BARRETT MAHONY
CIVIL & STRUCTURAL
CONSULTING ENGINEERS

Infrastructure Report & Surface Water Management Plan

Project: 24.145

McAuley Place, Naas

DOCUMENT CONTROL

Project: McAuley Place, Naas

Project No: 24.145

Document Title: Infrastructure Report

Document No: 24.145– IR – 01

DOCUMENT STATUS

Issue	Date	Description	Orig.	PE	Issue Check
P2	05.03.2026	Issued for Planning	SO'C	SN	SO'C
P1	23.04.2025	For Planning Draft	SN	SN	SO'C

Prepared by:

BMCE
52-54 Lower Sandwith Street
Dublin 2
D02WR26

Prepared for:

McAuley Place
Sallins Rd, Naas
Kildare
W91D62E

CONTENTS

1. INTRODUCTION

1.1 General Description

The subject site is located on the Sallins Road (R407) in Naas, Co.Kildare and is bounded by a residential development to the north, the Sallins Road to the east, Father Murphy Place and a surface car park to the south and by an existing watercourse to the west. Figure 1.1 below shows the outline of the site from Google maps

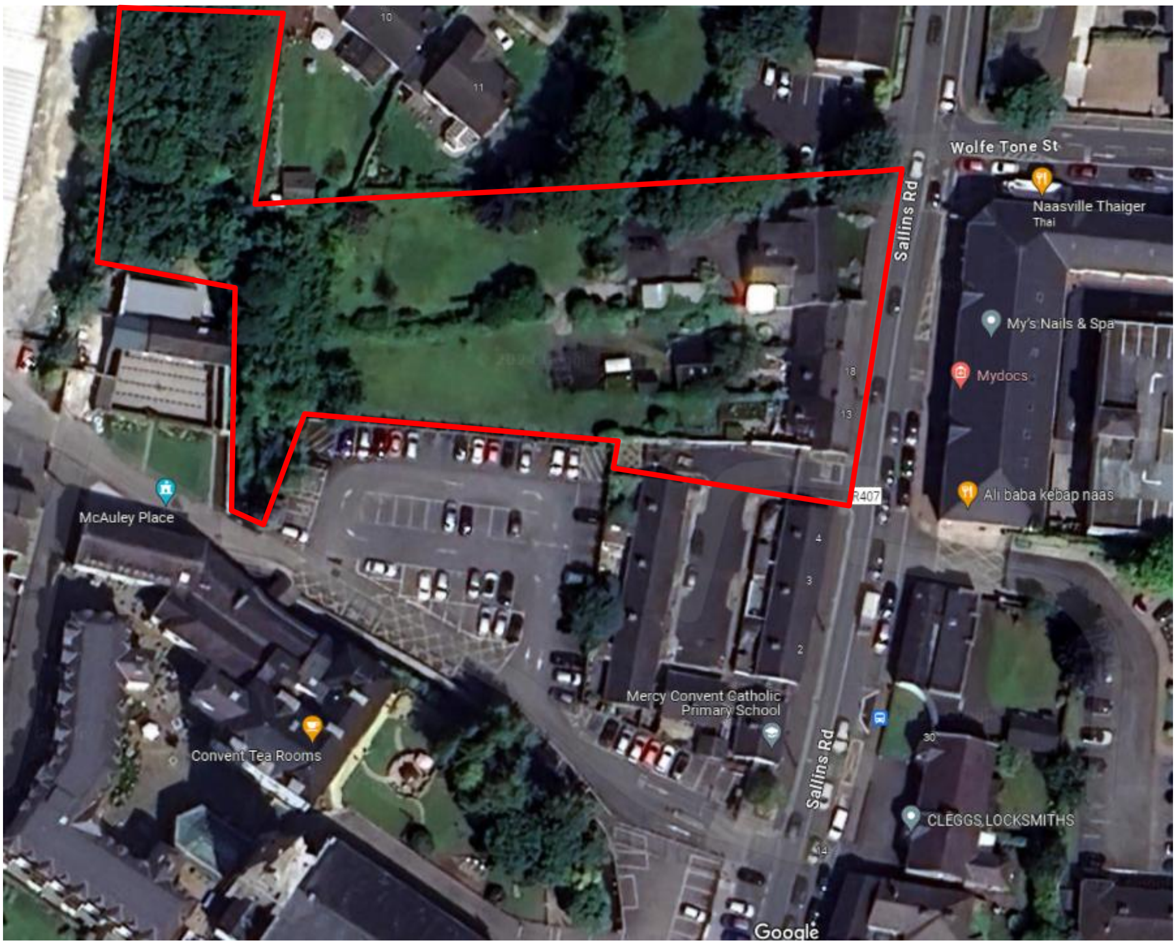


Figure 1.1 – Site Location (site red line boundary shown indicatively).

1.2 Development Description

The development comprises the construction of a residential development for older persons located at 13 & 18 Sallins Road, Beaufort Cottage and Beaufort, Sallins Road, Naas West, Naas, Co. Kildare.

Beaufort (house) is proposed to be retained and repurposed to facilitate a community room for the proposed residents and the demolition of the non-original fabric alterations and additions is proposed. Demolition of the three existing terraced cottages fronting Sallins Road is proposed. The residential development will provide 44 no. 1 and 2-bedroom units across 3 interconnecting 4 storey blocks on a 0.48ha site. The development will also include a single storey rear garden pavilion, a single storey plant room, associated communal and public open spaces and 4 surface car parking spaces. Additional car parking (20 spaces) will be made available within the existing

town centre car park located opposite the site. A pedestrian crossing is proposed at the front of the site, across Sallins Road.
Vehicular access is proposed from Sallins Road via a right of way from Father Murphy's Terrace along the southern boundary. A bridge is proposed across the Mill Lane stream connecting the rear of the site with the Luisne Gardens public open space.

Figure 1.2 – Proposed development outline

1.3 Purpose of this Report

This report considers the proposed development's drainage infrastructural elements and how they connect to the public infrastructure in the area.

This report covers surface and foul drainage infrastructure only. The report should be read in conjunction with the following drawings submitted with the planning application:

BEN-ZZ-ZZZ-SW-ZZZ-DR-BMC-CE-10000	Civil General Notes
BEN-ZZ-04-SW-ZZZ-DR-BMC-CE-11000	Site Layout
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-11101	Roads Layout - Full site
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-11110	Entrance and Sightlines
BEN-ZZ-04-SW-ZZZ-DR-BMC-CE-11200	External Drainage & Watermain Layout - Full Site
BEN-ZZ-04-SW-ZZZ-DR-BMC-CE-11300	SUDS Strategy & Catchment Arrangement
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-11400	Site Access - Fire Tender Vehicle Analysis
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-11410	Site Access - Private car & Refuse Vehicle Analysis
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-12100	Roads Standard Details - Sheet 1
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-12101	Roads Standard Details - Sheet 2
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-12110	Footpaths Standard Details - Sheet 1
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-12111	Footpaths Standard Details - Sheet 2
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-12300	Permeable Paving Standard Details
BEN-ZZ-05-SW-ZZZ-DR-BMC-CE-12310	Soft & Hard Landscaping on Podium / Roof Standard Details
BEN-ZZ-04-SW-ZZZ-DR-BMC-CE-12320	SuDS Details - Swales, Bio-Retention & Tree Pits
BEN-ZZ-04-SW-ZZZ-DR-BMC-CE-12321	SuDS Details - Filter Drain & Detention Basin Details
BEN-ZZ-04-SW-ZZZ-DR-BMC-CE-12322	SuDS Details - Tree Pits
BEN-ZZ-04-SW-ZZZ-DR-BMC-CE-12330	SuDS Details - Typical Stormtech Attenuation Tank Details
BEN-ZZ-04-SW-ZZZ-DR-BMC-CE-12331	SuDS Details - Typical Petrol Interceptor Details

1.4 SITE TOPOGRAPHY

A detailed topographical survey of the existing site has been prepared.
At the east the Sallins Road is at a level of 90.500 approx. The levels fall in the central part of the site to approx. 89.500 before rising again to 90.000 approx. along the western boundary with the stream.

There is evidence of the forming of an embankment along the boundary of the stream as indicated in Fig.1.3 below and it is expected this was to provide flood protection to the site.

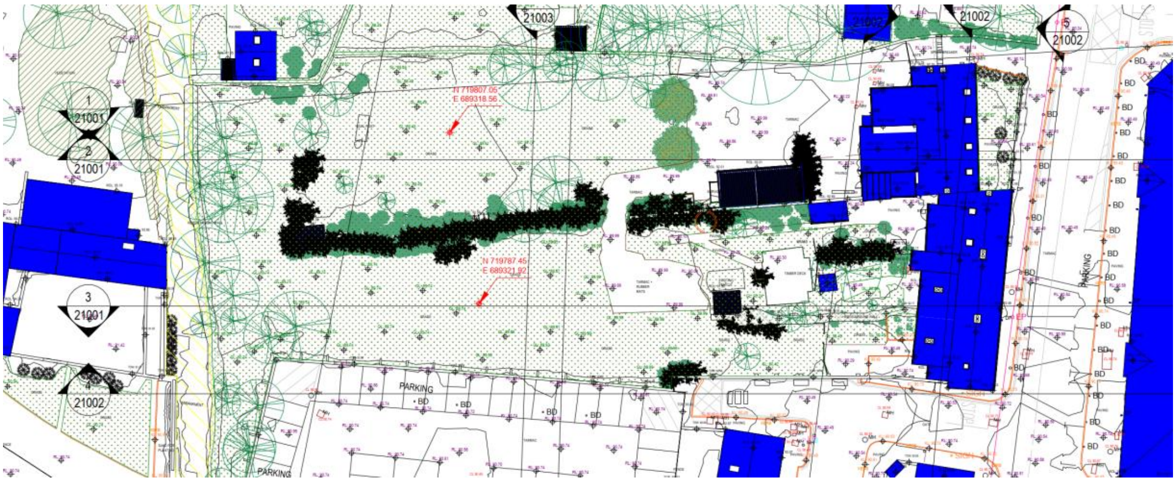


Fig 1.3 –Existing Site Topography Drawing. (Ordnance Datum Levels).

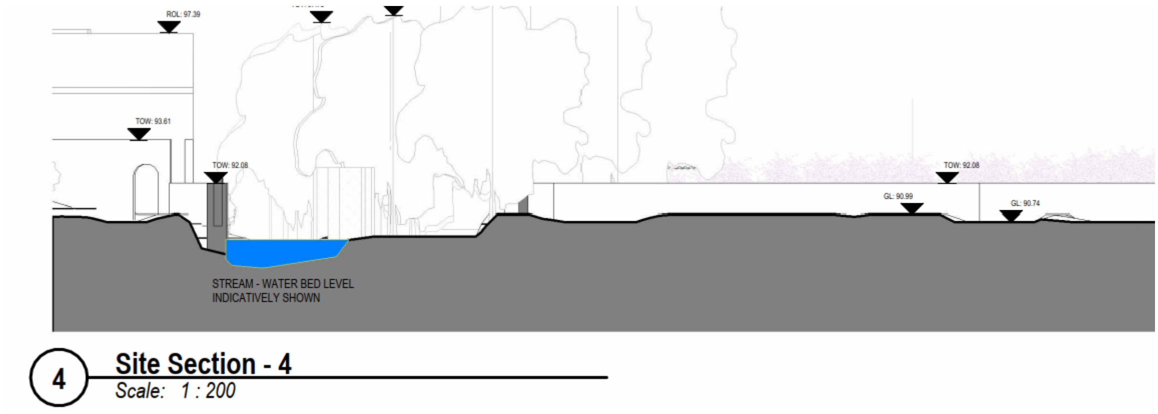


Fig 1.4 –Existing Site Topography – Section (Ordnance Datum Levels).

2. SURFACE WATER DRAINAGE SYSTEM

2.1 Introduction

This chapter follows the guidelines set out in Greater Dublin Strategic Drainage Study (GDSDS), CIRIA 2015 SuDS Manual and Kildare County Council publication "Sustainable Drainage Systems Guidance Document".

The aim of any SuDS strategy is to ensure that a new development does not negatively affect surrounding watercourse systems, existing surface water networks and groundwater systems. This SuDS strategy will aim to achieve these aims by using a variety of SuDS measures within the site. These measures include water interception, treatment, infiltration and attenuation.

The SuDS strategy will be developed with the following steps:

1. The existing greenfield run-off of the development site will be calculated and used as the minimum benchmark for the SuDS design. This run-off calculation is based on the drained area of the new development. The post development run-off will not exceed the greenfield run-off.
2. A set of SuDS measures will be chosen based on their applicability and usage for the site.
3. A "Causeway FLOW" model will be created to analyse the rainfall on the site and the effectiveness of the proposed SuDS measures.
4. If effective, these SuDS measures will be incorporated into the proposed design.

2.2 Existing Surface Water Infrastructure

With reference to Uisce Eireann records the subject site is not shown as being serviced by surface water drainage. We note that the existing houses along Sallins Road discharge surface water into the combined network which ultimately discharges to a 525mm diameter combined sewer which is located below the Sallins Road (R407) and running in a northerly direction from the site – see Appendix 1.

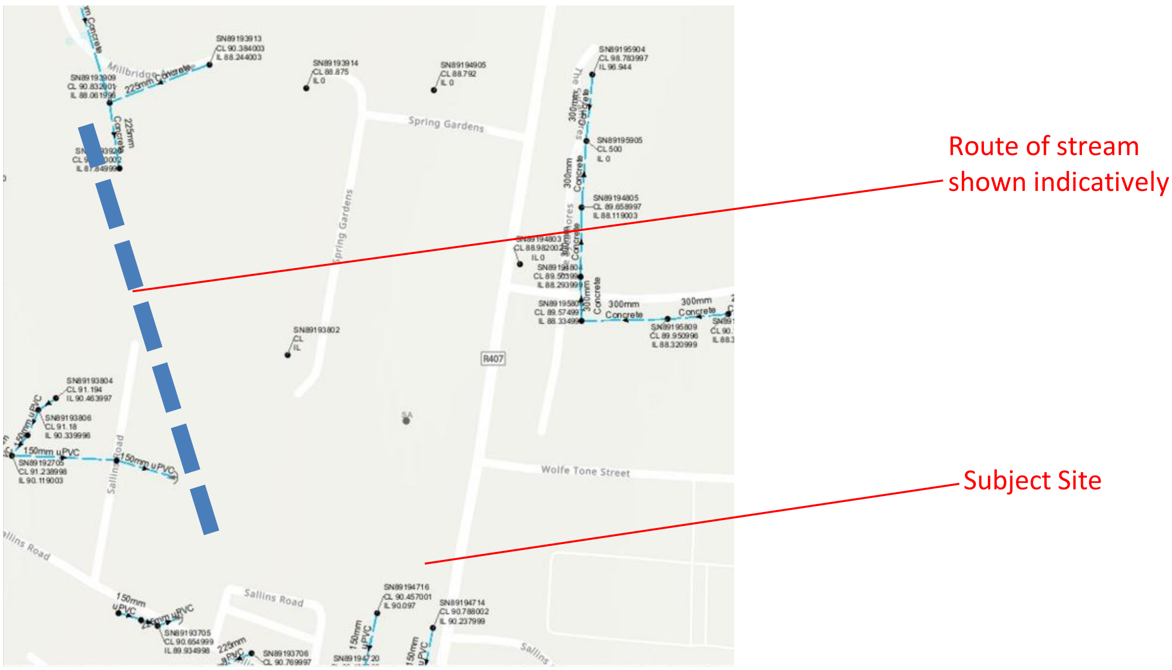


Fig 2.1 – Uisce Eireann Surface Water Records

The Uisce Eireann records do not include the route of the existing stream which has been added to the map as shown. With reference to Fig. 2.1, it is noted that the surrounding sites discharge surface water to the stream with sites to the west and north discharging directly.

2.3 PROPOSED SURFACE WATER DRAINAGE SYSTEM

It is proposed to provide the following aspects as part of the development surface water design:

- 2 of the 4 buildings on the site have will be provided with permeable paved finishes overlying a drainage board for interception storage and a blue roof storage facility for attenuation storage. Majority of the run-off from these buildings will be in effect attenuated at source.
- In the central courtyard area the hard paved areas will be formed with permeable paved surfaces with underlying gravel sub-bases with sufficient voids to provide attenuation storage for these areas and any run off from the roofs not directed to blue roof. These areas will be provided with perforated overflow pipes which will discharge to the private surface water network before ultimately being discharged to the public drainage on the Sallins Road (R407).
- Green area to the back of Beaufort house will be taken as a bioretention area with underlying gravel sub bases with sufficient voids to provide attenuation storage for these areas. Similar to the central plaza, areas of the roofs not directed to the blue roof will discharge to this biorentention area
- The remaining ground floor areas will be soft landscaped and, given the site's sloping topography towards the west, surface water runoff from these areas will continue to discharge naturally to the adjacent stream, and will therefore not be directed into the surface water drainage network.

By implementing various SuDS elements as part of the drainage strategy, biodiversity is improved along with water quality.

2.3.1 CATCHMENT STRATEGY

As outlined in previous sections, the FFLs of the apartments are ~500-1000mm higher than existing levels. Positively drained area will be from the edge of the west apartment back to the Sallins Road. Area to the west of here will remain untouched and in effective existing drainage will be maintained and drained to the stream.

2.3.2 CATCHMENT AREA

As outlined previously, the soft landscaped areas at ground level—due to the site's natural fall towards the stream—will discharge surface water directly to the adjacent watercourse and are therefore excluded from the positively drained area. The total area contributing to the surface water drainage network is therefore limited to the hardstanding and roofed surfaces within the development footprint which totals 0.253 ha and outlined in figure 2.2 below The drainage system will use different SuDS measures in the treatment train, which will have an influence on the runoff coefficients. The more porous the material, the lower the runoff coefficient. Materials in the area will consist of, but not limited to permeable paving, blue roofs, impermeable roofs, impermeable hardstanding, bioretention areas and landscaped areas. Please refer to the BMCE typical detail C-12000 series for the illustration and location of the SuDS measures and attenuation storage areas.

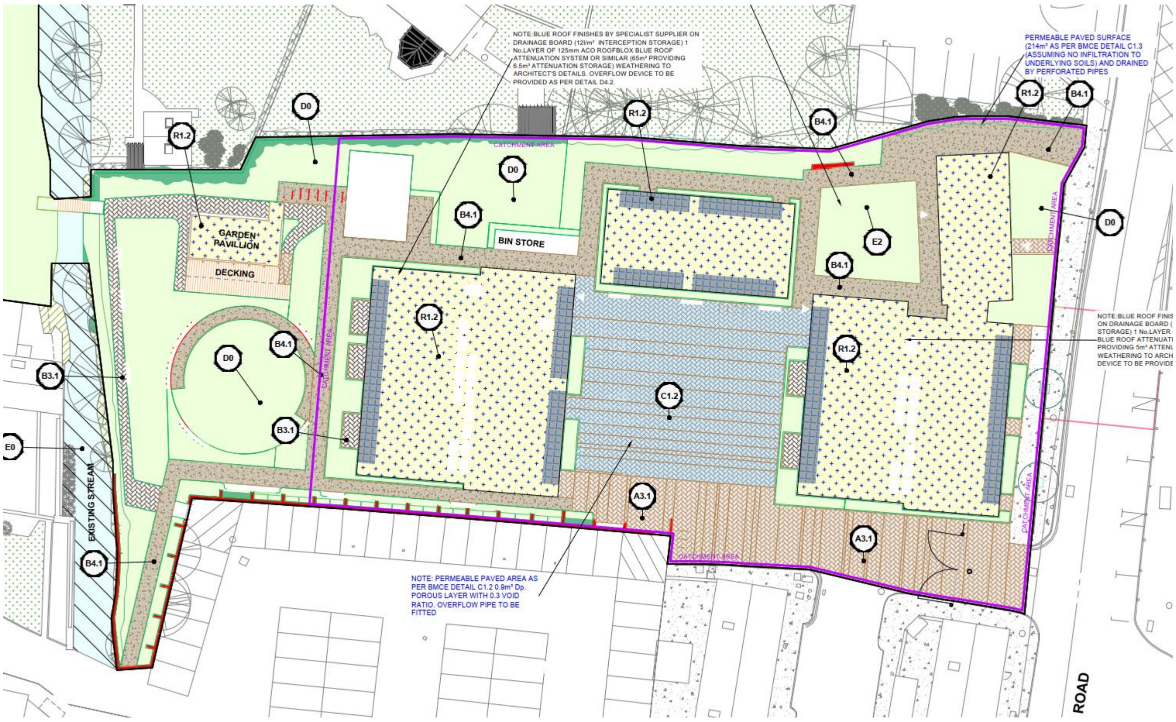


Fig 2.1 – Positively drained area in purple line

The runoff coefficients are shown in the table below:

Table 2.1: Runoff Coefficients

Type of areas	CV
Landscaping (Imported material for Grass / Soft)	0.37
Blue roof	0.80
Permeable Paving	0.80
Impermeable Paving	1.00
Bioretention	1.00

2.3.3 Estimation of Greenfield Runoff Rate

As the subject site is less than 1 hectare in area, the maximum allowable surface water discharge rate post-development will be limited to 2 litres per second.

2.3.4 Compliance with the Principles of SuDS

2.3.4.1 Compliance with the principles of the GDSDS

The proposed development will be designed in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS) and will significantly reduce run-off rates and improve storm water quality discharging to the public storm water system. The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization by replicating the run-off characteristics of the greenfield site. The criteria provide a consistent approach to addressing the increase in both rate and volume of run-off, as well as ensuring the environment is protected from any pollution from roads and buildings. These drainage design criteria are as follows:

- Criterion 1 – River Water Quality Protection
- Criterion 2 – River Regime Protection
- Criterion 3 – Flood Risk Assessment
- Criterion 4 – River Flood Protection

The requirements of SuDS are typically addressed by provision of the following:

- Interception storage
- Treatment storage (commonly addressed in interception storage)
- Attenuation storage
- Long term storage (not applicable if growth factors are not applied to Qbar when designing attenuation storage)

2.3.4.2 Compliance with the principles of the CIRIA C573 SuDS Manual

The C753 SuDS Manual explains that the primary function of SuDS measures is to protect watercourses from any impact due to the new development. However, SuDS can also improve the quality of life in a new development and urban spaces by making them more vibrant, visually attractive, sustainable and more resilient to change. This document explains the wider social context of SuDS and how SuDS can deliver high quality drainage while supporting urban areas to cope better with sever rainfall both in present and future.

There are four main categories of benefits that can be achieved by SuDS:

1. Water Quantity (mitigate flood risk & protect natural water cycle)
2. Water Quality (manage the quality of the runoff to prevent pollution)
3. Amenity (create and sustain better places for people)
4. Biodiversity (create and sustain better places for nature)

2.3.5 SuDS Measure Selection

Below are the applicable SuDs measures which have been chosen for the site. The runoff generated from the catchments will be attenuated within these SuDs features. The proposed attenuation systems area explained in section 2.3.6.

2.3.5.1 Blue Roofs – General

Blue roofs are areas of permeable paving, installed on the top of buildings. They provide water quality and water quantity benefits. Blue roofs also intercept rainfall at source reducing the reliance on attenuation storage structures.

Refer to the Barrett Mahony SuDS detail drawings and Landscape Architects drawings for typical roof details.

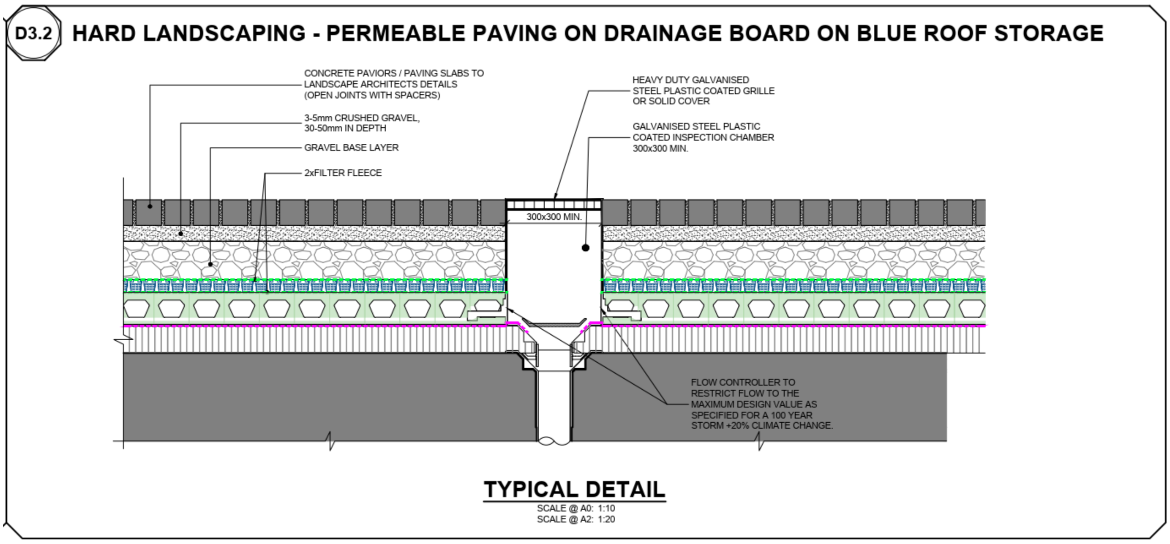


Figure 2.2 – Blue Roof

2.3.5.2 Permeable Paving

Permeable paving provides a surface suitable for pedestrian and/or vehicular traffic, while also allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface before slowly infiltrating. Permeable paving systems are an effective way of managing surface water runoff close to its source. The car parking spaces, podium courtyards and footpaths throughout the site will be made up of permeable paving.

By providing a raised drainage outlet above the base of the coarse graded gravel bed it is possible to achieve interception storage. Please refer to the BMCE typical detail C-12000 series.

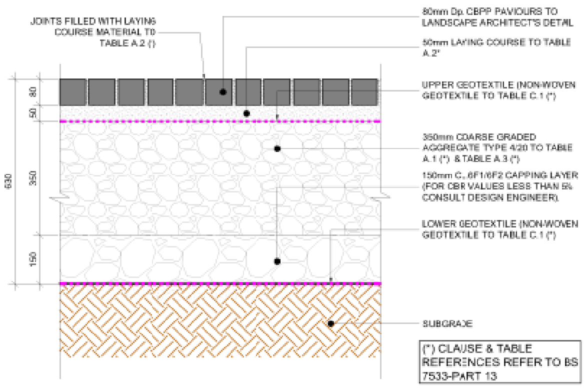


Figure 2.3 – Permeable Paving Build-up

2.3.5.3 Bioretention areas

Shallow, landscaped depressions designed with engineered soils and enhanced vegetation to manage and treat runoff at source. These systems also promote biodiversity and ecological benefits. Positioned adjacent to roads, bioretention areas provide effective water quality treatment while integrating seamlessly into the landscape.

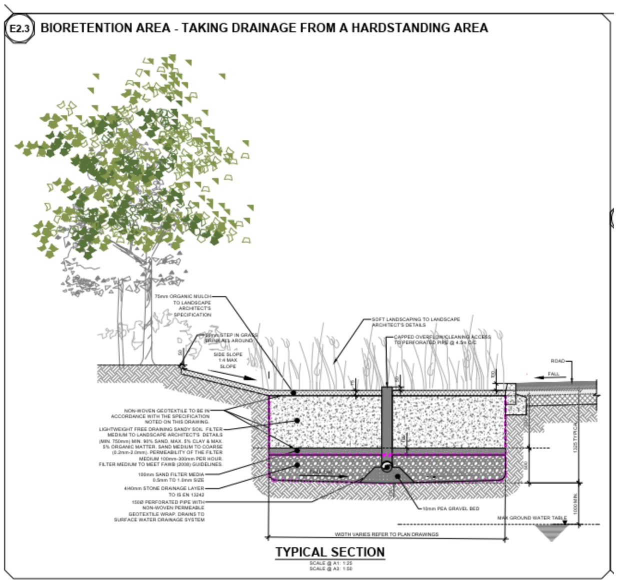


Figure 2.3 – Bioretention area

2.4 SuDS Management Train

The SuDS measures proposed are linked in series, and this is commonly known as a SuDS Management Train, (SMT). The SMT ensures that rainwater falling on a site is captured, conveyed, stored, intercepted and removed of any pollutants, correctly and efficiently before it is discharged back into the surrounding water course of network.

A robust SMT will ensure that the most effective measures are utilised in the correct sequence throughout the site. Table 26.7 (Figure 2.5 below) in *(CIRIA, SuDS Manual 2015)* illustrates the effectiveness of each SuDS measure along the SMT.

2.4.1 Drained Catchment

The following flowchart was created to illustrate the drainage train that each block will use. This flowchart should be read in conjunction with the proposed drainage drawing C10 and SuDS layout C1005.

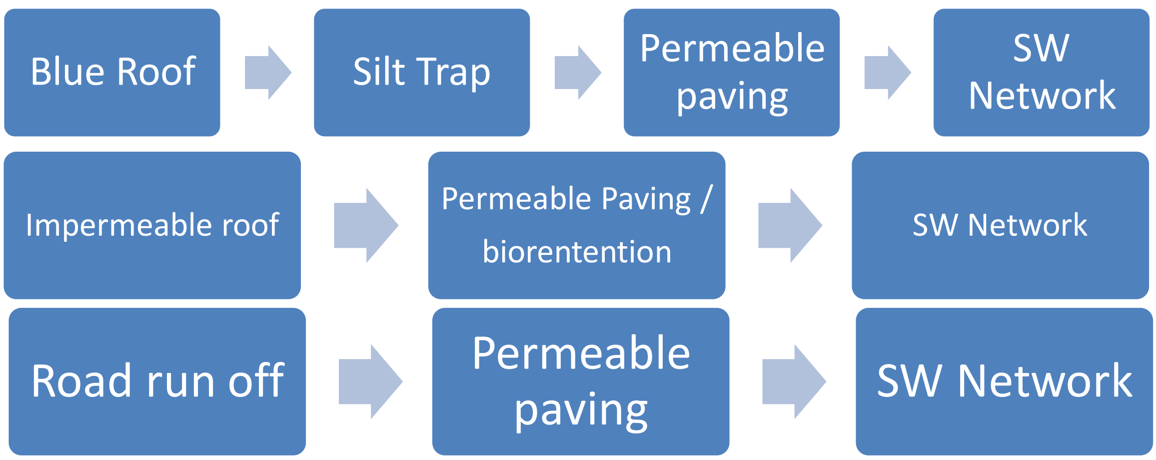


TABLE 26.7 Indicative suitability of SuDS components within the Management Train

SuDS component	Interception[1]	Close to source/ primary treatment	Secondary treatment	Tertiary treatment
Rainwater harvesting	Y			
Filter strip	Y	Y		
Swale	Y	Y	Y	
Filter drain	Y		Y	
Permeable pavement	Y	Y		
Bioretention	Y	Y	Y	
Green roof	Y	Y		
Detention basin	Y	Y	Y	
Pond	[3]	Y[2]	Y	Y
Wetland	[3]	Y[2]	Y	Y
Infiltration system (soakaways/ trenches/ blankets/basins)	Y	Y	Y	Y
Attenuation storage tanks	Y[4]			
Catchpits and gullies		Y		
Proprietary treatment systems		Y[5]	Y[5]	Y[5]

Figure 2.5 - C753 SuDS Manual Table 26.7

2.4.2 Surface Water Attenuation Storage

The GDSDS requires that flood waters be managed within the site for a 1 in 100-year flood. The surface water from each sub-catchment will flow into an attenuation tank or detention basin, which has been designed for that drained area.

The surface water system within each catchment has been hydraulically modelled in CAUSEWAY FLOW software. Please see Appendix 1 for full breakdown of calculations.

2.4.2.1 Maintenance of Attenuation Systems

The SuDS detail drawings submitted with this report set out the maintenance requirements for the various SuDS measures proposed. Add maintenance to SuDS detail drawings.

2.4.3 Interception Storage

The GDSDS requires that Interception storage, where provided, should ensure that at a minimum the first 5mm and preferably the first 10mm of rainfall is intercepted on site and does not directly pass to the receiving watercourse. Interception storage can be attained using SuDS features which allow the rainwater to infiltrate into the ground, evaporate into the atmosphere or transpire through vegetation.

2.4.3.1 Interception Storage

Interception storage required m^3 = Total drained area (m^2) x minimum rainfall (mm)
Interception storage required = 2530m^2 x 10mm = 2.53m^3

Table 2.3 – Interception Storage Catchment

Catchment			
Feature	**Area (m2)**	**Storage (l/m^2)**	**Capacity (m^3)**
Landscaping (Grass / Soft)	668	15	10.0
Permeable Paving	286	30	8.6
Bio Retention Areas	98	75	7.4
Blue roof	110	80	8.8
Total	1162	-	34.8

2.4.4 GSDS Criterion Compliance

2.4.4.1 Criterion 1 GDSDS – River Water Quality Protection

Run-off from natural greenfield areas contributes very little pollution and sediment to rivers and for most rainfall events direct run-off from greenfield sites to rivers does not take place as rainfall percolates into the ground. By contrast, urban run-off, when drained by pipe systems, results in run-off from virtually every rainfall event with high levels of pollution, particularly in the first phase of run-off, with little rainfall percolating to the ground. To prevent this happening, Criterion 1 requires that interception storage and/or treatment storage is provided, thereby replicating the run-off characteristics of the pre-development greenfield site.

2.4.4.2 Criterion 3 GDSDS – Site Flooding

The GDSDS requires that no flooding should occur on site for storms up to and including the 1 in 30-year event. The pipe network and the attenuation storage volumes should, therefore, be checked for such storms to ensure that no site flooding occurs although partial surcharging of the system is allowed if it does not threaten to flood.
For the 1 in 100-year event, the pipe network can fully surcharge and cause site flooding, but the top water level due to any such flooding must be at least 500mm below any vulnerable internal floor levels, and the flood waters should be contained within the site. In addition, the top water level in any attenuation device during the 100-year storm must be at least 500mm below any vulnerable internal floor levels.

The pipe network is limited in extent due to the medium-rise nature of the proposed development. Therefore, the pipes have been oversized to ensure the following:

The system does not surcharge for the 1-year event.
The system surcharges but does not flood for the 30-year event.
The system surcharges but does not flood for the 100-year event.

Detailed modelling of the surface water sewer network has been carried out using Causeway Flow software to confirm the above criteria is adequately met. The outputs are appended to this report.

GDSDS Criterion 3 is therefore complied with.

2.4.4.3 Criterion 2 & Criterion 4 GDSDS – River Regime and Flood Protection

Regardless of the rainfall event, unchecked run-off from the developed site through traditional pipe networks will discharge into receiving waters at rates that are an order of magnitude greater than that prior to development. This can cause flash flow in the outfall river / stream that can cause scour, erosion & downstream flooding. Attenuation storage is provided to prevent this occurring by limiting the rate of run-off to that which took place from the pre-development greenfield site. In practice, the rate of run-off needs to be appropriately low for most rainfall events, and attenuation storage volumes should be provided for the 1 and 100-year storm event + 20% for climate change. The rate of outflow from such storage should be controlled so that it does not exceed the greenfield run-off rate of QBAR, which can be factored upwards by factors appropriate to the various return periods (given in the Flood Studies Report) if long term storage is provided. Notwithstanding that significant long-term storage will be provided in the form of interception storage, this does not equate to full long-term storage volume provision and so growth factors will not be applied to QBAR when calculating the attenuation storage volume required.

Qbar for the site has been adopted as 2l/s.

Criterion 4 is intended to prevent flooding of the receiving system / watercourse limiting the volume of run-off to the pre-development greenfield volume using ‘long-term storage’.

Significant long-term storage will be provided in the form of interception storage within SUDs features as outline in sections above.

Refer to Appendix 1 for surface water network design calculations.

2.4.5 SuDS CIRIA Pillars of Design

2.4.5.1 Water Quantity

The “Water Quantity” design objective is to ensure that the surface water runoff from a developed site does not have a detrimental impact on people, property or the environment, it is important to control:

- How fast the runoff is discharged from the site (ie the peak runoff rate) and
- How much runoff is discharged from the site (ie the runoff volume)

2.4.5.2 Water Quality

The “Water Quality” design objective seeks to ensure the surface water runoff from the site does not compromise the groundwater or surrounding water courses relating to the site.

The only applicable area within the site capable of providing surface water runoff is the entrances to the car park. This was resolved with permeable pavement treating the potential pollutants prior to them entering the surface water network and ultimately the surrounding watercourse.

2.4.5.3 Amenity

The “Amenity” design objective aims to deliver attractive, pleasant, useful and above all liveable urban environments. SuDS measures should be designed to replicate the existing natural environment and blend in with the urban development.

2.4.5.4 Biodiversity

The encouragement of biodiverse environments within urban environments is incredibly important. The SuDS measures must not only replicate the pre-development surface water runoff systems and treatment for rainfall, but they must only replicate the existing habitats pre-development.

By incorporating landscaped areas in all areas biodiversity on site is promoted. In addition, a large number of mature trees have been retained on site.

2.4.6 SuDS Conclusion

This section of the report has comprehensively discussed the various SuDS measures which can be applied to the site and then selected the applicable devices, based on the site layout. SuDS management trains have then been developed based upon these SuDS measures.

Finally, the chosen SuDS measures have been analysed for various rainfall scenarios to ensure that all the SuDS design criteria are met an extensive range of SuDS measures are proposed with almost total coverage of the developed area of the site.

In conclusion, SuDS measures are the most effective measures which can be applied to the site and these measures are effective in treating rainfall on the site to GDSDS and CIRIA criterion.

3. FOUL WATER DRAINAGE

3.1 EXISTING FOUL DRAINAGE SYSTEM

The existing private foul network within the site boundary currently serves Beaufort House and the three other units that face onto the Sallins Road. A series of manholes and ICs collect the foul drainage at the back of the units and discharges to the public sewer on the Sallins Road.

3.2 PROPOSED FOUL DRAINAGE SYSTEM

It is proposed to remove the existing private foul drainage network on the site and construct and entirely new network to suit the new development. Foul drainage from the proposed development shall be drained by a completely separate system to that of the surface water drainage system until the last manhole that will be combined with the surface water and drain by gravity to the combined sewer within the Sallins Road.

3.3 FOUL DEMAND CALCULATIONS

The foul drainage system will be designed to take discharges from apartments. Drainage from any kitchen/canteen facilities will discharge through a grease separator designed in accordance with BS EN 1825 Part 1 and Part 2, the Local Authority Services National Training Group and / or to Irish Water requirements.

A detailed breakdown of the foul demand calculations for the proposed development is provided in Appendix 2. Please refer to summary below:

	SUMMARY :	Total Peak Flow	Total Average Flow
A:	Residential	1.552 l/s	0.517 l/s
		1.552 l/s	**0.517 l/s**

Figure 3.1- Foul Demand Calculations

Engagement with Uisce Éireann for the proposed development has not yet been undertaken but will occur at a later stage.

4. WATER SUPPLY

4.1 EXISTING WATER SUPPLY

There is an existing Ø203.2mm water supply in the Sallins Road.

4.2 PROPOSED WATER SUPPLY

The proposed development will be served by a 150mm diameter HDPE watermain connection, fed from the existing watermain pipe in the southeastern corner.

4.3 WATER DEMAND CALCULATIONS

A detailed breakdown of the water demand calculations for the proposed development is provided in Appendix 2. Please refer to summary below:

	SUMMARY:	Total Peak Demand	Total Average Demand
A:	Residential	2.939 l/s	0.588 l/s
		2.939 l/s	**0.588 l/s**

Figure 5.1: Water Demand Calculations

Engagement with Uisce Éireann for the proposed development has not yet been undertaken but will occur at a later stage.

Appendix 1

Causeway Flow Network Model

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	17.100	Minimum Backdrop Height (m)	0.200
Ratio-R	0.288	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Block 2	0.025	4.00	90.900	1200	0.400
S1.0	0.000		90.900	1200	0.900
Block 1	0.029	4.00	90.900	1200	0.400
Paving	0.139	4.00	90.900	1200	1.300
S1.1	0.000		90.900	1200	1.450
S1.2	0.000		90.900	1200	1.550
S2.0	0.037	4.00	90.600	1200	1.300
S1.3HB	0.000		90.500	1200	1.500
S1.4	0.000		90.500	1200	1.593

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Block 2	S1.0	15.000	0.600	90.500	90.351	0.149	100.7	150	4.25	50.0
1.001	S1.0	Paving	5.000	0.600	90.000	89.950	0.050	100.0	225	4.31	50.0
2.000	Block 1	Paving	10.000	0.600	90.500	90.301	0.199	50.3	150	4.12	50.0
1.002	Paving	S1.1	10.000	0.600	89.600	89.450	0.150	66.7	225	4.42	50.0
1.003	S1.1	S1.2	10.000	0.600	89.450	89.391	0.059	169.5	225	4.58	50.0
1.004	S1.2	S1.3HB	13.000	0.600	89.350	89.273	0.077	168.8	225	4.80	50.0
3.000	S2.0	S1.3HB	5.000	0.600	89.300	89.038	0.262	19.1	225	4.03	50.0
1.005	S1.3HB	S1.4	14.000	0.600	89.000	88.907	0.093	150.0	225	5.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.001	17.7	4.5	0.250	0.399	0.025	0.0
1.001	1.307	52.0	4.5	0.675	0.725	0.025	0.0
2.000	1.422	25.1	5.2	0.250	0.449	0.029	0.0
1.002	1.604	63.8	34.9	1.075	1.225	0.193	0.0
1.003	1.001	39.8	34.9	1.225	1.284	0.193	0.0
1.004	1.003	39.9	34.9	1.325	1.002	0.193	0.0
3.000	3.009	119.6	6.7	1.075	1.237	0.037	0.0
1.005	1.065	42.3	41.6	1.275	1.368	0.230	0.0

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m³/ha)	20.0
M5-60 (mm)	17.100	Starting Level (m)	
Ratio-R	0.288	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	20	0	0
10	20	0	0
100	20	0	0

Node Block 2 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.120	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	4.0		
Invert Level (m)	90.500	Diameter (m)	0.090		

Node Block 1 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.120	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	4.0		
Invert Level (m)	90.500	Diameter (m)	0.090		

Node S1.3HB Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	89.000	Product Number	CTL-SHE-0061-2000-1500-2000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node Block 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	90.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.90	Time to half empty (mins)	35

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	65.0	65.0	0.120	65.0	68.4	0.121	0.0	68.4

Node Block 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	90.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	33

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	50.0	0.120	50.0	53.0	0.121	0.0	53.0

Node Paving Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	300.0	300.0	0.900	300.0	355.3	0.901	0.0	355.3

Node S2.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	100.0	1.200	100.0	142.5	1.201	0.0	142.5

Results for 5 year +20% CC Critical Storm Duration. Lowest mass balance: 99.82%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	Block 2	74	90.557	0.057	3.5	3.4994	0.0000	OK
120 minute summer	S1.0	74	90.028	0.028	1.5	0.0311	0.0000	OK
60 minute summer	Block 1	39	90.571	0.071	6.0	3.5634	0.0000	OK
720 minute summer	Paving	540	89.969	0.369	7.8	34.4448	0.0000	SURCHARGED
720 minute summer	S1.1	540	89.969	0.519	4.7	0.5872	0.0000	SURCHARGED
720 minute summer	S1.2	540	89.969	0.619	4.3	0.7002	0.0000	SURCHARGED
720 minute summer	S2.0	540	89.969	0.669	3.6	21.2056	0.0000	SURCHARGED
720 minute summer	S1.3HB	540	89.969	0.969	4.0	1.0959	0.0000	SURCHARGED
720 minute summer	S1.4	540	88.937	0.030	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	Block 2	1.000	S1.0	1.5	0.609	0.086	0.0374	
120 minute summer	S1.0	1.001	Paving	1.5	0.568	0.029	0.0134	
60 minute summer	Block 1	2.000	Paving	2.2	0.863	0.088	0.0256	
720 minute summer	Paving	1.002	S1.1	4.7	0.743	0.073	0.3977	
720 minute summer	S1.1	1.003	S1.2	4.3	0.583	0.108	0.3977	
720 minute summer	S1.2	1.004	S1.3HB	4.0	0.470	0.100	0.5170	
720 minute summer	S2.0	3.000	S1.3HB	-2.5	0.405	-0.021	0.1989	
720 minute summer	S1.3HB	1.005	S1.4	1.6	0.512	0.038	0.0444	78.1

Final Discharge

Results for 10 year +20% CC Critical Storm Duration. Lowest mass balance: 99.82%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	Block 2	74	90.565	0.065	4.1	3.9303	0.0000	OK
720 minute summer	S1.0	555	90.057	0.057	1.0	0.0649	0.0000	OK
60 minute summer	Block 1	39	90.581	0.081	7.0	4.0399	0.0000	OK
720 minute summer	Paving	555	90.057	0.457	8.9	42.6667	0.0000	SURCHARGED
720 minute summer	S1.1	555	90.057	0.607	5.4	0.6869	0.0000	SURCHARGED
720 minute summer	S1.2	555	90.057	0.707	5.0	0.7999	0.0000	SURCHARGED
720 minute summer	S2.0	555	90.057	0.757	4.5	23.9994	0.0000	SURCHARGED
720 minute summer	S1.3HB	555	90.057	1.057	4.8	1.1956	0.0000	SURCHARGED
720 minute summer	S1.4	555	88.938	0.031	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	Block 2	1.000	S1.0	1.8	0.642	0.103	0.0427	
720 minute summer	S1.0	1.001	Paving	1.1	0.508	0.022	0.0666	
60 minute summer	Block 1	2.000	Paving	2.7	0.912	0.107	0.0295	
720 minute summer	Paving	1.002	S1.1	5.4	0.712	0.084	0.3977	
720 minute summer	S1.1	1.003	S1.2	5.0	0.567	0.125	0.3977	
720 minute summer	S1.2	1.004	S1.3HB	4.8	0.474	0.120	0.5170	
720 minute summer	S2.0	3.000	S1.3HB	-3.3	0.491	-0.027	0.1989	
720 minute summer	S1.3HB	1.005	S1.4	1.7	0.518	0.040	0.0457	82.2

Final Discharge

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.82%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
60 minute summer	Block 2	39	90.597	0.097	9.9	5.8946	0.0000	OK
480 minute summer	S1.0	480	90.478	0.478	2.1	0.5403	0.0000	SURCHARGED
60 minute summer	Block 1	38	90.654	0.154	11.4	6.1200	0.0000	FLOOD RISK
480 minute summer	Paving	480	90.478	0.878	18.2	81.8615	0.0000	SURCHARGED
480 minute summer	S1.1	480	90.478	1.028	5.0	1.1621	0.0000	SURCHARGED
480 minute summer	S1.2	480	90.477	1.127	4.6	1.2751	0.0000	SURCHARGED
480 minute summer	S2.0	480	90.477	1.177	5.0	37.3170	0.0000	FLOOD RISK
480 minute summer	S1.3HB	480	90.477	1.477	4.4	1.6707	0.0000	FLOOD RISK
480 minute summer	S1.4	480	88.940	0.033	2.0	0.0000	0.0000	OK

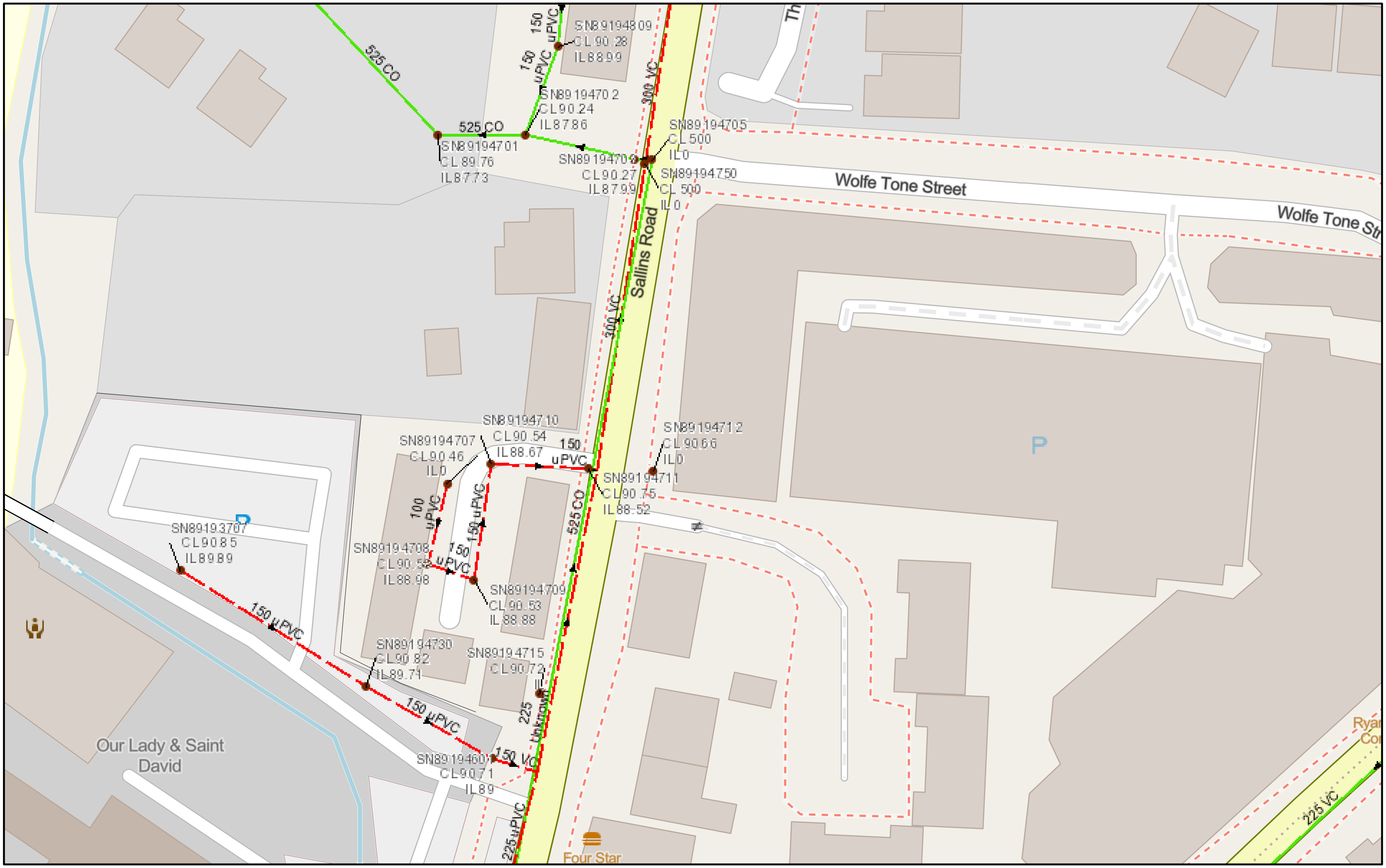
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
60 minute summer	Block 2	1.000	S1.0	3.7	0.782	0.211	0.0715	
480 minute summer	S1.0	1.001	Paving	2.3	0.583	0.044	0.1989	
60 minute summer	Block 1	2.000	Paving	5.5	1.104	0.217	0.0494	
480 minute summer	Paving	1.002	S1.1	5.0	0.718	0.078	0.3977	
480 minute summer	S1.1	1.003	S1.2	4.6	0.555	0.115	0.3977	
480 minute summer	S1.2	1.004	S1.3HB	4.4	0.475	0.110	0.5170	
480 minute summer	S2.0	3.000	S1.3HB	-2.9	0.553	-0.024	0.1989	
480 minute summer	S1.3HB	1.005	S1.4	2.0	0.542	0.047	0.0510	73.3

Final Discharge

Appendix 2

UE records

General Maps



4/14/2025

Sewer Manholes: Standard, Backdrop, Cascade, Catchpit, Bifurcation, Hatchbox, Lamphole, Hydrobrake, Other; Unknown

Sewer Discharge Points: Outfall, Overflow, Soakaway, Other; Unknown

Sewer Clean Outs: Rodding Eye, Flushing Structure, Other; Unknown

Waste Water Treatment plant

Waste Water Pump station

Sewer Inlets: Standard, Catchpit, Gully, Other; Unknown

Sewer Fittings: Vent/Col, Other; Unknown

Sewer Chambers

Sewer Mains: Gravity - Combined, Gravity - Foul, Gravity - Overflow, Gravity - Unknown, Pumping - Combined, Pumping - Foul, Pumping - Overflow, Pumping - Unknown, Syphon - Combined, Syphon - Foul, Syphon - Overflow, Overflow

Sewer Mains (Private): Gravity - Combined, Gravity - Foul, Gravity - Overflow, Gravity - Unknown, Pumping - Combined

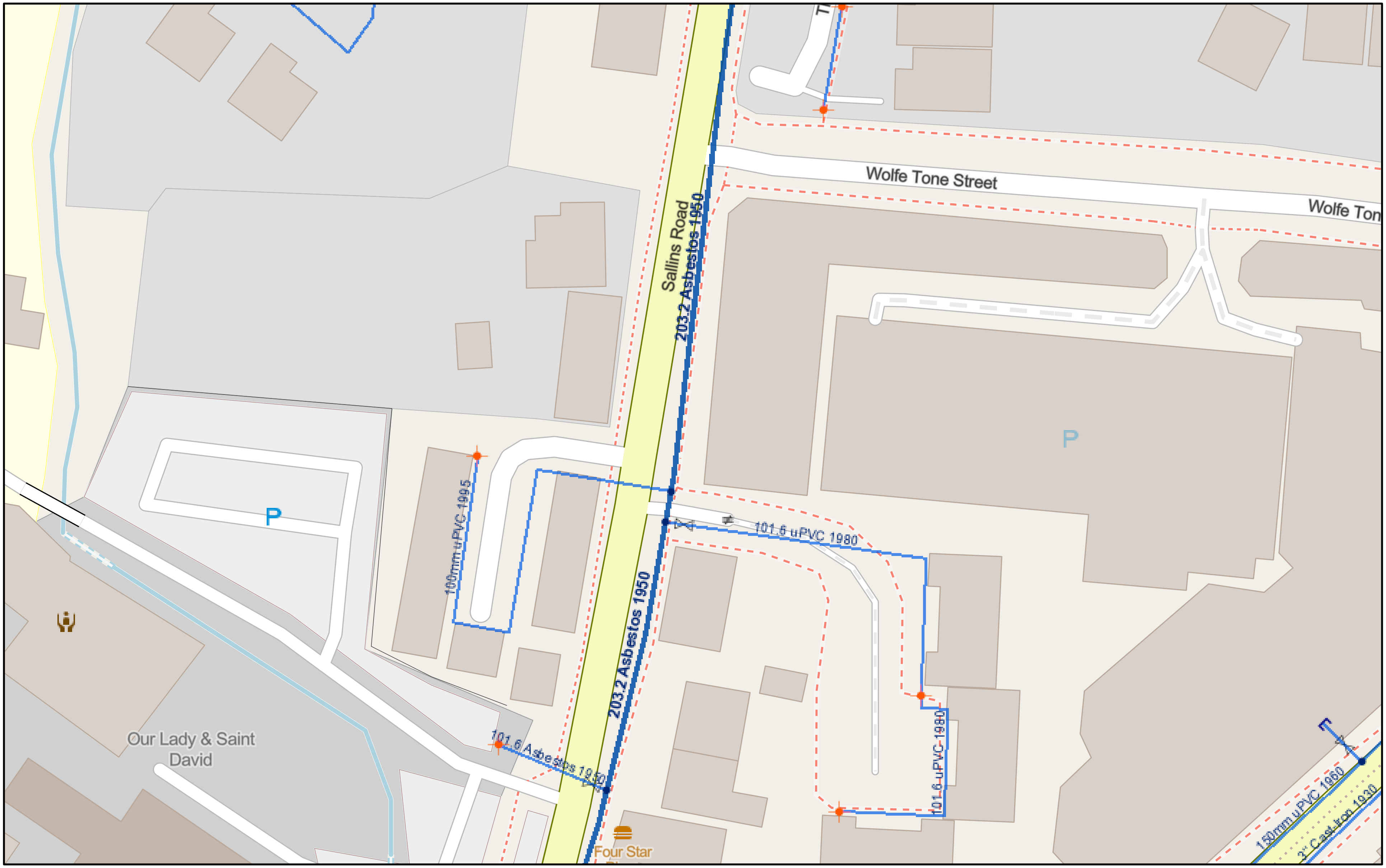
1:1,518

0 0.01 0.01 0.03 mi

0 0.01 0.02 0.04 km

Map data © OpenStreetMap contributors, Microsoft, Facebook, Google, Esri Community Maps contributors, Map layer by Esri

General Maps



4/14/2025

1:1,518

0 0.01 0.01 0.03 mi

0 0.01 0.02 0.04 km

Appendix 3

Foul and Water Demand Calculations

BM
BARRETT MAHONY
CONSULTING ENGINEERS
CIVIL & STRUCTURAL

Dublin | London | Sofia
Sandwith House,
52-54 Lower Sandwith Street,
Dublin 2, D02 WR26, Ireland

Phone +353 1 6773200
Email bmce@bmce.ie
www.bmce.ie

PROJECT TITLE:	McAuley Place		BY: SN
CALCULATION:	WATER DEMAND		PAGE: 1
APPENDIX:			DATE: 23/04/2025

SUMMARY:

		Total Peak Demand	Total Average Demand
A:	Residential	2.939 l/s	0.588 l/s
		2.939 l/s	**0.588 l/s**

A: **RESIDENTIAL - 43 UNITS**

The water demand for the proposed development has been calculated using the guidelines given in the Irish Water Code of Practice for Water Infrastructure July 2020 Rev 2) Section 3.7.2 assuming a per-capita consumption of 350 l/head/day and using the Irish Water assumed average occupancy of 2.7 persons/unit. The average day/peak week demand is taken as 1.25 times the average daily domestic demand. The peak demand factor is taken as 5 times the average day/peak week demand.

No. of Units = 43
No. of Occupants = 43 x 2.7 = 116.1

Avg. Daily Demand = No. of Occupants x Allowance per head
Avg. Daily Demand = 116.1 x 350 = 40,635 l/day

$$\text{Average Flow} = \frac{\text{Daily Flow}}{\text{Flow Duration}} \times 1.25 = \frac{40{,}635 \text{ l/day}}{24 \times 60 \times 60} \times 1.25 = \mathbf{0.588\ l/s}$$

Peak Demand = Average Flow x 5
Peak Demand = 0.588 l/s x 5 = **2.939 l/s**

BM
BARRETT MAHONY
CONSULTING ENGINEERS
CIVIL & STRUCTURAL

Dublin | London | Sofia
Sandwith House,
52-54 Lower Sandwith Street,
Dublin 2, D02 WR26, Ireland

Phone +353 1 6773200
Email bmce@bmce.ie
www.bmce.ie

PROJECT TITLE:	McAuley Place		BY: SN
CALCULATION:	FOUL WATER FLOW		PAGE: 1
APPENDIX:			DATE: 23/04/2025

SUMMARY :		Total Peak Flow	Total Average Flow
A:	Residential	1.552 l/s	0.517 l/s
		1.552 l/s	**0.517 l/s**

A: **RESIDENTIAL - 43 UNITS**

The foul effluent from the proposed dwellings is calculated as per the Irish Water Code of Practice for Wastewater Infrastructure (July 2020 (rev. 2)) assuming dry weather flow of 350 l/head/day plus a 10% infiltration rate and using the Irish Water assumed average occupancy of 2.7 persons/unit.

No. of Units = 43

No. of Occupants = 43 x 2.7 = 116.1

Daily Flow = No. of Occupants x Dry Weather Flow

Daily Flow = 116.1 x 350 x 1.1 = 44,699 l/day

$$\text{Average Flow} = \frac{\text{Daily Flow}}{\text{Flow Duration}} = \frac{44{,}699 \text{ l/day}}{24 \times 60 \times 60} = \mathbf{0.517\ l/s}$$

Peak Flow = Average Flow x 3

Peak Flow = 0.517 l/s x 3 = **1.552 l/s**

Barrett Mahony Consulting Engineers

Dublin:
Sandwith House,
52-54 Lower Sandwith Street,
Dublin 2,
D02 WR26, Ireland.
Tel: +353 1 677 3200

London:
12 Mill Street,
London, SE1 2AY,
United Kingdom
Tel: +44 203 750 3530.

Sofia:
19 Yakubitsa Street,
Lozenets,
Sofia 1164,
Bulgaria
Tel: +359 2 494 9772

WWW.BMCE.IE