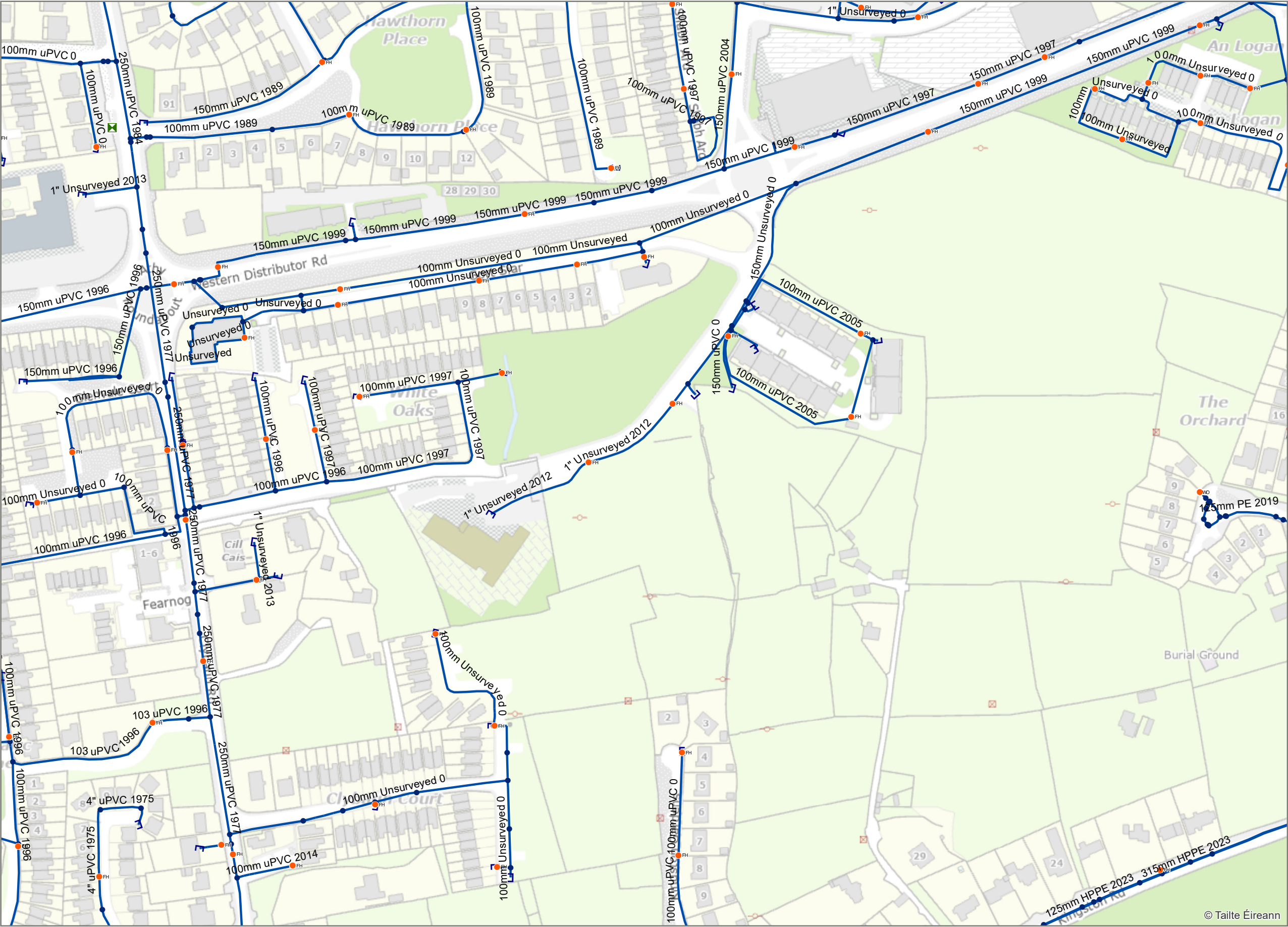


Appendix A Existing Service Record Drawings



Legend

Water Hydrants

- FH Fire Hydrant
- WO Washout

Kisok

- Kisok

Water Fittings

- Cap
- Other Fitting

Water Mains(Irish Water Owned)

- Potable Water



Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3: 1:2,500

Drawing No.: IW-AGG-2018-000

Drawn By: NMC

Checked By: <Add Name>

Approved By: <Add Name>

Drawn Date 27/08/2025

Checked Date: <dd/mm/yyyy>

Approved Date: <dd/mm/yyyy>



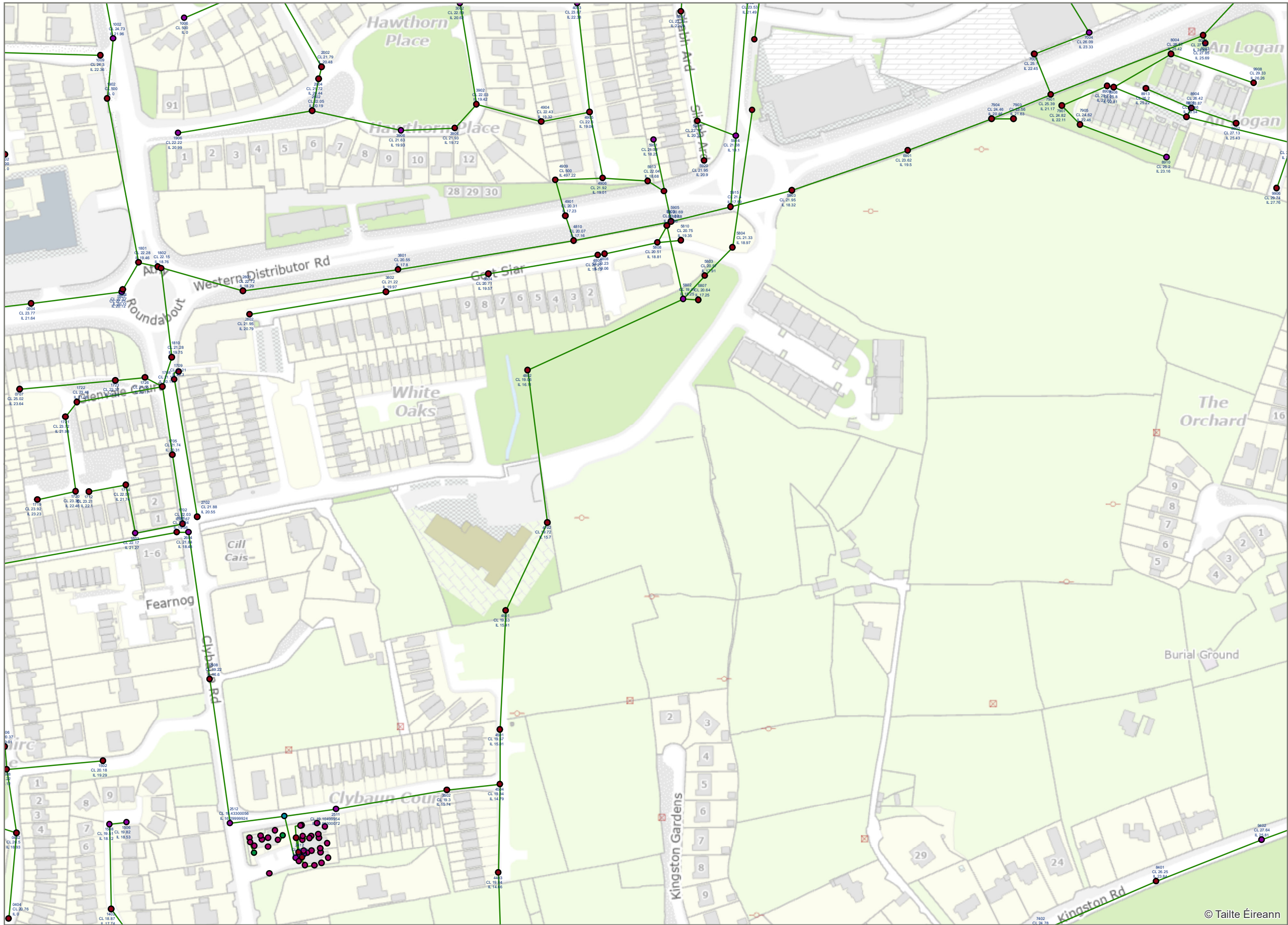
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Water Network



- Legend**
- GISDB.IWGIS.StormwaterNet_Junct...
 - Storm Inlets
 - Storm Manholes
 - Storm Fittings
 - Storm Discharge Points
 - GISDB.IWGIS.swGravityMain

0 20 40 80
m

Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3: 1:2,500

Drawing No.: IW-AGG-2018-000

Drawn By: NMC

Checked By: <Add Name>

Approved By: <Add Name>

Drawn Date: 27/08/2025

Checked Date: <dd/mm/yyyy>

Approved Date: <dd/mm/yyyy>



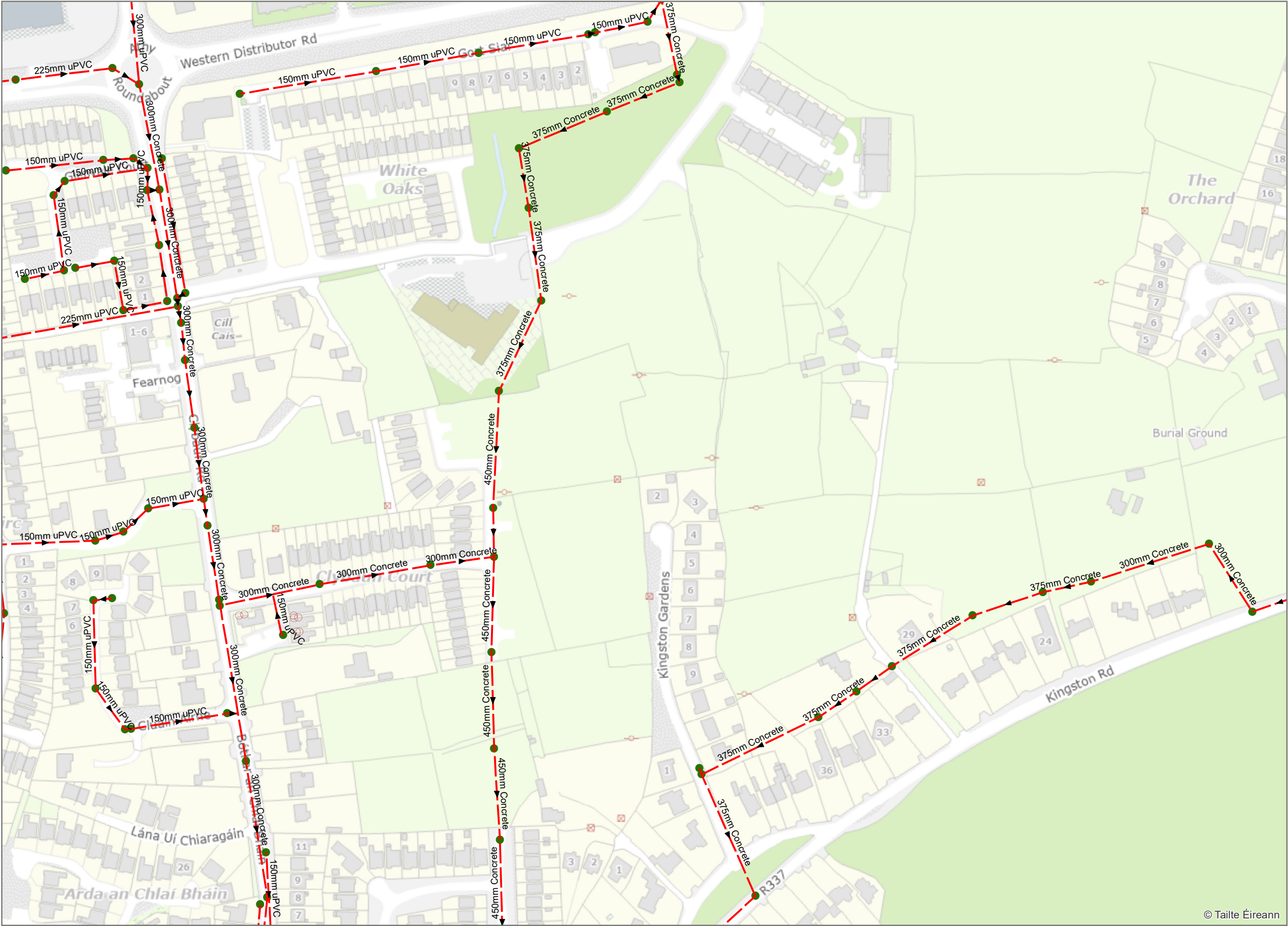
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Surface Water Network



- Legend
- Sewer Gravity Mains (Irish Water owned)**
- Liquid Type
- Foul
- Sewer Manholes**
- Manhole Type
- Standard
 - Sewer Storm Water Network Junctions



Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3:	1:2,500
Drawing No.:	IW-AGG-2018-000
Drawn By:	JJ
Checked By:	<Add Name>
Approved By:	<Add Name>
Drawn Date	07/10/2025
Checked Date:	<dd/mm/yyyy>
Approved Date:	<dd/mm/yyyy>

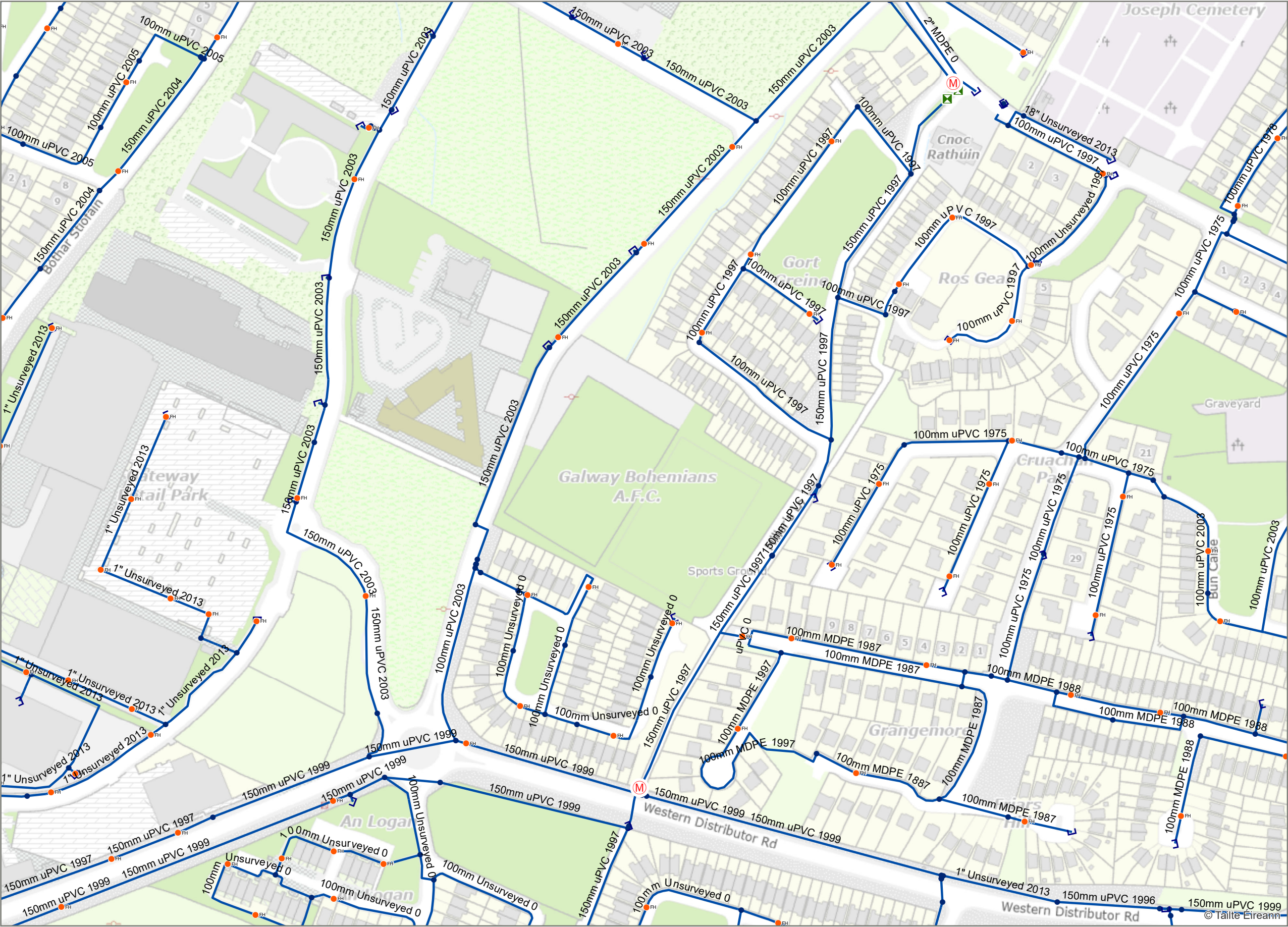


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Sewer Network



Legend

Boundary Meter

Ⓜ District (Boundary Meter)

Water Hydrants

● FH Fire Hydrant

Kisok

⊠ Kisok

Water Fittings

⊠ Cap

● Other Fitting

Water Mains(Irish Water Owned)

— Potable Water

0 20 40 80
m

Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3: 1:2,500

Drawing No.: IW-AGG-2018-000

Drawn By: NMC

Checked By: <Add Name>

Approved By: <Add Name>

Drawn Date: 27/08/2025

Checked Date: <dd/mm/yyyy>

Approved Date: <dd/mm/yyyy>



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Water Network



Legend

Sewer Gravity Mains (Irish Water owned)

Liquid

→ Foul

Sewer

Manhole

● Standard

OTHER Other;

0 20 40 80
m

Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3: 1:2,500

Drawing No.: IW-AGG-2018-000

Drawn By: NMC

Checked By: <Add Name>

Approved By: <Add Name>

Drawn Date 27/08/2025

Checked Date: <dd/mm/yyyy>

Approved Date: <dd/mm/yyyy>



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Sewer Network



Legend

- GISDB.IWGIS.StormwaterNet_Junct...
- Storm Manholes
- GISDB.IWGIS.swGravityMain

0 20 40 80
m

Coordinate System: TM65 Irish Grid
Projection: Transverse Mercator

Scale @ A3: 1:2,500

Drawing No.: IW-AGG-2018-000

Drawn By: NMC

Checked By: <Add Name>

Approved By: <Add Name>

Drawn Date: 27/08/2025

Checked Date: <dd/mm/yyyy>

Approved Date: <dd/mm/yyyy>



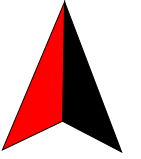
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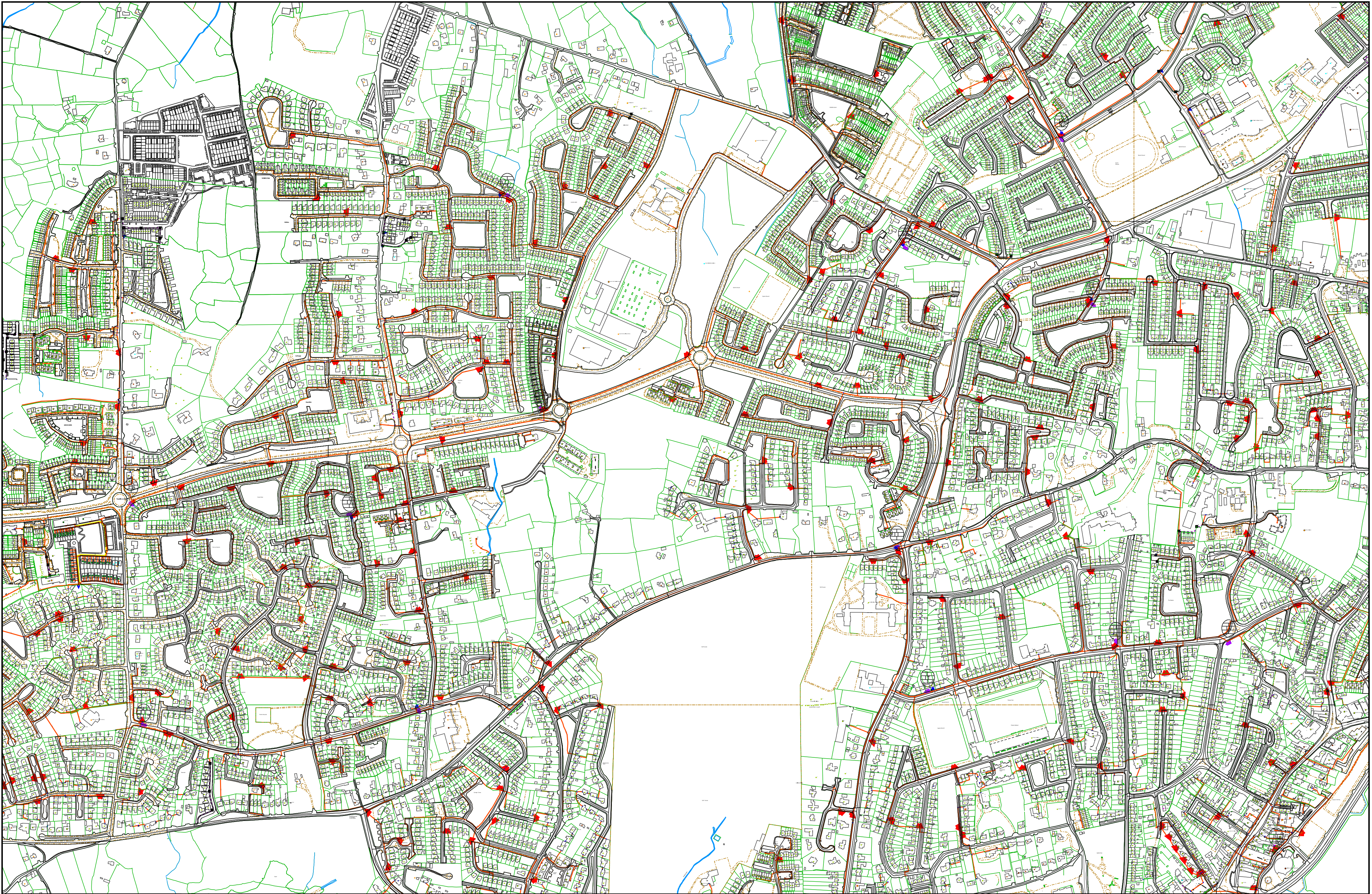
Surface Water Network



Smallworld
Powered by GE



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TITLE: 20250827-045_A3

COLOUR CODE:

- BLACK - 38KV & HIGHER VOLTAGE OVERHEAD LINES
- GREEN - MV(10KV/20KV) OVERHEAD LINES
- BLUE - LV (400V/230V) OVERHEAD LINES
- CYAN - 38KV & HIGHER VOLTAGE UNDERGROUND CABLE ROUTES
- RED - MV/LV (10KV/20KV/400V/230V) UNDERGROUND CABLE ROUTES

DATE: 27-Aug-2025

** SCALE: 1:2000

** SCALE WHEN PRINTED ON AN A3 PAGE
XY COORDINATES DISPLAYED IN IRISH GRID COORDINATE SYSTEM

WARNING

THIS MAP INDICATES THE APPROXIMATE LOCATION OF ESB TRANSMISSION (400KV, 220KV, 110KV, 38KV) AND DISTRIBUTION (20KV, 10KV, 230V/400V) UNDERGROUND CABLES AND OVERHEAD LINES IN THE GENERAL AREA OF THE PROPOSED WORKS. ESB NETWORKS TAKES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE MAP. IT IS THE USER'S RESPONSIBILITY TO INDEPENDENTLY VERIFY THE INFORMATION AND THE LOCATION OF UNDERGROUND CABLES AND OVERHEAD LINES. LOW VOLTAGE (230V/400V) SERVICE CABLES (E.G. HOUSE SERVICES, FACTORY/SHOP SERVICES, PUBLIC LIGHTING LAMP SERVICES, ETC) ARE NOT INCLUDED BUT THEIR PRESENCE SHOULD BE ANTICIPATED. THE DEPTHS OF UNDERGROUND CABLES MUST NEVER BE ASSUMED. BEFORE ANY MECHANICAL EXCAVATION IS UNDERTAKEN, THE ACTUAL LOCATION OF ALL UNDERGROUND ELECTRICITY CABLES MUST BE ESTABLISHED AND VERIFIED ON THE SITE USING:

- (A) UP-TO-DATE MAP RECORDS;
- (B) CABLE LOCATER EQUIPMENT OPERATED IN BOTH POWER AND RADIO MODES;
- (C) CAREFUL HAND DIGGING OF TRIAL HOLES USING 'SAFE DIGGING PRACTICE'

REFER ALSO TO 'HSA CODE OF PRACTICE FOR AVOIDING DANGER FROM UNDERGROUND SERVICES'

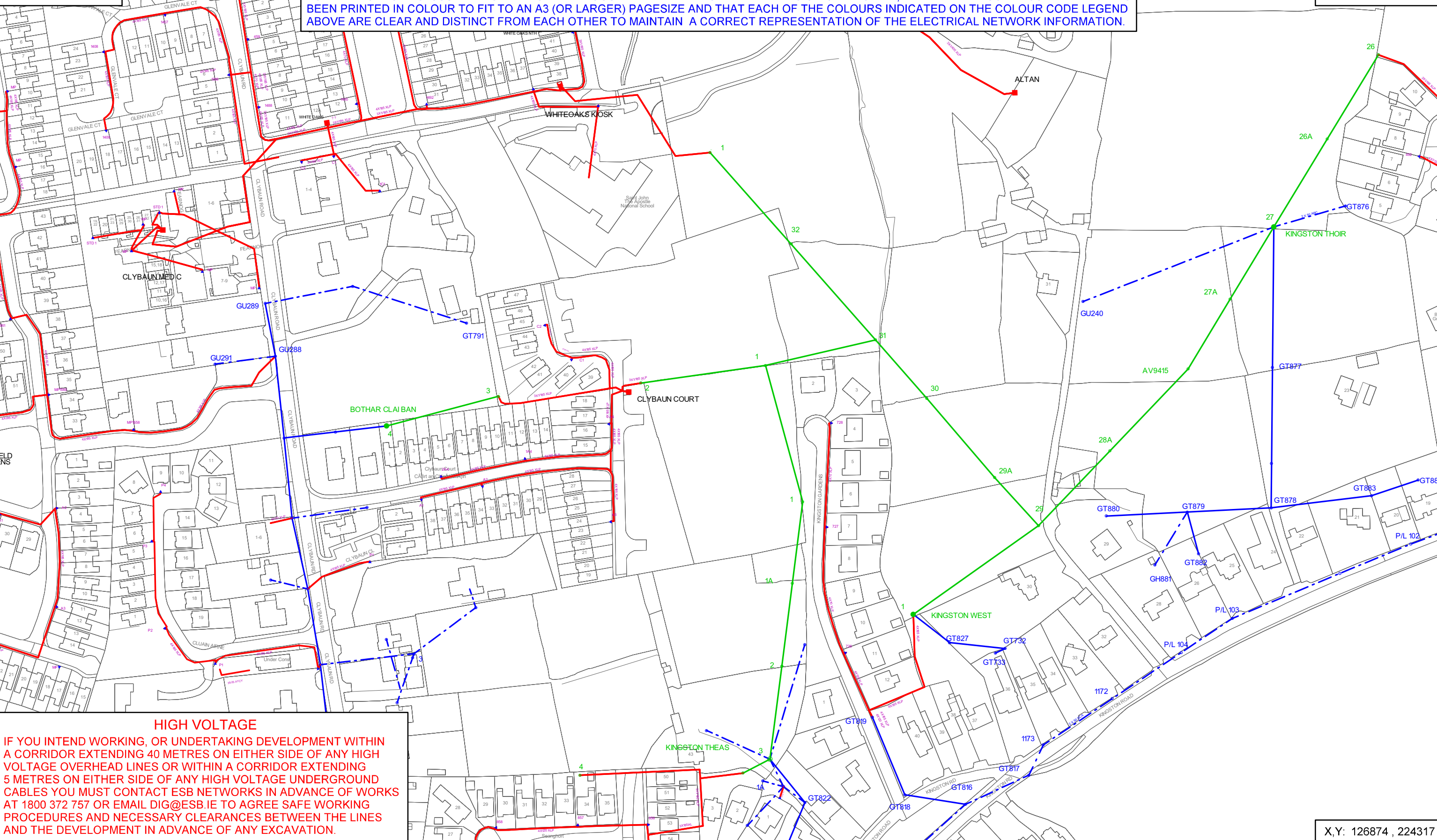
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X,Y: 126058 , 224800

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X,Y: 126874 , 224800





TITLE: 20250827-045_A3_01

COLOUR CODE:

BLACK - 38KV & HIGHER VOLTAGE OVERHEAD LINES
 GREEN - MV(10KV/20KV) OVERHEAD LINES
 BLUE - LV (400V/230V) OVERHEAD LINES
 CYAN - 38KV & HIGHER VOLTAGE UNDERGROUND CABLE ROUTES
 RED - MV/LV (10KV/20KV/400V/230V) UNDERGROUND CABLE ROUTES

DATE: 27-Aug-2025

**** SCALE: 1:1500**

** SCALE WHEN PRINTED ON AN A3 PAGE
XY COORDINATES DISPLAYED IN IRISH GRID COORDINATE SYSTEM

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X,Y: 126762 , 225495

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X,Y: 127374 , 225495

WARNING

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(A) UP-TO-DATE MAP RECORDS;
(B) CABLE LOCATOR EQUIPMENT OPERATED IN BOTH POWER AND RADIO MODES;
(C) CAREFUL HAND DIGGING OF TRIAL HOLES USING 'SAFE DIGGING PRACTICE'.

REFER ALSO TO 'HSA CODE OF PRACTICE FOR AVOIDING DANGER FROM UNDERGROUND SERVICES'.

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HIGH VOLTAGE

IF YOU INTEND WORKING, OR UNDERTAKING DEVELOPMENT WITHIN A CORRIDOR EXTENDING 40 METRES ON EITHER SIDE OF ANY HIGH VOLTAGE OVERHEAD LINES OR WITHIN A CORRIDOR EXTENDING 5 METRES ON EITHER SIDE OF ANY HIGH VOLTAGE UNDERGROUND CABLES YOU MUST CONTACT ESB NETWORKS IN ADVANCE OF WORKS AT 1800 372 757 OR EMAIL [DIG@ESB.IE](mailto:Dig@ESB.ie) TO AGREE SAFE WORKING PROCEDURES AND NECESSARY CLEARANCES BETWEEN THE LINES AND THE DEVELOPMENT IN ADVANCE OF ANY EXCAVATION.

X.Y: 127374 . 225132



Important Safety Notice: Damage to gas pipelines can result in serious injury or death. Gas network information is provided as a general guide. The exact location and depth of medium or low pressure distribution gas pipes must be verified on site by carrying out necessary investigations, including, for example, hand digging trial holes along the route of the pipe. Service pipes are not generally shown but their presence should always be anticipated.

High pressure transmission pipelines are shown in red. If a transmission pipeline is identified within 10m of any intended excavations then work must not proceed before GNI has been consulted. The true location and depth of a transmission pipeline must be verified on site by a representative of GNI. Contact can be made through 1800 427 747.

All work in the vicinity of the gas network must be completed in accordance with the current edition of the Health and Safety Authority publication, 'Code of Practice For Avoiding Danger From Underground Services' which is available from the Health and Safety Authority (0818 289 389) or can be downloaded at www.hsa.ie.

Legal Notice: Gas Networks Ireland (GNI) and its affiliates, accept no responsibility for the accuracy of any information contained in this document including data concerning location and technical designation of the gas distribution and transmission network (the 'Information'). The Information should not be relied on for accurate distance or depth of cover measurements.

Any representations and warranties, express or implied, are excluded to the fullest extent permitted by law. No liability shall be accepted for any loss or damage including, without limitation, direct, indirect or consequential loss, arising out of or in connection with the use or re-use of the Information.

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Aurora Telecom Duct

Aurora Telecom Sub Duct

Aurora Telecom Inserted Gas Pipe

Aurora Telecom Queries - 01-8926166 (Office Hours)

Aurora_Network_Queries@gasnetworks.ie

Aurora Telecom Emergency Only 1800 427399 / 01 2030120

Transmission Pipe (High Pressure)

Transmission Pipe (Construction Issue)

Distribution Pipe (Medium Pressure)

Distribution Pipe (Low Pressure)

Service Pipe (Medium Pressure)

Service Pipe (Low Pressure)

Strategic Pipe (Medium Pressure)

Strategic Pipe (Low Pressure)

Inserted

Abandoned Pipe

C=?

Cover (depth in metres)

Pressure Monitor

CP

CP Test Point

Protection (Slabbing)

End Cap

Protection (Sleeve)

Hot Tap

Reducer

Installation

Service Terminator

Valve

Tee

Mains Verification**

Transition

** Please contact GNI on 1800-427747 for specific information

DIAL BEFORE YOU DIG

1800 42 77 47

In Emergency call 1800 20 50 50

Gas Networks Ireland

GAS NETWORK INFORMATION

Description: test

Location: 527061,725223

Plot Date: 27/08/2025 11:23

Scale: 2500 @ A3

Plotted By: 9580

Ref ID: 9580_27082025112306

Appendix B Surface Water Calculations

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)	16.400	Minimum Backdrop Height (m)	0.200
Ratio-R	0.247	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1			20.112		526475.076	724861.952	1.725
S2-0	0.271	4.00	20.319	1200	526436.976	724842.717	1.125
2			20.975		526450.107	724815.958	2.570
S1-0	0.167	4.00	20.425	1200	526507.893	724878.412	1.664
3			20.112		526472.869	724860.850	1.000
S1-1	0.129	4.00	20.112	1200	526473.978	724861.363	1.425
S1-2	0.071	4.00	20.553	1200	526483.136	724840.305	1.937

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1-3	0.269	4.00	20.553	1200	526478.213	724828.674	2.070
S1-4	0.202	4.00	20.975	1200	526449.219	724815.499	2.870
S1-5	0.140	4.00	20.247	1200	526401.997	724809.779	2.499
S1-6	0.211	4.00	20.608	1350	526407.253	724772.110	3.189
S1-7	0.652	4.00	21.167	1500	526420.215	724763.040	3.951
S10-0	0.340	4.00	21.620	1500	526445.431	724646.638	4.642
S10-1	0.961	4.00	21.620		526437.388	724642.146	4.947
SMH-4601			19.530	1500	526375.894	724668.858	2.957

Links (Results)

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	0.721	28.7	17.5	1.200	1.712	0.129	0.0	127	0.756
2.001	1.065	42.3	27.2	1.712	1.796	0.200	0.0	131	1.129
1.000	1.004	39.9	27.3	2.645	2.199	0.202	0.0	137	1.078
1.001	1.281	90.6	46.2	2.199	2.814	0.341	0.0	152	1.288
1.002	1.041	114.9	74.9	2.814	3.426	0.553	0.0	221	1.106
1.003	0.995	215.3	162.2	3.426	4.117	1.205	0.0	342	1.088
1.004	2.909	629.7	207.5	4.117	4.272	1.545	0.0	207	2.622
1.005	1.004	359.4	317.8	4.272	2.282	2.506	0.0	497	1.127

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	22.963	323.4	225	Circular	20.112	18.687	1.200	20.553	18.616	1.712
2.001	12.630	150.0	225	Circular	20.553	18.616	1.712	20.553	18.532	1.796
1.000	47.567	168.7	225	Circular	20.975	18.105	2.645	20.247	17.823	2.199

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	S1-1	1200	Manhole	Adoptable	S1-2	1200	Manhole	Adoptable
2.001	S1-2	1200	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable
1.000	S1-4	1200	Manhole	Adoptable	S1-5	1200	Manhole	Adoptable

Pipeline Schedule

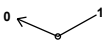
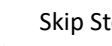
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	38.034	150.0	300	Circular	20.247	17.748	2.199	20.608	17.494	2.814
1.002	15.820	300.0	375	Circular	20.608	17.419	2.814	21.167	17.366	3.426
1.003	119.102	500.0	525	Circular	21.167	17.216	3.426	21.620	16.978	4.117
1.004	9.212	59.4	525	Circular	21.620	16.978	4.117	21.620	16.823	4.272
1.005	67.045	670.5	675	Circular	21.620	16.673	4.272	19.530	16.573	2.282

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	S1-5	1200	Manhole	Adoptable	S1-6	1350	Manhole	Adoptable
1.002	S1-6	1350	Manhole	Adoptable	S1-7	1500	Manhole	Adoptable
1.003	S1-7	1500	Manhole	Adoptable	S10-0	1500	Manhole	Adoptable
1.004	S10-0	1500	Manhole	Adoptable	S10-1		Junction	
1.005	S10-1		Junction		SMH-4601	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	526475.076	724861.952	20.112	1.725						
S2-0	526436.976	724842.717	20.319	1.125	1200					
2	526450.107	724815.958	20.975	2.570						
S1-0	526507.893	724878.412	20.425	1.664	1200					
3	526472.869	724860.850	20.112	1.000						
S1-1	526473.978	724861.363	20.112	1.425	1200		0	2.000	18.687	225
S1-2	526483.136	724840.305	20.553	1.937	1200		1	2.000	18.616	225
							0	2.001	18.616	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1-3	526478.213	724828.674	20.553	2.070	1200	 1	2.001	18.532	225
S1-4	526449.219	724815.499	20.975	2.870	1200	 0	1.000	18.105	225
S1-5	526401.997	724809.779	20.247	2.499	1200	 1 0	1.000	17.823	225
S1-6	526407.253	724772.110	20.608	3.189	1350	 1 0	1.001	17.748	300
S1-7	526420.215	724763.040	21.167	3.951	1500	 1 0	1.001	17.494	300
S10-0	526445.431	724646.638	21.620	4.642	1500	 1 0	1.002	17.419	375
S10-1	526437.388	724642.146	21.620	4.947		 0 1	1.003	17.216	525
SMH-4601	526375.894	724668.858	19.530	2.957	1500	 1	1.003	16.978	525
						 0	1.004	16.978	525
						 0 1	1.004	16.823	525
						 0	1.005	16.673	675
						 1	1.005	16.573	675

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)	0.0
M5-60 (mm)	16.400	Starting Level (m)	
Ratio-R	0.247	Check Discharge Rate(s)	✓
Summer CV	0.750	100 year (l/s)	11.9
Winter CV	0.840	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 %)
1	20	10	0
30	20	10	0
100	20	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node S10-1 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(CL) Minimise blockage risk
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	16.673	Product Number	CTL-SCL-0140-1000-0450-1000
Design Depth (m)	0.450	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	10.0	Min Node Diameter (mm)	1200

Node S1-7 Online Orifice Control

Flap Valve	✓	Design Depth (m)	0.450	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	62.8		
Invert Level (m)	17.216	Diameter (m)	0.227		

Node S1-1 Bioretention Area Storage Structure

Underdrain Link Type	Circular	Base Inf Coefficient (m/hr)	0.00001
Underdrain Diameter (mm)	150	Side Inf Coefficient (m/hr)	0.00000
Underdrain Velocity	Colebrook-White	Safety Factor	2.0
Underdrain ks (mm) / n	0.600	Porosity	0.30
Underdrain Length (m)	36.880	Invert Level (m)	18.687
Underdrain Slope (1:X)	500.0	Time to half empty (mins)	0
Underdrain Height above base (m)	0.100	Main Channel Length (m)	36.880
Underdrain DS Node	1	Main Channel Slope (1:X)	500.0
Filter Conductivity (m/hr)	0.10000	Main Channel n	0.032
Filter Depth (m)	0.400		

Inlet Node **Connects To**
S1-0 Storage

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	218.0	0.400	239.4

Node 2 Bioretention Area Storage Structure

Underdrain Link Type	Circular	Base Inf Coefficient (m/hr)	0.00001
Underdrain Diameter (mm)	150	Side Inf Coefficient (m/hr)	0.00000
Underdrain Velocity	Colebrook-White	Safety Factor	2.0
Underdrain ks (mm) / n	0.600	Porosity	0.30
Underdrain Length (m)	38.760	Invert Level (m)	18.405
Underdrain Slope (1:X)	500.0	Time to half empty (mins)	0
Underdrain Height above base (m)	0.100	Main Channel Length (m)	38.760
Underdrain DS Node	S1-4	Main Channel Slope (1:X)	500.0
Filter Conductivity (m/hr)	0.10000	Main Channel n	0.032
Filter Depth (m)	0.400		

Inlet Node **Connects To**
S1-3 Storage

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	317.2	0.400	343.0

Node 3 Bioretention Area Storage Structure

Underdrain Link Type	Circular	Base Inf Coefficient (m/hr)	0.00001
Underdrain Diameter (mm)	150	Side Inf Coefficient (m/hr)	0.00000
Underdrain Velocity	Colebrook-White	Safety Factor	2.0
Underdrain ks (mm) / n	0.600	Porosity	0.30
Underdrain Length (m)	41.000	Invert Level (m)	19.112
Underdrain Slope (1:X)	500.0	Time to half empty (mins)	128
Underdrain Height above base (m)	0.100	Main Channel Length (m)	41.000
Underdrain DS Node	S1-1	Main Channel Slope (1:X)	500.0
Filter Conductivity (m/hr)	0.10000	Main Channel n	0.032
Filter Depth (m)	0.400		

Inlet Node **Connects To**
S2-0 Storage

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	246.4	0.400	269.2

Node S10-1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	16.673
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.43	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	9672.0	9672.0	0.200	9741.9	9770.8	0.350	9794.4	9845.1
0.100	9706.9	9721.4	0.250	9759.4	9795.6	0.400	9812.0	9870.0
0.150	9724.4	9746.1	0.300	9776.9	9820.3	0.450	9829.5	9894.8

Node S1-6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	17.419	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	12	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Node S1-5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	17.748	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	12	Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	6.000		

Results for 1 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	18.387	0.000	0.0	0.0000	0.0000	OK
480 minute winter	S2-0	328	19.332	0.138	7.0	0.0000	0.0000	OK
720 minute winter	2	510	18.769	0.363	6.7	105.8195	0.0000	OK
720 minute winter	2 Filter Layer	495	18.185	0.180	10.3	17.4200	0.0000	OK
60 minute winter	S1-0	40	18.811	0.050	14.5	0.0000	0.0000	OK
480 minute winter	3	328	19.327	0.215	3.6	43.1153	0.0000	OK
480 minute winter	3 Filter Layer	352	18.851	0.139	4.1	10.3739	0.0000	OK
60 minute winter	S1-1	40	18.803	0.116	22.5	17.0866	0.0000	OK
8640 minute summer	S1-1 Filter Layer	4440	18.396	0.109	0.4	7.1269	0.0000	OK
720 minute winter	S1-2	510	18.778	0.162	8.4	0.1834	0.0000	OK
720 minute winter	S1-3	510	18.777	0.294	13.4	0.0000	0.0000	OK
15 minute winter	S1-4	10	18.212	0.107	30.7	0.1210	0.0000	OK
15 minute winter	S1-5	12	18.105	0.357	45.0	3.5584	0.0000	SURCHARGED
15 minute winter	S1-6	13	18.076	0.657	96.1	20.3635	0.0000	SURCHARGED
15 minute winter	S1-7	13	18.062	0.846	99.3	1.4943	0.0000	SURCHARGED
15 minute winter	S10-0	11	17.145	0.167	120.5	0.2942	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)
480 minute winter	S2-0	Bioretention Area	3	3.6	0.038	0.001		
720 minute winter	2	Filtration		8.0				
720 minute winter	2	Underdrain		3.1	0.331	0.401	0.3716	
720 minute winter	2 Filter Layer	Infiltration		0.0				
60 minute winter	S1-0	Bioretention Area	S1-1	11.8	0.039	0.001		
480 minute winter	3	Filtration		3.7				
480 minute winter	3	Underdrain		1.1	0.310	0.144	0.1488	
480 minute winter	3 Filter Layer	Infiltration		0.0				
60 minute winter	S1-1	2.000	S1-2	14.2	0.728	0.494	0.4587	
60 minute winter	S1-1	Filtration		1.7				
60 minute winter	S1-1	Underdrain		0.0	0.000	0.000	0.0054	0.0
8640 minute summer	S1-1 Filter Layer	Infiltration		0.0				
720 minute winter	S1-2	2.001	S1-3	8.2	0.723	0.195	0.4447	
720 minute winter	S1-3	Bioretention Area	2	6.7	0.025	0.000		
15 minute winter	S1-4	1.000	S1-5	17.7	0.971	0.444	1.2617	
15 minute winter	S1-5	1.001	S1-6	34.2	0.922	0.377	2.6783	
15 minute winter	S1-6	1.002	S1-7	60.9	0.881	0.530	1.7449	
15 minute winter	S1-7	1.003	S10-0	85.0	1.205	0.395	8.8052	
15 minute winter	S10-0	1.004	S10-1	119.4	2.163	0.190	0.5090	

Results for 1 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
4320 minute winter	S10-1	3060	16.962	0.289	21.4	1207.4960	0.0000	OK
10080 minute summer	SMH-4601	5760	16.634	0.061	10.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
4320 minute winter	S10-1	1.005	SMH-4601	10.0	0.507	0.028	1.3315	1532.9

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	18.387	0.000	0.2	0.0000	0.0000	OK
360 minute winter	S2-0	256	19.499	0.305	16.6	0.0000	0.0000	OK
600 minute winter	2	435	18.956	0.551	11.1	170.2469	0.0000	OK
15 minute winter	2 Filter Layer	14	18.405	0.400	73.9	28.3771	0.0000	OK
600 minute winter	S1-0	435	18.981	0.220	7.2	0.0000	0.0000	OK
360 minute winter	3	256	19.490	0.378	8.0	85.9530	0.0000	OK
600 minute winter	3 Filter Layer	435	18.943	0.231	8.0	17.5007	0.0000	OK
600 minute winter	S1-1	435	18.976	0.289	12.0	56.5439	0.0000	SURCHARGED
600 minute winter	S1-1 Filter Layer	435	18.434	0.147	5.4	9.7039	0.0000	OK
600 minute winter	S1-2	435	18.972	0.356	13.3	0.4024	0.0000	SURCHARGED
600 minute winter	S1-3	435	18.968	0.485	23.1	0.0000	0.0000	OK
30 minute winter	S1-4	21	19.272	1.167	65.0	1.3197	0.0000	SURCHARGED
30 minute winter	S1-5	21	19.298	1.550	65.3	15.6499	0.0000	SURCHARGED
30 minute winter	S1-6	22	19.285	1.866	128.0	58.3598	0.0000	SURCHARGED
30 minute winter	S1-7	22	19.265	2.049	178.2	3.6213	0.0000	SURCHARGED
5760 minute winter	S10-0	4140	17.260	0.282	68.2	0.4988	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)
360 minute winter	S2-0	Bioretention Area	3	8.0	0.047	0.001		
600 minute winter	2	Filtration		12.1				
600 minute winter	2	Underdrain		5.2	0.388	0.665	0.5175	
15 minute winter	2 Filter Layer	Infiltration		0.0				
600 minute winter	S1-0	Bioretention Area	S1-1	5.3	0.019	0.000		
360 minute winter	3	Filtration		6.5				
360 minute winter	3	Underdrain		2.5	0.295	0.325	0.5636	
600 minute winter	3 Filter Layer	Infiltration		0.0				
600 minute winter	S1-1	2.000	S1-2	10.6	0.653	0.368	0.9133	
600 minute winter	S1-1	Filtration		4.4				
600 minute winter	S1-1	Underdrain		1.6	0.349	0.207	0.1717	28.7
600 minute winter	S1-1 Filter Layer	Infiltration		0.0				
600 minute winter	S1-2	2.001	S1-3	13.0	0.733	0.307	0.5023	
600 minute winter	S1-3	Bioretention Area	2	11.1	0.037	0.000		
30 minute winter	S1-4	1.000	S1-5	28.1	1.043	0.705	1.8918	
30 minute winter	S1-5	1.001	S1-6	43.6	0.996	0.481	2.6783	
30 minute winter	S1-6	1.002	S1-7	87.4	0.879	0.760	1.7449	
30 minute winter	S1-7	1.003	S10-0	142.4	1.377	0.661	13.1932	
5760 minute winter	S10-0	1.004	S10-1	84.4	1.219	0.134	1.4151	

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute winter	S10-1	4260	17.254	0.581	90.8	2438.8190	0.0000	OK
5760 minute winter	SMH-4601	4260	16.635	0.062	10.5	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)
5760 minute winter	S10-1	1.005	SMH-4601	10.5	0.516	0.029	1.3741	2420.9

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	18.387	0.000	0.3	0.0000	0.0000	OK
360 minute winter	S2-0	256	19.586	0.392	21.0	0.0000	0.0000	OK
600 minute winter	2	435	19.050	0.645	12.0	202.6215	0.0000	OK
15 minute summer	2 Filter Layer	13	18.405	0.400	88.9	33.0070	0.0000	OK
600 minute winter	S1-0	435	19.080	0.319	9.0	0.0000	0.0000	OK
360 minute winter	3	256	19.576	0.463	10.0	108.8400	0.0000	OK
600 minute winter	3 Filter Layer	435	19.048	0.336	10.0	25.3008	0.0000	OK
600 minute winter	S1-1	435	19.074	0.387	12.6	79.7255	0.0000	SURCHARGED
600 minute winter	S1-1 Filter Layer	435	18.444	0.157	7.7	10.4526	0.0000	OK
600 minute winter	S1-2	435	19.069	0.453	12.8	0.5118	0.0000	SURCHARGED
600 minute winter	S1-3	435	19.063	0.581	24.5	0.0000	0.0000	OK
30 minute winter	S1-4	22	20.112	2.007	80.6	2.2699	0.0000	SURCHARGED
30 minute winter	S1-5	22	20.140	2.392	62.0	24.1844	0.0000	FLOOD RISK
30 minute winter	S1-6	22	20.130	2.711	161.1	84.9193	0.0000	SURCHARGED
30 minute winter	S1-7	22	20.107	2.891	232.4	5.1091	0.0000	SURCHARGED
5760 minute winter	S10-0	4260	17.385	0.407	61.1	0.7200	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)
360 minute winter	S2-0	Bioretention Area	3	10.0	0.053	0.001		
600 minute winter	2	Filtration		14.2				
600 minute winter	2	Underdrain		6.3	0.408	0.802	0.5942	
15 minute summer	2 Filter Layer	Infiltration		0.0				
600 minute winter	S1-0	Bioretention Area	S1-1	5.1	0.020	0.000		
360 minute winter	3	Filtration		7.9				
360 minute winter	3	Underdrain		3.3	0.275	0.420	0.7218	
600 minute winter	3 Filter Layer	Infiltration		0.0				
600 minute winter	S1-1	2.000	S1-2	10.1	0.657	0.352	0.9133	
600 minute winter	S1-1	Filtration		5.8				
600 minute winter	S1-1	Underdrain		2.4	0.382	0.302	0.2287	48.9
600 minute winter	S1-1 Filter Layer	Infiltration		0.0				
600 minute winter	S1-2	2.001	S1-3	12.6	0.736	0.297	0.5023	
600 minute winter	S1-3	Bioretention Area	2	12.0	0.036	0.000		
30 minute winter	S1-4	1.000	S1-5	29.8	1.051	0.748	1.8918	
30 minute winter	S1-5	1.001	S1-6	44.6	1.018	0.493	2.6783	
30 minute winter	S1-6	1.002	S1-7	114.2	1.036	0.994	1.7449	
30 minute winter	S1-7	1.003	S10-0	172.0	1.439	0.799	15.3441	
5760 minute winter	S10-0	1.004	S10-1	65.1	1.211	0.103	1.8234	

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute winter	S10-1	4320	17.381	0.708	76.2	2978.3550	0.0000	SURCHARGED
5760 minute winter	SMH-4601	4320	16.638	0.065	11.6	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)
5760 minute winter	S10-1	1.005	SMH-4601	11.6	0.535	0.032	1.4709	2698.6

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Inverts
M5-60 (mm)	16.400	Minimum Backdrop Height (m)	0.000
Ratio-R	0.247	Preferred Cover Depth (m)	0.000
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Hockey Pitch	0.829	5.00	33.609	1200	527078.844	725235.538	1.859
S5-1			33.237	1200	527030.611	725209.547	3.437
Basketball	0.033	5.00	31.243	1200	527020.988	725215.395	1.556
S5-3			30.184	1200	527009.124	725221.596	0.884
S1-3			31.154	1200	527003.063	725335.490	1.474
S1-4			30.700	1200	527001.037	725329.898	1.060
Soccer Pitch	1.145	5.00	30.172	1200	526985.341	725284.452	1.470
S1-6			29.867	1200	526947.383	725246.487	1.433
Outfall			30.050	1200	526936.499	725246.620	1.689

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1-1		5.00	31.676	1200	527053.836	725411.228	1.076
Car Park 1	0.038	5.00	31.619	1200	527040.934	725398.099	1.341
S1-2	0.145		31.057	1200	527000.117	725348.416	1.347
S3-0		5.00	32.150	1200	527068.760	725316.445	1.977
Car Park 3	0.047	5.00	31.090	1200	527028.949	725337.386	1.217
Car Park 2	0.067	5.00	31.341	1200	527031.778	725363.484	1.201
S2-1			31.157	1200	527020.610	725342.836	1.350
S4-0	0.080		31.306	1200	527035.356	725322.079	1.536
S1-0	0.035		32.427	1200	527062.278	725422.712	1.771
D1			31.209	1200	527002.670	725337.667	1.879
D2			31.233	1200	527005.401	725336.288	1.903

Links (Results)

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S5.000	1.572	111.1	100.7	1.559	1.735	0.829	0.0	225	1.771
S5.001	1.572	111.1	99.9	3.137	1.256	0.829	0.0	224	1.770
S5.002	1.573	111.2	103.0	1.256	0.331	0.862	0.0	229	1.776
S5.003	1.477	163.1	98.2	0.509	0.945	0.862	0.0	210	1.541
S3.000	0.818	14.5	0.0	1.827	1.067	0.000	0.0	0	0.000
S3.001	0.817	14.4	5.5	1.067	1.200	0.047	0.0	64	0.762
S2.000	0.818	14.5	8.2	1.051	1.023	0.067	0.0	81	0.844
S2.001	0.818	14.5	13.1	1.200	1.324	0.114	0.0	112	0.925
S2.003	1.069	42.5	13.0	1.249	0.835	0.114	0.0	85	0.940
S1.004	1.648	116.5	12.6	0.760	0.760	0.114	0.0	67	1.092
S1.005	1.433	227.8	227.0	1.020	0.983	2.121	0.0	370	1.621
S1.006	1.662	264.4	225.6	0.983	1.239	2.121	0.0	321	1.857
S1.000	0.818	14.5	0.0	0.926	0.992	0.000	0.0	0	0.000
S1.001	0.818	14.5	4.3	0.992	0.859	0.038	0.0	56	0.714

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S5.000	54.790	100.0	300	Circular	33.609	31.750	1.559	33.237	31.202	1.735
S5.001	11.261	100.0	300	Circular	33.237	29.800	3.137	31.243	29.687	1.256
S5.002	13.387	99.9	300	Circular	31.243	29.687	1.256	30.184	29.553	0.331
S5.003	67.205	150.0	375	Circular	30.184	29.300	0.509	30.172	28.852	0.945
S3.000	44.983	150.0	150	Circular	32.150	30.173	1.827	31.090	29.873	1.067
S3.001	9.962	150.3	150	Circular	31.090	29.873	1.067	31.157	29.807	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S5.000	Hockey Pitch	1200	Manhole	Adoptable	S5-1	1200	Manhole	Adoptable
S5.001	S5-1	1200	Manhole	Adoptable	Basketball	1200	Manhole	Adoptable
S5.002	Basketball	1200	Manhole	Adoptable	S5-3	1200	Manhole	Adoptable
S5.003	S5-3	1200	Manhole	Adoptable	Soccer Pitch	1200	Manhole	Adoptable
S3.000	S3-0	1200	Manhole	Adoptable	Car Park 3	1200	Manhole	Adoptable
S3.001	Car Park 3	1200	Manhole	Adoptable	S2-1	1200	Manhole	Adoptable

Pipeline Schedule

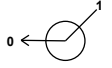
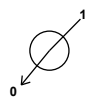
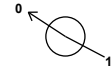
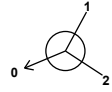
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S2.000	23.475	150.0	150	Circular	31.341	30.140	1.051	31.157	29.984	1.023
S2.001	19.023	150.0	150	Circular	31.157	29.807	1.200	31.154	29.680	1.324
S2.003	5.948	148.8	225	Circular	31.154	29.680	1.249	30.700	29.640	0.835
S1.004	48.080	91.1	300	Circular	30.700	29.640	0.760	30.172	29.112	0.760
S1.005	53.686	200.3	450	Circular	30.172	28.702	1.020	29.867	28.434	0.983
S1.006	10.885	149.1	450	Circular	29.867	28.434	0.983	30.050	28.361	1.239
S1.000	18.407	150.0	150	Circular	31.676	30.600	0.926	31.619	30.477	0.992
S1.001	64.300	149.9	150	Circular	31.619	30.477	0.992	31.057	30.048	0.859

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S2.000	Car Park 2	1200	Manhole	Adoptable	S2-1	1200	Manhole	Adoptable
S2.001	S2-1	1200	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable
S2.003	S1-3	1200	Manhole	Adoptable	S1-4	1200	Manhole	Adoptable
S1.004	S1-4	1200	Manhole	Adoptable	Soccer Pitch	1200	Manhole	Adoptable
S1.005	Soccer Pitch	1200	Manhole	Adoptable	S1-6	1200	Manhole	Adoptable
S1.006	S1-6	1200	Manhole	Adoptable	Outfall	1200	Manhole	Adoptable
S1.000	S1-1	1200	Manhole	Adoptable	Car Park 1	1200	Manhole	Adoptable
S1.001	Car Park 1	1200	Manhole	Adoptable	S1-2	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
Hockey Pitch	527078.844	725235.538	33.609	1.859	1200		0	S5.000	31.750	300
S5-1	527030.611	725209.547	33.237	3.437	1200		1	S5.000	31.202	300
							0	S5.001	29.800	300
Basketball	527020.988	725215.395	31.243	1.556	1200		1	S5.001	29.687	300
							0	S5.002	29.687	300
S5-3	527009.124	725221.596	30.184	0.884	1200		1	S5.002	29.553	300
							0	S5.003	29.300	375
S1-3	527003.063	725335.490	31.154	1.474	1200		1	S2.001	29.680	150
							0	S2.003	29.680	225
S1-4	527001.037	725329.898	30.700	1.060	1200		1	S2.003	29.640	225
							0	S1.004	29.640	300
Soccer Pitch	526985.341	725284.452	30.172	1.470	1200		1	S1.004	29.112	300
							2	S5.003	28.852	375
							0	S1.005	28.702	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1-6	526947.383	725246.487	29.867	1.433	1200	 1	S1.005	28.434	450
						0	S1.006	28.434	450
Outfall	526936.499	725246.620	30.050	1.689	1200	 1	S1.006	28.361	450
S1-1	527053.836	725411.228	31.676	1.076	1200	 0	S1.000	30.600	150
Car Park 1	527040.934	725398.099	31.619	1.341	1200	 1	S1.000	30.477	150
						0	S1.001	30.477	150
S1-2	527000.117	725348.416	31.057	1.347	1200	 1	S1.001	30.048	150
S3-0	527068.760	725316.445	32.150	1.977	1200	 0	S3.000	30.173	150
Car Park 3	527028.949	725337.386	31.090	1.217	1200	 1	S3.000	29.873	150
						0	S3.001	29.873	150
Car Park 2	527031.778	725363.484	31.341	1.201	1200	 0	S2.000	30.140	150
S2-1	527020.610	725342.836	31.157	1.350	1200	 1	S2.000	29.984	150
						2	S3.001	29.807	150
						0	S2.001	29.807	150
S4-0	527035.356	725322.079	31.306	1.536	1200				
S1-0	527062.278	725422.712	32.427	1.771	1200				
D1	527002.670	725337.667	31.209	1.879	1200				
D2	527005.401	725336.288	31.233	1.903	1200				

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m ³ /ha)	20.0
M5-60 (mm)	16.400	Starting Level (m)	
Ratio-R	0.247	Check Discharge Rate(s)	✓
Summer CV	0.750	100 year (l/s)	2.4
Winter CV	0.840	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 %)
1	20	10	0
30	20	10	0
100	20	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	1
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 100 year (l/s)	
SPR	0.10		

Node Outfall Online Hydro-Brake® Control

Flap Valve	✓	Objective	(CL) Minimise blockage risk
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	28.361	Product Number	CTL-SCL-0067-2400-1278-2400
Design Depth (m)	1.278	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.4	Min Node Diameter (mm)	1200

Node Soccer Pitch Online Hydro-Brake® Control

Flap Valve	✓	Objective	(CL) Minimise blockage risk
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	28.702	Product Number	CTL-SCL-0054-2500-3400-2500
Design Depth (m)	3.400	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node Basketball Online Hydro-Brake® Control

Flap Valve	✓	Objective	(CL) Minimise blockage risk
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	29.687	Product Number	CTL-SCL-0054-2500-3400-2500
Design Depth (m)	3.400	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node Hockey Pitch Online Hydro-Brake® Control

Flap Valve	✓	Objective	(CL) Minimise blockage risk
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	31.750	Product Number	CTL-SCL-0054-2500-3400-2500
Design Depth (m)	3.400	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node S5-1 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(CL) Minimise blockage risk
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	29.800	Product Number	CTL-SCL-0064-2500-1700-2500
Design Depth (m)	1.700	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node Car Park 1 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(CL) Minimise blockage risk
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	30.477	Product Number	CTL-SCL-0054-2500-3400-2500
Design Depth (m)	3.400	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node S1-3 Bioretention Area Storage Structure

Underdrain Link Type	Circular	Base Inf Coefficient (m/hr)	0.00001
Underdrain Diameter (mm)	150	Side Inf Coefficient (m/hr)	0.00000
Underdrain Velocity	Colebrook-White	Safety Factor	2.0
Underdrain ks (mm) / n	0.600	Porosity	0.40
Underdrain Length (m)	15.000	Invert Level (m)	29.680
Underdrain Slope (1:X)	500.0	Time to half empty (mins)	0
Underdrain Height above base (m)	0.100	Main Channel Length (m)	15.000
Underdrain DS Node	D1	Main Channel Slope (1:X)	500.0
Filter Conductivity (m/hr)	0.10000	Main Channel n	0.032
Filter Depth (m)	0.450		

Inlet Node **Connects To**
S1-2 Storage

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	444.3	0.500	482.4

Node S1-1 Bioretention Area Storage Structure

Underdrain Link Type	Circular	Base Inf Coefficient (m/hr)	0.00010
Underdrain Diameter (mm)	150	Side Inf Coefficient (m/hr)	0.00000
Underdrain Velocity	Colebrook-White	Safety Factor	2.0
Underdrain ks (mm) / n	0.600	Porosity	0.40
Underdrain Length (m)	14.000	Invert Level (m)	30.628
Underdrain Slope (1:X)	500.0	Time to half empty (mins)	0
Underdrain Height above base (m)	0.100	Main Channel Length (m)	14.000
Underdrain DS Node	Car Park 1	Main Channel Slope (1:X)	500.0
Filter Conductivity (m/hr)	0.20000	Main Channel n	0.032
Filter Depth (m)	0.450		

Inlet Node
S1-0

Connects To
Storage

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	250.3	0.500	279.1

Node S1-3 Bioretention Area Storage Structure

Underdrain Link Type	Circular	Base Inf Coefficient (m/hr)	0.00001
Underdrain Diameter (mm)	150	Side Inf Coefficient (m/hr)	0.00000
Underdrain Velocity	Colebrook-White	Safety Factor	2.0
Underdrain ks (mm) / n	0.600	Porosity	0.40
Underdrain Length (m)	45.000	Invert Level (m)	29.680
Underdrain Slope (1:X)	500.0	Time to half empty (mins)	0
Underdrain Height above base (m)	0.100	Main Channel Length (m)	45.000
Underdrain DS Node	D2	Main Channel Slope (1:X)	500.0
Filter Conductivity (m/hr)	0.10000	Main Channel n	0.032
Filter Depth (m)	0.450		

Inlet Node
S4-0

Connects To
Storage

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	254.8	0.500	283.9

Node Soccer Pitch Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	28.702
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	7000.0	7000.0	0.500	7000.0	7148.3	0.501	7000.0	7148.6

Node Hockey Pitch Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	31.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	6000.0	6000.0	0.250	6000.0	6068.6	0.251	6000.0	6068.9

Node Basketball Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.687
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	260.0	260.0	0.250	260.0	274.3	0.251	0.0	274.3

Node Car Park 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	30.477
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	115.0	115.0	0.250	115.0	124.5	0.251	0.0	124.5

Node Car Park 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	30.140
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	180.0	180.0	0.250	180.0	191.9	0.251	0.0	191.9

Node Car Park 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.873
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	9

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	60.0	60.0	0.250	60.0	66.9	0.251	0.0	66.9

Results for 1 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
8640 minute winter	Hockey Pitch	6120	31.928	0.178	3.7	429.2420	0.0000	OK
10080 minute winter	S5-1	7080	29.975	0.175	1.3	0.1977	0.0000	OK
10080 minute winter	Basketball	7080	29.904	0.217	1.4	22.9031	0.0000	OK
10080 minute winter	S5-3	7080	29.324	0.024	1.3	0.0272	0.0000	OK
180 minute winter	S1-3	124	29.745	0.065	10.8	30.7896	0.0000	OK
10080 minute winter	S1-3 Filter Layer	9840	29.316	0.086	0.3	15.2054	0.0000	OK
10080 minute winter	S1-3 Filter Layer	9420	29.334	0.104	0.2	10.5965	0.0000	OK
180 minute winter	S1-4	124	29.690	0.050	7.1	0.0569	0.0000	OK
10080 minute winter	Soccer Pitch	10320	29.147	0.445	6.7	1254.6120	0.0000	OK
5760 minute summer	S1-6	3480	28.457	0.023	1.3	0.0259	0.0000	OK
10080 minute summer	Outfall	5520	28.429	0.068	1.3	0.0764	0.0000	OK
30 minute winter	S1-1	25	30.637	0.037	3.5	1.7551	0.0000	OK
7200 minute winter	S1-1 Filter Layer	4200	30.502	0.324	0.5	32.6312	0.0000	OK
7200 minute winter	Car Park 1	4200	30.516	0.238	0.4	2.2573	0.0000	OK
180 minute winter	S1-2	120	29.749	0.039	6.6	0.0000	0.0000	OK
15 minute summer	S3-0	1	30.173	0.000	0.0	0.0000	0.0000	OK
30 minute summer	Car Park 3	20	29.930	0.057	6.2	1.4843	0.0000	OK
60 minute winter	Car Park 2	40	30.193	0.053	5.8	3.9444	0.0000	OK
30 minute winter	S2-1	21	29.891	0.084	7.7	0.0953	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)
8640 minute winter	Hockey Pitch	S5.000	S5-1	1.3	0.534	0.012	0.1329	
10080 minute winter	S5-1	S5.001	Basketball	1.3	0.162	0.012	0.4289	
10080 minute winter	Basketball	S5.002	S5-3	1.3	0.533	0.012	0.0332	
10080 minute winter	S5-3	S5.003	Soccer Pitch	1.3	0.427	0.008	3.2221	
180 minute winter	S1-3	S2.003	S1-4	7.1	0.878	0.166	0.0480	
180 minute winter	S1-3	Filtration		1.8				
180 minute winter	S1-3	Underdrain		0.0	0.000	0.000	0.0003	0.0
10080 minute winter	S1-3 Filter Layer	Infiltration		0.0				
180 minute winter	S1-3	Filtration		1.0				
180 minute winter	S1-3	Underdrain		0.0	0.000	0.000	0.0008	0.0
10080 minute winter	S1-3 Filter Layer	Infiltration		0.0				
180 minute winter	S1-4	S1.004	Soccer Pitch	7.1	0.917	0.061	0.3702	
10080 minute winter	Soccer Pitch	S1.005	S1-6	1.3	0.413	0.006	0.1720	
5760 minute summer	S1-6	S1.006	Outfall	1.3	0.166	0.005	0.0972	
10080 minute summer	Outfall	Hydro-Brake®		1.3				526.1
30 minute winter	S1-1	S1.000	Car Park 1	1.9	0.566	0.133	0.0624	
30 minute winter	S1-1	Filtration		0.3				
30 minute winter	S1-1	Underdrain		0.0	-0.024	-0.004	0.0198	
7200 minute winter	S1-1 Filter Layer	Infiltration		0.0				
7200 minute winter	Car Park 1	S1.001	S1-2	0.3	0.316	0.018	0.0530	
180 minute winter	S1-2	Bioretention Area	S1-3	4.4	0.014	0.000		
15 minute summer	S3-0	S3.000	Car Park 3	0.0	0.000	0.000	0.1243	
30 minute summer	Car Park 3	S3.001	S2-1	4.4	0.553	0.306	0.0797	
60 minute winter	Car Park 2	S2.000	S2-1	3.7	0.682	0.259	0.1287	
30 minute winter	S2-1	S2.001	S1-3	7.7	1.166	0.535	0.1340	

Results for 1 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S4-0	12	29.795	0.025	11.6	0.0000	0.0000	OK
30 minute summer	S1-0	19	30.664	0.008	4.6	0.0000	0.0000	OK
15 minute summer	D1	1	29.330	0.000	0.0	0.0000	0.0000	OK
15 minute summer	D2	1	29.330	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S4-0	Bioretention Area	S1-3	9.0	0.096	0.001		
30 minute summer	S1-0	Bioretention Area	S1-1	3.5	0.037	0.000		

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute winter	Hockey Pitch	7680	32.090	0.340	5.5	820.4854	0.0000	SURCHARGED
4320 minute winter	S5-1	2760	30.917	1.117	1.3	1.2635	0.0000	SURCHARGED
4320 minute winter	Basketball	2760	30.845	1.158	1.7	27.9064	0.0000	SURCHARGED
10080 minute winter	S5-3	10320	29.481	0.181	1.5	0.2048	0.0000	OK
120 minute winter	S1-3	84	29.791	0.111	28.5	58.8567	0.0000	OK
1440 minute winter	S1-3 Filter Layer	1050	29.346	0.116	1.3	20.5890	0.0000	OK
10080 minute winter	S1-3 Filter Layer	6240	29.337	0.107	0.3	10.8627	0.0000	OK
120 minute winter	S1-4	84	29.723	0.083	18.9	0.0935	0.0000	OK
10080 minute winter	Soccer Pitch	10320	29.481	0.779	10.8	2195.4750	0.0000	SURCHARGED
480 minute summer	S1-6	448	28.457	0.023	1.3	0.0259	0.0000	OK
480 minute summer	Outfall	448	28.429	0.068	1.3	0.0764	0.0000	OK
30 minute winter	S1-1	25	30.655	0.055	8.5	4.1035	0.0000	OK
1440 minute winter	S1-1 Filter Layer	990	30.547	0.369	3.1	37.0908	0.0000	OK
1440 minute winter	Car Park 1	990	30.561	0.283	1.7	4.3817	0.0000	OK
120 minute winter	S1-2	82	29.798	0.088	17.9	0.0000	0.0000	OK
15 minute summer	S3-0	1	30.173	0.000	0.0	0.0000	0.0000	OK
30 minute winter	Car Park 3	23	29.996	0.123	12.4	3.2079	0.0000	OK
30 minute winter	Car Park 2	22	30.236	0.096	17.8	7.1170	0.0000	OK
30 minute winter	S2-1	23	29.984	0.177	16.2	0.2007	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute winter	Hockey Pitch	S5.000	S5-1	1.3	0.537	0.012	0.1350	
4320 minute winter	S5-1	S5.001	Basketball	1.4	0.117	0.012	0.7930	
4320 minute winter	Basketball	S5.002	S5-3	1.5	0.557	0.014	0.0366	
10080 minute winter	S5-3	S5.003	Soccer Pitch	1.5	0.425	0.009	5.4754	
120 minute winter	S1-3	S2.003	S1-4	18.9	1.158	0.443	0.0970	
120 minute winter	S1-3	Filtration		3.0				
120 minute winter	S1-3	Underdrain		0.0	0.000	0.000	0.0032	0.0
1440 minute winter	S1-3 Filter Layer	Infiltration		0.0				
120 minute winter	S1-3	Filtration		1.7				
120 minute winter	S1-3	Underdrain		0.0	0.000	0.000	0.0061	0.0
10080 minute winter	S1-3 Filter Layer	Infiltration		0.0				
120 minute winter	S1-4	S1.004	Soccer Pitch	18.9	1.215	0.162	0.7465	
10080 minute winter	Soccer Pitch	S1.005	S1-6	1.3	0.413	0.006	0.1720	
480 minute summer	S1-6	S1.006	Outfall	1.3	0.169	0.005	0.0972	
480 minute summer	Outfall	Hydro-Brake®		1.3				40.6
30 minute winter	S1-1	S1.000	Car Park 1	3.9	0.691	0.273	0.1053	
30 minute winter	S1-1	Filtration		0.8				
30 minute winter	S1-1	Underdrain		-3.4	-0.354	-0.431	0.1329	
1440 minute winter	S1-1 Filter Layer	Infiltration		0.0				
1440 minute winter	Car Park 1	S1.001	S1-2	0.8	0.449	0.058	0.1205	
120 minute winter	S1-2	Bioretention Area	S1-3	8.3	0.035	0.000		
15 minute summer	S3-0	S3.000	Car Park 3	0.0	0.000	0.000	0.2799	
30 minute winter	Car Park 3	S3.001	S2-1	8.6	0.611	0.595	0.1650	
30 minute winter	Car Park 2	S2.000	S2-1	10.1	0.869	0.695	0.2715	
30 minute winter	S2-1	S2.001	S1-3	16.1	1.286	1.117	0.2758	

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S4-0	11	29.812	0.042	25.7	0.0000	0.0000	OK
15 minute winter	S1-0	11	30.671	0.015	11.1	0.0000	0.0000	OK
15 minute summer	D1	1	29.330	0.000	0.0	0.0000	0.0000	OK
15 minute summer	D2	1	29.330	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S4-0	Bioretention Area	S1-3	21.4	0.125	0.002		
15 minute winter	S1-0	Bioretention Area	S1-1	9.4	0.054	0.000		

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
8640 minute winter	Hockey Pitch	7920	32.171	0.421	7.2	1015.8440	0.0000	SURCHARGED
2880 minute winter	S5-1	1860	31.148	1.348	1.3	1.5243	0.0000	SURCHARGED
2880 minute winter	Basketball	1860	31.077	1.390	1.9	28.2788	0.0000	FLOOD RISK
10080 minute winter	S5-3	10080	29.615	0.315	1.6	0.3568	0.0000	OK
120 minute winter	S1-3	84	29.811	0.131	36.7	73.3929	0.0000	OK
1440 minute winter	S1-3 Filter Layer	960	29.352	0.122	1.6	21.7146	0.0000	OK
10080 minute winter	S1-3 Filter Layer	6000	29.337	0.107	0.3	10.9285	0.0000	OK
120 minute winter	S1-4	84	29.736	0.096	25.2	0.1089	0.0000	OK
10080 minute winter	Soccer Pitch	10080	29.615	0.913	12.6	2574.3810	0.0000	SURCHARGED
10080 minute winter	S1-6	10080	28.457	0.023	1.4	0.0263	0.0000	OK
10080 minute winter	Outfall	10080	28.431	0.070	1.4	0.0787	0.0000	OK
30 minute winter	S1-1	24	30.663	0.063	11.3	5.2722	0.0000	OK
1440 minute winter	S1-1 Filter Layer	960	30.582	0.404	2.8	40.5477	0.0000	OK
1440 minute winter	Car Park 1	960	30.596	0.318	3.3	6.0307	0.0000	OK
120 minute winter	S1-2	82	29.819	0.109	23.1	0.0000	0.0000	OK
15 minute summer	S3-0	1	30.173	0.000	0.0	0.0000	0.0000	OK
30 minute winter	Car Park 3	24	30.076	0.203	16.2	5.2634	0.0000	SURCHARGED
30 minute winter	Car Park 2	22	30.260	0.120	23.2	8.8881	0.0000	OK
30 minute winter	S2-1	24	30.059	0.252	19.1	0.2854	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
8640 minute winter	Hockey Pitch	S5.000	S5-1	1.3	0.537	0.012	0.1350	
2880 minute winter	S5-1	S5.001	Basketball	1.4	0.118	0.012	0.7930	
2880 minute winter	Basketball	S5.002	S5-3	1.7	0.572	0.015	0.0387	
10080 minute winter	S5-3	S5.003	Soccer Pitch	1.6	0.424	0.010	7.0323	
120 minute winter	S1-3	S2.003	S1-4	25.2	1.255	0.592	0.1193	
120 minute winter	S1-3	Filtration		3.6				
120 minute winter	S1-3	Underdrain		0.0	0.000	0.000	0.0051	0.0
1440 minute winter	S1-3 Filter Layer	Infiltration		0.0				
120 minute winter	S1-3	Filtration		2.0				
120 minute winter	S1-3	Underdrain		0.0	0.000	0.000	0.0099	0.0
10080 minute winter	S1-3 Filter Layer	Infiltration		0.0				
120 minute winter	S1-4	S1.004	Soccer Pitch	25.2	1.315	0.216	0.9208	
10080 minute winter	Soccer Pitch	S1.005	S1-6	1.4	0.417	0.006	0.1758	
10080 minute winter	S1-6	S1.006	Outfall	1.4	0.166	0.005	0.1010	
10080 minute winter	Outfall	Hydro-Brake®		1.4				628.1
30 minute winter	S1-1	S1.000	Car Park 1	5.1	0.738	0.353	0.1271	
30 minute winter	S1-1	Filtration		1.1				
30 minute winter	S1-1	Underdrain		-5.9	-0.460	-0.760	0.1744	
1440 minute winter	S1-1 Filter Layer	Infiltration		0.0				
1440 minute winter	Car Park 1	S1.001	S1-2	1.2	0.494	0.080	0.1510	
120 minute winter	S1-2	Bioretention Area	S1-3	12.1	0.038	0.000		
15 minute summer	S3-0	S3.000	Car Park 3	0.0	0.000	0.000	0.3937	
30 minute winter	Car Park 3	S3.001	S2-1	8.8	0.618	0.613	0.1754	
30 minute winter	Car Park 2	S2.000	S2-1	13.2	0.928	0.915	0.3340	
30 minute winter	S2-1	S2.001	S1-3	19.1	1.293	1.322	0.3054	

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S4-0	11	29.820	0.050	33.2	0.0000	0.0000	OK
15 minute winter	S1-0	11	30.674	0.018	14.4	0.0000	0.0000	OK
15 minute summer	D1	1	29.330	0.000	0.0	0.0000	0.0000	OK
15 minute summer	D2	1	29.330	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S4-0	Bioretention Area	S1-3	28.1	0.136	0.003		
15 minute winter	S1-0	Bioretention Area	S1-1	12.5	0.057	0.000		

Appendix C Uisce Éireann Consultation

CONFIRMATION OF FEASIBILITY

Matthew Greene

Punch Consulting Engineer
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Oranmore
Co. Galway
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Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

16 October 2025

Our Ref: CDS25006216 Pre-Connection Enquiry
Miller's lane, Ragoon, Galway

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Business Connection of 1 unit(s) at Miller's lane, Ragoon, Galway, Galway, (the **Development**).

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Uisce Éireann
- **Wastewater Connection** - Feasible without infrastructure upgrade by Uisce Éireann

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Stiúthóirí / Directors: Niall Gleeson (POF / CEO), Jerry Grant (Cathaoirleach / Chairperson), Gerard Britchfield, Liz Joyce, Michael Nolan, Patricia King, Eileen Maher, Cathy Mannion, Paul Reid, Michael Walsh.

Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin, Ireland D01NP86

Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Uisce Éireann is a designated activity company, limited by shares.

Cláraithe in Éirinn Uimh.: 530363 / Registered in Ireland No.: 530363.

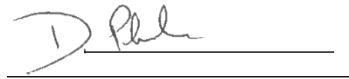
Where can you find more information?

- **Section A** - What is important to know?

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit www.water.ie/connections, email newconnections@water.ie or contact 1800 278 278.

Yours sincerely,

A handwritten signature in dark ink, appearing to read 'D. Phelan', is written over a horizontal line. Below this line is another horizontal line, creating a space for a printed name.

Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application <u>and be granted and sign</u> a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • What to do? - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • What to do? - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with <i>the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice</i>, available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Appendix D SuDS Strategy & Maintenance Plan

Kingston Park and Miller's Lane

SuDS Maintenance Strategy

233114-PUNCH-XX-XX-RP-C-000XX

October 2025

Document Control

Document Number: 233114-PUNCH-XX-XX-RP-C-00XX

Revision	Description	Date	Prepared	Checked	Approved
P0	Draft Issue	October 2025	D. Madden	M. Ncube	M. Greene

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1 Introduction

PUNCH Consulting Engineers were commissioned by the client, Galway City Council, to provide civil and structural engineering consultancy services for a proposed Kingston Park and Miller's Lane developments which are currently at planning stage.

This document sets out the maintenance requirements for the different SuDS devices proposed as part of the surface water management strategy for the new developments.

2 Rainwater Harvesting

The maintenance requirements for the rainwater harvesting system are laid out in Table 2-1 below.

Table 2-1 Rainwater Harvesting Operational & Maintenance Requirements

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspection of the tank for debris and sediment build-up, inlets / outlets / withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional Maintenance	Cleaning and/or replacement of any filters	Quarterly (or as required)
Remedial Actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

3 Green Roofs

Extensive green roofs, such as that proposed for the Kingston Park development, should normally only require biannual or annual visits to remove litter, check fire breaks and drains and, in some cases, remove unwanted invasive plants. The most maintenance is generally required during the establishment stage (12 to 15 months), and this should usually be made the responsibility of the green roof provider. Maintenance contractors with specialist training in green roof care should be used, where possible.

Table 3-1 provides guidance on the type of operational and maintenance requirements that may be appropriate for green roofs. The list of actions is not exhaustive, and some actions may not always be required. Actual requirements will depend on the planting, the desired aesthetic and visual effect and the biodiversity objectives for the system.

Table 3-1 Operation and Maintenance of Green Roofs

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (i.e., year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (If appropriate) as required -	Six monthly or as required

	clippings should be removed and not allowed to accumulate	
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate like the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked, or moved, investigate and repair as appropriate	As required

4 Porous Asphalt

Regular inspection and maintenance are important for the effective operation of porous asphalt pavements. Porous asphalt pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Extensive experience suggests that sweeping once per year should be sufficient to maintain an acceptable infiltration rate on most sites. However, in some instances, more or less sweeping may be required and the frequency should be adjusted to suit site-specific circumstances and should be informed by inspection reports.

A brush and suction cleaner (which can be a lorry-mounted device or a smaller precinct sweeper) should be used for regular sweeping. It is also possible to clean the surface using lightweight rotating brush cleaners combined with power spraying using hot water.

If the surface has clogged then a more specialist sweeper with water jetting and oscillating and rotating brushes may be required for porous asphalt surfaces, to restore the surface infiltration rate to an acceptable level. The specialist equipment should be adjusted so that it does not strip binder from the aggregate in the asphalt. Porous asphalt will lose strength and begin to fatigue due to oxidation of the binder. This is likely to occur slightly faster in porous asphalt than normal asphalt, so the design life will be reduced slightly.

Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Table 4-1 provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive, and some actions may not always be required.

Table 4-1 - Porous Asphalt Maintenance & Operation

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required

	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action	Three-monthly, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Many of the specific maintenance activities for porous asphalt can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. There is also less risk of ice formation after snow melt, as the melt water drains directly into the underlying sub-base and does not have chance to refreeze. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours. It does not happen in all installations and, if necessary, this can be dealt with by application of salt. It is not likely to pose a hazard to vehicle movements.

5 Rain Gardens, Bio Retention Areas and Tree Pits

Bioretention systems will require regular maintenance to ensure continuing operation to design performance standards. The treatment performance of bioretention systems is dependent on maintenance, and robust management plans will be required to ensure that maintenance is carried out in the long term. Different designs will have different operation and maintenance requirements. Ease of access for maintenance and inspection is essential.

The main cause of failure of bioretention systems is clogging of the surface, which is easily visible. Underdrains and drainage layers are beneath the ground, and malfunctioning is not so easy to detect and therefore could potentially be ignored. However, the results of any malfunction are likely to cause surface ponding.

Table 5-1 provides guidance on the type of operation and maintenance schedule that may be appropriate. The list of actions is not exhaustive, and some actions may not always be required.

Table 5-1 Bioretention Systems Operation and Maintenance

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular Maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional Maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

6 Attenuation Systems

Regular inspection and maintenance are required to ensure the effective long-term operation of below-ground storage systems. Maintenance responsibility for systems should be placed with a responsible organisation. Table 6-1 provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive, and some actions may not always be required. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Table 6-1 Attenuation Storage Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae, or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

7 Bypass Interceptors

Proprietary treatment systems will require routine maintenance to ensure continuing operation to design performance standards. Because of the wide range of different designs and performance, all manufacturers should provide detailed specifications and frequencies for the required maintenance activities along with likely machinery requirements and typical annual costs for any given site. The treatment performance of proprietary systems is strongly dependent on maintenance, and robust management plans will be required to ensure that maintenance is carried out in the long term.

Table 7-1 provides guidance on the type of operation and maintenance schedule that may be appropriate for a proprietary treatment system. The list of actions is not exhaustive, and some actions may not always be required

Table 7-1 Bypass Interceptors Operation and Maintenance

Maintenance Schedule	Required Action	Typical Frequency
Routine Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary - indicated by system inspections or immediately following significant spill
Remedial Actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

8 Permeable Grass Paving

Permeable grass paving requires routine maintenance to ensure continuing operation and maximize successful results. Because of the wide range of site-specific conditions and turf stress from traffic, all manufacturers should provide detailed guidelines and frequencies for the required maintenance activities along with specific instructions for issues like thatch removal, drainage, and spills. The long-term health and beauty of the turf within the permeable paving system is strongly dependent on regular and careful observation by maintenance staff. The provided guide offers instructions on the general maintenance, turf care, and specific solutions for possible issues that may be appropriate for the permeable grass paving system.

Table 8-1 Permeable Grass Paving Operation and Maintenance

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect turf for signs of wear, thinning, or bare patches; monitor irrigation system for leaks or poor coverage	Monthly (and after heavy traffic or weather events)
	Mow grass to maintain 25-75mm height using a lawn mower with a grass catcher	Weekly (or as needed)
	Inspect and adjust irrigation system (sprinkler or drip) to suit seasonal requirements	Seasonally
	Apply slow-release or liquid fertilizer; avoid clay-based products	Twice per year
Occasional Maintenance	Remove thatch buildup (>12mm) using spring tines or shallow sod cutter	Annually (or as needed)
	Inspect and clear drainage inlets and surrounding landscape drainage systems	Annually (and after storms)
	Apply herbicides/insecticides only as needed for site-specific problems	As required
Remedial Actions	Re-seed bare or damaged turf areas; maintain soil moisture until established	As required
	Repair ponding or oversaturated areas by improving drainage	As required
	Replace damaged permeable grass paving mats and re-seed affected area	As required
	Educate snowplow operators; fit plows with Teflon runners; avoid de-icing salts	Prior to winter (and ongoing as needed)

	Clean minor oil spills using diluted detergent; replace bedding and pavers for large spills	As required
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8 References

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Limerick County Council, 2010 Limerick County Development Plan 2010 - 2016

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Limerick City & County Council, 2021 Draft Limerick Development Plan 2022 - 2028 Volume 1 Written Statement.

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Appendix E Met Eireann Rainfall

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 126760, Northing: 224775,

DURATION	Interval		Years											
	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	120,	
5 mins	3.2,	4.1,	4.6,	5.3,	5.7,	6.1,	7.1,	8.2,	9.0,	10.0,	10.8,	11.4,	11.9,	
10 mins	4.5,	5.8,	6.4,	7.4,	8.0,	8.4,	9.9,	11.5,	12.5,	13.9,	15.1,	15.9,	16.5,	
15 mins	5.2,	6.8,	7.5,	8.6,	9.4,	9.9,	11.7,	13.5,	14.7,	16.3,	17.7,	18.8,	19.5,	
30 mins	6.8,	8.8,	9.8,	11.2,	12.1,	12.8,	15.0,	17.3,	18.8,	20.8,	22.6,	23.9,	24.8,	
1 hours	8.9,	11.4,	12.7,	14.5,	15.6,	16.5,	19.3,	22.2,	24.1,	26.6,	28.8,	30.4,	31.5,	
2 hours	11.7,	14.9,	16.4,	18.7,	20.2,	21.3,	24.8,	28.5,	30.8,	34.0,	36.7,	38.7,	40.1,	
3 hours	13.7,	17.3,	19.1,	21.7,	23.4,	24.7,	28.7,	32.9,	35.6,	39.2,	42.3,	44.6,	46.2,	
4 hours	15.3,	19.3,	21.3,	24.2,	26.1,	27.5,	31.8,	36.5,	39.4,	43.4,	46.8,	49.3,	51.0,	
6 hours	17.8,	22.5,	24.8,	28.1,	30.3,	31.9,	36.9,	42.2,	45.5,	50.1,	53.9,	56.8,	58.7,	
9 hours	20.9,	26.2,	28.9,	32.7,	35.1,	37.0,	42.7,	48.8,	52.6,	57.8,	62.2,	65.5,	67.6,	
12 hours	23.3,	29.2,	32.2,	36.4,	39.1,	41.1,	47.4,	54.1,	58.3,	63.9,	68.7,	72.4,	74.7,	
18 hours	27.2,	34.1,	37.5,	42.3,	45.4,	47.7,	54.9,	62.5,	67.3,	73.8,	79.2,	83.4,	86.1,	
24 hours	30.4,	38.0,	41.7,	47.0,	50.4,	53.0,	61.0,	69.3,	74.6,	81.6,	87.6,	92.1,	95.1,	
2 days	40.0,	49.0,	53.4,	59.6,	63.5,	66.5,	75.6,	85.0,	90.9,	98.7,	105.4,	110.3,	113.6,	
3 days	48.2,	58.4,	63.3,	70.2,	74.6,	77.9,	87.9,	98.3,	104.7,	113.2,	120.4,	125.7,	129.2,	
4 days	55.6,	66.8,	72.2,	79.8,	84.5,	88.1,	98.9,	110.1,	117.0,	126.1,	133.8,	139.5,	143.2,	
6 days	69.0,	82.1,	88.4,	97.0,	102.5,	106.5,	118.8,	131.4,	139.1,	149.2,	157.8,	164.1,	168.2,	
8 days	81.5,	96.1,	103.1,	112.7,	118.8,	123.2,	136.8,	150.6,	159.0,	170.1,	179.4,	186.2,	190.7,	
10 days	93.2,	109.4,	117.0,	127.5,	134.1,	138.9,	153.6,	168.5,	177.6,	189.5,	199.4,	206.7,	211.5,	
12 days	104.5,	122.0,	130.2,	141.6,	148.6,	153.8,	169.6,	185.5,	195.2,	207.8,	218.4,	226.2,	231.2,	
16 days	126.2,	146.1,	155.5,	168.3,	176.2,	182.1,	199.7,	217.5,	228.2,	242.3,	254.0,	262.5,	268.1,	
20 days	146.9,	169.1,	179.5,	193.6,	202.4,	208.9,	228.3,	247.7,	259.4,	274.7,	287.4,	296.7,	302.7,	
25 days	172.1,	196.9,	208.4,	224.1,	233.8,	241.0,	262.3,	283.7,	296.5,	313.2,	327.0,	337.2,	343.7,	

NOTES:

These values are derived from a Depth Duration Frequency (DDF) Model update 2023

For details refer to:

'Mateus C., and Coonan, B. 2023. Estimation of point rainfall frequencies in Ireland. Technical Note No. 68. Met Eireann',

Available for download at:

<http://hdl.handle.net/2262/102417>

KINGSTON PARK

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 127021, Northing: 225240,

DURATION	Interval		Years											
	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	120,	
5 mins	3.1,	4.1,	4.7,	5.4,	5.9,	6.3,	7.5,	8.8,	9.6,	10.7,	11.7,	12.5,	13.0,	
10 mins	4.4,	5.8,	6.5,	7.5,	8.2,	8.7,	10.4,	12.2,	13.4,	14.9,	16.3,	17.4,	18.1,	
15 mins	5.2,	6.8,	7.6,	8.9,	9.7,	10.3,	12.2,	14.4,	15.7,	17.6,	19.2,	20.4,	21.3,	
30 mins	6.8,	8.8,	9.9,	11.4,	12.4,	13.2,	15.6,	18.3,	19.9,	22.2,	24.2,	25.7,	26.7,	
1 hours	8.9,	11.5,	12.8,	14.8,	16.0,	17.0,	20.0,	23.2,	25.3,	28.1,	30.6,	32.4,	33.6,	
2 hours	11.7,	15.0,	16.7,	19.1,	20.6,	21.8,	25.6,	29.6,	32.1,	35.6,	38.6,	40.8,	42.3,	
3 hours	13.7,	17.5,	19.4,	22.1,	23.9,	25.3,	29.5,	34.1,	36.9,	40.8,	44.2,	46.7,	48.4,	
4 hours	15.3,	19.5,	21.6,	24.6,	26.6,	28.1,	32.7,	37.6,	40.8,	45.0,	48.6,	51.4,	53.2,	
6 hours	17.9,	22.7,	25.1,	28.6,	30.8,	32.5,	37.7,	43.3,	46.9,	51.6,	55.7,	58.8,	60.8,	
9 hours	21.0,	26.5,	29.3,	33.2,	35.7,	37.6,	43.6,	49.9,	53.9,	59.2,	63.8,	67.3,	69.6,	
12 hours	23.5,	29.6,	32.6,	36.9,	39.7,	41.8,	48.3,	55.1,	59.5,	65.3,	70.3,	74.0,	76.5,	
18 hours	27.6,	34.5,	38.0,	42.9,	46.0,	48.4,	55.7,	63.5,	68.4,	74.9,	80.5,	84.7,	87.5,	
24 hours	30.9,	38.5,	42.3,	47.6,	51.1,	53.7,	61.7,	70.2,	75.5,	82.6,	88.7,	93.2,	96.2,	
2 days	40.6,	49.7,	54.1,	60.4,	64.3,	67.3,	76.5,	86.0,	92.0,	99.9,	106.6,	111.6,	114.9,	
3 days	48.8,	59.1,	64.1,	71.1,	75.5,	78.8,	88.9,	99.4,	105.9,	114.5,	121.7,	127.1,	130.7,	
4 days	56.3,	67.7,	73.1,	80.8,	85.6,	89.2,	100.1,	111.4,	118.4,	127.6,	135.3,	141.1,	144.8,	
6 days	69.9,	83.2,	89.5,	98.2,	103.7,	107.8,	120.2,	132.9,	140.7,	151.0,	159.6,	165.9,	170.1,	
8 days	82.5,	97.4,	104.4,	114.1,	120.2,	124.8,	138.4,	152.4,	160.9,	172.1,	181.4,	188.3,	192.9,	
10 days	94.4,	110.7,	118.5,	129.1,	135.7,	140.6,	155.5,	170.5,	179.7,	191.7,	201.7,	209.1,	214.0,	
12 days	105.9,	123.5,	131.9,	143.3,	150.4,	155.7,	171.6,	187.7,	197.5,	210.3,	220.9,	228.8,	233.9,	
16 days	127.8,	148.0,	157.4,	170.4,	178.4,	184.3,	202.2,	220.1,	231.0,	245.2,	257.0,	265.6,	271.3,	
20 days	148.8,	171.3,	181.8,	196.1,	204.9,	211.5,	231.1,	250.7,	262.5,	278.0,	290.8,	300.2,	306.3,	
25 days	174.3,	199.4,	211.1,	226.9,	236.8,	244.0,	265.6,	287.1,	300.1,	317.0,	331.0,	341.2,	347.8,	

NOTES:

These values are derived from a Depth Duration Frequency (DDF) Model update 2023

For details refer to:

'Mateus C., and Coonan, B. 2023. Estimation of point rainfall frequencies in Ireland. Technical Note No. 68. Met Eireann',

Available for download at:

<http://hdl.handle.net/2262/102417>

MILLERS LANE PARK

Appendix F Surface Water Audit

**Kingston Park & Miller's Lane,
Knocknacarra, Co. Galway**

**Stage 1 Stormwater Audit
252234-PUNCH-XX-XX-RP-C-0001**

October 2025

Document Control

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S3	P01	Draft Issue	6/10/2025	P. McDowell	JP Murray	D Trkulja
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Report by:



Date: 17th October 2025

Philip McDowell
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Checked by:



Date: 17th October 2025

John Paul Murray
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1 Introduction

1.1 Purpose of Report

This report presents a Stage 1 Stormwater Audit carried out for a proposed Kingston Park and Millers Lane Development located at Knocknacarra, Co. Galway.

PUNCH Consulting Engineers Audit team were appointed by PUNCH Consulting Engineers Design team to carry out an independent Stage 1 Stormwater Audit on the proposal in line with Dún Laoghaire Rathdown County Council's (DLRCC) "Stormwater Audit Procedure" and section 9.5 "Sustainable Urban Drainage Systems (SuDS)" of the Galway City Council City Development Plan 2023-2029.

1.2 Site Details

The proposed development comprises two sites, Miller's Lane and Kingston Park.

The site at Miller's Lane is approximately 2.2 hectares in area, located on the Gort na Bró road in Knocknacarra. It is bounded by Gort Gréine residential developments to the north, Millers Lane to the east, Gort na Bró residential development to the south and Gort na Bró road (L5000) to the west. On the opposite side of the L5000 road is Gaelscoil Mhic Amhlaigh primary school. The existing site consists of two grass soccer pitches with a walkway around the perimeter, and an unmarked parking area. The site is primarily a greenfield with no existing buildings

The site at Kingston Park is approximately 4.8 hectares in area located at the Western Distributor Road, Knocknacarra. The site is bounded by the L10111 road to the North, residential development and land designated for future residential developments to the east, south and west. St. John the Apostle Knocknacarra National School is located at the Northwest of the site. The site is accessed from the Western Distributor Road via the school's access road (L10111), which is not a through route for vehicular traffic. The existing site is a greenfield site with no existing buildings.

1.3 Report Details

The audit was carried out by Philip McDowell, checked by John Paul Murray, and approved by Drazen Trkulja between the dates of 24th September and 6th November 2025.

In the absence of a Surface Water Audit Procedure by the relevant authority, Galway City Council (GCC), this Stage 1 Audit has been carried out in accordance with the Dún Laoghaire-Rathdown County Council (DLRCC) procedures outlined in the Dun Laoghaire Rathdown Development Plan 2022-2028, Appendix 7 "Stormwater Management Policy - Including Stormwater Audit Procedure", as well as the GCC City Development Plan 2023-2029, Greater Dublin Strategic Drainage Study (GDSDS) and CIRIA C753 (The SuDS Manual). The auditor has examined only those issues within the design relating to surface water drainage and Sustainable Drainage Systems (SuDS) implications of the scheme and has therefore not examined or verified the compliance of the design to any other criteria. Design responsibility for the stormwater drainage and SuDS remains solely with the Design Engineer.

Appendix A contains the copies of drawings and documents examined by the auditor. Appendix B contains the Stage 1 Surface Water Audit Feedback form.

All findings outlined in Section 2 of this report are considered by the auditor to require action to improve the stormwater credentials of the scheme.

1.4 Drawings & Documents Reviewed

Planning Stage

Drawings:

1. 233114-PUNCH-KP-XX-DR-C-0101 (Rev P01, received 17/09/2025)
2. 233114-PUNCH-KP-XX-DR-C-0441 (Rev P01, received 17/09/2025)
3. 233114-PUNCH-ML-XX-M2-C-0101 - 2025-09-12-233114-PUNCH-KP-XX-DR-C-0101 (Rev P01, received 12/09/2025)
4. 233114-PUNCH-ML-XX-DR-C-0441 (Rev P01, received 17/09/2025)

Reports and other Documents:

1. Drainage assumptions and brief.1pdf (Received 12/09/2025)
2. 233114-PUNCH-ML-XX-RP-C-0013-Millers Lane Stormwater Drainage (Rev P0, received 17/09/2025)
3. Kingston park simulation results (Received 12/09/2025)
4. 233114- Kingston Park-Greenfield Runoff-02 (Received 12/09/2025)
5. 233114-PUNCH-XX-XX-RP-C-0013-Surface Cover Type Area Table (Received 17/09/2025)

2 Stage 1 Audit Findings

2.1 General Requirements as per DLRCC County Development Plan 2022-2028

Table 2-1 below outlines the result of a review of the scheme designer's proposals against the general requirements outlined in the DLRCC County Development Plan 2022-2028, Appendix 7, section 7.1.1.

Table 2-1 General Requirements for all developments greater than a single house

	Requirements as per DLRCC 2022-2028 Development Plan	Addressed by Scheme Designer?
2.1.1	Climate Change All developments must apply a minimum factor of 1.2 to their drainage design and attenuation volumes to accommodate climate change.	STATUS Y
2.1.2	Urban Creep All developments must apply a factor of 1.1 to their drainage design and attenuation volumes to accommodate urban creep.	STATUS Y
2.1.3	Blockage Analysis Scheme Designers must submit details of the proposed surface water drainage system in the event of blockage or partial blockage of the system, commenting on any surcharging or flood risk that may be identified, particularly in relation to freeboard used in the simulation analysis. The proposal must include a drawing confirming that safe overland flow routes do not negatively impact properties both within and without the site. The overland flow route plan should identify drop kerbs or ramps required for channelling the flow and address low point areas in the site and detail how properties, both within the development and on adjacent lands, will be protected in the event of excessive overland flows.	STATUS N
2.1.4	Utility Clash Check The Scheme Designer must undertake a utilities clash check to ensure all utilities' vertical and horizontal separation distances can be provided throughout the scheme. The Scheme Designer should demonstrate this with cross-sections at critical locations such as junctions, site thresholds and connection points to public utilities. Minimum separation distances must be in accordance with applicable Codes of Practice.	STATUS N
2.1.5	Private Drains Where an applicant's land is crossed by a private drain, the applicant is responsible for acquiring any rights or permissions necessary to connect to, or to increase the discharge into, or to build over, or divert, or to ensure the adequate capacity is not exceeded, or otherwise alter any private drains not in their exclusive ownership or control, and for ensuring their adequacy.	STATUS N
2.1.6	Pumping of Surface Water	STATUS (N/A)
2.1.7	Sustainable Drainage Systems (SuDS): The proposal must demonstrate that they meet the requirements of the Greater Dublin Strategic Drainage Study (GSDSDS) policies in relation to Sustainable Drainage Systems (SuDS). The design must incorporate SuDS measures appropriate to the scale of the proposed development	STATUS N

	such as green roofs, bioretention areas, permeable paving, rainwater harvesting, swales, etc. that minimise flows to the public drainage system and maximises local infiltration potential. The Scheme Designer should provide cross-sections and long-sections, and commentary that demonstrates all proposed SuDS measures have been designed in accordance with the relevant industry standards and the recommendations of The SuDS Manual (CIRIA C753)	
2.1.8	Infiltration: The Scheme Designer should submit Site Investigation Report and results, including infiltration tests, and a plan showing the trial pits/soakaway test locations across the site. The report should address instances where groundwater, if any, was encountered during testing and its impact.	STATUS N
2.1.9	Hardstanding/Parking Areas: All proposed parking and hardstanding areas should maximise local infiltration before discharge to the surface water drainage system, via a specifically designed permeable paving/porous asphalt system, in accordance with the requirements of Section 12.4.8 of the DLRCC County Development Plan 2022-2028.	STATUS N
2.1.10	Basement: If basement carparking is provided, then all incidental run-off from the basement should be shown to drain to the foul system and not the surface water system	STATUS (N/A)
2.1.11	Run-off Factors: Where Scheme Designers propose to use reduced run-off factors (or reduced impermeable contributing areas) for areas of their site that drain to SuDS measures these factors must be agreed with Municipal Services, preferable during the pre-planning process. It should be noted that standard surface water simulation software uses default Cv values of 0.84 for Winter and 0.75 for Summer. If the Scheme Designer proposes to use their own reduced run-off rates, then the default Cv values should be amended to a value of 1.0. Maintaining the default Cv values in conjunction with the Scheme Designers proposed rates reduces the run-off in simulations of rainfall events, giving inaccurate simulation results which may lead to under sizing of the drainage system and attenuation storage required.	STATUS N
2.1.12	Hydrological Parameters Scheme Designers must use site specific or local data in their Qbar, attenuation volume and surface water system design such as: • SAAR • Soil Type • Rainfall Return Period Table (available from MET Eireann) • Rainfall intensity • Other hydrological parameters	STATUS N
2.1.13	Discharge Rate: Surface Water discharge from a development must be restricted to 2 l/s/ha or the calculated Qbar, whichever is greater. The Qbar should be calculated using the net area drained and not the gross area of the site (i.e. red line boundary). This discharge rate should be marked on the drainage drawing on the manhole in which the flow restricting device is located. The manhole in which the flow restricting device is located should not have a bypass pipe and, a penstock and silt trap should be provided. Flow restricting devices with an orifice of less than 50mm in diameter should be avoided. Where this is not possible then the Scheme Designer must submit a robust maintenance regime to ensure blockages are avoided, to the satisfaction of the local authority. Scheme Designers are recommended to use the HR Wallingford UK SuDS Greenfield runoff rate estimation tool to estimate Qbar for their site: https://www.uksuds.com/drainage-calculation-tools/greenfield-runoff-rate-estimation	STATUS N
2.1.14	Attenuation: If an attenuation system is proposed it should, where possible, not be located under the internal roads but in/under open space or parking areas. Attenuation systems must be inline. The preference is for attenuation systems that	STATUS

	allow for infiltration and/or treatment within the site. The Scheme Designer should note that certain landscaping items, such as trees, may not be compatible with attenuation systems. The Scheme Designer must provide fully dimensioned plans and sections of the attenuation storage system. All relevant inlet and outlet levels, dimensioned clearances between other utilities, and actual depths of cover to the system should be provided. Details of the proposed inlet and outlet manholes and arrangements to facilitate draw down and maintenance should also be provided. Scheme Designers are recommended to use the HR Wallingford UK SuDS Surface water storage volume estimation tool to estimate the attenuation storage required for their site: https://www.uksuds.com/drainage-calculation-tools/surface-water-storage .	N
2.1.15	Green Roof: The proposal must meet the requirements of Appendix 7.2: Green Roof Policy of the County Development Plan 2022-2028.	STATUS N
2.1.16	Interception and Treatment: The Scheme Designer must demonstrate that required interception and/or treatment of surface water run-off is achieved in accordance with GDSDS policy. To be in compliance with GDSDS Volume 2 Section 6.3.3 Table 6.3 Criterion 1, interception of the first 5-10mm is required. If interception of first 5-10mm can't be achieved, then treatment of first 15mm is required.	STATUS N
2.1.17	Maintenance: Scheme Designers must submit a post-construction maintenance specification and schedule for the drainage system, including SuDS measures and attenuation system to the relevant local authority for approval. This maintenance specification and schedule must be included in the Safety File.	To be addressed by the Scheme Designer at Construction Stage
2.1.18	New Connections: Prior to submission of the planning application, the Scheme Designer must obtain the sewer network records from the relevant local authority and assess if a new connection to the public sewer is technically feasible.	STATUS N

2.2 DLRCC 2022 Development Plan - Stormwater Audit Procedure Table

Table 2-2 Stormwater Audit Procedure Table - Completed by Scheme Designer

Surface Cover Type	Kingston Park Area (m ²)	Miller's Lane Area (m ²)	Total Area (m ²)
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.			
Semi-natural vegetation (e.g. hedgerows, trees, woodland, species-rich grassland) maintained or established on site.			
Reuse of existing soils and seed source to develop vegetation cover	TBA		TBA
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree.			
Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.			
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm.	245.33		245.33
Non intensive Brown Roof (Biodiversity Roof). Substrate minimum settled depth of 150mm. Design will be site specific and developed by a suitably qualified ecologist.			
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket)			
Extensive green roof of sedum mat or other lightweight systems			
Green wall - modular system or climbers rooted in soil.			
Rain gardens and other vegetated sustainable drainage elements.	2967	1170	3787
Flower-rich perennial planting.			
Hedges (line of mature shrubs one or two shrubs wide).			
Hedgerows or double hedgerow of native species (may have an associated ditch and bank)			
Groundcover planting.			
Amenity grassland entire area or sections managed for lesser mowing frequencies for pollinators (e.g. six week meadow)			
Amenity grassland (species-poor, regularly mown lawn).			
Water features (chlorinated) or unplanted detention basins.			
Permeable paving.	9672	13358	23380
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone)	8131		8131
Blue roof			

2.3 Blockage Analysis (Flow Exceedance)

Problem: Documentation provided does not reference a strategy for blockage or partial blockage of stormwater drainage.

Recommendation: Consider providing details regarding a strategy to mitigate the impacts of a potential blockage, including a drawing detailing overland flow paths.

2.4 Utility Clash Checks

Problem: Details of utility clash check procedure have not been provided.

Recommendation: Consider providing drainage cross and long sections showing that utility clash detection has been carried out.

2.5 Private Drains

Problem: No comment provided on the presence of Private Drains.

Recommendation: Consider providing commentary on whether there are any known private drains present on site. If applicable comments should be provided on how the site drainage design interacts with the private drainage.

2.6 Extents of SuDS Measures

Problem: The extents of proposed SuDS measures is unclear from drawings provided. For example drawings should clearly indicate in the legend if a proposed pavement/finish is a permeable or impermeable surface. For example, the Kingston Park pitches should be highlighted as a SuDS finish but are currently shown in white.

Recommendation: Consider providing a proposed SuDS layout drawing or otherwise clearly indicating the location of all proposed SuDS measures.

2.7 Infiltration

Problem: Details of site investigation not provided.

Recommendation: Consider providing details of the site investigation carried out, in particular infiltration rates and locations of infiltration tests.

2.8 Hardstanding/Parking Areas

Problem: It is the policy of GCC to promote local infiltration into the ground. In report 233114-PUNCH-ML-XX-RP-C-0013 section 1.3 it is stated that all SuDS devices will be a lined with an impermeable liner to prevent infiltration.

Recommendation: Consider providing comments regarding the water table and infiltration rates to allow the maximising of local infiltration in line with GCC policy 9.5 "Sustainable urban Drainage Systems".

2.9 Run-off Factors

Problem: Details of the run-off rates for different surface types was not provided. A Cv value of 0.75 was used in modelling as per calculations provided. However, it is not clear if this is in addition to reduced run-off factors for different SuDS surfaces.

Recommendation: Consider providing details of the run-off rates adopted in the modelling of all surface types within the scheme.

2.10 Hydrological Parameters

Problem: A soil value of 0.3 is noted in report 233114-PUNCH-ML-XX-RP-C-0013 but supporting information for this value has not been provided (site investigation results or geological records).

Recommendation: Consider providing details of the supporting information behind the soil value used.

2.11 Hydrological Parameters

Problem: Site specific rainfall data used in the calculation of M5-60 and ratio R is unclear.

Recommendation: Consider providing details of the supporting information behind these values.

2.12 Discharge Rate

Problem: Discharge rates are not clearly indicated on drawings.

Recommendation: Consider providing the discharge rate on manhole(s) with flow control device(s) on all drawings.

2.13 Attenuation

Problem: The proposed attenuation storage volumes are unclear on drawings 233114-PUNCH-KP-XX-DR-C-0101 and 233114-PUNCH-ML-XX-DR-C-0101 and in the reports supplied.

Recommendation: Consider indicating attenuation storage volumes for any attenuation storage devices shown on drawings, as well as indicating volumes proposed in table format within reports.

2.14 Attenuation Drainage Details

Problem: The Scheme Designer must provide fully dimensioned plans and sections of the attenuation storage system. All relevant inlet and outlet levels, dimensioned clearances between other utilities, and actual depths of cover to the system should be provided. Details of the proposed inlet and outlet manholes and arrangements to facilitate draw down and maintenance should also be provided.

Recommendation: Consider providing drainage details drawings of the proposed attenuation systems for review.

2.15 Green Roofs

Problem: The percentage of roof area proposed as green roof has not provided.

Recommendation: Consider showing the extent of green roofs on plan drawings, as well as indicating the percentage of green roof proposed in table format within reports.

2.16 Interception and treatment

Problem: The Scheme Designer must demonstrate that required interception and/or treatment of surface water run-off is achieved in accordance with GDSDS policy. To be in compliance with GDSDS Volume 2 Section 6.3.3 Table 6.3 Criterion 1, interception of the first 5-10mm is required. If interception of first 5-10mm can't be achieved, then treatment of first 15mm is required.

Recommendation: Consider providing details regarding the provision of interception and/or treatment of surface water run-off in accordance with GDSDS policy for review.

2.17 Maintenance

Problem: Scheme Designers must submit a post-construction maintenance specification and schedule for the drainage system, including SuDS measures and attenuation system to the relevant local authority for approval. This maintenance specification and schedule must be included in the Safety File.

Recommendation: The provision of a post-construction maintenance specification and schedule is outside the scope of this Stage 1 Surface Water Audit and should be addressed by the Scheme Designer at Construction Stage.

2.18 New Connections

Problem: There is no commentary with regard the feasibility of new surface water connections.

Recommendation: Consider providing commentary regarding any agreement with the local authority on the feasibility of proposed surface water connections.

2.19 Missing / incomplete information

Problem: There are several items that were not included or are unclear from the submission and therefore have not been assessed as part of this audit.

Recommendation: Consider providing the following items for review:

- a) A single Engineering Planning Report suitable for planning submission is required. Note: Memorandums are not suitable for the purposes of this audit.
- b) Appendices to be included in reports
- c) Simulation results for Millers Lane to be included.
- d) SuDS details drawings.
- e) Drainage tables including pipe/node information should be provided on drainage drawings.

2.20 Flood Risk

Problem: Commentary regarding flood risk has not been included.

Recommendation: Consider providing commentary regarding flood risk for the site(s).

2.21 Planning Status

Problem: Draft status documents have been supplied as part of this audit.

Recommendation: "Planning" status drawings and reports are required for this stage 1 audit.

2.22 Management of Pollution Risks

Problem: The calculation of pollution mitigation is not clearly additive.

Recommendation: Consider providing a table showing how the inclusion of various SuDS measures equals or exceeds the pollution hazard index.

2.23 Causeway Flow Simulation

Problem: Not all all pipes are included in simulation carried out (e.g. S10-0 downstream).

Recommendation: Consider providing updated drawings and/or simulation results which includes all pipes.

Appendix A Surface Water Audit Feedback Form

STORMWATER AUDIT FEEDBACK FORM

PUNCH Consulting Engineers

Scheme Title: Kingston Park and Miller's Lane

Audit Stage: 1 Audit Completed: 16/10/2025 Project Ref: 252234

Paragraph No. in Audit Report	Issue Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.3	N	N	The permeable grassed area provides interception (source control) and surface water conveyed through the land-drains, once the storage of the permeable grassed area is exceeded overflow chambers (OFC) facilitate conveyance of surface water to the mains piped network. Furthermore, dropped kerbs will be provided to ensure any excess runoff will discharge to adjacent rain gardens. The Finished Floor Level will be maintained 500mm above ground of the proposed site levels. And a SuDs strategy sketches appended which will show flow paths for the choice of SuDs devices used in the strategy	Y
2.4	Y	Y		
2.5	Y	Y		
2.6	Y	Y		
2.7	N	N	In the assumptions provided, the design assumed no infiltration since no SI has been completed yet. At detailed design stage, design can be refined to include the permeability of soil as applicable. Though for Kingston Park infiltration will not be considered due to the significant cut and fill exercise to accommodate the pitch, roads and car parking across the site. Active infiltration will cause consolidation of ground in fill area in turn causing differential settlement.	Y

STORMWATER AUDIT FEEDBACK FORM

PUNCH Consulting Engineers

Paragraph No. in Audit Report	Issue Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.8	N	N	In the assumptions provided, the design assumed no infiltration since no SI has been completed yet, and any comment on the same will be very speculative. A desktop study was undertaken to assess these parameters (infiltration, groundwater vulnerability), and a worst-case scenario assumed i.e, no infiltration allowed which suffices for this stage of the project. At detailed design stage, design can be refined to include the permeability of soil as applicable, though for Kingston Park infiltration will not be considered due to the significant cut and fill exercise to accommodate the pitch, roads and car parking across the site. Active infiltration will cause consolidation of ground in fill area in turn causing differential settlement.	Y
2.9	N	N	The Wallingford Procedure and best practices assume a Cv value of 0.75 and 0.85 for the determination of runoff for the Summer and Winter conditions. Hence, the use in this hydraulic modelling. Also, since this is an urban catchment with mixed surfaces use of these values has been premised on the simplicity and speed which they provide at the stage of the project. And because they are historically calibrated based on empirical studies and have been calibrated against observed data across many UK sites.	Y
2.10	N	N	Soil value has been obtained using the Winter Rainfall Acceptance Potential (WRAP) mapping from the Wallingford Procedure in the absence of a Site Investigation (SI). SI to be carried out to inform detail design stage.	Y
2.11	N	N	M5-60, was determined using Met Éireann rainfall data appended in the drainage pack and shown on the green field runoff calculations sheets provided.	Y
2.12	Y	Y		

STORMWATER AUDIT FEEDBACK FORM
PUNCH Consulting Engineers

Paragraph No. in Audit Report	Issue Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.13	Y	Y		
2.14	Y	Y		
2.15	N	N	In the design brief and assumptions, it was clearly articulated that the extent of green or blue roof or type thereof as well the size of rainwater harvesting tank is yet to be finalised by the relevant specialist/ designers. Hence, the drainage design did not include these in the storage/ attenuation regime of the management train. However, acknowledged their presence, in providing amenity/ biodiversity i.e. green roof as part of the SuDs pillars.	Y
2.16	N	N	Runoff from the access road is directed to either permeable grassed paving areas or rain gardens thus providing interception storage. The SuDs devices are note as capable of providing interception for the first 5mm based on the SuDs Manual. Car parking bays will be permeable grassed paved areas such as grasscrete or reinforced grass ritter to further accommodate interception storage.	Y
2.17	Y	N	Maintenance specification and outline schedule will be included in the planning submission and will be refined further during the detailed design stage.	Y
2.18	Y	Y	On the 26 th of August a meeting was held with Galway City Council to discuss this drainage strategy who seemed not have any objections to the proposed connection point(s). GCC alluded to the fact that the enquiry is usually undertaken at construction stage, but have made an exception in this case. Subsequent emails have confirmed	
2.19	Y	Y		

STORMWATER AUDIT FEEDBACK FORM**PUNCH** Consulting Engineers

Paragraph No. in Audit Report	Issue Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.20	Y	Y	Included in the Engineering Planning Report. Site Specific Flood Risk Assessments (SSFRAs) completed for both sites and confirmed as Flood Zone C.	
2.21	Y	N	Scheme design 'susceptible' to changes based on client. Public consultation was also ongoing during the SWA and design was evolving based on public feedback and comments. Planning drawings will have correct Status and issue reference aligned for planning issue.	Y
2.22	N	N	The SuDs Manual Section 26.7.1. details the simple index approach for showing the suitability of SuDs devices for the treatment pillar. And that if the total indices for mitigation exceeds pollution indices then the devices provided should suffice treatment. And has been demonstrated in calculations on the Tables provided that if the difference between the mitigation indices and the pollution indices equates to a negative value. Then the treatment devices provided are satisfactory for treatment, and vice versa.	Y
2.23	Y	Y	Has been updated accordingly, as one was a dummy link	

Note: This Stage 1 Stormwater Audit has been prepared with reference to the Dun Laoghaire-Rathdown County Council Stormwater Audit procedure. We note that no additional documents accompany the responses provided in the feedback form. In the absence of a defined Galway City Council procedure, the auditor has issued this report without reviewing the revised, final planning drawings. The designer is responsible for addressing all findings in Section 2 within the final planning submission, with confirmation of agreement to proceed on this basis provided via this signed feedback form attached to the report.

STORMWATER AUDIT FEEDBACK FORM

PUNCH Consulting Engineers

Signed:



Design Team Project Manager

Date: 16/10/2025

Please complete and return to the auditor

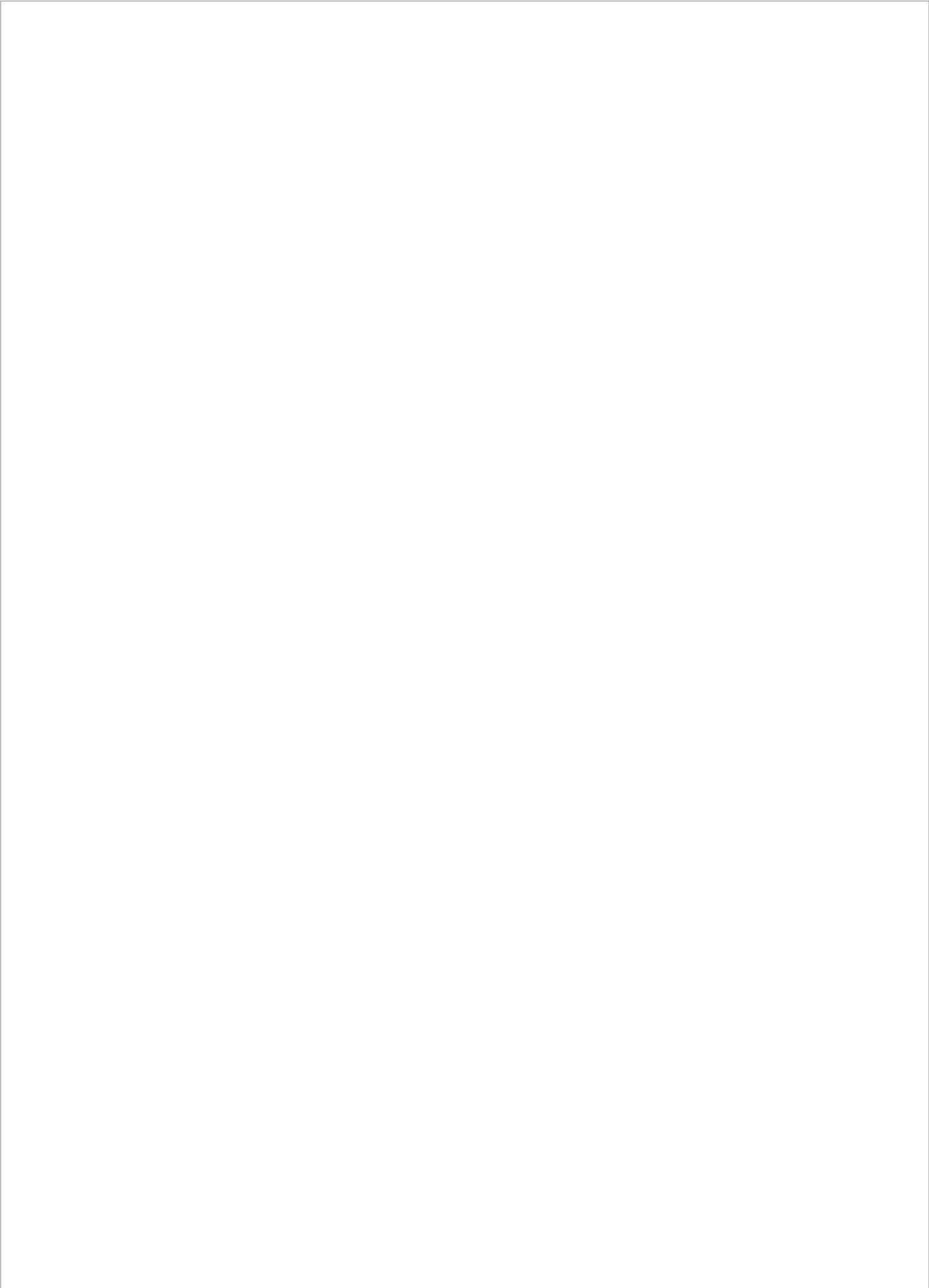
Auditor Signed
Off:

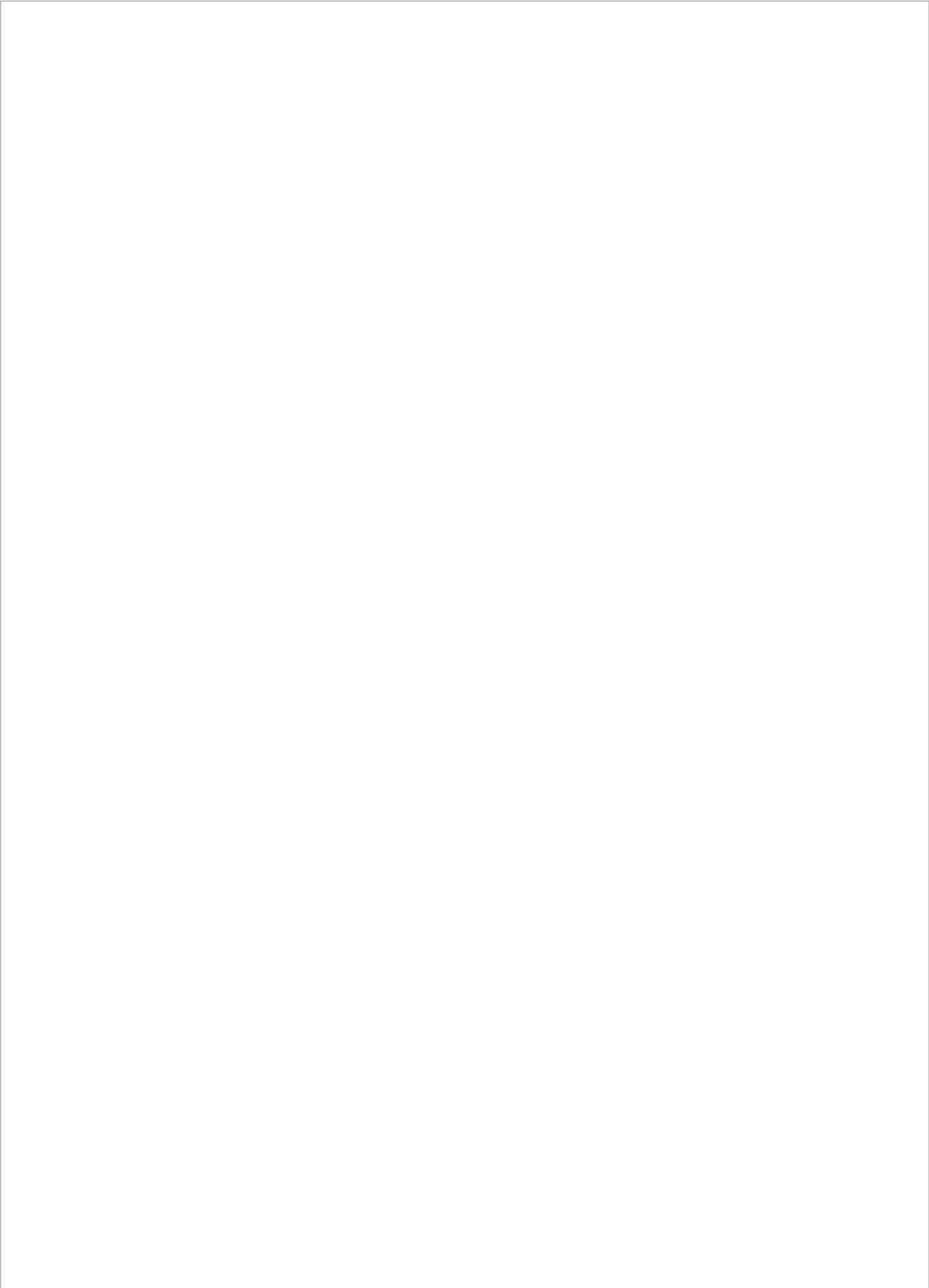


Auditor

Date: 16/10/2025

Appendix G Foul Water Drainage Calculations





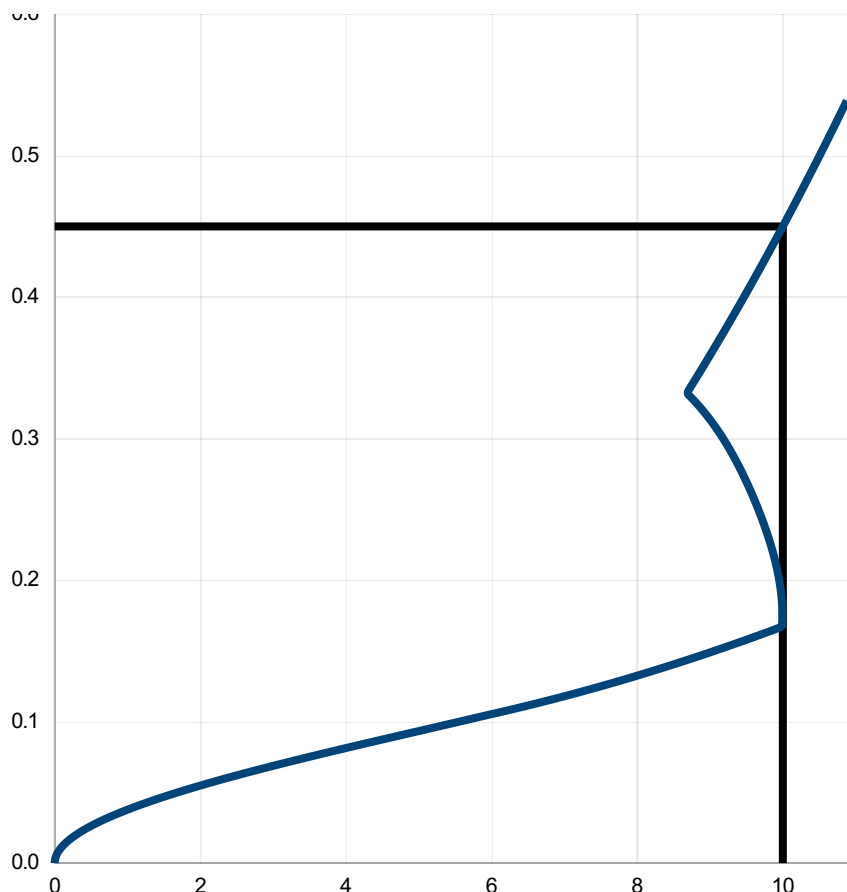
Appendix H Flow Controls

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.450	10.000
Flush-Flo™	0.175	9.993
Kick-Flo®	0.332	8.680
Mean Flow		7.616



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Head (m)	Flow (l/s)
0.000	0.000
0.016	0.179
0.031	0.688
0.047	1.480
0.062	2.504
0.078	3.695
0.093	4.981
0.109	6.277
0.124	7.442
0.140	8.450
0.155	9.352
0.171	9.992
0.186	9.984
0.202	9.944
0.217	9.876
0.233	9.786
0.248	9.676
0.264	9.551
0.279	9.408
0.295	9.243
0.310	9.045
0.326	8.800
0.341	8.792
0.357	8.976
0.372	9.155
0.388	9.331
0.403	9.503
0.419	9.672
0.434	9.837
0.450	10.000

DESIGN ADVICE



The head/flow characteristics of this SCL-0140-1000-0450-1000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International
A CRH COMPANY

DATE 29/10/2025 15:20

Site

DESIGNER Matthew Greene

Ref CTL-SCL-0140-1000-0450-1000

SCL-0140-1000-0450-1000

Hydro-Brake® Optimum

Technical Specification

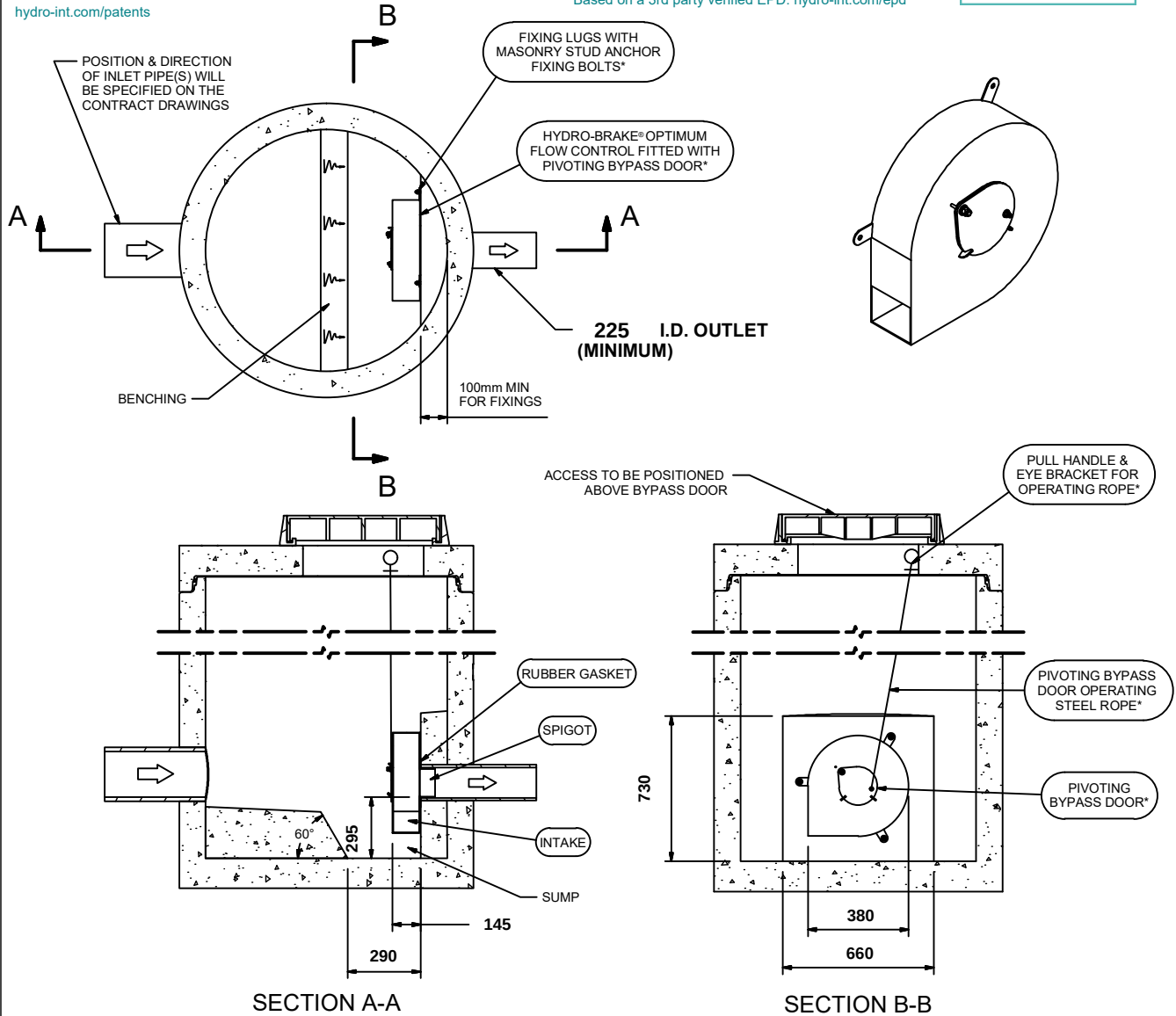
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Flush-Flo™	0.175	9.993
Kick-Flo®	0.332	8.680
Mean Flow		7.616

hydro-int.com/patents

This Hydro-Brake® Optimum includes:

- All in 3 mm Grade 304L stainless steel
- Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- Media blasted for corrosion resistance
- Variable flow rate post installation via adjustable inlet (if necessary)
- Indicative Weight: 10 kg
- Product Carbon Footprint: 40.04 kgCO2e

Based on a 3rd party verified EPD: hydro-int.com/epd



IMPORTANT: ○ LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® IS A REGISTERED TRADEMARK FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY
 HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



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**Hydro
International**
 A CRH COMPANY

DATE	29/10/2025 15:20
SITE	
DESIGNER	Matthew Greene
REF	CTL-SCL-0140-1000-0450-1000

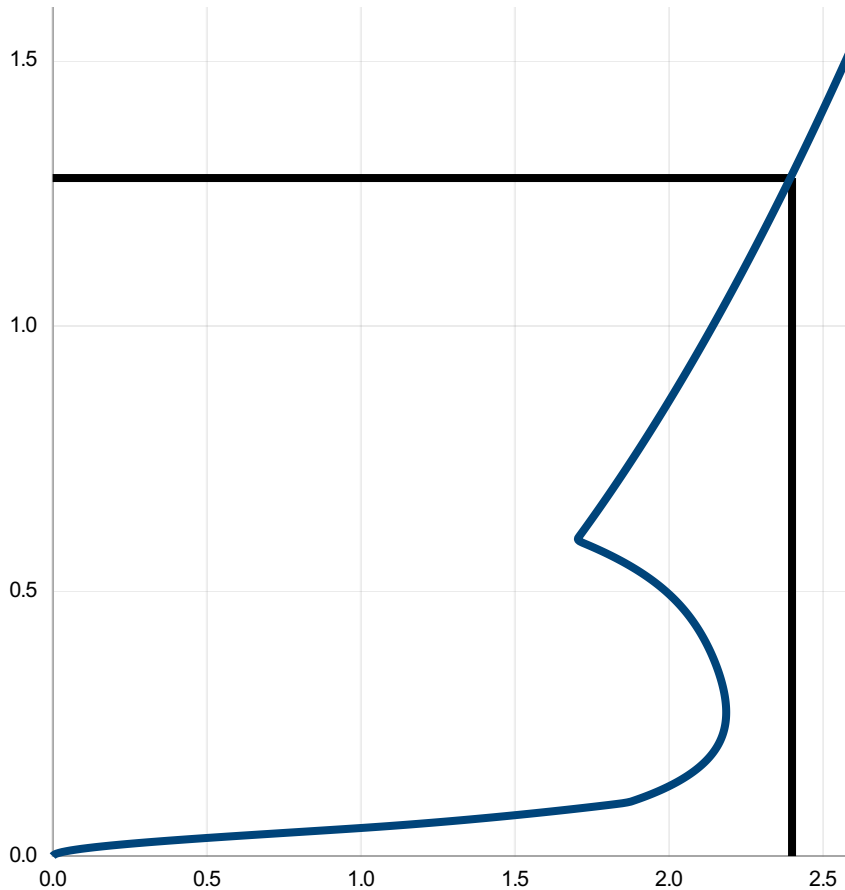
SCL-0140-1000-0450-1000
 Hydro-Brake® Optimum

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.278	2.400
Flush-Flo™	0.271	2.186
Kick-Flo®	0.595	1.699
Mean Flow		1.977



hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.044	0.761
0.088	1.681
0.132	2.002
0.176	2.115
0.220	2.169
0.264	2.186
0.308	2.180
0.353	2.158
0.397	2.126
0.441	2.081
0.485	2.017
0.529	1.924
0.573	1.789
0.617	1.727
0.661	1.781
0.705	1.833
0.749	1.883
0.793	1.932
0.837	1.979
0.881	2.025
0.925	2.070
0.970	2.114
1.014	2.156
1.058	2.198
1.102	2.239
1.146	2.279
1.190	2.318
1.234	2.357
1.278	2.394

DESIGN ADVICE



The head/flow characteristics of this SCL-0067-2400-1278-2400 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International
A CRH COMPANY

DATE	29/10/2025 15:23	SCL-0067-2400-1278-2400 Hydro-Brake® Optimum
Site		
DESIGNER	Matthew Greene	
Ref	CTL-SCL-0140-1000-0450-1000	

Technical Specification

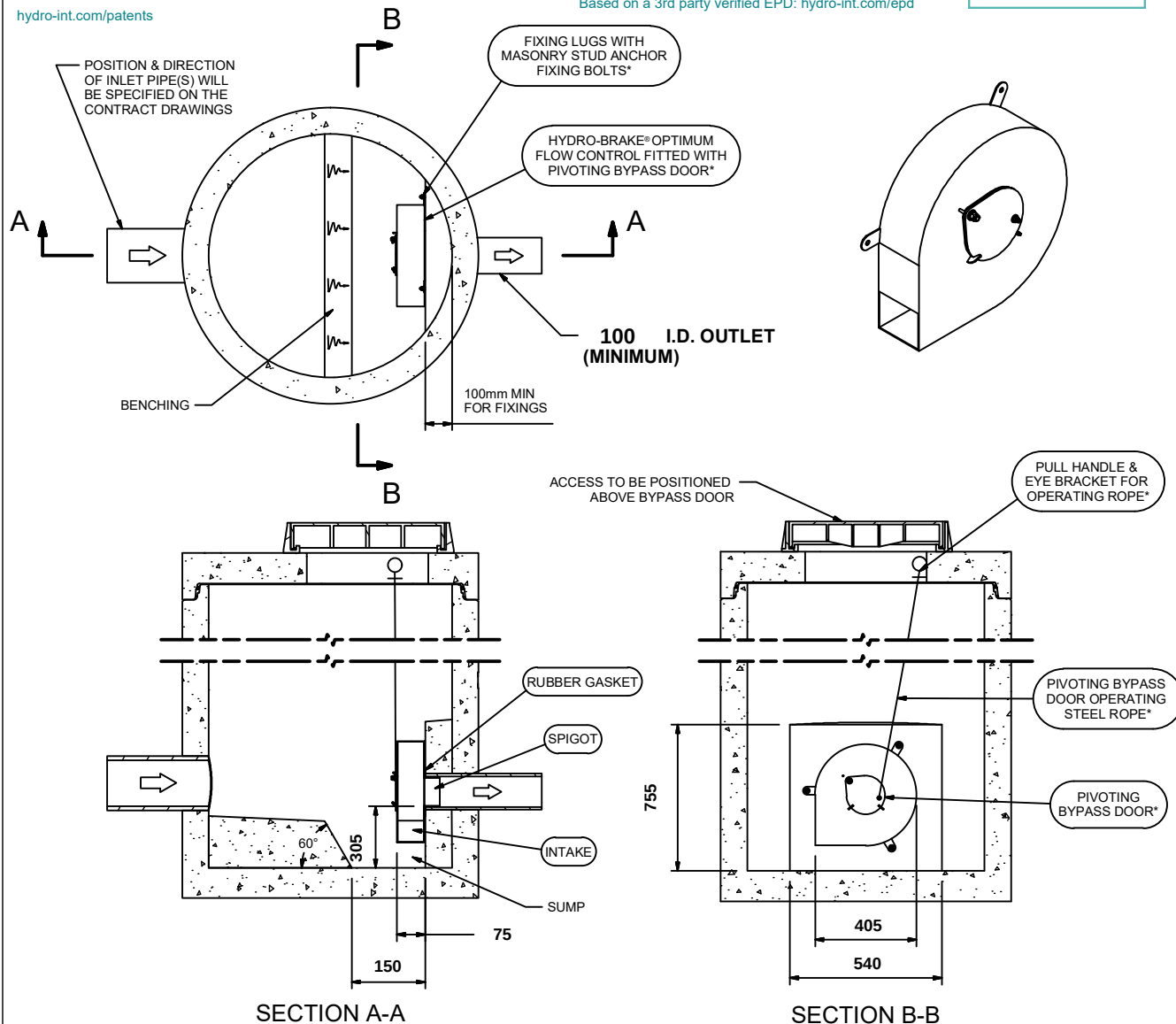
Control Point	Head (m)	Flow (l/s)
Primary Design	1.278	2.400
Flush-Flo™	0.271	2.186
Kick-Flo®	0.595	1.699
Mean Flow		1.977

hydro-int.com/patents

This Hydro-Brake® Optimum includes:

- All in 3 mm Grade 304L stainless steel
- Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- Media blasted for corrosion resistance
- Variable flow rate post installation via adjustable inlet (if necessary)
- Indicative Weight: 10 kg
- Product Carbon Footprint: 37.45 kgCO2e

Based on a 3rd party verified EPD: hydro-int.com/epd



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THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

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The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

**Hydro
International**
 A CRH COMPANY

DATE	29/10/2025 15:23
SITE	
DESIGNER	Matthew Greene
REF	CTL-SCL-0140-1000-0450-1000

SCL-0067-2400-1278-2400
 Hydro-Brake® Optimum