NOVOT Holdings Limited

Proposed Residential Development at Cairns Road, Co. Sligo

Civils Design Report

6665-JOD-XX-XX-RP-C-001-P01

March 2022

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DOCUMENT APPROVAL

PROJECT	Proposed Residential Development at Cairns Road, Co. Sligo	
CLIENT / JOB NO	NOVOT Holdings Limited	6665
DOCUMENT TITLE/No.	Civils Design Report	6665-JOD-XX-XX-RP-C-001-P01

	Prepared by	Reviewed
Issue / Revision P01	Name Adam Parkes	Name Mark Forbes
Date March 2022	Signature	Signature

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1 INTRODUCTION

This report has been prepared to detail the Civil Works element of the proposed Residential Development at Cairns Road, Co. Sligo. It should be read in conjunction with the foul and storm drainage design drawings (refer to **Appendix A** for drawings) as outlined and noted herein.

This report details the foul and storm drainage design and watermain details for said development. The proposed development will entail the construction of a residential development consisting of semi-detached and terraced dwellings as well as duplexes / townhouses with a total combined gross floor area of 5,062m^2 as detailed on the architects' drawings.

The proposed site, which consists of approximately 2.1 hectares, is a greenfield site along the Cairns Road, approximately 2km south of Sligo city. It is proposed to access the sites directly from the Cairns Road.

It is proposed to direct the foul sewer from the development to the existing foul sewer network in the adjoining Ardcairn estate at the north-western boundary of the proposed site. This existing network serves the Ardcairn estate located to the north of the proposed site. The proposed foul sewer will discharge under gravity to the existing Ardcairn foul network. As part of the design process, the option of connecting the foul waste to a 150mm diameter sewer on Cairn Road was also explored, however, given the prohibitive nature of the existing ground levels and high invert level of the existing manhole, it was decided that the Ardcairn connection provided the most feasible connection option with regards to constructability and capacity. Therefore, it was decided to model the proposed system into the Ardcairn foul node which can cater for the development flows.

It is proposed to discharge the storm networks into to two separate soakaways, one located in the central amenity area and the other located within the northern public pocket park. One soakaway is to serve the northwest of the development and another soakaway to serve the South and East of the development.

An IW Pre-connection enquiry form was submitted to Irish Water in relation to the proposed development on the 20th of September 2021, for the required Water and Wastewater Connections. On the 11th of February 2022 the Feasibility response to the pre-connection enquiry was received, advising that the proposed connections to the Irish Water networks can be facilitated at this moment in time (refer to **Appendix F** for IW Pre-connection Response) as outlined and noted herein.

2 FOUL WATER DRAINAGE DESIGN

2.1 Introduction

The drainage systems including all pipe sizes and gradients have been designed using Flow Drainage Design Software. The details of the Flow Outputs for the pipe designs are outlined in **Appendix B** of this report. The pipework to the drainage system has been designed to provide for six times the dry weather flow (DWF) in accordance with the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). It is proposed that all pipes will be HDPE twinwall. The maximum pipe diameter is to be 450mm, with a maximum and minimum gradient such that all velocities fall within the limits of 0.75 and 2.5m/sec as set out in the "Code of Practice for Wastewater Infrastructure" by Irish Water.

As noted, the foul drainage for the entire development will be collected throughout the site in the foul pipe network and will then discharge by gravity to the existing foul network in the adjoining Ardcairn estate at the north-western boundary of the proposed site. All of the pipe sizes and gradients are clearly indicated on the associated drawing. The typical specification of the proposed pipes are detailed in **Appendix C.** Details of the development's foul drainage network are shown on drawing 6665-JOD-XX-DR-C-700-001, included in **Appendix A**.

2.2 Occupancy Figures & Wastewater Flow Rates

The wastewater flow rate of the proposed development is calculated as follows in accordance with the recommendations from the Irish Water Code of Practice for Wastewater Infrastructure. Therefore, a wastewater flow rate of 150 litres/person/day was assumed. A detailed breakdown of the Hydraulic loadings is outlined as follows:

Source		**Hydraulic Loading (Litres/Day)**		
Description	**Total Units**	**Occupancy Per Unit**	**Total (Litres/Day)**	**Total 6 DWF (Litres/Day)**
4 Bed Semi-Detached Houses	26	5	19,500	117,000
4 Bed Terrace Houses	2	5	1,500	9,000
3 Bed Semi-Detached Houses	14	4	8,400	50,400
3 Bed Terrace Houses	8	4	4,800	28,800
2 Bed Own-Door Apartments	19	2	5,700	34,200
1 Bed Own-Door Apartments	5	2	1,500	9,000
Total	74		41,400	248,400

The total hydraulic load for the proposed development is 41,400 Litres per day with a 6DWF of 248,400 Litres per day. We note that the proposed development will create an additional average daily amount of 0.48 litres / second on the existing public foul system. The proposed foul network was sized to accommodate 6 times the dry weather flow, 2.88 litres / second.

3 STORM WATER DRAINAGE DESIGN

3.1 Introduction

The storm water drainage system has been designed to cater for the developments hardstanding areas (including roofs, footways, roadways and car parking). The proposed storm network will discharge surface water run-off to two separate proposed soakaways, one located in the central amenity area and the other located within the northern public pocket park. It is proposed that all storm water generated by the site will gravity flow to the each of the proposed soakaways via a Class 1 Klargester Bypass separator or similar. For the soakaway located within the central amenity area it is proposed to use a Class 1 Klargester NSBE015 Bypass separator or similar. For the soakaway located in the within the northern public pocket park it is proposed to use a Class 1 Klargester NSBP004 Bypass separator or similar.
This can also be seen on drawing 6665-JOD-XX-ZZ-DR-C-700-001, included in **Appendix A**.

The storm drainage for the entire development has been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS). The details of the pipe designs and are outlined at **Appendix B** of this report. The storm water drainage design has been designed to cater for surface water from hard surfaces in the proposed development including roadways, footpaths, and the proposed buildings.

The following parameters form the basis of the design:

- The surface water run-off is calculated using the Modified Rational Method (Wallingford Procedure)

  Q = 2.78 x Cv x Cr x I x A

Where,	Q	=	rate of run-off, l/s
	Cv	=	Volumetric Run-off Coefficient
	Cr	=	Routing Coefficient
	I	=	Intensity of Rainfall, mm/hr
	A	=	Impermeable Area, hectares

- A design return period of 100 years has been adopted for the storm network in accordance with good design practice.
- The rainfall intensity is based on rainfall data for Sligo town
- Soakaway is designed for a 1 in 100-year storm event
- Minimum self-cleansing velocity of 0.50 m/s
- The Principles of SuDS to be adopted for the surface water drainage

The following impermeability factors were adopted in accordance with good design practice:

- Macadam Roadways = 0.45
- Roof Areas = 0.85
- Concrete Areas = 0.85

3.1.1 Site Drainage

Storm water run-off from the internal roads, parking bays and footpaths will be collected by precast concrete gullies including lockable cast iron grating and frames connected to a piped system. Surface water run-off from roof areas will be collected via downpipe connections to the main network.

Gullies are located as shown on the drawings included in **Appendix A**. Gullies are positioned in accordance with the 'Recommendations for Site Development Works'. Gullies are provided at a minimum rate of one gully per 200m^2.

The total storm water run-off calculated is based on the impermeable area of the site:

Roads	=	1,922	m^2
Footpaths	=	1,578	m^2
Parking Bays	=	1,464	m^2
Roofs	=	5,062	m^2

Total Impermeable Area	=	10,026	m^2
Total Greenfield Run-off for the site	=	16.64	L/s

3.2 Soakaway Design

The two proposed soakaways are proposed to discharge surface water run-off from the site directly into the ground.

The soakaways have been designed according to BRE Digest 365 and TII publications: Design of Soakaways. The soakaway design calculations are included in **Appendix B** of this report.

A class 1 petrol/oil interceptor is required to be installed before the southern soakaway capable of accommodating a peak flowrate of 150 l/s for this network. A Klargester Bypass Separator NSBE015 or similar approved is recommended for the South soakaway. A class 1 petrol/oil interceptor is also required to be installed before the Northern soakaway capable of accommodating a peak flowrate of 45 l/s for this network. A Klargester Bypass Separator NSBP004 or similar approved is recommended for the Northern soakaway.

3.3 SuDS Principles

The key SuDS principles that influence the planning and design process, enabling SuDS to mimic natural drainage are:

- Storing runoff and releasing it slowly (soakaway)
- Harvesting and using the rain close to where it falls
- Allowing water to soak into the ground (infiltration)
- Slowly transporting (conveying) water on the surface
- Filtering out pollutants
- Allowing sediments to settle out by controlling the flow of the water

The proposed drainage scheme takes into account the following in relation to the above listed principles through the following measures:

- Proposing a class 1 petrol/oil interceptor to remove pollutants from the system. A Klargester Bypass Separator NSBE015 or similar approved is recommended for the Northern soakaway, and a Klargester Bypass Separator NSBP004 or similar approved is recommended for the Southern soakaway.

4 WATER MAIN

The water main has been designed in accordance with the Code of Practice for Water Infrastructure. A 110mm OD PE connection is proposed to be made to the existing water main located in the Cairn Road as shown on drawing 6665-JOD-XX-ZZ-DR-C-700-005, included in **Appendix A**. A 50mm PE connection will be made to each dwelling/unit.

Hydrants will be positioned within the site such that:

- The distance from each building is not less than 6m or more than 46m,
- The distance from a hydrant to a vehicle access road or hard-standing area for fire appliances is not more than 30m,
- They are distributed around the perimeter of the buildings, having regard for the provision of access for fire appliances,

(as per Building Regulations 2006 Technical Guidance Document B)

The hydrants shall be capable of delivering a minimum of 35 litres per second through any single hydrant as per Water UK – National Guidance Document on the Provision of Water for Fire Fighting.

In accordance with Irish Water standards a Water meter, Logging Device (Larson Type) and sluice valves are proposed at the connection into the proposed site. All water mains are to be commissioned and pressure tested to Irish Water Standards. The typical connection details and meter details are shown in revision 4 of Irish Water standard details.

5 FLOOD RISK OVERVIEW

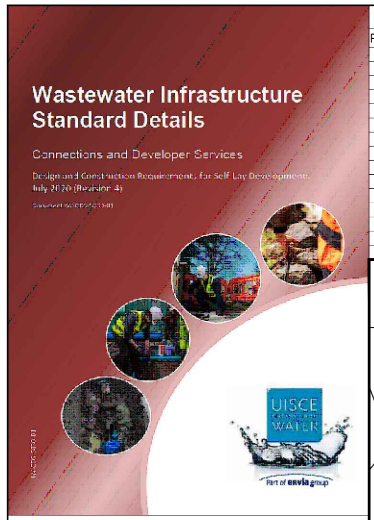
The proposed site, which consists of approximately 2.1 hectares, is a greenfield site along the Cairns Road, approximately 2km south of Sligo city. According to the Sligo Flood Risk Map, there are no noted major flooding events in close proximity to the proposed site. Therefore, it can be determined that there are no risks of flooding of adjacent lands/schemes as a result of this proposed development. All available maps of the area for the proposed development including latest OPW maps have been reviewed. The CFRAM map for Sligo area has also been included in **Appendix F** of this report.

6 CONCLUSION

The report should be read in conjunction with the associated drawings, layouts and specifications. The wastewater drainage layout, storm water drainage layout and watermain layout meet the requirements of the proposed development and are in accordance with the relevant codes of practice and standards.

APPENDIX A

DRAWINGS



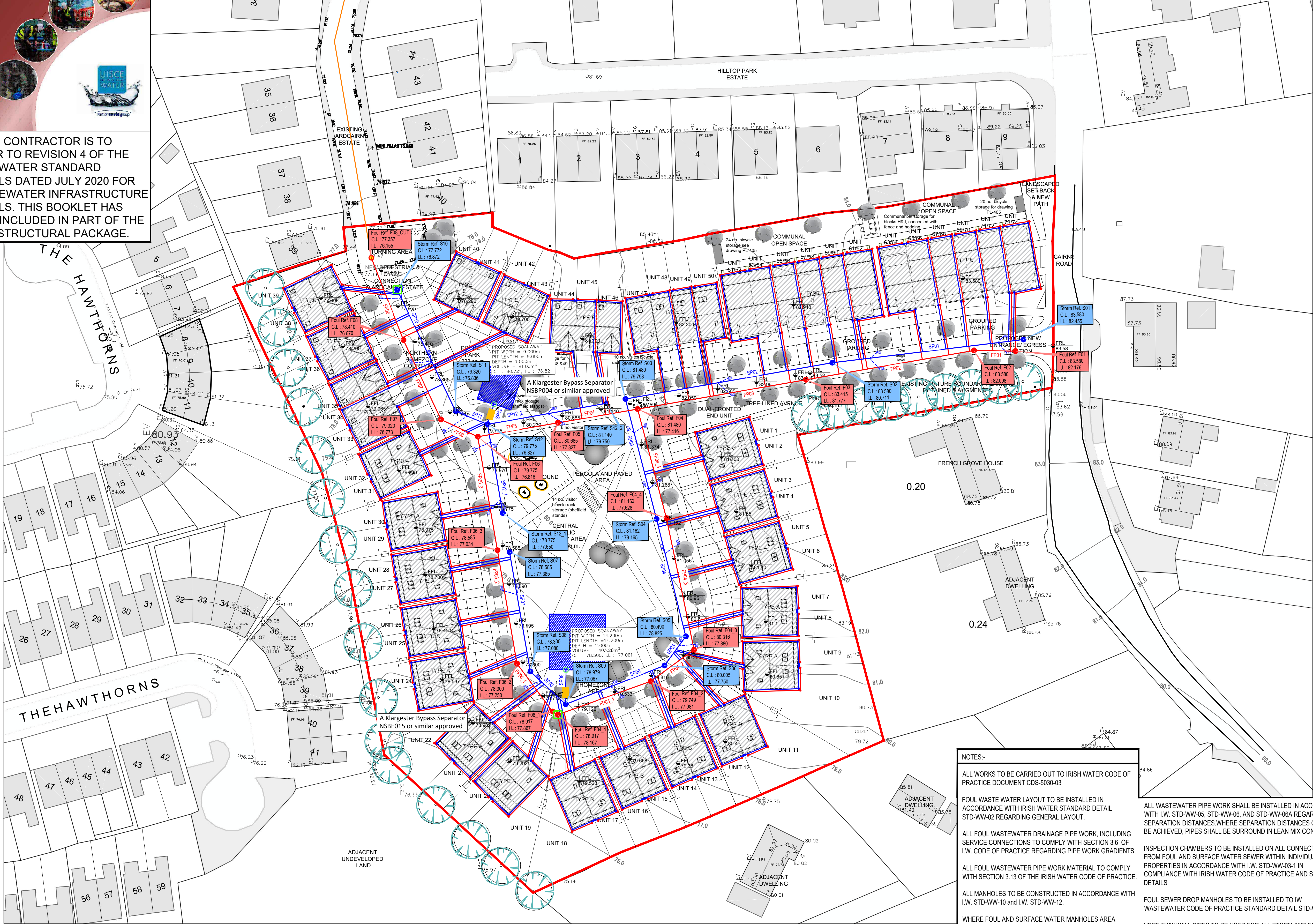
NOTE: CONTRACTOR IS TO REFER TO REVISION 4 OF THE IRISH WATER STANDARD DETAILS DATED JULY 2020 FOR WASTEWATER INFRASTRUCTURE DETAILS. THIS BOOKLET HAS BEEN INCLUDED IN PART OF THE CIVIL/STRUCTURAL PACKAGE.

FOUL PIPE SCHEDULE

PIPE REFERENCE	SIZE Ø (mm)	SLOPE	LENGTH (m)
FP01	150	1:136	10.562
FP02	150	1:136	43.664
FP03	150	1:32.4	43.663
FP04_1	150	1:136	25.299
FP04_2	150	1:136	13.737
FP04_3	150	1:136	34.333
FP04_4	150	1:136	28.883
FP04	225	1:233	20.700
FP05	225	1:40.8	20.792
FP06_1	150	1:24.7	15.262
FP06_2	150	1:136	29.435
FP06_3	150	1:136	29.435
FP06	225	1:233	10.381
FP07	225	1:233	22.499
FP08	225	1:43.3	22.553

STORM PIPE SCHEDULE

PIPE REFERENCE	SIZE Ø (mm)	SLOPE	LENGTH (m)
SP01	225	1:66.2	49.238
SP02	225	1:59.2	53.720
SP03	225	1:50.1	31.714
SP04	225	1:91	30.948
SP05	300	1:40.9	9.213
SP06	300	1:39.8	27.171
SP07	300	1:101.7	31.010
SP08	300	1:958	12.319
SP09	450	1:1595	8.812
SP10	300	1:958	34.509
SP11	300	1:958	8.803
SP12_1	225	1:28.1	30.912
SP12_2	225	1:665	23.028
SP12	300	1:958	5.368



NOTES:-

ALL WORKS TO BE CARRIED OUT TO IRISH WATER CODE OF PRACTICE DOCUMENT CDS-5030-03

FOUL WASTE WATER LAYOUT TO BE INSTALLED IN ACCORDANCE WITH IRISH WATER STANDARD DETAIL STD-WW-02 REGARDING GENERAL LAYOUT.

ALL FOUL WASTEWATER DRAINAGE PIPE WORK, INCLUDING SERVICE CONNECTIONS TO COMPLY WITH SECTION 3.6 OF I.W. CODE OF PRACTICE REGARDING PIPE WORK GRADIENTS.

ALL FOUL WASTEWATER PIPE WORK MATERIAL TO COMPLY WITH SECTION 3.13 OF THE IRISH WATER CODE OF PRACTICE.

ALL MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH I.W. STD-WW-10 and I.W. STD-WW-12.

WHERE FOUL AND SURFACE WATER MANHOLES AREA ADJACENT THEIR POSITIONS SHOULD BE STAGGERED TO ALLOW FOR CROSSING OVER OF SEWERS AS PER SECTION 3.5.13 OF I.W. CODE OF PRACTICE.

WHERE 0.3m SEPERATION DISTANCE CANNOT BE ACHIEVED BETWEEN FOUL AND STORM PIPES, THE PIPES SHALL BE SURROUNDED IN LEAN MIX CONCRETE.

ALL WASTEWATER PIPE WORK SHALL BE INSTALLED IN ACCORDANCE WITH I.W. STD-WW-05, STD-WW-06, AND STD-WW-06A REGARDING SEPARATION DISTANCES.WHERE SEPARATION DISTANCES CANNOT BE ACHIEVED, PIPES SHALL BE SURROUND IN LEAN MIX CONCRETE.

INSPECTION CHAMBERS TO BE INSTALLED ON ALL CONNECTIONS FROM FOUL AND SURFACE WATER SEWER WITHIN INDIVIDUAL PROPERTIES IN ACCORDANCE WITH I.W. STD-WW-03-1 IN COMPLIANCE WITH IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS

FOUL SEWER DROP MANHOLES TO BE INSTALLED TO IW WASTEWATER CODE OF PRACTICE STANDARD DETAIL STD-WW-12.

HDPE TWINWALL PIPES TO BE USED FOR ALL STORM AND FOUL SEWER PIPES UNLESS OTHERWISE SPECIFIED.

PIPES ARE TO BE BBA (BRITISH BOARD OF AGRÉMENT) OR SIMILAR APPROVED AND HAPAS (HIGHWAYS AGENCY PRODUCT APPROVAL SCHEME) OR SIMILAR CERTIFIED.

WHERE 0.9m COVER TO THE ROADWAY CANNOT BE ACHIEVED, PIPES SHALL BE SURROUNDED IN LEAN MIX CONCRETE.

FOUL & STORM SITE LAYOUT PLAN
SCALE 1:500 @ A1

NOTES

GENERAL NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER/EMPLOYERS REPRESENTATIVE, AS APPROPRIATE, TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES
5. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS. CONTRACTOR TO VERIFY THE ACCURACY OF THIS PROPOSAL TO THE ENGINEER AND ALLOW FOR MINOR CORRECTIONS AS DEEMED NECESSARY WITH A REASONABLE TIMEFRAME.

LEGEND

PROPOSED STORM MANHOLE shown thus
PROPOSED STORM WATER NETWORK shown thus
PROPOSED FOUL MANHOLE shown thus
EXISTING FOUL MANHOLE shown thus
PROPOSED FOUL NETWORK shown thus
PROPOSED SURFACE WATER CONNECTIONS shown thus
PROPOSED ROAD GULLIES shown thus RG
MANHOLE SURROUNDED IN LEAN MIX shown thus
EXISTING FOUL 225 uPVC NETWORK shown thus

Site Area:-
21,000 m^2, 5.189 Acres, 2.1 Hectares
ITM Co-Ordinates of site:-
569700, 833700

OS Sheet No.1071-A

rev.	modifications	by	chkd	date
P.01	Issued for Planning	AP	MF	04.03.22

Layout Ref.:
file P:\Jod-jobs\6665 Cairns Hill Hsing\700 Drawings\703 Planning\01 WIP\6665-JOD-XX-ZZ-DR-C-700-001 Foul & Storm Site Layout Plan.dwg

client
NOVOT HOLDINGS LIMITED

project
PROPOSED RESIDENTIAL DEVELOPMENT AT CAIRNS ROAD, CO. SLIGO

stage
PLANNING

title
FOUL & STORM SITE LAYOUT PLAN

scale
1:500 @ A1

surveyed	drawn	checked	date
JOD	AP	MF	March 2022

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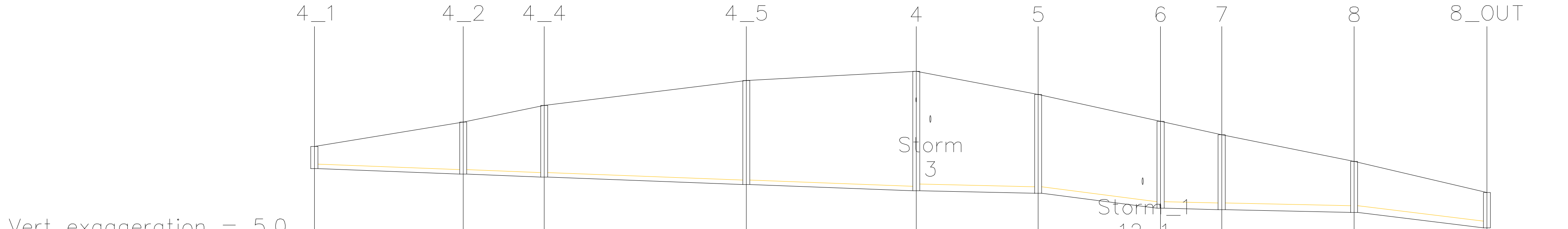
drawing no. 6665-JOD-XX-ZZ-DR-C-700-001
revision P.01



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Datum = 75.0

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Cover Level	78.917	79.749	80.316	81.162	81.480	80.685	79.775	79.320	78.410 / 77.357
Invert Level	78.167 / 77.981	77.981 / 77.880	77.880 / 77.628	77.628 / 77.416	77.416 / 77.327	77.327 / 76.818	76.818 / 76.773	76.773 / 76.676	76.676 / 76.155
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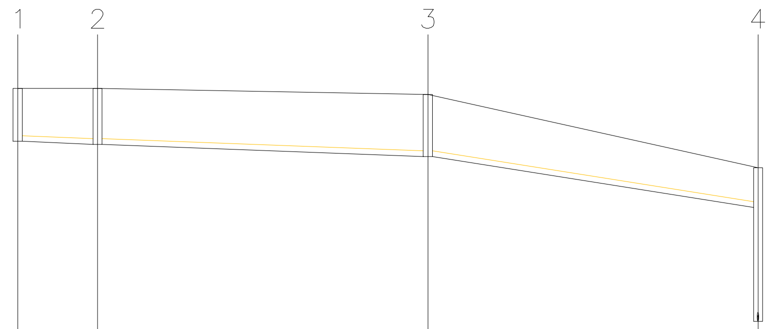

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Invert Level	82.176 / 82.098	82.098 / 81.777	81.777 / 80.430
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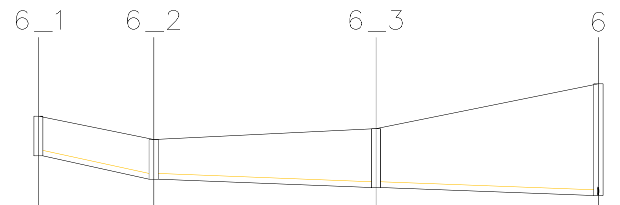

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Datum = 75.0

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Section Type	150mm	150mm	150mm
Slope	1:24.7	1:136.3	1:136.3
Cover Level	78.917	78.300	78.585 / 79.775
Invert Level	77.867 / 77.250	77.250 / 77.034	77.034 / 76.818
Length	15.262	29.435	29.435

NOTES

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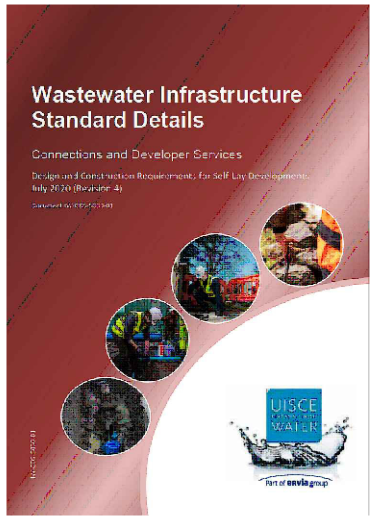

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rev.	modifications	by	chkd	date
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file P:\Jod-jobs\6665 Cairns Hill Hsing\700 Drawings\703 Planning\01 WIP\6665-JOD-XX-ZZ-DR-C-700-001 Foul & Storm Site Layout Plan.dwg

client
NOVOT HOLDINGS LIMITED

project
PROPOSED RESIDENTIAL DEVELOPMENT AT CAIRNS HILL, CO. SLIGO

stage
PLANNING

title
PROPOSED FOUL SEWER SECTIONS

scale
HORIZ: 1:1000, VERT: 1:200 @ A3

surveyed	drawn	checked	date
	AP	MF	March '22

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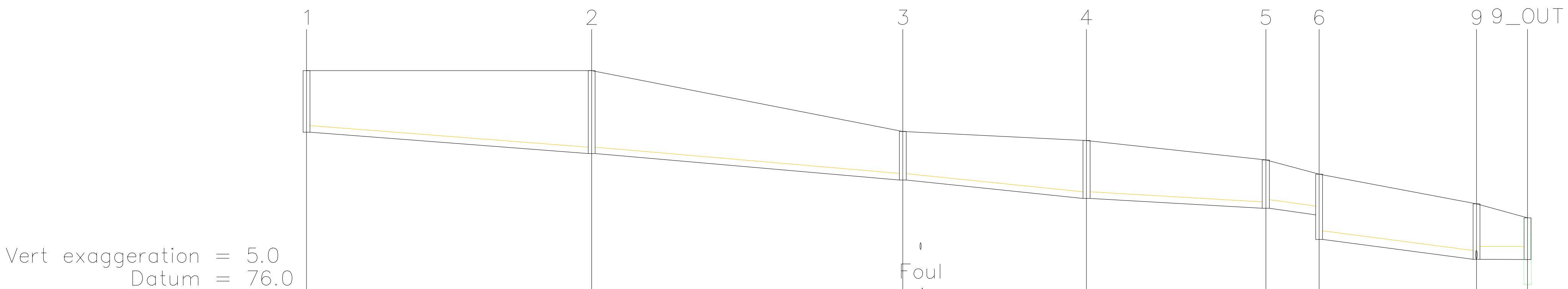
drawing no.	revision
6665-JOD-XX-ZZ-DR-C-002	P.01



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Invert Level	81.455		80.711 / 80.711		79.803 / 79.798		79.165 / 79.165		78.825 / 78.825		78.600 / 77.750		77.067 / 77.067		77.061
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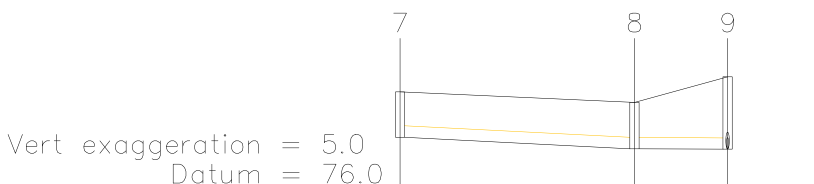

	Node 7	Link 7	Node 8	Link 8	Node 9
Link Name		7		8	
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Slope		1:101.7		1:947.6	
Cover Level	78.585		78.300		78.979
Invert Level	77.385		77.080 / 77.080		77.067
Length		31.010		12.319	

NOTES

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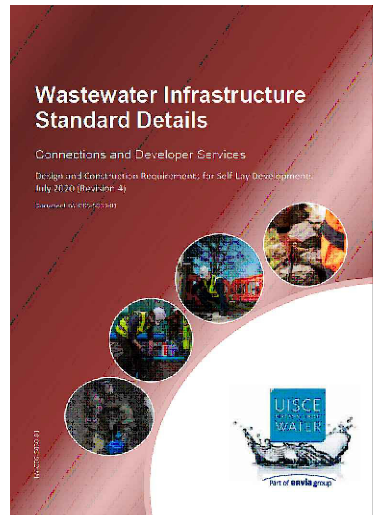

NOTE: CONTRACTOR IS TO REFER TO REVISION 4 OF THE IRISH WATER STANDARD DETAILS DATED JULY 2020 FOR WASTEWATER INFRASTRUCTURE DETAILS.

rev.	modifications	by	chkd	date
P.01	Issued for Planning	AP	MF	04.03.22

Layout Ref.:

file: P:\Jod-jobs\6665 Cairns Hill Hsing\700 Drawings\703 Planning\01 WIP\6665-JOD-XX-ZZ-DR-C-700-001 Foul & Storm Site Layout Plan.dwg

client
NOVOT HOLDINGS LIMITED

project
PROPOSED RESIDENTIAL DEVELOPMENT AT CAIRNS HILL, CO. SLIGO

stage
PLANNING

title
PROPOSED STORM SEWER SECTIONS (SHEET 1 OF 2)

scale
HORIZ: 1:1000, VERT: 1:200 @ A3

surveyed	drawn	checked	date
	AP	MF	March '22

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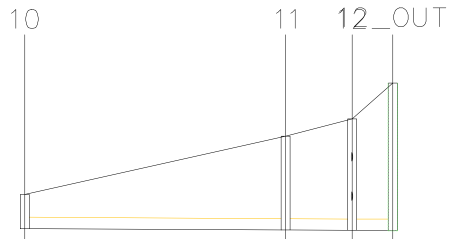
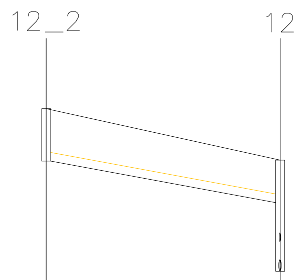
drawing no.	revision
6665-JOD-XX-ZZ-DR-C-003	P.01



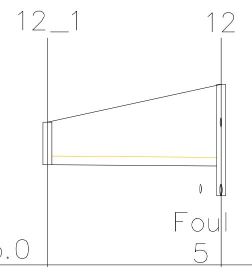
Vert exaggeration = 5.0
Datum = 75.0

Link Name	10	11 12
Section Type	300mm	300300mm
Slope	1:958.6	1:978894.6
Cover Level	77.772	79.320 / 79.775 / 80.721
Invert Level	76.872	76.836 / 76.836 / 76.827 / 76.827 / 76.821
Length	34.509	8.805368



Vert exaggeration = 5.0
Datum = 75.0

Link Name	12_2
Section Type	225mm
Slope	1:28.1
Cover Level	81.140 / 79.775
Invert Level	79.750 / 78.650
Length	30.912



Datum = 75.0

Link Name	12_1
Section Type	225mm
Slope	1:658.0
Cover Level	78.775 / 79.775
Invert Level	77.650 / 77.615
Length	23.028

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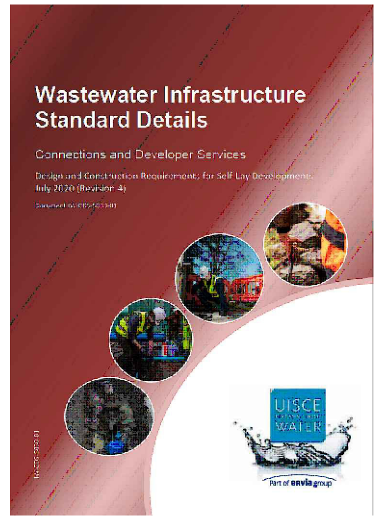

NOTE: CONTRACTOR IS TO REFER TO REVISION 4 OF THE IRISH WATER STANDARD DETAILS DATED JULY 2020 FOR WASTEWATER INFRASTRUCTURE DETAILS.

rev.	modifications	by	chkd	date
P.01	Issued for Planning	AP	MF	04.03.22

Layout Ref.:

file: P:\Jod-jobs\6665 Cairns Hill Hsing\700 Drawings\703 Planning\01 WIP\6665-JOD-XX-ZZ-DR-C-700-001 Foul & Storm Site Layout Plan.dwg

client
NOVOT HOLDINGS LIMITED

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stage
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title
PROPOSED STORM SEWER SECTIONS (SHEET 2 OF 2)

scale
HORIZ: 1:1000, VERT: 1:200 @ A3

surveyed	drawn	checked	date
	AP	MF	March '22

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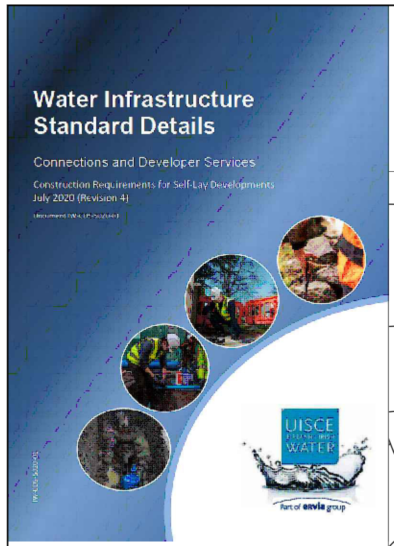
drawing no.	revision
6665-JOD-XX-ZZ-DR-C-004	P.01



NOTE: CONTRACTOR IS TO REFER TO REVISION 4 OF THE IRISH WATER STANDARD DETAILS DATED JULY 2020 FOR WATER INFRASTRUCTURE DETAILS. THIS BOOKLET HAS BEEN INCLUDED AS PART OF THE CIVIL/STRUCTURAL PACKAGE.

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LEGEND

- WATERMAIN SUPPLY Ø 110mm OUTSIDE DIAMETER PE100 JDRI, PIPE MATERIAL SHALL BE IN COMPLIANCE WITH IRISH WATER SECTION 3.9 OF THE CODE OF PRACTICE.
- PROPOSED WATER SUPPLY CONNECTION WITH BOUNDARY BOX TO I.W. STD-W-03 shown thus (Public)
- FIRE HYDRANT TO I.W. STD-W-18/19 shown thus (6 No. Hyd)
- DOUBLE AIR VALVE TO I.W STD-W-22-2 (1 No. DAV's)
- SLUICE VALVE TO I.W. STD-W-15-2 (11 No. SV's)
- SCOUR VALVE TO I.W. STD-W-30A-2 (2 No. SC.v's)
- BULK FLOW METER To Incl. Kiosk TO STD-W-36 AND METER CHAMBER TO STD-W-26
- EXISTING 300mm DI WATERMAIN

Site Area:-
21,000 m^2, 5.189 Acres, 2.1 Hectares
ITM Co-Ordinates of site:-
569700, 833700

OS Sheet No.1071-A

rev.	modifications	by	chkd	date
P.01	Issued for Planning	AP	MF	04.03.22

Layout Ref.:

file: P:\Jod-jobs\6665 Cairns Hill Hsing\700 Drawings\703 Planning\01 WIP\6665-JOD-XX-ZZ-DR-C-700-005 Watermains Layout Plan.dwg

client
NOVOT HOLDINGS LIMITED

project
PROPOSED RESIDENTIAL DEVELOPMENT AT CAIRNS ROAD, CO. SLIGO

stage
PLANNING

title
PROPOSED WATERMAIN LAYOUT PLAN

scale
1:500 @ A1

surveyed	drawn	checked	date
JOD	AP	MF	March 2022

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drawing no. 6665-JOD-XX-ZZ-DR-C-700-005 | revision P.01

PROPOSED WATERMAIN LAYOUT PLAN
SCALE 1:500 @ A1

APPENDIX B

DESIGN CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	0.50
FSR Region	Scotland and Ireland	Connection Type	Level Inverts
M5-60 (mm)	15.700	Minimum Backdrop Height (m)	0.600
Ratio-R	0.261	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

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

Available Diameters (mm)

100	150

Nodes

	Name	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
✓	10	5.00	77.772	1200	0.900
✓	11	5.00	79.320	1200	2.484
✓	12_2	5.00	81.140	1200	1.390
✓	12_1	5.00	78.775	1200	1.125
✓	12	5.00	79.775	1200	2.948
✓	12_OUT		80.721	1200	3.900

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
10	10	11	34.509	0.600	76.872	76.836	0.036	958.0	300	6.15	50.0
11	11	12	8.803	0.600	76.836	76.827	0.009	958.0	300	6.44	50.0
12_2	12_2	12	30.912	0.600	79.750	78.650	1.100	28.1	225	5.21	50.0
12_1	12_1	12	23.028	0.600	77.650	77.615	0.035	665.0	225	5.77	50.0
12	12	12_OUT	5.368	0.600	76.827	76.821	0.006	958.0	300	6.62	50.0

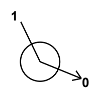
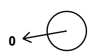
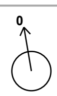
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
10	0.500	35.3	15.9	0.600	2.184	0.117	0.0	141	0.487
11	0.500	35.3	21.7	2.184	2.648	0.160	0.0	170	0.525
12_2	2.477	98.5	0.7	1.165	0.900	0.005	0.0	14	0.721
12_1	0.500	19.9	2.8	0.900	1.935	0.021	0.0	58	0.356
12	0.500	35.3	27.4	2.648	3.600	0.202	0.0	199	0.551

Pipeline Schedule

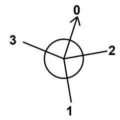
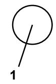
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
10	34.509	958.0	300	Circular	77.772	76.872	0.600	79.320	76.836	2.184
11	8.803	958.0	300	Circular	79.320	76.836	2.184	79.775	76.827	2.648
12_2	30.912	28.1	225	Circular	81.140	79.750	1.165	79.775	78.650	0.900
12_1	23.028	665.0	225	Circular	78.775	77.650	0.900	79.775	77.615	1.935
12	5.368	958.0	300	Circular	79.775	76.827	2.648	80.721	76.821	3.600

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
10	10	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
11	11	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
12_2	12_2	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
12_1	12_1	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
12	12	1200	Manhole	Adoptable	12_OUT	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
10	569620.625	833788.083	77.772	0.900	1200		0	10	76.872	300
11	569635.591	833756.988	79.320	2.484	1200		1	10	76.836	300
							0	11	76.836	300
12_2	569674.179	833759.037	81.140	1.390	1200		0	12_2	79.750	225
12_1	569647.632	833730.958	78.775	1.125	1200		0	12_1	77.650	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
12	569643.739	833753.655	79.775	2.948	1200		1	12_1	77.615	225
							2	12_2	78.650	225
							3	11	76.827	300
							0	12	76.827	300
12_OUT	569645.394	833758.761	80.721	3.900	1200		1	12	76.821	300

Simulation Settings

Rainfall Methodology	FSR	Additional Storage (m³/ha)	20.0
FSR Region	Scotland and Ireland	Check Discharge Rate(s)	✓
M5-60 (mm)	15.700	1 year (l/s)	7.1
Ratio-R	0.261	30 year (l/s)	14.1
Summer CV	0.750	100 year (l/s)	16.7
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year 360 minute (m³)	
Drain Down Time (mins)	240		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
1	20	0	0
30	0	0	0
30	20	0	0
100	0	0	0
100	20	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.65
Greenfield Method	IH124	Growth Factor 100 year	1.96
Positively Drained Area (ha)	2.279	Betterment (%)	0
SAAR (mm)	1295	QBar	8.5
Soil Index	2	Q 1 year (l/s)	7.1
SPR	0.30	Q 30 year (l/s)	14.1
Region	11	Q 100 year (l/s)	16.7
Growth Factor 1 year	0.83		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	2.279	Storm Duration (mins)	360
Soil Index	2	Betterment (%)	0
SPR	0.30	PR	
CWI		Runoff Volume (m³)	

Node 12_OUT Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.07668	Invert Level (m)	76.821	Depth (m)	1.000
Side Inf Coefficient (m/hr)	0.07668	Time to half empty (mins)	608	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	9.000	Number Required	1
Porosity	0.95	Pit Length (m)	9.000		

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	82.600	23.373	1 year +20% CC 720 minute summer	10.693	2.866
1 year 30 minute summer	57.169	16.177	1 year +20% CC 960 minute summer	9.158	2.412
1 year 60 minute summer	41.075	10.855	1 year +20% CC 1440 minute summer	6.986	1.872
1 year 120 minute summer	27.115	7.166	30 year 15 minute summer	183.194	51.838
1 year 180 minute summer	21.761	5.600	30 year 30 minute summer	127.219	35.999
1 year 240 minute summer	17.776	4.698	30 year 60 minute summer	90.011	23.787
1 year 360 minute summer	14.243	3.665	30 year 120 minute summer	57.882	15.296
1 year 480 minute summer	11.608	3.068	30 year 180 minute summer	45.578	11.729
1 year 600 minute summer	9.771	2.673	30 year 240 minute summer	36.690	9.696
1 year 720 minute summer	8.911	2.388	30 year 360 minute summer	28.746	7.397
1 year 960 minute summer	7.632	2.010	30 year 480 minute summer	23.075	6.098
1 year 1440 minute summer	5.822	1.560	30 year 600 minute summer	19.183	5.247
1 year +20% CC 15 minute summer	99.120	28.047	30 year 720 minute summer	17.310	4.639
1 year +20% CC 30 minute summer	68.603	19.412	30 year 960 minute summer	14.504	3.819
1 year +20% CC 60 minute summer	49.290	13.026	30 year 1440 minute summer	10.830	2.902
1 year +20% CC 120 minute summer	32.538	8.599	30 year +20% CC 15 minute summer	219.833	62.205
1 year +20% CC 180 minute summer	26.113	6.720	30 year +20% CC 30 minute summer	152.663	43.198
1 year +20% CC 240 minute summer	21.331	5.637	30 year +20% CC 60 minute summer	108.014	28.545
1 year +20% CC 360 minute summer	17.091	4.398	30 year +20% CC 120 minute summer	69.458	18.356
1 year +20% CC 480 minute summer	13.930	3.681	30 year +20% CC 180 minute summer	54.694	14.075
1 year +20% CC 600 minute summer	11.725	3.207	30 year +20% CC 240 minute summer	44.028	11.635

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +20% CC 360 minute summer	34.495	8.877
30 year +20% CC 480 minute summer	27.690	7.318
30 year +20% CC 600 minute summer	23.020	6.296
30 year +20% CC 720 minute summer	20.773	5.567
30 year +20% CC 960 minute summer	17.405	4.583
30 year +20% CC 1440 minute summer	12.996	3.483
100 year 15 minute summer	237.029	67.071
100 year 30 minute summer	165.941	46.956
100 year 60 minute summer	117.103	30.947
100 year 120 minute summer	74.705	19.742
100 year 180 minute summer	58.469	15.046
100 year 240 minute summer	46.850	12.381
100 year 360 minute summer	36.447	9.379
100 year 480 minute summer	29.103	7.691
100 year 600 minute summer	24.092	6.590

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 720 minute summer	21.664	5.806
100 year 960 minute summer	18.050	4.753
100 year 1440 minute summer	13.372	3.584
100 year +20% CC 15 minute summer	284.435	80.485
100 year +20% CC 30 minute summer	199.129	56.347
100 year +20% CC 60 minute summer	140.524	37.136
100 year +20% CC 120 minute summer	89.646	23.691
100 year +20% CC 180 minute summer	70.163	18.055
100 year +20% CC 240 minute summer	56.219	14.857
100 year +20% CC 360 minute summer	43.736	11.255
100 year +20% CC 480 minute summer	34.923	9.229
100 year +20% CC 600 minute summer	28.910	7.908
100 year +20% CC 720 minute summer	25.996	6.967
100 year +20% CC 960 minute summer	21.660	5.704
100 year +20% CC 1440 minute summer	16.046	4.301

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
600 minute summer	10	420	77.037	0.165	2.4	0.6161	0.0000	OK
600 minute summer	11	420	77.037	0.201	3.1	0.2971	0.0000	OK
15 minute summer	12_2	11	79.762	0.012	0.5	0.0140	0.0000	OK
15 minute summer	12_1	11	77.701	0.051	2.1	0.0761	0.0000	OK
600 minute summer	12	420	77.037	0.210	3.6	0.2605	0.0000	OK
600 minute summer	12_OUT	420	77.037	0.216	3.5	16.8740	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)
600 minute summer	10	10	11	2.2	0.193	0.061	1.5519
600 minute summer	11	11	12	2.8	0.197	0.080	0.4530
15 minute summer	12_2	12_2	12	0.5	0.644	0.005	0.0237
15 minute summer	12_1	12_1	12	2.0	0.372	0.099	0.1222
600 minute summer	12	12	12_OUT	3.5	0.371	0.099	0.2873
600 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	10	480	77.101	0.229	2.6	0.8550	0.0000	OK
720 minute summer	11	480	77.101	0.265	3.3	0.3916	0.0000	OK
15 minute summer	12_2	11	79.763	0.013	0.6	0.0152	0.0000	OK
15 minute summer	12_1	11	77.705	0.055	2.5	0.0830	0.0000	OK
720 minute summer	12	480	77.101	0.274	4.0	0.3400	0.0000	OK
720 minute summer	12_OUT	480	77.101	0.280	3.9	21.8743	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
720 minute summer	10	10	11	2.3	0.184	0.065	2.1333
720 minute summer	11	11	12	3.0	0.198	0.085	0.5871
15 minute summer	12_2	12_2	12	0.6	0.681	0.006	0.0270
15 minute summer	12_1	12_1	12	2.4	0.393	0.119	0.1395
720 minute summer	12	12	12_OUT	3.9	0.371	0.109	0.3649
720 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	10	555	77.379	0.507	4.2	1.8928	0.0000	SURCHARGED
720 minute summer	11	555	77.377	0.541	5.4	0.7995	0.0000	SURCHARGED
15 minute summer	12_2	11	79.767	0.017	1.1	0.0203	0.0000	OK
15 minute summer	12_1	11	77.725	0.075	4.7	0.1130	0.0000	OK
720 minute summer	12	525	77.378	0.551	6.8	0.6837	0.0000	SURCHARGED
720 minute summer	12_OUT	525	77.377	0.556	6.7	43.4000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
720 minute summer	10	10	11	3.8	0.165	0.107	2.4301
720 minute summer	11	11	12	5.2	0.177	0.146	0.6199
15 minute summer	12_2	12_2	12	1.1	0.822	0.011	0.0412
15 minute summer	12_1	12_1	12	4.5	0.482	0.228	0.2181
720 minute summer	12	12	12_OUT	6.7	0.517	0.190	0.3780
720 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
960 minute summer	10	690	77.535	0.663	4.2	2.4743	0.0000	FLOOD RISK
960 minute summer	11	690	77.538	0.702	5.5	1.0366	0.0000	SURCHARGED
15 minute summer	12_2	11	79.768	0.018	1.3	0.0219	0.0000	OK
15 minute summer	12_1	11	77.732	0.082	5.7	0.1240	0.0000	OK
960 minute summer	12	720	77.540	0.713	6.6	0.8845	0.0000	SURCHARGED
960 minute summer	12_OUT	690	77.539	0.718	7.4	56.0545	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)
960 minute summer	10	10	11	3.9	0.154	0.111	2.4301
960 minute summer	11	11	12	5.0	0.177	0.141	0.6199
15 minute summer	12_2	12_2	12	1.3	0.866	0.013	0.0463
15 minute summer	12_1	12_1	12	5.5	0.510	0.277	0.2492
960 minute summer	12	12	12_OUT	7.4	0.531	0.209	0.3780
960 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	10	705	77.574	0.702	4.4	2.6183	0.0000	FLOOD RISK
960 minute summer	11	705	77.575	0.739	5.7	1.0910	0.0000	SURCHARGED
15 minute summer	12_2	11	79.769	0.019	1.5	0.0230	0.0000	OK
15 minute summer	12_1	11	77.735	0.085	6.1	0.1284	0.0000	OK
960 minute summer	12	690	77.574	0.747	7.3	0.9267	0.0000	SURCHARGED
960 minute summer	12_OUT	690	77.574	0.753	7.1	58.8120	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute summer	10	10	11	4.1	0.154	0.117	2.4301
960 minute summer	11	11	12	5.7	0.177	0.161	0.6199
15 minute summer	12_2	12_2	12	1.4	0.895	0.015	0.0496
15 minute summer	12_1	12_1	12	5.9	0.522	0.297	0.2615
960 minute summer	12	12	12_OUT	7.1	0.517	0.200	0.3780
960 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	10	735	77.772	0.900	5.3	3.3577	0.0000	FLOOD RISK
960 minute summer	11	735	77.772	0.936	6.9	1.3824	0.0000	SURCHARGED
15 minute summer	12_2	11	79.771	0.021	1.7	0.0249	0.0000	OK
960 minute summer	12_1	735	77.772	0.122	0.9	0.1834	0.0000	OK
960 minute summer	12	735	77.772	0.945	8.1	1.1717	0.0000	SURCHARGED
960 minute summer	12_OUT	735	77.772	0.951	9.1	74.2474	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute summer	10	10	11	5.0	0.159	0.142	2.4301
960 minute summer	11	11	12	6.3	0.203	0.178	0.6199
15 minute summer	12_2	12_2	12	1.7	0.941	0.017	0.0558
960 minute summer	12_1	12_1	12	0.9	0.293	0.045	0.5932
960 minute summer	12	12	12_OUT	9.1	0.550	0.256	0.3780
960 minute summer	12_OUT	Infiltration		1.2			

Results for 1 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	10	10	77.015	0.143	11.8	0.5335	0.0000	OK
15 minute summer	11	9	76.990	0.154	16.9	0.2281	0.0000	OK
15 minute summer	12_2	11	79.762	0.012	0.5	0.0140	0.0000	OK
15 minute summer	12_1	11	77.701	0.051	2.1	0.0761	0.0000	OK
15 minute summer	12	9	76.979	0.152	22.3	0.1884	0.0000	OK
15 minute summer	12_OUT	20	76.915	0.094	23.1	7.3234	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	10	10	11	12.8	0.406	0.361	1.1767
15 minute summer	11	11	12	18.4	0.616	0.520	0.3182
15 minute summer	12_2	12_2	12	0.5	0.644	0.005	0.0237
15 minute summer	12_1	12_1	12	2.0	0.372	0.099	0.1222
15 minute summer	12	12	12_OUT	23.1	1.525	0.653	0.0972
15 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 30 minute summer. 270 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	10	18	76.990	0.118	11.2	0.4407	0.0000	OK
30 minute summer	11	19	76.962	0.126	14.9	0.1861	0.0000	OK
30 minute summer	12_2	18	79.762	0.012	0.5	0.0139	0.0000	OK
30 minute summer	12_1	18	77.700	0.050	2.0	0.0748	0.0000	OK
30 minute summer	12	33	76.944	0.117	18.3	0.1448	0.0000	OK
30 minute summer	12_OUT	33	76.944	0.123	18.3	9.5896	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
30 minute summer	10	10	11	10.8	0.403	0.305	0.9249
30 minute summer	11	11	12	14.6	0.575	0.413	0.2249
30 minute summer	12_2	12_2	12	0.5	0.640	0.005	0.0233
30 minute summer	12_1	12_1	12	1.9	0.370	0.095	0.1191
30 minute summer	12	12	12_OUT	18.3	1.245	0.517	0.1409
30 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	10	33	76.977	0.105	9.0	0.3934	0.0000	OK
60 minute summer	11	61	76.974	0.138	12.0	0.2035	0.0000	OK
60 minute summer	12_2	34	79.761	0.011	0.4	0.0127	0.0000	OK
60 minute summer	12_1	34	77.695	0.045	1.6	0.0682	0.0000	OK
60 minute summer	12	62	76.974	0.147	14.7	0.1821	0.0000	OK
60 minute summer	12_OUT	62	76.974	0.153	14.4	11.9424	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	10	10	11	8.7	0.373	0.247	0.9072
60 minute summer	11	11	12	11.6	0.503	0.328	0.2897
60 minute summer	12_2	12_2	12	0.4	0.606	0.004	0.0203
60 minute summer	12_1	12_1	12	1.5	0.346	0.078	0.1040
60 minute summer	12	12	12_OUT	14.4	0.889	0.409	0.1889
60 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 120 minute summer. 360 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	10	120	77.002	0.130	6.3	0.4867	0.0000	OK
120 minute summer	11	120	77.002	0.166	8.4	0.2456	0.0000	OK
120 minute summer	12_2	64	79.759	0.009	0.3	0.0111	0.0000	OK
120 minute summer	12_1	64	77.689	0.039	1.1	0.0583	0.0000	OK
120 minute summer	12	120	77.002	0.175	10.3	0.2173	0.0000	OK
120 minute summer	12_OUT	120	77.002	0.181	10.1	14.1467	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
120 minute summer	10	10	11	6.1	0.310	0.173	1.1983
120 minute summer	11	11	12	8.0	0.367	0.227	0.3644
120 minute summer	12_2	12_2	12	0.3	0.558	0.003	0.0164
120 minute summer	12_1	12_1	12	1.1	0.310	0.055	0.0815
120 minute summer	12	12	12_OUT	10.1	0.609	0.285	0.2340
120 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 180 minute summer. 420 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	10	156	77.014	0.142	4.9	0.5303	0.0000	OK
180 minute summer	11	160	77.014	0.178	6.4	0.2631	0.0000	OK
180 minute summer	12_2	100	79.758	0.008	0.2	0.0093	0.0000	OK
180 minute summer	12_1	96	77.686	0.036	0.9	0.0536	0.0000	OK
180 minute summer	12	160	77.014	0.187	7.7	0.2320	0.0000	OK
180 minute summer	12_OUT	160	77.014	0.193	7.4	15.0767	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
180 minute summer	10	10	11	4.6	0.274	0.129	1.3188
180 minute summer	11	11	12	5.9	0.306	0.167	0.3951
180 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
180 minute summer	12_1	12_1	12	0.9	0.293	0.045	0.0714
180 minute summer	12	12	12_OUT	7.4	0.575	0.210	0.2526
180 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 240 minute summer. 480 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	10	188	77.023	0.151	4.3	0.5646	0.0000	OK
240 minute summer	11	192	77.023	0.187	5.5	0.2766	0.0000	OK
240 minute summer	12_2	128	79.758	0.008	0.2	0.0093	0.0000	OK
240 minute summer	12_1	124	77.683	0.033	0.8	0.0499	0.0000	OK
240 minute summer	12	192	77.023	0.196	6.6	0.2434	0.0000	OK
240 minute summer	12_OUT	192	77.023	0.202	6.4	15.7927	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
240 minute summer	10	10	11	3.9	0.249	0.111	1.4124
240 minute summer	11	11	12	5.1	0.267	0.143	0.4185
240 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
240 minute summer	12_1	12_1	12	0.8	0.276	0.038	0.0642
240 minute summer	12	12	12_OUT	6.4	0.515	0.181	0.2667
240 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 360 minute summer. 600 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	10	264	77.032	0.160	3.5	0.5973	0.0000	OK
360 minute summer	11	264	77.032	0.196	4.4	0.2896	0.0000	OK
360 minute summer	12_2	168	79.756	0.006	0.1	0.0069	0.0000	OK
360 minute summer	12_1	184	77.679	0.029	0.6	0.0443	0.0000	OK
360 minute summer	12	264	77.032	0.205	5.2	0.2543	0.0000	OK
360 minute summer	12_OUT	264	77.032	0.211	5.1	16.4806	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
360 minute summer	10	10	11	3.1	0.219	0.089	1.5014
360 minute summer	11	11	12	4.0	0.231	0.114	0.4406
360 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
360 minute summer	12_1	12_1	12	0.6	0.253	0.029	0.0536
360 minute summer	12	12	12_OUT	5.1	0.463	0.143	0.2799
360 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 480 minute summer. 720 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	10	336	77.035	0.163	2.8	0.6072	0.0000	OK
480 minute summer	11	336	77.035	0.199	3.5	0.2935	0.0000	OK
480 minute summer	12_2	224	79.756	0.006	0.1	0.0069	0.0000	OK
480 minute summer	12_1	248	77.678	0.028	0.5	0.0417	0.0000	OK
480 minute summer	12	336	77.035	0.208	4.2	0.2576	0.0000	OK
480 minute summer	12_OUT	336	77.035	0.214	4.1	16.6872	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute summer	10	10	11	2.5	0.206	0.071	1.5279
480 minute summer	11	11	12	3.2	0.215	0.091	0.4471
480 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
480 minute summer	12_1	12_1	12	0.5	0.242	0.025	0.0483
480 minute summer	12	12	12_OUT	4.1	0.423	0.115	0.2838
480 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 600 minute summer. 840 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	10	420	77.037	0.165	2.4	0.6161	0.0000	OK
600 minute summer	11	420	77.037	0.201	3.1	0.2971	0.0000	OK
600 minute summer	12_2	285	79.756	0.006	0.1	0.0069	0.0000	OK
600 minute summer	12_1	315	77.675	0.025	0.4	0.0381	0.0000	OK
600 minute summer	12	420	77.037	0.210	3.6	0.2605	0.0000	OK
600 minute summer	12_OUT	420	77.037	0.216	3.5	16.8740	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute summer	10	10	11	2.2	0.193	0.061	1.5519
600 minute summer	11	11	12	2.8	0.197	0.080	0.4530
600 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
600 minute summer	12_1	12_1	12	0.4	0.227	0.020	0.0413
600 minute summer	12	12	12_OUT	3.5	0.371	0.099	0.2873
600 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 720 minute summer. 960 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	10	480	77.035	0.163	2.2	0.6063	0.0000	OK
720 minute summer	11	480	77.035	0.199	2.8	0.2932	0.0000	OK
720 minute summer	12_2	345	79.756	0.006	0.1	0.0069	0.0000	OK
720 minute summer	12_1	375	77.675	0.025	0.4	0.0381	0.0000	OK
720 minute summer	12	480	77.035	0.208	3.4	0.2573	0.0000	OK
720 minute summer	12_OUT	480	77.034	0.213	3.3	16.6696	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
720 minute summer	10	10	11	2.0	0.186	0.056	1.5257
720 minute summer	11	11	12	2.6	0.205	0.073	0.4466
720 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
720 minute summer	12_1	12_1	12	0.4	0.227	0.020	0.0413
720 minute summer	12	12	12_OUT	3.3	0.371	0.092	0.2835
720 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 960 minute summer. 1200 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	10	630	77.033	0.161	1.9	0.6018	0.0000	OK
960 minute summer	11	630	77.033	0.197	2.4	0.2914	0.0000	OK
960 minute summer	12_2	465	79.756	0.006	0.1	0.0069	0.0000	OK
960 minute summer	12_1	480	77.673	0.023	0.3	0.0339	0.0000	OK
960 minute summer	12	630	77.033	0.206	2.9	0.2558	0.0000	OK
960 minute summer	12_OUT	630	77.033	0.212	2.8	16.5747	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute summer	10	10	11	1.7	0.181	0.048	1.5136
960 minute summer	11	11	12	2.2	0.190	0.063	0.4436
960 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
960 minute summer	12_1	12_1	12	0.3	0.206	0.015	0.0343
960 minute summer	12	12	12_OUT	2.8	0.371	0.081	0.2817
960 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	10	900	77.018	0.146	1.4	0.5456	0.0000	OK
1440 minute summer	11	900	77.018	0.182	1.8	0.2691	0.0000	OK
1440 minute summer	12_2	720	79.756	0.006	0.1	0.0069	0.0000	OK
1440 minute summer	12_1	750	77.673	0.023	0.3	0.0339	0.0000	OK
1440 minute summer	12	900	77.018	0.191	2.3	0.2371	0.0000	OK
1440 minute summer	12_OUT	900	77.018	0.197	2.2	15.3970	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute summer	10	10	11	1.3	0.172	0.036	1.3607
1440 minute summer	11	11	12	1.7	0.176	0.047	0.4056
1440 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
1440 minute summer	12_1	12_1	12	0.3	0.206	0.015	0.0343
1440 minute summer	12	12	12_OUT	2.2	0.291	0.062	0.2590
1440 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year +20% CC 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	10	10	77.025	0.153	14.2	0.5701	0.0000	OK
15 minute summer	11	9	76.997	0.161	20.7	0.2376	0.0000	OK
15 minute summer	12_2	11	79.763	0.013	0.6	0.0152	0.0000	OK
15 minute summer	12_1	11	77.705	0.055	2.5	0.0830	0.0000	OK
15 minute summer	12	9	76.984	0.157	25.9	0.1946	0.0000	OK
15 minute summer	12_OUT	19	76.933	0.112	26.6	8.7300	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	10	10	11	15.5	0.429	0.440	1.2808
15 minute summer	11	11	12	21.2	0.657	0.601	0.3336
15 minute summer	12_2	12_2	12	0.6	0.681	0.006	0.0270
15 minute summer	12_1	12_1	12	2.4	0.393	0.119	0.1395
15 minute summer	12	12	12_OUT	26.6	1.623	0.754	0.1235
15 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year +20% CC 30 minute summer. 270 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	10	18	77.004	0.132	13.5	0.4917	0.0000	OK
30 minute summer	11	19	76.975	0.139	18.0	0.2055	0.0000	OK
30 minute summer	12_2	18	79.763	0.013	0.6	0.0151	0.0000	OK
30 minute summer	12_1	18	77.704	0.054	2.4	0.0818	0.0000	OK
30 minute summer	12	33	76.968	0.141	22.1	0.1747	0.0000	OK
30 minute summer	12_OUT	33	76.968	0.147	21.9	11.4808	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
30 minute summer	10	10	11	13.0	0.425	0.369	1.0608
30 minute summer	11	11	12	17.5	0.611	0.495	0.2740
30 minute summer	12_2	12_2	12	0.6	0.676	0.006	0.0265
30 minute summer	12_1	12_1	12	2.3	0.391	0.116	0.1364
30 minute summer	12	12	12_OUT	21.9	1.262	0.619	0.1793
30 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year +20% CC 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	10	64	77.007	0.135	10.8	0.5042	0.0000	OK
60 minute summer	11	63	77.007	0.171	14.5	0.2526	0.0000	OK
60 minute summer	12_2	33	79.762	0.012	0.5	0.0139	0.0000	OK
60 minute summer	12_1	34	77.699	0.049	1.9	0.0739	0.0000	OK
60 minute summer	12	62	77.007	0.180	17.4	0.2233	0.0000	OK
60 minute summer	12_OUT	62	77.007	0.186	17.0	14.5373	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	10	10	11	10.5	0.387	0.296	1.2463
60 minute summer	11	11	12	13.7	0.521	0.387	0.3770
60 minute summer	12_2	12_2	12	0.5	0.641	0.005	0.0233
60 minute summer	12_1	12_1	12	1.8	0.366	0.093	0.1171
60 minute summer	12	12	12_OUT	17.0	0.868	0.482	0.2418
60 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year +20% CC 120 minute summer. 360 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	10	120	77.043	0.171	7.6	0.6370	0.0000	OK
120 minute summer	11	122	77.043	0.207	10.0	0.3052	0.0000	OK
120 minute summer	12_2	66	79.759	0.009	0.3	0.0112	0.0000	OK
120 minute summer	12_1	64	77.693	0.043	1.4	0.0648	0.0000	OK
120 minute summer	12	122	77.043	0.216	12.1	0.2675	0.0000	OK
120 minute summer	12_OUT	122	77.043	0.222	11.7	17.3126	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
120 minute summer	10	10	11	7.2	0.313	0.205	1.6071
120 minute summer	11	11	12	9.4	0.366	0.266	0.4665
120 minute summer	12_2	12_2	12	0.3	0.560	0.003	0.0166
120 minute summer	12_1	12_1	12	1.4	0.332	0.069	0.0965
120 minute summer	12	12	12_OUT	11.7	0.656	0.333	0.2954
120 minute summer	12_OUT	Infiltration		0.9			

Results for 1 year +20% CC 180 minute summer. 420 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
180 minute summer	10	176	77.061	0.189	5.9	0.7039	0.0000	OK
180 minute summer	11	176	77.061	0.225	7.5	0.3318	0.0000	OK
180 minute summer	12_2	96	79.759	0.009	0.3	0.0112	0.0000	OK
180 minute summer	12_1	96	77.689	0.039	1.1	0.0586	0.0000	OK
180 minute summer	12	176	77.061	0.234	9.0	0.2897	0.0000	OK
180 minute summer	12_OUT	176	77.061	0.240	8.7	18.7103	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)
180 minute summer	10	10	11	5.3	0.270	0.151	1.7815
180 minute summer	11	11	12	6.9	0.298	0.195	0.5082
180 minute summer	12_2	12_2	12	0.3	0.560	0.003	0.0165
180 minute summer	12_1	12_1	12	1.1	0.311	0.055	0.0820
180 minute summer	12	12	12_OUT	8.7	0.593	0.246	0.3199
180 minute summer	12_OUT	Infiltration		1.0			

Results for 1 year +20% CC 240 minute summer. 480 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	10	208	77.072	0.200	5.2	0.7470	0.0000	OK
240 minute summer	11	208	77.072	0.236	6.5	0.3488	0.0000	OK
240 minute summer	12_2	128	79.758	0.008	0.2	0.0093	0.0000	OK
240 minute summer	12_1	128	77.686	0.036	0.9	0.0537	0.0000	OK
240 minute summer	12	208	77.072	0.245	7.7	0.3040	0.0000	OK
240 minute summer	12_OUT	208	77.072	0.251	7.4	19.6109	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
240 minute summer	10	10	11	4.6	0.246	0.131	1.8886
240 minute summer	11	11	12	5.9	0.262	0.167	0.5332
240 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
240 minute summer	12_1	12_1	12	0.9	0.293	0.045	0.0717
240 minute summer	12	12	12_OUT	7.4	0.575	0.211	0.3345
240 minute summer	12_OUT	Infiltration		1.0			

Results for 1 year +20% CC 360 minute summer. 600 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
360 minute summer	10	272	77.087	0.215	4.2	0.8021	0.0000	OK
360 minute summer	11	272	77.087	0.251	5.2	0.3707	0.0000	OK
360 minute summer	12_2	192	79.758	0.008	0.2	0.0093	0.0000	OK
360 minute summer	12_1	184	77.682	0.032	0.7	0.0475	0.0000	OK
360 minute summer	12	272	77.087	0.260	6.2	0.3224	0.0000	OK
360 minute summer	12_OUT	272	77.087	0.266	6.0	20.7682	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)
360 minute summer	10	10	11	3.7	0.218	0.104	2.0187
360 minute summer	11	11	12	4.7	0.220	0.133	0.5626
360 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
360 minute summer	12_1	12_1	12	0.7	0.266	0.034	0.0596
360 minute summer	12	12	12_OUT	6.0	0.525	0.169	0.3513
360 minute summer	12_OUT	Infiltration		1.0			

Results for 1 year +20% CC 480 minute summer. 720 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	10	344	77.093	0.221	3.4	0.8237	0.0000	OK
480 minute summer	11	344	77.093	0.257	4.2	0.3792	0.0000	OK
480 minute summer	12_2	216	79.756	0.006	0.1	0.0069	0.0000	OK
480 minute summer	12_1	248	77.680	0.030	0.6	0.0449	0.0000	OK
480 minute summer	12	344	77.093	0.266	5.0	0.3295	0.0000	OK
480 minute summer	12_OUT	344	77.093	0.272	4.8	21.2178	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute summer	10	10	11	3.0	0.201	0.085	2.0666
480 minute summer	11	11	12	3.8	0.204	0.108	0.5731
480 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
480 minute summer	12_1	12_1	12	0.6	0.255	0.030	0.0549
480 minute summer	12	12	12_OUT	4.8	0.463	0.137	0.3572
480 minute summer	12_OUT	Infiltration		1.0			

Results for 1 year +20% CC 600 minute summer. 840 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	10	420	77.093	0.221	2.9	0.8241	0.0000	OK
600 minute summer	11	420	77.093	0.257	3.7	0.3794	0.0000	OK
600 minute summer	12_2	285	79.756	0.006	0.1	0.0069	0.0000	OK
600 minute summer	12_1	315	77.678	0.028	0.5	0.0417	0.0000	OK
600 minute summer	12	420	77.093	0.266	4.3	0.3297	0.0000	OK
600 minute summer	12_OUT	420	77.093	0.272	4.2	21.2275	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute summer	10	10	11	2.6	0.189	0.073	2.0676
600 minute summer	11	11	12	3.3	0.196	0.095	0.5733
600 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
600 minute summer	12_1	12_1	12	0.5	0.242	0.025	0.0483
600 minute summer	12	12	12_OUT	4.2	0.418	0.119	0.3573
600 minute summer	12_OUT	Infiltration		1.0			

Results for 1 year +20% CC 720 minute summer. 960 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	10	480	77.101	0.229	2.6	0.8550	0.0000	OK
720 minute summer	11	480	77.101	0.265	3.3	0.3916	0.0000	OK
720 minute summer	12_2	330	79.756	0.006	0.1	0.0069	0.0000	OK
720 minute summer	12_1	375	77.678	0.028	0.5	0.0417	0.0000	OK
720 minute summer	12	480	77.101	0.274	4.0	0.3400	0.0000	OK
720 minute summer	12_OUT	480	77.101	0.280	3.9	21.8743	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
720 minute summer	10	10	11	2.3	0.184	0.065	2.1333
720 minute summer	11	11	12	3.0	0.198	0.085	0.5871
720 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
720 minute summer	12_1	12_1	12	0.5	0.242	0.025	0.0483
720 minute summer	12	12	12_OUT	3.9	0.371	0.109	0.3649
720 minute summer	12_OUT	Infiltration		1.0			

Results for 1 year +20% CC 960 minute summer. 1200 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	10	630	77.096	0.224	2.2	0.8370	0.0000	OK
960 minute summer	11	630	77.096	0.260	2.8	0.3845	0.0000	OK
960 minute summer	12_2	450	79.756	0.006	0.1	0.0069	0.0000	OK
960 minute summer	12_1	495	77.675	0.025	0.4	0.0381	0.0000	OK
960 minute summer	12	630	77.096	0.269	3.3	0.3340	0.0000	OK
960 minute summer	12_OUT	630	77.096	0.275	3.2	21.4970	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute summer	10	10	11	2.0	0.178	0.055	2.0955
960 minute summer	11	11	12	2.5	0.185	0.071	0.5792
960 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
960 minute summer	12_1	12_1	12	0.4	0.227	0.020	0.0413
960 minute summer	12	12	12_OUT	3.2	0.371	0.091	0.3606
960 minute summer	12_OUT	Infiltration		1.0			

Results for 1 year +20% CC 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	10	900	77.086	0.214	1.7	0.7983	0.0000	OK
1440 minute summer	11	900	77.086	0.250	2.1	0.3692	0.0000	OK
1440 minute summer	12_2	690	79.756	0.006	0.1	0.0069	0.0000	OK
1440 minute summer	12_1	720	77.673	0.023	0.3	0.0339	0.0000	OK
1440 minute summer	12	900	77.086	0.259	2.6	0.3211	0.0000	OK
1440 minute summer	12_OUT	900	77.086	0.265	2.5	20.6874	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute summer	10	10	11	1.5	0.168	0.043	2.0099
1440 minute summer	11	11	12	2.0	0.173	0.056	0.5607
1440 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
1440 minute summer	12_1	12_1	12	0.3	0.206	0.015	0.0343
1440 minute summer	12	12	12_OUT	2.5	0.372	0.071	0.3503
1440 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	10	10	77.073	0.201	26.3	0.7481	0.0000	OK
15 minute summer	11	11	77.036	0.200	35.4	0.2948	0.0000	OK
15 minute summer	12_2	11	79.767	0.017	1.1	0.0203	0.0000	OK
15 minute summer	12_1	11	77.725	0.075	4.7	0.1130	0.0000	OK
15 minute summer	12	19	77.022	0.195	44.0	0.2415	0.0000	OK
15 minute summer	12_OUT	19	77.022	0.201	43.9	15.7043	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	10	10	11	25.8	0.518	0.730	1.7185
15 minute summer	11	11	12	35.0	0.783	0.992	0.4150
15 minute summer	12_2	12_2	12	1.1	0.822	0.011	0.0412
15 minute summer	12_1	12_1	12	4.5	0.482	0.228	0.2181
15 minute summer	12	12	12_OUT	43.9	1.819	1.243	0.2647
15 minute summer	12_OUT	Infiltration		0.9			

Results for 30 year 30 minute summer. 270 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	10	36	77.093	0.221	25.0	0.8253	0.0000	OK
30 minute summer	11	34	77.093	0.257	33.4	0.3801	0.0000	OK
30 minute summer	12_2	18	79.767	0.017	1.1	0.0202	0.0000	OK
30 minute summer	12_1	18	77.724	0.074	4.5	0.1113	0.0000	OK
30 minute summer	12	34	77.094	0.267	41.0	0.3305	0.0000	OK
30 minute summer	12_OUT	34	77.094	0.273	40.1	21.2889	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
30 minute summer	10	10	11	24.2	0.499	0.684	2.0701
30 minute summer	11	11	12	32.1	0.712	0.910	0.5742
30 minute summer	12_2	12_2	12	1.1	0.820	0.011	0.0411
30 minute summer	12_1	12_1	12	4.4	0.476	0.220	0.2132
30 minute summer	12	12	12_OUT	40.1	1.290	1.134	0.3580
30 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	10	63	77.176	0.304	19.7	1.1345	0.0000	SURCHARGED
60 minute summer	11	65	77.176	0.340	25.7	0.5029	0.0000	SURCHARGED
60 minute summer	12_2	34	79.765	0.015	0.8	0.0176	0.0000	OK
60 minute summer	12_1	33	77.716	0.066	3.5	0.0991	0.0000	OK
60 minute summer	12	64	77.177	0.350	31.1	0.4338	0.0000	SURCHARGED
60 minute summer	12_OUT	64	77.176	0.355	30.3	27.7090	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	10	10	11	18.5	0.412	0.524	2.4301
60 minute summer	11	11	12	24.2	0.522	0.685	0.6199
60 minute summer	12_2	12_2	12	0.8	0.746	0.008	0.0331
60 minute summer	12_1	12_1	12	3.5	0.444	0.174	0.1806
60 minute summer	12	12	12_OUT	30.3	0.977	0.858	0.3780
60 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year 120 minute summer. 360 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
120 minute summer	10	122	77.261	0.389	13.5	1.4512	0.0000	SURCHARGED
120 minute summer	11	126	77.262	0.426	16.7	0.6292	0.0000	SURCHARGED
120 minute summer	12_2	64	79.763	0.013	0.6	0.0153	0.0000	OK
120 minute summer	12_1	64	77.705	0.055	2.4	0.0833	0.0000	OK
120 minute summer	12	122	77.262	0.435	20.0	0.5388	0.0000	SURCHARGED
120 minute summer	12_OUT	124	77.261	0.440	19.3	34.3887	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)
120 minute summer	10	10	11	11.7	0.296	0.333	2.4301
120 minute summer	11	11	12	15.2	0.336	0.430	0.6199
120 minute summer	12_2	12_2	12	0.6	0.682	0.006	0.0271
120 minute summer	12_1	12_1	12	2.4	0.394	0.120	0.1404
120 minute summer	12	12	12_OUT	19.3	0.821	0.546	0.3780
120 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year 180 minute summer. 420 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	10	180	77.304	0.432	10.4	1.6112	0.0000	SURCHARGED
180 minute summer	11	184	77.305	0.469	12.8	0.6929	0.0000	SURCHARGED
180 minute summer	12_2	100	79.761	0.011	0.4	0.0127	0.0000	OK
180 minute summer	12_1	96	77.700	0.050	1.9	0.0749	0.0000	OK
180 minute summer	12	184	77.305	0.478	15.4	0.5931	0.0000	SURCHARGED
180 minute summer	12_OUT	184	77.304	0.483	14.9	37.7356	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
180 minute summer	10	10	11	9.0	0.239	0.255	2.4301
180 minute summer	11	11	12	11.7	0.266	0.331	0.6199
180 minute summer	12_2	12_2	12	0.4	0.607	0.004	0.0204
180 minute summer	12_1	12_1	12	1.9	0.369	0.096	0.1194
180 minute summer	12	12	12_OUT	14.9	0.738	0.422	0.3780
180 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year 240 minute summer. 480 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	10	244	77.336	0.464	8.9	1.7300	0.0000	SURCHARGED
240 minute summer	11	244	77.333	0.497	11.0	0.7338	0.0000	SURCHARGED
240 minute summer	12_2	128	79.761	0.011	0.4	0.0127	0.0000	OK
240 minute summer	12_1	124	77.696	0.046	1.6	0.0687	0.0000	OK
240 minute summer	12	240	77.336	0.509	13.2	0.6308	0.0000	SURCHARGED
240 minute summer	12_OUT	240	77.333	0.512	12.7	39.9622	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
240 minute summer	10	10	11	7.7	0.215	0.218	2.4301
240 minute summer	11	11	12	10.0	0.245	0.283	0.6199
240 minute summer	12_2	12_2	12	0.4	0.607	0.004	0.0204
240 minute summer	12_1	12_1	12	1.6	0.347	0.079	0.1051
240 minute summer	12	12	12_OUT	12.7	0.656	0.361	0.3780
240 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year 360 minute summer. 600 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	10	344	77.360	0.488	7.0	1.8189	0.0000	SURCHARGED
360 minute summer	11	352	77.357	0.521	8.7	0.7701	0.0000	SURCHARGED
360 minute summer	12_2	184	79.759	0.009	0.3	0.0112	0.0000	OK
360 minute summer	12_1	184	77.692	0.042	1.3	0.0625	0.0000	OK
360 minute summer	12	328	77.357	0.530	10.5	0.6571	0.0000	SURCHARGED
360 minute summer	12_OUT	328	77.356	0.535	10.2	41.8057	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
360 minute summer	10	10	11	6.1	0.187	0.172	2.4301
360 minute summer	11	11	12	7.9	0.222	0.225	0.6199
360 minute summer	12_2	12_2	12	0.3	0.560	0.003	0.0166
360 minute summer	12_1	12_1	12	1.3	0.325	0.064	0.0909
360 minute summer	12	12	12_OUT	10.2	0.576	0.289	0.3780
360 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year 480 minute summer. 720 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	10	384	77.373	0.501	5.6	1.8683	0.0000	SURCHARGED
480 minute summer	11	384	77.371	0.535	7.0	0.7900	0.0000	SURCHARGED
480 minute summer	12_2	232	79.758	0.008	0.2	0.0093	0.0000	OK
480 minute summer	12_1	248	77.687	0.037	1.0	0.0562	0.0000	OK
480 minute summer	12	384	77.370	0.543	8.7	0.6731	0.0000	SURCHARGED
480 minute summer	12_OUT	400	77.369	0.548	8.5	42.7571	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute summer	10	10	11	4.9	0.177	0.139	2.4301
480 minute summer	11	11	12	6.7	0.203	0.188	0.6199
480 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
480 minute summer	12_1	12_1	12	1.0	0.303	0.050	0.0769
480 minute summer	12	12	12_OUT	8.5	0.559	0.241	0.3780
480 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year 600 minute summer. 840 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	10	495	77.373	0.501	4.7	1.8686	0.0000	SURCHARGED
600 minute summer	11	495	77.371	0.535	5.9	0.7896	0.0000	SURCHARGED
600 minute summer	12_2	300	79.758	0.008	0.2	0.0093	0.0000	OK
600 minute summer	12_1	315	77.684	0.034	0.8	0.0510	0.0000	OK
600 minute summer	12	465	77.370	0.543	7.1	0.6734	0.0000	SURCHARGED
600 minute summer	12_OUT	465	77.370	0.549	7.5	42.8716	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute summer	10	10	11	4.2	0.168	0.120	2.4301
600 minute summer	11	11	12	5.5	0.200	0.156	0.6199
600 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
600 minute summer	12_1	12_1	12	0.8	0.282	0.040	0.0663
600 minute summer	12	12	12_OUT	7.5	0.535	0.213	0.3780
600 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year 720 minute summer. 960 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
720 minute summer	10	555	77.379	0.507	4.2	1.8928	0.0000	SURCHARGED
720 minute summer	11	555	77.377	0.541	5.4	0.7995	0.0000	SURCHARGED
720 minute summer	12_2	375	79.758	0.008	0.2	0.0093	0.0000	OK
720 minute summer	12_1	375	77.684	0.034	0.8	0.0510	0.0000	OK
720 minute summer	12	525	77.378	0.551	6.8	0.6837	0.0000	SURCHARGED
720 minute summer	12_OUT	525	77.377	0.556	6.7	43.4000	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)
720 minute summer	10	10	11	3.8	0.165	0.107	2.4301
720 minute summer	11	11	12	5.2	0.177	0.146	0.6199
720 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
720 minute summer	12_1	12_1	12	0.8	0.282	0.040	0.0663
720 minute summer	12	12	12_OUT	6.7	0.517	0.190	0.3780
720 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year 960 minute summer. 1200 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	10	720	77.370	0.498	3.5	1.8579	0.0000	SURCHARGED
960 minute summer	11	675	77.371	0.535	4.4	0.7908	0.0000	SURCHARGED
960 minute summer	12_2	495	79.758	0.008	0.2	0.0093	0.0000	OK
960 minute summer	12_1	495	77.680	0.030	0.6	0.0449	0.0000	OK
960 minute summer	12	660	77.372	0.545	5.6	0.6760	0.0000	SURCHARGED
960 minute summer	12_OUT	675	77.372	0.551	5.5	43.0424	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute summer	10	10	11	3.1	0.163	0.088	2.4301
960 minute summer	11	11	12	4.3	0.170	0.121	0.6199
960 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
960 minute summer	12_1	12_1	12	0.6	0.255	0.030	0.0549
960 minute summer	12	12	12_OUT	5.5	0.453	0.156	0.3780
960 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	10	960	77.363	0.491	2.6	1.8332	0.0000	SURCHARGED
1440 minute summer	11	960	77.363	0.527	3.3	0.7785	0.0000	SURCHARGED
1440 minute summer	12_2	630	79.756	0.006	0.1	0.0069	0.0000	OK
1440 minute summer	12_1	750	77.678	0.028	0.5	0.0417	0.0000	OK
1440 minute summer	12	960	77.363	0.536	4.6	0.6642	0.0000	SURCHARGED
1440 minute summer	12_OUT	960	77.363	0.542	3.9	42.2848	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute summer	10	10	11	2.3	0.161	0.066	2.4301
1440 minute summer	11	11	12	3.6	0.167	0.102	0.6199
1440 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
1440 minute summer	12_1	12_1	12	0.5	0.242	0.025	0.0483
1440 minute summer	12	12	12_OUT	3.9	0.371	0.111	0.3780
1440 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	10	11	77.095	0.223	31.5	0.8331	0.0000	OK
15 minute summer	11	19	77.062	0.226	42.2	0.3340	0.0000	OK
15 minute summer	12_2	11	79.768	0.018	1.3	0.0219	0.0000	OK
15 minute summer	12_1	11	77.732	0.082	5.7	0.1240	0.0000	OK
15 minute summer	12	20	77.062	0.235	52.1	0.2913	0.0000	OK
15 minute summer	12_OUT	20	77.062	0.241	51.6	18.8451	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	10	10	11	30.6	0.551	0.867	1.9363
15 minute summer	11	11	12	41.3	0.830	1.168	0.5110
15 minute summer	12_2	12_2	12	1.3	0.866	0.013	0.0463
15 minute summer	12_1	12_1	12	5.5	0.510	0.277	0.2492
15 minute summer	12	12	12_OUT	51.6	1.861	1.461	0.3219
15 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year +20% CC 30 minute summer. 270 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	10	36	77.153	0.281	30.0	1.0476	0.0000	OK
30 minute summer	11	35	77.153	0.317	39.8	0.4687	0.0000	SURCHARGED
30 minute summer	12_2	18	79.768	0.018	1.3	0.0219	0.0000	OK
30 minute summer	12_1	18	77.731	0.081	5.4	0.1219	0.0000	OK
30 minute summer	12	36	77.153	0.326	47.8	0.4040	0.0000	SURCHARGED
30 minute summer	12_OUT	34	77.153	0.332	46.4	25.9104	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
30 minute summer	10	10	11	28.8	0.522	0.814	2.3977
30 minute summer	11	11	12	37.1	0.740	1.050	0.6199
30 minute summer	12_2	12_2	12	1.3	0.864	0.013	0.0461
30 minute summer	12_1	12_1	12	5.3	0.503	0.266	0.2429
30 minute summer	12	12	12_OUT	46.4	1.275	1.314	0.3780
30 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year +20% CC 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	10	65	77.259	0.387	23.6	1.4439	0.0000	SURCHARGED
60 minute summer	11	65	77.259	0.423	30.5	0.6242	0.0000	SURCHARGED
60 minute summer	12_2	34	79.766	0.016	1.0	0.0195	0.0000	OK
60 minute summer	12_1	33	77.722	0.072	4.2	0.1082	0.0000	OK
60 minute summer	12	64	77.259	0.432	36.8	0.5358	0.0000	SURCHARGED
60 minute summer	12_OUT	64	77.259	0.438	35.8	34.1678	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	10	10	11	21.8	0.416	0.617	2.4301
60 minute summer	11	11	12	28.5	0.525	0.806	0.6199
60 minute summer	12_2	12_2	12	1.0	0.799	0.010	0.0387
60 minute summer	12_1	12_1	12	4.1	0.468	0.208	0.2050
60 minute summer	12	12	12_OUT	35.8	1.032	1.014	0.3780
60 minute summer	12_OUT	Infiltration		1.0			

Results for 30 year +20% CC 120 minute summer. 360 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	10	124	77.366	0.494	16.2	1.8424	0.0000	SURCHARGED
120 minute summer	11	124	77.367	0.531	19.9	0.7840	0.0000	SURCHARGED
120 minute summer	12_2	64	79.764	0.014	0.7	0.0165	0.0000	OK
120 minute summer	12_1	64	77.711	0.061	2.9	0.0910	0.0000	OK
120 minute summer	12	124	77.367	0.540	24.2	0.6695	0.0000	SURCHARGED
120 minute summer	12_OUT	124	77.366	0.545	23.5	42.5382	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
120 minute summer	10	10	11	14.0	0.283	0.397	2.4301
120 minute summer	11	11	12	18.4	0.316	0.520	0.6199
120 minute summer	12_2	12_2	12	0.7	0.715	0.007	0.0302
120 minute summer	12_1	12_1	12	2.9	0.420	0.145	0.1597
120 minute summer	12	12	12_OUT	23.5	0.844	0.665	0.3780
120 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 180 minute summer. 420 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	10	184	77.428	0.556	12.4	2.0743	0.0000	SURCHARGED
180 minute summer	11	184	77.428	0.592	15.6	0.8743	0.0000	SURCHARGED
180 minute summer	12_2	96	79.762	0.012	0.5	0.0141	0.0000	OK
180 minute summer	12_1	96	77.703	0.053	2.2	0.0801	0.0000	OK
180 minute summer	12	184	77.429	0.602	19.6	0.7459	0.0000	SURCHARGED
180 minute summer	12_OUT	184	77.428	0.607	19.3	47.3780	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
180 minute summer	10	10	11	11.0	0.225	0.312	2.4301
180 minute summer	11	11	12	15.2	0.278	0.431	0.6199
180 minute summer	12_2	12_2	12	0.5	0.647	0.005	0.0239
180 minute summer	12_1	12_1	12	2.2	0.386	0.111	0.1324
180 minute summer	12	12	12_OUT	19.3	0.788	0.546	0.3780
180 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 240 minute summer. 480 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	10	244	77.466	0.594	10.7	2.2150	0.0000	SURCHARGED
240 minute summer	11	244	77.465	0.629	13.3	0.9293	0.0000	SURCHARGED
240 minute summer	12_2	124	79.761	0.011	0.5	0.0138	0.0000	OK
240 minute summer	12_1	124	77.700	0.050	1.9	0.0745	0.0000	OK
240 minute summer	12	244	77.464	0.637	16.7	0.7905	0.0000	SURCHARGED
240 minute summer	12_OUT	244	77.464	0.643	16.4	50.2264	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
240 minute summer	10	10	11	9.4	0.208	0.266	2.4301
240 minute summer	11	11	12	13.0	0.263	0.369	0.6199
240 minute summer	12_2	12_2	12	0.5	0.640	0.005	0.0232
240 minute summer	12_1	12_1	12	1.9	0.367	0.094	0.1182
240 minute summer	12	12	12_OUT	16.4	0.738	0.465	0.3780
240 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 360 minute summer. 600 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	10	360	77.507	0.635	8.4	2.3691	0.0000	FLOOD RISK
360 minute summer	11	360	77.505	0.669	10.8	0.9875	0.0000	SURCHARGED
360 minute summer	12_2	184	79.760	0.010	0.4	0.0126	0.0000	OK
360 minute summer	12_1	184	77.694	0.044	1.5	0.0667	0.0000	OK
360 minute summer	12	352	77.504	0.677	13.3	0.8390	0.0000	SURCHARGED
360 minute summer	12_OUT	360	77.503	0.682	13.5	53.2849	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
360 minute summer	10	10	11	7.7	0.189	0.219	2.4301
360 minute summer	11	11	12	10.3	0.243	0.292	0.6199
360 minute summer	12_2	12_2	12	0.4	0.603	0.004	0.0200
360 minute summer	12_1	12_1	12	1.5	0.339	0.074	0.1006
360 minute summer	12	12	12_OUT	13.5	0.598	0.383	0.3780
360 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 480 minute summer. 720 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	10	424	77.526	0.654	6.7	2.4398	0.0000	FLOOD RISK
480 minute summer	11	424	77.524	0.688	8.8	1.0157	0.0000	SURCHARGED
480 minute summer	12_2	248	79.759	0.009	0.3	0.0112	0.0000	OK
480 minute summer	12_1	248	77.691	0.041	1.2	0.0609	0.0000	OK
480 minute summer	12	440	77.523	0.696	11.1	0.8632	0.0000	SURCHARGED
480 minute summer	12_OUT	432	77.523	0.702	11.0	54.7741	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute summer	10	10	11	6.3	0.180	0.178	2.4301
480 minute summer	11	11	12	8.8	0.214	0.248	0.6199
480 minute summer	12_2	12_2	12	0.3	0.560	0.003	0.0166
480 minute summer	12_1	12_1	12	1.2	0.320	0.060	0.0874
480 minute summer	12	12	12_OUT	11.0	0.576	0.312	0.3780
480 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 600 minute summer. 840 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	10	480	77.526	0.654	5.6	2.4409	0.0000	FLOOD RISK
600 minute summer	11	495	77.525	0.689	7.3	1.0171	0.0000	SURCHARGED
600 minute summer	12_2	285	79.758	0.008	0.2	0.0093	0.0000	OK
600 minute summer	12_1	315	77.687	0.037	1.0	0.0562	0.0000	OK
600 minute summer	12	495	77.527	0.700	9.3	0.8674	0.0000	SURCHARGED
600 minute summer	12_OUT	495	77.525	0.704	8.9	54.9761	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute summer	10	10	11	5.2	0.172	0.148	2.4301
600 minute summer	11	11	12	7.3	0.203	0.206	0.6199
600 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
600 minute summer	12_1	12_1	12	1.0	0.303	0.050	0.0769
600 minute summer	12	12	12_OUT	8.9	0.570	0.251	0.3780
600 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 720 minute summer. 960 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	10	555	77.533	0.661	5.1	2.4670	0.0000	FLOOD RISK
720 minute summer	11	555	77.535	0.699	6.6	1.0321	0.0000	SURCHARGED
720 minute summer	12_2	360	79.758	0.008	0.2	0.0093	0.0000	OK
720 minute summer	12_1	375	77.686	0.036	0.9	0.0537	0.0000	OK
720 minute summer	12	555	77.535	0.708	8.3	0.8776	0.0000	SURCHARGED
720 minute summer	12_OUT	570	77.535	0.714	8.4	55.7134	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
720 minute summer	10	10	11	4.7	0.164	0.134	2.4301
720 minute summer	11	11	12	6.5	0.203	0.184	0.6199
720 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
720 minute summer	12_1	12_1	12	0.9	0.293	0.045	0.0717
720 minute summer	12	12	12_OUT	8.4	0.550	0.237	0.3780
720 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 960 minute summer. 1200 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	10	690	77.535	0.663	4.2	2.4743	0.0000	FLOOD RISK
960 minute summer	11	690	77.538	0.702	5.5	1.0366	0.0000	SURCHARGED
960 minute summer	12_2	480	79.758	0.008	0.2	0.0093	0.0000	OK
960 minute summer	12_1	495	77.684	0.034	0.8	0.0510	0.0000	OK
960 minute summer	12	720	77.540	0.713	6.6	0.8845	0.0000	SURCHARGED
960 minute summer	12_OUT	690	77.539	0.718	7.4	56.0545	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute summer	10	10	11	3.9	0.154	0.111	2.4301
960 minute summer	11	11	12	5.0	0.177	0.141	0.6199
960 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
960 minute summer	12_1	12_1	12	0.8	0.282	0.040	0.0663
960 minute summer	12	12	12_OUT	7.4	0.531	0.209	0.3780
960 minute summer	12_OUT	Infiltration		1.1			

Results for 30 year +20% CC 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	10	960	77.531	0.659	3.2	2.4581	0.0000	FLOOD RISK
1440 minute summer	11	990	77.532	0.696	4.2	1.0281	0.0000	SURCHARGED
1440 minute summer	12_2	630	79.756	0.006	0.1	0.0069	0.0000	OK
1440 minute summer	12_1	750	77.680	0.030	0.6	0.0449	0.0000	OK
1440 minute summer	12	990	77.532	0.705	5.4	0.8748	0.0000	SURCHARGED
1440 minute summer	12_OUT	990	77.533	0.712	5.1	55.5739	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute summer	10	10	11	3.0	0.154	0.086	2.4301
1440 minute summer	11	11	12	4.3	0.168	0.122	0.6199
1440 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
1440 minute summer	12_1	12_1	12	0.6	0.255	0.030	0.0549
1440 minute summer	12	12	12_OUT	5.1	0.419	0.146	0.3780
1440 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	10	11	77.107	0.235	34.0	0.8781	0.0000	OK
15 minute summer	11	21	77.080	0.244	45.3	0.3607	0.0000	OK
15 minute summer	12_2	11	79.769	0.019	1.5	0.0230	0.0000	OK
15 minute summer	12_1	11	77.735	0.085	6.1	0.1284	0.0000	OK
15 minute summer	12	20	77.080	0.253	55.9	0.3136	0.0000	OK
15 minute summer	12_OUT	20	77.081	0.260	55.3	20.2629	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	10	10	11	32.9	0.565	0.930	2.0377
15 minute summer	11	11	12	44.2	0.848	1.252	0.5490
15 minute summer	12_2	12_2	12	1.4	0.895	0.015	0.0496
15 minute summer	12_1	12_1	12	5.9	0.522	0.297	0.2615
15 minute summer	12	12	12_OUT	55.3	1.867	1.565	0.3439
15 minute summer	12_OUT	Infiltration		1.0			

Results for 100 year 30 minute summer. 270 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	10	35	77.186	0.314	32.6	1.1707	0.0000	SURCHARGED
30 minute summer	11	34	77.186	0.350	42.8	0.5163	0.0000	SURCHARGED
30 minute summer	12_2	18	79.769	0.019	1.4	0.0227	0.0000	OK
30 minute summer	12_1	18	77.735	0.085	5.9	0.1274	0.0000	OK
30 minute summer	12	35	77.185	0.358	52.1	0.4445	0.0000	SURCHARGED
30 minute summer	12_OUT	34	77.185	0.364	50.5	28.4564	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
30 minute summer	10	10	11	30.8	0.532	0.871	2.4301
30 minute summer	11	11	12	40.5	0.753	1.145	0.6199
30 minute summer	12_2	12_2	12	1.4	0.885	0.014	0.0485
30 minute summer	12_1	12_1	12	5.8	0.517	0.291	0.2584
30 minute summer	12	12	12_OUT	50.5	1.273	1.431	0.3780
30 minute summer	12_OUT	Infiltration		1.0			

Results for 100 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	10	65	77.301	0.429	25.6	1.6017	0.0000	SURCHARGED
60 minute summer	11	64	77.301	0.465	32.8	0.6866	0.0000	SURCHARGED
60 minute summer	12_2	33	79.767	0.017	1.1	0.0203	0.0000	OK
60 minute summer	12_1	33	77.725	0.075	4.6	0.1131	0.0000	OK
60 minute summer	12	65	77.303	0.476	39.7	0.5902	0.0000	SURCHARGED
60 minute summer	12_OUT	64	77.301	0.480	38.6	37.4955	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	10	10	11	23.4	0.417	0.662	2.4301
60 minute summer	11	11	12	30.6	0.527	0.866	0.6199
60 minute summer	12_2	12_2	12	1.1	0.820	0.011	0.0411
60 minute summer	12_1	12_1	12	4.5	0.482	0.229	0.2184
60 minute summer	12	12	12_OUT	38.6	1.051	1.093	0.3780
60 minute summer	12_OUT	Infiltration		1.0			

Results for 100 year 120 minute summer. 360 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	10	124	77.415	0.543	17.4	2.0267	0.0000	SURCHARGED
120 minute summer	11	126	77.415	0.579	21.4	0.8559	0.0000	SURCHARGED
120 minute summer	12_2	66	79.764	0.014	0.7	0.0165	0.0000	OK
120 minute summer	12_1	64	77.712	0.062	3.1	0.0940	0.0000	OK
120 minute summer	12	124	77.415	0.588	26.4	0.7293	0.0000	SURCHARGED
120 minute summer	12_OUT	124	77.415	0.594	26.0	46.4082	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
120 minute summer	10	10	11	15.0	0.277	0.424	2.4301
120 minute summer	11	11	12	20.3	0.318	0.574	0.6199
120 minute summer	12_2	12_2	12	0.7	0.716	0.007	0.0302
120 minute summer	12_1	12_1	12	3.1	0.429	0.156	0.1672
120 minute summer	12	12	12_OUT	26.0	0.873	0.735	0.3780
120 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year 180 minute summer. 420 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	10	184	77.479	0.607	13.3	2.2638	0.0000	FLOOD RISK
180 minute summer	11	184	77.480	0.644	17.2	0.9506	0.0000	SURCHARGED
180 minute summer	12_2	96	79.763	0.013	0.6	0.0153	0.0000	OK
180 minute summer	12_1	96	77.705	0.055	2.4	0.0834	0.0000	OK
180 minute summer	12	184	77.479	0.652	21.8	0.8086	0.0000	SURCHARGED
180 minute summer	12_OUT	184	77.478	0.657	21.2	51.3354	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
180 minute summer	10	10	11	12.3	0.226	0.349	2.4301
180 minute summer	11	11	12	17.0	0.284	0.482	0.6199
180 minute summer	12_2	12_2	12	0.6	0.683	0.006	0.0272
180 minute summer	12_1	12_1	12	2.4	0.395	0.121	0.1408
180 minute summer	12	12	12_OUT	21.2	0.807	0.599	0.3780
180 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year 240 minute summer. 480 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	10	244	77.513	0.641	11.4	2.3933	0.0000	FLOOD RISK
240 minute summer	11	240	77.513	0.677	14.7	1.0004	0.0000	SURCHARGED
240 minute summer	12_2	128	79.762	0.012	0.5	0.0141	0.0000	OK
240 minute summer	12_1	124	77.701	0.051	2.0	0.0763	0.0000	OK
240 minute summer	12	240	77.514	0.687	18.4	0.8518	0.0000	SURCHARGED
240 minute summer	12_OUT	244	77.514	0.693	18.2	54.1191	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
240 minute summer	10	10	11	10.5	0.209	0.298	2.4301
240 minute summer	11	11	12	14.4	0.270	0.407	0.6199
240 minute summer	12_2	12_2	12	0.5	0.647	0.005	0.0239
240 minute summer	12_1	12_1	12	2.0	0.373	0.099	0.1227
240 minute summer	12	12	12_OUT	18.2	0.743	0.516	0.3780
240 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year 360 minute summer. 600 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	10	360	77.556	0.684	8.9	2.5510	0.0000	FLOOD RISK
360 minute summer	11	360	77.553	0.717	11.6	1.0596	0.0000	SURCHARGED
360 minute summer	12_2	184	79.760	0.010	0.4	0.0126	0.0000	OK
360 minute summer	12_1	184	77.696	0.046	1.6	0.0687	0.0000	OK
360 minute summer	12	360	77.551	0.724	14.8	0.8983	0.0000	SURCHARGED
360 minute summer	12_OUT	360	77.550	0.729	14.0	56.9594	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
360 minute summer	10	10	11	8.3	0.191	0.234	2.4301
360 minute summer	11	11	12	11.6	0.243	0.328	0.6199
360 minute summer	12_2	12_2	12	0.4	0.603	0.004	0.0200
360 minute summer	12_1	12_1	12	1.6	0.347	0.079	0.1051
360 minute summer	12	12	12_OUT	14.0	0.601	0.396	0.3780
360 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year 480 minute summer. 720 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	10	424	77.568	0.696	7.1	2.5986	0.0000	FLOOD RISK
480 minute summer	11	424	77.565	0.729	9.2	1.0774	0.0000	SURCHARGED
480 minute summer	12_2	248	79.759	0.009	0.3	0.0112	0.0000	OK
480 minute summer	12_1	248	77.692	0.042	1.3	0.0631	0.0000	OK
480 minute summer	12	432	77.566	0.739	11.8	0.9167	0.0000	SURCHARGED
480 minute summer	12_OUT	440	77.565	0.744	11.3	58.0854	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute summer	10	10	11	6.6	0.181	0.187	2.4301
480 minute summer	11	11	12	9.2	0.224	0.262	0.6199
480 minute summer	12_2	12_2	12	0.3	0.560	0.003	0.0166
480 minute summer	12_1	12_1	12	1.3	0.327	0.065	0.0925
480 minute summer	12	12	12_OUT	11.3	0.576	0.320	0.3780
480 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year 600 minute summer. 840 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	10	510	77.572	0.700	5.9	2.6114	0.0000	FLOOD RISK
600 minute summer	11	510	77.570	0.734	7.7	1.0838	0.0000	SURCHARGED
600 minute summer	12_2	315	79.759	0.009	0.3	0.0112	0.0000	OK
600 minute summer	12_1	315	77.689	0.039	1.1	0.0586	0.0000	OK
600 minute summer	12	495	77.571	0.744	9.4	0.9221	0.0000	SURCHARGED
600 minute summer	12_OUT	495	77.570	0.749	10.1	58.4469	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute summer	10	10	11	5.5	0.175	0.157	2.4301
600 minute summer	11	11	12	7.2	0.212	0.203	0.6199
600 minute summer	12_2	12_2	12	0.3	0.560	0.003	0.0166
600 minute summer	12_1	12_1	12	1.1	0.312	0.055	0.0822
600 minute summer	12	12	12_OUT	10.1	0.570	0.286	0.3780
600 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year 720 minute summer. 960 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	10	600	77.567	0.695	5.3	2.5940	0.0000	FLOOD RISK
720 minute summer	11	585	77.567	0.731	6.9	1.0802	0.0000	SURCHARGED
720 minute summer	12_2	345	79.758	0.008	0.2	0.0093	0.0000	OK
720 minute summer	12_1	375	77.686	0.036	0.9	0.0537	0.0000	OK
720 minute summer	12	570	77.572	0.745	8.2	0.9234	0.0000	SURCHARGED
720 minute summer	12_OUT	570	77.569	0.748	9.0	58.3761	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
720 minute summer	10	10	11	5.0	0.165	0.141	2.4301
720 minute summer	11	11	12	6.4	0.203	0.182	0.6199
720 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
720 minute summer	12_1	12_1	12	0.9	0.293	0.045	0.0717
720 minute summer	12	12	12_OUT	9.0	0.570	0.256	0.3780
720 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year 960 minute summer. 1200 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	10	705	77.574	0.702	4.4	2.6183	0.0000	FLOOD RISK
960 minute summer	11	705	77.575	0.739	5.7	1.0910	0.0000	SURCHARGED
960 minute summer	12_2	480	79.758	0.008	0.2	0.0093	0.0000	OK
960 minute summer	12_1	495	77.684	0.034	0.8	0.0510	0.0000	OK
960 minute summer	12	690	77.574	0.747	7.3	0.9267	0.0000	SURCHARGED
960 minute summer	12_OUT	690	77.574	0.753	7.1	58.8120	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute summer	10	10	11	4.1	0.154	0.117	2.4301
960 minute summer	11	11	12	5.7	0.177	0.161	0.6199
960 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
960 minute summer	12_1	12_1	12	0.8	0.282	0.040	0.0663
960 minute summer	12	12	12_OUT	7.1	0.517	0.200	0.3780
960 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	10	960	77.563	0.691	3.3	2.5773	0.0000	FLOOD RISK
1440 minute summer	11	990	77.564	0.728	4.3	1.0755	0.0000	SURCHARGED
1440 minute summer	12_2	600	79.756	0.006	0.1	0.0069	0.0000	OK
1440 minute summer	12_1	750	77.680	0.030	0.6	0.0449	0.0000	OK
1440 minute summer	12	1020	77.564	0.737	5.1	0.9133	0.0000	SURCHARGED
1440 minute summer	12_OUT	990	77.565	0.744	5.9	58.0769	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute summer	10	10	11	3.1	0.154	0.089	2.4301
1440 minute summer	11	11	12	4.0	0.168	0.114	0.6199
1440 minute summer	12_2	12_2	12	0.1	0.402	0.001	0.0077
1440 minute summer	12_1	12_1	12	0.6	0.255	0.030	0.0549
1440 minute summer	12	12	12_OUT	5.9	0.406	0.168	0.3780
1440 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year +20% CC 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	10	11	77.144	0.272	40.8	1.0157	0.0000	OK
15 minute summer	11	20	77.134	0.298	54.0	0.4408	0.0000	OK
15 minute summer	12_2	11	79.771	0.021	1.7	0.0249	0.0000	OK
15 minute summer	12_1	11	77.744	0.094	7.3	0.1410	0.0000	OK
15 minute summer	12	20	77.134	0.307	66.6	0.3811	0.0000	SURCHARGED
15 minute summer	12_OUT	19	77.134	0.313	65.6	24.4318	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	10	10	11	39.0	0.599	1.103	2.3448
15 minute summer	11	11	12	52.4	0.894	1.484	0.6196
15 minute summer	12_2	12_2	12	1.7	0.941	0.017	0.0558
15 minute summer	12_1	12_1	12	7.1	0.552	0.358	0.2976
15 minute summer	12	12	12_OUT	65.6	1.861	1.856	0.3780
15 minute summer	12_OUT	Infiltration		1.0			

Results for 100 year +20% CC 30 minute summer. 270 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	10	35	77.269	0.397	39.1	1.4794	0.0000	SURCHARGED
30 minute summer	11	36	77.269	0.433	50.4	0.6394	0.0000	SURCHARGED
30 minute summer	12_2	18	79.771	0.021	1.7	0.0249	0.0000	OK
30 minute summer	12_1	18	77.743	0.093	7.0	0.1392	0.0000	OK
30 minute summer	12	35	77.269	0.442	62.2	0.5476	0.0000	SURCHARGED
30 minute summer	12_OUT	34	77.268	0.447	60.9	34.9405	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
30 minute summer	10	10	11	36.0	0.554	1.018	2.4301
30 minute summer	11	11	12	48.3	0.763	1.366	0.6199
30 minute summer	12_2	12_2	12	1.7	0.939	0.017	0.0555
30 minute summer	12_1	12_1	12	6.9	0.546	0.347	0.2918
30 minute summer	12	12	12_OUT	60.9	1.336	1.723	0.3780
30 minute summer	12_OUT	Infiltration		1.0			

Results for 100 year +20% CC 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	10	65	77.410	0.538	30.7	2.0090	0.0000	SURCHARGED
60 minute summer	11	64	77.410	0.574	38.6	0.8474	0.0000	SURCHARGED
60 minute summer	12_2	33	79.768	0.018	1.3	0.0219	0.0000	OK
60 minute summer	12_1	33	77.732	0.082	5.5	0.1235	0.0000	OK
60 minute summer	12	64	77.410	0.583	48.3	0.7232	0.0000	SURCHARGED
60 minute summer	12_OUT	64	77.410	0.589	47.6	45.9935	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	10	10	11	27.7	0.418	0.785	2.4301
60 minute summer	11	11	12	37.7	0.536	1.066	0.6199
60 minute summer	12_2	12_2	12	1.3	0.865	0.013	0.0462
60 minute summer	12_1	12_1	12	5.4	0.508	0.274	0.2477
60 minute summer	12	12	12_OUT	47.6	1.121	1.348	0.3780
60 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year +20% CC 120 minute summer. 360 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	10	124	77.553	0.681	20.9	2.5417	0.0000	FLOOD RISK
120 minute summer	11	126	77.554	0.718	27.1	1.0599	0.0000	SURCHARGED
120 minute summer	12_2	64	79.765	0.015	0.9	0.0186	0.0000	OK
120 minute summer	12_1	64	77.718	0.068	3.7	0.1022	0.0000	OK
120 minute summer	12	124	77.554	0.727	34.0	0.9010	0.0000	SURCHARGED
120 minute summer	12_OUT	124	77.553	0.732	33.4	57.1396	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
120 minute summer	10	10	11	19.4	0.275	0.548	2.4301
120 minute summer	11	11	12	26.5	0.377	0.751	0.6199
120 minute summer	12_2	12_2	12	0.9	0.773	0.009	0.0359
120 minute summer	12_1	12_1	12	3.7	0.452	0.186	0.1893
120 minute summer	12	12	12_OUT	33.4	0.959	0.944	0.3780
120 minute summer	12_OUT	Infiltration		1.1			

Results for 100 year +20% CC 180 minute summer. 420 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	10	184	77.633	0.761	15.9	2.8378	0.0000	FLOOD RISK
180 minute summer	11	184	77.633	0.797	20.7	1.1770	0.0000	SURCHARGED
180 minute summer	12_2	96	79.764	0.014	0.7	0.0165	0.0000	OK
180 minute summer	12_1	96	77.711	0.061	2.9	0.0912	0.0000	OK
180 minute summer	12	184	77.633	0.806	25.7	0.9994	0.0000	SURCHARGED
180 minute summer	12_OUT	184	77.633	0.812	25.9	63.4022	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
180 minute summer	10	10	11	14.8	0.233	0.418	2.4301
180 minute summer	11	11	12	19.9	0.302	0.563	0.6199
180 minute summer	12_2	12_2	12	0.7	0.716	0.007	0.0302
180 minute summer	12_1	12_1	12	2.9	0.420	0.146	0.1600
180 minute summer	12	12	12_OUT	25.9	0.819	0.732	0.3780
180 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year +20% CC 240 minute summer. 480 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
240 minute summer	10	244	77.684	0.812	13.7	3.0283	0.0000	FLOOD RISK
240 minute summer	11	244	77.684	0.848	17.7	1.2523	0.0000	SURCHARGED
240 minute summer	12_2	124	79.763	0.013	0.6	0.0151	0.0000	OK
240 minute summer	12_1	124	77.706	0.056	2.5	0.0843	0.0000	OK
240 minute summer	12	244	77.684	0.857	22.2	1.0626	0.0000	SURCHARGED
240 minute summer	12_OUT	244	77.684	0.863	21.9	67.3789	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)
240 minute summer	10	10	11	12.7	0.218	0.359	2.4301
240 minute summer	11	11	12	17.3	0.281	0.489	0.6199
240 minute summer	12_2	12_2	12	0.6	0.676	0.006	0.0266
240 minute summer	12_1	12_1	12	2.4	0.397	0.123	0.1616
240 minute summer	12	12	12_OUT	21.9	0.794	0.619	0.3780
240 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year +20% CC 360 minute summer. 600 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	10	360	77.735	0.863	10.7	3.2206	0.0000	FLOOD RISK
360 minute summer	11	360	77.735	0.899	13.8	1.3281	0.0000	SURCHARGED
360 minute summer	12_2	184	79.762	0.012	0.5	0.0139	0.0000	OK
360 minute summer	12_1	360	77.735	0.085	1.9	0.1281	0.0000	OK
360 minute summer	12	360	77.735	0.908	17.4	1.1261	0.0000	SURCHARGED
360 minute summer	12_OUT	360	77.735	0.914	17.1	71.3779	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
360 minute summer	10	10	11	9.9	0.201	0.281	2.4301
360 minute summer	11	11	12	13.5	0.262	0.383	0.6199
360 minute summer	12_2	12_2	12	0.5	0.643	0.005	0.0236
360 minute summer	12_1	12_1	12	1.9	0.367	0.094	0.4067
360 minute summer	12	12	12_OUT	17.1	0.629	0.484	0.3780
360 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year +20% CC 480 minute summer. 720 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	10	472	77.758	0.886	8.5	3.3064	0.0000	FLOOD RISK
480 minute summer	11	472	77.758	0.922	11.0	1.3621	0.0000	SURCHARGED
480 minute summer	12_2	248	79.761	0.011	0.4	0.0127	0.0000	OK
480 minute summer	12_1	472	77.758	0.108	1.5	0.1627	0.0000	OK
480 minute summer	12	472	77.758	0.931	14.4	1.1546	0.0000	SURCHARGED
480 minute summer	12_OUT	472	77.758	0.937	13.2	73.1741	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute summer	10	10	11	7.9	0.187	0.223	2.4301
480 minute summer	11	11	12	11.3	0.243	0.319	0.6199
480 minute summer	12_2	12_2	12	0.4	0.607	0.004	0.0204
480 minute summer	12_1	12_1	12	1.5	0.342	0.076	0.5240
480 minute summer	12	12	12_OUT	13.2	0.598	0.374	0.3780
480 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year +20% CC 600 minute summer. 840 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	10	540	77.771	0.899	7.0	3.3541	0.0000	FLOOD RISK
600 minute summer	11	540	77.771	0.935	9.1	1.3810	0.0000	SURCHARGED
600 minute summer	12_2	315	79.759	0.009	0.3	0.0112	0.0000	OK
600 minute summer	12_1	540	77.771	0.121	1.3	0.1819	0.0000	OK
600 minute summer	12	540	77.771	0.944	11.1	1.1705	0.0000	SURCHARGED
600 minute summer	12_OUT	540	77.771	0.950	12.0	74.1727	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute summer	10	10	11	6.5	0.181	0.185	2.4301
600 minute summer	11	11	12	8.5	0.225	0.241	0.6199
600 minute summer	12_2	12_2	12	0.3	0.560	0.003	0.0166
600 minute summer	12_1	12_1	12	1.3	0.327	0.065	0.5884
600 minute summer	12	12	12_OUT	12.0	0.604	0.340	0.3780
600 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year +20% CC 720 minute summer. 960 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	10	600	77.770	0.898	6.3	3.3495	0.0000	FLOOD RISK
720 minute summer	11	600	77.770	0.934	8.2	1.3791	0.0000	SURCHARGED
720 minute summer	12_2	375	79.759	0.009	0.3	0.0112	0.0000	OK
720 minute summer	12_1	600	77.770	0.120	1.1	0.1801	0.0000	OK
720 minute summer	12	600	77.770	0.943	10.7	1.1690	0.0000	SURCHARGED
720 minute summer	12_OUT	600	77.770	0.949	9.9	74.0755	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
720 minute summer	10	10	11	5.9	0.174	0.166	2.4301
720 minute summer	11	11	12	8.4	0.215	0.238	0.6199
720 minute summer	12_2	12_2	12	0.3	0.560	0.003	0.0166
720 minute summer	12_1	12_1	12	1.1	0.312	0.055	0.5822
720 minute summer	12	12	12_OUT	9.9	0.590	0.280	0.3780
720 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year +20% CC 960 minute summer. 1200 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	10	735	77.772	0.900	5.3	3.3577	0.0000	FLOOD RISK
960 minute summer	11	735	77.772	0.936	6.9	1.3824	0.0000	SURCHARGED
960 minute summer	12_2	465	79.758	0.008	0.2	0.0093	0.0000	OK
960 minute summer	12_1	735	77.772	0.122	0.9	0.1834	0.0000	OK
960 minute summer	12	735	77.772	0.945	8.1	1.1717	0.0000	SURCHARGED
960 minute summer	12_OUT	735	77.772	0.951	9.1	74.2474	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute summer	10	10	11	5.0	0.159	0.142	2.4301
960 minute summer	11	11	12	6.3	0.203	0.178	0.6199
960 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
960 minute summer	12_1	12_1	12	0.9	0.293	0.045	0.5932
960 minute summer	12	12	12_OUT	9.1	0.550	0.256	0.3780
960 minute summer	12_OUT	Infiltration		1.2			

Results for 100 year +20% CC 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	10	1020	77.760	0.888	3.9	3.3138	0.0000	FLOOD RISK
1440 minute summer	11	1020	77.760	0.924	5.1	1.3650	0.0000	SURCHARGED
1440 minute summer	12_2	750	79.758	0.008	0.2	0.0093	0.0000	OK
1440 minute summer	12_1	1020	77.760	0.110	0.7	0.1657	0.0000	OK
1440 minute summer	12	1020	77.760	0.933	6.2	1.1571	0.0000	SURCHARGED
1440 minute summer	12_OUT	1020	77.760	0.939	6.4	73.3292	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute summer	10	10	11	3.7	0.154	0.105	2.4301
1440 minute summer	11	11	12	4.9	0.182	0.138	0.6199
1440 minute summer	12_2	12_2	12	0.2	0.498	0.002	0.0124
1440 minute summer	12_1	12_1	12	0.7	0.269	0.035	0.5341
1440 minute summer	12	12	12_OUT	6.4	0.424	0.182	0.3780
1440 minute summer	12_OUT	Infiltration		1.2			

APPENDIX C

TYPICAL PIPE SPECIFICATIONS

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Agrément Certificate
02/H069
Product Sheet 1

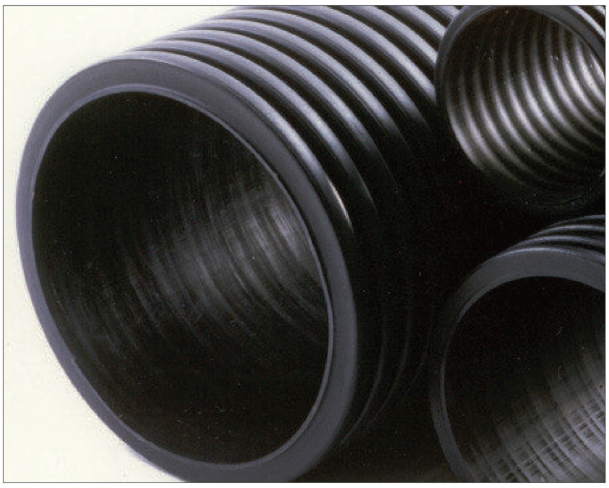
JFC CORRIPIPE TWINWALL DRAINAGE SYSTEM

JFC CORRIPIPE TWINWALL HIGH-DENSITY POLYETHYLENE FILTER AND CARRIER PIPES AND COUPLINGS

This Certificate is issued under the Highway Authorities' Product Approval Scheme (HAPAS) by the British Board of Agrément (BBA) in conjunction with the Highways Agency (HA) (acting on behalf of the overseeing organisations of the Department for Transport; the Scottish Executive; the Welsh Assembly Government and the Department for Regional Development, Northern Ireland), the Association of Directors of Environment, Economy, Planning and Transport (ADEPT), the Local Government Technical Advisers' Group and industry bodies. HAPAS Agrément Certificates are normally each subject to a review every five years.

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to JFC CorriPipe Twinwall High-Density Polyethylene Filter and Carrier Pipes and Couplings, in a range of sizes for use in highway drainage for the collection and disposal of surface and sub-surface water.



AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with HAPAS requirements
- factors relating to compliance with Regulations where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal five-yearly review.

KEY FACTORS ASSESSED

Strength — the fittings have adequate strength to resist loads associated with installation and service (see section 5).

Performance of joints — the system will remain watertight under normal service conditions (see section 6).

Durability — the system will have a service life in excess of 50 years (see section 10).

The BBA has awarded this Agrément Certificate to the company named above for the system described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 18 July 2011

Brian Chamberlain
Head of Approvals — Engineering

Greg Cooper
Chief Executive

Originally certificated on 28 March 2002 (150 mm, 225 mm and 300 mm) and on 23 December 2005 (375 mm, 450 mm and 600 mm).

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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HAPAS Requirements

Requirements

The general requirements for drains are contained in the Manual of Contract Documents for Highway Works (MCHW), Volume 1.

The general requirements for structural wall pipes and fittings are contained in the MCHW, Volume 1, Clause 518.

Further information and guidance is given in the MCHW, Volume 2 and Volume 3 (Drawing Numbers F1 and F2).

Additional site requirements may be included on particular contracts.

Regulations

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 1 *Description* (1.3), 2 *Delivery and site handling* (2.1), 3 *General* and 11 *General* of the *Installation* part of this Certificate.

General

This Certificate relates to JFC CorriPipe Twinwall 150 mm, 225 mm, 300 mm, 375 mm, 450 mm and 600 mm High-Density Polyethylene Filter and Carrier Pipes and Couplings.

The system is for use in highway drainage for the collection and disposal of surface and sub-surface water in accordance with Highways Agency (HA) requirements, *Manual of Contract Documents for Highway Works* (MCHW), Volume 1, Clause 518, and Volume 2, and the conditions set out in the *Design Considerations* and *Installation* parts of this Certificate.

Technical Specification

1 Description

1.1 JFC CorriPipe Twinwall 150 mm, 225 mm, 300 mm, 375 mm, 450 mm and 600 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings are manufactured from a blended, black polyethylene by a twin extrusion process. The two high-density polyethylene pipes are extruded simultaneously, one inside the other, and heat-welded together in one continuous process.

1.2 The products tested and covered by this Certificate are manufactured from material with the specification given in Table 1.

Table 1 Material properties/specification

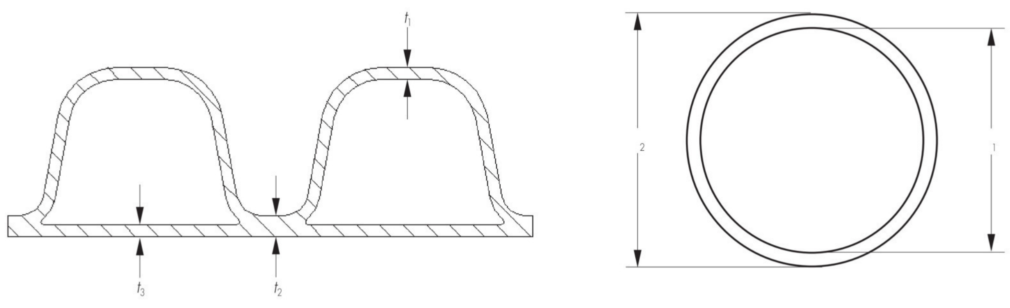
Property	Test method reference	Specification
Tensile properties	EN 638, ISO 527-2	≥18 MPa
Oxygen induction time	EN 728	≥4 mins
Melt flow rate	ISO 1133	≤0.75 g (10 mins) 2.16 kg at 190°C
Density	ISO 1183-3	≥935 kg·m^{-3}
Heat reversion	ISO 12091	N/A

1.3 The outer wall is corrugated and the inner wall is smooth finished. Details and dimensions are given in Table 2 and Figure 1.

Table 2 Pipe dimensions

Nominal internal pipe diameter d_1 (mm)	External pipe diameter d_2 (mm)	t_1 min (mm)	t_2 min (mm)	t_3 min (mm)	Nominal length (m)	Nominal weight (kg·m^{-1})	Pitch (mm)
150	178 ± 1.5	0.8	1.8	1.0	6	1.4	20.0
225	265 ± 2	0.9	2.6	1.2	6	3.0	25.5
300	354 ± 2.5	1.2	3.0	1.5	6	5.0	31.0
375	426 ± 3	1.5	3.5	1.5	6	6.0	39.9
450	512 ± 3	1.8	4.0	1.5	6	8.5	50.1
600	680 ± 4	2.1	4.3	1.8	6	14.5	66.9

Figure 1 Twinwall pipe



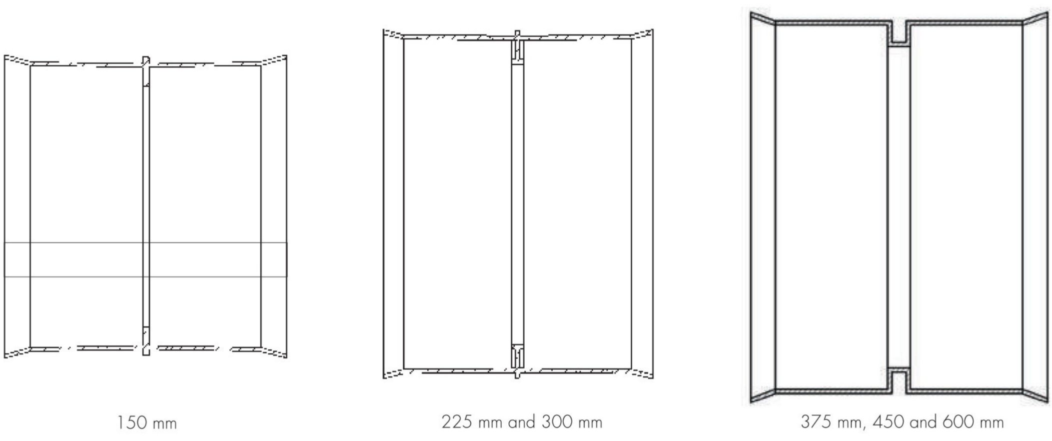
1.4 Black polypropylene couplings are available for the 150 mm, 225 mm and 300 mm sizes of pipe and black polyethylene for the 375 mm, 450 mm and 600 mm sizes (see Table 3 and Figure 2).

Table 3 Coupling dimensions

Nominal internal/external pipe diameter (mm)	Internal diameter		Nominal length (mm)	Nominal seal height (mm)
	at first dwell (mm)	at second dwell (mm)		
150/178	178	179	180	17.0
225/265	268	269	220	25.5
300/354	356	356.5	245	32.0
375/426	429	429	321	32.5
450/512	514	514	390	36.9
600/680	686	686	675	49.0

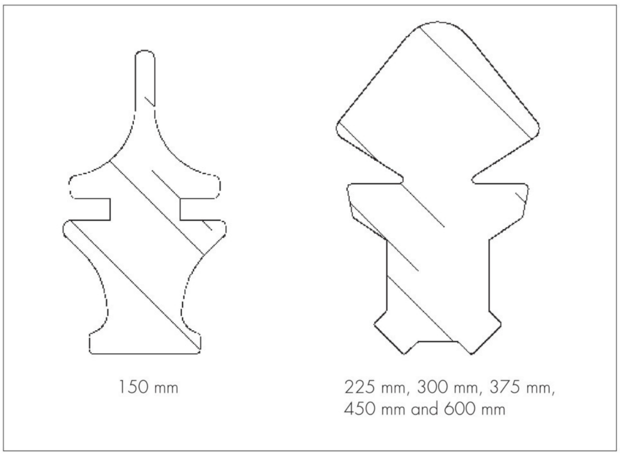
(1) Tapered along coupling length.

Figure 2 Couplings



1.5 Each coupling requires two rubber seals which are manufactured to BS EN 681-1 : 1996 (see Figure 3). The seals must be fitted in accordance with the installation instructions to ensure a watertight joint.

Figure 3 Seals

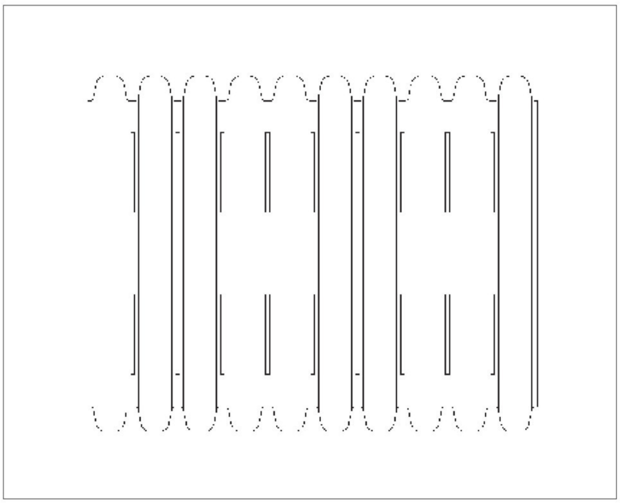


1.6 Pipes can be supplied either slotted or unslotted. Slotted pipe is available with the slots in the dwell between corrugations equally spaced around the circumference (see Table 4 and Figure 4).

Table 4 Slotted pipe details

Internal pipe diameter (nominal) (mm)	No of slots per alternate dwell	No of dwells per metre	Slot length (mm)	Slot width (mm)	Permeable area (minimum) ($mm^2 \cdot m^{-1}$)
150	4	51	15 to 20	2.0 to 2.5	6120
225	4	39	15 to 30	2.0 to 2.5	4680
300	4	32	20 to 40	2.0 to 2.5	5120
375	3	25	42 to 85	2.7 to 3.3	4263
450	3	20	48 to 85	2.8 to 3.5	4024
600	3	15	76 to 106	2.9 to 3.5	4942

Figure 4 Details of slots (optional)



1.7 Continuous quality control is exercised during manufacture. Checks include:

Pipes

- dimensional accuracy
- impact resistance
- short-term stiffness

Couplings

- dimensional accuracy/visual check.

1.8 A label bearing the BBA identification mark is attached to each pipe length and fitting or to each pack of pipes.

2 Delivery and site handling

2.1 Handling, storage and transportation should be in accordance with BS 5955-6 : 1980.

2.2 When long-term storage is envisaged, JFC CorriPipe twinwall slotted and unslotted pipes and couplings should be protected from direct sunlight. If protection cannot be provided, consideration must be given to the effects of daily exposure to direct sunlight:

- up to 3 months — negligible UV degradation but possible extreme surface temperatures of up to 80°C may cause some localised distortion
- 3 months to 12 months — may have significant effect on the impact resistance and physical properties
- over 12 months — damage will occur unless protection provided.

2.3 The manufacturer has the option of adding chemicals to provide enhanced UV stability on request.

2.4 Pipes are generally delivered in prepacked bundles and should be retained in their packaging until installation.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on JFC CorriPipe Twinwall 150 mm, 225 mm, 300 mm, 375 mm, 450 mm and 600 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings.

Design Considerations

3 General

JFC CorriPipe Twinwall 150 mm, 225 mm, 300 mm, 375 mm, 450 mm and 600 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings comply with the requirements of the Highways Agency (HA) *Manual of Contract Documents for Highway Works* (MCHW), Volume 1, Clause 518.5 for pipe, Clause 518.6 for couplings and Clause 518.7 for the system, and is suitable for use in highways for the collection and disposal of surface and sub-surface water.

4 Practicability of installation

The pipes are installed using traditional drain-laying methods in accordance with HA requirements and the MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8. Due to the lightweight nature of the pipe material, handling and jointing are easily performed.

5 Strength

5.1 The pipes have a ring stiffness in excess of 6 $kN{\cdot}m^{-2}$, a creep ratio of less than 4 and adequate resistance to static loads.

5.2 The pipes have adequate resistance to impact loads to which they may be subjected during installation and in service.

6 Performance of joints

6.1 Joints on filter pipes made from pipe and couplings without the rubber seals are not partially watertight as defined in the MCHW, Volume 1, Clause 504.3.

6.2 Correctly made, the joints constructed from pipe and couplings with rubber seals remain watertight when subjected to deflection and distortion, and comply with the MCHW, Volume 1, Clauses 504.3 and 518.7 (see section 14).

7 Water infiltration

The slot area for the pipes exceeds the minimum requirement of 1000 mm^2 per metre length as given in the MCHW, Volume 1, Clause 518.3 (see Table 3).

8 Flow characteristics

8.1 The pipes will have normal flow characteristics associated with thermoplastics pipes.

8.2 Full-bore velocities are available from the *Tables for the Hydraulic Design of Pipes, Sewers and Channels*, Volume 2, 8th Edition, by H R Wallingford and D I H Barr. Appropriate values are based on the Colebrook-White equation. An appropriate value of roughness coefficient should be selected when designing the drainage system. For new pipes, a value of 0.006 is applicable, but for designs a value of 0.6 is generally used.

9 Maintenance

9.1 The slots are designed to restrict the ingress of silt into the drains.

9.2 Access to the system for cleaning should be provided by conventional methods.

9.3 The system can be rodded using flexible drain rods. In common with other standard plastic drainage systems, toothed root cutters and rods with metal ferrules, as used with some mechanical clearing systems, could damage the pipes and couplings and should not be used.

9.4 Tests indicate that the pipes have adequate resistance to cleansing using pressure jetting equipment (see section 13.1). It is recommended that low-pressure, high-volume systems are utilised in accordance with MCHW, Clause 520.

10 Durability

In the opinion of the BBA, the material from which the pipes and couplings are manufactured will not significantly deteriorate and the anticipated life of the system will be in excess of 50 years.

Installation

11 General

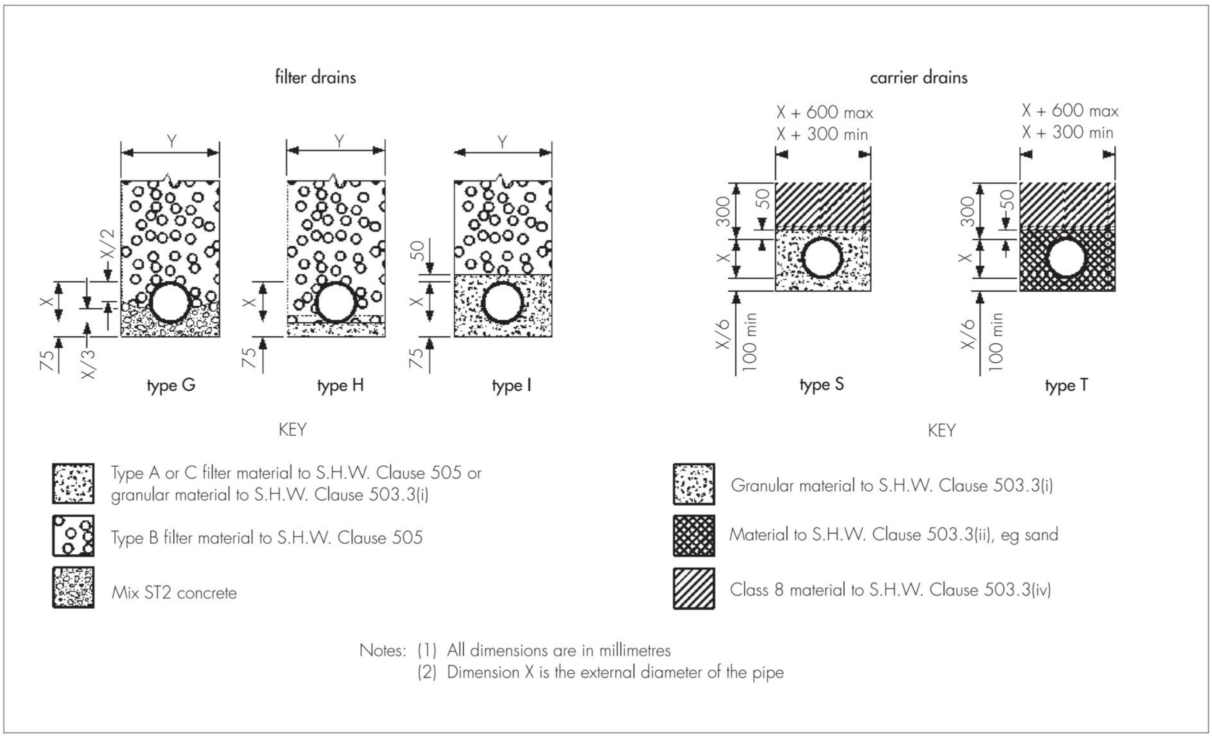
11.1 JFC CorriPipe Twinwall 150 mm, 225 mm, 300 mm, 375 mm, 450 mm and 600 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings must be installed in accordance with HA requirements and the MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

11.2 The pipes and couplings must be protected against damage from site construction traffic.

12 Procedures

12.1 For typical laying, trench and backfilling specification details, reference should be made to Figure 5 and the MCHW, Volume 3, Drawings No F1 (Type T and S) and No F2 (Type G, H and I).

Figure 5 Installation details



12.2 Pipes are cut easily using conventional hand tools, and should be cut square between the corrugations.

12.3 For a watertight joint, the pipe ends and coupling should be cleaned and the rubber seal fitted externally in the first or second dwell. The seal and inside of the coupling should be lubricated and the pipe pushed fully home to the central register either by hand, or using a lever if necessary.

12.4 Care should be taken during backfill to maintain the line and level of the pipeline. If necessary, the pipe should be restrained to prevent uplift.

Technical Investigations

13 Tests

13.1 Tests were carried out on the pipe in accordance with the MCHW, Volume 1, Clause 518.5 to determine:

- ring stiffness to BS EN ISO 9969 : 1995
- creep ratio to BS EN ISO 9967 : 1995
- longitudinal bending to the MCHW, Volume 1, Clause 518.11
- rodding resistance to the MCHW, Volume 1, Clause 518.12
- impact resistance at 0°C and 23°C to BS EN 1411 : 1996 with a striker of 1.0 kg mass and 25 mm diameter conical head
- water jetting WRc method.

13.2 Tests were carried out on the system to establish:

- leaktightness of joint to BS EN 1277 : 2003, Method 4, Conditions A, B and C
- insertion force (ease of jointing).

13.3 Tests were carried out to establish the dimensional accuracy of the pipe, coupling and ring seal.

14 Investigations

14.1 An examination was made of data in relation to the effect of the production tolerances on the performance of the products.

14.2 An evaluation of existing data was made to assess material properties, chemical resistance and durability.

14.3 Calculations were carried out to determine slot area.

14.4 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

BS 5955-6 : 1980 *Plastics pipework (thermoplastics materials) — Code of practice for the installation of unplasticized PVC pipework for gravity drains and sewers*

BS EN 681-1 : 1996 *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Vulcanized rubber*

BS EN 763 : 1995 *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Test method for visually assessing effects of heating*

BS EN 1277 : 2003 *Plastics piping systems — Thermoplastics piping systems for buried non-pressure applications — Test methods for leaktightness of elastomeric sealing ring type joints*

BS EN 1411 : 1996 *Plastics piping and ducting systems — Thermoplastics pipes — Determination of resistance to external blows by the staircase method*

BS EN ISO 9967 : 1995 *Thermoplastics pipes — Determination of creep ratio*

BS EN ISO 9969 : 1995 *Thermoplastics pipes — Determination of ring stiffness*

EN 638 : 1994 *Plastics piping and ducting systems — Thermoplastics pipes — Determination of tensile properties*

EN 728 : 1997 *Plastics piping and ducting systems — Polyolefin pipes and fittings — Determination of oxidation induction time*

ISO 527-2 : 1993 *Plastics — Determination of tensile properties — Test conditions for moulding and extrusion plastics*

ISO 1133 : 1997 *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

ISO 1183-3 : 1999 *Plastics — Methods for determining the density of non-cellular plastics — Gas pyknometer method*

ISO 4440-1 : 1994 *Thermoplastics pipes and fittings — Determination of melt mass-flow rate — Test method*

ISO 4451 : 1980 *Polyethylene (PE) pipes and fittings — Determination of reference density of uncoloured and black polyethylenes*

ISO 12091 : 1995 *Structural wall thermoplastics pipes — Oven test*

Manual of Contract Documents for Highway Works, Volume 1 Specification for Highway Works, August 1998 (as amended)

Manual of Contract Documents for Highway Works, Volume 2 Notes for Guidance on the Specification for Highway Works, August 1998 (as amended)

Manual of Contract Documents for Highway Works, Volume 3 Highway Construction Details, March 1998 (as amended)

Conditions of Certification

15 Conditions

15.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

15.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

15.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate
- remain in accordance with the requirements of Highway Authorities' Product Approval Scheme.

15.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

15.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal.

15.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

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website: www.bbacerts.co.uk

JFC

CorriPipe™ Technical Specification

BBA BRITISH BOARD OF AGRÉMENT
CERTIFICATE No 02/H069

CIWM awards FOR ENVIRONMENTAL EXCELLENCE

www.jfc.ie

CorriPipe™ Technical Specification

1. Introduction

CorriPipe™ is a twin wall high density polyethylene pipe manufactured from a blended black polyethylene by a twin extrusion process.

Two high density polyethylene walls are extruded simultaneously, one inside the other, and heat-welded together in one continuous process. The outer wall is corrugated and the inner wall is smooth finished.

It is a combination of the corrugations, and the heat-welding of the two walls, that give CorriPipe™ its excellent structural strength while its smooth inner wall ensures increased flow capacity.

Its applications include surface and storm water drainage in civil engineering, construction, sports amenity, agricultural and other sub-soil applications.

CorriPipe™ is fully BBA (British Board of Agrément) approved and HAPAS (Highways Agency Product Approval Scheme) certified.

Figure 1. – CorriPipe™

2. Dimensions

CorriPipe™ comes in a complete range between 100m and 600mm and is available in either carrier of filter pipe. CorriPipe™ also has a complete range of fittings and junctions as detailed below.

Nominal Size (mm)	Inside Diameter (mm)	Outside Diameter (mm)	Pipe Length (m)
94	94	110	6
150	149	176	6
225	221	265	6
300	295	354	6
375	370	426	6
450	445	512	6
600	590	680	6

Table 1. – CorriPipe™ Dimensions

Nominal Size (mm)	No. of slots per alternate dwell	Nom. Slot Width (mm)	Pefrorated Area (mm²/m)
94	4	1.5	7920
150	4	2	6120
225	4	2	4680
300	4	2	5120
375	3	3	4263
450	3	3	4024
600	3	3	4942

Table 2. – Perforated Pipe Detail

Note: CorriPipe also available in various perforation specification. e.g. half perforated, double perforated.

Nominal Size (mm)	Code	Fitting Type
150	150TB30	30° Bend
150	150TB45	45° Bend
150	150TB90	90° Bend
150	150TT90	Equal Tee
150	150TY45	Equal Wye
150	150SWSTT90	Single Wall Tee
225	225TB30	30° Bend
225	225TB45	45° Bend
225	225TB90	90° Bend
225	225TT90	Equal Tee
225	225TY45	Equal Wye
225	225/150TT90	Unequal Tee 150
225	225/150TY45	Unequal Wye 150
225	225SWSTT90	Single Wall Tee
300	300TB30	30° Bend
300	300TB45	45° Bend
300	300TB90	90° Bend
300	300TT90	Equal Tee
300	300TY45	Equal Wye
300	300/150TT90	Unequal Tee 150
300	300/150TY45	Unequal Wye 150
300	300/225TT90	Unequal Tee 225
300	300/225TY45	Unequal Wye 225
300	300SWSTT90	Single Wall Tee

Table 3. – CorriPipe™ Fittings

Note: Larger fitting sizes fabricated on request

CorriPipe™ Technical Specification

3. Hydraulic Capacity

There are two main formulas used in hydraulic calculations of gravity flow pipelines – Manning's and Colebrook-White:

Manning's

Manning's is the most popular equation for stormwater design because it is simple to apply and it generally provides an acceptable level of accuracy.

$$Q = \frac{1}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

Q = Water Discharge [m^3/s]

n = Manning's roughness factor [s/m1/3]]

A = Cross-sectional area [m2]

R = Hydraulic radius [m]

S = Surface Water Slope [m/m]

Colebrook-White

A more accurate method for calculations involving FRC™ pipes is to utilize the Colebrook-White formula. The Colebrook-White design chart for FRC™ should allow quick and easy estimates without involved calculations.

$$V = -2\sqrt{2gDS}\,\log\left(\frac{k}{3.7D} + \frac{2.51v}{d\sqrt{2gDS}}\right)$$

V = Velocity (m/s)

S = Hydraulic gradient (m/m)

k = Hydraulic roughness (m)

R = Hydraulic radius = D/4 (m)

D = Pipe internal diameter (m)

g = Gravitational acceleration (m/s2)

v = Kinematic viscosity of water (m2/s)

4. Cover Depths

Minimum Cover Depths

JFC Manufacturing Limited recommends the following minimum cover depths.

- 0.6m for non trafficked green areas
- 0.9m to finished surface for trafficked areas not subject to Highways Agency or National Roads Authority requirements
- 1.2m to finished surface for trafficked areas subject to Highways Agency or National Roads Authority requirements.

In certain circumstances lower minimum cover levels may be allowed. e.g. installation with rigid pavement, concrete surround etc. Please contact JFC for more information.

Maximum Cover Depths

The maximum cover depth for CorriPipe™ is normally between 6-10 meters when installed in accordance with series 500 of the MCDHW Volume 1 as detailed in the CorriPipe™ BBA certificate.

The actual maximum allowable cover level is dependent on the following installation parameters and is often well in excess of 6-10 meters:

- The native soil stiffness
- The pipe bed and surround stiffness
- The size of the trench
- The density of the overburden
- Hydrostatic loading
- Factor of Safety
- Maximum allowable deflection limit

For specific site conditions JFC can calculate the maximum pipe deflection based on the above parameters. Contact JFC for more details.

CorriPipe™ Technical Specification

4. Installation

JFC CorriPipe is to be installed in accordance with the following national guidelines. In countries outside that specified contact JFC for more details.

Ireland

The Manual of Contract Documents for Road Works, Volume 1 series 500, clauses 503 and 505 as published by the NRA.

United Kingdom

The Manual of Contract Documents for Highway Works, Volume 1 series 500, clauses 503, 505, 518.7 and 518.8 as published by the Highways Agency

Trench Preparation

The trench width is generally between OD+300mm and OD+600mm but larger trenches are permissible. The trench should provide for a minimum of 150mm pipe bed and local soft spots must be removed and replaced with hardcore. The pipe must sit evenly on the bed and must be free of voids under the pipe. The trench should not be excavated too far in advance of pipe installation. All trenches are to be excavated in accordance with national health and safety regulations and local building regulations.

Sidefill

CorriPipe™ is to backfilled as described in the MCDHW, Volume 1, Series 500. Sidefill material is dependent on specification but is normally a well graded granular material or small single size aggregate. The pipe surround material must fully support the pipe. Compaction may be required depending on ground conditions and sidefill material used. If compaction is required the compaction equipment must not come in contact with the pipe. The sidefill material should extend to 100mm over the crown of the pipe.

Backfill

Backfill is to continue to a minimum of 300mm above the crown of the pipe with suitable material as per specification. The material should be free of any stone particles greater than 50mm. Compaction should not be carried out until a minimum cover of 300mm is achieved. Compaction equipment should be sized so as not to exert any undue stress in the pipe. Further backfill to the required level should be carried out in layer no greater than 300mm.

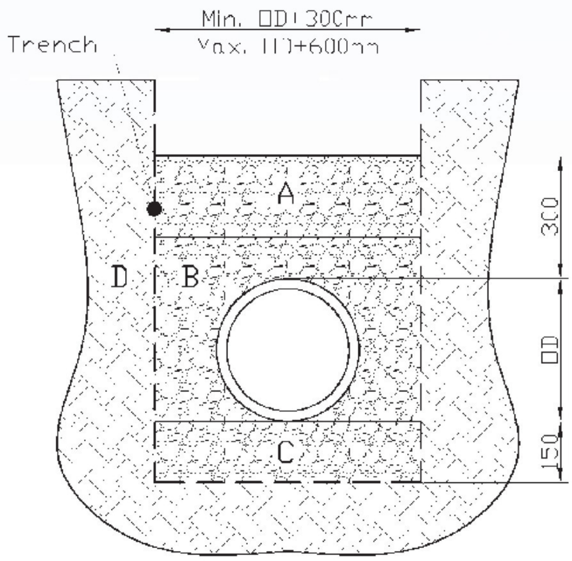

Figure 2. – Typical Installation Details

A = Backfill

B = Sidefill

C = Bed

D = Earth

OD = Outside Diameter of Pipe

5. Jointing

CorriPipe™ is manufactured in 6 meter lengths and is joined with straight couplers or suitable fittings (e.g. tees, wyes, bends etc.)

CorriPipe™ provides a fully watertight seal when installed in accordance with JFC recommendations.

Leak tightness is in accordance with BS EN 1277:1997. The maximum permitted angular deflection is 2°.

Rubber seals used in watertight applications are in accordance with BS EN 681-1:1996

JFC recommends the following procedure for joining CorriPipe™ and associated fittings / couplers.

- Cut the pipe to the require length with a conventional handsaw.
- Clean the end of the pipe and accompanying coupler / fitting.
- Install a ring seal in the first dwell of the pipe for watertight joints.
- Ring seals are bi directional
- Lubricate the ring seal and accompanying coupler / fitting.
- Offer the fitting / coupler up to the pipe
- Lever the fitting / coupler onto the pipe with a piece of timber ensuring not to damage the pipe. Larger pipes may require mechanical assistance.
- Ensure the fitting / coupler is butted fully against the pipe.
- For joining pipes to the opposite side of the fitting / coupler follow the same steps as outlined above.

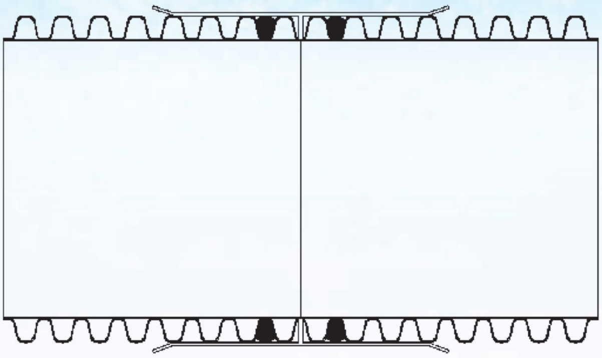

Figure 3. – Typical Joint Details

6. Pressure Testing

There are two methods of pressure testing, the air test method and the water test method. The most common method is the air test method and the test procedure is outlined below.

- Block the ends of the pipe / fitting with a suitable expanding stopper, ensuring both plug and pipe are cleaned prior to fitting.
- Fill a U-Tube manometer with water to the correct level, ensuring there are no trapped air bubbles in the water.
- Connect the u-tube to the fitting on the expandable stopper.
- Increase the pressure in the pipe until a head of water of 100mm is reached.
- Allow the pressure to stabilise for a number of minutes, increasing the pressure if it drops.
- Record the pressure drop over a five minute period.
- To pass the test the pressure should not drop below a 75mm head of water.

Note: Temperature has a critical effect on the test, a 1°C change in air temperature inside the pipe is sufficient for the test to fail.

6. Transportation, Handling and Storage

General

Handling should be done carefully and in accordance with national health and safety guidelines. Dragging of pipes and fittings must be avoided. HDPE pipes and fittings become slippery in wet or in cold weather and extra precautions may be necessary.

Pipes up to 450mm in size are palletised with wooden frames and steel straps. 600mm pipes are generally steel banded in two's but can also be supplied loose.

Nominal Size (mm)	Number of Pipes per Pallet
100	100
150	33
225	14
300	8
375	5
450	4
600	2 / steel banded

Table 4. – CorriPipe™ Pallet Quantities

Storage

All materials should be carefully inspected at the time of delivery and any defects should be notified and reported immediately. All pipe stacks should be made on firm, flat ground to support the weight of the pipes and lifting equipment. For safety and Pipes and fittings should be transported and stored in their packaging.

Delivery vehicles should be provided with a clean, flat bed, free from sharp objects. Care must be taken to prevent slippage or excessive bowing of the pipes. Tie the load well to prevent rubbing. Use nylon straps, not chains or ropes.

The stacking height for pipes should be limited to not more than 3 meters. Pipes should be not be stored in open areas subject to high winds.

It is recommended that CorriPipe™ is not stored in direct sunlight for more than 3 months.

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APPENDIX D

Oil Interceptor Details

SEPARATORS

A RANGE OF FUEL/OIL SEPARATORS
FOR PEACE OF MIND

Kingspan Klargester

60 YEARS OF Expertise & Innovation
1955–2015

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

Get in touch for a **FREE** professional site visit and a representative will contact you within 5 working days to arrange a visit.
helpingyou@klargester.com to make the right decision or call **028 302 66799**

BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

FORECOURT SEPARATORS

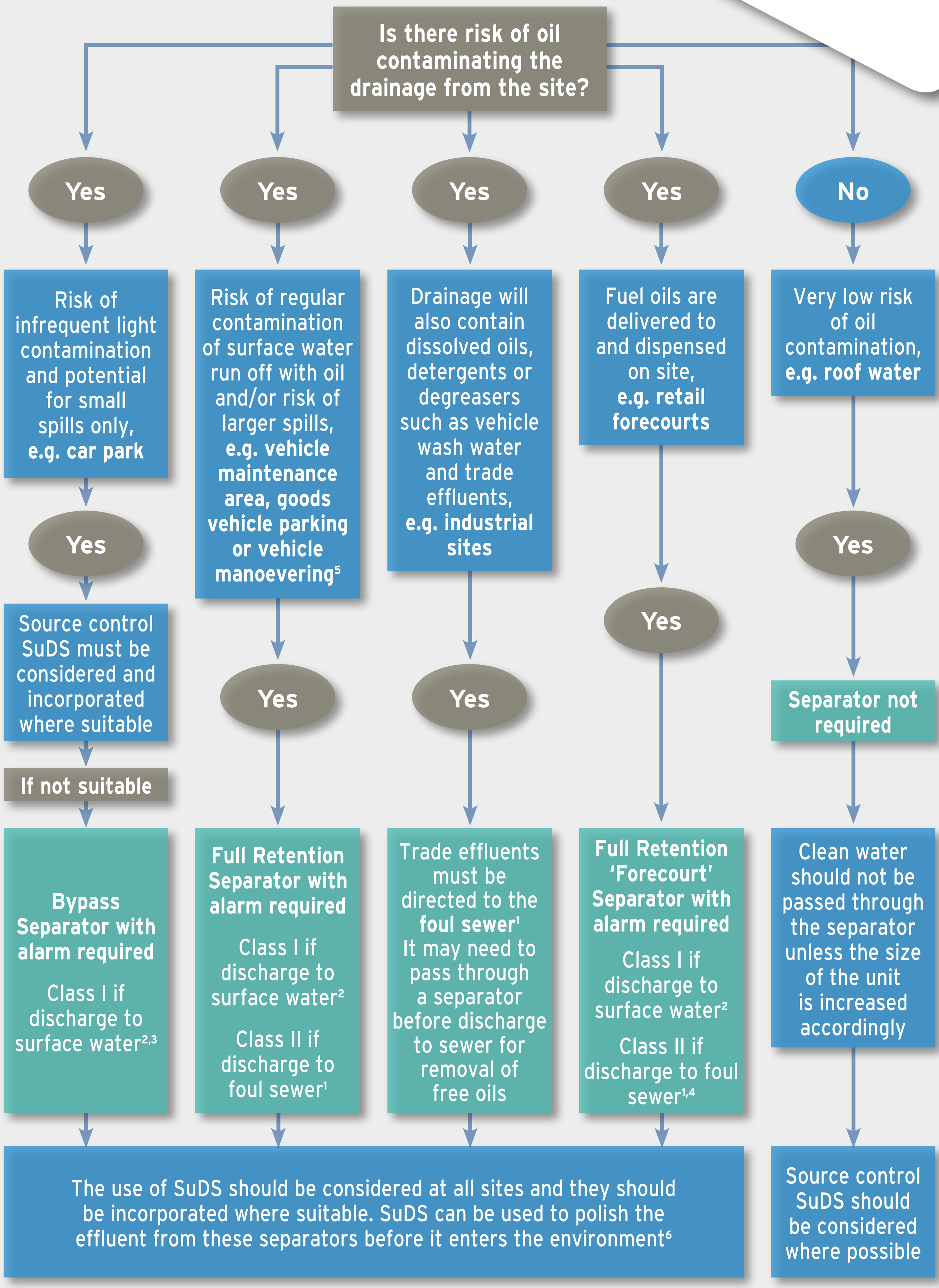
Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

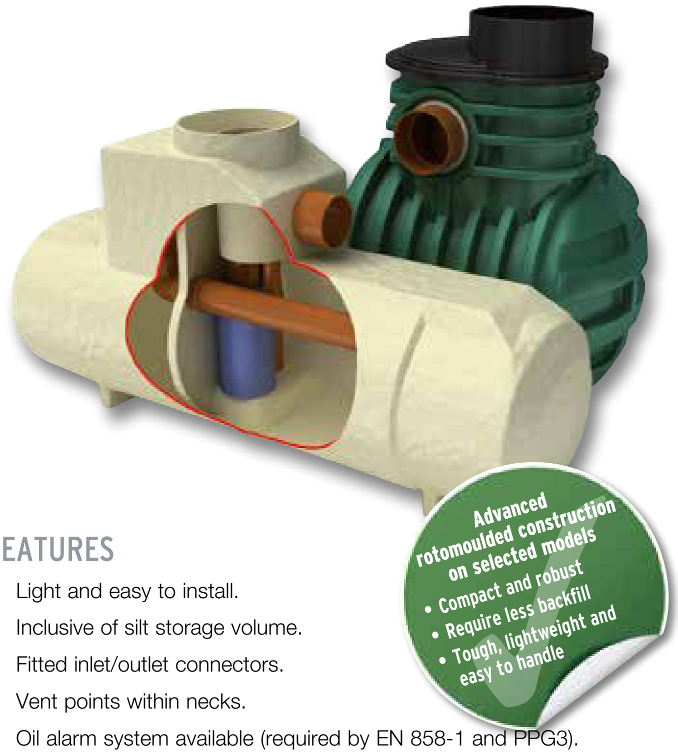
For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Kingspan Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.



1 You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.
2 You must seek prior permission from the relevant environmental body before you decide which separator to install.
3 In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.
5 Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.
6 In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.

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.
- Oil storage volume.
- Silt storage capacity.
- 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:-

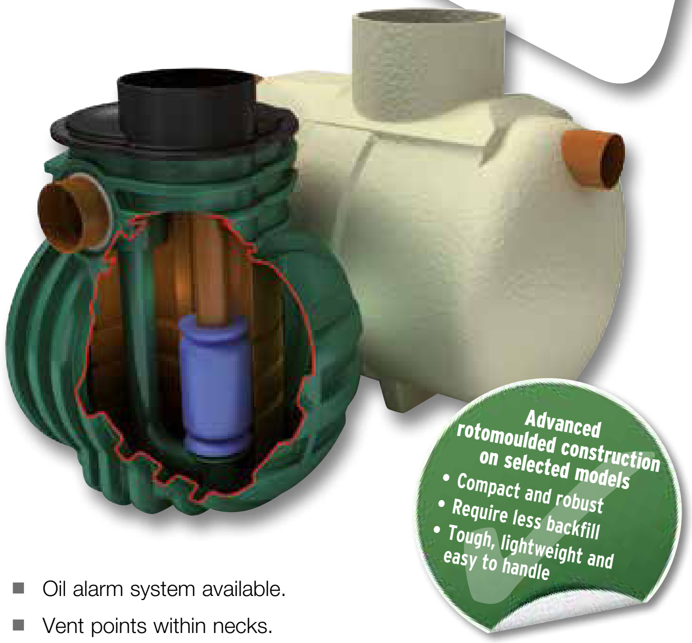
- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m^2)	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.

Full Retention NSF RANGE



APPLICATION

Full retention separators are used in high risk spillage areas such as:

- Fuel distribution depots.
- Vehicle workshops.
- Scrap Yards

PERFORMANCE

Kingspan Klargester were the first UK manufacturer to have the required range (3-30 l/sec) certified to EN 858-1 in the UK. The NSF number denotes the flow at which the separator operates.

The British Standards Institute (BSI) have witnessed the performance tests of the required range of separators and have certified their performance, in relation to their flow and process performance to ensure that they met the effluent quality requirements of EN 858-1. Larger separator designs have been determined using the formulas extrapolated from the test range.

Each full retention separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Automatic closure device.
- Oil storage volume.
- Coalescer (Class I units only).

Klargester full retention separators treat the whole of the specified flow.

FEATURES

- Light and easy to install.
- Class I and Class II designs.
- 3-30 l/sec range independently tested and performance sampled, certified by the BSI.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Oil alarm system available.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

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

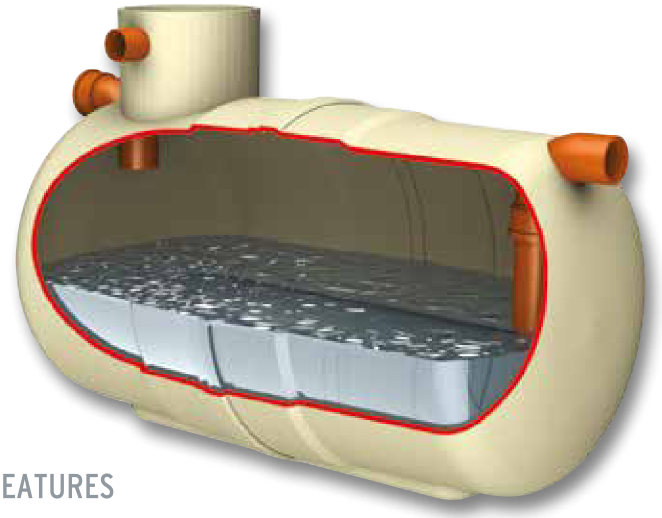
- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the influent is not pumped.
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	DRAINAGE AREA (m²) PPG-3 (0.018)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	MIN. INLET INLET (mm)	STANDARD PIPEWORK DIA. (mm)
NSFP003	3	170	300	30	1700	1350	1420	1345	500	160
NSFP006	6	335	600	60	1700	1350	1420	1345	500	160
NSFA010	10	555	1000	100	2610	1225	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	1050	1000	500	200
NSFA020	20	1115	2000	200	3200	2010	1810	1760	1000	315
NSFA030	30	1670	3000	300	3915	2010	1810	1760	1000	315
NSFA040	40	2225	4000	400	4640	2010	1810	1760	1000	315
NSFA050	50	2780	5000	500	5425	2010	1810	1760	1000	315
NSFA065	65	3610	6500	650	6850	2010	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	2500	2450	1000	300
NSFA100	100	5560	10000	1000	6200	2820	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	2550	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	2550	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	2550	2450	1000	600

■ Rotomoulded chamber construction ■ GRP chamber construction

Washdown & Silt



APPLICATION

This unit can be used in areas such as car wash and other cleaning facilities that discharge directly into a foul drain, which feeds to a municipal treatment facility.

If emulsifiers are present the discharge must not be allowed to enter an NS Class I or Class II unit.

- Car wash.
- Tool hire depots.
- Truck cleansing.
- Construction compounds cleansing points.

PERFORMANCE

Such wash down facilities must not be allowed to discharge directly into surface water but must be directed to a foul connection leading to a municipal treatment works as they utilise emulsifiers, soaps and detergents, which can dissolve and disperse the oils.

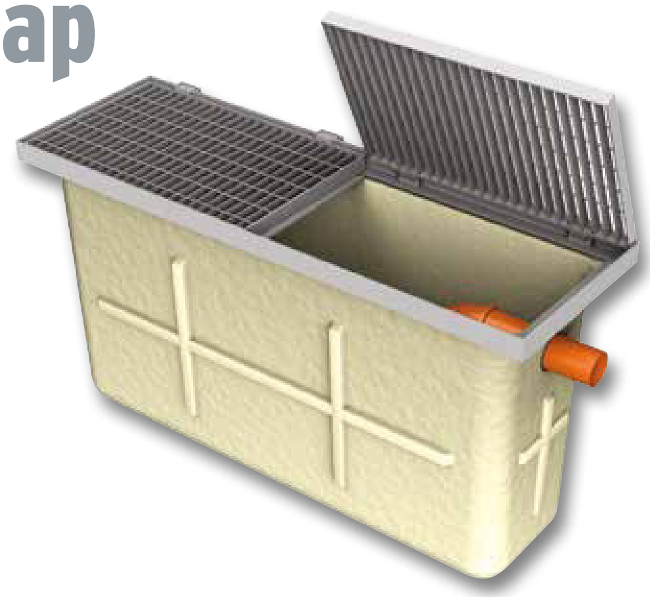
FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.

SIZES AND SPECIFICATIONS

REF.	TOTAL CAPACITY (litres)	MAX. REC. SILT	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STANDARD FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA. (mm)	APPROX EMPTY (kg)
W1/010	1000	500	3	1123	1225	460	1150	1100	50	500	160	60
W1/020	2000	1000	5	2074	1225	460	1150	1100	50	500	160	120
W1/030	3000	1500	8	2952	1225	460	1150	1100	50	500	160	150
W1/040	4000	2000	11	3898	1225	460	1150	1100	50	500	160	180
W1/060	6000	3000	16	4530	1440	600	1360	1310	50	500	160	320
W1/080	8000	4000	22	3200	2020	600	2005	1955	50	500	160	585
W1/100	10000	5000	27	3915	2020	600	2005	1955	50	500	160	680
W1/120	12000	6000	33	4640	2020	600	2005	1955	50	500	160	770
W1/150	15000	7500	41	5435	2075	600	1940	1890	50	500	160	965
W1/190	19000	9500	52	6865	2075	600	1940	1890	50	500	160	1200

Car Wash Silt Trap



APPLICATION

Car Wash silt trap is designed for use before a separator in car wash applications to ensure effective silt removal.

FEATURES

- FACTA Class B covers.
- Light and easy to install.
- Maintenance from ground level.

Forecourt

APPLICATION

The forecourt separator is designed for installation in petrol filling station forecourts and similar applications. The function of the separator is to intercept hydrocarbon pollutants such as petroleum and oil and prevent their entry to the drainage system, thus protecting the environment against hydrocarbon contaminated surface water run-off and gross spillage.

PERFORMANCE

Operation ensures that the flow cannot exit the unit without first passing through the coalescer assembly.

In normal operation, the forecourt separator has sufficient capacity to provide storage for separated pollutants within the main chamber, but is also able to contain up to 7,600 litres of pollutant arising from the spillage of a fuel delivery tanker compartment on the petrol forecourt. The separator has been designed to ensure that oil cannot exit the separator in the event of a major spillage, subsequently the separator should be emptied immediately.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- Class I and Class II design.
- Oil storage volume.
- Coalescer (Class I unit only).
- Automatic closure device.
- Oil alarm system available.

INSTALLATION

The unit should be installed on a suitable concrete base slab and surrounded with concrete or pea gravel backfill. See sales drawing for installation.

If the separator is to be installed within a trafficked area, then a suitable cover slab must be designed to ensure that loads are not transmitted to the unit.

The separator should be installed and vented in accordance with Health and Safety Guidance Note HS(G)41 for filling stations, subject to Local Authority requirements.

SIZES AND SPECIFICATIONS

ENVIROCEPTOR CLASS	TOTAL CAP. (litres)	DRAINAGE AREA (m^2)	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STD. FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STD. PIPEWORK (mm)	EMPTY WEIGHT (kg)
I	10000	555	10	3963	1920	600	2110	2060	50	400	160	500
II	10000	555	10	3963	1920	600	2110	2060	50	400	160	500
I	10000	1110	20	3963	1920	600	2110	2060	50	400	200	500
II	10000	1110	20	3963	1920	600	2110	2060	50	400	200	500

Alarm Systems

British European Standard EN 858-1 and Environment Agency Pollution Prevention Guideline PPG3 requires that all separators are to be fitted with an oil level alarm system and that it should be installed and calibrated by a suitably qualified technician so that it will respond to an alarm condition when the separator requires emptying.

- Easily fitted to existing tanks.
- Excellent operational range.
- Visual and audible alarm.
- Additional telemetry option.

PROFESSIONAL INSTALLERS

Kingspan Klargester Accredited Installers

Experience shows that correct installation is a prerequisite for the long-lasting and successful operation of any wastewater treatment product. This is why using an installer with the experience and expertise to install your product is highly recommended.

Services include :

- Site survey to establish ground conditions and soil types
- Advice on system design and product selection
- Assistance on gaining environmental consents and building approvals
- Tank and drainage system installation
- Connection to discharge point and electrical networks
- Waste emptying and disposal

Discover more about the Accredited Installers and locate your local expert online.

www.kingspanenviro.com/klargester

Kingspan Klargester Accredited Installer

CARE & MAINTENANCE

Kingspan Environmental Services

Who better to look after your treatment plant than the people who designed and built it?

Kingspan Environmental have a dedicated service division providing maintenance for wastewater products.

Factory trained engineers are available for site visits as part of a planned maintenance contract or on a one-off call out basis.

To find out more about protecting your investment and ensuring peace of mind, call us on:

0844 846 0500

or visit us online:

www.kingspanenvservice.com

Kingspan Environmental Services

Kingspan Klargester

COMMERCIAL WASTEWATER SOLUTIONS

- **BIODISC® & ENVIROSAFE**
  HIGH PERFORMANCE SEWAGE TREATMENT SYSTEMS
- PACKAGE PUMP STATIONS
- **PUMPSTOR24** PUMPING SYSTEMS
- OIL/WATER SEPARATORS
- BELOW GROUND STORAGE TANKS
- GREASE & SILT TRAPS

RAINWATER SOLUTIONS

- BELOW GROUND RAINWATER HARVESTING SYSTEMS
- ABOVE GROUND RAINWATER HARVESTING SYSTEMS

Klargester

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email: klargesterinfo@kingspan.com

Visit our website **www.kingspanenviro.com/klargester**

Part of Kingspan Environmental

Certificate No. FM 575486 *Certificate No. OHS 575489*

BRITISH WATER

UK GREEN BUILDING COUNCIL Founding Member

CPD

Issue No. 21: September 2015

APPENDIX E

IW Pre-connection Response

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

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

www.water.ie

Ritika Singh
Jennings O'Donovan & Partners Ltd
Consulting Engineers
Finisklin
Sligo
F91 RHH9

11 February 2022

Re: CDS21007593 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 60 unit(s) at Carins Hill, Sligo, Sligo

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Carins Hill, Sligo, Sligo (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	There is an existing Irish Water owned water main located adjacent to the entrance to the proposed development.
Wastewater Connection	There is an existing 150mm dia. foul sewer located adjacent to the entrance to the proposed development however given the number of houses proposed for this development, a larger size sewer would be required. There appears to be a 225mm dia. foul sewer located approx. 60m to the north along the Cairns Hill road, a foul sewer network extension of 60m approx. will be required to be installed by the Irish Water Regional Contractor and be funded by the Customer in order to facilitate this development.

The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Cormac Healy from the design team by email to corhealy@water.ie For further information, visit **www.water.ie/connections.**

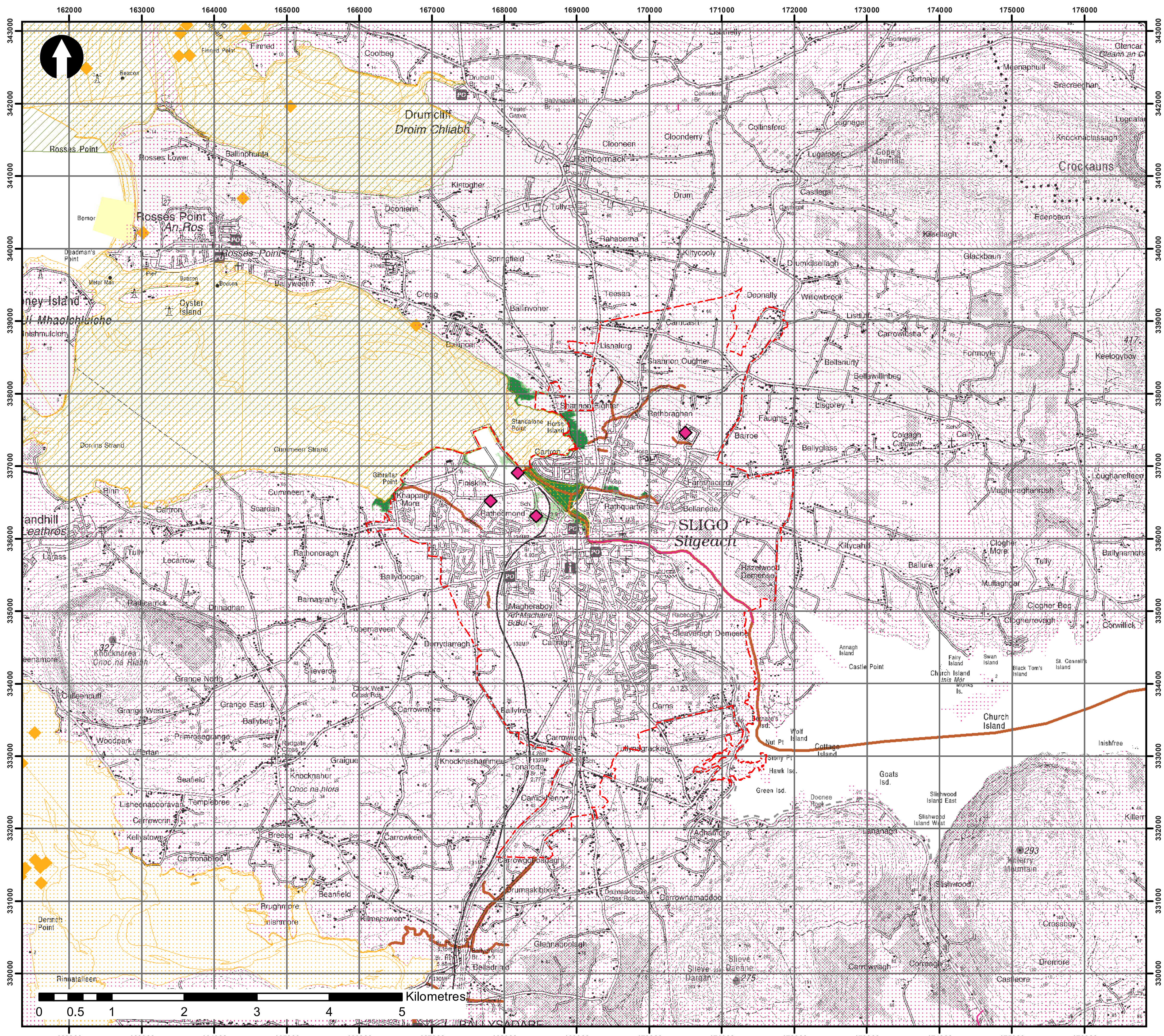
Yours sincerely,

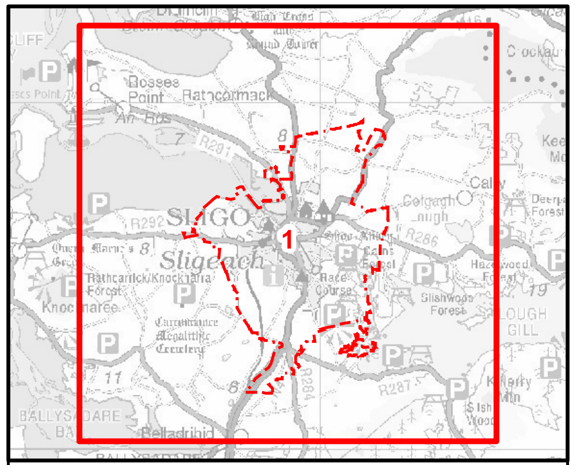
Yvonne Harris

Head of Customer Operations

APPENDIX F

CFRAM Map





Grey squares have no relevent receptors for this suite of risk maps so no maps have been produced.

- AFA Boundary
- Modelled River Centreline
- 10% AEP Tidal Extent
- 0.5% AEP Tidal Extent
- 0.1% AEP Tidal Extent

General Risk – Environment

- IED Sites
- Designated for Drinking Water Abstraction
- Designated for Drinking Water Abstraction
- Recreational Waters
- SAC Water Dependent
- SAC Water Dependent
- SAC Water Dependent
- SPA Water Dependent

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

The Office of Public Works
Jonathan Swift Street
Trim
Co. Meath

JBA consulting

JBA Consulting
24 Grove Island
Corbally
Limerick, Ireland

WESTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

Map: Sligo and Environs Coastal General Risk - Environment			
Map Type: General Risk - Environment			Final
Map Area: HPW		Source: Coastal	Scenario: Current
Drawn by: DR	Date: Sep 2016	Scale: 1:50,000	
Checked by: JC	Date: Sep 2016		
Approved by: SPW	Date: Sep 2016		Original @ A3
Map No: W35SLG_RVCCD_F1_01		**Sheet:** 1 of 1	