Ruirside Developments Limited

Parkgate Street Redevelopment

Planning Drainage and Watermain Report

PGATE-ARUP-ZZ-XX-RP-CD-0001

Issue 1 | 17 December 2019

Job number 265381-00

Ove Arup & Partners Ireland Ltd

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ARUP

Document verification

ARUP

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Issue 1	17 Dec 2019	**Description**	Issued for Planning		
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Contents

Appendices

1 Introduction

This report has been prepared to accompany drainage and watermain drawings as prepared by Arup and architectural drawings prepared by Reddy Architecture and Urbanism for the planning application of a mixed-use residential and commercial development at the former Hickey's site, Parkgate Street, Dublin 08.

The proposed development consists of a mixed-use residential and commercial scheme comprising of build to rent residential units with associated residential amenities and facilities, commercial office and café/ restaurant floor space. A new public square will also be provided, along with a public riverside walk and private amenity courtyard. The new development elements will range in height from 8 to 29 storeys. At basement level further bicycle parking is provided, as well as car parking.

The existing development site area is 0.684 hectares which is approximately 95% existing roof and hardstanding areas. Refer to the architect's layouts for the proposed redevelopment.

The site is located adjacent to the River Liffey fronting onto Parkgate Street to the north, Heuston Station to the south and Wolfe Tone Quay to the southeast. See Figure 1 below for site location.

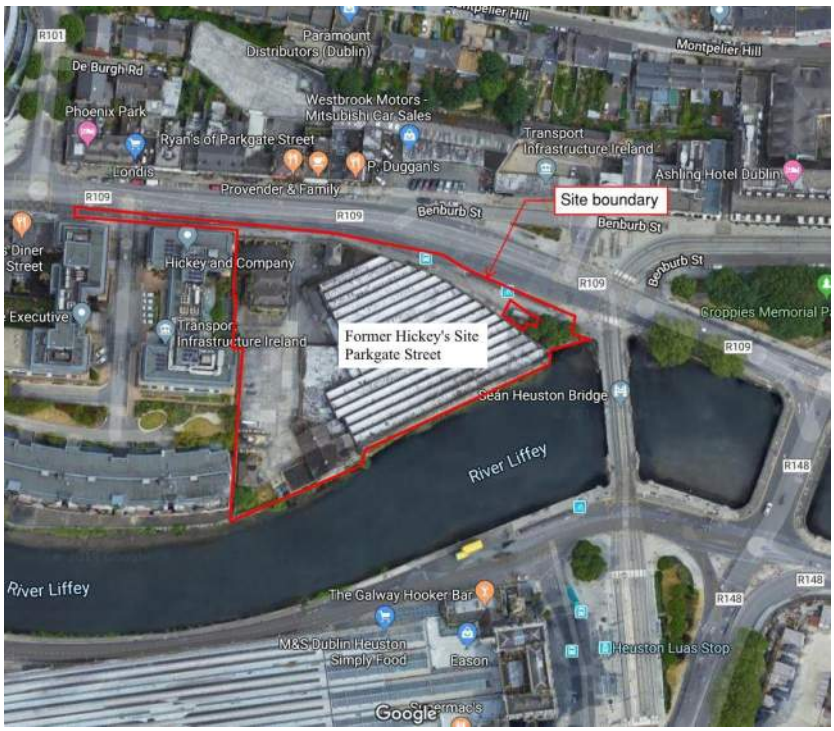

Figure 1 Map data © 2019 Google

2 Existing Drainage Systems

The existing drainage systems on the site are mainly separate with the surface water system discharging unrestricted into the River Liffey and the foul system into the existing sewerage network on Parkgate Street. There is an existing 450mm combined sewer on Parkgate Street discharging in an easterly direction into a 750mm combined sewer on Wolfe Tone Quay, which eventually discharges into the Municipal Waste Water Treatment Plant at Ringsend. Approximately 6% of the existing roof area of the site discharges to the existing sewer on Parkgate Street. Refer to Arup drawing PGATE-ARUP-ZZ-00-DR-CD-0001 in Appendix A and Appendix C for a copy of the existing drainage and sewerage systems in the vicinity.

3 Proposed Drainage

Drainage from the proposed development will be drained on a completely separate system, with separate foul and surface water drains connecting to the receiving systems on Parkgate Street and the River Liffey respectively.

Sustainable drainage systems will be incorporated into the design with surface water run-off from the development discharging through a minimum of a two-stage treatment train process prior to discharge by gravity to the River Liffey.

Foul drainage from the proposed development will discharge by gravity to the existing 450mm foul sewer on Parkgate Street.

The drainage systems shall be designed in accordance with Part H of the Building Regulations, EN 752: Drain and Sewer Systems outside Buildings, The Greater Dublin Regional Code of Practice for Drainage Works, Irish Water's Code of Practice for Water and Wastewater and to DCC Drainage Division and Irish Water requirements.

3.1 Proposed Foul Drainage

Foul drainage from the proposed development shall be drained by a separate system to that of the surface water drainage system. Foul drainage from the new development shall drain by gravity and discharge to the existing 450mm sewer on the Parkgate Street. See Arup drawings C002 and C003.

Foul drainage from basement level shall drain by gravity to a central pumping chamber and be pumped via a rising main to an external foul manhole prior to discharge by gravity to the existing 450mm foul sewer on Parkgate Street. Incidental run-off from the basement car park will discharge through a Class 2 full retention petrol interceptor before discharge via a pump chamber and rising main to the external foul gravity drainage system.

The foul drainage system will be designed to take discharges from residential apartments, small office, retail, café and gym. Drainage from kitchen/canteen facilities will discharge through a grease separator designed in accordance with IS EN 1825 Part 1 and Part 2 and / or to Irish Water requirements.

The existing development is a warehouse with 10 number of employees equivalent to a total hydraulic loading of 0.75 m^3 per day of foul effluent equating to an average flow of 0.009 litres/second (over a 24-hour period) and a peak flow of 0.04 litres/second based on 4.5 x Dry Weather Flows (DWF). An average daily BOD_5 loading of 0.2 kg/day based on 20 grams of BOD_5/head/day for office usage.

The new development will have an estimated total hydraulic loading of 227m^3 per day of foul effluent generated on completion of the development. This equates to an average flow of 2.63 litres/second (over a 24-hour period) and a peak flow of 8.45 litres/second. The final average daily BOD_5 loading from the new development would be 93.6 kg/day. Refer to **Table 1** for a breakdown of foul loading calculations.

Three new foul connections will be required to the existing sewerage system on Parkgate Street in agreement with Irish Water. A Pre-connection Enquiry application was submitted to Irish Water to confirm capacity in the receiving network. Based upon details submitted as part of the application, Irish Water can confirm that subject to a specific condition, a connection to the foul sewer network can be facilitated. Irish Water outlined the requirement to construct a new surface water sewer on Parkgate Street to reduce equivalent peak flows from the network, to accommodate the proposed development. Arup has carried out a design and has entered into discussions with Dublin City Council Drainage Division and Irish Water for the construction of a new surface water sewer on Parkgate Street. Refer to Arup drawing PGATE-ARUP-ZZ-00-DR-CD-0004 for a copy of the proposed sewer improvement on Parkgate Street. Refer to Appendix E for a copy of the Confirmation of Feasibility and Design Acceptance letters from Irish Water. Outfall manholes will be constructed to Irish Water's Code of Practice. See Arup drawings PGATE-ARUP-ZZ-00-DR-CD-0002 and PGATE-ARUP-ZZ-00-DR-CD-0004 in Appendix A.

Table 1 Proposed development foul loading

Use type	**Nett floor area (m^2)**	**Number of units**	**Occupancy level**	**Number of persons**	**Design flows (litres per person per day)**	**Peaking Factor**	**Daily foul loading (litres)**
Commercial / offices	3,698	-	1 person / 10m^2	370	75	4.5	27,750
Commercial / Retail	214	-	1 person / 20m^2	11	45	4.5	495
Amenity / Gym	150	-	1 person / 55m^2	3	45	4.5	135
Visitors	-	-	-	400	10	4.5	4,000
Residential	-	481	2.7 persons / unit	1,299	150	3.0	194,850
						Total	227,230

3.2 Proposed Surface Water Drainage

Surface water run-off from the proposed development shall drain by gravity and discharge to the River Liffey. Sustainable drainage systems will be incorporated into the development and will include greenroofs, rain-gardens, filter strips, filter drains, rainwater harvesting for irrigation purposes and surface water treatment systems. Surface water run-off will go through a minimum of two-stage treatment prior to discharge by gravity to the River Liffey. The proposed SuDS measures will reduce the quantity and improve the quality of water discharging into the receiving system, see Section 3.3 below.

Run-off from roofs and paved areas will discharge unrestricted to the River Liffey above the 1 in 200-year tidal event plus 20% climate change of 3.82m OD. A non-return valve will be located at the outfall headwall in agreement with DCC Drainage Division.

3.3 Surface Water Management Plan

The proposed Surface Water Management Plan is in line with the key requirements of the Dublin City Council Drainage Division Planning & Development Control Section. The proposed surface water drainage system takes cognisance of the Dublin City Development Plan 2016 – 2022 with respect to Sustainable Drainage Systems (SuDS) Section 9.5.4. The proposed SuDS measures provide a minimum of two stage treatment train approach including interception and primary and secondary treatment of surface water run-off. This treatment approach is in line with The CIRIA SuDS Manual C753 and is outlined below.

3.3.1 Greenroof

The proposed greenroofs will be mainly sedum (extensive type) covering 60% of the roof areas and will provide interception of rainfall, filtration through the medium, storage within the voids facilitating evapotranspiration.

The greenroofs will intercept and absorb the first 5 – 10mm of rainfall thereby reducing the volume of run-off into the receiving systems. Rainfall run-off that is not absorbed by the greenroof will filtrate through substrate and geotextile filter fabric. A limited attenuation volume will be provided by the greenroof crate layer system below the geotextile filter fabric, which will provide a time delay between the rainfall event and discharge into the system thereby reducing peak discharge rates. According to the leading greenroof supplier / manufacturer Bauder, up to 40% of average annual rainfall can be absorbed and released back into the atmosphere by transpiration and evaporation.

Amenity areas at roof-top level account for 11% of roof space. These areas will drain onto or into adjacent extensive and intensive greenroofs providing a total of 60% roof area with 2-stage treatment. The remaining 40% of roof area will discharge into rainwater harvesting tanks for use as irrigation of planting in amenity rooftop areas. This measure will provide a single stage treatment and a second stage treatment through catchpits on the receiving drainage system.

Therefore, rainfall run-off from roof areas will go through a two-stage treatment train including interception and primary treatment in line with SuDS Manual C753 Table 26.7, replicated in Table 1 Section 4.

3.3.2 Raingarden

The proposed raingardens will allow surface water run-off from paved areas to pond temporarily before filtering through vegetation and underlaying soil before discharge into the system.

Paved areas at ground level will discharge into the proposed raingardens. The raingardens will serve as a bio-retention system providing interception as the water discharges through plants, shrubs and landscape medium. The planters will provide temporary retention for the 1 in 1 year event in the shallow depressions. Sand based material circa 750 – 850mm deep will be used to filter the water passing through. Further filtration will be provided by the geotextile filter membrane prior to discharge into the surface water system.

Therefore, rainfall run-off from approximately 11% of paved areas at ground level will go through a three-stage treatment train including interception, primary and secondary treatment in line with SuDS Manual C753 Table 26.7.

3.3.3 Filter Drains

The proposed filter drains will reduce peak run-off rates prior to discharge into the surface water drainage system. The filter drains are linear excavations filled with suitable granular material with a minimum void porosity of 30% and wrapped in a geotextile filter membrane. Catchpits will also be provided downstream of the infiltration trenches to provide primary treatment. The granular material and geotextile filter material will provide interception and act as a secondary treatment in preventing ingress of fine material from paved areas prior to discharge into surface water drainage system.

Therefore, rainfall run-off from approximately 14% of paved areas discharging into the filter drains / catchpits will go through a three-stage treatment train including interception, primary and secondary treatment in line with SuDS Manual C753 Table 26.7.

3.3.4 Filter Strips

The proposed filter strips will provide interception from impermeable areas before discharging into the filter drains or surface water drainage system. This additional measure will promote sedimentation and filtration thereby providing primary treatment.

Therefore, rainfall run-off from paved areas discharging into the filter strips will go through treatment train including interception and primary treatment in line with SuDS Manual C753 Table 26.7.

3.3.5 Proprietary Surface Water Treatment System

A portion of the external pavement including some low level roof terraces equivalent to 17% of the site area will receive a single stage treatment using catchpits followed by a proprietary surface water treatment system like "First Defense or Downstream Defender". This measure will improve the quality of surface water run-off discharging into the receiving system, in compliance with best drainage practice and SuDS requirements. The "First Defense or Downstream Defender" will provide removal efficiency rates of 50% for suspended solids and 80% for hydrocarbons. Refer to Appendix F for Hydro-International Guide to Surface Water Treatment System and their compliance with SuDS Manual C753. Third party testing has confirmed Mitigation Indices for proprietary surface water treatment systems similar to swales and ponds. All surface water run-off from the site will discharge by gravity through these treatment systems prior to discharge to the River Liffey.

3.3.6 Summary of SuDS Measures

The proposed comprehensive Surface Water Management Plan for the development, carried out in consultation with Mitchell & Associates Landscape Architects, is in line with the key requirements of the Dublin City Drainage Division and the Dublin City Development Plan 2016 – 2022 with respect to Sustainable Drainage Systems.

Rainfall run-off from the proposed site development will go through at least a two-stage treatment train prior to discharge into the River Liffey.

Table 2 is a summary of the proposed SuDS measures for the development and the management train in line with The CIRIA SuDS Manual C753. The key SuDS measures for the proposed development include but not limited to greenroofs, raingardens, filter drains, filter strips and rainwater harvesting for irrigation purposes.

Table 2 SuDS Component and Treatment Train (Source CIRIA C753)

SuDS Component	Interception	Close to source / primary treatment	Secondary treatment	Tertiary treatment
Greenroof	Yes	Yes		
Bio-retention Raingarden / raised planters	Yes	Yes	Yes	
Filter drains	Yes		Yes	
Rainwater harvesting	Yes			
Filter strip	Yes	Yes		
Catchpits		Yes		
Proprietary treatment systems		Yes (where design performance can be demonstrated)	Yes (where design performance can be demonstrated)	Yes (where design performance can be demonstrated)

3.4 Flood Risk Assessment

Please see separate report for Flood Risk Assessment.

4 Watermains

The water supply connection to the proposed development will be from the existing 150mm public main adjacent to the site on Parkgate Street with a cross-connection to the 600mm public main running in parallel with the 150mm public main, as directed by Irish Water.

The proposed watermain system will be designed to supply water to the redevelopment with sluice valves and hydrants located in compliance with Part B of the Building Regulations and the local Fire Officers requirements. See Arup drawing PGATE-ARUP-ZZ-00-DR-CD-0002 for layout of the watermain and connection to the public network.

A Pre-connection Enquiry application was submitted to Irish Water to confirm capacity in the network. Based upon details submitted as part of the application, Irish Water can confirm that a water supply connection can be facilitated. A new water connection from the existing mains on Parkgate Street will be required in agreement with Irish Water.

We would recommend that flow tests be carried out on the existing mains/hydrants to confirm both the pressure and flow from the existing network to confirm adequacy of supply and compliance with the Local Fire Officer's requirements and Part B of the Building Regulations.

We expect the peak flow demand for the proposed development to be in the region of 16.44 litres/second.

The installation of low flow fittings and a rainwater harvesting system for the development will reduce the demand on the existing water supply network.

Appendix A

Arup Drawings

A1

N

CONYNGHAM ROAD

INFIRMARY ROAD

PARKGATE STREET

WAREHOUSE

PARKGATE HOUSE

Factory

Hotel

CROPPY'S MEM

WOLFE TONE QUAY

HEUSTON BRIDGE

RIVER LIFFEY

RIVER LIFFEY

Ex.FMH CL:7.35 IL:4.05

Ex.FMH CL:6.20 IL:3.39

Ex.FMH CL:5.236 IL:1.676

Ex.FMH CL:7.58 IL:2.43

Ex.FMH CL:5.244 IL:0.914

Ex.SMH CL:5.12 IL:-0.39

Ex.FMH CL:5.31 IL:0.76

Ex.FMH CL:4.94 IL:1.49

Existing surface water culvert outfall IL:-0.069

E: 713644
N: 734411

0 5 10 20 Metres
Scale 1:500

Legend

- Existing Watermain — Hydrant
- Existing Surface Sewer — Ex. SMH
- Existing Combined Sewer — Ex. FMH
- Site Boundary Line

Rev	Date	By	Chkd	Appd
PL1	17/12/19	MC	AB	KD
Planning Issue				

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Client
Ruirside Developments Limited

Project Title
Parkgate Street Redevelopment

Drawing Title
Existing Drainage and Watermain Site Plan Layout

Scale at A1 1:500
Role Civil
Suitability Planning
Arup Job No 265381-00
Rev PL1
Name PGATE-ARUP-ZZ-00-DR-CD-0001

Do not scale

A1

N

Catchment equivalent to 1,356m² added to the surface water sewer network to provide resilience

Catchment highlighted in blue equivalent to 1,610m² will remove peak flow rate of 22.4 l/s from the Irish Water combined sewer network; this is based on a 2 year design storm and a rainfall intensity of 50mm/hr.

Catchment equivalent to 1,610m² to be diverted into a new surface sewer as shown. Run-off to be treated using road gullies sumps and manhole catchpits prior to connection to the 910mm surface water outfall and River Liffey.

New 150Ø watermain cross connection to the existing 600Ø public main in agreement with Irish Water

New 200Ø watermain connection to the existing 150Ø public main with cross connection to the 600Ø public main in agreement with Irish Water

New connection to existing 450Ø combined sewer on Parkgate Street in agreement with Irish Water.

New disconnecting foul manhole to be constructed to Irish Water Code of Practice.

FMH04
CL:5.200
IL:3.725

New connection to existing 450Ø combined sewer on Parkgate Street in agreement with Irish Water.

New disconnecting foul manhole to be constructed to Irish Water Code of Practice.

FMH12
CL:5.200
IL:3.191

New disconnecting foul manhole to be constructed to Irish Water Code of Practice.

Connection into existing 910mm surface water outfall. Run-off to be treated using road gullies sumps and manhole catchpits prior to connection.

Existing surface water culvert outfall
IL:-0.069

First Defense OSA Surface Water Treatment System.

Proposed surface water outfall discharge to the River Liffey to be fitted with a non return valve in agreement with DCC Drainage Division.
IL: 3.825m
1 in 200 year tidal level in the river including climate change is 3.820m.

Note:
Refer to M&A drawings for Greenroof layouts .

Ex.FMH
CL:7.58
IL:2.43

Ex.FMH
CL:7.35
IL:4.05

SMH100
CL:7.115
IL:5.315

Ex.FMH
CL:6.20
IL:3.39

Ex.FMH
CL:5.236
IL:1.676

SMH102
CL:5.306
IL:3.575

SMH103
CL:5.200
IL:3.543

SMH104
CL:5.345
IL:3.378

Ex.FMH
CL:4.94
IL:1.49

Ex.SMH
CL:5.12
IL:0.39

Ex.FMH
CL:5.31
IL:0.76

SMH101
CL:5.900
IL:4.167

Ex.FMH
CL:5.244
IL:0.914

FMH01
CL:5.407
IL:3.907

BD IL: 3.342

GENERAL SURFACE WATER MANAGEMENT PLAN

Notes:

1. Proposed extensive and intensive greenroof equivalent to 60% of total roof area offering a two-stage treatment train including interception and primary treatment in line with CIRIA Manual C753 Table 26.7

   Run-off from the amenity area at roof level equivalent to 374m² or 11% of total roof area will discharge into the proposed greenroofs.

   Therefore a roof area equivalent to 60% of total roof area, will discharge into the proposed extensive and intensive greenroofs providing interception of rainfall, filtration through the medium, storage within the voids and evapotranspiration. The remaining 40% will collect roof run-off into the rainwater butts for re-use as irrigation of planting in the amenity roof gardens.

2. Run-off from pavement at ground level equivalent to 941m² or 13.8% of site area will discharge into the proposed filter drain offering a three-stage treatment train including interception, primary and secondary treatment in line with CIRIA Manual C753 Table 26.7. The proposed filter drain will reduce peak run-off rates prior to discharge into raingardens or surface water drainage system.

3. Proposed filter strips will provide interception from impermeable areas before discharge into filter drains. This additional measure will promote sedimentation and filtration thereby providing 2 stage treatment.

4. Run-off from pavement at ground level equivalent to 707m² or 10.3% of site area will discharge into the proposed raingardens, (Bio-retention system) offering a three-stage treatment train including interception, primary and secondary treatment in line with CIRIA Manual C753 Table 26.7.
   The proposed raingardens will allow surface water run-off from paved areas to pond temporarily before filtering through vegetation and underlaying soils and discharge into the system.

5. Discharge to the River Liffey through a proposed surface water treatment system as shown.

0 5 10 20 Metres
Scale 1:500

Legend

- Existing Watermain
- Existing Surface Sewer
- Existing Combined Sewer
- Proposed Surface Water Drain (225Ø 1:72 SIC1 CP=Catch Pit)
- Proposed Foul Drain (225Ø 1:80 FMH1)
- Proposed Watermain (SV = Sluice valve, ScV = Scour valve, 100Ø Hydrant)
- Proposed Water Meter (WM)
- Proposed Paving Gully (PG)
- Prposed Drainage Channel (DC SU)
- Proposed Filter drain (FD)
- Proposed Rain Garden
- Proposed Filter Strip
- Proposed Surface Water Treatment System (SWTS)
- Proposed Low Level Land Drain (100Ø)
- Site Boundary Line

Rev	Date	By	Chkd	Appd
PL1	17/12/19	AB	KD	KD
Planning Issue				

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Project Title: Parkgate Street Redevelopment

Drawing Title: Proposed Drainage and Watermain Site Plan Layout

Scale at A1: 1:500
Role: Civil
Suitability: Planning
Arup Job No: 265381-00
Rev: PL1
Name: PGATE-ARUP-ZZ-00-DR-CD-0004

Do not scale

A1

New 200Ø watermain cross connection to the existing 600Ø public main in agreement with Irish Water

New 200Ø watermain connection to the existing 150Ø public main with cross-connection to the 600Ø public main in agreement with Irish Water

Ex.FMH CL:6.20 IL:3.39

Ex.FMH CL:5.236 IL:1.676

Ex.FMH CL:5.244 IL:0.914

Ex.FMH CL:4.94 IL:1.49

Ex.SMH CL:5.12 IL:0.39

Ex.FMH CL:5.31 IL:0.76

New connection to existing 450Ø combined sewer on Parkgate Street in agreement with Irish Water.

New disconnecting foul manhole to be constructed to Irish Water Code of Practice.

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Outline of basement below

Water meter

FMH01 CL:5.407 IL:3.907

FMH04 CL:5.200 IL:3.725

AJ13 CL:5.200 IL:4.786

150Ø foul drain connection from basement foul pumping main and Blocks B3 & B1

Off-line hydrant for meter calibration

FMH03 CL:5.200 IL:3.905

Block C3 82 Units

Water meter

100Ø blank end supply pipe Block C3

Block B2 49 Units

100Ø blank end supply pipe for Block B2

Water meter

Block B1

Outline of basement below

SIC14 CL:5.200 IL:4.566

FMH02 CL:5.200 IL:4.050

CP1 CL:5.443 IL:4.366

Rain Garden

FMH09 CL:5.200 IL:3.655

CP7 CL:5.200 IL:4.231

FMH12 CL:5.200 IL:3.191

FMH11 CL:5.200 IL:3.236

FMH10 CL:5.200 IL:3.334

SIC15 CL:5.200 IL:4.472

Private Amenity

Rain garden high level overflow

FMH08 CL:5.200 IL:3.393

CP10 CL:5.176 IL:4.416

Existing surface water culvert outfall IL:-0.069

Block C2 40 Units

CP8 CL:5.200 IL:3.986

FMH06 CL:5.200 IL:3.496

Block A 160 Units

Proposed Class 1 Full Retention oil separator. Design flows 9.5 l/s

Water meter

Public Plaza

100Ø blank end supply pipe Block A

100Ø blank end supply pipe Block C2

CP2 CL:5.201 IL:4.169

100Ø blank end supply pipe Block B1

CP16 CL:5.200 IL:4.346

CP3 CL:5.000 IL:4.139

FMH07 CL:5.200 IL:3.850

Water meter

FMH05 CL:5.100 IL:3.750

CP17 CL:5.200 IL:4.320

CP4 CL:5.000 IL:4.107

CP11 CL:5.100 IL:4.076

100Ø blank end supply pipe Block C1

Water meter

Rain garden

Rain garden high level overflow

Block B1 92 Units

CP9 CL:5.040 IL:3.839

Low level land drain connection to the surface water system

First Defense OSA Surface Water Treatment System

SIC17 CL:5.200 IL:4.550

Proposed surface water cutfall discharge to the River Liffey to be fitted with a non return valve in agreement with DCC Drainage Division IL:3.825m
1 in 200 year tidal level in the river including climate change is 3.820m

Rain garden high level overflow

Water meter

50Ø blank end supply pipe for Existing Building

CP6 CL:4.912 IL:4.030

CP5 CL:4.962 IL:4.078

CP5 CL:5.500 IL:3.965

Outline of basement below

Block C1 58 Units

Site boundary

GENERAL SURFACE WATER MANAGEMENT PLAN

Notes:

1. Proposed extensive and intensive greenroof equivalent to 60% of total roof area offering a two-stage treatment train including interception and primary treatment in line with CIRIA Manual C753 Table 26.7

   Run-off from the amenity area at roof level equivalent to 374m² or 11% of total roof area will discharge into the proposed greenroofs.

   Therefore a roof area equivalent to 60% of total roof area, will discharge into the proposed extensive and intensive greenroofs providing interception of rainfall, filtration through the medium, storage within the voids and evapotranspiration. The remaining 40% will collect roof run-off into the rainwater butts for re-use as irrigation of planting in the amenity roof gardens.

2. Run-off from pavement at ground level equivalent to 941m² or 13.8% of site area will discharge into the proposed filter drain offering a three-stage treatment train including interception, primary and secondary treatment in line with CIRIA Manual C753 Table 26.7. The proposed filter drain will reduce peak run-off rates prior to discharge into raingardens or surface water drainage system.

3. Proposed filter strips will provide interception from impermeable areas before discharge into filter drains. This additional measure will promote sedimentation and filtration thereby providing 2 stage treatment.

4. Run-off from pavement at ground level equivalent to 707m² or 10.3% of site area will discharge into the proposed raingardens, (Bio-retention system) offering a three-stage treatment train including interception, primary and secondary treatment in line with CIRIA Manual C753 Table 26.7.
   The proposed raingardens will allow surface water run-off from paved areas to pond temporarily before filtering through vegetation and underlaying soils and discharge into the system.

5. Discharge to the River Liffey through a proposed surface water treatment system as shown.

0 5 10 Metres
Scale 1:250

Legend

- Existing Watermain
- Existing Surface Sewer
- Existing Combined Sewer
- Proposed Surface Water Drain
- Proposed Foul Drain
- Proposed Watermain
- Proposed Water Meter
- Proposed Paving Gully
- Prposed Drainage Channel
- Proposed Filter drain
- Proposed Rain Garden
- Proposed Filter Strip
- Proposed Surface Water Treatment System
- Proposed Low Level Land Drain
- Site Boundary Line

Note:

Refer to M&A drawings for Greenroof layouts .

Rev	Date	By	Chkd	Appd
PL1	17/12/19	MC	AB	KD
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Scale at A1: 1:250
Role: Civil
Suitability: Planning
Arup Job No: 265381-00
Rev: PL1
Name: PGATE-ARUP-ZZ-00-DR-CD-0002

A1

N

100Ø Foul rising main from basement level to rise to high level and discharge into foul manhole FMH 01 at ground level

For continuation refer to Arup drawing C-002

Foul water pump and valve chamber. Rising main to discharge to foul Manhole FMH 01. See Arup drawing C-002

NRV

PI

I.L. 0.27m

150Ø 1:80

100Ø

DC

DC

Car Lifts

Reversing Bay

Core C3 Above

FFL: 2.00m

Core B2

Office Cores

Office Bikes

Office Changing

Bikes

Plant

FFL: 2.00m

Plant

Plant

Core B1 above

FMH 25
C.L. 2.00m
I.L. 0.56m

FMH 26
C.L. 2.00m
I.L. 0.41m

FMH 24
C.L. 2.00m
I.L. 0.62m

FMH 23
C.L. 2.00m
I.L.0.68m

FIC 22
C.L. 2.00m
I.L. 0.95m

FIC 21
C.L. 2.00m
I.L.1.09m

FIC 20
C.L. 2.00m
I.L.1.25m

150Ø 1:80

150Ø 1:80

150Ø 1:80

150Ø 1:80

150Ø 1:80

150Ø 1:80

2000

100Ø rising main from lower ground floor to rise to high level and discharge into the surface water catch pit CP5 at ground level. For continuation refer to Arup drawing C-002.

Surface water pump and valve chamber. Rising main to surface water manhole CP5.

RM

IL:1.99m

Bicycle Storage

Core C1 above

Amenity

FFL: 3.00m

FFL: 3.00m

150Ø 1:80

150Ø 1:100

150Ø 1:100

DC

SIC 22
C.L. 3.00m
I.L. 2.09m

SIC 21
C.L. 3.00m
I.L. 2.17m

SIC 20
C.L. 3.00m
I.L. 2.25m

0 5 10 Metres
Scale 1:200

Legend

Proposed Foul Drain	150Ø 1:60 FMH20 FIC20
Proposed Foul Water Rising Main	100Ø
Proposed Foul Pump and valve chamber	
Proposed Petrol Interceptor	PI
Proposed Non-Return Valve	NRV
Proposed Drainage Channel	DC
Proposed Surface Water Drain	150Ø 1:100 SMH20 SIC20
Proposed Surface Water Rising Main	100Ø RM
Proposed Surface Water Pump Chamber	
Site Boundary Line	

Issue	Date	By	Chkd	Appd
PL1	17/12/19	MC	AB	KD
Planning Issue				

ARUP

Arup, 50 Ringsend Road
Dublin, D04 T6X0
www.arup.ie
Tel +353(0)1 233 4455 Fax +353(0)1 668 3169

Client
Ruirside Developments Limited

Job Title
Parkgate Street Redevelopment

Drawing Title
Proposed Basement Drainage Layout

Scale at A1 1:200

Discipline Civil

Job No 265381-00

Drawing Status Planning

Drawing No PGATE-ARUP-ZZ-B1-DR-CD-0003

Issue PL1

Do not scale

Appendix B

Storm Water Attenuation Calculations

Technical Note

ARUP

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Project title	Parkgate Street Redevelopment	Job number	265381-00
cc	Kieran Dowdall Alan Fitzsimons Sean Barrett	File reference	P01
Prepared by	Alpha Barry	Date	06 December 2019
Subject	Proposed Surface Water Drainage Design		

1 Microdrainage Simulation Summary

The Parkgate Street Redevelopment proposed surface water drainage system is designed for a 2 year storm return period. The system is simulated and indicates no surface flooding at any part of the site for storms up to and including the 1:100 year return period plus 20% for climate change. Refer to Arup drawing C-0002 Proposed Drainage Layout for the surface water drainage layout.

2 Introduction

Microdrainage design software is based on the Wallingford procedure. It has the ability to model and analyse fully integrated drainage systems. The rainfall and runoff variables required are explained under the following headings.

3 Design Criteria and Loading

The Parkgate Street Redevelopment proposed surface water drainage system is designed in accordance with Part H of the Building Regulations, BS EN 752 Drain and Sewer System, the Greater Dublin Regional Code of Practice for Drainage Works.

The Flood Studies Report (FSR) rainfall methodology is used in the programme. Rainfall is calculated using Region, Return Period, M5-60, and Ratio R as explained further below.

The programme uses the M5-60 (60 minutes storm duration of 5 year return period) and ratio R (M5-60/M5-2 day) to calculate the intensity/duration/ frequency characteristics for any location in Ireland.

A rainfall depth of 16.300mm on 60 minutes storm duration of 5 year return period and a ratio of 0.278 was applied as design criteria on Microdrainage. Refer to this report for a copy of the Met Eireann Rainfall Statistics for the location.

4 Storm Network Details

The storm network is designed on Microdrainage using a 2 year return period. The pipe network and gradient are assigned using the Modified Rational Method where:

Q (l/s) = Cv*Cr*(2.78*I(mm/hr)*A (ha))

Cv= 0.75 and Cr= 1.3 (as recommended by the Wallingford Procedure)

Run-off from roofs will discharge via a suspended pipework into a surface water system at ground level. The roads and paving at grade level are drained by gravity via a system of road gullies, drainage channels and filter drains. The proposed surface water system at ground level is a series of drains and catchpits. The system discharges unrestricted into the River Liffey following a two-stage treatment train in line with SuDS Manual C753 Table 26.7. Therefore, there are no online control devices such as Hydrobrakes or orifices. The surface water system has no offline controls such as overflow pipes.

There are no attenuation systems in place as the proposed surface water system discharges unrestricted to the River Liffey above the 1 in 200-year tidal event plus 20% climate change of 3.82m OD. The proposed surface water system is simulated for the critical 1 in 100 year return including climate change. Refer to this Report for a copy of the simulation of the surface water system.

A non-return valve will be located at the outfall headwall in agreement with DCC Drainage Division.

5 Network Simulation

The level of service includes no surface flooding for return periods up to 1:100 year plus 20% for climate change. Detailed summary of critical results of the 2 year+20%, 30 year+20% and 100 year + 20% is included in this report.

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Alpha Barry	Kieran Dowdall	Kieran Dowdall
Signature			

Microdrainage Simulation

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	16.300	Add Flow / Climate Change (%)	0
Ratio R	0.278	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	500	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	300	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Design criteria and loading

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.278
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.300	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	0.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SCP1	360 Winter	2	+20%	30/15 Summer				4.366
S2.000	SAJ13	15 Winter	2	+20%					4.833
S2.001	SIC14	15 Winter	2	+20%					4.616
S2.002	SIC15	15 Winter	2	+20%					4.522
S3.000	SIC17	15 Summer	2	+20%					4.579
S2.003	SCP16	15 Winter	2	+20%	30/15 Summer				4.418
S2.004	SCP17	15 Winter	2	+20%	30/15 Summer				4.339
S1.001	SCP3	15 Winter	2	+20%	30/15 Summer				4.158
S1.002	SCP4	15 Winter	2	+20%	30/15 Summer				4.143
S1.003	SCP5	15 Winter	2	+20%	30/15 Summer				4.120
S1.004	SCP6	15 Winter	2	+20%	30/15 Summer				4.083
S4.000	SCP7	15 Winter	2	+20%	30/15 Summer				4.365
S4.001	SCP8	15 Winter	2	+20%	30/15 Summer				4.156
S5.000	SCP10	15 Winter	2	+20%	100/15 Summer				4.496
S5.001	SCP11	15 Winter	2	+20%	100/15 Summer				4.154
S1.005	SCP9	15 Winter	2	+20%	2/15 Winter				4.022

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SCP1	-0.225	0.000	0.00		0.0	OK	
S2.000	SAJ13	-0.053	0.000	0.45		2.7	OK*	
S2.001	SIC14	-0.096	0.000	0.27		4.3	OK*	
S2.002	SIC15	-0.096	0.000	0.28		4.4	OK*	
S3.000	SIC17	-0.121	0.000	0.08		1.9	OK*	
S2.003	SCP16	-0.073	0.000	0.52		7.5	OK	
S2.004	SCP17	-0.076	0.000	0.48		7.3	OK	
S1.001	SCP3	-0.088	0.000	0.48		24.9	OK	
S1.002	SCP4	-0.070	0.000	0.91		46.6	OK	
S1.003	SCP5	-0.064	0.000	0.81		45.6	OK	
S1.004	SCP6	-0.053	0.000	0.71		44.9	OK	
S4.000	SCP7	-0.091	0.000	0.66		25.7	OK	
S4.001	SCP8	-0.130	0.000	0.60		36.2	OK	
S5.000	SCP10	-0.070	0.000	0.55		9.4	OK	
S5.001	SCP11	-0.148	0.000	0.25		9.3	OK	
S1.005	SCP9	0.002	0.000	1.17		95.0	SURCHARGED	

Simulation results for 2 year return period

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.278
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.300	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	0.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SCP1	15 Winter	30	+20%	30/15 Summer				4.642
S2.000	SAJ13	15 Winter	30	+20%					4.855
S2.001	SIC14	15 Winter	30	+20%					4.712
S2.002	SIC15	15 Winter	30	+20%					4.618
S3.000	SIC17	15 Winter	30	+20%					4.700
S2.003	SCP16	15 Winter	30	+20%	30/15 Summer				4.707
S2.004	SCP17	15 Winter	30	+20%	30/15 Summer				4.672
S1.001	SCP3	15 Winter	30	+20%	30/15 Summer				4.646
S1.002	SCP4	15 Winter	30	+20%	30/15 Summer				4.576
S1.003	SCP5	15 Winter	30	+20%	30/15 Summer				4.476
S1.004	SCP6	15 Winter	30	+20%	30/15 Summer				4.377
S4.000	SCP7	15 Winter	30	+20%	30/15 Summer				4.530
S4.001	SCP8	15 Winter	30	+20%	30/15 Summer				4.298
S5.000	SCP10	15 Winter	30	+20%	100/15 Summer				4.546
S5.001	SCP11	15 Winter	30	+20%	100/15 Summer				4.225
S1.005	SCP9	15 Winter	30	+20%	2/15 Winter				4.200

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SCP1	0.051	0.000	0.04		1.4	SURCHARGED	
S2.000	SAJ13	-0.031	0.000	0.81		4.9	OK*	
S2.001	SIC14	0.000	0.000	0.54		8.5	SURCHARGED*	
S2.002	SIC15	0.000	0.000	0.46		7.3	SURCHARGED*	
S3.000	SIC17	0.000	0.000	0.15		3.3	SURCHARGED*	
S2.003	SCP16	0.217	0.000	0.84		12.0	SURCHARGED	
S2.004	SCP17	0.257	0.000	0.87		13.3	SURCHARGED	
S1.001	SCP3	0.400	0.000	0.69		36.2	SURCHARGED	
S1.002	SCP4	0.362	0.000	1.55		78.9	SURCHARGED	
S1.003	SCP5	0.291	0.000	1.38		78.4	SURCHARGED	
S1.004	SCP6	0.241	0.000	1.23		78.1	SURCHARGED	
S4.000	SCP7	0.074	0.000	1.14		44.8	SURCHARGED	
S4.001	SCP8	0.011	0.000	1.12		67.2	SURCHARGED	
S5.000	SCP10	-0.020	0.000	0.99		16.8	OK	
S5.001	SCP11	-0.077	0.000	0.44		16.1	OK	
S1.005	SCP9	0.179	0.000	2.16		175.1	SURCHARGED	

Simulation results for 30 year return period

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.278
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.300	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	0.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SCP1	15 Winter	100	+20%	30/15 Summer				4.928
S2.000	SAJ13	15 Winter	100	+20%					4.886
S2.001	SIC14	30 Winter	100	+20%					4.712
S2.002	SIC15	30 Winter	100	+20%					4.618
S3.000	SIC17	30 Winter	100	+20%					4.700
S2.003	SCP16	15 Winter	100	+20%	30/15 Summer				4.993
S2.004	SCP17	15 Winter	100	+20%	30/15 Summer				4.954
S1.001	SCP3	15 Winter	100	+20%	30/15 Summer				4.934
S1.002	SCP4	15 Winter	100	+20%	30/15 Summer				4.867
S1.003	SCP5	15 Winter	100	+20%	30/15 Summer				4.716
S1.004	SCP6	15 Winter	100	+20%	30/15 Summer				4.568
S4.000	SCP7	15 Winter	100	+20%	30/15 Summer				4.754
S4.001	SCP8	15 Winter	100	+20%	30/15 Summer				4.435
S5.000	SCP10	15 Winter	100	+20%	100/15 Summer				4.696
S5.001	SCP11	15 Winter	100	+20%	100/15 Summer				4.359
S1.005	SCP9	15 Winter	100	+20%	2/15 Winter				4.304

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SCP1	0.337	0.000	0.06		2.5	SURCHARGED	
S2.000	SAJ13	0.000	0.000	0.94		5.7	SURCHARGED*	
S2.001	SIC14	0.000	0.000	0.52		8.2	SURCHARGED*	
S2.002	SIC15	0.000	0.000	0.53		8.4	SURCHARGED*	
S3.000	SIC17	0.000	0.000	0.13		3.0	SURCHARGED*	
S2.003	SCP16	0.503	0.000	1.04		14.9	SURCHARGED	
S2.004	SCP17	0.538	0.000	1.09		16.6	SURCHARGED	
S1.001	SCP3	0.688	0.000	0.84		44.3	SURCHARGED	
S1.002	SCP4	0.654	0.000	1.90		96.5	SURCHARGED	
S1.003	SCP5	0.532	0.000	1.69		95.5	SURCHARGED	
S1.004	SCP6	0.432	0.000	1.51		95.5	SURCHARGED	
S4.000	SCP7	0.298	0.000	1.39		54.2	SURCHARGED	
S4.001	SCP8	0.148	0.000	1.35		81.5	SURCHARGED	
S5.000	SCP10	0.130	0.000	1.16		19.7	SURCHARGED	
S5.001	SCP11	0.057	0.000	0.55		20.2	SURCHARGED	
S1.005	SCP9	0.284	0.000	2.64		214.6	SURCHARGED	

Simulation results for 100 year return period

Rainfall Statistics

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 313712, Northing: 234384,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.4,	3.5,	4.1,	5.0,	5.6,	6.1,	7.7,	9.5,	10.7,	12.4,	14.0,	15.2,	17.1,	18.6,	19.8,	N/A ,
10 mins	3.4,	4.9,	5.7,	7.0,	7.8,	8.5,	10.7,	13.2,	14.9,	17.3,	19.5,	21.2,	23.8,	25.9,	27.6,	N/A ,
15 mins	4.0,	5.7,	6.7,	8.2,	9.2,	10.0,	12.6,	15.6,	17.6,	20.4,	22.9,	24.9,	28.0,	30.4,	32.4,	N/A ,
30 mins	5.3,	7.5,	8.7,	10.5,	11.8,	12.7,	15.9,	19.6,	22.0,	25.4,	28.5,	30.8,	34.5,	37.4,	39.7,	N/A ,
1 hours	7.0,	9.8,	11.3,	13.6,	15.1,	16.3,	20.2,	24.6,	27.5,	31.6,	35.3,	38.1,	42.5,	45.8,	48.6,	N/A ,
2 hours	9.2,	12.7,	14.6,	17.5,	19.4,	20.8,	25.6,	31.0,	34.5,	39.4,	43.8,	47.1,	52.3,	56.3,	59.6,	N/A ,
3 hours	10.8,	14.9,	17.0,	20.2,	22.4,	24.0,	29.4,	35.4,	39.3,	44.8,	49.6,	53.3,	59.0,	63.4,	67.1,	N/A ,
4 hours	12.1,	16.6,	19.0,	22.5,	24.8,	26.6,	32.5,	38.9,	43.2,	49.1,	54.3,	58.2,	64.4,	69.1,	72.9,	N/A ,
6 hours	14.3,	19.4,	22.1,	26.1,	28.7,	30.7,	37.3,	44.5,	49.2,	55.8,	61.5,	65.9,	72.7,	77.9,	82.1,	N/A ,
9 hours	16.8,	22.7,	25.7,	30.2,	33.2,	35.5,	42.8,	50.9,	56.2,	63.4,	69.8,	74.7,	82.1,	87.8,	92.5,	N/A ,
12 hours	18.9,	25.3,	28.7,	33.6,	36.8,	39.3,	47.3,	56.0,	61.7,	69.5,	76.3,	81.5,	89.5,	95.6,	100.6,	N/A ,
18 hours	22.2,	29.6,	33.4,	38.9,	42.6,	45.4,	54.3,	64.0,	70.3,	79.0,	86.5,	92.3,	101.0,	107.7,	113.2,	N/A ,
24 hours	25.0,	33.0,	37.2,	43.2,	47.2,	50.2,	59.9,	70.4,	77.2,	86.5,	94.6,	100.8,	110.2,	117.3,	123.1,	143.2,
2 days	30.7,	39.8,	44.4,	51.0,	55.4,	58.7,	69.1,	80.4,	87.6,	97.3,	105.8,	112.2,	121.8,	129.1,	135.1,	155.5,
3 days	35.2,	45.2,	50.2,	57.4,	62.0,	65.6,	76.7,	88.6,	96.1,	106.3,	115.1,	121.8,	131.8,	139.3,	145.5,	166.4,
4 days	39.3,	49.9,	55.3,	62.9,	67.8,	71.6,	83.2,	95.7,	103.6,	114.2,	123.3,	130.2,	140.5,	148.3,	154.7,	176.1,
6 days	46.3,	58.1,	64.1,	72.4,	77.9,	81.9,	94.6,	108.1,	116.5,	127.9,	137.6,	144.9,	155.8,	164.0,	170.7,	193.2,
8 days	52.4,	65.4,	71.8,	80.8,	86.6,	91.0,	104.6,	118.9,	127.8,	139.8,	150.0,	157.7,	169.1,	177.7,	184.7,	208.1,
10 days	58.1,	72.0,	78.8,	88.4,	94.6,	99.2,	113.6,	128.6,	138.0,	150.6,	161.3,	169.3,	181.2,	190.1,	197.3,	221.5,
12 days	63.3,	78.1,	85.3,	95.5,	102.0,	106.8,	121.9,	137.6,	147.4,	160.5,	171.6,	179.9,	192.2,	201.5,	209.0,	233.9,
16 days	73.1,	89.3,	97.3,	108.4,	115.4,	120.7,	137.0,	154.0,	164.5,	178.5,	190.4,	199.3,	212.4,	222.2,	230.1,	256.5,
20 days	82.0,	99.7,	108.2,	120.2,	127.8,	133.5,	150.9,	168.9,	180.0,	194.9,	207.4,	216.8,	230.6,	240.9,	249.2,	276.8,
25 days	92.5,	111.7,	120.9,	133.9,	142.0,	148.1,	166.8,	186.1,	197.9,	213.7,	227.0,	236.9,	251.5,	262.3,	271.1,	300.1,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

$M_5 60$ = 16.3mm
M_5 2days = 58.7mm
Ratio = 0.278

Appendix C

Irish Water Drainage &
Watermain Records

UISCE ÉIREANN : IRISH WATER

Legend

- Unknown Meter ; Other Meter
- Sluice Valve Open
- Sluice Valve Closed
- Sluice Valve Closed

Water Hydrants

Hydrant Function

- Fire Hydrant
- Telemetry Kiosk
- Cap
- Other Fittings

Water Distribution Mains

Owned By

- Irish Water
- Private
- Irish Water

Sewer Manholes

Manhole Type

- Standard

Sewer Discharge Points

Discharge Type

- Other; Unknown

Sewer Inlets

Inlet Type

- Catchpit
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow

Storm Manholes

Manhole Type

- Standard

Storm Discharge Points

Discharge Type

- Outfall
- Surface Gravity Mains

a3 - Scale **1:1,000**

Date: 21/05/2019

Meters

0 12.5 25

Appendix D

Greenroof Layout

Level 07
Rooftop Amenity

BLOCK
C3

BLOCK
B2 - Resi

+ 39.6 m

+ 40.8 m

PARKGATE ST

1
SEC-33303

1
SEC-33306

1
SEC-33305

1
SEC-33305

Level 09
Part 5 Amenity

BLOCK
B2 - Office

Level 09
Rooftop Amenity
(Residential)

+ 36.6 m

+ 84.6 m

+ 93.5 m

BLOCK A

+ 84.6 m

4905

+ 33.9 m

Level 08
Rooftop Amenity

BLOCK
C2

20525

BLOCK
B1

+ 45.6 m

21295

Building Maintenance
Unit (BMU) to specialist
design.

1
SEC-33306

BLOCK
C1

8765

+ 34.1 m

6160

RIVER LIFFEY

1
SEC-33303

20m

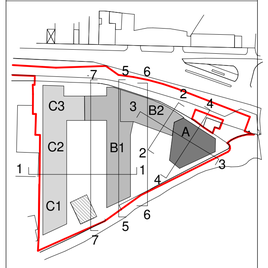
20m

0

Notes:
DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS IN ALL CASES. VERIFY DIMENSIONS ON SITE AND REPORT ANY DISCREPANCIES TO THE ARCHITECTS IMMEDIATELY. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE ARCHITECTS SPECIFICATION. © THIS DRAWING IS COPYRIGHT AND MAY ONLY BE REPRODUCED WITH THE ARCHITECTS PERMISSION.

OSi License Number - AR 0052219
Projection / Spatial Reference:
Projection= IRENET95_Irish_Transverse_Mercator
Centre Point Coordinates:
X,Y= 713657.3699,734403.2446
Reference Index:
Map Series | Map Sheets
1:1,000 | 3263-02
1:1,000 | 3263-08
1:1,000 | 3263-07
1:1,000 | 3263-03

N



PLANNING LEGEND

SYMBOL	DESCRIPTION
	SITE BOUNDARY LINE
	EXISTING STRUCTURES
	WAYLEAVE / RIGHT OF WAY
	RESIDENTIAL ENTRANCE
	PUBLIC ENTRANCE
	PART 5

Rev	Date	DRN	Description
P02	12/12/19	EOB	Full Planning ABP issue
P01	14/06/19	EOB	Pre-Planning ABP issue

reddy architecture +urbanism
Reddy Architecture + Urbanism
Darty Mills,
Darty Road
Dublin 6, D06 Y0E3.
T: +353 (0)1 4987000
W: www.reddyarchitecture.com
E: info@reddyarchitecture.com

Client Details:
Ruirside Developments Ltd.

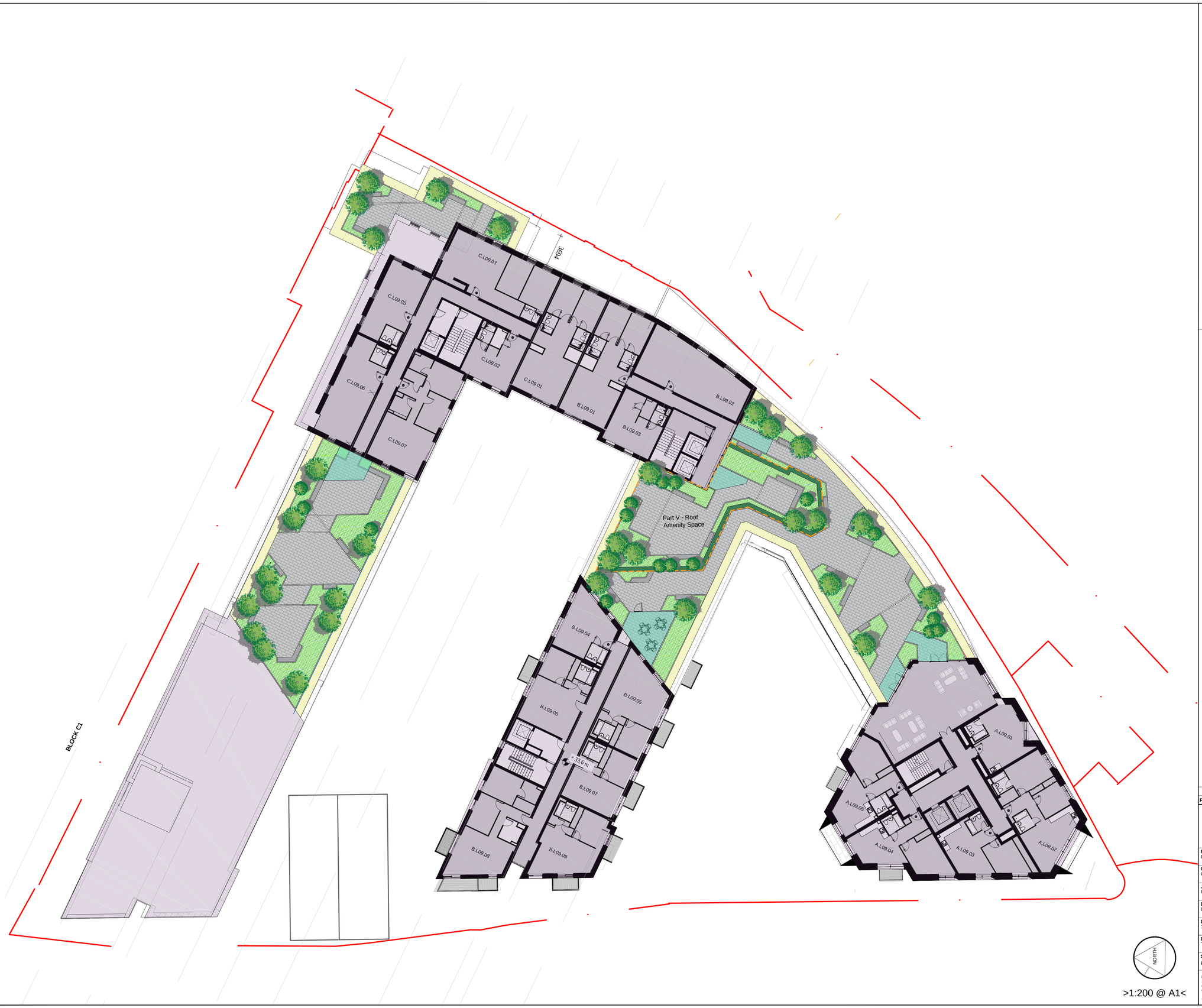
Project Details:
PGATE
42A Parkgate Street, Dublin 8

Drawing Title:
Proposed Roof Plan

Job No	Date	Scale@A1
P18-107D	12/12/19	As indicated
Status: Planning		Drawn By: M.McGuire
Purpose: Planning Permission		Checked By: E.O'Brien

Drawing Number	Revision
PGATE-RAU-ZZ-28-DR-A-GAP-31129	P02

A1 Landscape



LEGEND

- NEW SMALL TO MEDIUM TREE PLANTING
- SHRUB PLANTING IN PLANTER
- NATURAL FLAG PAVING
- SEDUM
- HEDGE
- SEATING ELEMENT
- GLASS STRUCTURE
- PART V BOUNDARY LINE

INDICATIVE PLANT LIST

PROPOSED TREES

Roof level small scale trees:

Acer spp.	16-18cmg
Amelanchier spp.	2.5m high
Arbutus unedo	1m high
Betula spp.	14-16 cmg
Corylus spp.	2.5m ht

FORMAL HEDGE PLANTING

Species	Size
Prunus lusitanica	60-80cm/ 100-120cm
Buxus sempervirens	60-80cm

SHRUB HERBACEOUS AND GROUNDCOVER PLANTING

- Pollinator friendly

Species	Size
Anemone japonica 'Prinz Heinrich'	2L
Berberis darwinii	2L
Choisya ternata	5L
Dryopteris erythrosora	2L
Escalonia 'apple blossom'	2L
Heuchera micrantha 'Palace Purple'	3L
Helleborus foetidus	2L
Hydrangea quercifolia	5L
Kniphofia 'Prince Igor'	2L
Liriope muscari	2L
Luzula nivea	2L
Mischantus sinenis 'Gracilimus'	3L
Pachysandra terminalis	2L
Pennisetum alopecuroides	3L
Salvia spp.	2L
Sarcococca hookeriana	5L
Verbena bonariensis	2L
Vinca minor 'Gertrude Jeckyll'	2L
Hypericum calycinum	2L

CLIMBERS

Species	
Hydrangea anomala ssp petiolaris	5L
Trachylospermum jasminoides	5L
Clematis montana 'Rosea'	5L

REV	DESCRIPTION	ISSUED BY	DATE

MITCHELL + ASSOCIATES

LANDSCAPE ARCHITECTURE URBAN DESIGN

Unit 5, Woodpark, The Rise, Glasnevin, Dublin 9, Ireland t: + 353 1 454 5066 e:info@mitchellassoc.net

PROJECT
Parkgate Street

CLIENT
Chartered Land

JOB NO.
LPAR010

DRAWING
Landscape masterplan - Rooftops

DRAWING NO.
101

DRAWN BY	CHECKED	DATE
Tijana Cavara Petrovic	FMcG	06.12.2019
STATUS: Planning	**SCALE** >1:200 @ A1<	**REVISION** -

NOTES:
All dimensions are in millimeters unless otherwise stated and shall be checked and confirmed by the contractor on site. Any discrepancies shall be immediately reported to the landscape architects. Work to figured dimensions only - Do not scale from drawing. Do Not Scale. Use Figured Dimensions Only. Not for Construction Purposes unless Specifically Marked.

NORTH

>1:200 @ A1<

Appendix E

Irish Water Correspondence

Uisce Éireann
Bosca OP 448
Oifig Sheachadta Na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City

www.water.ie

Kieran Dowdall
50 Ringsend Road
Dublin 4

13 December 2019

Re: Design Submission for Former Hickey & Co LTD, Parkgate Street, Dublin 8 (the "Development")
(the "Design Submission") / Connection Reference No: CDS19000532

Dear Kieran Dowdall,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Marina Zivanovic Byrne
Phone: 01 89 25991
Email: mzbyrne@water.ie

Yours sincerely,

Maria O'Dwyer
Connections and Developer Services

Appendix A

Document Title & Revision

- [Proposed Drainage & Watermain Layout] 265381-C-002-P05
- [Watermain Cross-section Near Structures] 265381-SK-C-005-P01

Standard Details/Code of Practice Exemption:

1. *Irish Water notes that longitudinal sections of the on-site foul sewer network, as required under Section 1.8.14 of the Wastewater Code of Practice, will not be produced until detailed design stage. Before Connection Application, these must be produced and agreed upon with Irish Water, after which a new Statement of Design Acceptance will be issued, to include agreed longitudinal sections..*
2. *Reduced separation distance between (south of) Block B1 and Watermain, and between the Watermain loop and the basement foundation.*

*For further information, visit **www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

Kieran Dowdall
50 Ringsend Road
Dublin 4

15 October 2019

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City

www.water.ie

Dear Kieran Dowdall,

Re: Connection Reference No CDS19000532 pre-connection enquiry - Subject to contract | Contract denied

Connection for Mixed Use Development of 584 units at Former Hickey & Co LTD, Parkgate Street, Dublin 8.

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Former Hickey & Co LTD, Parkgate Street, Dublin 8.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated subject to following:

Water:

- New connection to the water network should be 150mm ID taken from the existing 6'' cast iron watermain on opposite side of Parkgate Street.
- The connection should be cross-connected back into the existing 24'' cast iron main running in parallel with the 6'' main in Parkgate Street.

Wastewater:

- Surface water inflow from Parkgate Street should be removed from the combined network. Minimum reduction should be equivalent to the proposed 22.4 l/s peak foul water discharge from the Development. At connection application stage you should provide evidence of the successful delivery of the Project in agreement with Dublin City Council.

Housing Development Strategic

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

- In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
- You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details.

A connection agreement can be applied for by completing the connection application form available at **www.water.ie/connections**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities.

If you have any further questions, please contact Marina Zivanovic Byrne from the design team on 01 89 25991 or email mzbyrne@water.ie. For further information, visit **www.water.ie/connections.**

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

Appendix F

Hydro International Guide to Surface Water Treatment Systems

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]

Notes

1 Interception components are also normally also a treatment component (excluding rainwater harvesting which only removes runoff from the system)

2 for roof runoff only

3 Interception design may be possible in certain scenarios, but would require detailed justification

4 If unlined and design performance can be demonstrated (noting the need to protect groundwater)

5 where design performance can be demonstrated

A Guide to The SuDS Manual (C753) Simple Index Approach

Author: Mark Goodger, Regional Technical Manager
Hydro International

The SuDS Manual (C753) Simple Index Approach

Introduction

In Table 26.1 of The SuDS Manual (C753) four risk based approaches for water quality management are specified:

1. Simple Index Approach
2. Risk Screening (generally used to determine if Simple Index Approach is appropriate)
3. Detailed Risk Assessment
4. Process-Based Treatment Modelling

With the intention that the simpler approaches are applied in lower risk scenarios, with more sophisticated assessments only used when appropriate to the risk.

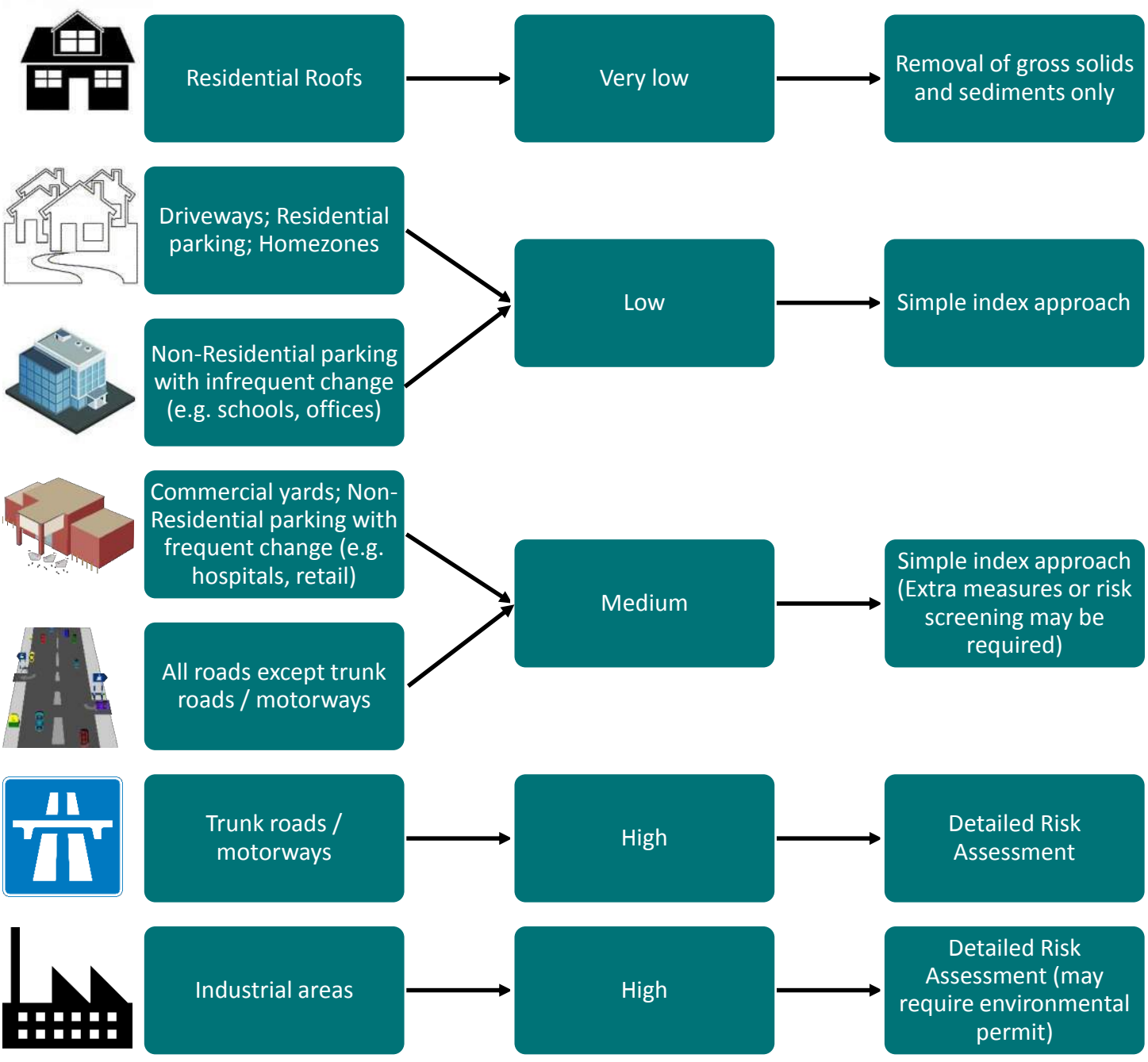


Figure 1: Applying the Risk Based Water Quality Management Approaches (Source: After Table 4.3 of the SuDS Manual)

Applying the Simple Index Approach (SIA)

The Simple Index Approach (SIA) recommended in Section 26.7.1 of The SuDS Manual (C753) was developed from that set out by Middlesex University (as outlined in Annex 5 of Chapter 26 of The SuDS Manual) and follows a three step approach:

Step 1 – Allocate suitable pollution hazard indices for the proposed land use categories

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected[1] surface waters or groundwater, consider the need for a more precautionary approach.

Note:

1 Designated as those protected for the supply of drinking water (see SuDS Manual Table 4.3).

Step 1: Define pollution hazard indices

Pollution hazad indices are presented in Table 26.2 of The SuDS Manual and reproduced here for simplicity. The indices range from 0 (no pollution of this type) to 1 (high pollution hazard for this contaminant type).

Table 1: Pollution hazard indices for different land use classes (Source: Reproduced from The SuDS Manual Table 26.2)

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Liquid Hydrocarbons (free floating oils)
Residential Roofs	Very low	0.2	0.2	0.05
Other Roofs (typically commercial / industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, homezones and general access roads) **and non-residential car parks with infrequent change** (e.g. schools, offices) – i.e. <300 traffic movements / day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential parking with frequent change (e.g. hospitals, retail)**; all roads except low traffic roads and trunk roads / motorways[1]**	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites)**; sites where chemicals and fuels** (other than domestic fuel oil) **are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]**	High	0.8[2]	0.8[2]	0.9[2]

Notes:

1. Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009)
2. These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (see also The SuDS Manual Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help to determine the most appropriate treatment approach to the development of a design solution. **Also consider spill protection – contact Hydro International to find out more about our specialist treatment and containment options for high pollultion hazard sites.**

Where a site land use falls outside of these categories, the indices should be adapted (and agreed with the drainage approving / adopting body) or else a more detailed risk assessment should be carried out.
Equivalent indices should be developed for other contaminants of interest of any given site. **For assistance with development of indices or detailed site analysis, contact Hydro International.**

Step 2: Determine SuDS Pollution Mitigation Indices

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for that contaminant type):

Total SuDS Mitigation Index (for each contaminant) ≥ Pollution hazard index (for each contaminant)

If the mitigation index of an individual component is insufficient, two components (or more) in series will be required, with a factor of 0.5 used to account for the reduced performance of secondary or tertiary components, in line with the following equation:

$$\text{Total SuDS Mitigation Index} = \text{Mitigation Index}_1 + 0.5\,(\text{Mitigation Index}_2)$$

Where *Mitigation Index$_n$ = Mitigation Index for Component n.*

If the only runoff destination is to surface water (i.e. there is no infiltration from the SuDS to groundwater), the surface water mitigation indices should be used.

Where the principal destination of the runoff is to groundwater, then the groundwater indices should be used. This will be the case, even for infiltration systems that are designed to discharge to surface waters once the infiltration capacity is exceeded – In this scenario, the overflow will often not need to be treated prior to discharge to surface waters as the risk will be low (highly contaminated flows will have been treated prior to infiltration) and dilution will be high.

In England and Wales, if the principal runoff destination is intended to be to surface water, but some infiltration (even in small amounts) may occur through unlined components, then the groundwater indices should be used for the proportion of runoff that discharges to groundwater and the surface water indices used for the proportion of runoff that discharges to surface waters. In Scotland & Northern Ireland, groundwater risk management is not a requirement for this scenario.

Table 2: SuDS mitigation indices for discharges to surface waters (Source: Extended and reproduced from The SuDS Manual Table 26.3)

Type of SuDS Component	Mitigation Indices[1]		
	TSS	Metals	Liquid Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond[3]	0.7[2]	0.7	0.5
Wetland[3]	0.8[2]	0.8	0.8
First Defense® Vortex Separator	0.5[a]	0.33[c]	0.4[d]
Downstream Defender® Advanced Vortex Separator	0.5[a]	0.4[c]	0.8[a]
Up-Flo™ Filter	0.8[a]	0.69[c, e]	0.4[d]
Hydro-BioCell™ Bioretention System	0.8[b]	0.8[b]	0.8[d]

Notes:

1) SuDS components only deliver these indices if they are designed and constructed in accordance with the relevant technical chapters of the SuDS Manual. Designers and installers of SuDS components should be able to demonstrate competence in their respective areas.
2) Filter drains, ponds and wetlands are not recommended for removal of coarse sediments as their use for this purpose will have significant maintenance implications. Sediment (TSS) should be removed upstream where possible.
3) Where a wetland is not specifically designed to provide significantly enhanced treatment performance, it should be considered as having the same mitigation indices as a pond.

a) Derived from 3rd party testing and / or verification programmes. Test reports available on request.
b) Derived from testing and / or monitoring. Test reports available on request.
c) Derived from partitioning of sediment bound and dissolved contaminants and associated testing. Evidence available on request.
d) Based on typical values for components of this type.
e) Dependant on filter media used.

Table 3: SuDS mitigation indices for discharges to groundwater (Source: Extended and reproduced from The SuDS Manual Table 26.4)

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates[1]	Mitigation Indices		
	TSS	Metals	Liquid Hydrocarbons
A layer of dense vegetation underlain by soil with good contaminant attenuation potential[2] of at least 300mm in depth[3]	0.6[4]	0.5	0.6
A soil with good contaminant attenuation potential[2] of at least 300mm in depth[3]	0.4[4]	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment) underlain by soil with good contaminant attenuation potential[2] of at least 300mm in depth[3]	0.4[4]	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment and including a geotextile at the base separating the foundation from the subgrade) underlain by soil with good contaminant attenuation potential[2] of at least 300mm in depth[3]	0.7[4]	0.6	0.7
Bioretention underlain by soil with good contaminant attenuation potential[2] of at least 300mm in depth[3]	0.8[4]	0.8	0.8
Flow through Proprietary Treatment System prior to infiltration SuDS	**TSS**	**Metals**	**Liquid Hydrocarbons**
First Defense® Vortex Separator	0.5[a]	0.33[c]	0.4[d]
Downstream Defender® Advanced Vortex Separator	0.5[a]	0.4[c]	0.8[a]
Up-Flo™ Filter	0.8[a]	0.69[c,e]	0.4[d]
Hydro-BioCell™ Bioretention System	0.8[b]	0.8[b]	0.8[d]

Notes:

SuDS components only deliver these indices if they are designed and constructed in accordance with the relevant technical chapters of the SuDS Manual. Designers and installers of SuDS components should be able to demonstrate competence in their respective areas.

1) All designs must include a minimum of 1m unsaturated depth of aquifer material between the infiltration surface and the maximum likely groundwater level (as required by infiltration design – see The SuDS Manual Chapter 25).
2) For example as recommended in Sniffer (2008a and 2008b), Scott Wilson (2010) or other appropriate guidance.
3) Alternative depths may be considered where it can be demonstrated that the combination of the proposed depth and soil characteristics will provide equivalent protection to the underlying groundwater – see note 1.
4) If significant amounts of sediment are allowed to enter an infiltration system, there will be a high risk of rapid clogging and subsequent system failure. It is recommended to remove sediment prior to the infiltration system as far as reasonably practical.

a) Derived from 3rd party testing and / or verification programmes. Test reports available on request.
b) Derived from testing and / or monitoring. Test reports available on request.
c) Derived from partitioning of sediment bound and dissolved contaminants and associated testing. Evidence available on request.
d) Based on typical values for components of this type.
e) Dependant on filter media used.

IMPORTANT NOTES:

- Where the indices are not considered representative by the designer, a more detailed risk assessment can be undertaken.
- Components should always be designed for treatment, as described in the relevant technical guidance set out in the individual component chapters of The SuDS Manual. **If they are incorrectly designed, constructed or inadequately maintained, their treatment performance could be significanty adversely affected.**
- Where the infiltration component itself does not provide sufficient pollution mitigation, the design should include upstream SuDS components that are lined to prevent infiltration from occurring until sufficient treatment has taken place.

Step 3: Consider the need for a precautionary approach where discharges are to protected waters

Reference should be made to local standards, planning requirements and guidance, particularly with reference to discharges to protected waters where more detailed risk assessments or enhanced treatment may be required.

Case Studies:

Small is Beautiful

A First Defense® provided a much-needed small footprint solution to meeting regulatory requirements on a confined site for a new commercial office development in Perkins Township, Ohio.
TSS was the main pollutant of concern and although the Simple Index Approach was not in use in Ohio at the time of installation, retrospectively considering this approach would give:

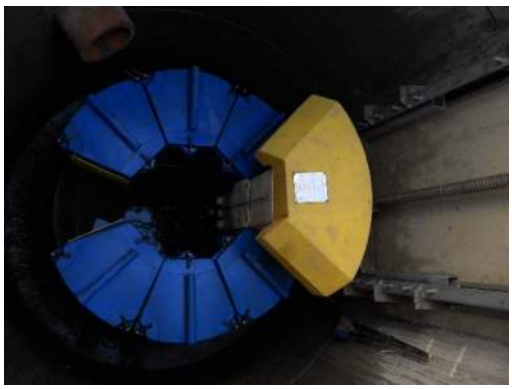
TSS Hazard Index (Office Development) = 0.5
First Defense® TSS Mitigation Index = 0.5

Mitigation Index ≥ Hazard Index

Pollution Protection in Whisky Country

Poor drainage, flooding and freezing weather led to a landslip and extreme surface degradation along a section of the narrow A95 near Elgin. Although it pre-dated the new SuDS Manual risk based approach, treatment was vital as the surface water runoff destination was to an area world-renowned for the production of single malt whiskey and an important salmon fishery.
A Downstream Defender® advanced hydrodynamic vortex separator minimises the risk of sediment and hydrocarbon pollution reaching the sensitive watercourse.

Downstream Defender® Mitigation Indices:
TSS = 0.5
Heavy Metals = 0.4
Liquid Hydrocarbons = 0.8



Fine Filtration enables Mixed-Use Development

Environment Agency planning conditions for a new commercial access road to retail and light commercial units as part of a mixed-use development in Faversham, Kent, required treatment prior to infiltration.
A bypass separator provides important spill protection for liquid hydrocarbons, prior to an Up-Flo™ Filter that ensures fine filtration of sediments and associated contaminants, such as Polycyclic Aromatic Hydrocarbons (PAHs). Although the installation pre-dates the Simple Index Approach, retrospective consideration of the approach gives:

Contaminant	TSS	Metals	PAHs
Hazard Indices (Commercial Access)	**0.7**	**0.6**	**0.7**
Up-Flo™ Filter Mitigation Indices	**0.8**	**0.69**	**0.72**

Stringent Quality Control, Naturally

Hydro BioCell™ have brought attractive landscaping and stringent surface water quality control to a sensitive location in Barry, South Wales.
3 units were retrofitted to the Business Support Centre car park as part of a wide urban regeneration scheme, effectively removing pollutants prior to discharge into the adjacent, rejuvenated harbourside.

Contaminant	TSS	Metals	Hydro-carbons
Hazard Indices (Commercial / Retail Parking)	**0.7**	**0.6**	**0.7**
Hydro BioCell™ Mitigation Indices	**0.8**	**0.8**	**0.8**

Simple Index Approach (SIA) Tool

A SIA spreadsheet tool has been developed by HR Wallingford on behalf of the Scottish Environment Protection Agency (SEPA) to support the implementation of the Simple Index Approach. The tool is freely available to download at www.susdrain.org/resources/SuDS_Manual.html.
The spreadsheet tool works through the Simple Index Approach Design Steps:

Step 1: Define pollution hazard indices

				Pollution Hazard Indices		
	Runoff Area Land Use Description		*Hazard Level*	Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Residential parking		Low	0.5	0.4	0.4
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:						
	Landuse Pollution Hazard Index		**Low**	**0.5**	**0.4**	**0.4**

Step 2: Determine SuDS Pollution Mitigation Indices

				Pollution Mitigation Indices		
	SuDS Component Description			Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Proprietary treatment system	Enter User Defined Indices in row below				
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	None					
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None					
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:	Hydro BioCell	SuDS Component 1		0.8	0.8	0.8

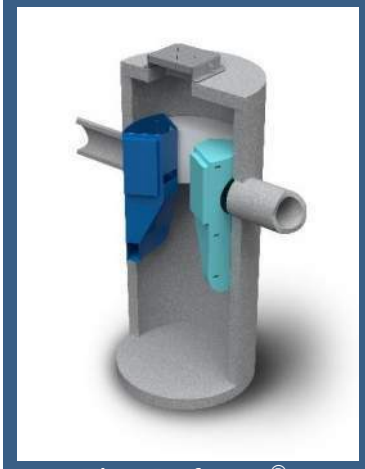
Calculation of Total SuDS Mitigation Indices and Results

	Combined Pollution Mitigation Indices		
	Suspended Solids	Metals	Hydrocarbons
Total Pollution Mitigation Indices for the Runoff Area	**0.8**	**0.8**	**0.8**

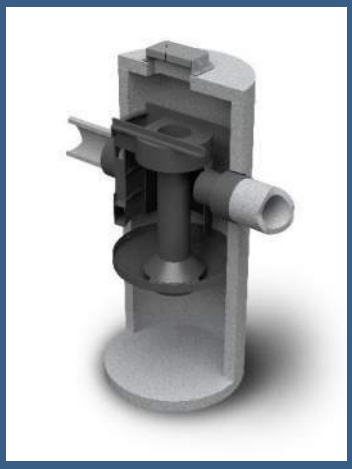
	Sufficiency of Pollution Mitigation Indices		
	Suspended Solids	Metals	Hydrocarbons
	Sufficient	Sufficient	Sufficient

The Hydro StormTrain® Series of Surface Water Treatment Devices

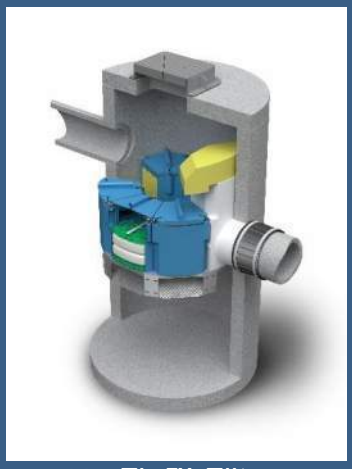
Each Hydro StormTrain® device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the specific treatment needs of a site; or can combined with one another or in conjunction with other SuDS components to form a mangament train; or can be used to protect and enhance SuDS features less suited to providing the first stage of treatment or more prone to failure due to sedimentation or shock loads associated with spills.



First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodyanmic Vortex Separator



Up-Flo™ Filter
Fluidised Bed Up Flow Filtration System

Hydro BioCell™
Bioretention System

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