Drainage Addendum

Site: Former St Joseph's Preparatory School, Gravesend, Kent DA12 1NR.

Client: GHL (Gravesend) Ltd

Prepared by: DHA Environment
Eclipse House
Eclipse Park
Sittingbourne Road
Maidstone ME14 3EN

Date: May 2024

1.1 Introduction

1.1.1 This Drainage Technical Note (TN) has been produced in response to the latest response from Kent County Council (LLFA) dated 21th February 2024 in relation to Planning Application Reference: 20240013 concerning a development comprising of the demolition of existing outbuildings , erection of a 3 storey medical centre, erection of a building containing 7no flats and Erection of 41no houses on land at the Former St Joseph's Preparatory School, Gravesend, Kent DA12 1NR.

1.2 KCC's full response is contained in **Appendix A** and can be summarised as follows:-

"As of the 10th of May 2022, the Environment Agency's climate change allowances have been updated. As part of this update, revisions have been made to the 'Peak Rainfall Intensity Allowances' that are used in applying climate change percentages to new drainage schemes.

The LLFA would now seek the 'upper end' allowance is designed for both the 30 (3.3%) and 100 (1%) year storm scenarios. The latest information on the allowances and map can be found at the following link:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

This analysis must determine if the impacts of the greater allowance are significant and exacerbate any flood risk. The design may need to be minimally modified but may also need additional mitigation allowances, for example attenuation features or provision of exceedance routes. This will tie into existing designing for exceedance principles. We would expect to see hydraulic calculations for the 2 year, 30 year +35% and 100 year +45% events modelled as a worst case scenario"

1.2.1 The calculations have been modified to reflect the 30 year + 35% and 1 in 100 + 45% event.

"Given the site is located within Zone 1 Groundwater Source Protection Zone. We would recommend consultation is undertaken with the Environment Agency's groundwater protection team regarding the use of infiltration on this site, and their comments included within the submission."

1.2.2 The Environment Agency responded to the application on the 23 February 2024 and raised no objection to the use of infiltration on the scheme. A copy of the response is contained in **Appendix B.**

"We also recommend using the worst-case infiltration rate (0.11 x 10^{-5} m/s) found for all drainage features, unless justification can be provided for using the faster rate, for all drainage features on site until further testing provides location specific rates per drainage feature for detailed design".

1.2.3 The rate of 0.11 x 10^{-5} m/s stated by KCC was incorrect and should have been 0.011 m/hr. This was clarified with KCC with the correspondence contained in **Appendix A**.

1.2.4 The more conservative rate of 0.011 m/hr has been for all the infiltration features. Further infiltration testing will be carried out as part of the detailed design.

"The Environment Agency mapping shows there is an area of high risk of surface water flooding to the west of the site. Please confirm that this risk has been mitigated and depths have been assessed".

1.2.5 An extract from the Environment Agency's surface water flood map is shown in figure 1 below. This shows most of the site not to be at risk of surface water flooding however there are some isolated areas at low to medium risk on the west and southwestern boundaries.

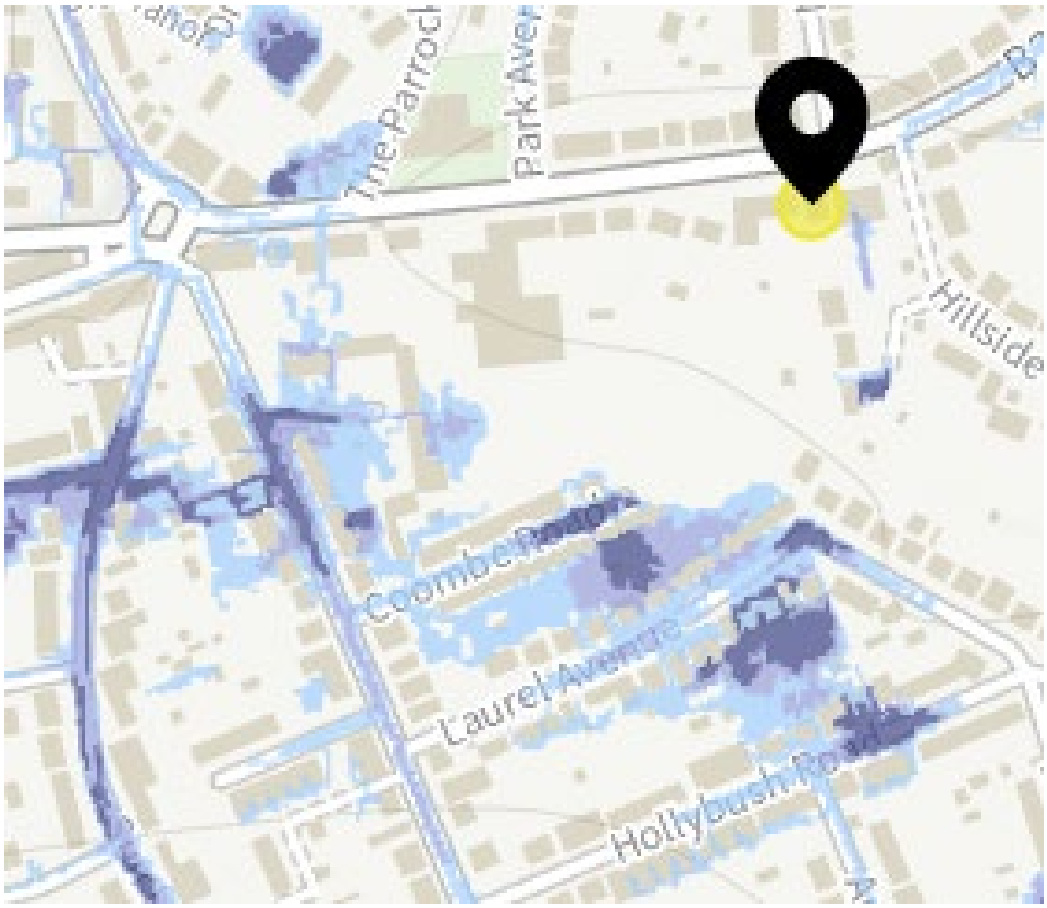

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Figure 1 – Extent of surface water flooding

1.2.6 Surface water flooding is sometimes known as flash flooding. It happens when rainwater cannot drain away through normal drainage systems. On reviewing the topographical survey, that the two areas which are shown to be at risk of surface water flooding are located at low points on the site where overland run off would collect.

1.2.7 The proposals will provide a positive drainage system as such it is considered that this mitigates the cause of any surface water flooding. In addition, the area to the southwest which shows the worse of the surface water flooding has an overland route to the southwest. There are no dwellings in this location to impede any exceedance routes.

1.2.8 In summary It can be demonstrated that the risk of surface water flooding has been mitigated.

1.3 Summary and Conclusions

1.3.1 The drainage has been remodelled based on the more conservative infiltration rate and make an allowance for the updated climate change rates. Revised calculations and the drainage strategy are contained within **Appendix C**.

1.3.2 Based on the above we consider that KCC comments have been addressed and the holding objection can be removed.

APPENDIX A

KCC Correspondence

Ethan Bonthron
Gravesham Borough Council
Civic Centre
Windmill Street
Gravesend
Kent
DA12 1AU

Flood and Water Management
Invicta House
Maidstone
Kent
ME14 1XX
Website: www.kent.gov.uk/flooding
Email: suds@kent.gov.uk
Tel: 03000 41 41 41
Our Ref: GBC/2024/099158
Date: 21 February 2024

Application No: 20240013

Location: Former St Josephs Convent Preparatory School , 46 Old Road East, Gravesend, Kent DA12 1NR

Proposal: Conversion of existing Victorian building into 6 flats. Demolition of existing outbuildings. Erection of a 3 storeymedical centre. Erection of a building containing 7no flats.Erection of 41no houses. Associated works to include; access, public open space and landscaping

Thank you for your consultation on the above referenced planning application.

Kent County Council as Lead Local Flood Authority have the following comments:

We have reviewed submitted information and understand it is proposed to discharge via infiltration through permeable paving, infiltration blankets and a basin.

As of the 10th of May 2022, the Environment Agency's climate change allowances have been updated. As part of this update, revisions have been made to the 'Peak Rainfall Intensity Allowances' that are used in applying climate change percentages to new drainage schemes.

The LLFA would now seek the 'upper end' allowance is designed for both the 30 (3.3%) and 100 (1%) year storm scenarios. The latest information on the allowances and map can be found at the following link:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

This analysis must determine if the impacts of the greater allowance are significant and exacerbate any flood risk. The design may need to be minimally modified but may also need additional mitigation allowances, for example attenuation features or provision of exceedance routes. This will tie into existing designing for exceedance principles.

We would expect to see hydraulic calculations for the 2 year, 30 year +35% and 100 year +45% events modelled as a worst case scenario.

Given the site is located within Zone 1 Groundwater Source Protection Zone. We would recommend consultation is undertaken with the Environment Agency’s groundwater

protection team regarding the use of infiltration on this site, and their comments included within the submission.

We also recommend using the worst case infiltration rate (0.11×10^{-5} m/s) found for all drainage features, unless justification can be provided for using the faster rate, for all drainage features on site until further testing provides location specific rates per drainage feature for detailed design.

The Environment Agency mapping shows there is an area of high risk of surface water flooding to the west of the site. Please confirm that this risk has been mitigated and depths have been assessed.

Until the above comments have been addressed, we recommend that a holding objection is in place.

This response has been provided using the best knowledge and information submitted as part of the planning application at the time of responding and is reliant on the accuracy of that information.

Yours faithfully,

Lucy Senior
Flood Risk Officer
Flood and Water Management

Chris Smoker

From: Rebecca Tilley
Sent: 17 May 2024 10:07
To: Chris Smoker
Subject: FW: Former St Josephs Convent Preparatory School , 46 Old Road East,Gravesend, Kent DA12 1NR

Rebecca Tilley
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Sent: Thursday, February 29, 2024 4:51 PM
To: Chris Smoker <chris.smoker@dhatransport.co.uk>
Cc: Mark Bewsey <Mark.Bewsey@dhaplanning.co.uk>; Rebecca Tilley <rebecca.tilley@dhaplanning.co.uk>
Subject: RE: Former St Josephs Convent Preparatory School , 46 Old Road East,Gravesend, Kent DA12 1NR

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Good afternoon Chris,

The requirement is within the EA guidance for using the higher 2050s figure of 45% for the 1% event. Please see the screenshot from the guidance below:

Exceptions

In some locations the allowance for the 2050s epoch is higher than that for the 2070s epoch. If so, and development has a lifetime beyond 2061, use the higher of the two allowances.

Apologies for the incorrect figure, the recommendation is that until more testing confirms the rates for the exact location of infiltration feature at detailed design, that the conservative worst-case rate (0.011 m/hr) is used for infiltration features in the hydraulic calculations.

Kind regards,

Lucy Senior MCIWEM | Flood Risk Officer | Flood & Water Management | Kent County Council | Invicta House, County Hall, Maidstone ME14 1XX
(I am available and work on Mondays to Thursdays)

As Lead Local Flood Authority (LLFA) for the County, we are the statutory consultee in planning to promote the provision of Sustainable Drainage Systems. You can find out more by visiting: http://www.kent.gov.uk/waste-planning-and-land/flooding-and-drainage/sustainable-drainage-systems

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From: Chris Smoker <chris.smoker@dhatransport.co.uk>
Sent: Thursday, February 22, 2024 1:31 PM
To: SUDS - GT <SUDS@kent.gov.uk>
Cc: Mark Bewsey <Mark.Bewsey@dhaplanning.co.uk>; Rebecca Tilley <rebecca.tilley@dhaplanning.co.uk>
Subject: Former St Josephs Convent Preparatory School , 46 Old Road East,Gravesend, Kent DA12 1NR

FAO Lucy Senior

Good afternoon Lucy.

I'm writing in response to your comments dated 21st February 2024. I will prepare a formal response to the LPA is due course but have the following queries which we would like to resolve before undertaking and further abortive design work.

Climate change.

I made reference to the EA recommendations for climate change in the previous FRA. For developments with a design life beyond 2100 the guidance states designing for the 1% event for the 2070 epoch for the upper end allowance.

The maps state that for this event a 40% allowance needs to be designed for. Can you confirm why 45% is required? We agree the for the 3.3% an allowance of 35% is required.

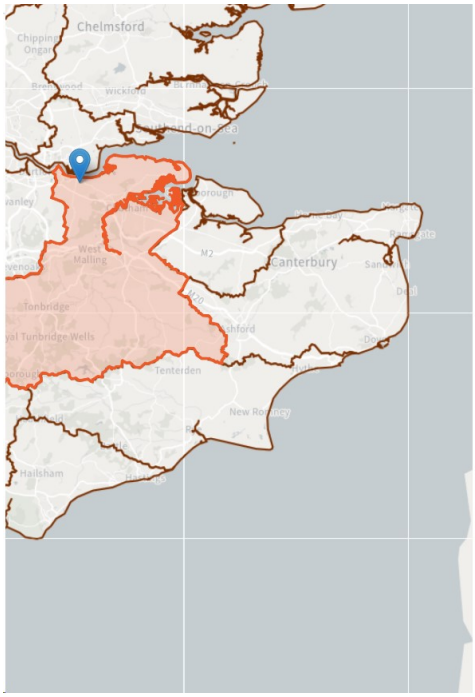
Development with a lifetime beyond 2100

This includes development proposed in applications or local plan allocations.

For flood risk assessments and strategic flood risk assessments assess the upper end allowances. You must do this for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125).

Design your development so that for the upper end allowance in the 1% annual exceedance probability event:

- there is no increase in flood risk elsewhere
- your development will be safe from surface water flooding



Medway Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	20%	35%
2070s	20%	35%

1% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	20%	45%
2070s	20%	40%

Infiltration rates.

You have stated that we should use an infiltration rate of 0.11 x 10^{-5} m/s. Can you confirm where this rate has come from?

We have testing at two depths which gave the following rates.

2m bgl - Trial Pit 1(a) = 2.97 x 10^{-6} m/s (0.011m/hr)
0.6m bgl - Trial Pit 1(b) = 1.16 x 10^{-5}m/s (0.041m/hr)

These tests were carried out in the location/depth of the main feature in the public open space so we consider the rates to be appropriate for the infiltration basin and blanket.

The porous paving is located away so we will either carry out more testing or use the lower rate of 0.011 m/hr

I would be grateful if you could confirm the above. Happy to talk through.

Regards

Chris Smoker

Email: chris.smoker@dhatransport.co.uk

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APPENDIX B

Environment Agency Correspondence

creating a better place for
people and wildlife

Environment Agency

Gravesham Borough Council
Development Control
Civic Centre Windmill Street
Gravesend
Kent
DA12 1AU

Our ref: KT/2024/131393/01-L01
Your ref: 20240013

Date: 23 February 2024

Dear Ethan Bonthron

Conversion of existing Victorian building into 6 flats. demolition of existing outbuildings. erection of a 3 storey medical centre. erection of a building containing 7 no flats. erection of 41 no houses. associated works to include; access, public open space and landscaping.

Former St Joseph's Convent Preparatory School, 46 Old Road East, Gravesend, Kent, DA12 1NR

Thank you for consulting us on the above application.

Environment Agency Position

We have **no objection** if the following **planning conditions** are included in any planning permission granted as set out below. Without these conditions, the proposed development on this site poses an unacceptable risk to the environment and we would object to the application.

Land affected by contamination:

Condition 1

No development approved by this planning permission shall commence until a strategy to deal with the potential risks associated with any contamination of the site has been submitted to, and approved in writing by, the Local Planning Authority. This strategy will include the following components:

1. A preliminary risk assessment which has identified:
   - all previous uses;
   - potential contaminants associated with those uses;
   - a conceptual model of the site indicating sources, pathways and receptors; and
   - potentially unacceptable risks arising from contamination at the site.
2. A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.
3. The results of the site investigation and the detailed risk assessment referred to in (2) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.
4. A verification plan providing details of the data that will be collected in order to

demonstrate that the works set out in the remediation strategy in (3) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.

Any changes to these components require the written consent of the local planning authority. The scheme shall be implemented as approved.

Reason
To ensure that the development does not contribute to, or is not put at unacceptable risk from, or adversely affected by, unacceptable levels of water pollution in line with paragraph 180 of the National Planning Policy Framework.

Condition 2
Prior to any part of the permitted development being occupied a verification report demonstrating the completion of works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to, and approved in writing, by the local planning authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met.

Reason
To ensure that the site does not pose any further risk to human health or the water environment by demonstrating that the requirements of the approved verification plan have been met and that remediation of the site is complete. This is in line with paragraph 180 of the National Planning Policy Framework.

Condition 3
If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the Local Planning Authority) shall be carried out until a remediation strategy detailing how this contamination will be dealt with has been submitted to and approved in writing by the Local Planning Authority. The remediation strategy shall be implemented as approved.

Reason
To ensure that the development does not contribute to, or is not put at unacceptable risk from, or adversely affected by, unacceptable levels of water pollution from previously unidentified contamination sources at the development site in line with paragraph 180 of the National Planning Policy Framework.

Surface Water Drainage:

It is understood that surface water is to be discharged to ground via Sustainable Drainage System (SuDS) features. This is acceptable in principle, however it is noted that no pollution prevention measures are included within the supplied drainage strategy. Given the proposed development outlines 86 car spaces, this poses a potential pollution risk from parked vehicles, especially given that the site is situated within a Source Protection Zone 1.

The design of infiltration SuDS may be difficult or inappropriate in this location. We therefore request that the following planning condition is included in any permission

granted. Without this condition we would object to the proposal in line with paragraph 180 of the National Planning Policy Framework because it cannot be guaranteed that the development will not be put at unacceptable risk from, or be adversely affected by, unacceptable levels of water pollution.

Condition 4
No drainage systems infiltration of surface water drainage into the ground is permitted other than with the written consent of the Local Planning Authority. The development shall be carried out in accordance with the approved details.

Reason
To ensure that the development does not contribute to, or is not put at unacceptable risk from, or adversely affected by, unacceptable levels of water pollution caused by mobilised contaminants in line with paragraph 180 of the National Planning Policy Framework.

Piling
Condition 5
Piling or any other foundation designs using penetrative methods shall not be permitted other than with the express written consent of the Local Planning Authority, which may be given for those parts of the site where it has been demonstrated by a piling risk assessment that there is no resultant unacceptable risk to groundwater. The development shall be carried out in accordance with the approved details.

Reason
To ensure that the development does not contribute to, or is not put at unacceptable risk from, or adversely affected by, unacceptable levels of water pollution caused by mobilised contaminants in line with paragraph 180 of the National Planning Policy Framework.

Informatives
Piling
Piling can result in risks to groundwater quality by mobilising contamination when boring through different bedrock layers and creating preferential pathways. Thus it should be demonstrated that any proposed piling will not result in contamination of groundwater. If Piling is proposed, a Piling Risk Assessment must be submitted, written in accordance with EA guidance document “Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. National Groundwater & Contaminated Land Centre report NC/99/73”.

Surface Water
Only clean uncontaminated water should drain to the surface water system. Roof drainage shall drain directly to the surface water system (entering after the pollution prevention measures). Appropriate pollution control methods (such as trapped gullies and interceptors) should be used for drainage from access roads and car parking areas to prevent hydrocarbons from entering the surface water system. There should be no discharge into land impacted by contamination or land previously identified as being contaminated. There should be no discharge to made ground. There must be no direct discharge to groundwater, a controlled water.

Foul Drainage
It is understood that the proposed development is to discharge foul water to mains sewer.

Any foul drainage implemented on site should comply with Position Statement G8 of the 'The Environment Agency's approach to groundwater protection'.

Waste on-site
The CLAIRE Definition of Waste: Development Industry Code of Practice (DoWCoP, version 2) provides operators with a framework for determining whether or not excavated material arising from site during remediation and/or land development works are waste or have ceased to be waste. Under the Code of Practice:

- excavated materials that are recovered via a treatment operation can be re-used on-site providing they are treated to a standard such that they are fit for purpose and unlikely to cause pollution
- treated materials can be transferred between sites as part of a hub and cluster project formally agreed with the Environment Agency
- some naturally occurring clean material can be transferred directly between sites.

Developers should ensure that all contaminated materials are adequately characterised both chemically and physically, and that the permitting status of any proposed on site operations are clear. If in doubt, the Environment Agency should be contacted for advice at an early stage to avoid any delays.

It should be noted that re-use of historic landfill materials (including capping materials) is not covered under DoWCoP.

The Environment Agency recommends that developers should refer to:

- the Position statement on the Definition of Waste: Development Industry Code of Practice and;
- The Environmental regulations page on GOV.UK

Waste -
Contaminated soil that is, or must be disposed of, is waste. Therefore, its handling, transport, treatment and disposal is subject to waste management legislation, which includes:

- Duty of Care Regulations 1991
- Hazardous Waste (England and Wales) Regulations 2005
- Environmental Permitting (England and Wales) Regulations 2010
- The Waste (England and Wales) Regulations 2011

Developers should ensure that all contaminated materials are adequately characterised both chemically and physically in line with British Standard BS EN 14899:2005 'Characterization of Waste - Sampling of Waste Materials - Framework for the Preparation and Application of a Sampling Plan' and that the permitting status of any proposed treatment or disposal activity is clear. If in doubt, the Environment Agency should be contacted for advice at an early stage to avoid any delays.

If the total quantity of waste material to be produced at or taken off site is hazardous waste and is 500kg or greater in any 12 month period the developer will need to register with us as a hazardous waste producer.

Advice to Local Planning Authority

Conditions

If you wish to amend the wording of our requested conditions or if you wish to merge them with other Local Planning Authority conditions., please contact us to discuss the revised wording.

Decision Notice

The Environment Agency requires decision notice details for this planning application in order to report on our effectiveness in in influencing the planning process. Please email kslplanning@environment-agency.gov.uk with any decision notice details.

Please do not hesitate to contact us should you require any further information.

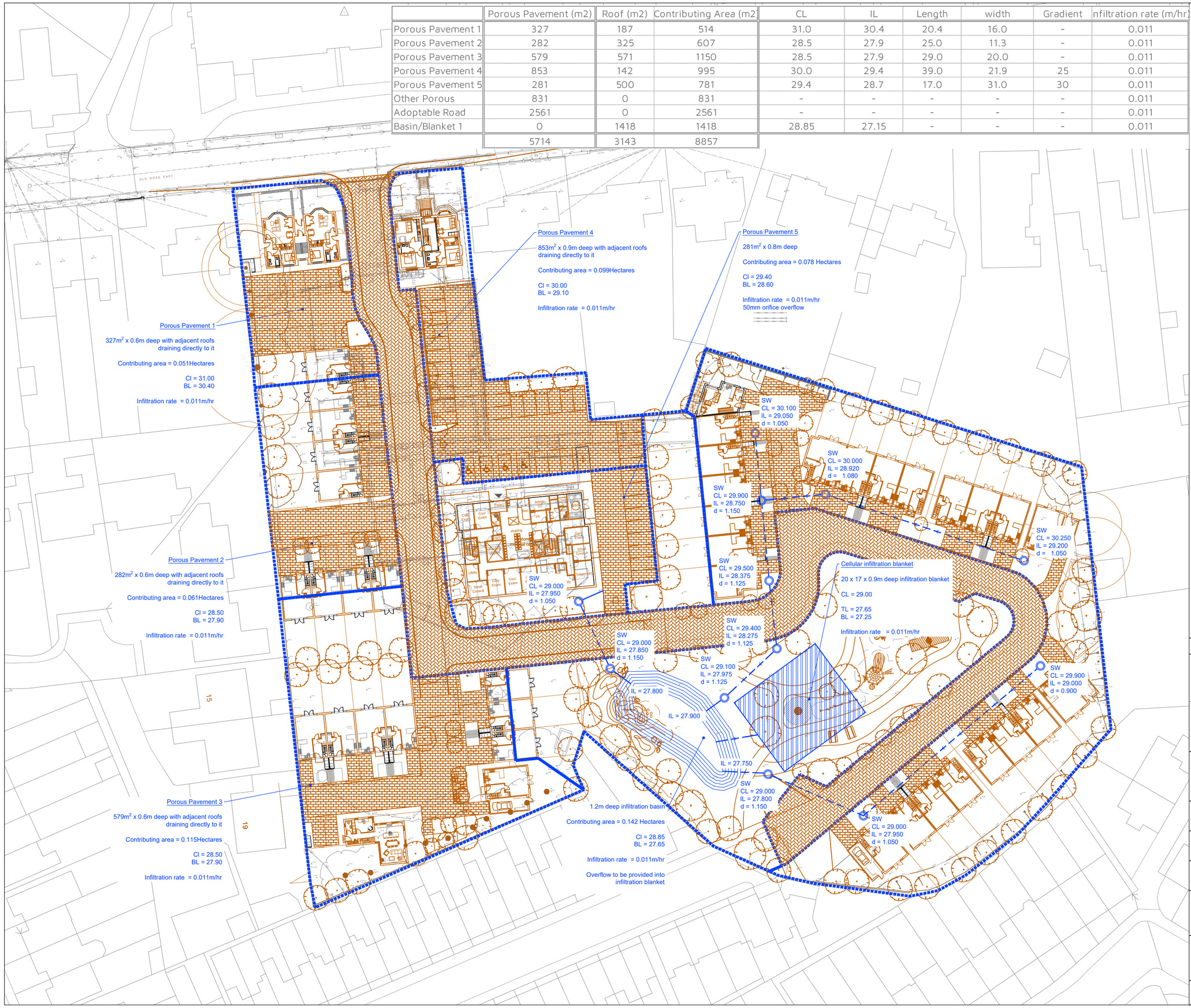
Yours sincerely

Ms Laura Edwards
Planning Advisor
Direct e-mail KSLPLANNING@environment-agency.gov.uk

APPENDIX C

Revised Drainage Strategy and Calculations

	Porous Pavement (m2)	Roof (m2)	Contributing Area (m2	CL	IL	Length	width	Gradient	nfiltration rate (m/hr)
Porous Pavement 1	327	187	514	31.0	30.4	20.4	16.0	-	0.011
Porous Pavement 2	282	325	607	28.5	27.9	25.0	11.3	-	0.011
Porous Pavement 3	579	571	1150	28.5	27.9	29.0	20.0	-	0.011
Porous Pavement 4	853	142	995	30.0	29.4	39.0	21.9	25	0.011
Porous Pavement 5	281	500	781	29.4	28.7	17.0	31.0	30	0.011
Other Porous	831	0	831	-	-	-	-	-	0.011
Adoptable Road	2561	0	2561	-	-	-	-	-	0.011
Basin/Blanket 1	0	1418	1418	28.85	27.15	-	-	-	0.011
	5714	3143	8857						



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REV	DATE	BY	DESCRIPTION	CHK	APD
P2	17.05.24	CS	KCC comments incorporated	CS	CS
P1	30.10.23	JM	First Issue	CS	CS

client

GHL (GRAVESEND) LTD

project

FORMER ST JOSEPH'S PREPARATORY SCHOOL, GRAVESEND

title

CONTRIBUTING AREAS PLAN

project	drwg	rev
31587	TS-01	P2

Drawn	Checked	Approved	scale @ A2	date
JM	CS	CS	1:1000	30.10.23

status: FOR INFORMATION — P

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Maidstone, Kent. ME14 3EN
t: 01622 776226 f: 01622 776227
e: info@dhaplanning.co.uk w: www.dhaplanning.co.uk

CAD Reference: A2

Summary of Results for 30 year Return Period (+35%)

Half Drain Time : 448 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	30.513	0.113	0.5	11.1	O K
30 min Summer	30.550	0.150	0.5	14.6	O K
60 min Summer	30.583	0.183	0.5	17.9	O K
120 min Summer	30.610	0.210	0.5	20.6	O K
180 min Summer	30.622	0.222	0.5	21.8	O K
240 min Summer	30.628	0.228	0.5	22.3	O K
360 min Summer	30.630	0.230	0.5	22.5	O K
480 min Summer	30.628	0.228	0.5	22.3	O K
600 min Summer	30.624	0.224	0.5	22.0	O K
720 min Summer	30.621	0.221	0.5	21.6	O K
960 min Summer	30.611	0.211	0.5	20.7	O K
1440 min Summer	30.591	0.191	0.5	18.7	O K
2160 min Summer	30.560	0.160	0.5	15.6	O K
2880 min Summer	30.532	0.132	0.5	12.9	O K
4320 min Summer	30.489	0.089	0.5	8.7	O K
5760 min Summer	30.461	0.061	0.5	6.0	O K
7200 min Summer	30.448	0.048	0.5	4.7	O K
8640 min Summer	30.443	0.043	0.4	4.2	O K
10080 min Summer	30.438	0.038	0.4	3.7	O K
15 min Winter	30.529	0.129	0.5	12.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	136.673	0.0	19
30 min Summer	88.388	0.0	33
60 min Summer	54.347	0.0	62
120 min Summer	32.316	0.0	122
180 min Summer	23.710	0.0	182
240 min Summer	18.995	0.0	240
360 min Summer	13.865	0.0	344
480 min Summer	11.076	0.0	396
600 min Summer	9.299	0.0	458
720 min Summer	8.058	0.0	520
960 min Summer	6.423	0.0	654
1440 min Summer	4.662	0.0	924
2160 min Summer	3.379	0.0	1320
2880 min Summer	2.687	0.0	1700
4320 min Summer	1.945	0.0	2420
5760 min Summer	1.547	0.0	3056
7200 min Summer	1.296	0.0	3744
8640 min Summer	1.121	0.0	4416
10080 min Summer	0.992	0.0	5144
15 min Winter	136.673	0.0	18

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Summary of Results for 30 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	30.570	0.170	0.5	16.7	O K
60 min Winter	30.608	0.208	0.5	20.4	O K
120 min Winter	30.640	0.240	0.5	23.5	O K
180 min Winter	30.655	0.255	0.5	24.9	O K
240 min Winter	30.662	0.262	0.5	25.7	O K
360 min Winter	30.667	0.267	0.5	26.1	O K
480 min Winter	30.664	0.264	0.5	25.8	O K
600 min Winter	30.658	0.258	0.5	25.3	O K
720 min Winter	30.653	0.253	0.5	24.8	O K
960 min Winter	30.640	0.240	0.5	23.5	O K
1440 min Winter	30.608	0.208	0.5	20.4	O K
2160 min Winter	30.561	0.161	0.5	15.8	O K
2880 min Winter	30.519	0.119	0.5	11.7	O K
4320 min Winter	30.461	0.061	0.5	5.9	O K
5760 min Winter	30.444	0.044	0.4	4.3	O K
7200 min Winter	30.437	0.037	0.4	3.6	O K
8640 min Winter	30.432	0.032	0.3	3.1	O K
10080 min Winter	30.429	0.029	0.3	2.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	88.388	0.0	33
60 min Winter	54.347	0.0	62
120 min Winter	32.316	0.0	120
180 min Winter	23.710	0.0	178
240 min Winter	18.995	0.0	236
360 min Winter	13.865	0.0	346
480 min Winter	11.076	0.0	452
600 min Winter	9.299	0.0	490
720 min Winter	8.058	0.0	562
960 min Winter	6.423	0.0	712
1440 min Winter	4.662	0.0	1010
2160 min Winter	3.379	0.0	1424
2880 min Winter	2.687	0.0	1792
4320 min Winter	1.945	0.0	2420
5760 min Winter	1.547	0.0	3000
7200 min Winter	1.296	0.0	3744
8640 min Winter	1.121	0.0	4416
10080 min Winter	0.992	0.0	5224

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.051

Time (mins) From:	To:	Area (ha)
0	4	0.051

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Model Details

Storage is Online Cover Level (m) 31.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01100	Width (m)	16.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.4
Max Percolation (l/s)	90.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	30.400	Membrane Depth (m)	0

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 660 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	30.567	0.167	0.5	16.4	O K
30 min Summer	30.620	0.220	0.5	21.6	O K
60 min Summer	30.668	0.268	0.5	26.3	O K
120 min Summer	30.707	0.307	0.5	30.1	Flood Risk
180 min Summer	30.726	0.326	0.5	31.9	Flood Risk
240 min Summer	30.736	0.336	0.5	32.9	Flood Risk
360 min Summer	30.743	0.343	0.5	33.6	Flood Risk
480 min Summer	30.741	0.341	0.5	33.4	Flood Risk
600 min Summer	30.736	0.336	0.5	32.9	Flood Risk
720 min Summer	30.730	0.330	0.5	32.3	Flood Risk
960 min Summer	30.718	0.318	0.5	31.1	Flood Risk
1440 min Summer	30.692	0.292	0.5	28.6	O K
2160 min Summer	30.654	0.254	0.5	24.9	O K
2880 min Summer	30.619	0.219	0.5	21.4	O K
4320 min Summer	30.559	0.159	0.5	15.5	O K
5760 min Summer	30.513	0.113	0.5	11.1	O K
7200 min Summer	30.480	0.080	0.5	7.9	O K
8640 min Summer	30.459	0.059	0.5	5.8	O K
10080 min Summer	30.449	0.049	0.5	4.8	O K
15 min Winter	30.590	0.190	0.5	18.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	192.260	0.0	19
30 min Summer	124.873	0.0	34
60 min Summer	76.528	0.0	64
120 min Summer	45.025	0.0	122
180 min Summer	32.838	0.0	182
240 min Summer	26.190	0.0	242
360 min Summer	18.990	0.0	360
480 min Summer	15.094	0.0	480
600 min Summer	12.621	0.0	526
720 min Summer	10.899	0.0	588
960 min Summer	8.640	0.0	712
1440 min Summer	6.218	0.0	980
2160 min Summer	4.466	0.0	1384
2880 min Summer	3.528	0.0	1764
4320 min Summer	2.529	0.0	2512
5760 min Summer	1.999	0.0	3232
7200 min Summer	1.666	0.0	3888
8640 min Summer	1.436	0.0	4504
10080 min Summer	1.266	0.0	5144
15 min Winter	192.260	0.0	19

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	30.649	0.249	0.5	24.4	O K
60 min Winter	30.704	0.304	0.5	29.8	Flood Risk
120 min Winter	30.749	0.349	0.5	34.2	Flood Risk
180 min Winter	30.772	0.372	0.5	36.4	Flood Risk
240 min Winter	30.784	0.384	0.5	37.6	Flood Risk
360 min Winter	30.795	0.395	0.5	38.7	Flood Risk
480 min Winter	30.797	0.397	0.5	38.8	Flood Risk
600 min Winter	30.792	0.392	0.5	38.4	Flood Risk
720 min Winter	30.784	0.384	0.5	37.6	Flood Risk
960 min Winter	30.767	0.367	0.5	35.9	Flood Risk
1440 min Winter	30.732	0.332	0.5	32.5	Flood Risk
2160 min Winter	30.676	0.276	0.5	27.1	O K
2880 min Winter	30.623	0.223	0.5	21.9	O K
4320 min Winter	30.535	0.135	0.5	13.2	O K
5760 min Winter	30.473	0.073	0.5	7.2	O K
7200 min Winter	30.448	0.048	0.5	4.7	O K
8640 min Winter	30.442	0.042	0.4	4.1	O K
10080 min Winter	30.437	0.037	0.4	3.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	124.873	0.0	33
60 min Winter	76.528	0.0	62
120 min Winter	45.025	0.0	120
180 min Winter	32.838	0.0	180
240 min Winter	26.190	0.0	238
360 min Winter	18.990	0.0	352
480 min Winter	15.094	0.0	464
600 min Winter	12.621	0.0	572
720 min Winter	10.899	0.0	674
960 min Winter	8.640	0.0	760
1440 min Winter	6.218	0.0	1066
2160 min Winter	4.466	0.0	1496
2880 min Winter	3.528	0.0	1904
4320 min Winter	2.529	0.0	2640
5760 min Winter	1.999	0.0	3280
7200 min Winter	1.666	0.0	3744
8640 min Winter	1.436	0.0	4440
10080 min Winter	1.266	0.0	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.051

Time (mins) From:	To:	Area (ha)
0	4	0.051

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Model Details

Storage is Online Cover Level (m) 31.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01100	Width (m)	16.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.4
Max Percolation (l/s)	90.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	30.400	Membrane Depth (m)	0

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Summary of Results for 30 year Return Period (+35%)

Half Drain Time : 672 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	28.064	0.164	0.4	13.9	O K
30 min Summer	28.115	0.215	0.4	18.2	O K
60 min Summer	28.163	0.263	0.4	22.3	O K
120 min Summer	28.205	0.305	0.4	25.8	Flood Risk
180 min Summer	28.225	0.325	0.4	27.6	Flood Risk
240 min Summer	28.237	0.337	0.4	28.6	Flood Risk
360 min Summer	28.247	0.347	0.4	29.4	Flood Risk
480 min Summer	28.247	0.347	0.4	29.4	Flood Risk
600 min Summer	28.244	0.344	0.4	29.1	Flood Risk
720 min Summer	28.239	0.339	0.4	28.8	Flood Risk
960 min Summer	28.229	0.329	0.4	27.9	Flood Risk
1440 min Summer	28.207	0.307	0.4	26.0	Flood Risk
2160 min Summer	28.172	0.272	0.4	23.1	O K
2880 min Summer	28.139	0.239	0.4	20.3	O K
4320 min Summer	28.081	0.181	0.4	15.3	O K
5760 min Summer	28.034	0.134	0.4	11.3	O K
7200 min Summer	27.997	0.097	0.4	8.3	O K
8640 min Summer	27.972	0.072	0.4	6.1	O K
10080 min Summer	27.955	0.055	0.4	4.7	O K
15 min Winter	28.086	0.186	0.4	15.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	136.673	0.0	19
30 min Summer	88.388	0.0	34
60 min Summer	54.347	0.0	64
120 min Summer	32.316	0.0	122
180 min Summer	23.710	0.0	182
240 min Summer	18.995	0.0	242
360 min Summer	13.865	0.0	360
480 min Summer	11.076	0.0	480
600 min Summer	9.299	0.0	536
720 min Summer	8.058	0.0	594
960 min Summer	6.423	0.0	716
1440 min Summer	4.662	0.0	982
2160 min Summer	3.379	0.0	1384
2880 min Summer	2.687	0.0	1788
4320 min Summer	1.945	0.0	2552
5760 min Summer	1.547	0.0	3280
7200 min Summer	1.296	0.0	3960
8640 min Summer	1.121	0.0	4584
10080 min Summer	0.992	0.0	5240
15 min Winter	136.673	0.0	19

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Summary of Results for 30 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	28.143	0.243	0.4	20.6	O K
60 min Winter	28.198	0.298	0.4	25.2	O K
120 min Winter	28.246	0.346	0.4	29.3	Flood Risk
180 min Winter	28.271	0.371	0.4	31.4	Flood Risk
240 min Winter	28.285	0.385	0.4	32.7	Flood Risk
360 min Winter	28.300	0.400	0.4	33.9	Flood Risk
480 min Winter	28.304	0.404	0.4	34.2	Flood Risk
600 min Winter	28.302	0.402	0.4	34.0	Flood Risk
720 min Winter	28.296	0.396	0.4	33.6	Flood Risk
960 min Winter	28.281	0.381	0.4	32.3	Flood Risk
1440 min Winter	28.251	0.351	0.4	29.7	Flood Risk
2160 min Winter	28.199	0.299	0.4	25.4	O K
2880 min Winter	28.149	0.249	0.4	21.1	O K
4320 min Winter	28.060	0.160	0.4	13.6	O K
5760 min Winter	27.993	0.093	0.4	7.9	O K
7200 min Winter	27.954	0.054	0.4	4.6	O K
8640 min Winter	27.945	0.045	0.4	3.8	O K
10080 min Winter	27.940	0.040	0.3	3.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	88.388	0.0	33
60 min Winter	54.347	0.0	62
120 min Winter	32.316	0.0	120
180 min Winter	23.710	0.0	180
240 min Winter	18.995	0.0	238
360 min Winter	13.865	0.0	352
480 min Winter	11.076	0.0	464
600 min Winter	9.299	0.0	572
720 min Winter	8.058	0.0	678
960 min Winter	6.423	0.0	770
1440 min Winter	4.662	0.0	1068
2160 min Winter	3.379	0.0	1512
2880 min Winter	2.687	0.0	1932
4320 min Winter	1.945	0.0	2684
5760 min Winter	1.547	0.0	3344
7200 min Winter	1.296	0.0	3824
8640 min Winter	1.121	0.0	4496
10080 min Winter	0.992	0.0	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.061

Time (mins) From:	To:	Area (ha)
0	4	0.061

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Model Details

Storage is Online Cover Level (m) 28.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01100	Width (m)	25.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.3
Max Percolation (l/s)	78.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	27.900	Membrane Depth (m)	0

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 989 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	28.139	0.239	0.4	20.2	O K
30 min Summer	28.213	0.313	0.4	26.5	Flood Risk
60 min Summer	28.282	0.382	0.4	32.3	Flood Risk
120 min Summer	28.339	0.439	0.4	37.2	Flood Risk
180 min Summer	28.370	0.470	0.4	39.8	Flood Risk
240 min Summer	28.388	0.488	0.4	41.4	Flood Risk
360 min Summer	28.407	0.507	0.4	43.0	Flood Risk
480 min Summer	28.413	0.513	0.4	43.5	Flood Risk
600 min Summer	28.412	0.512	0.4	43.4	Flood Risk
720 min Summer	28.406	0.506	0.4	42.9	Flood Risk
960 min Summer	28.391	0.491	0.4	41.6	Flood Risk
1440 min Summer	28.361	0.461	0.4	39.0	Flood Risk
2160 min Summer	28.318	0.418	0.4	35.4	Flood Risk
2880 min Summer	28.278	0.378	0.4	32.0	Flood Risk
4320 min Summer	28.205	0.305	0.4	25.9	Flood Risk
5760 min Summer	28.143	0.243	0.4	20.6	O K
7200 min Summer	28.090	0.190	0.4	16.1	O K
8640 min Summer	28.046	0.146	0.4	12.4	O K
10080 min Summer	28.011	0.111	0.4	9.4	O K
15 min Winter	28.170	0.270	0.4	22.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	192.260	0.0	19
30 min Summer	124.873	0.0	34
60 min Summer	76.528	0.0	64
120 min Summer	45.025	0.0	124
180 min Summer	32.838	0.0	182
240 min Summer	26.190	0.0	242
360 min Summer	18.990	0.0	362
480 min Summer	15.094	0.0	482
600 min Summer	12.621	0.0	600
720 min Summer	10.899	0.0	720
960 min Summer	8.640	0.0	820
1440 min Summer	6.218	0.0	1066
2160 min Summer	4.466	0.0	1468
2880 min Summer	3.528	0.0	1872
4320 min Summer	2.529	0.0	2640
5760 min Summer	1.999	0.0	3408
7200 min Summer	1.666	0.0	4112
8640 min Summer	1.436	0.0	4840
10080 min Summer	1.266	0.0	5456
15 min Winter	192.260	0.0	19

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	28.253	0.353	0.4	29.9	Flood Risk
60 min Winter	28.331	0.431	0.4	36.5	Flood Risk
120 min Winter	28.398	0.498	0.4	42.2	Flood Risk
180 min Winter	28.433	0.533	0.4	45.2	Flood Risk
240 min Winter	28.456	0.556	0.4	47.1	Flood Risk
360 min Winter	28.480	0.580	0.4	49.2	Flood Risk
480 min Winter	28.491	0.591	0.4	50.1	Flood Risk
600 min Winter	28.493	0.593	0.4	50.3	Flood Risk
720 min Winter	28.491	0.591	0.4	50.0	Flood Risk
960 min Winter	28.476	0.576	0.4	48.8	Flood Risk
1440 min Winter	28.436	0.536	0.4	45.4	Flood Risk
2160 min Winter	28.378	0.478	0.4	40.5	Flood Risk
2880 min Winter	28.319	0.419	0.4	35.5	Flood Risk
4320 min Winter	28.210	0.310	0.4	26.3	Flood Risk
5760 min Winter	28.117	0.217	0.4	18.4	O K
7200 min Winter	28.041	0.141	0.4	11.9	O K
8640 min Winter	27.985	0.085	0.4	7.2	O K
10080 min Winter	27.952	0.052	0.4	4.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	124.873	0.0	33
60 min Winter	76.528	0.0	62
120 min Winter	45.025	0.0	122
180 min Winter	32.838	0.0	180
240 min Winter	26.190	0.0	238
360 min Winter	18.990	0.0	356
480 min Winter	15.094	0.0	470
600 min Winter	12.621	0.0	584
720 min Winter	10.899	0.0	694
960 min Winter	8.640	0.0	912
1440 min Winter	6.218	0.0	1140
2160 min Winter	4.466	0.0	1596
2880 min Winter	3.528	0.0	2044
4320 min Winter	2.529	0.0	2856
5760 min Winter	1.999	0.0	3632
7200 min Winter	1.666	0.0	4320
8640 min Winter	1.436	0.0	4848
10080 min Winter	1.266	0.0	5256

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.061

Time (mins) From:	To:	Area (ha)
0	4	0.061

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Model Details

Storage is Online Cover Level (m) 28.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01100	Width (m)	25.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.3
Max Percolation (l/s)	78.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	27.900	Membrane Depth (m)	0

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Summary of Results for 30 year Return Period (+35%)

Half Drain Time : 599 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	28.049	0.149	0.9	25.9	O K
30 min Summer	28.096	0.196	0.9	34.0	O K
60 min Summer	28.139	0.239	0.9	41.6	O K
120 min Summer	28.177	0.277	0.9	48.1	O K
180 min Summer	28.195	0.295	0.9	51.3	O K
240 min Summer	28.205	0.305	0.9	53.0	Flood Risk
360 min Summer	28.212	0.312	0.9	54.3	Flood Risk
480 min Summer	28.211	0.311	0.9	54.1	Flood Risk
600 min Summer	28.207	0.307	0.9	53.5	Flood Risk
720 min Summer	28.203	0.303	0.9	52.7	Flood Risk
960 min Summer	28.193	0.293	0.9	51.1	O K
1440 min Summer	28.172	0.272	0.9	47.3	O K
2160 min Summer	28.138	0.238	0.9	41.4	O K
2880 min Summer	28.106	0.206	0.9	35.8	O K
4320 min Summer	28.051	0.151	0.9	26.2	O K
5760 min Summer	28.008	0.108	0.9	18.8	O K
7200 min Summer	27.978	0.078	0.9	13.5	O K
8640 min Summer	27.958	0.058	0.9	10.1	O K
10080 min Summer	27.949	0.049	0.9	8.5	O K
15 min Winter	28.069	0.169	0.9	29.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	136.673	0.0	19
30 min Summer	88.388	0.0	33
60 min Summer	54.347	0.0	64
120 min Summer	32.316	0.0	122
180 min Summer	23.710	0.0	182
240 min Summer	18.995	0.0	242
360 min Summer	13.865	0.0	360
480 min Summer	11.076	0.0	460
600 min Summer	9.299	0.0	512
720 min Summer	8.058	0.0	570
960 min Summer	6.423	0.0	694
1440 min Summer	4.662	0.0	966
2160 min Summer	3.379	0.0	1364
2880 min Summer	2.687	0.0	1760
4320 min Summer	1.945	0.0	2508
5760 min Summer	1.547	0.0	3224
7200 min Summer	1.296	0.0	3888
8640 min Summer	1.121	0.0	4496
10080 min Summer	0.992	0.0	5144
15 min Winter	136.673	0.0	19

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Summary of Results for 30 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	28.122	0.222	0.9	38.6	O K
60 min Winter	28.171	0.271	0.9	47.2	O K
120 min Winter	28.214	0.314	0.9	54.7	Flood Risk
180 min Winter	28.236	0.336	0.9	58.5	Flood Risk
240 min Winter	28.249	0.349	0.9	60.7	Flood Risk
360 min Winter	28.260	0.360	0.9	62.7	Flood Risk
480 min Winter	28.262	0.362	0.9	63.0	Flood Risk
600 min Winter	28.258	0.358	0.9	62.4	Flood Risk
720 min Winter	28.252	0.352	0.9	61.2	Flood Risk
960 min Winter	28.238	0.338	0.9	58.9	Flood Risk
1440 min Winter	28.207	0.307	0.9	53.5	Flood Risk
2160 min Winter	28.156	0.256	0.9	44.6	O K
2880 min Winter	28.108	0.208	0.9	36.1	O K
4320 min Winter	28.025	0.125	0.9	21.8	O K
5760 min Winter	27.969	0.069	0.9	12.0	O K
7200 min Winter	27.947	0.047	0.8	8.3	O K
8640 min Winter	27.941	0.041	0.7	7.1	O K
10080 min Winter	27.936	0.036	0.6	6.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	88.388	0.0	33
60 min Winter	54.347	0.0	62
120 min Winter	32.316	0.0	120
180 min Winter	23.710	0.0	178
240 min Winter	18.995	0.0	236
360 min Winter	13.865	0.0	350
480 min Winter	11.076	0.0	462
600 min Winter	9.299	0.0	568
720 min Winter	8.058	0.0	666
960 min Winter	6.423	0.0	750
1440 min Winter	4.662	0.0	1054
2160 min Winter	3.379	0.0	1492
2880 min Winter	2.687	0.0	1900
4320 min Winter	1.945	0.0	2636
5760 min Winter	1.547	0.0	3232
7200 min Winter	1.296	0.0	3752
8640 min Winter	1.121	0.0	4416
10080 min Winter	0.992	0.0	5240

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.115

Time (mins) From:	To:	Area (ha)
0	4	0.115

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Model Details

Storage is Online Cover Level (m) 28.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01100	Width (m)	29.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	161.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	27.900	Membrane Depth (m)	0

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 884 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	28.118	0.218	0.9	37.9	O K
30 min Summer	28.185	0.285	0.9	49.7	O K
60 min Summer	28.248	0.348	0.9	60.6	Flood Risk
120 min Summer	28.300	0.400	0.9	69.6	Flood Risk
180 min Summer	28.327	0.427	0.9	74.4	Flood Risk
240 min Summer	28.343	0.443	0.9	77.1	Flood Risk
360 min Summer	28.358	0.458	0.9	79.7	Flood Risk
480 min Summer	28.362	0.462	0.9	80.3	Flood Risk
600 min Summer	28.359	0.459	0.9	79.8	Flood Risk
720 min Summer	28.352	0.452	0.9	78.6	Flood Risk
960 min Summer	28.338	0.438	0.9	76.1	Flood Risk
1440 min Summer	28.309	0.409	0.9	71.2	Flood Risk
2160 min Summer	28.268	0.368	0.9	64.0	Flood Risk
2880 min Summer	28.229	0.329	0.9	57.2	Flood Risk
4320 min Summer	28.159	0.259	0.9	45.1	O K
5760 min Summer	28.101	0.201	0.9	34.9	O K
7200 min Summer	28.052	0.152	0.9	26.5	O K
8640 min Summer	28.014	0.114	0.9	19.9	O K
10080 min Summer	27.985	0.085	0.9	14.8	O K
15 min Winter	28.146	0.246	0.9	42.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	192.260	0.0	19
30 min Summer	124.873	0.0	34
60 min Summer	76.528	0.0	64
120 min Summer	45.025	0.0	122
180 min Summer	32.838	0.0	182
240 min Summer	26.190	0.0	242
360 min Summer	18.990	0.0	362
480 min Summer	15.094	0.0	480
600 min Summer	12.621	0.0	600
720 min Summer	10.899	0.0	686
960 min Summer	8.640	0.0	788
1440 min Summer	6.218	0.0	1036
2160 min Summer	4.466	0.0	1432
2880 min Summer	3.528	0.0	1844
4320 min Summer	2.529	0.0	2636
5760 min Summer	1.999	0.0	3352
7200 min Summer	1.666	0.0	4104
8640 min Summer	1.436	0.0	4752
10080 min Summer	1.266	0.0	5440
15 min Winter	192.260	0.0	19

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	28.222	0.322	0.9	56.1	Flood Risk
60 min Winter	28.293	0.393	0.9	68.4	Flood Risk
120 min Winter	28.353	0.453	0.9	78.9	Flood Risk
180 min Winter	28.385	0.485	0.9	84.5	Flood Risk
240 min Winter	28.405	0.505	0.9	87.9	Flood Risk
360 min Winter	28.425	0.525	0.9	91.4	Flood Risk
480 min Winter	28.433	0.533	0.9	92.7	Flood Risk
600 min Winter	28.433	0.533	0.9	92.8	Flood Risk
720 min Winter	28.429	0.529	0.9	92.0	Flood Risk
960 min Winter	28.412	0.512	0.9	89.2	Flood Risk
1440 min Winter	28.374	0.474	0.9	82.5	Flood Risk
2160 min Winter	28.317	0.417	0.9	72.5	Flood Risk
2880 min Winter	28.259	0.359	0.9	62.4	Flood Risk
4320 min Winter	28.154	0.254	0.9	44.2	O K
5760 min Winter	28.067	0.167	0.9	29.1	O K
7200 min Winter	28.001	0.101	0.9	17.6	O K
8640 min Winter	27.959	0.059	0.9	10.2	O K
10080 min Winter	27.947	0.047	0.8	8.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	124.873	0.0	33
60 min Winter	76.528	0.0	62
120 min Winter	45.025	0.0	122
180 min Winter	32.838	0.0	180
240 min Winter	26.190	0.0	238
360 min Winter	18.990	0.0	354
480 min Winter	15.094	0.0	468
600 min Winter	12.621	0.0	582
720 min Winter	10.899	0.0	692
960 min Winter	8.640	0.0	902
1440 min Winter	6.218	0.0	1112
2160 min Winter	4.466	0.0	1560
2880 min Winter	3.528	0.0	1992
4320 min Winter	2.529	0.0	2812
5760 min Winter	1.999	0.0	3528
7200 min Winter	1.666	0.0	4176
8640 min Winter	1.436	0.0	4672
10080 min Winter	1.266	0.0	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.115

Time (mins) From:	To:	Area (ha)
0	4	0.115

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Model Details

Storage is Online Cover Level (m) 28.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01100	Width (m)	29.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	161.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	27.900	Membrane Depth (m)	0

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Summary of Results for 30 year Return Period (+35%)

Half Drain Time : 660 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	29.500	0.400	0.6	22.4	O K
30 min Summer	29.559	0.459	0.7	29.4	O K
60 min Summer	29.609	0.509	0.7	36.1	O K
120 min Summer	29.648	0.548	0.8	41.9	O K
180 min Summer	29.667	0.567	0.8	44.8	O K
240 min Summer	29.677	0.577	0.8	46.4	O K
360 min Summer	29.686	0.586	0.8	47.9	O K
480 min Summer	29.688	0.588	0.8	48.2	O K
600 min Summer	29.688	0.588	0.8	48.2	O K
720 min Summer	29.687	0.587	0.8	48.0	O K
960 min Summer	29.684	0.584	0.8	47.5	O K
1440 min Summer	29.672	0.572	0.8	45.6	O K
2160 min Summer	29.651	0.551	0.8	42.3	O K
2880 min Summer	29.629	0.529	0.8	39.0	O K
4320 min Summer	29.589	0.489	0.7	33.3	O K
5760 min Summer	29.554	0.454	0.6	28.7	O K
7200 min Summer	29.524	0.424	0.6	25.1	O K
8640 min Summer	29.498	0.398	0.6	22.1	O K
10080 min Summer	29.475	0.375	0.5	19.6	O K
15 min Winter	29.527	0.427	0.6	25.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	136.673	0.0	19
30 min Summer	88.388	0.0	34
60 min Summer	54.347	0.0	64
120 min Summer	32.316	0.0	122
180 min Summer	23.710	0.0	182
240 min Summer	18.995	0.0	242
360 min Summer	13.865	0.0	360
480 min Summer	11.076	0.0	442
600 min Summer	9.299	0.0	498
720 min Summer	8.058	0.0	558
960 min Summer	6.423	0.0	684
1440 min Summer	4.662	0.0	954
2160 min Summer	3.379	0.0	1364
2880 min Summer	2.687	0.0	1760
4320 min Summer	1.945	0.0	2552
5760 min Summer	1.547	0.0	3336
7200 min Summer	1.296	0.0	4040
8640 min Summer	1.121	0.0	4760
10080 min Summer	0.992	0.0	5544
15 min Winter	136.673	0.0	19

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Summary of Results for 30 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	29.589	0.489	0.7	33.3	O K
60 min Winter	29.641	0.541	0.8	40.8	O K
120 min Winter	29.684	0.584	0.8	47.5	O K
180 min Winter	29.706	0.606	0.8	50.9	Flood Risk
240 min Winter	29.719	0.619	0.8	53.0	Flood Risk
360 min Winter	29.732	0.632	0.8	55.2	Flood Risk
480 min Winter	29.737	0.637	0.8	55.8	Flood Risk
600 min Winter	29.736	0.636	0.8	55.7	Flood Risk
720 min Winter	29.732	0.632	0.8	55.2	Flood Risk
960 min Winter	29.726	0.626	0.8	54.2	Flood Risk
1440 min Winter	29.708	0.608	0.8	51.3	Flood Risk
2160 min Winter	29.674	0.574	0.8	46.0	O K
2880 min Winter	29.643	0.543	0.8	41.2	O K
4320 min Winter	29.587	0.487	0.7	33.1	O K
5760 min Winter	29.540	0.440	0.6	27.1	O K
7200 min Winter	29.501	0.401	0.6	22.4	O K
8640 min Winter	29.467	0.367	0.5	18.8	O K
10080 min Winter	29.438	0.338	0.5	15.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	88.388	0.0	33
60 min Winter	54.347	0.0	62
120 min Winter	32.316	0.0	120
180 min Winter	23.710	0.0	178
240 min Winter	18.995	0.0	236
360 min Winter	13.865	0.0	350
480 min Winter	11.076	0.0	460
600 min Winter	9.299	0.0	566
720 min Winter	8.058	0.0	648
960 min Winter	6.423	0.0	740
1440 min Winter	4.662	0.0	1040
2160 min Winter	3.379	0.0	1472
2880 min Winter	2.687	0.0	1900
4320 min Winter	1.945	0.0	2684
5760 min Winter	1.547	0.0	3464
7200 min Winter	1.296	0.0	4248
8640 min Winter	1.121	0.0	4936
10080 min Winter	0.992	0.0	5656

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.099

Time (mins) From:	To:	Area (ha)
0	4	0.099

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Model Details

Storage is Online Cover Level (m) 30.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01100	Width (m)	31.0
Membrane Percolation (mm/hr)	1000	Length (m)	17.0
Max Percolation (l/s)	146.4	Slope (1:X)	30.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	29.100	Membrane Depth (m)	0

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 877 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	29.583	0.483	0.7	32.6	O K
30 min Summer	29.654	0.554	0.8	42.8	O K
60 min Summer	29.714	0.614	0.8	52.2	Flood Risk
120 min Summer	29.765	0.665	0.8	60.3	Flood Risk
180 min Summer	29.792	0.692	0.8	64.5	Flood Risk
240 min Summer	29.808	0.708	0.8	67.1	Flood Risk
360 min Summer	29.825	0.725	0.8	69.8	Flood Risk
480 min Summer	29.831	0.731	0.8	70.8	Flood Risk
600 min Summer	29.831	0.731	0.8	70.7	Flood Risk
720 min Summer	29.827	0.727	0.8	70.2	Flood Risk
960 min Summer	29.820	0.720	0.8	69.1	Flood Risk
1440 min Summer	29.803	0.703	0.8	66.3	Flood Risk
2160 min Summer	29.772	0.672	0.8	61.5	Flood Risk
2880 min Summer	29.742	0.642	0.8	56.6	Flood Risk
4320 min Summer	29.686	0.586	0.8	47.9	O K
5760 min Summer	29.645	0.545	0.8	41.5	O K
7200 min Summer	29.611	0.511	0.7	36.4	O K
8640 min Summer	29.581	0.481	0.7	32.3	O K
10080 min Summer	29.554	0.454	0.6	28.8	O K
15 min Winter	29.614	0.514	0.7	36.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	192.260	0.0	19
30 min Summer	124.873	0.0	34
60 min Summer	76.528	0.0	64
120 min Summer	45.025	0.0	122
180 min Summer	32.838	0.0	182
240 min Summer	26.190	0.0	242
360 min Summer	18.990	0.0	362
480 min Summer	15.094	0.0	480
600 min Summer	12.621	0.0	600
720 min Summer	10.899	0.0	656
960 min Summer	8.640	0.0	762
1440 min Summer	6.218	0.0	1012
2160 min Summer	4.466	0.0	1424
2880 min Summer	3.528	0.0	1820
4320 min Summer	2.529	0.0	2596
5760 min Summer	1.999	0.0	3352
7200 min Summer	1.666	0.0	4112
8640 min Summer	1.436	0.0	4840
10080 min Summer	1.266	0.0	5552
15 min Winter	192.260	0.0	19

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	29.689	0.589	0.8	48.3	O K
60 min Winter	29.756	0.656	0.8	59.0	Flood Risk
120 min Winter	29.815	0.715	0.8	68.2	Flood Risk
180 min Winter	29.846	0.746	0.8	73.2	Flood Risk
240 min Winter	29.866	0.766	0.8	76.3	Flood Risk
360 min Winter	29.888	0.788	0.8	79.8	Flood Risk
480 min Winter	29.898	0.798	0.8	81.3	Flood Risk
600 min Winter	29.900	0.800	0.8	81.7	Flood Risk
720 min Winter	29.899	0.799	0.8	81.5	Flood Risk
960 min Winter	29.888	0.788	0.8	79.7	Flood Risk
1440 min Winter	29.863	0.763	0.8	75.8	Flood Risk
2160 min Winter	29.820	0.720	0.8	69.0	Flood Risk
2880 min Winter	29.775	0.675	0.8	61.9	Flood Risk
4320 min Winter	29.694	0.594	0.8	49.1	O K
5760 min Winter	29.637	0.537	0.8	40.2	O K
7200 min Winter	29.591	0.491	0.7	33.7	O K
8640 min Winter	29.552	0.452	0.6	28.5	O K
10080 min Winter	29.518	0.418	0.6	24.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	124.873	0.0	33
60 min Winter	76.528	0.0	62
120 min Winter	45.025	0.0	122
180 min Winter	32.838	0.0	180
240 min Winter	26.190	0.0	238
360 min Winter	18.990	0.0	354
480 min Winter	15.094	0.0	468
600 min Winter	12.621	0.0	580
720 min Winter	10.899	0.0	688
960 min Winter	8.640	0.0	892
1440 min Winter	6.218	0.0	1098
2160 min Winter	4.466	0.0	1556
2880 min Winter	3.528	0.0	1988
4320 min Winter	2.529	0.0	2768
5760 min Winter	1.999	0.0	3520
7200 min Winter	1.666	0.0	4320
8640 min Winter	1.436	0.0	5024
10080 min Winter	1.266	0.0	5752

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.099

Time (mins) From:	To:	Area (ha)
0	4	0.099

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Model Details

Storage is Online Cover Level (m) 30.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01100	Width (m)	31.0
Membrane Percolation (mm/hr)	1000	Length (m)	17.0
Max Percolation (l/s)	146.4	Slope (1:X)	30.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	29.100	Membrane Depth (m)	0

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Cascade Summary of Results for pp5.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	infiltration basin.SRCX	(None)

Half Drain Time : 47 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	29.072	0.472	1.3	3.1	4.3	16.1	O K
30 min Summer	29.118	0.518	1.4	3.3	4.7	19.3	Flood Risk
60 min Summer	29.136	0.536	1.4	3.3	4.8	20.7	Flood Risk
120 min Summer	29.129	0.529	1.4	3.3	4.7	20.2	Flood Risk
180 min Summer	29.111	0.511	1.4	3.2	4.6	18.8	Flood Risk
240 min Summer	29.091	0.491	1.3	3.2	4.5	17.3	O K
360 min Summer	29.051	0.451	1.2	3.0	4.2	14.6	O K
480 min Summer	29.016	0.416	1.1	2.8	3.9	12.5	O K
600 min Summer	28.986	0.386	1.0	2.7	3.7	10.7	O K
720 min Summer	28.959	0.359	1.0	2.5	3.5	9.3	O K
960 min Summer	28.916	0.316	0.8	2.3	3.1	7.2	O K
1440 min Summer	28.857	0.257	0.7	1.9	2.6	4.7	O K
2160 min Summer	28.806	0.206	0.5	1.5	2.0	3.0	O K
2880 min Summer	28.778	0.178	0.5	1.2	1.7	2.3	O K
4320 min Summer	28.757	0.157	0.4	0.8	1.2	1.8	O K
5760 min Summer	28.746	0.146	0.4	0.6	1.0	1.5	O K
7200 min Summer	28.740	0.140	0.4	0.4	0.8	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.673	0.0	18.6	17
30 min Summer	88.388	0.0	24.5	30
60 min Summer	54.347	0.0	30.4	46
120 min Summer	32.316	0.0	36.4	80
180 min Summer	23.710	0.0	40.1	114
240 min Summer	18.995	0.0	42.9	148
360 min Summer	13.865	0.0	47.1	214
480 min Summer	11.076	0.0	50.2	276
600 min Summer	9.299	0.0	52.7	336
720 min Summer	8.058	0.0	54.8	398
960 min Summer	6.423	0.0	58.2	518
1440 min Summer	4.662	0.0	63.2	750
2160 min Summer	3.379	0.0	68.5	1104
2880 min Summer	2.687	0.0	72.4	1468
4320 min Summer	1.945	0.0	78.1	2192
5760 min Summer	1.547	0.0	82.2	2936
7200 min Summer	1.296	0.0	85.4	3648

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Cascade Summary of Results for pp5.SRCX

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
8640 min Summer	28.733	0.133	0.4	0.4	0.7	1.3	O K
10080 min Summer	28.729	0.129	0.3	0.3	0.6	1.2	O K
15 min Winter	29.104	0.504	1.3	3.2	4.6	18.3	Flood Risk
30 min Winter	29.155	0.555	1.5	3.4	4.9	22.2	Flood Risk
60 min Winter	29.172	0.572	1.5	3.5	5.0	23.6	Flood Risk
120 min Winter	29.158	0.558	1.5	3.4	4.9	22.4	Flood Risk
180 min Winter	29.130	0.530	1.4	3.3	4.7	20.3	Flood Risk
240 min Winter	29.101	0.501	1.3	3.2	4.5	18.0	Flood Risk
360 min Winter	29.044	0.444	1.2	2.9	4.1	14.2	O K
480 min Winter	28.996	0.396	1.1	2.7	3.8	11.3	O K
600 min Winter	28.956	0.356	0.9	2.5	3.5	9.1	O K
720 min Winter	28.922	0.322	0.9	2.3	3.2	7.5	O K
960 min Winter	28.870	0.270	0.7	2.0	2.7	5.3	O K
1440 min Winter	28.810	0.210	0.6	1.5	2.1	3.2	O K
2160 min Winter	28.770	0.170	0.5	1.1	1.5	2.1	O K
2880 min Winter	28.757	0.157	0.4	0.8	1.2	1.8	O K
4320 min Winter	28.743	0.143	0.4	0.5	0.9	1.5	O K
5760 min Winter	28.733	0.133	0.4	0.4	0.7	1.3	O K
7200 min Winter	28.727	0.127	0.3	0.3	0.6	1.2	O K
8640 min Winter	28.724	0.124	0.3	0.2	0.5	1.1	O K
10080 min Winter	28.720	0.120	0.3	0.1	0.4	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.121	0.0	88.1	4400
10080 min Summer	0.992	0.0	90.3	5136
15 min Winter	136.673	0.0	21.0	17
30 min Winter	88.388	0.0	27.6	30
60 min Winter	54.347	0.0	34.2	50
120 min Winter	32.316	0.0	40.9	88
180 min Winter	23.710	0.0	45.1	124
240 min Winter	18.995	0.0	48.3	158
360 min Winter	13.865	0.0	52.9	224
480 min Winter	11.076	0.0	56.4	288
600 min Winter	9.299	0.0	59.2	348
720 min Winter	8.058	0.0	61.6	408
960 min Winter	6.423	0.0	65.4	522
1440 min Winter	4.662	0.0	71.1	752
2160 min Winter	3.379	0.0	77.1	1100
2880 min Winter	2.687	0.0	81.5	1468
4320 min Winter	1.945	0.0	87.9	2176
5760 min Winter	1.547	0.0	92.6	2936
7200 min Winter	1.296	0.0	96.4	3656
8640 min Winter	1.121	0.0	99.4	4264
10080 min Winter	0.992	0.0	102.0	5040

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Cascade Rainfall Details for pp5.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.078

Time (mins) From:	To:	Area (ha)
0	4	0.078

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Cascade Model Details for pp5.SRCX

Storage is Online Cover Level (m) 29.400

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.04000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	23.0
Max Percolation (l/s)	76.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	28.600	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 28.700

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Cascade Summary of Results for infiltration basin.SRCX

Upstream Structures	Outflow To	Overflow To
pp5.SRCX	blanket.SRCX	(None)

Half Drain Time : 556 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	27.951	0.301	0.3	1.2	1.6	40.4	O K
30 min Summer	28.027	0.377	0.4	1.2	1.6	53.0	O K
60 min Summer	28.100	0.450	0.4	1.2	1.6	65.9	O K
120 min Summer	28.166	0.516	0.5	1.2	1.6	78.5	O K
180 min Summer	28.201	0.551	0.5	1.2	1.6	85.5	O K
240 min Summer	28.224	0.574	0.5	1.2	1.6	90.2	O K
360 min Summer	28.243	0.593	0.5	1.2	1.6	94.2	O K
480 min Summer	28.238	0.588	0.5	1.2	1.6	93.1	O K
600 min Summer	28.230	0.580	0.5	1.2	1.6	91.6	O K
720 min Summer	28.222	0.572	0.5	1.2	1.6	89.9	O K
960 min Summer	28.205	0.555	0.5	1.2	1.6	86.4	O K
1440 min Summer	28.169	0.519	0.5	1.2	1.6	79.1	O K
2160 min Summer	28.109	0.459	0.4	1.2	1.6	67.7	O K
2880 min Summer	28.050	0.400	0.4	1.2	1.6	57.0	O K
4320 min Summer	27.946	0.296	0.3	1.2	1.6	39.7	O K
5760 min Summer	27.865	0.215	0.3	1.2	1.5	27.5	O K
7200 min Summer	27.807	0.157	0.3	1.2	1.4	19.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.673	0.0	48.8	82
30 min Summer	88.388	0.0	63.5	108
60 min Summer	54.347	0.0	78.6	140
120 min Summer	32.316	0.0	93.8	184
180 min Summer	23.710	0.0	103.4	220
240 min Summer	18.995	0.0	110.5	258
360 min Summer	13.865	0.0	120.9	360
480 min Summer	11.076	0.0	128.1	438
600 min Summer	9.299	0.0	133.5	494
720 min Summer	8.058	0.0	137.8	556
960 min Summer	6.423	0.0	144.4	686
1440 min Summer	4.662	0.0	153.0	964
2160 min Summer	3.379	0.0	161.6	1364
2880 min Summer	2.687	0.0	167.5	1740
4320 min Summer	1.945	0.0	175.4	2468
5760 min Summer	1.547	0.0	180.9	3176
7200 min Summer	1.296	0.0	185.0	3840

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Cascade Summary of Results for infiltration basin.SRCX

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
8640 min Summer	27.767	0.117	0.2	1.1	1.4	14.2	O K
10080 min Summer	27.741	0.091	0.2	1.1	1.3	10.8	O K
15 min Winter	27.983	0.333	0.4	1.2	1.6	45.6	O K
30 min Winter	28.067	0.417	0.4	1.2	1.6	59.9	O K
60 min Winter	28.147	0.497	0.4	1.2	1.6	74.7	O K
120 min Winter	28.216	0.566	0.5	1.2	1.6	88.5	O K
180 min Winter	28.254	0.604	0.5	1.2	1.6	96.5	O K
240 min Winter	28.279	0.629	0.5	1.2	1.6	101.9	O K
360 min Winter	28.307	0.657	0.5	1.2	1.7	108.1	O K
480 min Winter	28.308	0.658	0.5	1.2	1.7	108.3	O K
600 min Winter	28.299	0.649	0.5	1.2	1.7	106.3	O K
720 min Winter	28.289	0.639	0.5	1.2	1.7	104.2	O K
960 min Winter	28.269	0.619	0.5	1.2	1.6	99.8	O K
1440 min Winter	28.220	0.570	0.5	1.2	1.6	89.5	O K
2160 min Winter	28.135	0.485	0.4	1.2	1.6	72.4	O K
2880 min Winter	28.042	0.392	0.4	1.2	1.6	55.6	O K
4320 min Winter	27.891	0.241	0.3	1.2	1.5	31.2	O K
5760 min Winter	27.791	0.141	0.2	1.2	1.4	17.3	O K
7200 min Winter	27.738	0.088	0.2	1.1	1.3	10.4	O K
8640 min Winter	27.717	0.067	0.2	0.9	1.1	7.9	O K
10080 min Winter	27.706	0.056	0.2	0.7	0.9	6.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.121	0.0	188.4	4504
10080 min Summer	0.992	0.0	191.2	5240
15 min Winter	136.673	0.0	54.8	90
30 min Winter	88.388	0.0	71.2	118
60 min Winter	54.347	0.0	88.2	152
120 min Winter	32.316	0.0	105.2	194
180 min Winter	23.710	0.0	116.0	230
240 min Winter	18.995	0.0	124.1	266
360 min Winter	13.865	0.0	136.1	356
480 min Winter	11.076	0.0	144.5	458
600 min Winter	9.299	0.0	151.0	554
720 min Winter	8.058	0.0	156.2	584
960 min Winter	6.423	0.0	164.2	732
1440 min Winter	4.662	0.0	174.3	1040
2160 min Winter	3.379	0.0	183.2	1484
2880 min Winter	2.687	0.0	189.0	1872
4320 min Winter	1.945	0.0	196.4	2572
5760 min Winter	1.547	0.0	201.3	3224
7200 min Winter	1.296	0.0	204.6	3824
8640 min Winter	1.121	0.0	207.3	4488
10080 min Winter	0.992	0.0	209.7	5152

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Cascade Rainfall Details for infiltration basin.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.142

Time (mins) From:	To:	Area (ha)
0	4	0.142

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Cascade Model Details for infiltration basin.SRCX

Storage is Online Cover Level (m) 28.850

Infiltration Basin Structure

Invert Level (m) 27.650 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.01100 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.01100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	112.0	1.200	344.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0055-1500-1200-1500
Design Head (m)	1.200
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	55
Invert Level (m)	27.650
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.5
Flush-Flo™	0.242	1.2
Kick-Flo®	0.493	1.0
Mean Flow over Head Range	-	1.2

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	1.1	1.200	1.5	3.000	2.3	7.000	3.4
0.200	1.2	1.400	1.6	3.500	2.4	7.500	3.5
0.300	1.2	1.600	1.7	4.000	2.6	8.000	3.6
0.400	1.2	1.800	1.8	4.500	2.7	8.500	3.7
0.500	1.0	2.000	1.9	5.000	2.9	9.000	3.8
0.600	1.1	2.200	2.0	5.500	3.0	9.500	3.9
0.800	1.2	2.400	2.1	6.000	3.1		
1.000	1.4	2.600	2.1	6.500	3.3		

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Cascade Summary of Results for blanket.SRCX

Upstream Structures	Outflow To	Overflow To
infiltration basin.SRCX pp5.SRCX	(None)	(None)

Half Drain Time : 1311 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	26.922	0.072	0.5	23.4	O K
30 min Summer	26.941	0.091	0.5	29.8	O K
60 min Summer	26.960	0.110	0.5	35.9	O K
120 min Summer	26.977	0.127	0.5	41.3	O K
180 min Summer	26.987	0.137	0.5	44.7	O K
240 min Summer	26.995	0.145	0.5	47.3	O K
360 min Summer	27.007	0.157	0.5	51.3	O K
480 min Summer	27.015	0.165	0.5	54.0	O K
600 min Summer	27.022	0.172	0.5	56.1	O K
720 min Summer	27.027	0.177	0.5	57.8	O K
960 min Summer	27.035	0.185	0.5	60.2	O K
1440 min Summer	27.045	0.195	0.5	63.7	O K
2160 min Summer	27.060	0.210	0.5	68.5	O K
2880 min Summer	27.063	0.213	0.5	69.4	O K
4320 min Summer	27.051	0.201	0.5	65.8	O K
5760 min Summer	27.036	0.186	0.5	60.8	O K
7200 min Summer	27.016	0.166	0.5	54.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	136.673	0.0	531
30 min Summer	88.388	0.0	692
60 min Summer	54.347	0.0	862
120 min Summer	32.316	0.0	1046
180 min Summer	23.710	0.0	1162
240 min Summer	18.995	0.0	1250
360 min Summer	13.865	0.0	1382
480 min Summer	11.076	0.0	1484
600 min Summer	9.299	0.0	1570
720 min Summer	8.058	0.0	1648
960 min Summer	6.423	0.0	1790
1440 min Summer	4.662	0.0	2042
2160 min Summer	3.379	0.0	2376
2880 min Summer	2.687	0.0	2692
4320 min Summer	1.945	0.0	3252
5760 min Summer	1.547	0.0	3864
7200 min Summer	1.296	0.0	4512

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Cascade Summary of Results for blanket.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	26.994	0.144	0.5	47.0	O K
10080 min Summer	26.972	0.122	0.5	39.9	O K
15 min Winter	26.930	0.080	0.5	26.1	O K
30 min Winter	26.951	0.101	0.5	33.0	O K
60 min Winter	26.970	0.120	0.5	39.3	O K
120 min Winter	26.989	0.139	0.5	45.3	O K
180 min Winter	27.001	0.151	0.5	49.2	O K
240 min Winter	27.010	0.160	0.5	52.2	O K
360 min Winter	27.024	0.174	0.5	56.9	O K
480 min Winter	27.034	0.184	0.5	60.2	O K
600 min Winter	27.042	0.192	0.5	62.8	O K
720 min Winter	27.049	0.199	0.5	64.8	O K
960 min Winter	27.058	0.208	0.5	68.0	O K
1440 min Winter	27.071	0.221	0.5	72.0	O K
2160 min Winter	27.086	0.236	0.5	77.2	O K
2880 min Winter	27.099	0.249	0.5	81.4	O K
4320 min Winter	27.082	0.232	0.5	75.8	O K
5760 min Winter	27.050	0.200	0.5	65.2	O K
7200 min Winter	27.008	0.158	0.5	51.7	O K
8640 min Winter	26.969	0.119	0.5	38.9	O K
10080 min Winter	26.938	0.088	0.5	28.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	1.121	0.0	5192
10080 min Summer	0.992	0.0	5872
15 min Winter	136.673	0.0	595
30 min Winter	88.388	0.0	776
60 min Winter	54.347	0.0	972
120 min Winter	32.316	0.0	1166
180 min Winter	23.710	0.0	1288
240 min Winter	18.995	0.0	1380
360 min Winter	13.865	0.0	1524
480 min Winter	11.076	0.0	1634
600 min Winter	9.299	0.0	1726
720 min Winter	8.058	0.0	1808
960 min Winter	6.423	0.0	1954
1440 min Winter	4.662	0.0	2212
2160 min Winter	3.379	0.0	2528
2880 min Winter	2.687	0.0	2836
4320 min Winter	1.945	0.0	3344
5760 min Winter	1.547	0.0	3976
7200 min Winter	1.296	0.0	4688
8640 min Winter	1.121	0.0	5384
10080 min Winter	0.992	0.0	6032

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Cascade Rainfall Details for blanket.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Cascade Model Details for blanket.SRCX

Storage is Online Cover Level (m) 27.850

Infiltration Blanket Structure

Infiltration Coefficient Base (m/hr)	0.01100	Diameter/Width (m)	20.0
Safety Factor	2.0	Length (m)	17.0
Porosity	0.96	Cap Volume Depth (m)	0.000
Invert Level (m)	26.850		

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Cascade Summary of Results for pp5.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	infiltration basin.SRCX	(None)

Half Drain Time : 65 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	29.173	0.573	1.5	3.5	5.0	23.6	Flood Risk
30 min Summer	29.237	0.637	1.5	3.7	5.3	28.9	Flood Risk
60 min Summer	29.264	0.664	1.5	3.8	5.4	31.2	Flood Risk
120 min Summer	29.256	0.656	1.5	3.8	5.3	30.5	Flood Risk
180 min Summer	29.234	0.634	1.5	3.7	5.3	28.7	Flood Risk
240 min Summer	29.210	0.610	1.5	3.6	5.2	26.7	Flood Risk
360 min Summer	29.165	0.565	1.5	3.5	5.0	23.0	Flood Risk
480 min Summer	29.125	0.525	1.4	3.3	4.7	19.9	Flood Risk
600 min Summer	29.090	0.490	1.3	3.2	4.5	17.3	O K
720 min Summer	29.059	0.459	1.2	3.0	4.2	15.2	O K
960 min Summer	29.006	0.406	1.1	2.8	3.8	11.9	O K
1440 min Summer	28.929	0.329	0.9	2.4	3.2	7.8	O K
2160 min Summer	28.857	0.257	0.7	1.9	2.6	4.8	O K
2880 min Summer	28.816	0.216	0.6	1.6	2.2	3.4	O K
4320 min Summer	28.773	0.173	0.5	1.1	1.6	2.1	O K
5760 min Summer	28.759	0.159	0.4	0.8	1.3	1.8	O K
7200 min Summer	28.750	0.150	0.4	0.7	1.1	1.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	192.260	0.0	26.7	17
30 min Summer	124.873	0.0	35.1	31
60 min Summer	76.528	0.0	43.4	52
120 min Summer	45.025	0.0	51.2	84
180 min Summer	32.838	0.0	56.1	118
240 min Summer	26.190	0.0	59.8	152
360 min Summer	18.990	0.0	65.1	218
480 min Summer	15.094	0.0	69.0	282
600 min Summer	12.621	0.0	72.1	344
720 min Summer	10.899	0.0	74.7	406
960 min Summer	8.640	0.0	78.9	524
1440 min Summer	6.218	0.0	85.1	764
2160 min Summer	4.466	0.0	91.4	1120
2880 min Summer	3.528	0.0	96.0	1472
4320 min Summer	2.529	0.0	102.7	2200
5760 min Summer	1.999	0.0	107.6	2912
7200 min Summer	1.666	0.0	111.5	3600

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Cascade Summary of Results for pp5.SRCX

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
8640 min Summer	28.743	0.143	0.4	0.5	0.9	1.5	O K
10080 min Summer	28.738	0.138	0.4	0.4	0.8	1.4	O K
15 min Winter	29.212	0.612	1.5	3.6	5.2	26.9	Flood Risk
30 min Winter	29.287	0.687	1.5	3.9	5.4	33.1	Flood Risk
60 min Winter	29.320	0.720	1.5	4.0	5.6	35.8	Flood Risk
120 min Winter	29.304	0.704	1.5	4.0	5.5	34.5	Flood Risk
180 min Winter	29.271	0.671	1.5	3.9	5.4	31.8	Flood Risk
240 min Winter	29.235	0.635	1.5	3.7	5.3	28.8	Flood Risk
360 min Winter	29.169	0.569	1.5	3.5	5.0	23.3	Flood Risk
480 min Winter	29.114	0.514	1.4	3.3	4.6	19.0	Flood Risk
600 min Winter	29.066	0.466	1.2	3.0	4.3	15.6	O K
720 min Winter	29.024	0.424	1.1	2.9	4.0	13.0	O K
960 min Winter	28.957	0.357	1.0	2.5	3.5	9.2	O K
1440 min Winter	28.870	0.270	0.7	2.0	2.7	5.3	O K
2160 min Winter	28.805	0.205	0.5	1.5	2.0	3.0	O K
2880 min Winter	28.773	0.173	0.5	1.1	1.6	2.2	O K
4320 min Winter	28.754	0.154	0.4	0.7	1.2	1.7	O K
5760 min Winter	28.744	0.144	0.4	0.5	0.9	1.5	O K
7200 min Winter	28.736	0.136	0.4	0.4	0.8	1.3	O K
8640 min Winter	28.730	0.130	0.3	0.3	0.7	1.2	O K
10080 min Winter	28.727	0.127	0.3	0.2	0.6	1.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.436	0.0	114.6	4400
10080 min Summer	1.266	0.0	117.3	5136
15 min Winter	192.260	0.0	30.1	17
30 min Winter	124.873	0.0	39.5	31
60 min Winter	76.528	0.0	48.7	58
120 min Winter	45.025	0.0	57.6	90
180 min Winter	32.838	0.0	63.1	128
240 min Winter	26.190	0.0	67.1	164
360 min Winter	18.990	0.0	73.1	232
480 min Winter	15.094	0.0	77.5	296
600 min Winter	12.621	0.0	81.0	360
720 min Winter	10.899	0.0	83.9	420
960 min Winter	8.640	0.0	88.6	540
1440 min Winter	6.218	0.0	95.6	766
2160 min Winter	4.466	0.0	102.7	1108
2880 min Winter	3.528	0.0	107.9	1468
4320 min Winter	2.529	0.0	115.4	2204
5760 min Winter	1.999	0.0	121.1	2936
7200 min Winter	1.666	0.0	125.5	3664
8640 min Winter	1.436	0.0	129.1	4352
10080 min Winter	1.266	0.0	132.2	4976

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Cascade Rainfall Details for pp5.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.078

Time (mins) From:	To:	Area (ha)
0	4	0.078

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Cascade Model Details for pp5.SRCX

Storage is Online Cover Level (m) 29.400

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.04000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	23.0
Max Percolation (l/s)	76.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	28.600	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 28.700

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Cascade Summary of Results for infiltration basin.SRCX

Upstream Structures	Outflow To	Overflow To
pp5.SRCX	blanket.SRCX	(None)

Half Drain Time : 778 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	28.057	0.407	0.4	1.2	1.6	58.3	O K
30 min Summer	28.160	0.510	0.5	1.2	1.6	77.4	O K
60 min Summer	28.246	0.596	0.5	1.2	1.6	94.9	O K
120 min Summer	28.319	0.669	0.5	1.2	1.7	110.8	O K
180 min Summer	28.360	0.710	0.6	1.2	1.8	120.1	O K
240 min Summer	28.387	0.737	0.6	1.2	1.8	126.5	O K
360 min Summer	28.419	0.769	0.6	1.2	1.8	134.4	O K
480 min Summer	28.425	0.775	0.6	1.2	1.8	135.8	O K
600 min Summer	28.416	0.766	0.6	1.2	1.8	133.6	O K
720 min Summer	28.407	0.757	0.6	1.2	1.8	131.4	O K
960 min Summer	28.388	0.738	0.6	1.2	1.8	126.9	O K
1440 min Summer	28.351	0.701	0.6	1.2	1.7	118.0	O K
2160 min Summer	28.297	0.647	0.5	1.2	1.7	105.8	O K
2880 min Summer	28.244	0.594	0.5	1.2	1.6	94.4	O K
4320 min Summer	28.136	0.486	0.4	1.2	1.6	72.7	O K
5760 min Summer	28.028	0.378	0.4	1.2	1.6	53.1	O K
7200 min Summer	27.941	0.291	0.3	1.2	1.6	38.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	192.260	0.0	69.1	109
30 min Summer	124.873	0.0	90.1	143
60 min Summer	76.528	0.0	111.5	174
120 min Summer	45.025	0.0	131.4	216
180 min Summer	32.838	0.0	143.8	252
240 min Summer	26.190	0.0	152.9	288
360 min Summer	18.990	0.0	166.4	364
480 min Summer	15.094	0.0	176.1	480
600 min Summer	12.621	0.0	183.3	544
720 min Summer	10.899	0.0	189.0	600
960 min Summer	8.640	0.0	197.7	722
1440 min Summer	6.218	0.0	208.8	990
2160 min Summer	4.466	0.0	219.3	1404
2880 min Summer	3.528	0.0	226.0	1816
4320 min Summer	2.529	0.0	235.1	2596
5760 min Summer	1.999	0.0	241.2	3312
7200 min Summer	1.666	0.0	245.9	4032

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Cascade Summary of Results for infiltration basin.SRCX

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
8640 min Summer	27.873	0.223	0.3	1.2	1.5	28.6	O K
10080 min Summer	27.821	0.171	0.3	1.2	1.5	21.3	O K
15 min Winter	28.100	0.450	0.4	1.2	1.6	65.9	O K
30 min Winter	28.209	0.559	0.5	1.2	1.6	87.1	O K
60 min Winter	28.300	0.650	0.5	1.2	1.7	106.5	O K
120 min Winter	28.378	0.728	0.6	1.2	1.8	124.5	O K
180 min Winter	28.422	0.772	0.6	1.2	1.8	135.2	O K
240 min Winter	28.452	0.802	0.6	1.3	1.9	142.6	O K
360 min Winter	28.490	0.840	0.7	1.3	1.9	152.2	O K
480 min Winter	28.506	0.856	0.7	1.3	2.0	156.5	O K
600 min Winter	28.503	0.853	0.7	1.3	1.9	155.6	O K
720 min Winter	28.492	0.842	0.7	1.3	1.9	152.9	O K
960 min Winter	28.471	0.821	0.6	1.3	1.9	147.4	O K
1440 min Winter	28.426	0.776	0.6	1.2	1.8	135.9	O K
2160 min Winter	28.351	0.701	0.6	1.2	1.7	118.1	O K
2880 min Winter	28.275	0.625	0.5	1.2	1.6	101.0	O K
4320 min Winter	28.109	0.459	0.4	1.2	1.6	67.6	O K
5760 min Winter	27.955	0.305	0.3	1.2	1.6	41.1	O K
7200 min Winter	27.844	0.194	0.3	1.2	1.5	24.5	O K
8640 min Winter	27.775	0.125	0.2	1.1	1.4	15.1	O K
10080 min Winter	27.735	0.085	0.2	1.0	1.3	10.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.436	0.0	249.4	4672
10080 min Summer	1.266	0.0	252.4	5352
15 min Winter	192.260	0.0	77.6	120
30 min Winter	124.873	0.0	101.0	153
60 min Winter	76.528	0.0	125.2	186
120 min Winter	45.025	0.0	147.6	228
180 min Winter	32.838	0.0	161.4	264
240 min Winter	26.190	0.0	171.6	298
360 min Winter	18.990	0.0	186.7	370
480 min Winter	15.094	0.0	198.0	472
600 min Winter	12.621	0.0	206.6	572
720 min Winter	10.899	0.0	213.4	672
960 min Winter	8.640	0.0	223.9	760
1440 min Winter	6.218	0.0	236.9	1068
2160 min Winter	4.466	0.0	250.1	1516
2880 min Winter	3.528	0.0	256.5	1960
4320 min Winter	2.529	0.0	264.9	2768
5760 min Winter	1.999	0.0	270.4	3456
7200 min Winter	1.666	0.0	274.2	4056
8640 min Winter	1.436	0.0	276.9	4672
10080 min Winter	1.266	0.0	278.9	5248

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Cascade Rainfall Details for infiltration basin.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.142

Time (mins) From:	To:	Area (ha)
0	4	0.142

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Cascade Model Details for infiltration basin.SRCX

Storage is Online Cover Level (m) 28.850

Infiltration Basin Structure

Invert Level (m) 27.650 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.01100 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.01100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	112.0	1.200	344.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0055-1500-1200-1500
Design Head (m)	1.200
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	55
Invert Level (m)	27.650
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.5
Flush-Flo™	0.242	1.2
Kick-Flo®	0.493	1.0
Mean Flow over Head Range	-	1.2

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	1.1	1.200	1.5	3.000	2.3	7.000	3.4
0.200	1.2	1.400	1.6	3.500	2.4	7.500	3.5
0.300	1.2	1.600	1.7	4.000	2.6	8.000	3.6
0.400	1.2	1.800	1.8	4.500	2.7	8.500	3.7
0.500	1.0	2.000	1.9	5.000	2.9	9.000	3.8
0.600	1.1	2.200	2.0	5.500	3.0	9.500	3.9
0.800	1.2	2.400	2.1	6.000	3.1		
1.000	1.4	2.600	2.1	6.500	3.3		

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Cascade Summary of Results for blanket.SRCX

Upstream Structures	Outflow To	Overflow To
infiltration basin.SRCX pp5.SRCX	(None)	(None)

Half Drain Time : 1709 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	26.949	0.099	0.5	32.2	O K
30 min Summer	26.973	0.123	0.5	40.0	O K
60 min Summer	26.995	0.145	0.5	47.3	O K
120 min Summer	27.018	0.168	0.5	54.7	O K
180 min Summer	27.032	0.182	0.5	59.5	O K
240 min Summer	27.043	0.193	0.5	63.1	O K
360 min Summer	27.060	0.210	0.5	68.5	O K
480 min Summer	27.072	0.222	0.5	72.4	O K
600 min Summer	27.081	0.231	0.5	75.3	O K
720 min Summer	27.088	0.238	0.5	77.7	O K
960 min Summer	27.099	0.249	0.5	81.1	O K
1440 min Summer	27.111	0.261	0.5	85.0	O K
2160 min Summer	27.117	0.267	0.5	87.2	O K
2880 min Summer	27.123	0.273	0.5	89.0	O K
4320 min Summer	27.124	0.274	0.5	89.3	O K
5760 min Summer	27.118	0.268	0.5	87.4	O K
7200 min Summer	27.104	0.254	0.5	83.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	192.260	0.0	749
30 min Summer	124.873	0.0	993
60 min Summer	76.528	0.0	1216
120 min Summer	45.025	0.0	1420
180 min Summer	32.838	0.0	1548
240 min Summer	26.190	0.0	1642
360 min Summer	18.990	0.0	1790
480 min Summer	15.094	0.0	1904
600 min Summer	12.621	0.0	1998
720 min Summer	10.899	0.0	2082
960 min Summer	8.640	0.0	2230
1440 min Summer	6.218	0.0	2498
2160 min Summer	4.466	0.0	2876
2880 min Summer	3.528	0.0	3232
4320 min Summer	2.529	0.0	3832
5760 min Summer	1.999	0.0	4344
7200 min Summer	1.666	0.0	4920

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Cascade Summary of Results for blanket.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	27.086	0.236	0.5	77.0	O K
10080 min Summer	27.063	0.213	0.5	69.6	O K
15 min Winter	26.959	0.109	0.5	35.5	O K
30 min Winter	26.984	0.134	0.5	43.9	O K
60 min Winter	27.010	0.160	0.5	52.3	O K
120 min Winter	27.036	0.186	0.5	60.8	O K
180 min Winter	27.053	0.203	0.5	66.2	O K
240 min Winter	27.065	0.215	0.5	70.3	O K
360 min Winter	27.084	0.234	0.5	76.4	O K
480 min Winter	27.098	0.248	0.5	81.1	O K
600 min Winter	27.109	0.259	0.5	84.6	O K
720 min Winter	27.118	0.268	0.5	87.4	O K
960 min Winter	27.131	0.281	0.5	91.7	O K
1440 min Winter	27.147	0.297	0.5	97.1	O K
2160 min Winter	27.158	0.308	0.5	100.5	O K
2880 min Winter	27.162	0.312	0.5	101.8	O K
4320 min Winter	27.176	0.326	0.5	106.4	O K
5760 min Winter	27.164	0.314	0.5	102.4	O K
7200 min Winter	27.133	0.283	0.5	92.4	O K
8640 min Winter	27.090	0.240	0.5	78.4	O K
10080 min Winter	27.046	0.196	0.5	63.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	1.436	0.0	5536
10080 min Summer	1.266	0.0	6192
15 min Winter	192.260	0.0	842
30 min Winter	124.873	0.0	1111
60 min Winter	76.528	0.0	1348
120 min Winter	45.025	0.0	1566
180 min Winter	32.838	0.0	1702
240 min Winter	26.190	0.0	1802
360 min Winter	18.990	0.0	1958
480 min Winter	15.094	0.0	2082
600 min Winter	12.621	0.0	2184
720 min Winter	10.899	0.0	2274
960 min Winter	8.640	0.0	2432
1440 min Winter	6.218	0.0	2704
2160 min Winter	4.466	0.0	3072
2880 min Winter	3.528	0.0	3424
4320 min Winter	2.529	0.0	4012
5760 min Winter	1.999	0.0	4456
7200 min Winter	1.666	0.0	5040
8640 min Winter	1.436	0.0	5736
10080 min Winter	1.266	0.0	6472

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Cascade Rainfall Details for blanket.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Cascade Model Details for blanket.SRCX

Storage is Online Cover Level (m) 27.850

Infiltration Blanket Structure

Infiltration Coefficient Base (m/hr)	0.01100	Diameter/Width (m)	20.0
Safety Factor	2.0	Length (m)	17.0
Porosity	0.96	Cap Volume Depth (m)	0.000
Invert Level (m)	26.850		

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