OBA | CONSULTING
CIVIL & STRUCTURAL
ENGINEERS

ENGINEERING DRAINAGE REPORT FOR PLANNING SUBMISSION

RENOVATIONS & EXTENSIONS TO 27 BALLYBODEN ROAD RATHFARNHAM DUBLIN 14

Reference: 500-22A
Date: 24 January 2022

ENGINEERS IRELAND

ACEI
Association of Consulting Engineers Ireland

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Proposed Extensions to 27 Ballyboden Road, Rathfarnham, Dublin 14

Ref: 500-22A

Drainage Summary for the Proposed Extensions to 27 Ballyboden Road, Rathfarnham, Dublin 14

1.0 General

The proposal is for the alterations and extension of the existing residence at 27 Ballyboden Road, Rathfarnham, Dublin 14.

Irish Records show a 225mm diameter foul sewer to the front of the property, however further on-site exploratory works confirm that this foul sewer is (incorrectly located on the Irish Water maps and is) actually 3.2m offset from the front wall of the house. Please refer to the attached report from Green Day Environmental and photos of the trial hole locating the foul sewer in adjacent property, 29 Ballyboden Road.

2.0 Foul Water Drainage

Currently, the wastewater and surface water from the existing building discharges as a combined system to the 225mm diameter foul sewer to the front of the property.

It is proposed to construct a new 100mm diameter wastewater drain as a dedicated foul drain, with a saddle connection to the existing 225mm diameter foul sewer in the front of the property. The final private manhole F1 is to be built in accordance with Irish Water standard detail STD-WW-13.

It is proposed to observe a standard 6m clear wayleave following the route of the existing 225mm diameter foul sewer in the front yard, by ensuring no new construction is to take place in this wayleave.

All new foul drains shall be 100mm diameter uPVC at gradients of minimum 1:60 (one wc connected) in accordance with Part H of the Building Regulations 2010, unless otherwise noted.

Refer to OBA drawing number 500-22A-C01, for further details.

3.0 Surface Water Drainage

It is proposed to provide an all new 100mm diameter dedicated SW drain, discharging to the existing 225 diameter SW sewer located in the Public Open Space across Willbrook Park (Road).

Sustainable Urban Drainage Systems (SUDS) in the form of a soakaway and/or sedum green roof have been considered unsuitable for this site, due to

- the limitations of the site area not providing sufficient mandatory offset distances (5m from foundations and 3m from boundaries and foul sewer wayleave); and
- proposed pitched roof structure.

Limited SUDS application is to be through the provision permeable hydropaving to the vehicle driveway, water butts on all rainwater downpipes and the provision of an Aquacell SW attenuation tank, providing sufficient attenuation to store the 100-year return storm with an additional allowance of 20% for climate change prior to discharge. Discharge is to be limited through the use of a hydrobrake in the final manhole, discharge is to be limited to 1.2 l/s.

Please refer to the attached attenuation related calculations and details for full details of the attenuation proposal. The hydrobrake has been limited to 1.2 l/s, based on a 0.8m head and hydrobrake orifice diameter of 50mm.

All new surface water drains shall be 100mm diameter uPVC at minimum gradient of 1:60/1:80, unless otherwise noted, and are designed and to be installed in accordance with Building Regulations 2010 and the Greater Dublin Regional Code of Practice for Drainage Work. All drainage works shall be in accordance with the requirements of South Dublin County Council.

Refer to drawing no. 500-22A-C01, for further clarity.

4.0 Water Connection

It is proposed to retain the existing service connection, including Irish Water compliant boundary box, feeding from the existing 100mm Cast Iron watermain located in the footpath of Ballyboden Road and Willbrook Park.

References: Building Regulations 2010, Part H, Drainage and Wastewater disposal
Greater Dublin Regional Code of Practice for Drainage Works
Greater Dublin Strategic Drainage Study
Irish Water 'Water Code of Practice'; and
Irish Water 'Waste-water Code of Practice'.

Irish Water Web Map

UISCE ÉIREANN · IRISH WATER

Print Date: 16/12/2021

Printed by: Irish Water

Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other Unknown

Sewer Fittings
- Vent/Col
- Other Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks
ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

DOCCTV

Job #29706

Status: Invoiced

Assigned to:
Ian Buckley
0867802801
867802801
ian.buckley@greenday.ie

Client:
Alan Walsh
27 ballyboden road
rathfarnham
D14PW73

Cat and mouse to trace drain that runs across the garden for planning permission and try figure out the depth as well , manhole is out the front , quoted €150 plus vat for the work, arrive between 3 and 5

Summary

Description	Amount	Tax	Total
Parts	152.48	35.07	187.55
		Subtotal	**187.55**
		Less: Payments	0.00
		Total	**187.55**

Parts

Date	Description	Quantity	Price	Tax	Amount
11-01-2022 08:23	DOCCTV:Domestic CCTV	1.00 units	152.48	23.00%	152.48
				Subtotal	**152.48**
				Total Tax	35.07
				Total	**187.55**

Notes

Date	Description	Attachment
11-01-2022 14:55	On site 14:55	-
11-01-2022 15:09	Manhole where mouse will be sent down	1641913803098.png
11-01-2022 15:35	On site 3.15pm to 4.15pm	-
	Cat and mouse to locate the 225mm foul drain from the manhole in the lane.	
	Alan paid nathan by cc.	
	Can we send alan the job card	

11-01-2022 15:37	Camera set up	1641915443729.png
11-01-2022 15:58	Council main is 3.2m from the front of the house and 1.5m deep	1641916758288.png

Attachment 1641913803098.png

Manhole where mouse will be sent down

Attachment 1641915443729.png

Camera set up

Attachment 1641916758288.png

Council main is 3.2m from the front of the house and 1.8m deep

https://share.icloud.com/photos/0KT484eoP0yUJAwlARm-AKsmQ

https://share.icloud.com/photos/0KT484eoP0yUJAwlARm-AKsmQ

Storm Water Attenuation Calculations

Total Site Area = 425 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof	tiles	98	90	88.2
Equivalent impermeable area:				**88.2**

Greenfield runoff rate (Qbar) = 0.24 l/s (HR Wallingford)
However, reference to GDSDS 6.8.2.3 recommends a minimum throttle size of 50mm for private developments, based on this and a maximum head achievable in the attenuation tank of 1m, the maximum Permissible outflow = **1.2 l/s** (Hydro Int.)

100 year storm

Permissible Volume (l)= Actual Achievable Outflow (l/s) x time (s)

Actual Volume (l)= (Equivalent Impermeable Area x depth of rainfall)

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	29.8	1080.00	2628.36	1548.36
30	36.9	2160.00	3254.58	1094.58
60	45.6	4320.00	4021.92	-298.08
120	56.4	8640.00	4974.48	-3665.52
240	69.7	17280.00	6147.54	-11132.46
360	78.9	25920.00	6958.98	-18961.02
720	97.6	51840.00	8608.32	-43231.68
1440	120.7	103680.00	10645.74	-93034.26
2880	135.1	207360.00	11915.82	-195444.18

Site specific, Met Eireann

From table above, required storage volume is 1.55 m^3
Allow 20% for climate change, volume required = 1.86 m^3

Hydrobrake discharge = 1.20 l/s

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 314084, Northing: 228028,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.9,	4.6,	5.6,	6.4,	6.9,	8.9,	11.1,	12.6,	14.7,	16.7,	18.2,	20.6,	22.5,	24.0,	N/A ,
10 mins	3.7,	5.4,	6.4,	7.9,	8.9,	9.7,	12.3,	15.4,	17.5,	20.5,	23.2,	25.4,	28.7,	31.3,	33.5,	N/A ,
15 mins	4.3,	6.4,	7.5,	9.2,	10.4,	11.4,	14.5,	18.2,	20.6,	24.2,	27.3,	29.8,	33.7,	36.8,	39.4,	N/A ,
30 mins	5.7,	8.3,	9.7,	11.9,	13.4,	14.5,	18.4,	22.9,	25.8,	30.1,	33.9,	36.9,	41.5,	45.2,	48.2,	N/A ,
1 hours	7.6,	10.8,	12.6,	15.3,	17.2,	18.6,	23.3,	28.8,	32.4,	37.5,	42.1,	45.6,	51.1,	55.5,	59.0,	N/A ,
2 hours	10.0,	14.1,	16.4,	19.7,	22.0,	23.8,	29.6,	36.2,	40.5,	46.7,	52.1,	56.4,	63.0,	68.1,	72.3,	N/A ,
3 hours	11.8,	16.5,	19.1,	22.9,	25.4,	27.4,	34.0,	41.4,	46.2,	53.1,	59.1,	63.8,	71.1,	76.7,	81.4,	N/A ,
4 hours	13.2,	18.4,	21.2,	25.4,	28.2,	30.4,	37.5,	45.5,	50.7,	58.1,	64.7,	69.7,	77.5,	83.5,	88.5,	N/A ,
6 hours	15.5,	21.5,	24.7,	29.4,	32.6,	35.1,	43.1,	52.0,	57.9,	66.1,	73.3,	78.9,	87.5,	94.2,	99.7,	N/A ,
9 hours	18.3,	25.1,	28.8,	34.1,	37.7,	40.5,	49.5,	59.5,	66.0,	75.1,	83.2,	89.4,	98.9,	106.2,	112.2,	N/A ,
12 hours	20.5,	28.1,	32.0,	37.9,	41.8,	44.8,	54.6,	65.4,	72.5,	82.3,	90.9,	97.6,	107.8,	115.6,	122.0,	N/A ,
18 hours	24.2,	32.8,	37.3,	43.9,	48.4,	51.8,	62.7,	74.8,	82.7,	93.6,	103.1,	110.5,	121.7,	130.3,	137.4,	N/A ,
24 hours	27.2,	36.6,	41.6,	48.8,	53.6,	57.3,	69.2,	82.3,	90.8,	102.5,	112.8,	120.7,	132.7,	141.9,	149.4,	175.6,
2 days	33.8,	44.7,	50.2,	58.3,	63.6,	67.7,	80.6,	94.7,	103.7,	116.1,	126.9,	135.1,	147.5,	157.0,	164.8,	191.4,
3 days	39.3,	51.2,	57.2,	66.0,	71.7,	76.1,	89.9,	104.8,	114.4,	127.4,	138.7,	147.2,	160.1,	169.9,	178.0,	205.3,
4 days	44.0,	56.8,	63.3,	72.7,	78.8,	83.4,	98.0,	113.7,	123.7,	137.2,	149.0,	157.8,	171.2,	181.3,	189.6,	217.7,
6 days	52.3,	66.7,	74.0,	84.3,	91.0,	96.1,	112.0,	129.0,	139.8,	154.3,	166.8,	176.3,	190.4,	201.1,	209.8,	239.3,
8 days	59.7,	75.4,	83.3,	94.5,	101.7,	107.2,	124.3,	142.4,	153.8,	169.2,	182.4,	192.3,	207.2,	218.4,	227.5,	258.2,
10 days	66.4,	83.4,	91.8,	103.8,	111.5,	117.3,	135.4,	154.5,	166.5,	182.6,	196.4,	206.8,	222.3,	234.0,	243.4,	275.3,
12 days	72.7,	90.8,	99.7,	112.4,	120.5,	126.6,	145.6,	165.7,	178.2,	195.0,	209.4,	220.2,	236.2,	248.3,	258.1,	291.0,
16 days	84.4,	104.4,	114.3,	128.2,	137.1,	143.8,	164.4,	186.0,	199.5,	217.6,	233.0,	244.5,	261.6,	274.4,	284.8,	319.5,
20 days	95.2,	117.0,	127.7,	142.7,	152.3,	159.4,	181.5,	204.6,	218.9,	238.1,	254.4,	266.5,	284.5,	298.0,	308.9,	345.3,
25 days	107.9,	131.7,	143.3,	159.5,	169.8,	177.6,	201.3,	226.0,	241.3,	261.7,	278.9,	291.8,	310.8,	325.1,	336.5,	374.8,

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

HR Wallingford

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Alan Manthe
Site name:	27 Ballyboden Road
Site location:	Dublin 14

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.29050° N
Longitude:	6.28969° W
Reference:	1024125684
Date:	Jan 21 2022 02:41

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics	Default	Edited
SAAR (mm):	870	870
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.86	2.86

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	0.24	0.24
1 in 1 year (l/s):	0.2	0.2
1 in 30 years (l/s):	0.5	0.5
1 in 100 year (l/s):	0.61	0.61
1 in 200 years (l/s):	0.67	0.67

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.800	1.200
Flush-Flo™	0.238	1.168
Kick-Flo®	0.482	0.958
Mean Flow		1.038

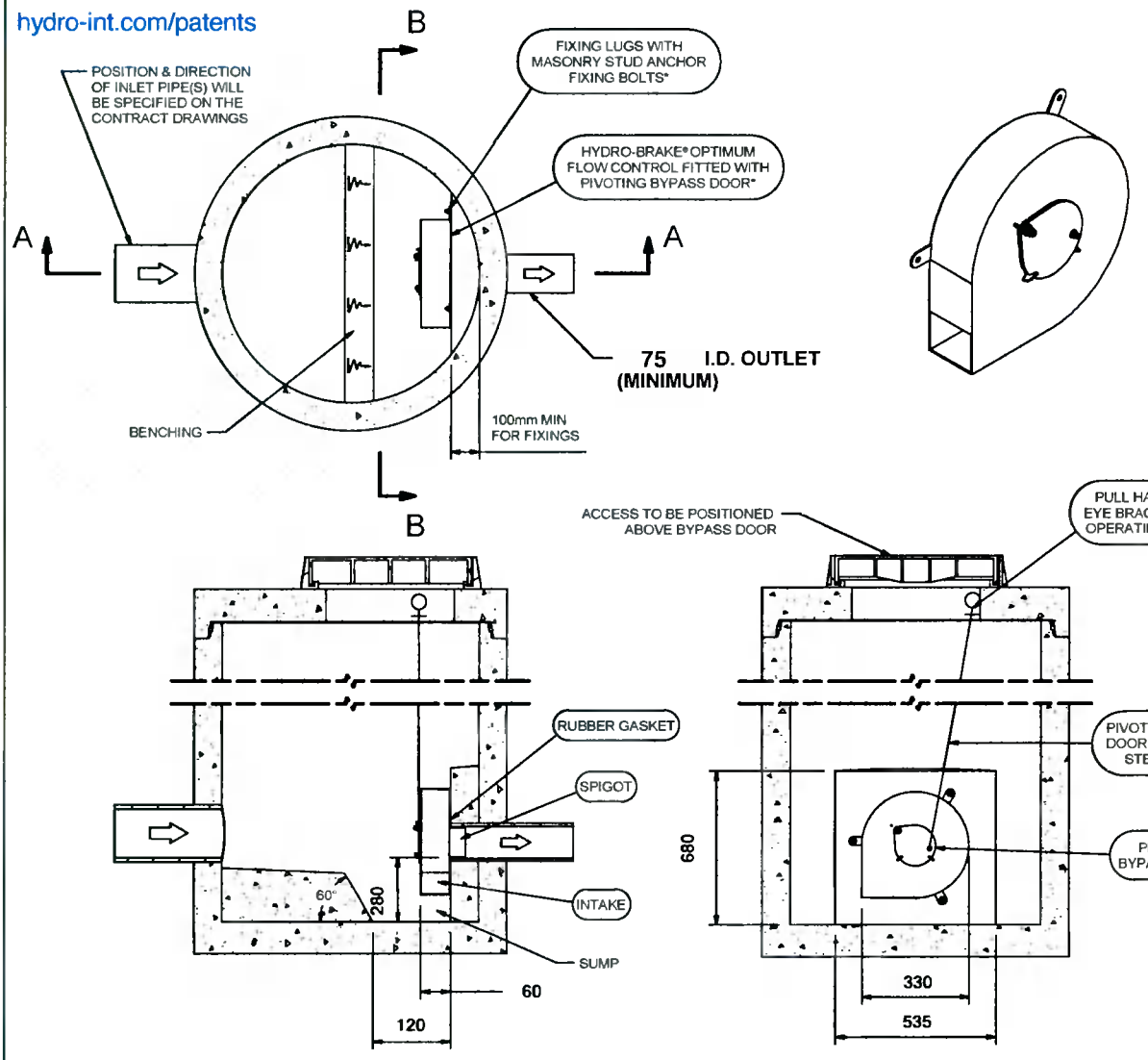
Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4598

WRc Approved PT/329/0412

hydro-int.com/patents



SECTION A-A

SECTION B-B

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® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

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

DESIGN ADVICE !

The head/flow characteristics of this SHE-0054-1200-0800-1200 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®

DATE	1/24/2022 2:14 PM
SITE	27 Ballyboden Road
DESIGNER	Alan Manthe
REF	500-22A

SHE-0054-1200-0800-1200
Hydro-Brake® Optimum

alanmanthe@campus.ie

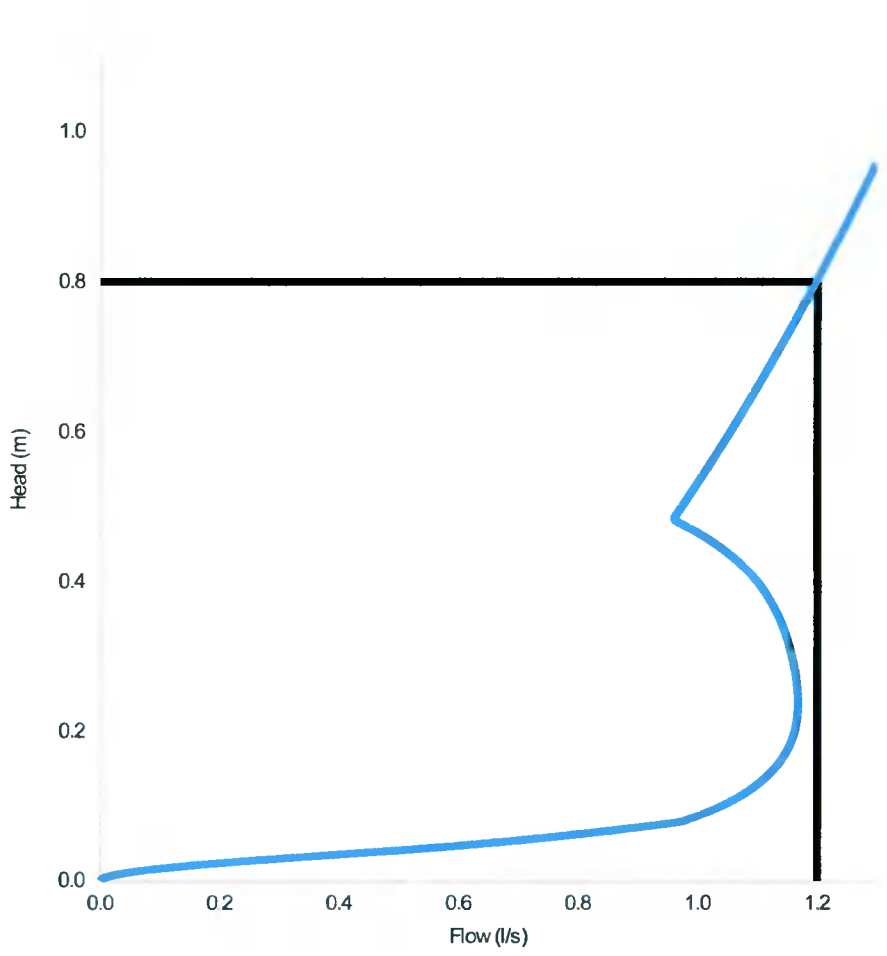
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.800	1.200
Flush-Flo	0.238	1.168
Kick-Flo®	0.482	0.958
Mean Flow		1.038

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.028	0.265
0.055	0.715
0.083	0.986
0.110	1.063
0.138	1.113
0.166	1.143
0.193	1.159
0.221	1.167
0.248	1.167
0.276	1.164
0.303	1.156
0.331	1.146
0.359	1.132
0.386	1.112
0.414	1.084
0.441	1.046
0.469	0.992
0.497	0.970
0.524	0.993
0.552	1.016
0.579	1.038
0.607	1.060
0.634	1.081
0.662	1.101
0.690	1.121
0.717	1.141
0.745	1.160
0.772	1.179
0.800	1.198

DESIGN ADVICE

The head/flow characteristics of this SHE-0054-1200-0800-1200 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

DATE	24/01/2022 14:14
Site	27 Ballyboden Road
DESIGNER	Alan Manthe
Ref	500-22A

SHE-0054-1200-0800-1200

Hydro-Brake Optimum®

Overview
AquaCell Systems

AquaCell units are a fully tried and tested modular technique for managing excessive rainfall. Units are assembled to create an underground structure as either a temporary storage tank or soakaway.

Continuing urban development, a changing climate and the consequences of intensified rainfall: all are increasingly prominent issues on the political and environmental agenda.

In combination, they represent a complex need for the most intelligent, effective Stormwater Management solutions possible.

There are 4 types of unit:

AquaCell Eco

AquaCell Eco is manufactured from specially reformulated, recycled material and has been designed for shallow, non-trafficked, landscaped applications (see page 6).

AquaCell Prime

AquaCell Prime is manufactured from specially reformulated, recycled material. It is ideal for use in both shallow and deep applications, subject to either regular traffic loading – such as car parks (for vehicles up to 12 tonnes) – or for landscaped areas (see page 7).

AquaCell Core

AquaCell Core has been designed for use in deep applications, subject to both regular and heavy traffic loadings, such as cars and HGV's (for vehicles up to 44 tonnes) – (see page 8).

AquaCell Plus

AquaCell Plus has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas (for vehicles up to 44 tonnes) (see page 9).

For quick, versatile assembly

The lightweight polypropylene, high void units are securely linked together using special clips and shear connectors.

They can be assembled quickly on site into whatever configuration suits each specific location.

AquaCell geocellular systems also allow 'brick-bonding', which can give extra stability, without the need for additional connector pieces. See Installation Guidance page 12.

Wrapped for infiltration or storage

The complete assembly is wrapped in either geotextile sheet or a geomembrane:

For **pervious** soils, the geotextile option allows infiltration of stormwater into the surrounding ground.

For **impervious** ground (e.g. clay) or where infiltration is not desirable, the geomembrane holds stormwater in temporary storage until local drainage flows can accept it for normal disposal.

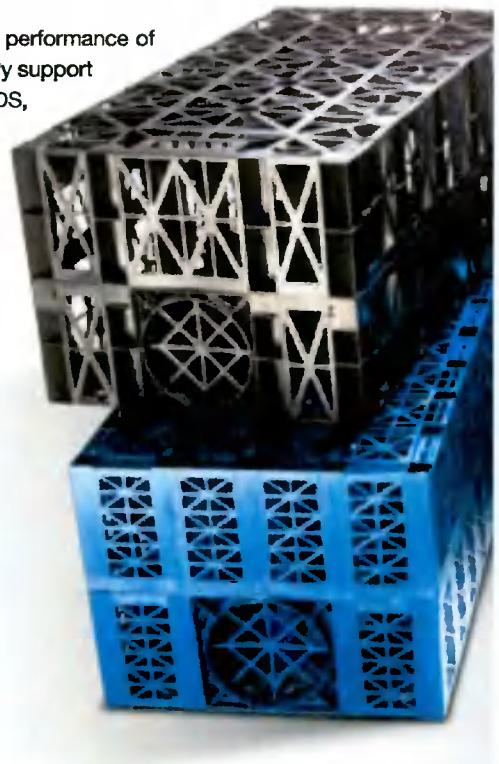
Benefiting community and environment

AquaCell units contribute the following benefits:

- Significantly reduced flooding risk
- Controlled, reduced-volume release of stormwater into existing sewer systems or watercourses
- Recharging of local groundwater (if infiltration/soakaway application)
- Aerobic purification to improve water run-off quality
- Sustainable, cost effective management of the water environment

Helping SUDS and planning approval

The proven qualities and performance of AquaCell systems not only support the achievement of SUDS, they can also help reinforce and enhance planning applications, and enable development to proceed.



CONNECT TO BETTER

Types of connections

There are a number of ways to provide a controlled feed into the AquaCell units to suit the required flow capacity.

These being:

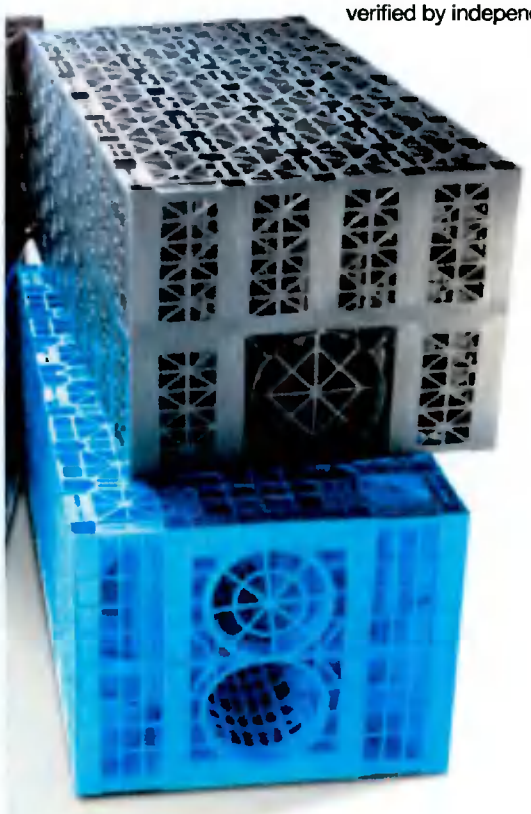
1. Manifold Configuration – this configuration utilizes standard pipe and fittings (see page 20)
2. Box Configuration – this configuration utilizes the AquaCell units (see page 20)
3. Central Pipe Configuration – this configuration utilizes standard perforated TwinWall pipe and fittings (see page 20)

Box systems – select with care

Rising rainfall levels, and increased focus on SUDS compliance, have led to a sharp increase in the use of modular units to create underground structures for infiltration or, temporary storage of stormwater.

However, not all currently available systems have the proven performance characteristics necessary for the wide range of complex underground geocellular applications.

The Wavin range of AquaCell units however provide peace of mind since, all strength and hydraulic capabilities have been verified by independent testing.



Acceptance – British Board of Agrément

The AquaCell Infiltration and Attenuation units; Eco, Prime, Core and Plus have all been awarded British Board of Agrément approval under Certificate No. 03/4018.

The certificate covers the design data, technical specification, installation and maintenance aspects for each unit as follows:

AquaCell Eco

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 4

AquaCell Prime

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 5

AquaCell Core

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 1

AquaCell Plus

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 3

AquaCell features

The following AquaCell features are applicable to all units:

- Suitable for use when constructing either a soakaway or storage tank
- Modular, lightweight and versatile
- 95% void: holds 190 litres of water per unit
- Safer option than open or above ground storage structures
- Easy to handle and install
- Proven clip and peg system to secure units
- Allows "brickbonding" assembly for extra stability
- Full range of ancillaries including, silt traps and adaptors
- AquaCell units can be "mixed and matched" together (see pages 11-14 for details)

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Design Guidance
AquaCell Units

Hydraulic and structural design

All AquaCell units have identical dimensions: 1m x 0.4m x 0.5m, with a nominal void ratio of 95%. Hydraulic calculations are accordingly the same for AquaCell Eco, Prime, Core and Plus.

Structural design however, requires careful consideration of loading factors specific to each location – see CIRIA C680.

Location type	Minimum cover depth			
	AquaCell Eco	AquaCell Prime	AquaCell Core	AquaCell Plus
Landscaped/non-trafficked areas	0.3m[b]	0.3m[b]	0.3m[b]	0.3m[b]
Car parks, vehicle up to 12000 kg[a] gross mass	n/a	0.71m	0.75m	0.75m
HA/HGV loading [a]	n/a	n/a	1.2m	1.1m
Maximum depth to base of unit (Landscaped)	1.5m	3.7m	4.25m[c]	5.08m
Maximum depth to base of unit (Trafficked)	n/a	3.45m	4.1m	4.78m

(a) For specific advice on cover depths for heavier loadings/HGV applications, contact Wavin Technical Design on 0844 856 5161.

(b) 0.3 is minimum depth for AquaCell Eco, although 0.5m cover is recommended to prevent accidental damage. If construction plant is to be used on site, extra protection may be needed.

(c) Allowable maximum depth to base of bottom layer of units is dependent on soil type, angle of shearing resistance, loadings, and groundwater level. The above depths are based on 38° angle of shearing resistance and no groundwater.

Installation and cover depths

After deciding which AquaCell unit is correct for the project location (using the System Selector on page 5), see Table for the recommended maximum installation depths and minimum cover depths.

The diagram also shows the depth parameters for each unit, and so gives guidance on combining two or more of the AquaCell units.

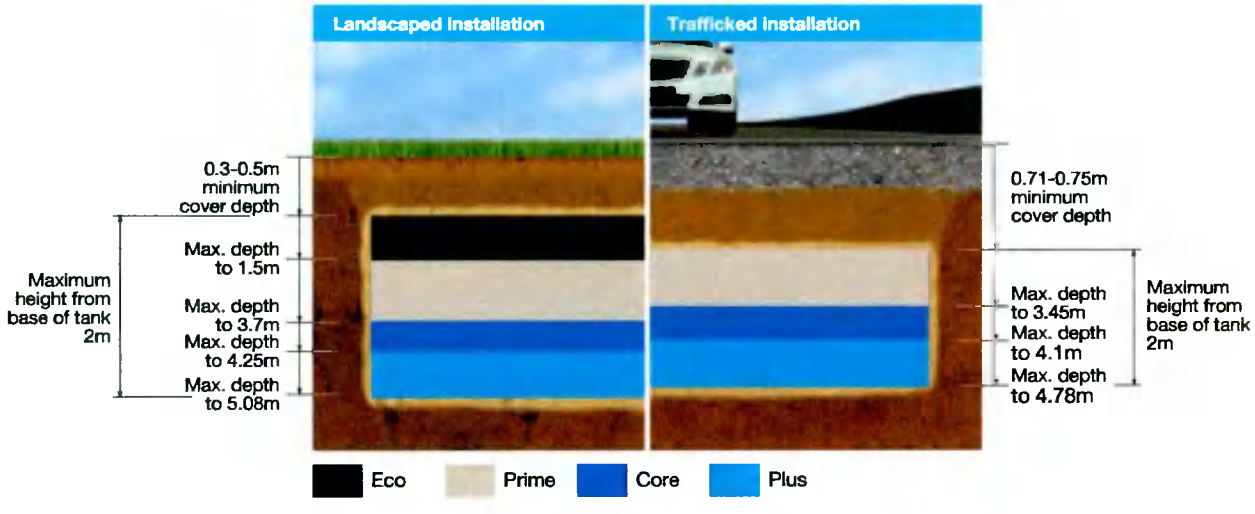
AquaCell systems: Installation depths

Each AquaCell unit has been designed to have specific loading capacities (see pages 6-10) that define the maximum depth parameters for which they are suitable.

Minimum depth of cover varies according to whether or not the installation will be subject to trafficking by cars/HGVs. In each case, the cover depths shown in the diagram include both absolute minimum and recommended minimum cover depths.

However, in some situations, installations may have to be located with greater cover depths. Reasons may include:

- Deep-running drainage network
- Other buried services running above tank location
- Installation into banked/ sloping ground
- Upper layer of clay preventing infiltration



Mixing AquaCell units together