storm Babet.

The proposed vulnerable new development is to be carried out within zone A & B. The development of this site is taking place on the boundary of the 0.1% flood level and there is no interference with any watercourse or water pathway. The existing road and car park adjacent to the site and the accesses to the site from the boundary are subject to flooding.

A number of mitigation measures have been discussed and we are satisfied that we have demonstrated that the flood risk to the development can be adequately managed, and the development of the site will not cause adverse impacts elsewhere.

As part of this flood risk assessment, a justification test in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities was carried out and it was deemed that the proposed development complied with the requirements of the justification test.

The flooding of the existing road network around the site will not be affected by the proposed development and will be addressed at a later stage via by the Midleton Flood Relief Scheme.

The predicted 0.1 % AEP flood level is 3.77 m OD. Accounting for the climate change and the additional freeboard allowances, OCSC Consulting Engineer's opinion is that setting the finished floor level to 4.22 m OD is adequate.

## 8 VERIFICATION

This report was compiled and verified by:

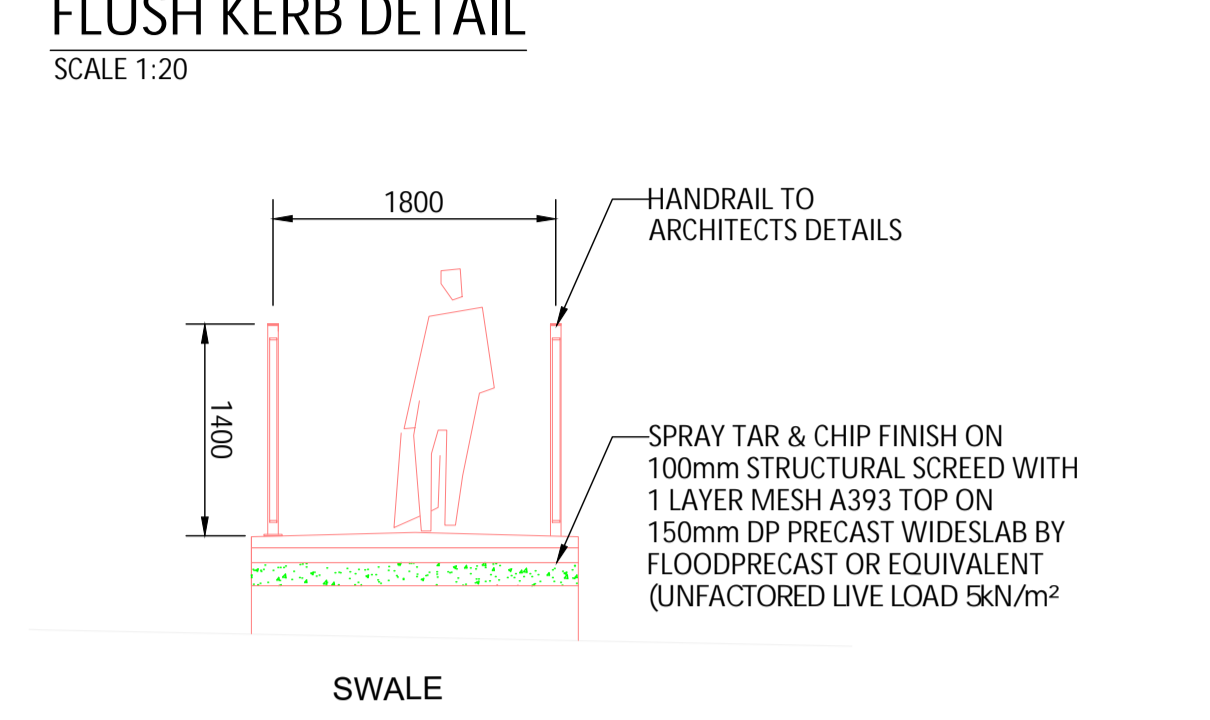
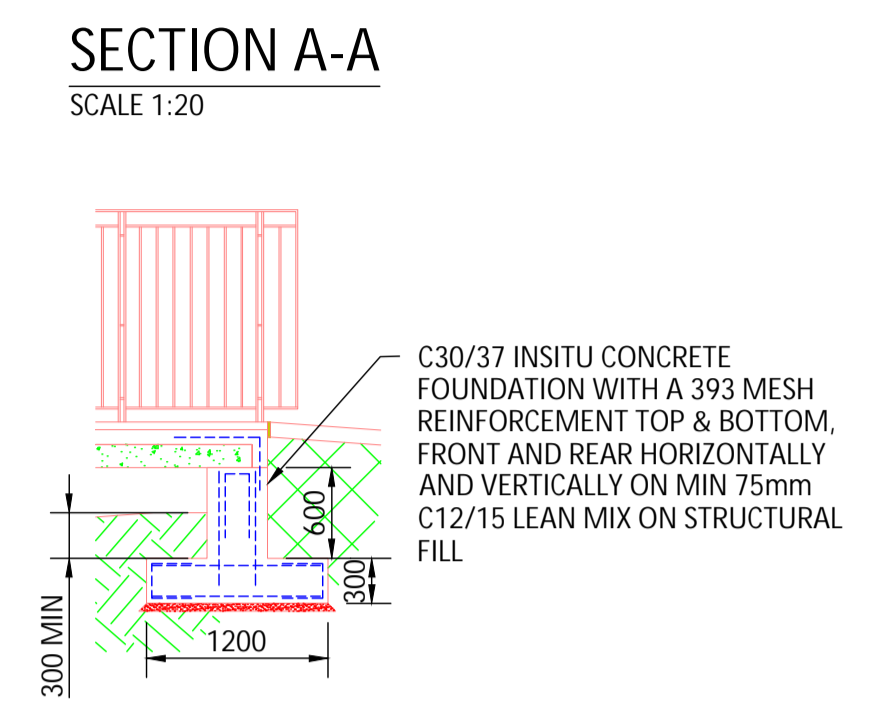
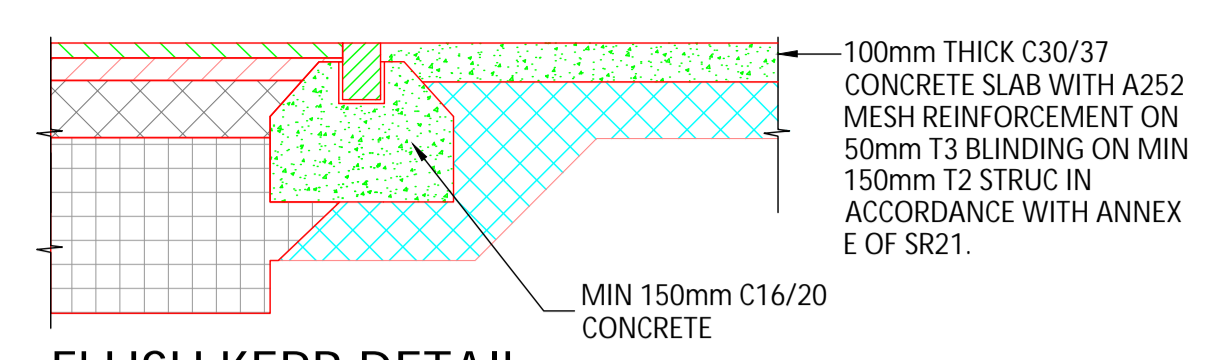
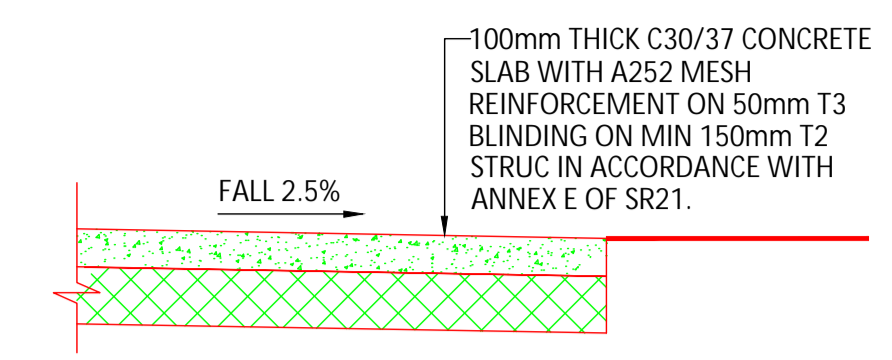
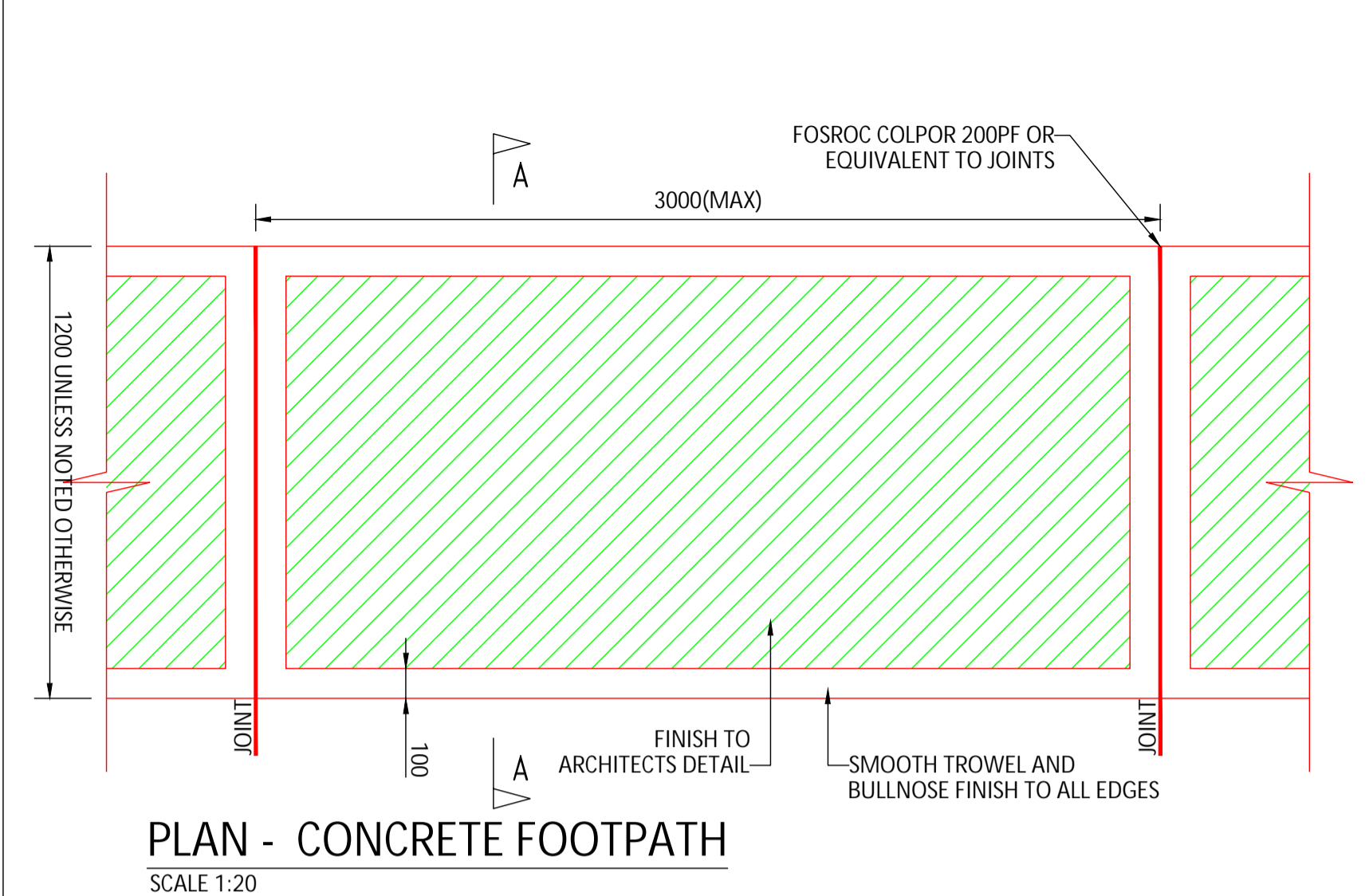
*John McBeath C.Eng, B.Eng, MSc, MIStructE, MIEI*

*Director*

*O'Connor Sutton Cronin & Associates*

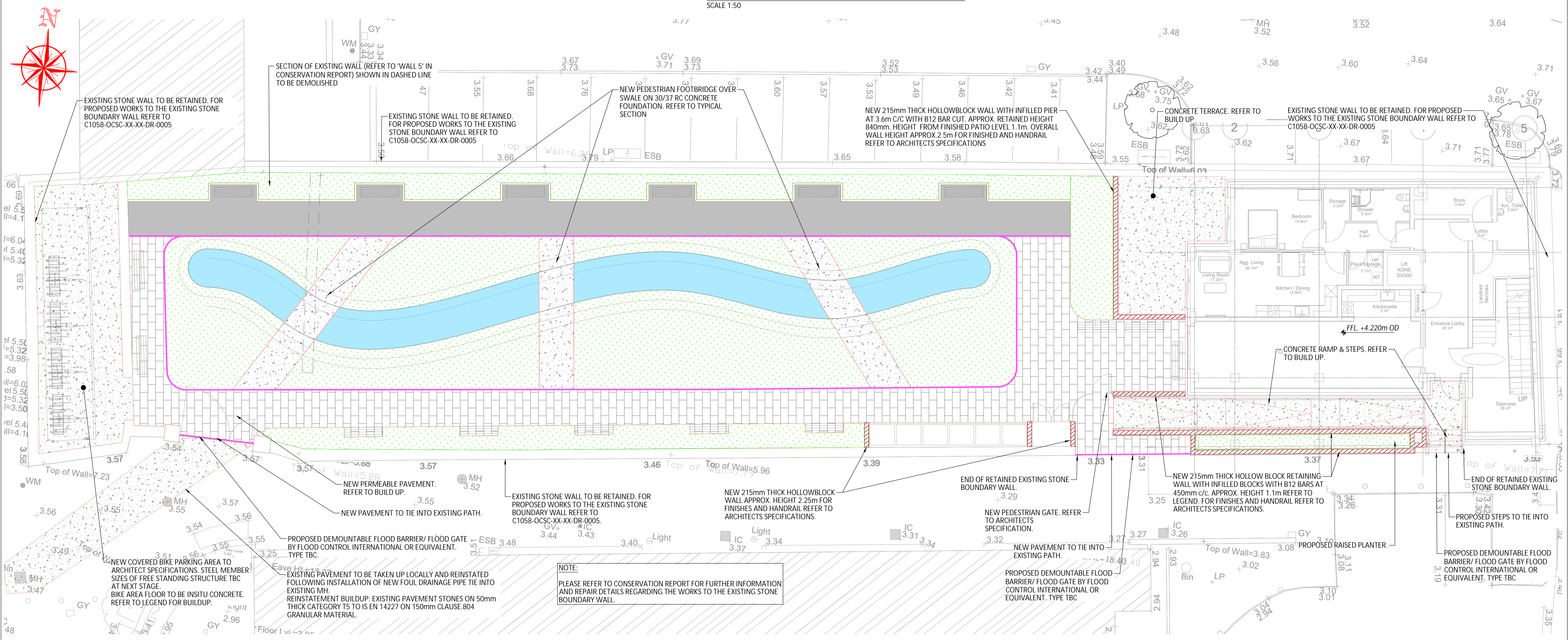


## Appendix A **PROPOSED SITE LAYOUT**



### LEGEND:

- PERMEABLE PAVED PATH: 80mm THICK PAVING STONES TO ARCHITECTS DETAILS, LAID ON 50mm THICK LAYING COURSE CONSISTING OF 6-2mm CLEAN GRIT ON GEOTEXTILE MEMBRANE ON MIN 350mm 20-5mm STONE SUBBASE ON GEOTEXTILE MEMBRANE.
- TARMAC PATH: 20mm BUFF MASTIC ASPHALT WEARING COURSE ON 50mm DBM BINDER COURSE ON 150mm THICK CL.804 SUB BASE ON 250mm 6F1/6F2 CAPPING LAYER. FINAL CAPPING LAYER BUILD UP TO BE DETERMINED VIA CBR RESULTS AND FLEXIBLE PAVEMENT BUILD UP TABLE.
- LANDSCAPING AREAS: REFER TO LANDSCAPE ARCHITECTS SPECIFICATIONS.
- CONCRETE TERRACE & RAMP & STEPS: 100mm THICK C30/37 CONCRETE SLAB WITH A252 MESH REINFORCEMENT ON 50mm T3 BLINDING ON MIN 150mm T2 STRUC IN ACCORDANCE WITH ANNEX E OF SR21.
- WET SWALE: ACCORDING TO CIRIA SUDS MANUAL 2015.
- 440x215mm HOLLOW BLOCK WALL WITH CAST INSITU CAPPING ON 900x300mm DP CONCRETE FOOTING WITH 1 LAYER OF A393 MESH. MIN COVER 50mm. HEIGHT VARIES - REFER TO NOTES ON DRAWINGS.
- FLUSH KERB



THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DESIGN TEAM DRAWINGS AND SPECIFICATIONS.

FOR SETTING OUT REFER TO ARCHITECT'S DRAWINGS. DO NOT SCALE THIS DRAWING. USE FIGURED DIMENSIONS ONLY.

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Rev No.	Date	Revision Note	Drn by	Chkd by
P01	26/02/24	ISSUED FOR PLANNING	MA	ABN
P02	03/05/24	ISSUED FOR PLANNING	MA	ABN

Rev No.	Date	Revision Note	Drn by	Chkd by



**OCSC**  
O'CONNOR SUTTON CRONIN  
MULTIDISCIPLINARY CONSULTING ENGINEERS  
Civil / Structural / Environmental / Mechanical / Electrical / Sustainability  
Cork Office: North Point House, North Point Business Park, New Mallow Road, Cork.  
Tel: +353 (0)21 2355816 Web: www.ocsc.ie  
Dublin London Belfast Galway Cork Birmingham

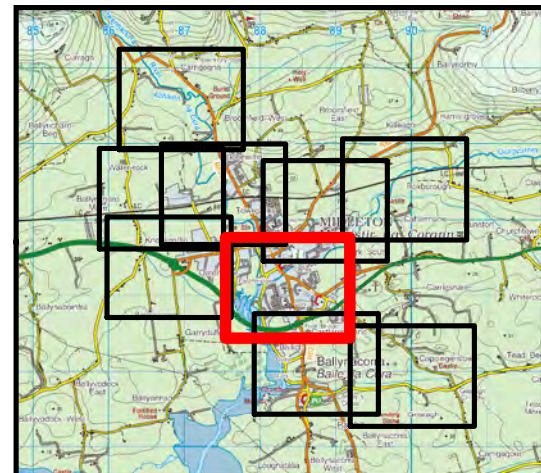
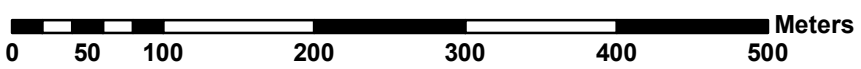
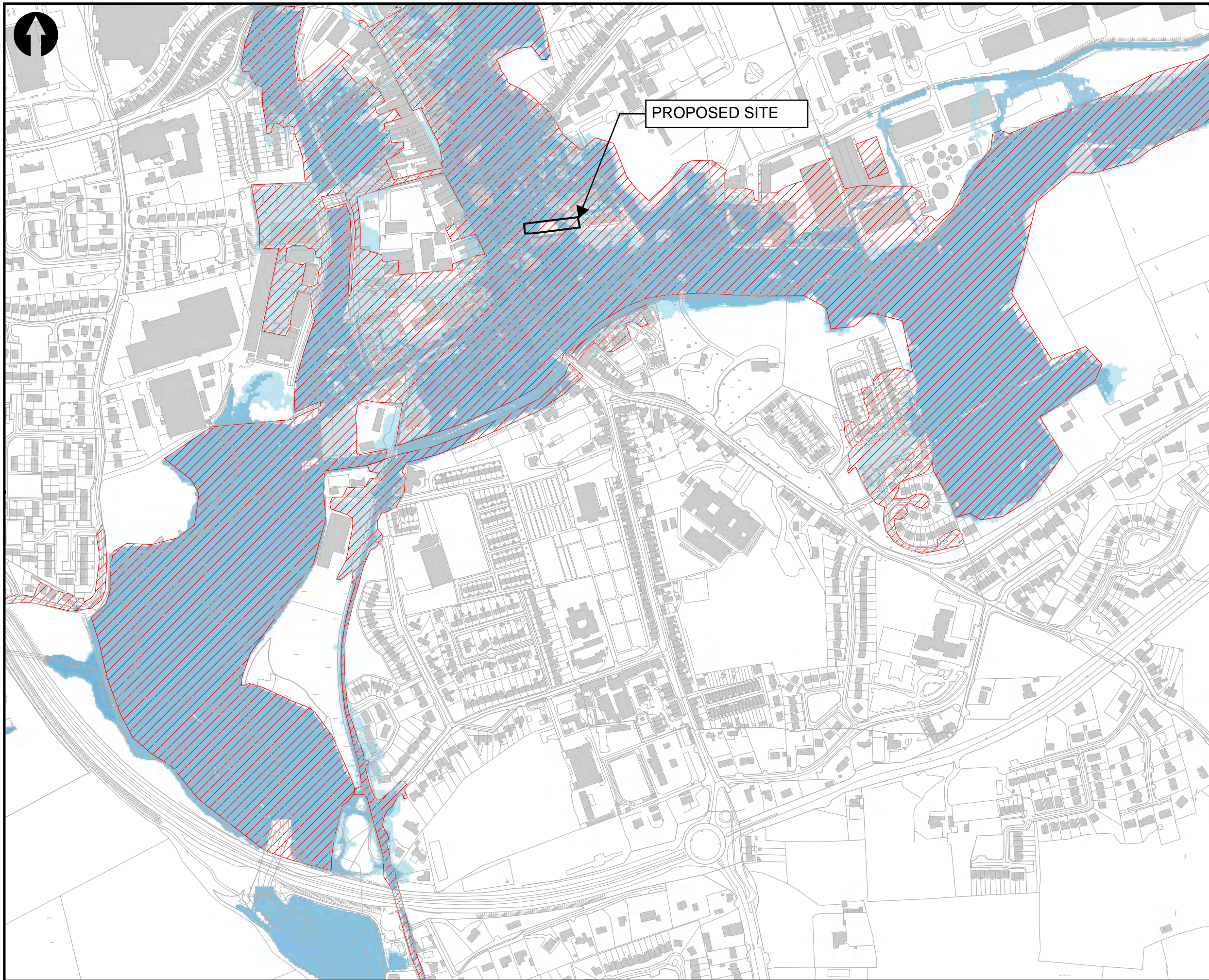
Client: CORK COUNTY COUNCIL  
Project: 16No. APARTMENTS AT DISTILLERY LANE, MIDDLETON CO.CORK  
Title: SITE LAYOUT

Code	Originator	Zone	Level	Type	Role	Number	Status	Revision
C1058	OCSC	XX	XX	DR	C	0001	S3	P02

Date: 02/24 Scale @ A1: 1/100 Drn by: CW Chkd by: ANB Aprvd by: JMcB

## Appendix B **OPW FLOOD MAPS**





**Legend:**

- 1% Fluvial AEP
- 0.1% Fluvial AEP
- Storm Babet Estimated Flood Extent

**WORKING DRAFT**

Rev:	Note:	Date:
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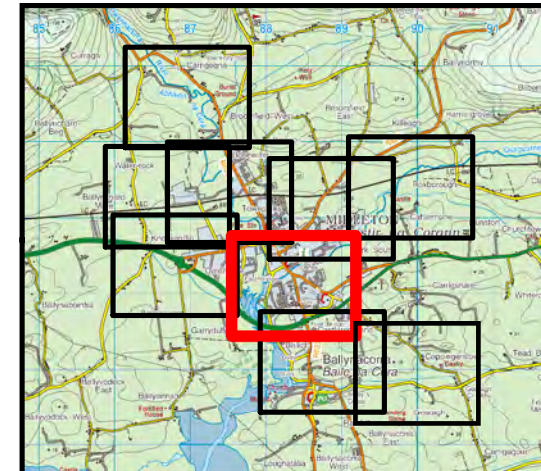
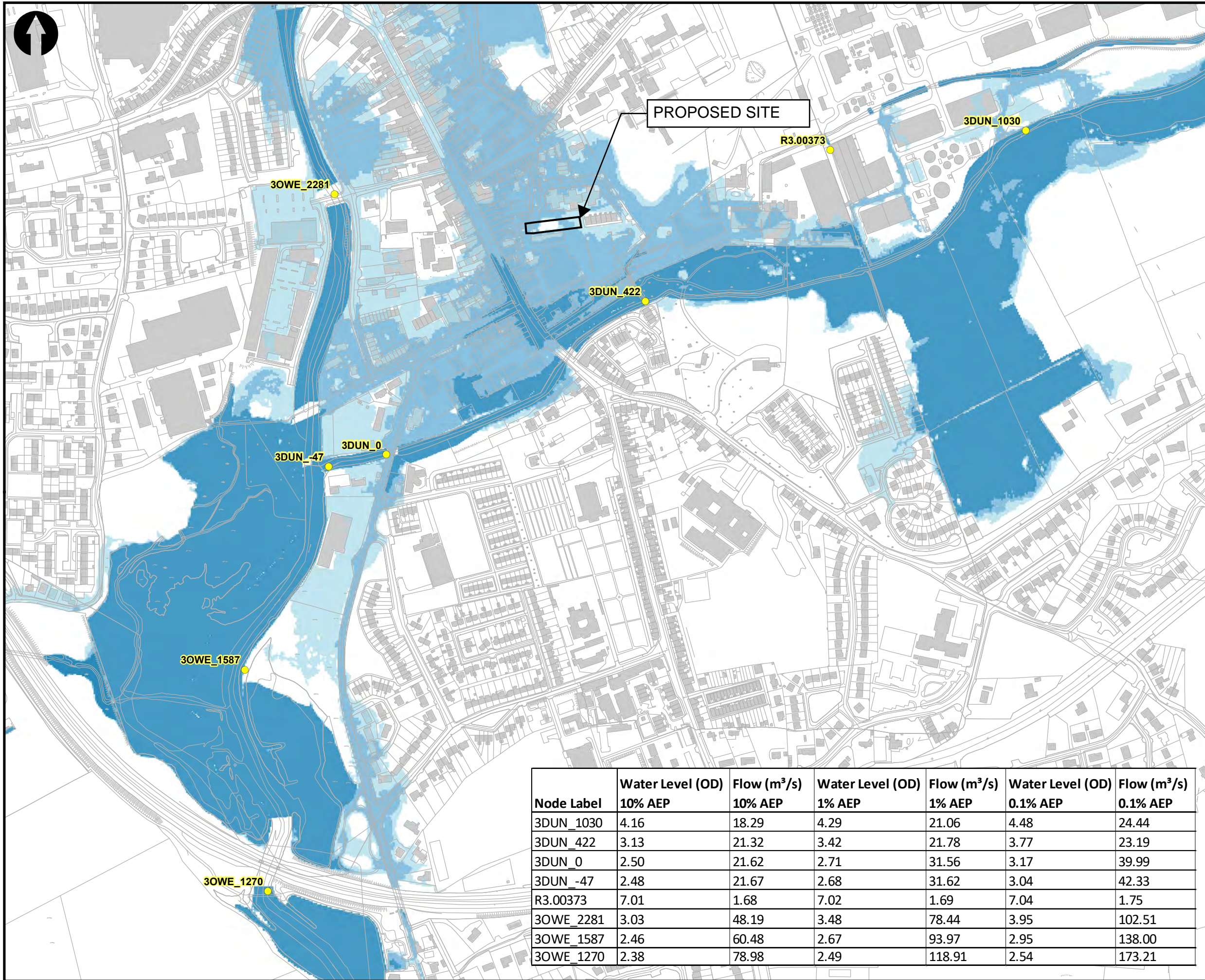


**ARUP**

Map:  
Midleton Storm Babet (18/10/2023)  
Estimated Flood Extents

Map type:	Fluvial Flood Extents	
Source:	Midleton Flood Relief Scheme	
Scenario:	Storm Babet	
Drawn By:	CB	Date: 20/12/2023
Checked By:	KB	Date: 20/12/2023
Approved By:	BO'B	Date: 20/12/2023
Drawing No:	1	

Map Series: Page 3 of 9  
Drawing Scale: 1:5,000 @ A3



**Legend:**

- 10% Fluvial AEP
- 1% Fluvial AEP
- 0.1% Fluvial AEP

Rev:                      Note:                      Date:



**ARUP**

Map:  
Midleton Fluvial Flood Extents

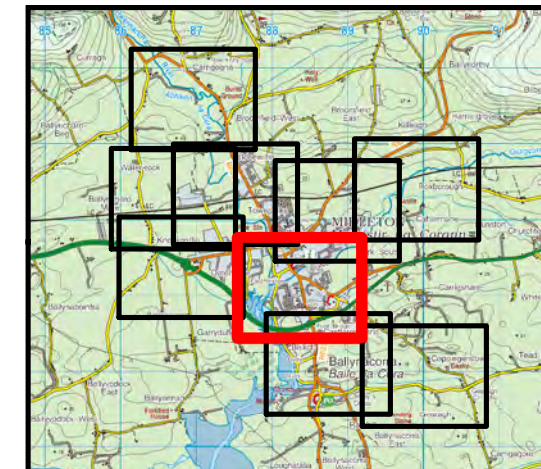
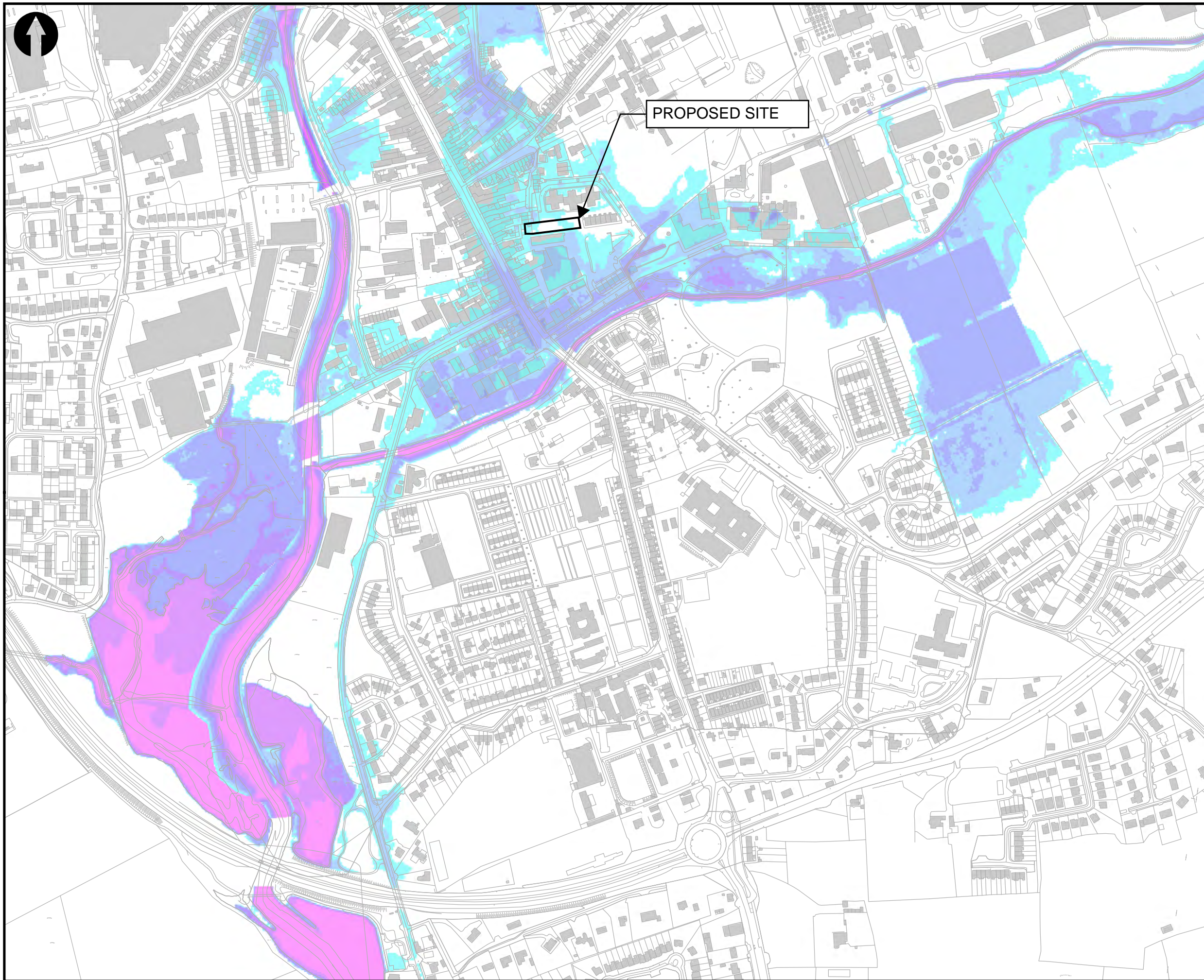
Map type:    Fluvial Flood Depth  
 Source:        Midleton Flood Relief Scheme  
 Scenario:     Current  
 Drawn By:    CB                      Date: 21/09/2022  
 Checked By: KB                      Date: 21/09/2022  
 Approved By: BO'B                      Date: 21/09/2022

Drawing No:    1

Map Series:    Page 3 of 9  
 Drawing Scale: 1:5,000 @ A3

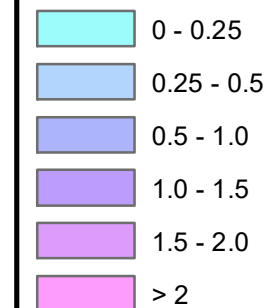
Node Label	Water Level (OD)		Flow (m <sup>3</sup> /s)		Water Level (OD)		Flow (m <sup>3</sup> /s)	
	10% AEP	10% AEP	1% AEP	1% AEP	0.1% AEP	0.1% AEP	0.1% AEP	0.1% AEP
3DUN_1030	4.16	18.29	4.29	21.06	4.48	24.44		
3DUN_422	3.13	21.32	3.42	21.78	3.77	23.19		
3DUN_0	2.50	21.62	2.71	31.56	3.17	39.99		
3DUN_-47	2.48	21.67	2.68	31.62	3.04	42.33		
R3.00373	7.01	1.68	7.02	1.69	7.04	1.75		
30WE_2281	3.03	48.19	3.48	78.44	3.95	102.51		
30WE_1587	2.46	60.48	2.67	93.97	2.95	138.00		
30WE_1270	2.38	78.98	2.49	118.91	2.54	173.21		





**Legend:**

**1% Fluvial AEP Flood Depth (m)**



Rev:	Note:	Date:
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**ARUP**

Map:  
Midleton Fluvial Flood Depths

Map type: Fluvial Flood Depth

Source: Midleton Flood Relief Scheme

Scenario: Current

Drawn By: CB Date: 22/09/2022

Checked By: KB Date: 22/09/2022

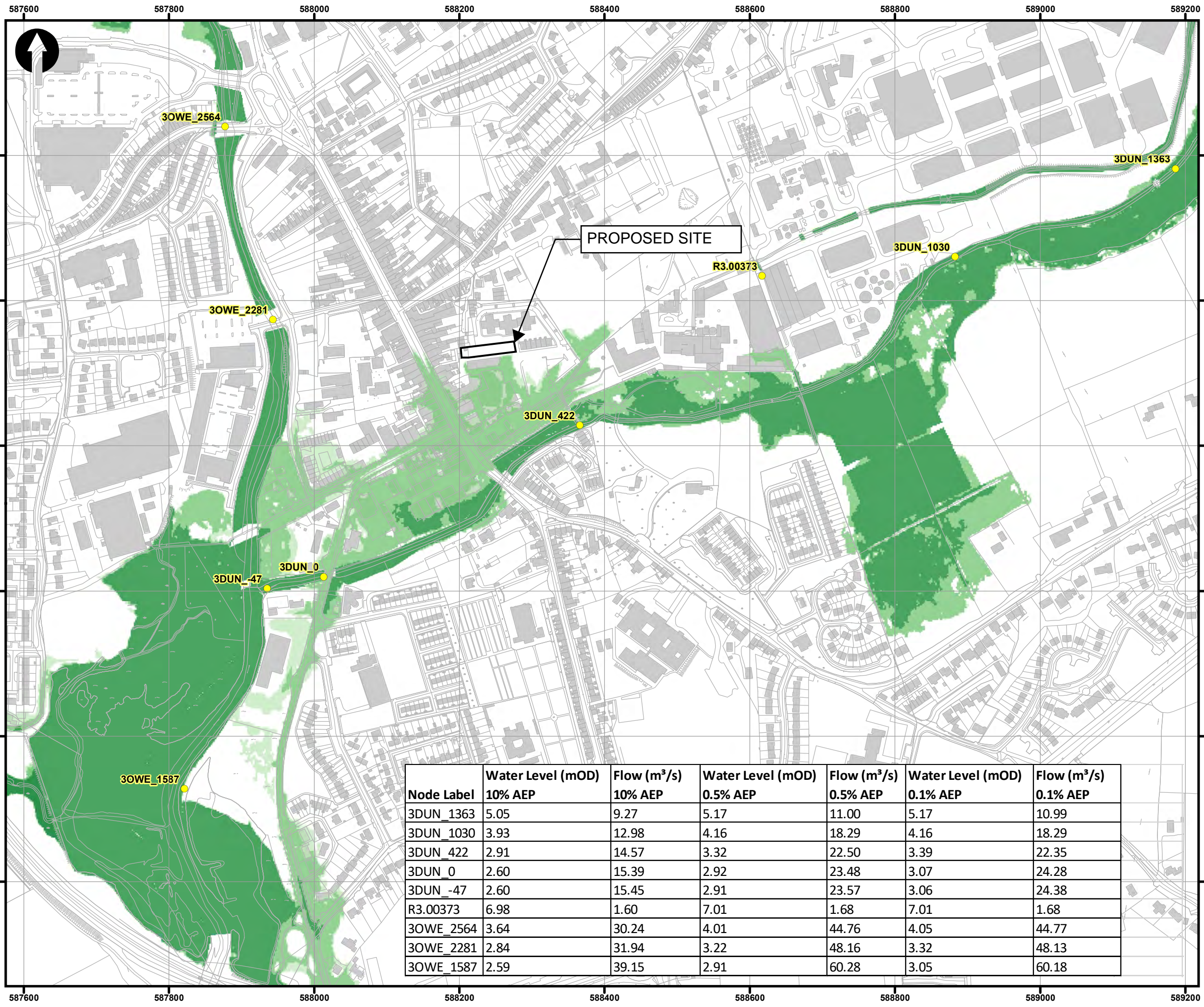
Approved By: BO'B Date: 22/09/2022

Drawing No: 1

Map Series: Page 3 of 9

Drawing Scale: 1:5,000 @ A3





- Legend:**
- 10% Tidal AEP
  - 0.5% Tidal AEP
  - 0.1% Tidal AEP

Rev:      Note:      Date:



**ARUP**

Node Label	Water Level (mOD)	Flow (m <sup>3</sup> /s)	Water Level (mOD)	Flow (m <sup>3</sup> /s)	Water Level (mOD)	Flow (m <sup>3</sup> /s)
	10% AEP	10% AEP	0.5% AEP	0.5% AEP	0.1% AEP	0.1% AEP
3DUN_1363	5.05	9.27	5.17	11.00	5.17	10.99
3DUN_1030	3.93	12.98	4.16	18.29	4.16	18.29
3DUN_422	2.91	14.57	3.32	22.50	3.39	22.35
3DUN_0	2.60	15.39	2.92	23.48	3.07	24.28
3DUN_-47	2.60	15.45	2.91	23.57	3.06	24.38
R3.00373	6.98	1.60	7.01	1.68	7.01	1.68
3OWE_2564	3.64	30.24	4.01	44.76	4.05	44.77
3OWE_2281	2.84	31.94	3.22	48.16	3.32	48.13
3OWE_1587	2.59	39.15	2.91	60.28	3.05	60.18

Map:  
Midleton Tidal Flood Extents

Map type: Tidal Flood Extent

Source: Midleton Flood Relief Scheme

Scenario: Current

Drawn By: CB      Date: 04/09/2020

Checked By: KB      Date: 04/09/2020

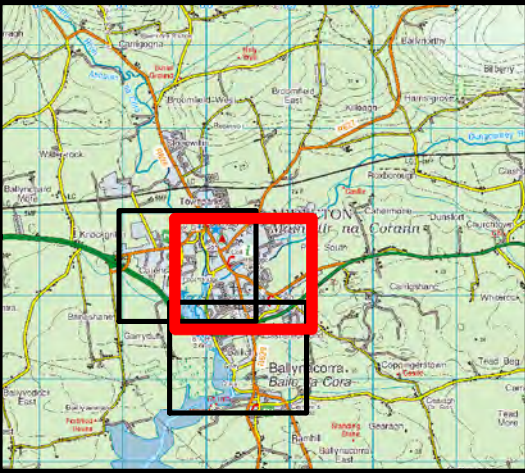
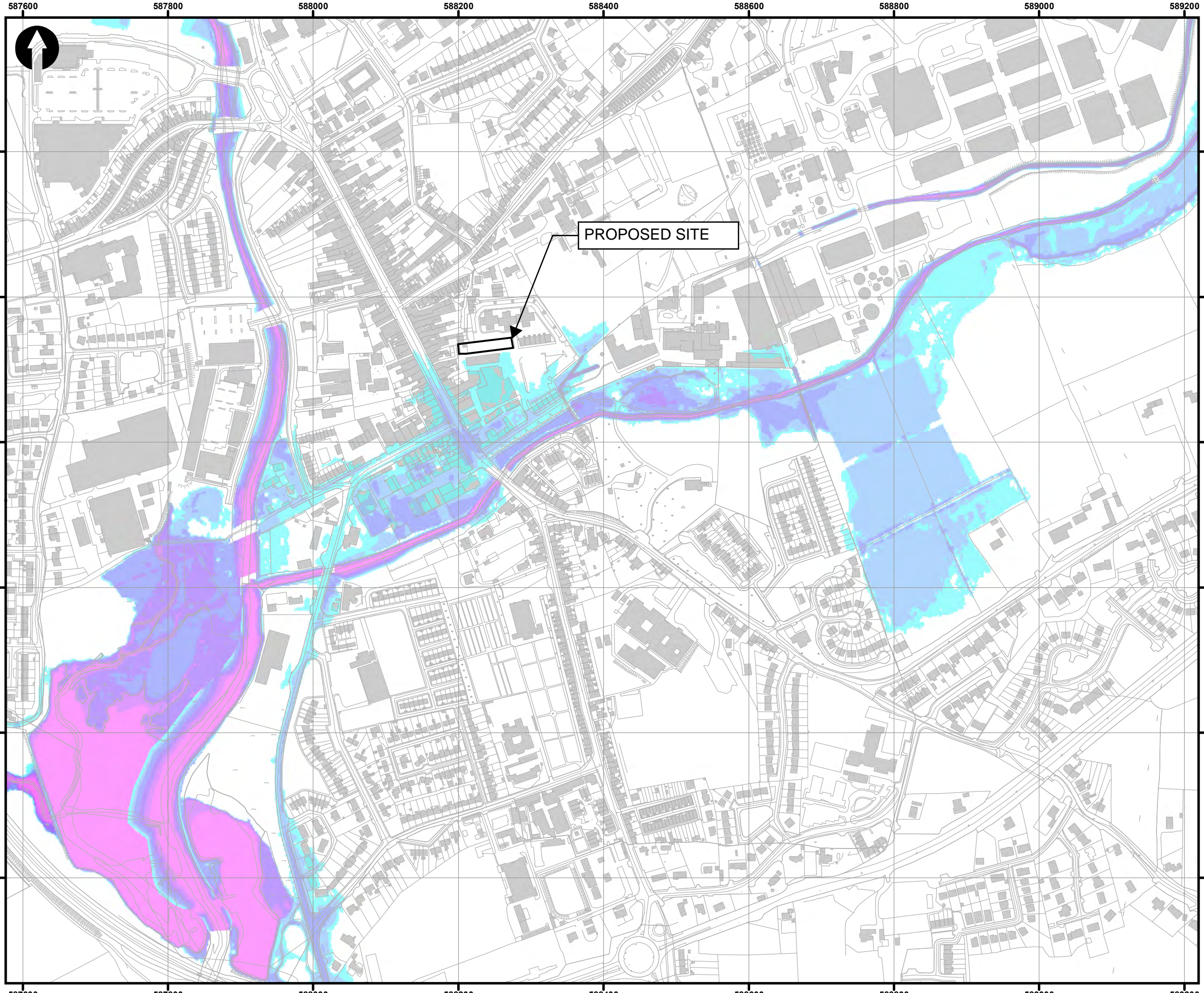
Approved By: BO'B      Date: 04/09/2020

Drawing No: 1

Map Series: Page 3 of 3

Drawing Scale: 1:5,000 @ A3





**Legend:**

**0.5% Tidal AEP Flood Depth (m)**

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- > 2

Rev:	Note:	Date:
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







ARUP

Map: Midleton Tidal Flood Depths	
Map type:	Tidal Flood Depth
Source:	Midleton Flood Relief Scheme
Scenario:	Current
Drawn By:	CB
Date:	04/09/2020
Checked By:	KB
Date:	04/09/2020
Approved By:	BO'B
Date:	04/09/2020
Drawing No:	1
Map Series:	Page 2 of 3
Drawing Scale:	1:5,000 @ A3

PROPOSED SITE

**Legend**  
Q100-2mm Pluvial Max Depths

-  0-0.1m
-  0.1-0.25m
-  0.25-0.5m
-  0.5-1.0m
-  1.0-2.0m
-  >2.0m



**ARUP**

Map:  
Midleton Pluvial Flood Depths

Map: Pluvial Flood Depths

Source: Midleton Flood Relief Scheme

Scenario: Current

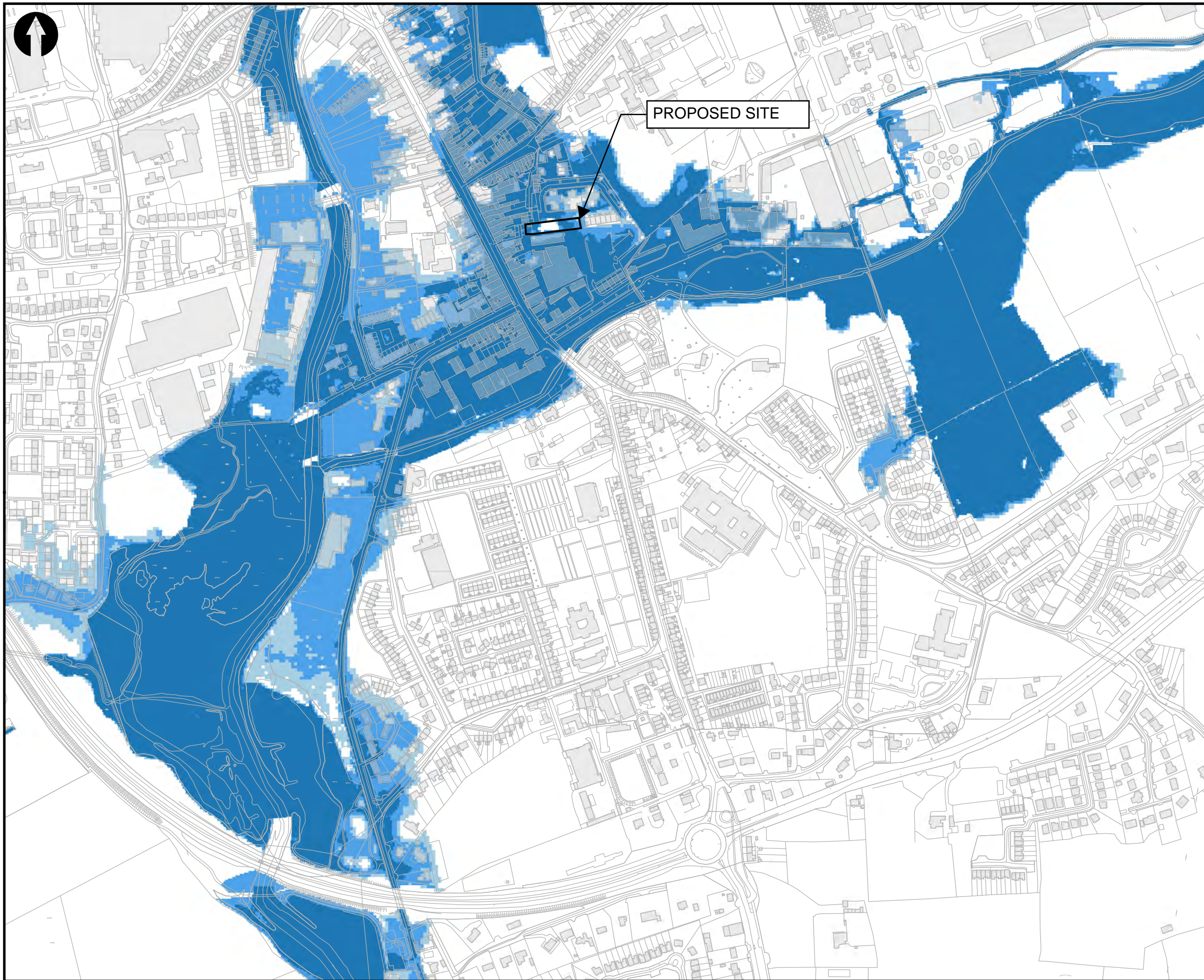
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Checked By: KB      Date: 10/09/2020

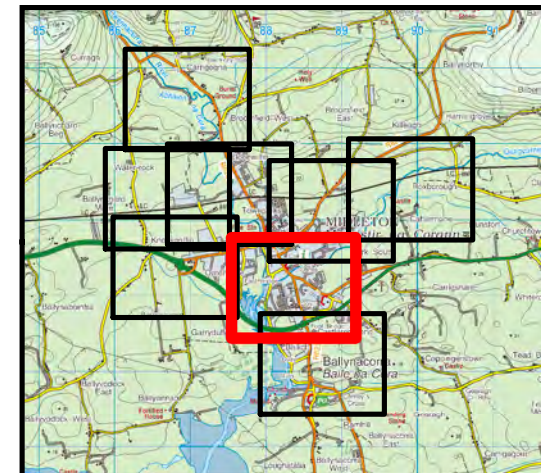
Approved By: BO'B      Date: 10/09/2020

Drawing No: 1




Map Series: Page 1 of 1



PROPOSED SITE



**Legend:**

-  Current 1% Fluvial AEP
-  MRFS Fluvial 1% AEP
-  HEFS Fluvial 1% AEP

Rev:	Note:	Date:
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**ARUP**

Map:  
Midleton Fluvial Flood Extents (Undefended)

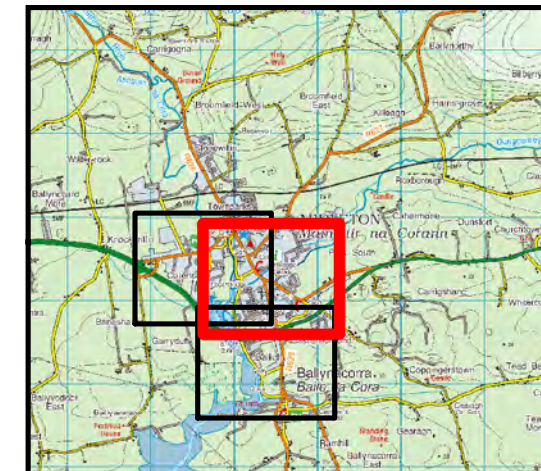
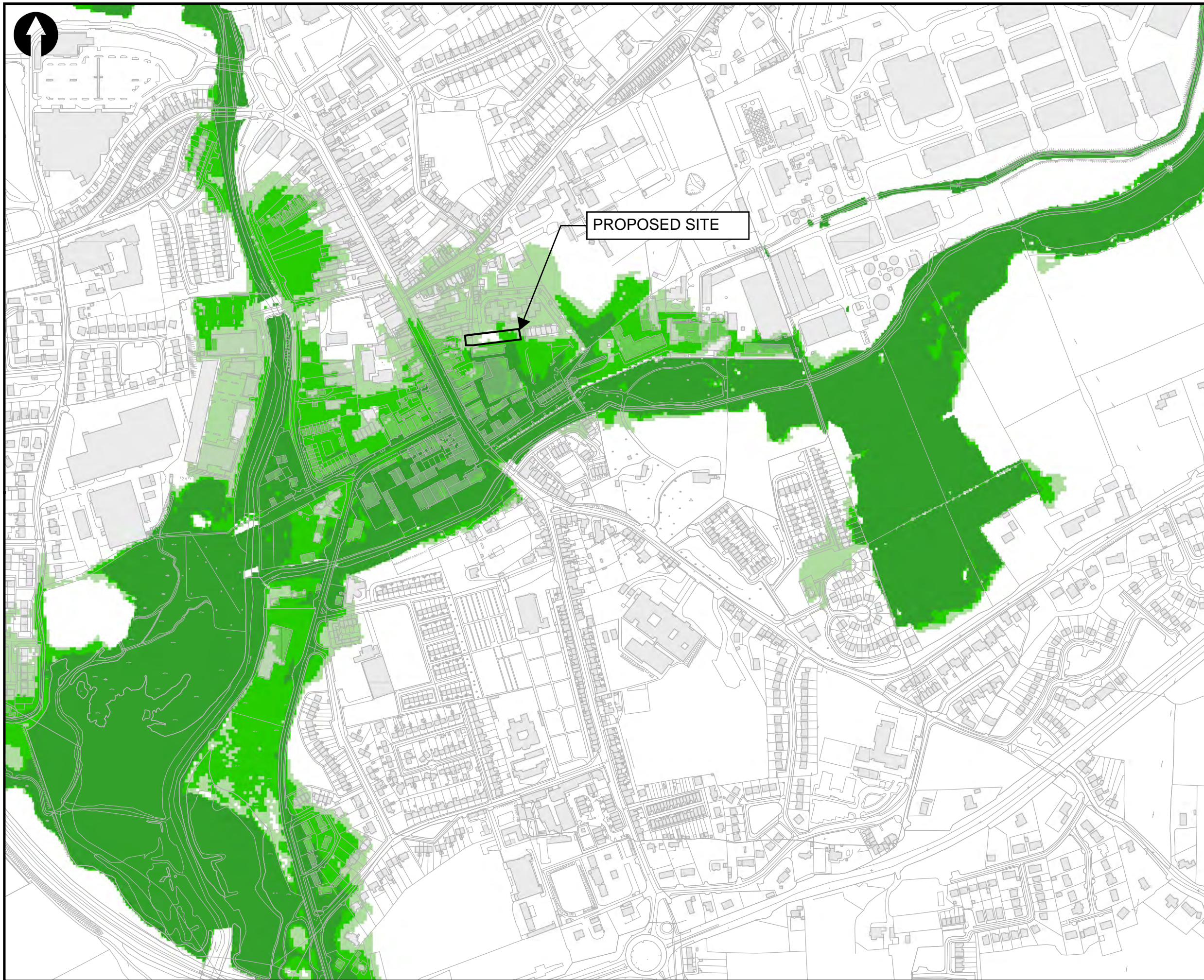
Map type:	Fluvial Flood Depth		
Source:	Midleton Flood Relief Scheme		
Scenario:	Current, MRFS & HEFS		
Drawn By:	CB	Date:	03/03/2022
Checked By:	KB	Date:	03/03/2022
Approved By:	BO'B	Date:	03/03/2022

Drawing No: 1

Map Series: Page 3 of 8

Drawing Scale: 1:5,000 @ A3





**Legend:**

- Current Tidal 0.5% AEP
- MRFS Tidal 0.5% AEP
- HEFS Tidal 0.5% AEP

Rev:	Note:	Date:
------	-------	-------



**ARUP**

Map:  
Midleton Tidal Flood Extents (Undefended)

Map type:	Tidal Flood Extent
Source:	Midleton Flood Relief Scheme
Scenario:	Current, MRFS & HEFS
Drawn By:	CB
Date:	03/03/2022
Checked By:	KB
Date:	03/03/2022
Approved By:	BO'B
Date:	03/03/2022

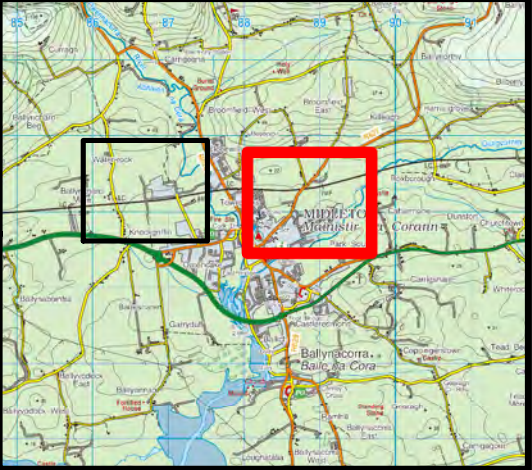
Drawing No: 1

Map Series: Page 3 of 3


Drawing Scale: 1:5,000 @ A3







**Legend:**

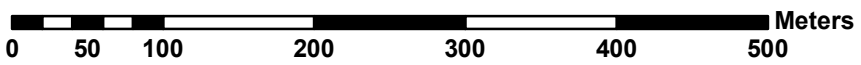
 Design Groundwater Flood Extent

Rev:	Note:	Date:
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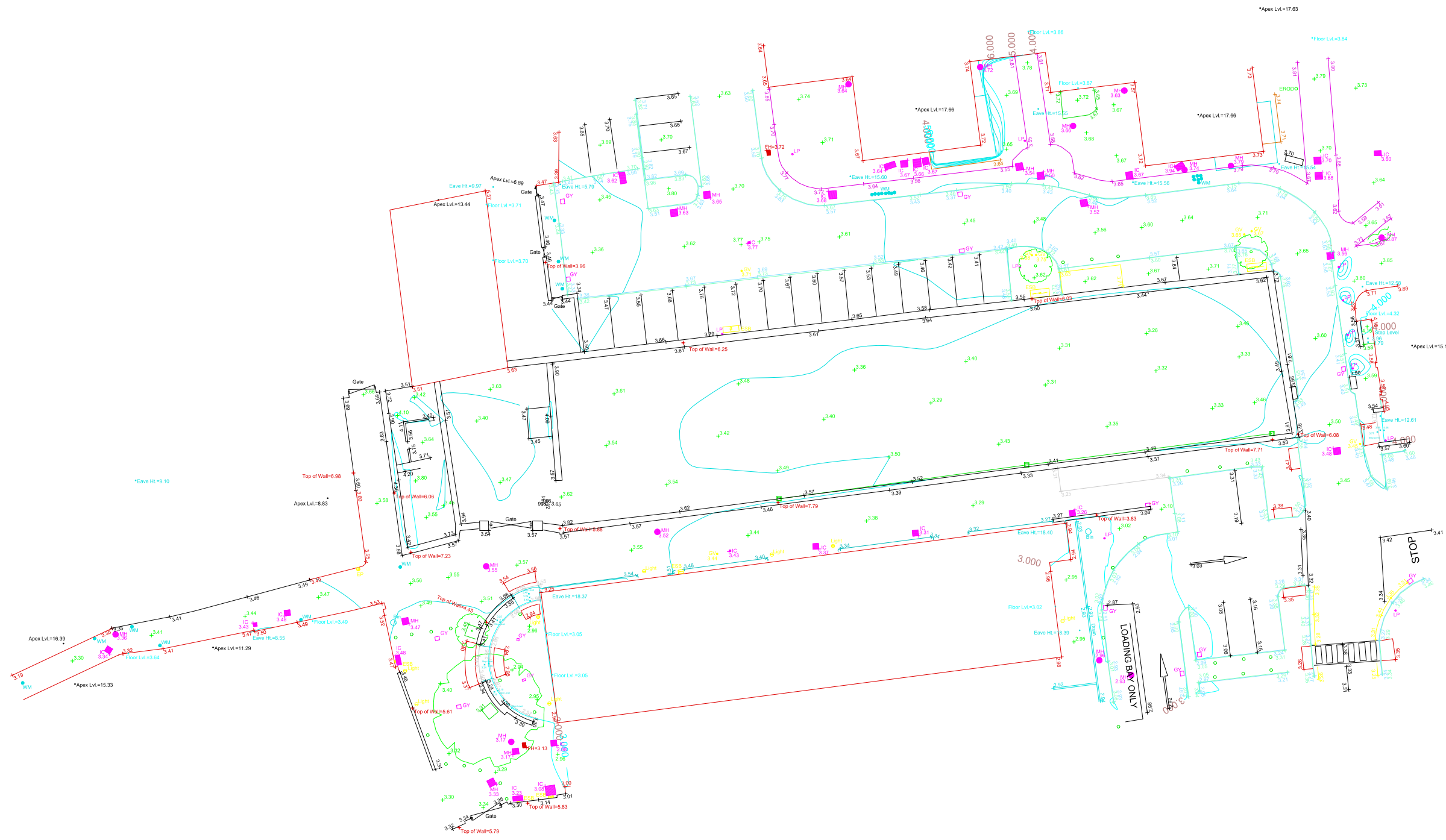


**ARUP**

Map: Midleton Groundwater Flood Extent		
Map type:	Groundwater Flood Extent	
Source:	Midleton Flood Relief Scheme	
Scenario:	Current	
Drawn By:	AP	Date: 07/09/2020
Checked By:	KB	Date: 07/09/2020
Approved By:	BO'B	Date: 07/09/2020
Drawing No:	1	
Map Series:	Page 1 of 2	
Drawing Scale:	1:5,000 @ A3	



## Appendix C **SITE SURVEY LEVELS**



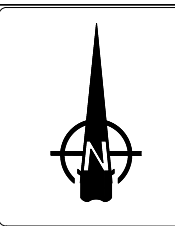
Address: Rathjarney  
Piercestown  
Co. Wexford  
Tel (086) 8522298  
(086) 1935847  
Email: john@metroscan.ie  
caran@metroscan.ie  
Website: www.metroscan.ie

Legend	
	Bottom of Bank
	Building Line
	Carriageway Edge
	Edge of Trees
	ESB Lines
	Fenceline
	Hard Shoulder
	Hedgeline
	Kerb Line
	Road Edge
	Road Centre Line
	Solid White Line
	Top of Bank
	Track
	Wall Line

Date	Rev. No.	Description	Drawn by	Checked by	Approved by

Client  
Cork Co Co

NOTES:  
1. ITM Co-ordinates.  
2. All levels relative to Malin Head Datum.  
3. Contour interval 0.50 metres.  
4. Although every effort has been made to survey all features, some may be missing due to obstructions.  
5. Every effort has been made to survey features at 10m intervals and retain their integrity.



Project Title:  
Site Survey at Midleton, Co. Cork.  
Drawing Title:  
2D Topographical Survey ITM

Approved by	KON	Y
Checked by	KON	Y
Drawn by:	KON	Y
Scale:	1:200	
Date:	December 16th 2020	

## Appendix D **HISTORIC FLOODING REPORTS**

# Past Flood Event Local Area Summary Report

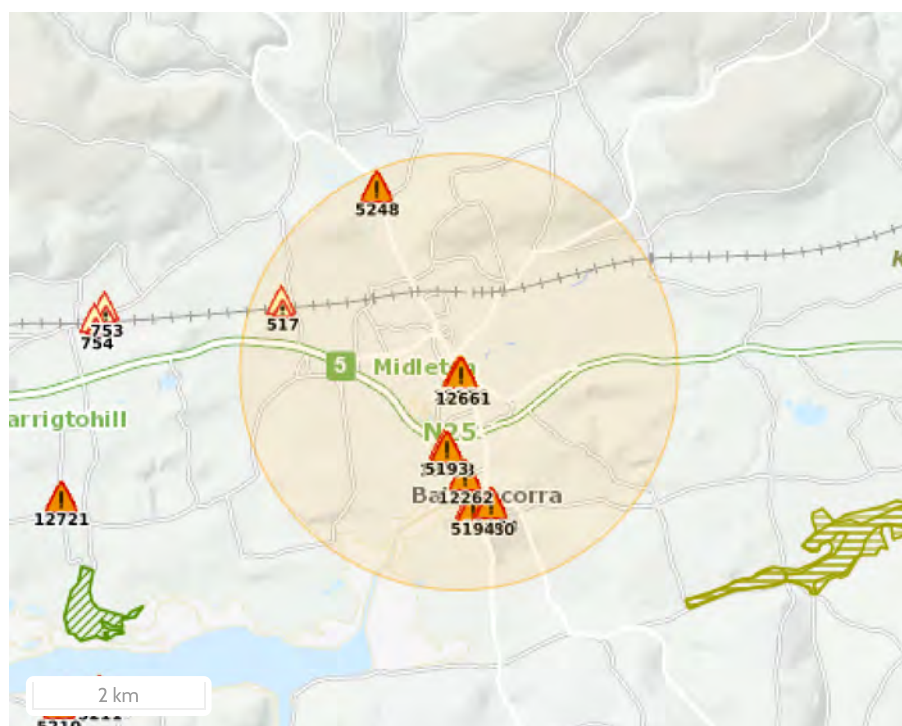


**OPW** Oifig na nOibreacha Poiblí  
Office of Public Works

Report Produced: 15/4/2021 13:53

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](http://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](http://Floodinfo.ie)

## 16 Results

Name (Flood_ID)	Start Date	Event Location
1.  Flood report for Main Street Midleton Co.Cork on the 6th of November 2014 (ID-12661) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	06/11/2014	Exact Point
2.  Water Rock Midleton, Cork Recurring (ID-517) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	n/a	Approximate Point
3.  Bailich Road Midleton recurring (ID-5193) Additional Information: <a href="#">Reports (2)</a> <a href="#">Press Archive (0)</a>	n/a	Approximate Point
4.  Road 96303 Ballynacorra near Midleton recurring (ID-5194) Additional Information: <a href="#">Reports (2)</a> <a href="#">Press Archive (0)</a>	n/a	Approximate Point
5.  Road 96303 Ballynacorra near Midleton Oct 2004 (ID-5195) Additional Information: <a href="#">Reports (2)</a> <a href="#">Press Archive (0)</a>	27/10/2004	Approximate Point
6.  Midleton Broomfield West Nov 2000 (ID-5248) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	05/11/2000	Approximate Point

Name (Flood_ID)	Start Date	Event Location
7.  Flooding at Midleton Co.Cork 5th June 2012 (ID-12176) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	05/06/2012	Approximate Point
8.  Flooding at Midleton, Co. Cork 5th June 2012 (ID-12041) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	05/06/2012	Approximate Point
9.  Flooding in Midleton 25th July 2013 (ID-12042) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	25/07/2013	Approximate Point
10.  Flooding at Midleton Co.Cork 5th June 2012 (ID-11862) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	05/06/2012	Exact Point
11.  Flooding at Ballinacurra, Midleton, Co. Cork on 25th July 2013 (ID-12080) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	25/07/2013	Approximate Point
12.  Main Street & Bailick Road Midleton Co.Cork on 3rd February 2014 (ID-12081) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	03/02/2014	Approximate Point
13.  Ballinacurra Village Co.Cork on 3rd.February 2014. (ID-12084) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	03/02/2014	Approximate Point
14.  Midleton, Co.Cork 2nd January 2014 (ID-12088) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	02/01/2014	Approximate Point
15.  Flood Report Bailick Road Midleton 8th of October 2014 (ID-12262) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	08/10/2014	Approximate Point
16.  Midleton, Co. Cork. 5th June 2012 (ID-11580) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	05/06/2012	Approximate Point

Extract from Midleton Flood Relief Scheme  
Storm Babet Flood Event Report  
(Reference: 252803-71)  
Draft 2 | 22 December 2023

### 3.5.6 The Baby's Walk/ Lower Main Street

#### Mechanisms of Flooding in Hydraulic Model

The main area of the town in the vicinity of The Baby's Walk and Lower Main Street is at risk from a number of mechanisms of flooding from the Dungourney and the Owenacurra. The mechanisms of flooding in the hydraulic model detailed below correspond to the arrows in Figure 71.

- A. For the large return period events, flood risk in the vicinity of Main Street is partly due to overland flow from the Owenacurra River as detailed in Section 3.5.3. The threshold of flooding of this flow path is the Q1000 event in the hydraulic model;
- B. There is also a risk of overland flow from Drury's Avenue which travels South and inundates Connolly Street/ Dickinson's Lane as detailed in Section 3.5.3. The threshold of flooding of this flow path in the hydraulic model is the Q100 event.
- C. Overland flow from the Owenacurra via Kennedy Park and Broderick Street travels East as detailed in Section 3.5.2.
- D. The Baby's Walk is flooded from the East due to overland flow from the IDL/ People's Park as discussed in Section 3.5.5.
- E. The Baby's Walk area is directly flooded from the Dungourney due to over topping of the right bank of the river. The threshold of flooding for fluvial flooding is the Q5 event.
- F. The Distillery Walk / Cuddigan's Yard area downstream of Lewis Bridge is also directly flooded from the Dungourney due to over topping of the right bank during the Q1000 event.
- G. Water overtops the Dungourney left bank upstream of Lewis Bridge and floods the Roxboro Close Area in the modelled Q1000 event.
- H. On the left bank downstream of Lewis Bridge water gets out of channel in the Q1000 model event.
- I. Broderick Street is also flooded from flow coming down Main Street





**Figure 71: Lower Main Street/ The Babys Walk: Existing Flood Mechanisms**

**Comparison of Modelled vs Observed Mechanisms During Storm Babet**

All the mechanisms of flooding in the hydraulic model detailed above occurred during Storm Babet. The mechanisms were largely validated using aerial images taken by the Guileen Coast Guard, drone footage uploaded to social media or images taken by the public and steering group members.

Figure 72 shows flooding of Lower Main Street at 2.11pm on the day of the event. Wracks marks taken at the Three shop at the end of Main Street were circa 3.8mOD which is 300mm above the modelled Q1000 modelled water level at this location (i.e. 3.5mOD).



**Figure 72: Flooding of Lower Main Street**

A wrack mark was also recorded by Arup at the front door of the Three shop, the maximum depth of flooding at this location was circa 1.18m as shown in Figure 73.



**Figure 73: Wrack Mark at Three Shop**

Figure 74 was provided by the Guileen Coast Guard shows the extent and active mechanisms of flooding in the IDL, People's Park and The Babys Walk area. Water flooded the rear of the Distillery Walk Cottages via the Corabbey Court development (Mechanism B), through the IDL entrance and the gap in the wall connecting People's Part to Distillery Walk (Mechanism D) and directly from the Dungourney (Mechanism E). The flood mechanism resulting in inundation of Roxboro Close can also be seen in Figure 74 (Mechanism G).



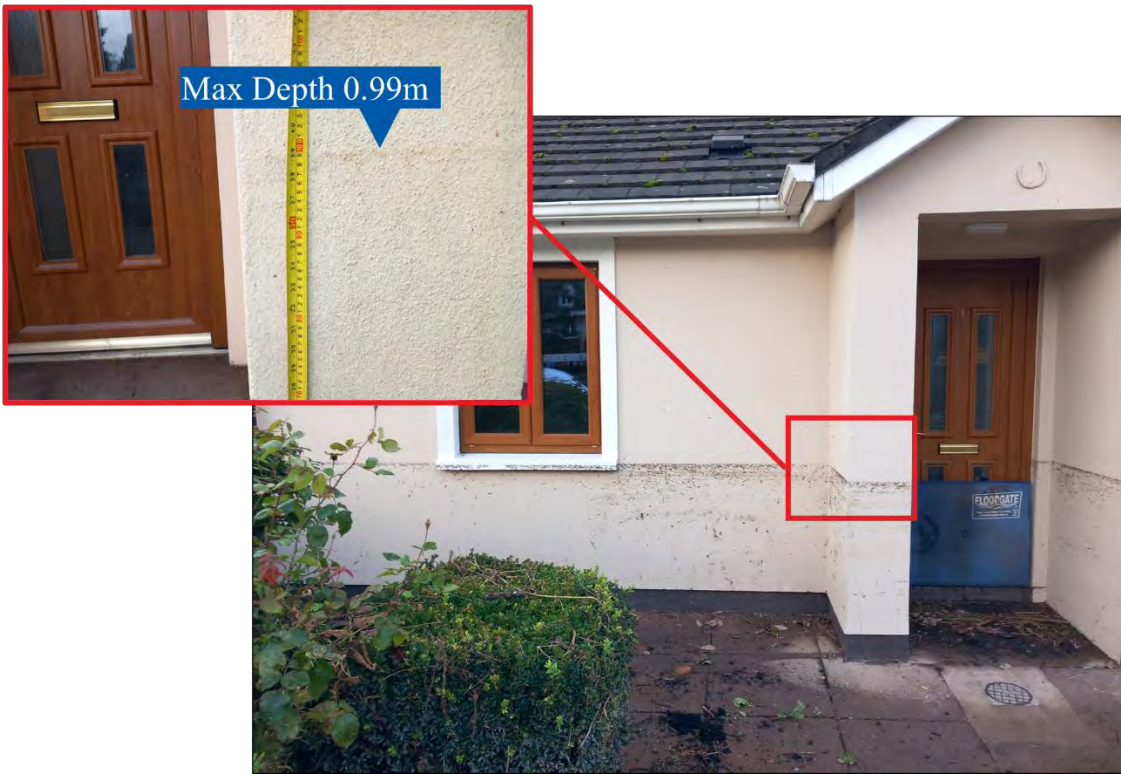
**Figure 74: Flooding of IDL, Peoples Park and The Babys Walk**

The gap in the wall connecting People’s Park and Distillery Walk squeezed the flow and resulted in very high velocities which led to significant scouring of a section of footpath as shown in Figure 75.



**Figure 75: Scour Damage at Distillery Walk**

A wrack mark was also recorded by Arup at the Distillery Walk Cottages, the maximum depth of flooding at this location was circa 0.99m as shown in Figure 76.



**Figure 76: Wrack Mark at Distillery Walk Cottages**

Figure 77 presents a still of drone footage taken just after the peak of the flood event and uploaded to social media. It shows flooding of Lower Main Street, The Baby’s Walk and Roxboro Close as discussed above. It also shows the flood extent of the right and left bank downstream of Lewis Bridge (Mechanism F and H respectively). Figure 76 illustrates the flooding Broderick Street, the source of which is believed to be from Kennedy Park in the direction of Main Street (Mechanism C) initially and then later in the event from Lower Main Street in the direction of Kennedy Park (Mechanism I). It is noted that the Owenacurra was also overtopped in this location such that water on Broderick Street was in effect a meeting point of two separate overland flow routes.



**Figure 77: Flooding of Lower Main Street, The Baby’s Walk and Broderick Street**

Figure 78 was taken at 3.06pm on the day of the event from Lewis Bridge in the direction of The Babys Walk. Based on water levels from other images it is estimated that this was the time of the peak of the flood in this area. It is estimated that the peak water level in The Baby's Walk was circa 3.6mOD which is circa 100mm higher than the modelled Q1000 model water level (i.e. 3.5mOD).



**Figure 78: Flooding of The Babys Walk**

Figure 79 was taken at 3.26pm from Lewis Bridge on the day of the event in the direction of Roxboro Close. Water has clearly overtopped the left bank where the metal fencing has been installed. Based on our inspection of the wrack marks, it is estimated that the peak water level in Roxboro Close was circa 4.05mOD.

This is notably higher than the Q1000 model water level in this area was circa which is 3.7mOD, i.e. the maximum water level during Storm Babet is circa 350mm higher than the modelled Q1000 water level.



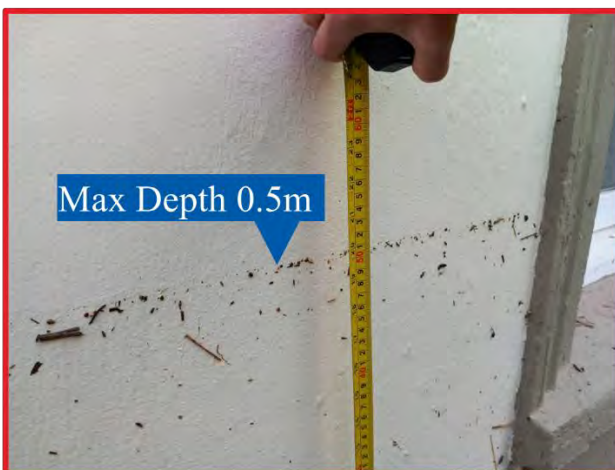
**Figure 79: Flooding of Roxboro Close**

Figure 80 is a still of a video and shows the mechanism of flooding on the right bank downstream of the Lewis Bridge (Mechanism F). No wrack marks were recorded after the event at this location however based on topographical survey data it is estimated that the flood level in this area was circa 3.6mOD which is 300mm higher than the Q1000 modelled level of 3.3mOD.



**Figure 80: Flooding of Right Bank Downstream of Lewis Bridge**

Figure 81 was taken at 3.02pm on the day of the event and shows the mechanism of flooding on the left bank downstream of the Lewis Bridge (Mechanism H). Based on topographical survey data, it is estimated the flood level in this area was circa 3.6mOD which is also 300mm above the modelled Q1000 water level of circa 3.3/3.35mOD in this area. A wrack mark was also recorded by Arup at this location, the maximum depth of flooding was circa 0.50m as shown in Figure 81.



**Figure 81: Flooding of Left Bank Downstream of Lewis Bridge**

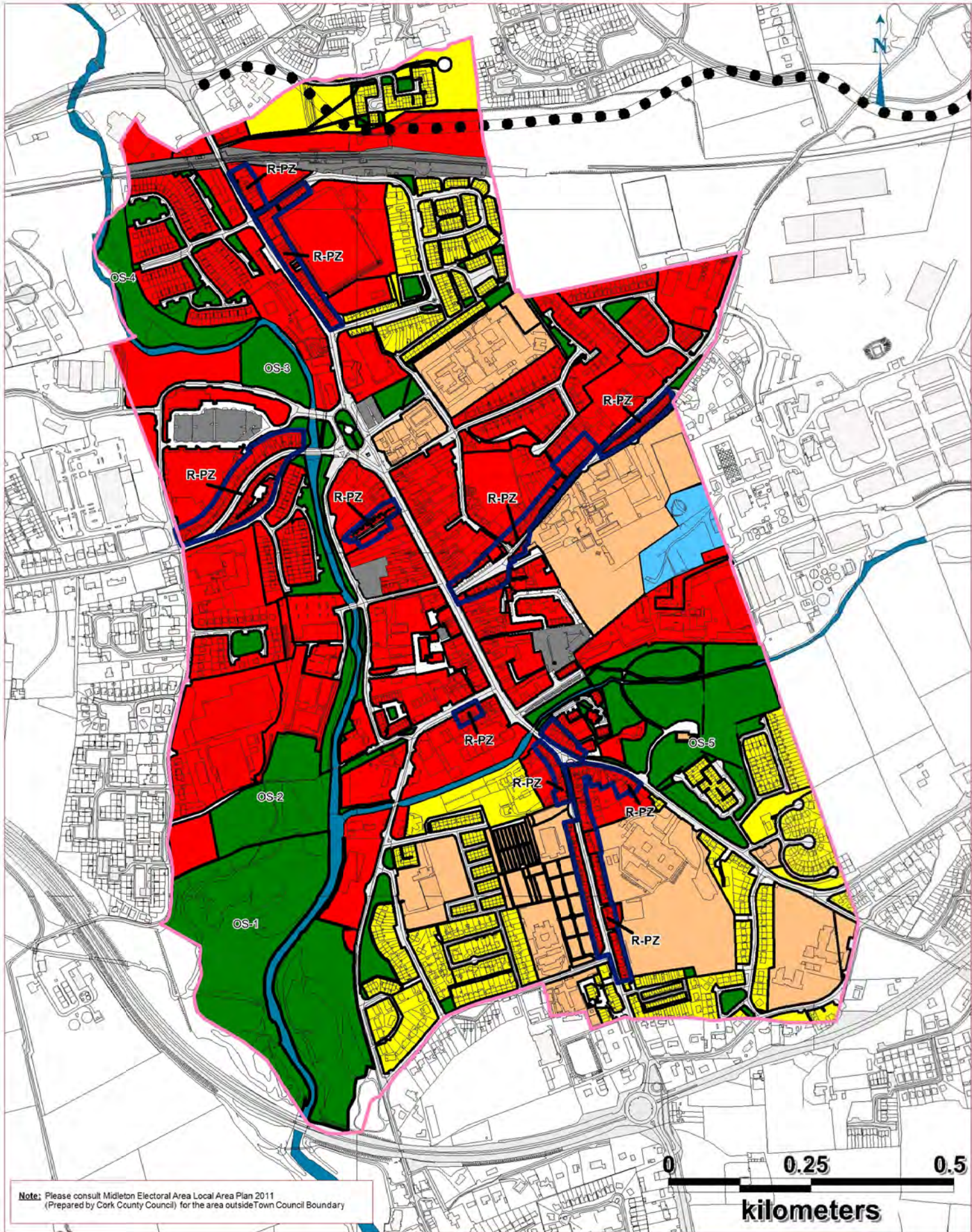
Reports from CCC note that the water levels at Lewis Bridge were significantly higher at 18.53 compared to water levels recorded at 14.15. A further observation shortly after high tide at 20:43 confirmed that the level

had dropped from the level observed at 18:53. Based on these observations it can be concluded that the peak of the Owenacurra passed before the peak of the Dungourney.

It is estimated that 151 properties were flooded in this area during Storm Babet, the majority of which were commercial.



## Appendix E **ZONING MAP FOR MIDLETON TOWN**



- |                             |                                   |                       |  |
|-----------------------------|-----------------------------------|-----------------------|--|
| Residential                 | Town Centre Mixed Uses            | Utilities             | Open Space/ Sports/ Recreation/ Amenity                    |
| Residential Protected Zones | Institutional / Civic Educational | Town Council Boundary | Ballynacorra River<br>Dungourney River<br>Ovenacurra River |
| Industry                    |                                   | Northern Relief Road  |  |

**Middleton Town Council**

**Middleton Town Development Plan 2013**

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# Zoning Objectives - Map 1

# OCSC

O'CONNOR · SUTTON · CRONIN  
MULTIDISCIPLINARY CONSULTING ENGINEERS

## **Cork Office**

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North Point House  
North Point Business Park  
New Mallow Road  
Cork  
T23 AT2P  
T: +353 21 235 5816  
E: [cork@ocsc.ie](mailto:cork@ocsc.ie) | W: [www.ocsc.ie](http://www.ocsc.ie)