MOLONY MILLAR
Consulting Civil and Structural Engineers

ENGINEERING REPORT

FOR

DEVELOPMENT OF AN APARTMENT BUILDING

AT

BALL ALLEY HOUSE, LEIXLIP ROAD, LUCAN, CO. DUBLIN

PROJECT NUMBER: 930-344				Document Ref: Engineering Report		
Revision	Description & Rationale	Originated	Date	Checked	Date	Date
-	Progress	RG	20.06.2021	AM	20.06.2021	
A	Planning	RG	30.06.2021	AM	30.06.2021	30.06.2021

Architect: CDP Architecture
Client: Gerry Teague

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APPENDICES

1 INTRODUCTION

1.1 General Description

The subject site is known as Ball Alley House, a protected structure with an extended car parking area to the rear. The site is bounded by Leixlip Road (R835) to the north, No. 1 & 2 Leixlip Road, Semi-detached housing and No. 19 & 21 Ardeevin Drive, Semi-detached housing, to the west, Ardfield House and terraced housing to the east and Ardeevin Drive with 20/22 Ardeevin Drive, Semi-detached housing to the south.

It is proposed to develop the car parking area and existing access drive to provide a 14 no. apartment building new parking access road and associated facilities.

1.2 Scope of this Report

This report describes the proposed civil engineering infrastructure for the development and how it connects to the existing infrastructure serving the area. In particular, Foul and Surface Water Drainage and Water supply aspects are considered. This report should be read in conjunction with the following drawings submitted with the Planning Application:

930-344-C01 Access & Parking Layout Plan;

930-344-C02 Surface Water & Foul Drainage Layout Plan;

930-344-C03 Watermain Layout Plan;

930-344-C04 Road Longitudinal Section, Typical Sections & Details;

930-344-C05 Surface Water Attenuation Related Details; and

930-344-C06 Foul & SW Drain and Sewer Longitudinal Sections.

2 ACCESS AND ROADS

2.1 General

It is proposed to retain the existing access point to the site from the Leixlip Road. Adequate kerb radii, entry treatment and pedestrian facilities are to be provided at the junction.

Road junction visibility requirements comply with the Design Manual for Urban Roads and Streets (DMURS). As per table 4.2 of DMURS, the required sightline at a setback of 2.4m is 49m (for 50km/h on a Bus Route).

Drawing no. 930-344 C01, Access & Parking Layout Plan, shows the layout of the access road/ parking serving the development.

2.2 Design of Roads / Access

The existing access junction and access road, adjacent to Ball Alley House, is to be retained as a shared surface comprising existing macadam surfacing.

Clear sight distances in accordance with DMURS of 49 x 2.4m for 50 km/h road on a bus route for the existing entrance is shown on Molony Millar drawing no. 930-344-C01.

New parking to the north of the proposed apartment building comprises a parking aisle of width 6m with parallel parking bays either side. 6 No. existing parking bays adjoining Ball Alley House are to be retained with 8 No. new permeable paving parking bays constructed on the southern side of the aisle.

A further 5 parking bays and 1 disable parking bay to be constructed as permeable parking bays on Ardeevin Drive to the south of the proposed apartment building.

All has been designed taking cognisance of DMURS and the local authority requirements. Refer to drawing no. 930-344 C01 for the Proposed Road Layout and drawing no. 930-344 C04 for sections and details indicating proposed construction. The proposed pavement design is based on 5% CBR, which would need to be confirmed by a geotechnical investigation prior to detailed design stage.

3 SURFACE WATER DRAINAGE SYSTEM

3.1 Existing Surface Water Infrastructure

The site is served by a network of existing surface water (SW) sewers – see layout of existing drainage infrastructure in Appendix I for clarity. An existing 225mm diameter SW sewer flows eastwards on Leixlip Road., while an existing 225mm diameter SW sewer, at higher level, flows westwards on Ardeevin Drive.

3.2 Proposed Site Surface Water Drainage System

It is proposed to discharge surface water (SW) run-off from the site (after interception and attenuation – see Section 3.3 below) to the existing stormwater sewer to the north of the site.

Run-off from the 442 m^2 roofs will drain into the surface water attenuation tank, along with 596 m^2 area of access road aisle and 92 m^2 parking bays and 420 m^2 area of paved and landscaped area.

The attenuation tank will be formed as a Stormtech DC-780 arched tank below ground, to the north of the apartment building in the landscaped public open space. The gravity outfall from the tank will be controlled by a Hydrobrake (max. flow of 1.43 l/s; equivalent green-field site discharge) and will flow to the existing SW sewer, on Leixlip Road.

It is proposed to construct all new car parking bays as permeable paving parking bays (with macadam aisle). Note that the area of the parking bays has been included in the under-ground attenuation volume, to cater for the unknown infiltration rate of the sub soil.

Refer to Molony and Millar Drawings 930-344-C02, 930-344-C05 & 930-344-C06 and Appendix III for SW pipe design calculations.

3.3 Compliance with the Principles of Sustainable Urban Drainage Systems

Currently, the surface water run-off from this site, which is practically entirely covered in impermeable areas, discharges un-attenuated flow to the SW sewer system serving the area. In order to both reduce and attenuate the flow; the proposed development will be designed in accordance with the principles of Sustainable Urban Drainage Systems (SUDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization by replicating the run-off characteristics of a greenfield site. The criteria provide a consistent approach to addressing both rate and volume of run-off as well as ensuring the environment is protected from pollution that is washed off roads and buildings.

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

- Interception storage;
- Treatment storage (not required if interception storage is provided);
- Attenuation storage;
- Long term storage (not required if growth factors are not applied to Q_{bar} when designing attenuation storage).

In the case of the subject site, interception storage will be provided, and a 20% climate change factor will be applied to the allowable discharge for the 100-year event. This means that both treatment storage and long-term storage are not required.

3.3.1 Interception Storage

Interception storage is catered for as follows:

- Sedum Green Roof; and
- Permeable Paving – All surface car parking is to comprise a full infiltration system with permeable paving car parking spaces and macadam aisles. Permeable paving has been designed to provide attenuation for the 100-year event (+20% climate change).

  In addition, as described in section 2.2, it is proposed to provide a conventional gulley and piped system to cater for excess run-off from the permeable paving system, which may not infiltrate timeously. A Klargester petrol by-pass interceptor is proposed to deal with any fuel related pollutants emanating from these parking bays.

3.3.2 Attenuation Storage

Attenuation storage will be provided by a Stromtech DC-780 arched tank system, located below ground level, to the north of the apartment building in the landscaped public open space.

Equivalent Greenfield runoff for the site (Q_{bar}) has been calculated as 1.43 l/s. Refer to appendix IV, HR Wallingford Greenfield runoff estimation for sites.

Because long term storage is not provided, the limiting value is used for the 100-year storm without growth factors being applied. The Calculations in Appendix III shows that for a 100-year return storm (+ 20% for climate change), a minimum volume of 45 m^3 is required when applying a constant maximum discharge of 1.43 l/s.

A tank of 48 m^3 has been proposed with a maximum depth of water in the tank = 0.91 m approximately.

4 FOUL DRAINAGE SYSTEM

4.1 Existing Foul Sewer Infrastructure

The existing site is served by a 225mm diameter foul sewer flowing eastwards, on Leixlip Road and a 150/225mm diameter foul sewer flowing westwards on Ardeevin Drive.

The proposed point of discharge is to the proposed foul manhole F1 on Leixlip Road.

See layout of existing drainage infrastructure in Appendix I for further clarity.

4.2 Proposed Foul Sewer System

Foul stacks in internal service shafts serving the units will feed into the foul drain system shown on drawing 930-344-C02.

The fully occupied proposed foul effluent estimate is calculated as follows:

Apartments:

No. of individual living units = 14

Say 14 x 405 l/unit/day = 5,250 l/day (assuming 2.7 PE/unit @ 150 l/p/d)

Total: WW Flow = **5,670 l/day**

Peak Flow = $\frac{6 \times 5{,}670}{24 \times 60 \times 60}$ = 0.4 l/s

<u>Foul Sewer Network Pipe Sizes</u>

Refer to attached Foul Sewer calculations in Appendix II.

5. WATER SUPPLY

5.1 Existing Watermain Infrastructure

An existing 6-inch Cast Iron watermain is located along the site frontage on Leixlip Road, with a 100mm diameter uPVC located on Ardeevin Drive to the rear of the site – see Irish Water Records contained in Appendix I of this report.

5.2 Proposed Watermain Connection

The existing service connection on Leixlip Road, serving the existing Ball Alley House, is to be retained. A 100mm diameter MDPE looped Watermain is proposed to tee off of the existing watermain on Leixlip Road (with associated sluice valves). This will serve the existing retained structures and the new nursing home building. It is proposed to provide a new 100mm diameter MDPE watermain, in order to provide a new fire hydrant on site and service connection for the apartment block.

The apartment block is to be provided with a manifold system feeding each individual unit.

The hydrant has been located on the new looped main, ensuring that no part of any building is further than 46m from the hydrant.

The water demand for the entire development is 5.67 m^3 (5,670 l/day) equivalent to the calculated total foul effluent discharge in Section 4.2 above.

APPENDIX I

RECORDS OF EXISTING SERVICES

APPENDIX II

FOUL DRAIN AND SEWER DESIGN CALCULATIONS

Self cleansing velocity when flowing half full: 0.75 to 3 m/s

Pipe Roughness Co-efficient (K_s): 0.6 for <420 Discharge Units (Intermittent Flow)
1.5 for >420 Discharge Units (Constant Flow)

References:
Code of Practice for Wastewater Infrastructure, Irish Water, 2017
Recommendations for Site Development Works, D.O.E. Nov. 1998
BS8301:1985, Table 4, 7.4.4.1
BS8301:1985, Table 4, 7.4.4.1

Pipe Run	Pipe Gradient	Pipe Diameter	Discharge Units for segment	Accumulative Discharge units	Actual Peak		Full Bore		Proportional flow	Discharge Velocity	Proportional Depth
					Flow Q	Velocity v	Flow Q_p	Velocity v_p	Q/Q_p		
	1 in	mm	units	units	l/s	m/s	l/s	m/s	OK?	OK?	OK?
Faj1-Faj2	75	150	196	196	4.596	0.940	20.495	1.160	YES	YES	YES
Faj2-F1	30	150	0	196	4.596	1.311	32.553	1.842	YES	YES	YES
F1-F2	30	150	0	196	4.596	1.311	32.553	1.842	YES	YES	YES
F2-F3	100	225	0	196	4.596	0.812	51.886	1.305	YES	YES	YES
F3-F4	30	225	0	196	4.596	1.246	95.205	2.394	YES	YES	YES

14 Units allowed per apartment

Prepared by: A. Manthe

APPENDIX III

SURFACE WATER DRAIN AND SEWER DESIGN CALCULATIONS

Rainfall Intensity (i) roof =	75	mm/hr	*RSDW, DOE, 1998, 3.4*
Rainfall Intensity (i) paved =	50	mm/hr	*RSDW, DOE, 1998, 3.4*
Storm Return Period =	5	years	*RSDW, DOE, 1998, Table 3.1*
Self cleansing Velocity =	0.8-3	m/s	*RSDW, DOE, 1998, 3.4*
Roof Vol. run-off coeffiecient (Cv) =		0.9	
Paved Vol. run-off coeffiecient (Cv) =		0.8	
Pipe Roughness K_s =	0.6	mm	*BS8301:1985, 7.4.4.1 Hydraulic Roughness*

Design calculations: Q = A_p x i x Cr x Cv x 2.78

Routing coefficient (Cr) = 1.0

Total Roof Area = 422.0 m^2

Qmax = 16.5 l/s

Total Paved Area = 771.0 m^2

Pipe No.	Impermeable Area (A_p)		Gradient	Diameter	Actual Rate of Flow	Accumulative Rate of Flow	Discharge Velocity	Capacity Full bore flow	Full Bore Velocity	Proportional flow	Discharge Velocity	Proportional Depth
	Roof (A_{p1})	Paved (A_{p2})			Q	Q_t	v	Q_p	v_p	Q/Q_p		
P	m^2	m^2	1 in	mm	l/s	l/s	m/s	l/s	m/s	OK?	OK?	OK?
Saj1-Saj2	0	45	40	100	0.5	0.5	0.65	9.585	1.220	YES	ncrease Velocit	YES
Saj2-Saj3	0	27	60	100	0.3	0.8	0.65	7.806	0.994	YES	ncrease Velocit	YES
Saj3-S1	370	0	60	150	6.9	7.7	1.17	22.944	1.298	YES	YES	YES
S1-S3	0	0	185	150	0.0	9.9	0.81	12.961	0.733	YES	YES	YES
S3-S4	0	0	185	225	0.0	9.9	0.81	38.000	0.956	YES	YES	YES
S4-S5a	0	70	200	225	0.8	14.5	0.87	36.526	0.919	YES	YES	YES
S5a-S5	0	175	200	225	1.9	16.5	0.90	36.526	0.919	YES	YES	YES
S5-S6	0	0	200	225	0.0	16.5	0.90	36.526	0.919	YES	YES	YES
Saj4-S2	52	50	50	100	1.5	1.5	0.83	8.561	1.090	YES	YES	YES
S2-S1	0	56	30	150	0.6	2.2	1.05	32.553	1.842	YES	YES	YES
Saj3-S1	0	0	30	150	0.0	2.2	1.05	32.553	1.842	YES	YES	YES
S7-S4	0	348	90	225	3.9	3.9	0.80	54.723	1.376	YES	YES	YES

APPENDIX IV

SURFACE WATER ATTENUATION CALCULATIONS

Storm Water Attenuation Calculations

Total Site Area = 1613 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof	concrete/sedam	422	90	379.8
Access Road & Footpaths	macadam/paving	596	80	476.8
Parking bays	permeable paviors	92	60	55.2
Landscaped Areas	landscaping	420	0	0.0
Equivalent impermeable area:				**911.8**

Permissible outflow = **1.43 l/s** (Qbar)

30 year storm

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

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

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	18.7	1287.00	17050.66	15763.66
30	23.4	2574.00	21336.12	18762.12
60	29.3	5148.00	26715.74	21567.74
120	36.7	10296.00	33463.06	23167.06
240	46	20592.00	41942.80	21350.80
360	52.4	30888.00	47778.32	16890.32
720	65.7	61776.00	59905.26	-1870.74
1440	82.2	123552.00	74949.96	-48602.04
2880	92.6	247104.00	84432.68	-162671.32

Site specific, Met Eireann

From table above, required storage volume is 23.17 m^3
However since there is no practical area on site to store the excess / overflow from the 1:30 year storm (GDSDS), the tank will be sized to cater for the 1:100 year storm.

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	27.2	1287.00	24800.96	23513.96
30	33.6	2574.00	30636.48	28062.48
60	41.6	5148.00	37930.88	32782.88
120	51.4	10296.00	46866.52	36570.52
240	63.6	20592.00	57990.48	37398.48
360	72	30888.00	65649.60	34761.60
720	82.8	61776.00	75497.04	13721.04
1440	110	123552.00	100298.00	-23254.00
2880	120.7	247104.00	110054.26	-137049.74

Site specific, Met Eireann

From table above, required storage volume is 37.40 m^3
Allow 20% for climate change, volume required = 44.88 m^3

Hydrobrake discharge = 1.43 l/s

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

alculated by:	Alan Manthe
e name:	Ball Alley House
ite location:	Leixlip Road, Lucan

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

Site Details

Latitude:	53.35514° N
Longitude:	6.45445° W
Reference:	1265572688
Date:	Jun 22 2021 16:29

noff estimation approach

IH124

ite characteristics

al site area (ha):	0.16

thodology

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

oil characteristics

	Default	Edited
L type:	2	5
ST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.53

drological characteristics

	Default	Edited
SAAR (mm):	951	951
drological region:	12	12
owth curve factor 1 year:	0.85	0.85
rowth curve factor 30 years:	2.13	2.13
wth curve factor 100 years:	2.61	2.61
rowth 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.

reenfield runoff rates

	Default	Edited
AR (l/s):	0.42	1.43
in 1 year (l/s):	0.35	1.22
in 30 years (l/s):	0.89	3.06
100 year (l/s):	1.09	3.74
in 200 years (l/s):	1.19	4.1

his report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and e agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the nsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or tional characteristics of any drainage scheme.

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 302945, Northing: 234971,

	Interval		Years													
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.3,	3.5,	4.1,	5.0,	5.7,	6.2,	8.0,	10.0,	11.4,	13.4,	15.2,	16.6,	18.8,	20.5,	22.0,	N/A ,
10 mins	3.2,	4.8,	5.7,	7.0,	7.9,	8.7,	11.1,	14.0,	15.9,	18.7,	21.2,	23.1,	26.2,	28.6,	30.6,	N/A ,
15 mins	3.8,	5.7,	6.7,	8.3,	9.4,	10.2,	13.1,	16.4,	18.7,	21.9,	24.9,	27.2,	30.8,	33.7,	36.1,	N/A ,
30 mins	5.0,	7.4,	8.7,	10.6,	12.0,	13.1,	16.6,	20.7,	23.4,	27.3,	30.9,	33.6,	37.9,	41.3,	44.1,	N/A ,
1 hours	6.7,	9.6,	11.2,	13.7,	15.4,	16.7,	21.0,	26.0,	29.3,	34.0,	38.3,	41.6,	46.7,	50.7,	54.1,	N/A ,
2 hours	8.8,	12.6,	14.6,	17.6,	19.7,	21.3,	26.6,	32.7,	36.7,	42.4,	47.5,	51.4,	57.5,	62.3,	66.2,	N/A ,
3 hours	10.4,	14.7,	17.0,	20.4,	22.8,	24.6,	30.6,	37.4,	41.9,	48.2,	53.8,	58.2,	64.9,	70.2,	74.5,	N/A ,
4 hours	11.7,	16.4,	18.9,	22.7,	25.3,	27.3,	33.8,	41.1,	46.0,	52.8,	58.9,	63.6,	70.8,	76.4,	81.1,	N/A ,
6 hours	13.7,	19.1,	22.0,	26.3,	29.2,	31.5,	38.8,	47.0,	52.4,	60.0,	66.8,	72.0,	80.0,	86.1,	91.3,	N/A ,
9 hours	16.2,	22.3,	25.6,	30.5,	33.8,	36.3,	44.6,	53.8,	59.8,	68.2,	75.7,	81.5,	90.3,	97.1,	102.7,	N/A ,
12 hours	18.1,	25.0,	28.5,	33.9,	37.5,	40.2,	49.2,	59.1,	65.7,	74.8,	82.8,	89.0,	98.4,	105.7,	111.8,	N/A ,
18 hours	21.4,	29.1,	33.2,	39.3,	43.3,	46.4,	56.5,	67.6,	74.9,	85.0,	93.9,	100.7,	111.2,	119.2,	125.8,	N/A ,
24 hours	24.0,	32.5,	37.0,	43.6,	48.0,	51.4,	62.3,	74.4,	82.2,	93.1,	102.7,	110.0,	121.2,	129.8,	136.9,	161.4,
2 days	30.1,	39.7,	44.7,	51.9,	56.7,	60.3,	71.9,	84.5,	92.6,	103.7,	113.4,	120.7,	131.9,	140.4,	147.4,	171.3,
3 days	35.0,	45.5,	50.9,	58.6,	63.7,	67.5,	79.7,	92.8,	101.2,	112.6,	122.5,	130.0,	141.3,	149.9,	157.0,	180.9,
4 days	39.3,	50.6,	56.3,	64.4,	69.8,	73.8,	86.5,	100.1,	108.7,	120.5,	130.6,	138.3,	149.8,	158.5,	165.6,	189.7,
6 days	46.9,	59.4,	65.7,	74.6,	80.3,	84.7,	98.3,	112.7,	121.8,	134.1,	144.7,	152.6,	164.5,	173.5,	180.8,	205.4,
8 days	53.6,	67.2,	73.9,	83.5,	89.6,	94.2,	108.6,	123.7,	133.2,	146.0,	157.0,	165.2,	177.4,	186.6,	194.1,	219.2,
10 days	59.8,	74.3,	81.4,	91.5,	98.0,	102.8,	117.9,	133.7,	143.5,	156.8,	168.0,	176.5,	189.0,	198.5,	206.1,	231.7,
12 days	65.6,	80.9,	88.4,	99.0,	105.7,	110.8,	126.5,	142.8,	153.0,	166.7,	178.2,	186.9,	199.8,	209.4,	217.2,	243.2,
16 days	76.3,	93.1,	101.3,	112.7,	120.0,	125.4,	142.2,	159.5,	170.3,	184.7,	196.8,	205.8,	219.2,	229.2,	237.3,	264.2,
20 days	86.3,	104.4,	113.1,	125.3,	133.0,	138.8,	156.5,	174.7,	186.0,	200.9,	213.5,	222.9,	236.8,	247.1,	255.4,	283.0,
25 days	98.0,	117.5,	126.9,	139.9,	148.1,	154.3,	172.9,	192.2,	204.0,	219.6,	232.8,	242.5,	256.9,	267.6,	276.2,	304.6,

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

User Inputs

Chamber Model:	DC-780
Outlet Control Structure:	No
Project Name:	Ball Alley
Engineer:	- -
Project Location:	
Measurement Type:	Metric
Required Storage Volume:	45.00 cubic meters.
Stone Porosity:	40%
Stone Foundation Depth:	229 mm.
Stone Above Chambers:	152 mm.
Average Cover Over Chambers:	457 mm.
Design Constraint Dimensions:	(5.00 m. x 18.50 m.)

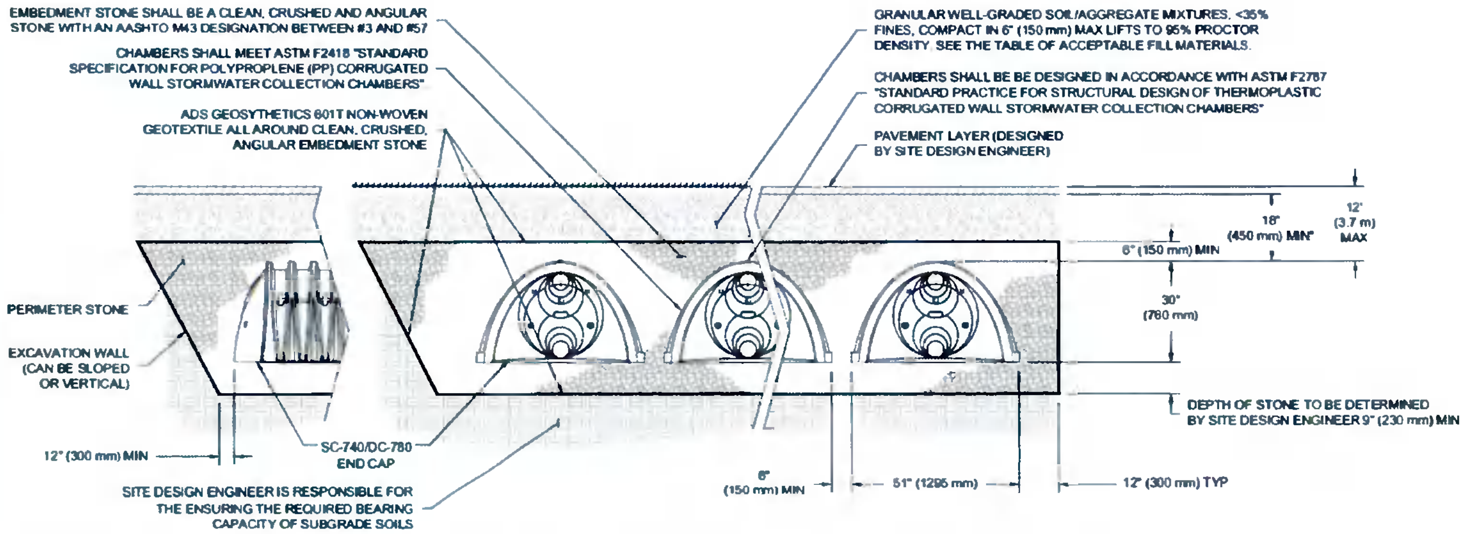
Results

System Volume and Bed Size

Installed Storage Volume:	47.73 cubic meters.
Storage Volume Per Chamber:	1.31 cubic meters.
Number of Chambers Required:	18
Number of End Caps Required:	6
Chamber Rows:	3
Maximum Length:	15.31 m.
Maximum Width:	4.80 m.
Approx. Bed Size Required:	73.50 square meters.

System Components

Amount Of Stone Required:	60.46 cubic meters
Volume of Excavation (Not Including Fill):	84.01 cubic meters



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm)

SYSTEM A - TOTAL INFILTRATION

Area / parking bay:	
Permeable Paved Car Park Area =	**11.5 m^2**
Macadam Aisle Area =	**0 m^2**

SUB-BASE THICKNESS REQUIRED FOR VEHICLE LOADINGS

Subgrade - CBR assumed min. 5%
Sub-base - Coarse graded aggregate Type 20/40 (20mm min. and 40mm max. particle size)

Loading category (Table 7):	**(2)-'CAR'; car parking bays and aisles**
Required thickness of Subbase (Table 7) =	**350 mm**

SUB-BASE THICKNESS REQUIRED FOR WATER STORAGE

r =	**Ratio of 60min to 2-day rainfalls of 5-years return period for Blessington**	**0.28**
M_5-60 =	**1 in 5 years , 60 min duration rainfall**	**16.7 mm**
CT (A) =	**1 in 100 year event (+20%)**	**380 mm**
	Table 6: Permeable sub-base thickness for infiltration system	
CT (2) =	**CT (A) * (Roof Area+Paved Area / Paved Area)**	**380 mm**

SUB-BASE THICKNESS REQUIRED = MAX CT (1) AND CT (2)	**380 mm**
Therefore Sub-base thickness =	**380 mm**

The design section is:

80 mm BLOCK PAVIOR, ON
50 mm AGGREGATE TYPE 20/40 LAYING COURSE, ON
380 mm PERMEABLE COARSE GRADED AGGREGATE TYPE 20/40 ACCORDING TO BS EN 13242:2002, ON SUBGRADE - CBR MIN. 5%

***Permeability of subgrade (k m/s) assumed to be 10^{-6} to 10^{-3} On-site infiltration tests to be undertaken to confirm actual k value prior to construction.**
***CBR to be confirmed on site prior to construction**

REFERENCES: **PERMEABLE PAVEMENTS. GUIDE TO THE DESIGN, CONSTRUCTION AND MAINTENANCE OF CONCRETE BLOCK PERMEABLE PAVEMENTS EDITION 6.**

BS 7533 13:2009

SYSTEM A - TOTAL INFILTRATION

Area / linear m:
Permeable Paved Footpath Area = 2.0 m^2

SUB-BASE THICKNESS REQUIRED FOR VEHICLE LOADINGS

Subgrade - CBR assumed min. 5%
Sub-base - Coarse graded aggregate Type 20/40 (20mm min. and 40mm max. particle size)

Loading category (Table 7):	(1)-'DOMESTIC'; Footway with zero vehicle overrun
Required thickness of Subbase (Table 7) =	250 mm

SUB-BASE THICKNESS REQUIRED FOR WATER STORAGE

r =	Ratio of 60min to 2-day rainfalls of 5-years return period for Blessington	0.28
M_5-60 =	1 in 5 years , 60 min duration rainfall	16.7 mm
CT (A) =	1 in 100 year event (+20%) Table 6: Permeable sub-base thickness for infiltration system	380 mm
CT (2) =	CT (A) * (Roof Area+Paved Area / Paved Area)	380 mm

SUB-BASE THICKNESS REQUIRED = MAX CT (1) AND CT (2) 380 mm
Therefore Sub-base thickness = 380 mm

The design section is:
80 mm BLOCK PAVIOR, ON
50 mm AGGREGATE TYPE 20/40 LAYING COURSE, ON
380 mm PERMEABLE COARSE GRADED AGGREGATE TYPE 20/40 ACCORDING TO BS EN 13242:2002, ON
SUBGRADE - CBR MIN. 5%

*Permeability of subgrade (k m/s) assumed to be 10^{-6} to 10^{-3} On-site infiltration tests to be undertaken to confirm actual k value prior to construction.
*CBR to be confirmed on site prior to construction

REFERENCES: PERMEABLE PAVEMENTS. GUIDE TO THE DESIGN, CONSTRUCTION AND MAINTENANCE OF CONCRETE BLOCK PERMEABLE PAVEMENTS EDITION 6.

BS 7533 13:2009

Bypass NSB RANGE

APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids.
The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Oil storage volume.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

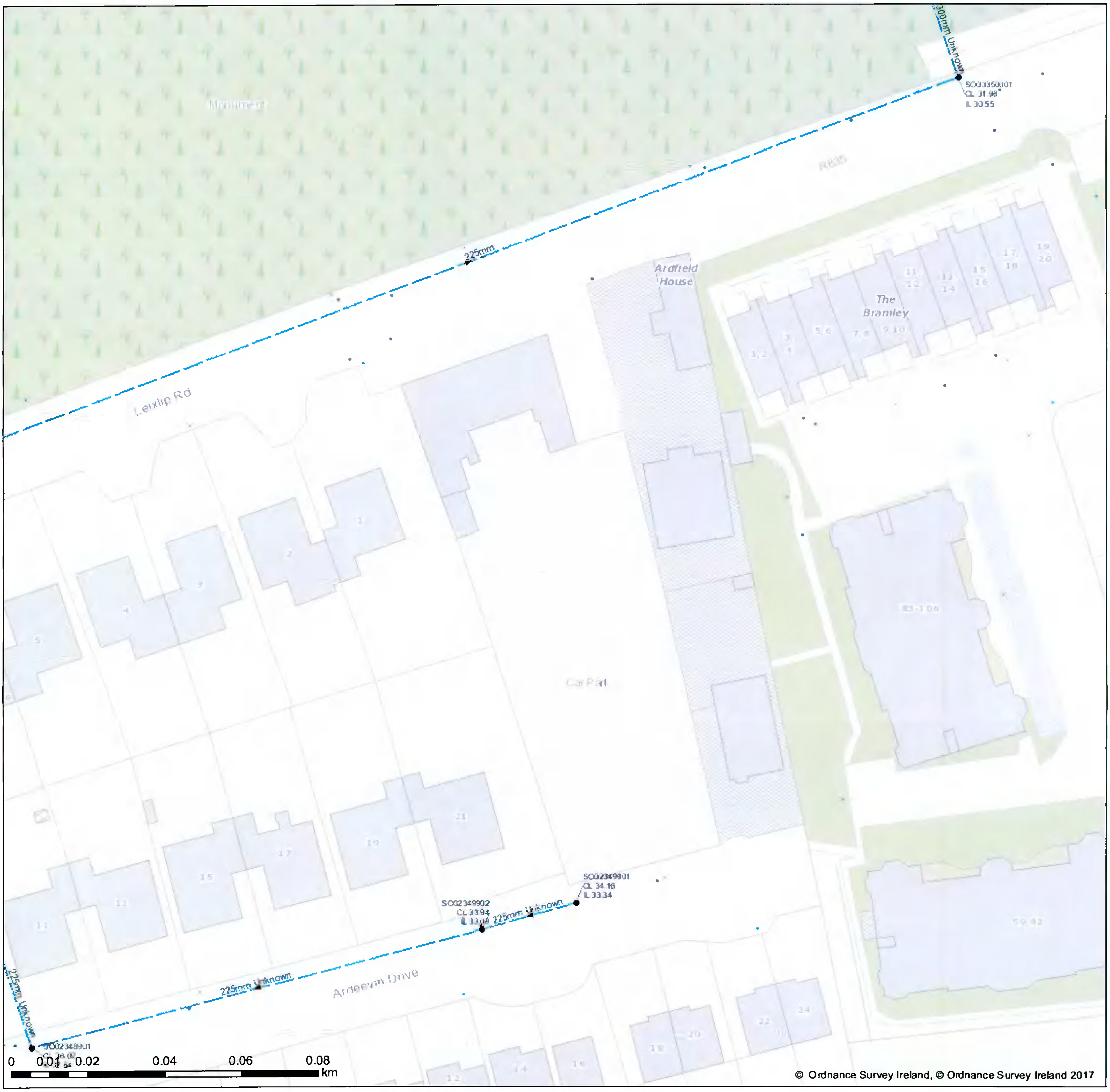
- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m²)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction   GRP chamber construction   * Some units have more than one access shaft – diameter of largest shown.

Irish Water Web Map



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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

Inlet Type
- Gully
- 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

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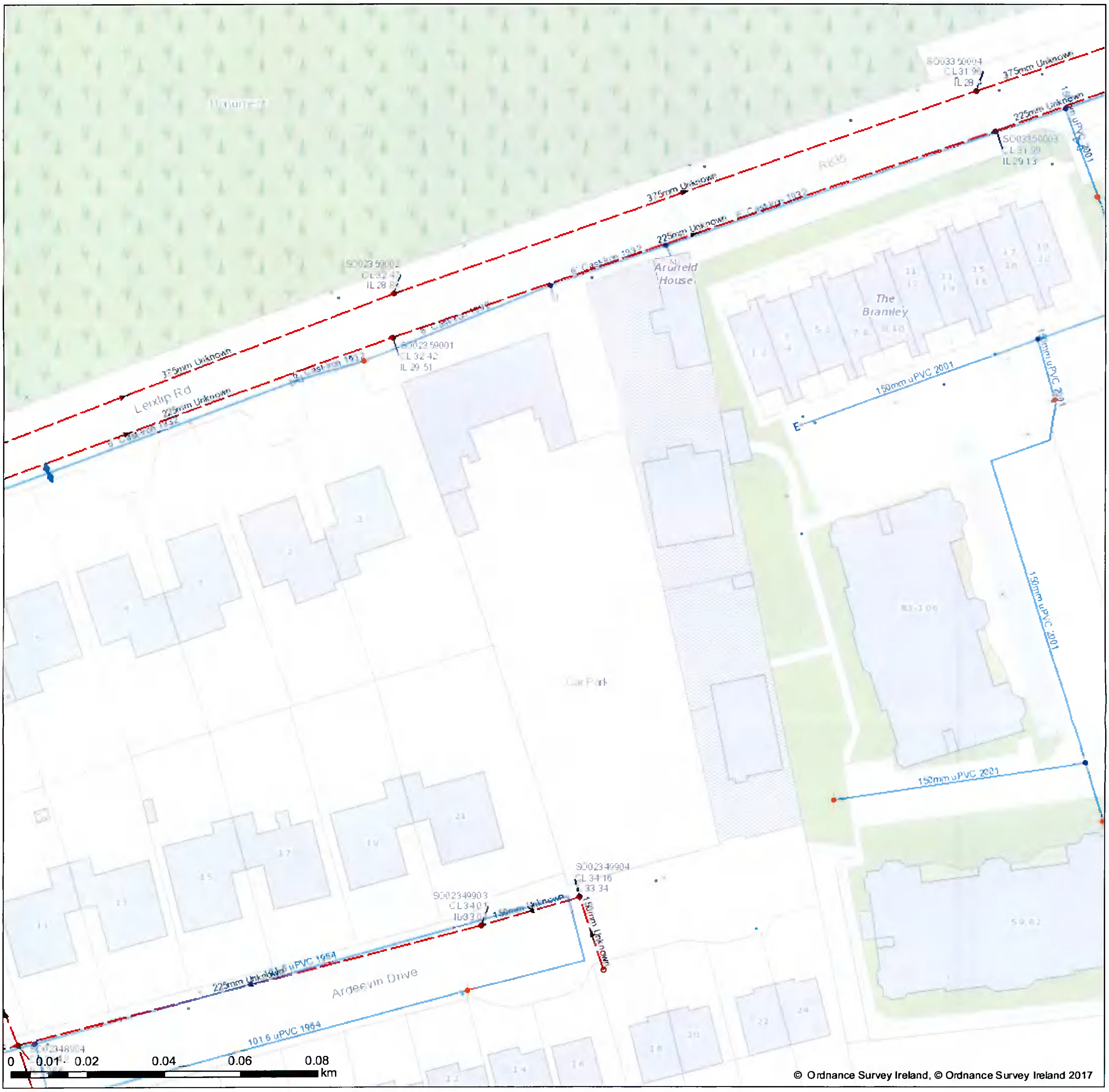
Irish Water Web Map



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