



**Mixed use development
46a and 47 Pier Road
Littlehampton**

Drainage Strategy Report

For

Emsdale Residential Limited

9th December 2019



Rev	Date	Purpose/Status	Document Ref.	QA
A	09.12.19	For approval	First issue	RAC/MGC
B	15.01.21	For approval	Second issue	RAC/MGC
C				
D				
E				

Disclaimer

This report is for the use of the Client only and is not for the use of any other parties without the express permission of the Client. All calculations and related quantified assumptions are indicative for planning purposes only and are based solely on the available design proposals and must be reassessed during detailed design with the appropriate compliance methodology.



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Executive Summary

Reports for Planning has been appointed by Emsdale Residential Limited to design the surface water and foul water drainage aspects of the proposed development at 46a and 47 Pier Road, Littlehampton.

The site area is 530m² and the proposed total impermeable area will be 530m² that includes 200m² of porous paving.

The report outlines the strategy for the surface water and foul water drainage for the proposed development.

It is advised that a combination of Sustainable Drainage Systems (SUDS) is used to increase the time of concentration of the water before it discharges to the receiving watercourse.

This can be achieved by using a no fines sub-base layer or porous paving, and a hydrobrake to restrict the discharge rate to the existing public surface water sewer in Clifton Road.

This combination of SUDS and retention currently designed will reduce surface runoff for the 1 in 100 year storm return period + 40% climate change allowance to a rate of 2.1l/s, runoff for the 1 in 30 year storm return period to a rate of 2.0l/s and runoff for the 1 in 1 year storm return period to a rate of 1.9l/s.

Construction will commence in June 2021 and it is anticipated that the development and all SUDs components will be completed by June 2022.



1.0 Existing Drainage

The site area is 530m² and consists of existing commercial units and hardstanding areas. The site is 100% impermeable

A copy of the topographical survey is shown in Appendix A.

The pre-development discharge rates are shown in Appendix B. These are shown in Table A on the drainage layout.

There is an existing public surface water sewer in Clifton Road to which a proposed connection is to be made.

There is an existing public foul sewer that crosses the site to discharge into the sewer in Clifton Road. A copy of the sewer records is shown in appendix A.

2.0 Proposed Drainage Strategy

The proposed development site consists the internal conversion of 46a Pier Road and a new block of apartments at No. 47 to produce in total four commercial units and nine apartments. The new development will have a roof area of 330m² and a 200m² carpark. The total impermeable area of the proposed development is 530m².

The surface water network will include a layer of no fines sub-base or porous paving for attenuation with a hydrobrake to restrict discharge rates to as shown in table A on the drainage layout drawing 1174-1001-CIV-10.

The Drainage Layout is shown in Appendix C.

2.1 Surface Water Drainage

In accordance with Ciria 753, SUDS Manual, flooding is permitted above ground during the 1 in 100 year storm event + 40% climate change allowance but all flood water is to be contained within the site boundaries. No flooding is permitted during the 1 in 30 year storm event.

Proposed post development surface water calculations are shown in Appendix D.

SUDS techniques will be included where local ground conditions permit. In conjunction with the surface water management requirements, consideration of green roofs, infiltration devices, and rainwater harvesting techniques will be made. These methods are further detailed in Section 5.

The flows at the outfall will require attenuation to comply with discharge consent limits.



2.1.1 Proposed Infrastructure

It is proposed that the surface water drainage system will take the form of a network of pipes transferring surface water from the buildings and carpark.

Surface water discharge will be restricted, and water will be attenuated within the development site boundaries.

2.1.2 Standards

The performance of the surface water drainage system will be designed to Sewers for Adoption 6th Edition, BS EN 752 Parts 3 and 4, and the most current issue of Part H of the Building Regulations. This requires the pipes to be sized so they can run full during a simulated 1 in 1 year storm of all durations, but there will be no surcharging within manholes. Additionally, the drainage system has to be tested to ensure there is no flooding as a result of a simulated 1 in 30 year storm of any duration. The 1 in 1, 1 in 30 and 1 in 100 year surface water calculations are shown in appendix D.

For storms in excess of this, the standard requires consideration of the route flood water will take to avoid ingress into properties. The latter has been achieved by the use of a no fines sub-base layer or porous paving to attenuate the worst case 1 in 100 year storm event to prevent flooding. 1 in 100 year storm calculations with a 40% Climate Change allowance are shown in Appendix D.

The materials specification for the scheme will be in accordance with the Highways Agency Specification for Highway Works. For the purposes of the indicative design, the following material types have been assumed:

- Drainage pipes up to 300mm diameter – Vitrified clayware, plastic pipes will be permitted subject to ground conditions.
- Drainage pipes over 300mm diameter - Concrete
- Manholes and chambers - Precast concrete with concrete surround or PPIC
- Chamber covers – Class D400 infill type in higher quality paved areas.
- Class D400 standard type in all other road / park areas
- Class C250 standard type in all footpath areas
- Pipe bedding - Imported granular
- Pipe Trench backfill - Selected as dug or imported material
- Manholes should be located at every change of alignment or gradient; at the head of all sewers; at every junction of a public sewer

The drainage shall be designed utilizing the following criteria:

- Minimum flow velocity 1.0m/s for self-cleansing
- Standard pipe roughness “Ks” of 0.



2.2 Foul Water Drainage

2.2.1 Proposed Infrastructure

Foul drainage from the buildings will be collected via pipes and discharge to the existing public sewer in Clifton Road.

Average Water flows will be 0.5l/s in accordance with Sewers for Adoption 6th Edition.

The existing public foul sewer crossing the site will be diverted under a Section 185 Sewer Diversion Agreement with Southern Water Services Ltd.

2.2.2 Standards

The performance of the foul drainage system has been designed to Sewers for Adoption 6th Edition, BS EN 752 Parts 3 and 4, and the most current issue of Part H of the Building Regulations. The main criteria used are as follows.

- Drainage pipes up to 100mm diameter – Vitrified clayware, plastic pipes will be permitted subject to ground conditions.
- Manholes and chambers - Precast concrete with concrete surround or PPIC
- Chamber covers – Class D400 infill type in higher quality paved areas.
- Class D400 standard type in all other road / parking areas
- Class C250 standard type in all footpath areas
- Pipe bedding - Imported granular
- Pipe Trench backfill - Selected as dug or imported material
- Manholes should be located at every change of alignment or gradient; at the head of all sewers; at the every junction of a public sewer

The drainage shall be designed utilizing the following criteria:

- Minimum flow velocity 0.75m/s for self-cleansing
- Standard pipe roughness “Ks” of 1.5.



3.0 Surface Water Flows

3.1 Existing and proposed site run-off flows

A summary of the existing and proposed peak flows are detailed in Table 1 below and include the 40% climate change allowance for the worst case 1 in 100 year storm event.

Return Period 1 in	Pre- Development l/s	Post- Development l/s
1 year	7.0	1.9
30 years	16.7	2.0
100 years	20.9	2.0
100 years + 40% CC	-	2.1

Table 1: Summary of Existing and Proposed Surface Water Flows

The pre-development surface water calculations are shown in Appendix B and the post-development surface water calculations are shown in Appendix D.

It can be seen from the above table that there is a considerable betterment as a result of the proposed development.

The 1 in 100 year + 40% climate change calculations show that no flooding occurs.



4.0 Attenuation

It is proposed that Sustainable Urban Drainage Systems (SUDS) will be the primary consideration for surface water management. There are several different methods that may be used to provide sufficient attenuation of the surface water described in Section 5 below.

Attenuation should be positioned as close to the outfall as possible and would control the surface water discharge from the site. Implementation of one or all of the SUDS methods outlined in Section 5 of this report is highly recommended to reduce the requirement for below ground storage.

The proposed drainage design includes a 350mm layer of no-fines sub-base or 500mm deep porous paving that provides attenuation.

5.0 Sustainable Urban Drainage Systems (SUDS)

The objective of SUDS is to minimise the impacts of the development on the quantity and quality of site runoff and maximise amenity and biodiversity opportunities. Surface water SUDS will be designed and installed in accordance with NPPF and associated technical guidance March 2012 and associated CIRIA documents.

The mix of SUDS to be used is determined by the conditions on site, in this case a development with areas of external space which can be utilised for SUDS. The methodology of surface water control is to slow the entry of the surface water into the system by using flow control devices, then retain the runoff by using below ground storage (a no-fines sub-base layer or porous paving), which will release surface water into the existing public surface water sewer in Clifton Road at an agreed rate to limit the impact of the development on drainage infrastructure and therefore reduce the potential for flooding.



5.1 Infiltration Devices

Infiltration devices drain water directly into the ground. Infiltration trenches and soakaways are more practicable for urban sites with limited space available. Infiltration devices can be integrated into and form part of the landscaped areas.

Infiltration trenches are completely below ground, and water should not occur on the surface.

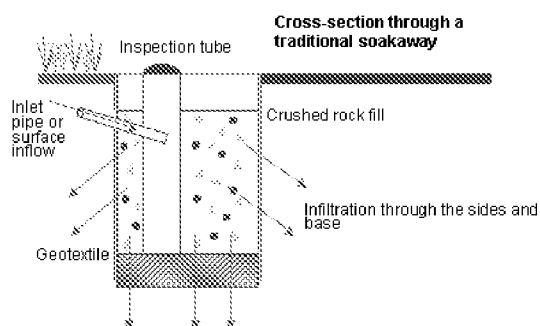


Figure 1 – Typical cross section through infiltration trench

Advantages – Reduces the volume of runoff, effective at pollutant removal, contributes to ground water recharge, simple and cost effective.

Disadvantages – Potentially high failure rates, comprehensive ground investigations required, offset from foundations (min. 5m away), risk of ground water pollution, reduced performance during prolonged wet periods.

Suitable for use – No, the subsoils of formed of silt/Clay that have poor infiltration characteristics.



5.2 Brown/Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover/landscaping over a drainage layer. They are designed to intercept and retain precipitation, increasing the time of concentration and reducing the volume of runoff and attenuation peak flows. Green roofs can be anything from a thin growing layer of sedums and mosses to plants, shrubs and large trees.

These roofs vary in specification and can be designed to attract bird and invertebrate species. Referring to CIRIA document C644, green and brown roofs also participate in attenuating rainwater. This would reduce the requirement for below ground storage attenuation on the site.

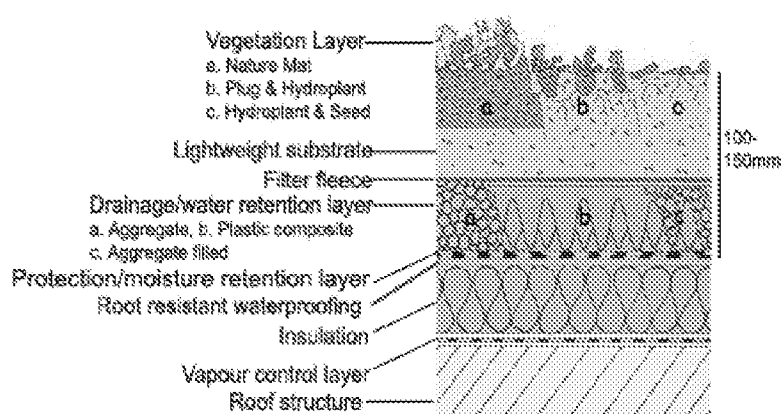


Figure 2 – Typical section through green roof build up

Advantages – Mimic greenfield state of building footprint, good removal of pollutants, ecological and amenity benefits, improve air quality, insulates building.

Disadvantages – Costs, increased structural loading, roof height, design, maintenance and exposure may preclude use.

Suitable for use – No, the roof area is less than 330m² with no access for regular maintenance therefore not suitable to support Green Roofs.



5.3 Rainwater Harvesting

These tanks act as mini-storage chambers for surface water, reducing the extent of underground storage required. They provide a source of water for plant irrigation, washing machines and for flushing wc's

Harvested rainwater is stored below ground and pumped to provide a substitute for potable mains water reducing both the site discharge and water consumption.

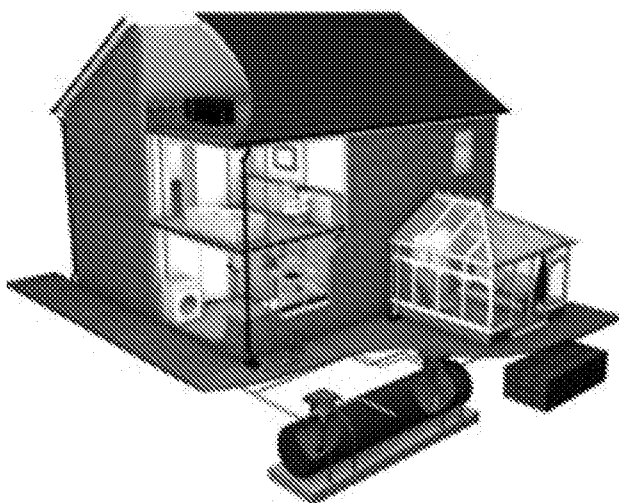


Figure 4 – Rainwater Harvesting

Advantages – Provided source control of storm water runoff, reduces demand on mains water.

Disadvantages – Costs, Risk to public health, use dependant on demand requirements and seasonal rainfall characteristics, maintenance of pumps & control systems.

Suitable for use – No, The cost of installing is not viable for a project of this type.



5.4 Porous Paving

Porous pavement is an alternative to conventional paving in which water permeates through the paved structure rather than draining off it. The surface water will be held in a reservoir structure (high void content sub-base) under the pavement for subsequent delayed discharge or infiltration into the sub-strata below.

The porous paving can be materials such as gravel, grasscrete, porous (no fines) concrete, concrete blocks or porous asphalt. Pollutant removal rates have been shown to be high, as the majority of the removal occurs as a result of the filtration of the water through the aggregate sub-base.

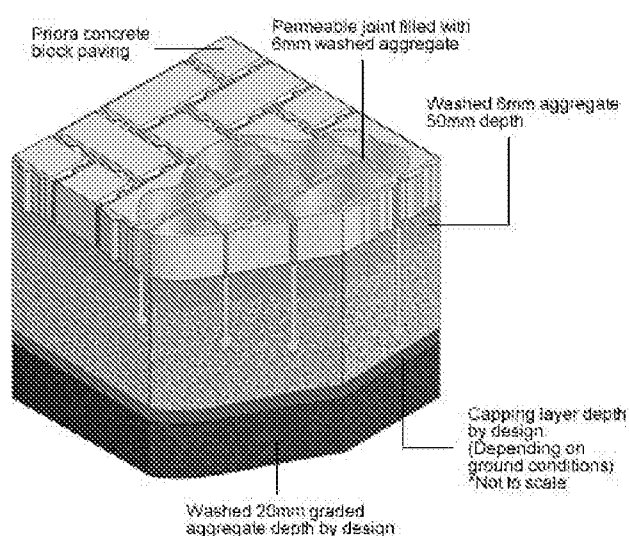


Figure 3 – Typical section through porous paving

Advantages – Effective in removing pollutants, lined systems can be used to avoid infiltration, reduces volume and rate of surface water runoff, suitable for high density developments. Mimics existing Greenfield conditions by filtering into the surrounding soft landscaped areas.

Disadvantages – Costs, used for low traffic volumes, low axle loads and speeds, risk of long term clogging due to poor maintenance.

Suitable for use – Yes, but the paving will be a tanked system for attenuation only.



5.5 Below Ground Attenuation

Attenuation involves the storing of surface water within pipework or underground tanks prior to controlled discharge into the public system. Attenuation tanks can also provide off line storage.

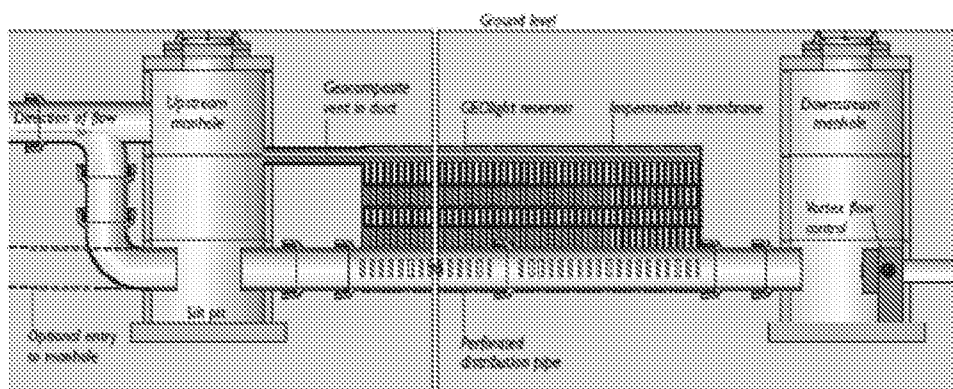


Figure 5 – Typical section through below ground attenuation chamber (cellular storage)

Advantages – Effective storage of surface water, can be used below trafficked areas, can be used below public open areas, minimum maintenance.

Disadvantages – No water quality treatment.

Suitable for use – No, a cellular storage tank could be utilised but a 350mm layer of no-fines sub-base storage has been chosen as an alternative.



5.6 Wetlands

Wetlands provide both stormwater attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands provide settlement of sediment and remove contaminants.

Advantages – Effective storage of surface water, good pollutant removal, ecological and amenity benefits.

Disadvantages – Requires large surface area. Health & Safety issues associated with large bodies of water.

Suitable for use – No, there is no space available.

5.7 Swales

Swales are vegetated drainage structures up to 500mm deep and used to provide flow control through attenuation. They can be used for infiltration, where possible.

Advantages – Can be incorporated into landscaping, good removal of contaminants, reduces discharge rates. Low costs.

Disadvantages – Requires large surface area. Limits extent of trees used in landscaping. Health & Safety issues associated with large bodies of water following heavy rainfall.

Suitable for use – No, there is no space available.

5.8 Ponds/Rain gardens

Ponds or rain gardens are irregular shaped vegetated drainage structures used to provide flow control through attenuation. They can be used for infiltration, where possible.

Advantages – Can be incorporated into landscaping, good removal of contaminants, reduces discharge rates. Low costs.

Disadvantages – Requires large surface area. Limits extent of trees used in landscaping. Health & Safety issues associated with large bodies of water following heavy rainfall.

Suitable for use – No, there is no space available.



6.0 Proposed SUDS solution

It is advised that a combination of Sustainable Drainage Systems (SUDS) is used to increase the time of concentration of the water before it discharges to the receiving surface water sewer in Clifton Road.

This can be achieved by using a 350mm thick no-fines sub-base layer, large diameter pipes and a hydrobrake to restrict discharge rates to the existing public surface water sewer in Clifton Road.

This combination of SUDS and retention currently designed will reduce surface runoff for the 1 in 100 year storm return period + 30% climate change allowance to a rate of 2.0l/s, runoff for the 1 in 30 year storm return period to a rate of 1.9l/s and runoff for the 1 in 1 year storm return period to a rate of 1.4l/s.

7.0 Management and Maintenance of SUDS

A management company will be appointed to complete routine maintenance of the development including all SUDs elements.

The gullies, manholes, and flow control manholes are to be inspected and cleaned out on a monthly basis.

The sub-base attenuation layer will require no maintenance as it will be surrounded with Terram so that no fine particles can enter the voids that are utilised for water storage.

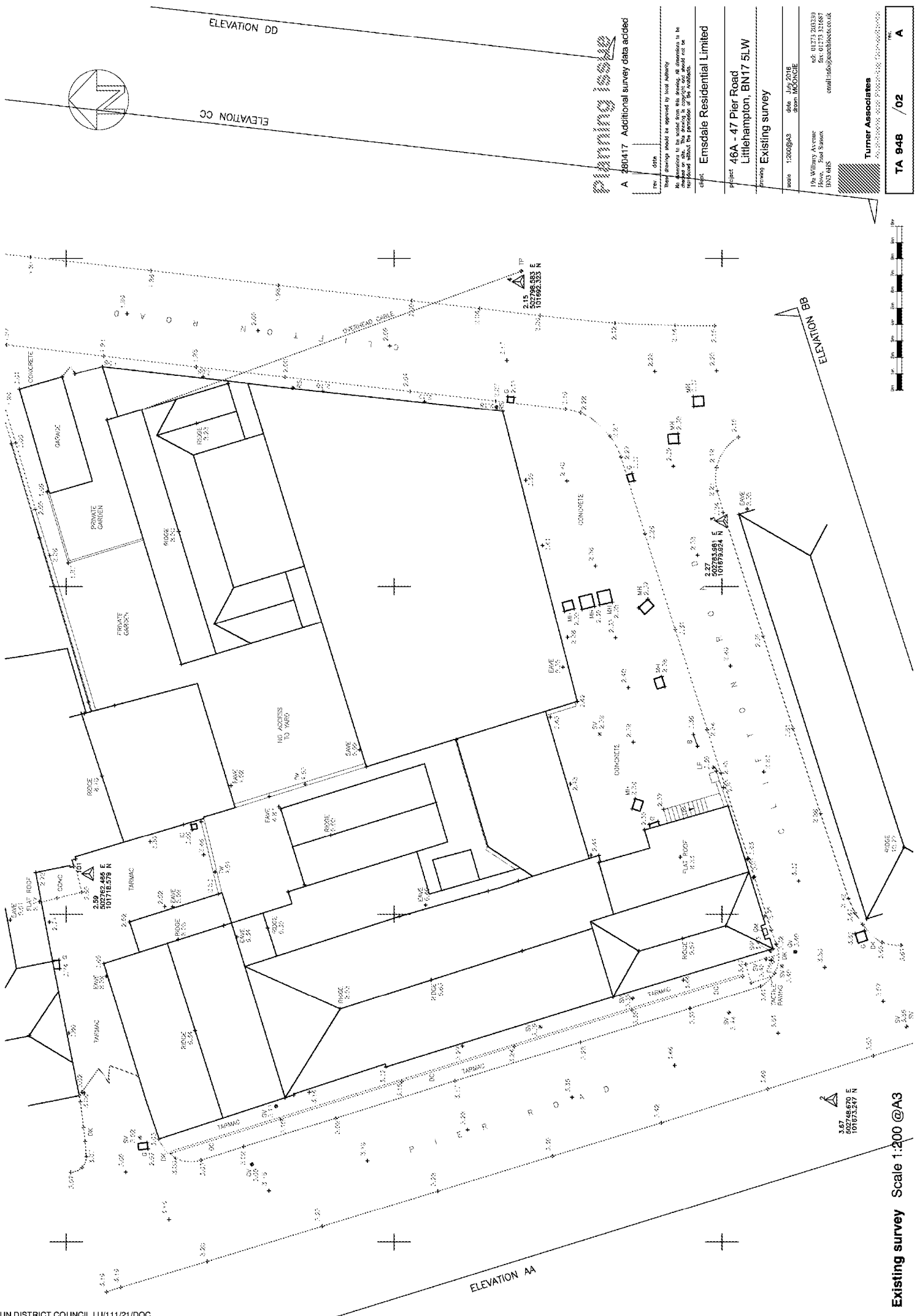
If porous paving is used then the blocks will be lifted every 25 years or at a period recommended by the manufacturer and the laying course shall be cleaned or replaced.

8.0 Implementation of SUDS

Construction will commence in Jun 2021 and it is anticipated that the development, all SUDs components and the sewer diversion will be completed by June 2022.



Appendix A
Topographical Survey and Sewer Records



Planning 15882

A 280417 Additional survey data added

rev	date	description
1	12/09/03	Initial survey
2	12/09/03	Additional survey data added

These drawings should be approved by local authority
No alterations to this scaled plan should be made without the permission of the local authority.
The drawings are for information only and should not be used for any other purpose without the permission of the local authority.

client Emsdale Residential Limited

project 48A - 47 Pier Road
Littlehampton, BN17 5LW

drawing Existing survey

scale 1:200 @ A3 date July 2018 from MOONGIE

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TA 948 /02 A

Existing survey Scale 1:200 @A3

SEWER RECORDS PAGE 1 OF 2



O.S. REF. TQ0201NE	Drawn by: kumaria	Scale: 1:1250	Date: 03/12/2019	Title: 362562_47 Pier Road, Littleham	502527	101538	502999	Southern Water
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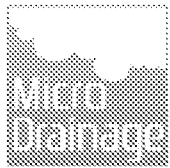
SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
5601X			150	UNK	CIRC	8689X			225	VC	CIRC						
5602X			150	UNK	CIRC	8690X			225	VC	CIRC						
7550X	2.59	-0.56	870	CP	CIRC	8691X			225	VC	CIRC						
7551X	2.88		870	CP	CIRC	8692X			225	VC	CIRC						
7552X	3.36		800	CP	CIRC	8693X			225	VC	CIRC						
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7554X			800	CP	CIRC	8695X			225	VC	CIRC						
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7556X	2.37	1.02	300	VC	CIRC	8697X			225	VC	CIRC						
7557X	2.29	0.87	300	VC	CIRC	8698X			225	VC	CIRC						
7600X			150	UNK	CIRC	8699X			225	VC	CIRC						
7601X			150	UNK	CIRC	8700X			225	VC	CIRC						
7610X			150	UNK	CIRC	8701X			225	VC	CIRC						
7611X			150	UNK	CIRC	8702X			225	VC	CIRC						
7620X			150	UNK	CIRC	8703X			225	VC	CIRC						
7621X			150	UNK	CIRC	8704X			225	VC	CIRC						
7630X			150	UNK	CIRC	8705X			225	VC	CIRC						
7631X			150	UNK	CIRC	8706X			225	VC	CIRC						
7640X			150	UNK	CIRC	8707X			225	VC	CIRC						
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7650X	2.3	-0.31	225	BAC	CIRC	8709X			225	VC	CIRC						
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7652X	3.8		225	BAC	CIRC	8711X			225	VC	CIRC						
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7671X			150	UNK	CIRC	8715X			225	VC	CIRC						
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7791X			225	VC	CIRC	8739X			225	VC	CIRC						
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7801X			225	VC	CIRC	8741X			225	VC	CIRC						
7810X			225	VC	CIRC	8742X			225	VC	CIRC						
7811X			225	VC	CIRC	8743X			225	VC	CIRC						
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7830X			225	VC	CIRC	8746X			225	VC	CIRC						
7831X			225	VC	CIRC	8747X			225	VC	CIRC						
7840X			225	VC	CIRC	8748X			225	VC	CIRC						
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7850X			225	VC	CIRC	8750X			225	VC	CIRC						
7851X			225	VC	CIRC	8751X			225	VC	CIRC						
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7861X			225	VC	CIRC	8753X			225	VC	CIRC						
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7871X			225	VC	CIRC	8755X			225	VC	CIRC						
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8000X			225	VC	CIRC	8780X			225	VC	CIRC						
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8010X			225	VC	CIRC	8782X			225	VC	CIRC						
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8031X			225	VC	CIRC	8787X			225	VC	CIRC						
8040X			225	VC	CIRC	8788X			225	VC	CIRC						
8041X			225	VC	CIRC	8789X			225	VC	CIRC						
8050X			225	VC	CIRC	8790X			225	VC	CIRC						
8051X			225	VC	CIRC	8791X			225	VC	CIRC						
8060X			225	VC	CIRC	8792X			225	VC	CIRC						
8061X			225	VC	CIRC	8793X			225	VC	CIRC						
8070X			225	VC	CIRC	8794X			225	VC	CIRC						
8071X			225	VC	CIRC	8795X			225	VC	CIRC						
8080X			225	VC	CIRC	8796X			225	VC	CIRC						
8081X			225	VC	CIRC	8797X			225	VC	CIRC						
8090X			225	VC	CIRC	8798X			225	VC	CIRC						
8091X			225	VC	CIRC	8799X			225	VC	CIRC						
8100X			225	VC	CIRC	8800X			225	VC	CIRC						
8101X			225	VC	CIRC	8801X			225	VC	CIRC						
8110X			225	VC	CIRC	8802X			225	VC	CIRC						
8111X			225	VC	CIRC	8803X			225	VC	CIRC						
8120X			225	VC	CIRC	8804X			225	VC	CIRC			</			



Appendix B

Pre-development surface water calculations

RCD		Page 1
9 Birchtree Way Maidstone Kent ME15 7RP	46A/47 PIER ROAD LITTLEHAMPTON	
Date 04/12/2019 08:06 File 1174-1001-PRE-DEV.MDX	Designed by RAC Checked by	
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.039	4-8	0.014

Total Area Contributing (ha) = 0.053

Total Pipe Volume (m³) = 0.353

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	10.000	0.100	100.0	0.053	5.00	0.0	0.600	o	150	Pipe/Conduit	☒
1.001	10.000	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	☒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	5.17	1.350	0.053	0.0	0.0	0.0	1.00	17.8	0.0
1.001	0.00	5.33	1.250	0.053	0.0	0.0	0.0	1.00	17.8	0.0

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9 Birchtree Way Maidstone Kent ME15 7RP	46A/47 PIER ROAD LITTLEHAMPTON	
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Micro Drainage	Network 2019.1	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	2.350	1.000	Open Manhole	1200	1.000	1.250	150				
2	2.350	1.100	Open Manhole	1200	1.001	1.250	150	1.000	1.250	150	
EX	2.350	1.200	Open Manhole	1200		OUTFALL		1.001	1.150	150	

No coordinates have been specified, layout information cannot be produced.

RCD		Page 3
9 Birchtree Way Maidstone Kent ME15 7RP		46A/47 PIER ROAD LITTLEHAMPTON
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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	1	2.350	1.350	0.850	Open Manhole	1200
1.001	o	150	2	2.350	1.250	0.950	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	10.000	100.0	2	2.350	1.250	0.950	Open Manhole	1200
1.001	10.000	100.0	EX	2.350	1.150	1.050	Open Manhole	1200

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001	EX	2.350	1.150	1.150	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.350		

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9 Birchtree Way Maidstone Kent ME15 7RP	46A/47 PIER ROAD LITTLEHAMPTON	
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+0%	30/15 Winter				1.421
1.001	2	15 Winter	1	+0%	30/15 Winter				1.321

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.079	0.000	0.44		7.0	OK	
1.001	2	-0.079	0.000	0.45		7.0	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales	Cv (Summer)	0.750	
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%	30/15 Winter				1.512
1.001	2	15 Winter	30	+0%	30/15 Winter				1.402

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.012	0.000	1.06		16.7	SURCHARGED	
1.001	2	0.002	0.000	1.02		16.2	SURCHARGED	

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9 Birchtree Way Maidstone Kent ME15 7RP	46A/47 PIER ROAD LITTLEHAMPTON	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales Cv (Summer)			0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+0%	30/15 Winter				1.645
1.001	2	15 Winter	100	+0%	30/15 Winter				1.463

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.145	0.000	1.32		20.9	SURCHARGED	
1.001	2	0.048	0.000	1.31		20.7	SURCHARGED	

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Appendix C
Drainage Layout

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Appendix D

Post Development surface water calculations

RCD		Page 1																																																																																																																																																																																																																																																																																		
9 Birchtree Way Maidstone Kent ME15 7RP		46a - 47 PIER ROAD LITTLEHAMPTON																																																																																																																																																																																																																																																																																		
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Micro Drainage		Source Control 2019.1																																																																																																																																																																																																																																																																																		
<u>Summary of Results for 1 year Return Period</u> Half Drain Time : 7 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>1.865</td><td>0.015</td><td>0.0</td><td>1.9</td><td>1.9</td><td>0.9</td><td>OK</td></tr><tr><td>30 min Summer</td><td>1.871</td><td>0.021</td><td>0.0</td><td>1.9</td><td>1.9</td><td>1.3</td><td>OK</td></tr><tr><td>60 min Summer</td><td>1.872</td><td>0.022</td><td>0.0</td><td>1.9</td><td>1.9</td><td>1.3</td><td>OK</td></tr><tr><td>120 min Summer</td><td>1.864</td><td>0.014</td><td>0.0</td><td>1.9</td><td>1.9</td><td>0.8</td><td>OK</td></tr><tr><td>180 min Summer</td><td>1.857</td><td>0.007</td><td>0.0</td><td>1.9</td><td>1.9</td><td>0.4</td><td>OK</td></tr><tr><td>240 min Summer</td><td>1.852</td><td>0.002</td><td>0.0</td><td>1.9</td><td>1.9</td><td>0.1</td><td>OK</td></tr><tr><td>360 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>1.7</td><td>1.7</td><td>0.0</td><td>OK</td></tr><tr><td>480 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>1.4</td><td>1.4</td><td>0.0</td><td>OK</td></tr><tr><td>600 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>1.2</td><td>1.2</td><td>0.0</td><td>OK</td></tr><tr><td>720 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>1.0</td><td>1.0</td><td>0.0</td><td>OK</td></tr><tr><td>960 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.9</td><td>0.9</td><td>0.0</td><td>OK</td></tr><tr><td>1440 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.6</td><td>0.6</td><td>0.0</td><td>OK</td></tr><tr><td>2160 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.5</td><td>0.5</td><td>0.0</td><td>OK</td></tr><tr><td>2880 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.4</td><td>0.4</td><td>0.0</td><td>OK</td></tr><tr><td>4320 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.3</td><td>0.3</td><td>0.0</td><td>OK</td></tr><tr><td>5760 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.2</td><td>0.2</td><td>0.0</td><td>OK</td></tr><tr><td>7200 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.2</td><td>0.2</td><td>0.0</td><td>OK</td></tr><tr><td>8640 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.2</td><td>0.2</td><td>0.0</td><td>OK</td></tr><tr><td>10080 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.2</td><td>0.2</td><td>0.0</td><td>OK</td></tr><tr><td>15 min Winter</td><td>1.870</td><td>0.020</td><td>0.0</td><td>1.9</td><td>1.9</td><td>1.2</td><td>OK</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>29.648</td><td>0.0</td><td>1.9</td><td>16</td></tr><tr><td>30 min Summer</td><td>19.726</td><td>0.0</td><td>2.9</td><td>24</td></tr><tr><td>60 min Summer</td><td>12.800</td><td>0.0</td><td>4.1</td><td>40</td></tr><tr><td>120 min Summer</td><td>8.156</td><td>0.0</td><td>5.5</td><td>72</td></tr><tr><td>180 min Summer</td><td>6.242</td><td>0.0</td><td>6.4</td><td>102</td></tr><tr><td>240 min Summer</td><td>5.155</td><td>0.0</td><td>7.1</td><td>130</td></tr><tr><td>360 min Summer</td><td>3.898</td><td>0.0</td><td>8.1</td><td>0</td></tr><tr><td>480 min Summer</td><td>3.196</td><td>0.0</td><td>9.0</td><td>0</td></tr><tr><td>600 min Summer</td><td>2.740</td><td>0.0</td><td>9.6</td><td>0</td></tr><tr><td>720 min Summer</td><td>2.417</td><td>0.0</td><td>10.2</td><td>0</td></tr><tr><td>960 min Summer</td><td>1.983</td><td>0.0</td><td>11.2</td><td>0</td></tr><tr><td>1440 min Summer</td><td>1.501</td><td>0.0</td><td>12.7</td><td>0</td></tr><tr><td>2160 min Summer</td><td>1.134</td><td>0.0</td><td>14.3</td><td>0</td></tr><tr><td>2880 min Summer</td><td>0.930</td><td>0.0</td><td>15.5</td><td>0</td></tr><tr><td>4320 min Summer</td><td>0.704</td><td>0.0</td><td>17.3</td><td>0</td></tr><tr><td>5760 min Summer</td><td>0.578</td><td>0.0</td><td>18.7</td><td>0</td></tr><tr><td>7200 min Summer</td><td>0.495</td><td>0.0</td><td>19.6</td><td>0</td></tr><tr><td>8640 min Summer</td><td>0.436</td><td>0.0</td><td>20.3</td><td>0</td></tr><tr><td>10080 min Summer</td><td>0.391</td><td>0.0</td><td>20.9</td><td>0</td></tr><tr><td>15 min Winter</td><td>29.648</td><td>0.0</td><td>2.2</td><td>16</td></tr></tbody></table>				Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	1.865	0.015	0.0	1.9	1.9	0.9	OK	30 min Summer	1.871	0.021	0.0	1.9	1.9	1.3	OK	60 min Summer	1.872	0.022	0.0	1.9	1.9	1.3	OK	120 min Summer	1.864	0.014	0.0	1.9	1.9	0.8	OK	180 min Summer	1.857	0.007	0.0	1.9	1.9	0.4	OK	240 min Summer	1.852	0.002	0.0	1.9	1.9	0.1	OK	360 min Summer	1.850	0.000	0.0	1.7	1.7	0.0	OK	480 min Summer	1.850	0.000	0.0	1.4	1.4	0.0	OK	600 min Summer	1.850	0.000	0.0	1.2	1.2	0.0	OK	720 min Summer	1.850	0.000	0.0	1.0	1.0	0.0	OK	960 min Summer	1.850	0.000	0.0	0.9	0.9	0.0	OK	1440 min Summer	1.850	0.000	0.0	0.6	0.6	0.0	OK	2160 min Summer	1.850	0.000	0.0	0.5	0.5	0.0	OK	2880 min Summer	1.850	0.000	0.0	0.4	0.4	0.0	OK	4320 min Summer	1.850	0.000	0.0	0.3	0.3	0.0	OK	5760 min Summer	1.850	0.000	0.0	0.2	0.2	0.0	OK	7200 min Summer	1.850	0.000	0.0	0.2	0.2	0.0	OK	8640 min Summer	1.850	0.000	0.0	0.2	0.2	0.0	OK	10080 min Summer	1.850	0.000	0.0	0.2	0.2	0.0	OK	15 min Winter	1.870	0.020	0.0	1.9	1.9	1.2	OK	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	29.648	0.0	1.9	16	30 min Summer	19.726	0.0	2.9	24	60 min Summer	12.800	0.0	4.1	40	120 min Summer	8.156	0.0	5.5	72	180 min Summer	6.242	0.0	6.4	102	240 min Summer	5.155	0.0	7.1	130	360 min Summer	3.898	0.0	8.1	0	480 min Summer	3.196	0.0	9.0	0	600 min Summer	2.740	0.0	9.6	0	720 min Summer	2.417	0.0	10.2	0	960 min Summer	1.983	0.0	11.2	0	1440 min Summer	1.501	0.0	12.7	0	2160 min Summer	1.134	0.0	14.3	0	2880 min Summer	0.930	0.0	15.5	0	4320 min Summer	0.704	0.0	17.3	0	5760 min Summer	0.578	0.0	18.7	0	7200 min Summer	0.495	0.0	19.6	0	8640 min Summer	0.436	0.0	20.3	0	10080 min Summer	0.391	0.0	20.9	0	15 min Winter	29.648	0.0	2.2	16
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																													
15 min Summer	1.865	0.015	0.0	1.9	1.9	0.9	OK																																																																																																																																																																																																																																																																													
30 min Summer	1.871	0.021	0.0	1.9	1.9	1.3	OK																																																																																																																																																																																																																																																																													
60 min Summer	1.872	0.022	0.0	1.9	1.9	1.3	OK																																																																																																																																																																																																																																																																													
120 min Summer	1.864	0.014	0.0	1.9	1.9	0.8	OK																																																																																																																																																																																																																																																																													
180 min Summer	1.857	0.007	0.0	1.9	1.9	0.4	OK																																																																																																																																																																																																																																																																													
240 min Summer	1.852	0.002	0.0	1.9	1.9	0.1	OK																																																																																																																																																																																																																																																																													
360 min Summer	1.850	0.000	0.0	1.7	1.7	0.0	OK																																																																																																																																																																																																																																																																													
480 min Summer	1.850	0.000	0.0	1.4	1.4	0.0	OK																																																																																																																																																																																																																																																																													
600 min Summer	1.850	0.000	0.0	1.2	1.2	0.0	OK																																																																																																																																																																																																																																																																													
720 min Summer	1.850	0.000	0.0	1.0	1.0	0.0	OK																																																																																																																																																																																																																																																																													
960 min Summer	1.850	0.000	0.0	0.9	0.9	0.0	OK																																																																																																																																																																																																																																																																													
1440 min Summer	1.850	0.000	0.0	0.6	0.6	0.0	OK																																																																																																																																																																																																																																																																													
2160 min Summer	1.850	0.000	0.0	0.5	0.5	0.0	OK																																																																																																																																																																																																																																																																													
2880 min Summer	1.850	0.000	0.0	0.4	0.4	0.0	OK																																																																																																																																																																																																																																																																													
4320 min Summer	1.850	0.000	0.0	0.3	0.3	0.0	OK																																																																																																																																																																																																																																																																													
5760 min Summer	1.850	0.000	0.0	0.2	0.2	0.0	OK																																																																																																																																																																																																																																																																													
7200 min Summer	1.850	0.000	0.0	0.2	0.2	0.0	OK																																																																																																																																																																																																																																																																													
8640 min Summer	1.850	0.000	0.0	0.2	0.2	0.0	OK																																																																																																																																																																																																																																																																													
10080 min Summer	1.850	0.000	0.0	0.2	0.2	0.0	OK																																																																																																																																																																																																																																																																													
15 min Winter	1.870	0.020	0.0	1.9	1.9	1.2	OK																																																																																																																																																																																																																																																																													
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																																
15 min Summer	29.648	0.0	1.9	16																																																																																																																																																																																																																																																																																
30 min Summer	19.726	0.0	2.9	24																																																																																																																																																																																																																																																																																
60 min Summer	12.800	0.0	4.1	40																																																																																																																																																																																																																																																																																
120 min Summer	8.156	0.0	5.5	72																																																																																																																																																																																																																																																																																
180 min Summer	6.242	0.0	6.4	102																																																																																																																																																																																																																																																																																
240 min Summer	5.155	0.0	7.1	130																																																																																																																																																																																																																																																																																
360 min Summer	3.898	0.0	8.1	0																																																																																																																																																																																																																																																																																
480 min Summer	3.196	0.0	9.0	0																																																																																																																																																																																																																																																																																
600 min Summer	2.740	0.0	9.6	0																																																																																																																																																																																																																																																																																
720 min Summer	2.417	0.0	10.2	0																																																																																																																																																																																																																																																																																
960 min Summer	1.983	0.0	11.2	0																																																																																																																																																																																																																																																																																
1440 min Summer	1.501	0.0	12.7	0																																																																																																																																																																																																																																																																																
2160 min Summer	1.134	0.0	14.3	0																																																																																																																																																																																																																																																																																
2880 min Summer	0.930	0.0	15.5	0																																																																																																																																																																																																																																																																																
4320 min Summer	0.704	0.0	17.3	0																																																																																																																																																																																																																																																																																
5760 min Summer	0.578	0.0	18.7	0																																																																																																																																																																																																																																																																																
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8640 min Summer	0.436	0.0	20.3	0																																																																																																																																																																																																																																																																																
10080 min Summer	0.391	0.0	20.9	0																																																																																																																																																																																																																																																																																
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RCD		Page 2					
9 Birchtree Way Maidstone Kent ME15 7RP		46a - 47 PIER ROAD LITTLEHAMPTON					
Date 15/01/2021 12:20 File 1174-1001.SRCX		Designed by RAC Checked by					
Micro Drainage		Source Control 2019.1					
Summary of Results for 1 year Return Period							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	1.875	0.025	0.0	1.9	1.9	1.5	○ K
60 min Winter	1.873	0.023	0.0	1.9	1.9	1.4	○ K
120 min Winter	1.859	0.009	0.0	1.9	1.9	0.6	○ K
180 min Winter	1.851	0.001	0.0	1.9	1.9	0.0	○ K
240 min Winter	1.850	0.000	0.0	1.6	1.6	0.0	○ K
360 min Winter	1.850	0.000	0.0	1.2	1.2	0.0	○ K
480 min Winter	1.850	0.000	0.0	1.0	1.0	0.0	○ K
600 min Winter	1.850	0.000	0.0	0.9	0.9	0.0	○ K
720 min Winter	1.850	0.000	0.0	0.7	0.7	0.0	○ K
960 min Winter	1.850	0.000	0.0	0.6	0.6	0.0	○ K
1440 min Winter	1.850	0.000	0.0	0.5	0.5	0.0	○ K
2160 min Winter	1.850	0.000	0.0	0.3	0.3	0.0	○ K
2880 min Winter	1.850	0.000	0.0	0.3	0.3	0.0	○ K
4320 min Winter	1.850	0.000	0.0	0.2	0.2	0.0	○ K
5760 min Winter	1.850	0.000	0.0	0.2	0.2	0.0	○ K
7200 min Winter	1.850	0.000	0.0	0.1	0.1	0.0	○ K
8640 min Winter	1.850	0.000	0.0	0.1	0.1	0.0	○ K
10080 min Winter	1.850	0.000	0.0	0.1	0.1	0.0	○ K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	19.726	0.0	3.4	25			
60 min Winter	12.800	0.0	4.7	44			
120 min Winter	8.156	0.0	6.3	74			
180 min Winter	6.242	0.0	7.3	98			
240 min Winter	5.155	0.0	8.1	0			
360 min Winter	3.898	0.0	9.3	0			
480 min Winter	3.196	0.0	10.2	0			
600 min Winter	2.740	0.0	11.0	0			
720 min Winter	2.417	0.0	11.6	0			
960 min Winter	1.983	0.0	12.7	0			
1440 min Winter	1.501	0.0	14.4	0			
2160 min Winter	1.134	0.0	16.3	0			
2880 min Winter	0.930	0.0	17.7	0			
4320 min Winter	0.704	0.0	19.8	0			
5760 min Winter	0.578	0.0	21.3	0			
7200 min Winter	0.495	0.0	22.5	0			
8640 min Winter	0.436	0.0	23.4	0			
10080 min Winter	0.391	0.0	24.1	0			
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9 Birchtree Way Maidstone Kent ME15 7RP			46a - 47 PIER ROAD LITTLEHAMPTON				
Date 15/01/2021 12:20 File 1174-1001.SRCX			Designed by RAC Checked by				
Micro Drainage			Source Control 2019.1				
<u>Summary of Results for 30 year Return Period</u>							
Half Drain Time : 36 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	1.929	0.079	0.0	1.9	1.9	4.7	OK
30 min Summer	1.949	0.099	0.0	1.9	1.9	6.0	OK
60 min Summer	1.955	0.105	0.0	2.0	2.0	6.3	OK
120 min Summer	1.948	0.098	0.0	1.9	1.9	5.9	OK
180 min Summer	1.936	0.086	0.0	1.9	1.9	5.1	OK
240 min Summer	1.923	0.073	0.0	1.9	1.9	4.4	OK
360 min Summer	1.899	0.049	0.0	1.9	1.9	2.9	OK
480 min Summer	1.880	0.030	0.0	1.9	1.9	1.8	OK
600 min Summer	1.866	0.016	0.0	1.9	1.9	1.0	OK
720 min Summer	1.856	0.006	0.0	1.9	1.9	0.4	OK
960 min Summer	1.850	0.000	0.0	1.8	1.8	0.0	OK
1440 min Summer	1.850	0.000	0.0	1.3	1.3	0.0	OK
2160 min Summer	1.850	0.000	0.0	0.9	0.9	0.0	OK
2880 min Summer	1.850	0.000	0.0	0.8	0.8	0.0	OK
4320 min Summer	1.850	0.000	0.0	0.6	0.6	0.0	OK
5760 min Summer	1.850	0.000	0.0	0.4	0.4	0.0	OK
7200 min Summer	1.850	0.000	0.0	0.4	0.4	0.0	OK
8640 min Summer	1.850	0.000	0.0	0.3	0.3	0.0	OK
10080 min Summer	1.850	0.000	0.0	0.3	0.3	0.0	OK
15 min Winter	1.943	0.093	0.0	1.9	1.9	5.6	OK
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	72.682	0.0	6.1	18			
30 min Summer	48.363	0.0	8.6	30			
60 min Summer	30.811	0.0	11.1	48			
120 min Summer	19.036	0.0	14.1	82			
180 min Summer	14.191	0.0	15.8	116			
240 min Summer	11.467	0.0	17.1	148			
360 min Summer	8.493	0.0	19.1	210			
480 min Summer	6.855	0.0	20.6	270			
600 min Summer	5.801	0.0	21.8	326			
720 min Summer	5.059	0.0	22.8	380			
960 min Summer	4.074	0.0	24.5	0			
1440 min Summer	2.998	0.0	27.0	0			
2160 min Summer	2.203	0.0	29.6	0			
2880 min Summer	1.769	0.0	31.6	0			
4320 min Summer	1.297	0.0	34.3	0			
5760 min Summer	1.040	0.0	36.3	0			
7200 min Summer	0.876	0.0	37.8	0			
8640 min Summer	0.762	0.0	39.0	0			
10080 min Summer	0.677	0.0	40.0	0			
15 min Winter	72.682	0.0	7.1	18			
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9 Birchtree Way Maidstone Kent ME15 7RP		46a - 47 PIER ROAD LITTLEHAMPTON					
Date 15/01/2021 12:20 File 1174-1001.SRCX		Designed by RAC Checked by					
Micro Drainage		Source Control 2019.1					
Summary of Results for 30 year Return Period							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	1.967	0.117	0.0	2.0	2.0	7.0	O K
60 min Winter	1.974	0.124	0.0	2.0	2.0	7.5	O K
120 min Winter	1.961	0.111	0.0	2.0	2.0	6.7	O K
180 min Winter	1.941	0.091	0.0	1.9	1.9	5.5	O K
240 min Winter	1.920	0.070	0.0	1.9	1.9	4.2	O K
360 min Winter	1.885	0.035	0.0	1.9	1.9	2.1	O K
480 min Winter	1.860	0.010	0.0	1.9	1.9	0.6	O K
600 min Winter	1.850	0.000	0.0	1.8	1.8	0.0	O K
720 min Winter	1.850	0.000	0.0	1.6	1.6	0.0	O K
960 min Winter	1.850	0.000	0.0	1.3	1.3	0.0	O K
1440 min Winter	1.850	0.000	0.0	0.9	0.9	0.0	O K
2160 min Winter	1.850	0.000	0.0	0.7	0.7	0.0	O K
2880 min Winter	1.850	0.000	0.0	0.5	0.5	0.0	O K
4320 min Winter	1.850	0.000	0.0	0.4	0.4	0.0	O K
5760 min Winter	1.850	0.000	0.0	0.3	0.3	0.0	O K
7200 min Winter	1.850	0.000	0.0	0.3	0.3	0.0	O K
8640 min Winter	1.850	0.000	0.0	0.2	0.2	0.0	O K
10080 min Winter	1.850	0.000	0.0	0.2	0.2	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	48.363	0.0	9.6	31			
60 min Winter	30.811	0.0	12.7	50			
120 min Winter	19.036	0.0	15.8	88			
180 min Winter	14.191	0.0	17.8	124			
240 min Winter	11.467	0.0	19.3	158			
360 min Winter	8.493	0.0	21.5	220			
480 min Winter	6.855	0.0	23.2	272			
600 min Winter	5.801	0.0	24.6	0			
720 min Winter	5.059	0.0	25.7	0			
960 min Winter	4.074	0.0	27.6	0			
1440 min Winter	2.998	0.0	30.4	0			
2160 min Winter	2.203	0.0	33.4	0			
2880 min Winter	1.769	0.0	35.6	0			
4320 min Winter	1.297	0.0	38.8	0			
5760 min Winter	1.040	0.0	41.1	0			
7200 min Winter	0.876	0.0	42.9	0			
8640 min Winter	0.762	0.0	44.3	0			
10080 min Winter	0.677	0.0	45.5	0			
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9 Birchtree Way Maidstone Kent ME15 7RP		46a - 47 PIER ROAD LITTLEHAMPTON																																																																																																																																																																																																																																																																																		
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Micro Drainage		Source Control 2019.1																																																																																																																																																																																																																																																																																		
Summary of Results for 100 year Return Period Half Drain Time : 52 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (1/s)</th><th>Max Control (1/s)</th><th>Max E Outflow (1/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>1.963</td><td>0.113</td><td>0.0</td><td>2.0</td><td>2.0</td><td>6.8</td><td>O K</td></tr><tr><td>30 min Summer</td><td>1.995</td><td>0.145</td><td>0.0</td><td>2.0</td><td>2.0</td><td>8.7</td><td>O K</td></tr><tr><td>60 min Summer</td><td>2.008</td><td>0.158</td><td>0.0</td><td>2.0</td><td>2.0</td><td>9.5</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>2.003</td><td>0.153</td><td>0.0</td><td>2.0</td><td>2.0</td><td>9.2</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>1.990</td><td>0.140</td><td>0.0</td><td>2.0</td><td>2.0</td><td>8.4</td><td>O K</td></tr><tr><td>240 min Summer</td><td>1.975</td><td>0.125</td><td>0.0</td><td>2.0</td><td>2.0</td><td>7.5</td><td>O K</td></tr><tr><td>360 min Summer</td><td>1.947</td><td>0.097</td><td>0.0</td><td>1.9</td><td>1.9</td><td>5.8</td><td>O K</td></tr><tr><td>480 min Summer</td><td>1.922</td><td>0.072</td><td>0.0</td><td>1.9</td><td>1.9</td><td>4.3</td><td>O K</td></tr><tr><td>600 min Summer</td><td>1.901</td><td>0.051</td><td>0.0</td><td>1.9</td><td>1.9</td><td>3.1</td><td>O K</td></tr><tr><td>720 min Summer</td><td>1.884</td><td>0.034</td><td>0.0</td><td>1.9</td><td>1.9</td><td>2.1</td><td>O K</td></tr><tr><td>960 min Summer</td><td>1.861</td><td>0.011</td><td>0.0</td><td>1.9</td><td>1.9</td><td>0.6</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>1.6</td><td>1.6</td><td>0.0</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>1.2</td><td>1.2</td><td>0.0</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.9</td><td>0.9</td><td>0.0</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.7</td><td>0.7</td><td>0.0</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.5</td><td>0.5</td><td>0.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.5</td><td>0.5</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.4</td><td>0.4</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>1.850</td><td>0.000</td><td>0.0</td><td>0.3</td><td>0.3</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>1.980</td><td>0.130</td><td>0.0</td><td>2.0</td><td>2.0</td><td>7.8</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>94.179</td><td>0.0</td><td>8.3</td><td>18</td></tr><tr><td>30 min Summer</td><td>63.261</td><td>0.0</td><td>11.5</td><td>31</td></tr><tr><td>60 min Summer</td><td>40.510</td><td>0.0</td><td>15.1</td><td>52</td></tr><tr><td>120 min Summer</td><td>25.003</td><td>0.0</td><td>18.7</td><td>86</td></tr><tr><td>180 min Summer</td><td>18.552</td><td>0.0</td><td>21.1</td><td>120</td></tr><tr><td>240 min Summer</td><td>14.912</td><td>0.0</td><td>22.5</td><td>154</td></tr><tr><td>360 min Summer</td><td>10.975</td><td>0.0</td><td>25.0</td><td>218</td></tr><tr><td>480 min Summer</td><td>8.815</td><td>0.0</td><td>26.8</td><td>282</td></tr><tr><td>600 min Summer</td><td>7.430</td><td>0.0</td><td>28.3</td><td>340</td></tr><tr><td>720 min Summer</td><td>6.458</td><td>0.0</td><td>29.5</td><td>398</td></tr><tr><td>960 min Summer</td><td>5.172</td><td>0.0</td><td>31.5</td><td>508</td></tr><tr><td>1440 min Summer</td><td>3.774</td><td>0.0</td><td>34.4</td><td>0</td></tr><tr><td>2160 min Summer</td><td>2.748</td><td>0.0</td><td>37.4</td><td>0</td></tr><tr><td>2880 min Summer</td><td>2.192</td><td>0.0</td><td>39.6</td><td>0</td></tr><tr><td>4320 min Summer</td><td>1.590</td><td>0.0</td><td>42.7</td><td>0</td></tr><tr><td>5760 min Summer</td><td>1.265</td><td>0.0</td><td>44.9</td><td>0</td></tr><tr><td>7200 min Summer</td><td>1.060</td><td>0.0</td><td>46.5</td><td>0</td></tr><tr><td>8640 min Summer</td><td>0.917</td><td>0.0</td><td>47.9</td><td>0</td></tr><tr><td>10080 min Summer</td><td>0.812</td><td>0.0</td><td>49.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>94.179</td><td>0.0</td><td>9.4</td><td>18</td></tr></table>				Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max E Outflow (1/s)	Max Volume (m³)	Status	15 min Summer	1.963	0.113	0.0	2.0	2.0	6.8	O K	30 min Summer	1.995	0.145	0.0	2.0	2.0	8.7	O K	60 min Summer	2.008	0.158	0.0	2.0	2.0	9.5	Flood Risk	120 min Summer	2.003	0.153	0.0	2.0	2.0	9.2	Flood Risk	180 min Summer	1.990	0.140	0.0	2.0	2.0	8.4	O K	240 min Summer	1.975	0.125	0.0	2.0	2.0	7.5	O K	360 min Summer	1.947	0.097	0.0	1.9	1.9	5.8	O K	480 min Summer	1.922	0.072	0.0	1.9	1.9	4.3	O K	600 min Summer	1.901	0.051	0.0	1.9	1.9	3.1	O K	720 min Summer	1.884	0.034	0.0	1.9	1.9	2.1	O K	960 min Summer	1.861	0.011	0.0	1.9	1.9	0.6	O K	1440 min Summer	1.850	0.000	0.0	1.6	1.6	0.0	O K	2160 min Summer	1.850	0.000	0.0	1.2	1.2	0.0	O K	2880 min Summer	1.850	0.000	0.0	0.9	0.9	0.0	O K	4320 min Summer	1.850	0.000	0.0	0.7	0.7	0.0	O K	5760 min Summer	1.850	0.000	0.0	0.5	0.5	0.0	O K	7200 min Summer	1.850	0.000	0.0	0.5	0.5	0.0	O K	8640 min Summer	1.850	0.000	0.0	0.4	0.4	0.0	O K	10080 min Summer	1.850	0.000	0.0	0.3	0.3	0.0	O K	15 min Winter	1.980	0.130	0.0	2.0	2.0	7.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	94.179	0.0	8.3	18	30 min Summer	63.261	0.0	11.5	31	60 min Summer	40.510	0.0	15.1	52	120 min Summer	25.003	0.0	18.7	86	180 min Summer	18.552	0.0	21.1	120	240 min Summer	14.912	0.0	22.5	154	360 min Summer	10.975	0.0	25.0	218	480 min Summer	8.815	0.0	26.8	282	600 min Summer	7.430	0.0	28.3	340	720 min Summer	6.458	0.0	29.5	398	960 min Summer	5.172	0.0	31.5	508	1440 min Summer	3.774	0.0	34.4	0	2160 min Summer	2.748	0.0	37.4	0	2880 min Summer	2.192	0.0	39.6	0	4320 min Summer	1.590	0.0	42.7	0	5760 min Summer	1.265	0.0	44.9	0	7200 min Summer	1.060	0.0	46.5	0	8640 min Summer	0.917	0.0	47.9	0	10080 min Summer	0.812	0.0	49.0	0	15 min Winter	94.179	0.0	9.4	18
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max E Outflow (1/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																													
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960 min Summer	1.861	0.011	0.0	1.9	1.9	0.6	O K																																																																																																																																																																																																																																																																													
1440 min Summer	1.850	0.000	0.0	1.6	1.6	0.0	O K																																																																																																																																																																																																																																																																													
2160 min Summer	1.850	0.000	0.0	1.2	1.2	0.0	O K																																																																																																																																																																																																																																																																													
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RCD							Page 2		
9 Birchtree Way Maidstone Kent ME15 7RP			46a - 47 PIER ROAD LITTLEHAMPTON						
Date 15/01/2021 12:18 File 1174-1001.SRCX			Designed by RAC Checked by						
Micro Drainage			Source Control 2019.1						
<u>Summary of Results for 100 year Return Period</u>									
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status		
30 min Winter	2.019	0.169	0.0	2.0	2.0	10.1	Flood	Risk	
60 min Winter	2.037	0.187	0.0	2.0	2.0	11.2	Flood	Risk	
120 min Winter	2.028	0.178	0.0	2.0	2.0	10.7	Flood	Risk	
180 min Winter	2.008	0.158	0.0	2.0	2.0	9.5	Flood	Risk	
240 min Winter	1.984	0.134	0.0	2.0	2.0	8.1	O	K	
360 min Winter	1.941	0.091	0.0	1.9	1.9	5.5	O	K	
480 min Winter	1.905	0.055	0.0	1.9	1.9	3.3	O	K	
600 min Winter	1.876	0.026	0.0	1.9	1.9	1.5	O	K	
720 min Winter	1.856	0.006	0.0	1.9	1.9	0.4	O	K	
960 min Winter	1.850	0.000	0.0	1.6	1.6	0.0	O	K	
1440 min Winter	1.850	0.000	0.0	1.2	1.2	0.0	O	K	
2160 min Winter	1.850	0.000	0.0	0.9	0.9	0.0	O	K	
2880 min Winter	1.850	0.000	0.0	0.7	0.7	0.0	O	K	
4320 min Winter	1.850	0.000	0.0	0.5	0.5	0.0	O	K	
5760 min Winter	1.850	0.000	0.0	0.4	0.4	0.0	O	K	
7200 min Winter	1.850	0.000	0.0	0.3	0.3	0.0	O	K	
8640 min Winter	1.850	0.000	0.0	0.3	0.3	0.0	O	K	
10080 min Winter	1.850	0.000	0.0	0.2	0.2	0.0	O	K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)					
30 min Winter	63.261	0.0	13.0	31					
60 min Winter	40.510	0.0	16.9	58					
120 min Winter	25.003	0.0	21.1	92					
180 min Winter	18.552	0.0	23.6	130					
240 min Winter	14.912	0.0	25.3	166					
360 min Winter	10.975	0.0	28.1	234					
480 min Winter	8.815	0.0	30.1	294					
600 min Winter	7.430	0.0	31.8	350					
720 min Winter	6.458	0.0	33.2	394					
960 min Winter	5.172	0.0	35.4	0					
1440 min Winter	3.774	0.0	38.7	0					
2160 min Winter	2.748	0.0	42.1	0					
2880 min Winter	2.192	0.0	44.6	0					
4320 min Winter	1.590	0.0	48.2	0					
5760 min Winter	1.265	0.0	50.7	0					
7200 min Winter	1.060	0.0	52.6	0					
8640 min Winter	0.917	0.0	54.2	0					
10080 min Winter	0.812	0.0	55.6	0					
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9 Birchtree Way Maidstone Kent ME15 7RP	46a - 47 PIER ROAD LITTLEHAMPTON	
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Micro Drainage Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 2.300

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	55.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	1.850	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	1.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

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Summer</td><td>5.284</td><td>0.0</td><td>48.8</td><td>764</td></tr><tr><td>2160 min Summer</td><td>3.848</td><td>0.0</td><td>53.2</td><td>0</td></tr><tr><td>2880 min Summer</td><td>3.068</td><td>0.0</td><td>56.3</td><td>0</td></tr><tr><td>4320 min Summer</td><td>2.226</td><td>0.0</td><td>60.9</td><td>0</td></tr><tr><td>5760 min Summer</td><td>1.771</td><td>0.0</td><td>64.2</td><td>0</td></tr><tr><td>7200 min Summer</td><td>1.483</td><td>0.0</td><td>66.8</td><td>0</td></tr><tr><td>8640 min Summer</td><td>1.284</td><td>0.0</td><td>68.9</td><td>0</td></tr><tr><td>10080 min Summer</td><td>1.137</td><td>0.0</td><td>70.7</td><td>0</td></tr><tr><td>15 min Winter</td><td>131.851</td><td>0.0</td><td>13.7</td><td>19</td></tr></tbody></table>				Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max E Outflow (1/s)	Max Volume (m³)	Status	15 min Summer	2.022	0.172	0.0	2.0	2.0	10.3	Flood Risk	30 min Summer	2.072	0.222	0.0	2.1	2.1	13.3	Flood Risk	60 min Summer	2.103	0.253	0.0	2.1	2.1	15.2	Flood Risk	120 min Summer	2.102	0.252	0.0	2.1	2.1	15.1	Flood Risk	180 min Summer	2.091	0.241	0.0	2.1	2.1	14.4	Flood Risk	240 min Summer	2.076	0.226	0.0	2.1	2.1	13.5	Flood Risk	360 min Summer	2.046	0.196	0.0	2.0	2.0	11.8	Flood Risk	480 min Summer	2.017	0.167	0.0	2.0	2.0	10.0	Flood Risk	600 min Summer	1.990	0.140	0.0	2.0	2.0	8.4	O K	720 min Summer	1.965	0.115	0.0	2.0	2.0	6.9	O K	960 min Summer	1.923	0.073	0.0	1.9	1.9	4.4	O K	1440 min Summer	1.869	0.019	0.0	1.9	1.9	1.2	O K	2160 min Summer	1.850	0.000	0.0	1.7	1.7	0.0	O K	2880 min Summer	1.850	0.000	0.0	1.3	1.3	0.0	O K	4320 min Summer	1.850	0.000	0.0	1.0	1.0	0.0	O K	5760 min Summer	1.850	0.000	0.0	0.8	0.8	0.0	O K	7200 min Summer	1.850	0.000	0.0	0.6	0.6	0.0	O K	8640 min Summer	1.850	0.000	0.0	0.5	0.5	0.0	O K	10080 min Summer	1.850	0.000	0.0	0.5	0.5	0.0	O K	15 min Winter	2.046	0.196	0.0	2.0	2.0	11.8	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	131.851	0.0	12.1	19	30 min Summer	88.566	0.0	16.5	32	60 min Summer	56.713	0.0	21.4	60	120 min Summer	35.004	0.0	26.7	92	180 min Summer	25.973	0.0	29.8	126	240 min Summer	20.877	0.0	32.0	160	360 min Summer	15.365	0.0	35.6	228	480 min Summer	12.341	0.0	38.1	294	600 min Summer	10.402	0.0	40.1	360	720 min Summer	9.042	0.0	41.7	420	960 min Summer	7.241	0.0	44.6	540	1440 min Summer	5.284	0.0	48.8	764	2160 min Summer	3.848	0.0	53.2	0	2880 min Summer	3.068	0.0	56.3	0	4320 min Summer	2.226	0.0	60.9	0	5760 min Summer	1.771	0.0	64.2	0	7200 min Summer	1.483	0.0	66.8	0	8640 min Summer	1.284	0.0	68.9	0	10080 min Summer	1.137	0.0	70.7	0	15 min Winter	131.851	0.0	13.7	19
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Date 15/01/2021 12:19 File 1174-1001.SRCX			Designed by RAC Checked by				
Micro Drainage			Source Control 2019.1				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	2.108	0.258	0.0	2.1	2.1	15.5	Flood Risk
60 min Winter	2.148	0.298	0.0	2.1	2.1	17.9	Flood Risk
120 min Winter	2.148	0.298	0.0	2.1	2.1	17.9	Flood Risk
180 min Winter	2.131	0.281	0.0	2.1	2.1	16.8	Flood Risk
240 min Winter	2.108	0.258	0.0	2.1	2.1	15.5	Flood Risk
360 min Winter	2.061	0.211	0.0	2.0	2.0	12.7	Flood Risk
480 min Winter	2.016	0.166	0.0	2.0	2.0	10.0	Flood Risk
600 min Winter	1.975	0.125	0.0	2.0	2.0	7.5	O K
720 min Winter	1.939	0.089	0.0	1.9	1.9	5.3	O K
960 min Winter	1.883	0.033	0.0	1.9	1.9	2.0	O K
1440 min Winter	1.850	0.000	0.0	1.6	1.6	0.0	O K
2160 min Winter	1.850	0.000	0.0	1.2	1.2	0.0	O K
2880 min Winter	1.850	0.000	0.0	1.0	1.0	0.0	O K
4320 min Winter	1.850	0.000	0.0	0.7	0.7	0.0	O K
5760 min Winter	1.850	0.000	0.0	0.5	0.5	0.0	O K
7200 min Winter	1.850	0.000	0.0	0.5	0.5	0.0	O K
8640 min Winter	1.850	0.000	0.0	0.4	0.4	0.0	O K
10080 min Winter	1.850	0.000	0.0	0.3	0.3	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	88.566	0.0	18.7	32			
60 min Winter	56.713	0.0	24.3	60			
120 min Winter	35.004	0.0	30.1	98			
180 min Winter	25.973	0.0	33.5	136			
240 min Winter	20.877	0.0	36.1	174			
360 min Winter	15.365	0.0	39.8	248			
480 min Winter	12.341	0.0	42.8	316			
600 min Winter	10.402	0.0	45.0	380			
720 min Winter	9.042	0.0	47.0	442			
960 min Winter	7.241	0.0	50.1	550			
1440 min Winter	5.284	0.0	54.9	0			
2160 min Winter	3.848	0.0	59.8	0			
2880 min Winter	3.068	0.0	63.4	0			
4320 min Winter	2.226	0.0	68.6	0			
5760 min Winter	1.771	0.0	72.3	0			
7200 min Winter	1.483	0.0	75.3	0			
8640 min Winter	1.284	0.0	77.8	0			
10080 min Winter	1.137	0.0	79.9	0			
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Micro Drainage Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 2.300

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	55.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	1.850	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	1.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

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Appendix E
Impermeable area plan

