LANMOR Consulting

Civil Engineers & Transport Planners

Kingston Bridge House

Drainage Strategy

March 2022

201345/DS/JR/KBL/02

Rev A

LANMOR Consulting

Civil Engineers & Transport Planners

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APPENDICES

1 INTRODUCTION

1.1 Scope

1.1.1 Lanmor Consulting has been commissioned by Westcombe Group to prepare a Drainage Strategy for the proposed development at Kingston Bridge House, Church Road, Hampton Wick, KT1 4AG. This report has been prepared in support of redevelopment of the site and has been commissioned to advise on the feasibility of providing a solution for the foul and surface water drainage for the proposed development.

1.1.2 This report will consider the drainage regime for the site and sets out the drainage strategy for the development including discharge rates and any requirements for attenuation.

1.1.3 The information within this report will be refined, modified, and updated as the detailed design is progressed. The scope of the works for this drainage strategy report is outlined below:

- Review available data in relation to on-site drainage and other drainage networks near the site
- Review of the ground conditions for the suitability of Sustainable Drainage Systems (SuDS)
- Consider the use of SuDS as an option for disposal of surface water runoff from the proposed development
- An assessment of the run-off likely to be generated.
- Undertake drainage assessments to establish attenuation requirements to deal with any increase in surface water runoff from the development.

2 SITE LOCATION AND DESCRIPTION

2.1 Location

2.1.1 The site is located with the Borough of Richmond. The site is located at the junction of Church Grove and Hampton Court Road, opposite the Kings Field. The River Thames is located just east of the site, approximately 140m away. Figure 2.1 below shows the location of the site.

2.1.2 Kingston Bridge House is currently made up of student living facilities which spans over 7 floors. Drawings FLU.1191.3.03 – 09 in Appendix A show the plans for the existing development.

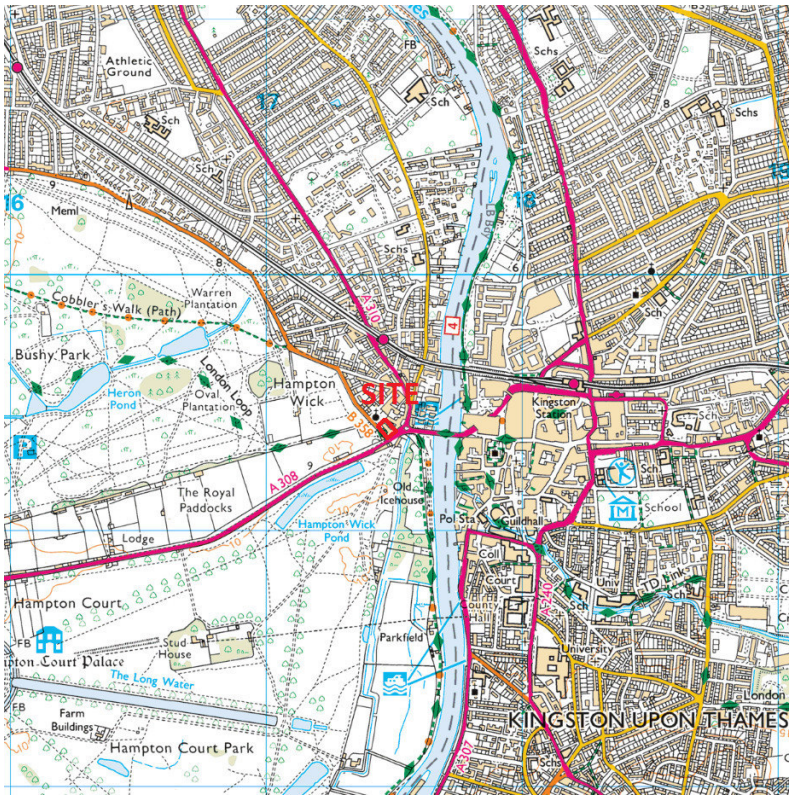


Figure 2.1 – Site Location

2.2 Existing Geology

2.2.1 The British Geological Survey indicates that the site has an underlying bedrock of London Clay Formation, which consists primarily of clay, silt and sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period.

2.2.2 Superficial deposits have also been recorded at the site. The superficial geology consists Kempton Park Gravel Member, which is made up of sand and gravel. These deposits were formed between 1.6 and 1.8 million years ago during the Quaternary period.

2.3 Proposed Development

2.3.1 The proposed development will consist of the conversion of the existing student living accommodation to residential apartments a total of 70 units will be provided.

2.3.2 Drawings FLU.1191.3.11 – 17 included in Appendix B shows the proposed make-up of the development at Kingston Bridge House.

3 EXISTING DRAINAGE

3.1 Existing Foul Drainage

3.1.1 As part of the investigation, Thames Water asset mapping was requested. The records show that there is an existing foul sewer located beneath Church Grove flowing from northwest to southeast. The pipe is 175mm in diameter and flows to another network located beneath Hampton Court Road. The nearest manholes located to the site are 4301 and 4302. Unfortunately, Thames Water have not provided any level information for either of these manholes.

3.1.2 The next nearest manholes are 4306 and 4308, which are located to towards the south of the site at the junction between Hampton Court Road and Church Grove. Manhole 4305 has no information. Manhole 4308 has a cover level of 7.61m and an invert level of 5.48m.

3.2 Existing Surface Water Drainage

3.2.1 According to the sewer records, there is an existing surface water located to the southeast of the site beneath Hampton Court Road, flowing from the southwest to the northeast. The sewer is a 450mm diameter pipe with the nearest manhole to the site being 4306. Manhole 4306 has a cover level of 7.49m and an invert level of 5.18m.

3.2.2 The Thames Water records can be found in Appendix B of this report.

4 PROPOSED DRAINAGE REGIME

4.1 Proposed Foul Drainage

4.1.1 The proposed foul drainage will utilise the existing foul drainage pipe network on site. The existing building accommodates approximately 216 students and has the potential to generate up to 10 l/s foul flows.

4.1.2 The proposed development will include for 70 new residential units with up to 210 residents in the development. Based on Sewers for Adoption 0.046 l/s per dwelling the 70 residential units might generate 3.2 l/s.

4.1.3 The proposed discharge rate will be a reduction on the current facility and therefore there will be no capacity issues with the existing drainage network as it will be approximately 50% less.

4.2 Proposed Surface Water Drainage

4.2.1 The development proposals do not involve any extension of to the existing buildings. The existing site is largely hard surfaced as indicated in Figure 4.1 below.

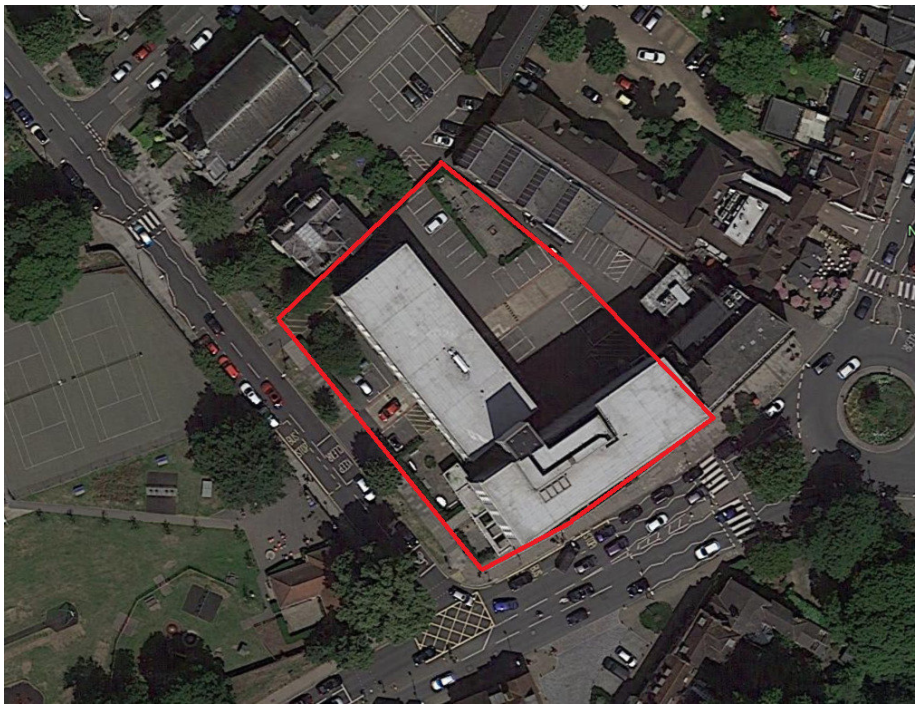


Figure 4.1 – Arrival View of Site

4.2.2 The proposed development will incorporate landscaped areas so the proposals will reduce the impermeable area on site. Sustainable Drainage Systems (SuDS) were considered as part of this assessment for disposing of the surface water run from the development. A copy of the proposed site plan is included in Appendix C as drawing FLU.1191.3.10. The building is already drained, and it is not possible to introduce any recycling of rainwater, or attenuation within the building, however the roof can be adjusted to provide a green/blue roof.

4.2.3 Also, for rainwater harvesting to be affective the harvesting tank needs to be empty to receive the next storm. For these reasons, rainwater harvesting has been discounted. With adjustments to the roof and parapets to provide safe access new green/blue roofs can be provided to collect and discharge runoff and attenuate for a 1 in 100 year +40% storm event. Each roof will need to be provided with 2 outlets, discharge at maximum rate of 0.5 l/s the minimum recommended by the manufacturers. This will give a total runoff rate from the upper and lower roofs of 2 l/s.

4.2.4 Next on the sustainable drainage hierarchy is the use of ground infiltration techniques such as soakaways and infiltration basins. BGS records indicate the underlying bedrock to consist of London Clay. Therefore, since the ground conditions are not viable infiltration for the hardstanding arears via permeable paving has been discounted.

4.2.5 The hierarchy suggest the next method of discharge is to a watercourse. The River Thames is the nearest but is located 140m away to the east of the site and is too far from the site to discharge surface water run-off there. Thus it is not possible to adopt this method of discharge.

4.2.6 Therefore, in accordance with the SuDS hierarchy, surface water runoff will discharge to the existing surface water sewer, the proposed development will reduce the volume and rate of discharge from the development due to the introduction of soft landscaped areas. The existing drainage network for the building is already in place and connected to the existing Thames Water sewer, the drainage will therefore be utilised for the proposed development.

4.2.7 The drainage proforma is included in Appendix D and shows the proposed / existing drainage areas and discharge rates.

4.2.8 The existing parking area is currently impermeable, part of this will be landscape so will be permeable and the remainder will be replaced with a new hard surfaced car park. This gives the opportunity to incorporate permeable paving into the development which will further reduce the runoff for the site. The rear car park will therefore have permeable surface over a 300m gravel layer with a restricted discharge to the on-site drainage system.

4.2.9 Drawing 201345/DS/01 included in appendix D shows the proposed SuDS features on site and the Microdrainage calculation are also included in Appendix D demonstrating the paving has been designed to accommodate a 1 in 1, 1 in 30, 1in 100 and 1 in 100 year +40% storm event.

5 SURFACE WATER DRAINAGE MAINTENANCE

5.1 General

5.1.1 Regularly inspection of the surface water drainage network for blockages and clearing unwanted debris / silt from the system should improve the performance of the surface water network and decrease the need for future repairs. In the event of blockages, high pressure water jets can be used to clear the gullies and pipes to ensure they are functioning correctly, this should be undertaken by certified trained professionals.

5.1.2 The level and frequency of maintenance required on site is dependent on the type of facility. The type of maintenance will fall into one of three categories “regular maintenance”, “occasional maintenance” and “remedial maintenance”.

5.1.3 Regular maintenance of the drainage features will include, inspections, removal of litter / debris and sweeping of the surfaces. Occasional maintenance will include removal of sediment etc. and remedial maintenance may include structural repairs and infiltration reconditioning if required.

5.1.4 Following completion of the development a Management Company will be set up to maintain all the communal areas, including the drainage. It will be their responsibility to maintain the drainage networks.

5.2 Inspection, Manhole, Catchpit Chambers and Pipes

5.2.1 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained.

5.2.2 Pipes are intended to be the main conveyance across the development. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

5.2.3 For the Inspection, Manhole, Catchpit Chambers and Pipes, the following maintenance will be required.

Manhole / Pipe Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
	Remove sediment from structures.	Annually or as required
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required
	If continued poor performance jet and CCTV survey poorly performing runs.	As required
Monitoring	Inspect/check all inlets, outlets, to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of pipe manholes for sediment build-up and remove if necessary	Every 5 years or as required

Table 5.1 – Manhole, Catchpit and Pipes Maintenance

5.3 Drainage Channels and Gullies

5.3.1 For the Inspection, drainage channel and gullies, the following maintenance will be required.

Channel and Gully Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Litter and debris removal	Monthly or as required
	Check and remove large vegetation growth near channel runs	Monthly or as required
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or berm adjacent to the paving	3-monthly, 48 hours after large storms
Remedial Actions	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required
Monitoring	Inspect/check all inlets, outlets, to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of gullies for sediment build-up and remove if necessary	Every year or as required

Table 5.2 – Channel and Gully Maintenance

Permeable Paving

5.3.2 For permeable paving areas, the following maintenance is recommended.

Permeable Paving Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Remove debris and leaves etc.	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required- once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting etc	As required
	Rehabilitation of surface and upper substructure	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action.	Three-monthly, 48 hours after large storms in the first six months
	Inspect silt accumulation rates and establish appropriate frequencies for rehabilitation	Annually
	Monitor inspection chambers	Annually

Table 5.3 – Permeable Paving Maintenance Schedule

Green Roofs

5.3.3 For Green roofs, the following maintenance is recommended.

Green Roof Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Table 5.4 – Blue Roof Maintenance

6 SUMMARY AND CONCLUSION

6.1.1 The proposals seek permission to convert the existing building to provide 70 residential. The majority of the site is currently hard surfaced, and the building is positively drained to the public surface water.

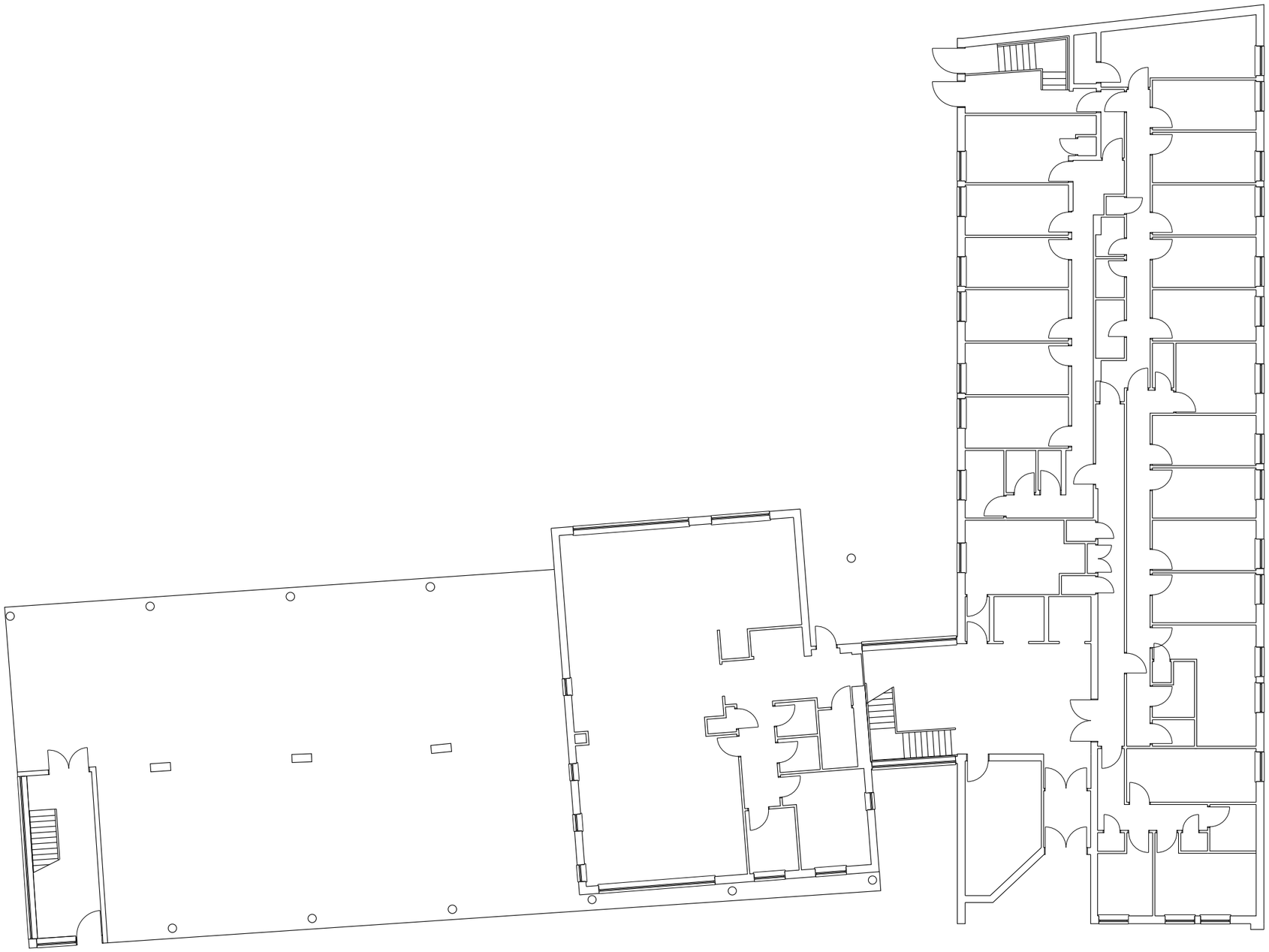
6.1.2 The proposed drainage strategy is to reuse the existing drainage network, for the proposed conversion. Additional soft landscape area will be provided in the existing hard surfaced parking areas which will result in a reduction in the volume and rate of discharge leaving the site. Permeable paving and green/blue roofs will be also be used to attenuate the runoff from the development.

6.1.3 The foul sewage currently serves 216 students, the proposed 70 apartments will generate 50% of the current discharge so there will no issue with the capacity for the proposed development.

6.1.4 The proposed development will result in a reduction in the discharge of both foul and surface water discharges from the development. For the reasons set out above, the proposed development is considered suitable for the development, as there will be no negative impacts on the public sewers or result in increased flood risk in the area.

APPENDIX A

Drawings FLU.1191.3.03 – 09 – Existing Floor Plans



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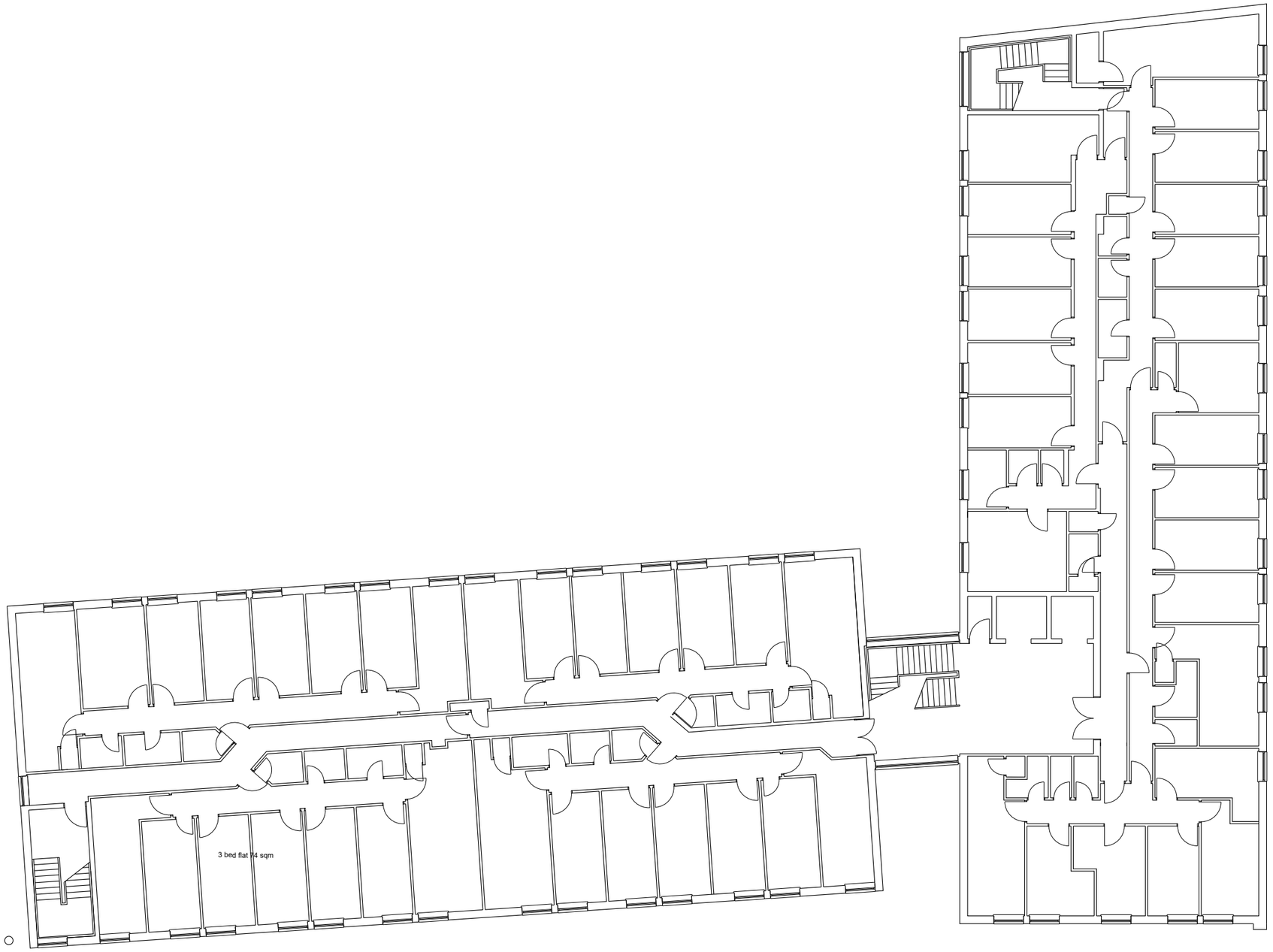
Web: fluent-ads.co.uk

Kingston Bridge House
Church Grove, Hampton Wick

Existing Ground Floor Plan

0 2 4 6 8

Scale: 1:200 @ A3	Dwg No.: FLU.1191.3.03
Date: 07.10.20	Rev
Drawn: N.Millin	



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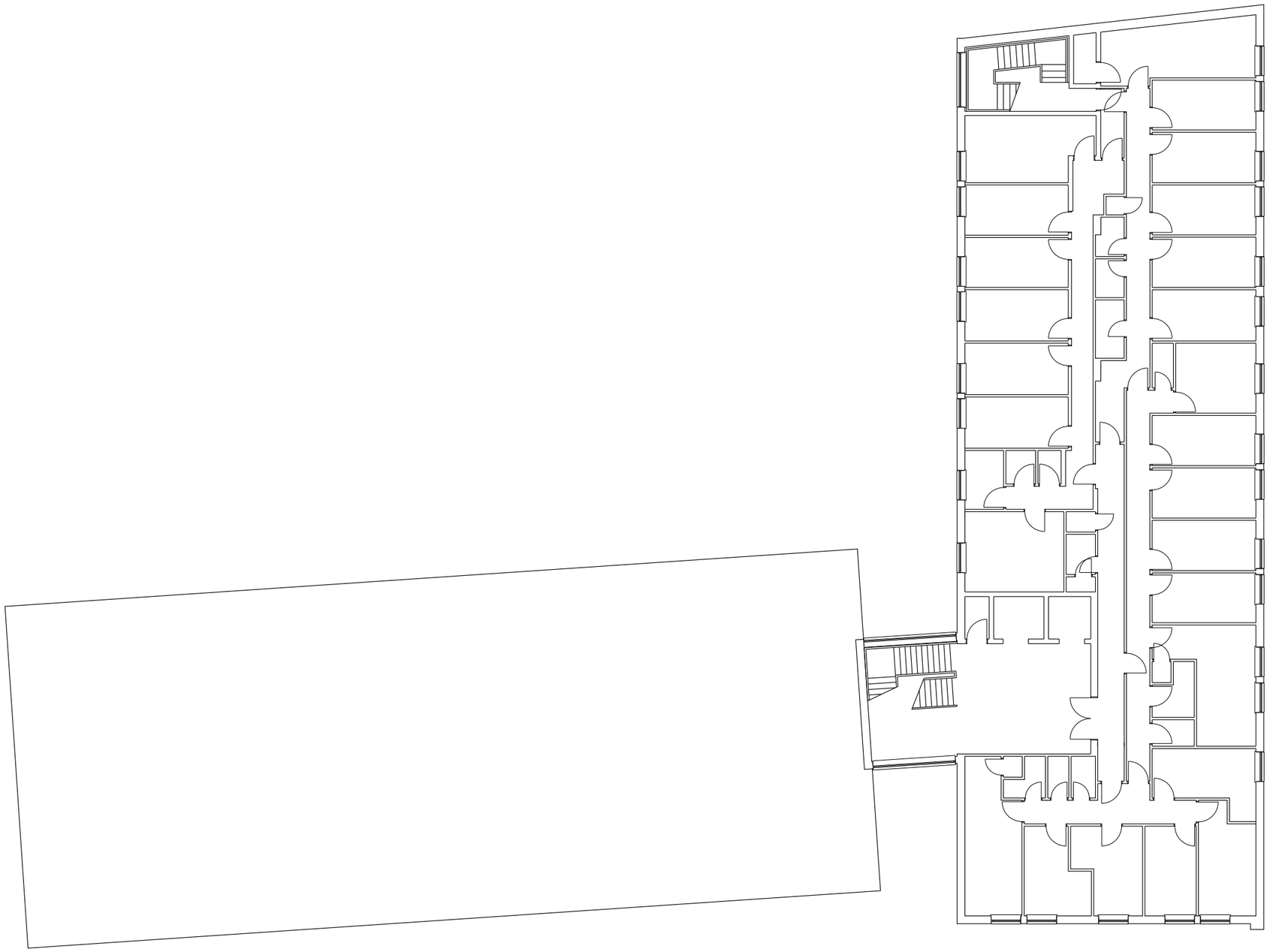
Existing 1st, 2nd & 3rd Floor Plan

0 2 4 6 8

Scale 1:200 @ A3	Dwg No. FLU.1191.3.04
Date 07.10.20	Rev
Drawn N.Millin	



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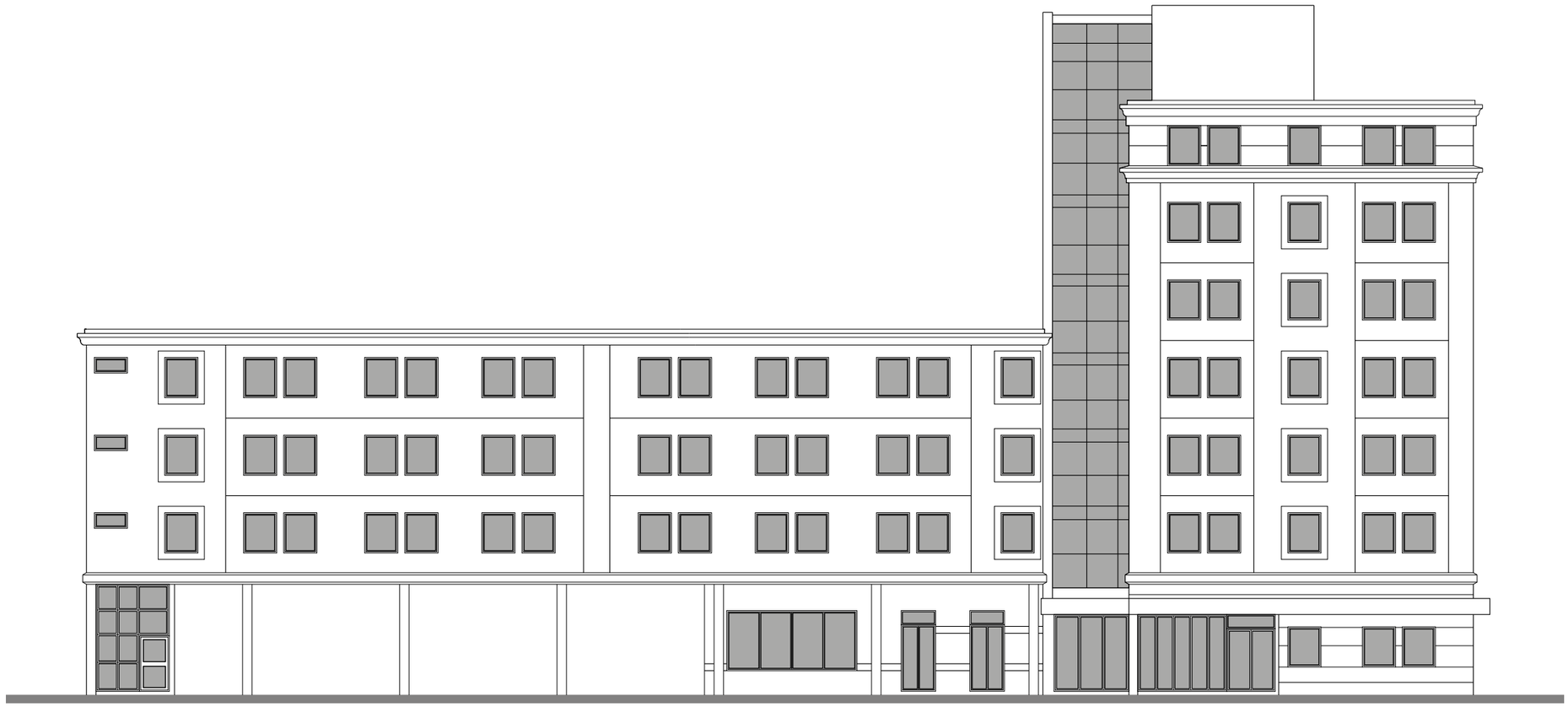
Existing 4th, 5th & 6th Floor Plan

0 2 4 6 8

Scale: 1:200 @ A3	Dwg No.: FLU.1191.3.05
Date: 07.10.20	Rev
Drawn: N.Millin	



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Existing Front Elevation

0 2 4 6 8

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Kingston Bridge House
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Existing Side Elevation

0 2 4 6 8

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Existing Rear Elevation

0 2 4 6 8

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Existing Side Elevation

0 2 4 6 8

Scale 1:200 @ A3	Dwg No. FLU.1191.3.09
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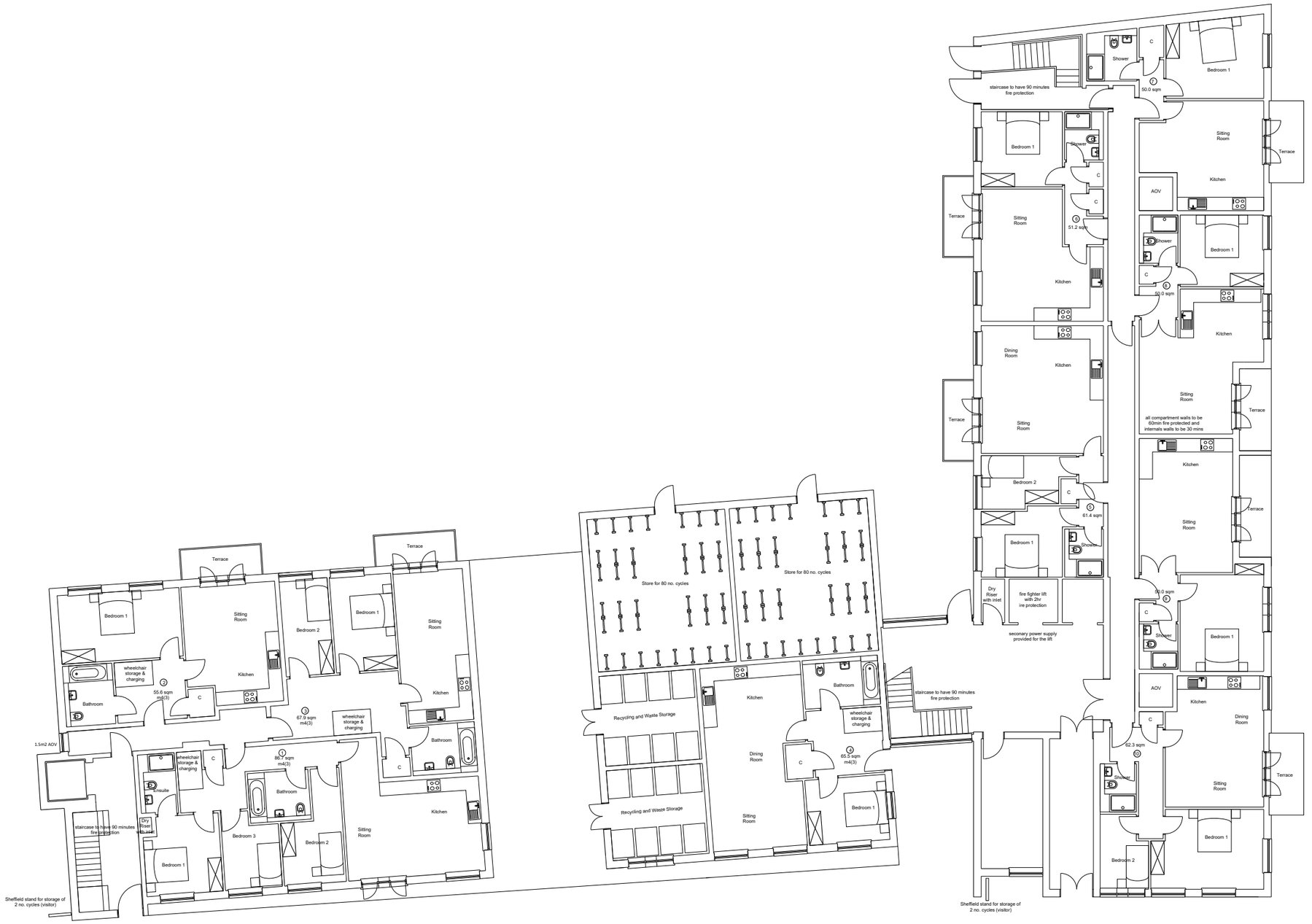
Drawings FLU.1191.3.11 – 17 – Proposed Floor Plans



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Kingston Bridge House
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Proposed Ground Floor Plan

0 2 4 6 8

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Kingston Bridge House
Church Grove, Hampton Wick

Proposed First Floor Plan

0 2 4 6 8

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Kingston Bridge House
Church Grove, Hampton Wick

Proposed Second Floor Plan

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Kingston Bridge House
Church Grove, Hampton Wick

Proposed Third Floor Plan

0 2 4 6 8

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Church Grove, Hampton Wick

Proposed Fourth Floor Plan

0 2 4 6 8

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Kingston Bridge House
Church Grove, Hampton Wick

Proposed Fifth Floor Plan

0 2 4 6 8

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Proposed Sixth Floor Plan

0 2 4 6 8

Scale	Dwg No.
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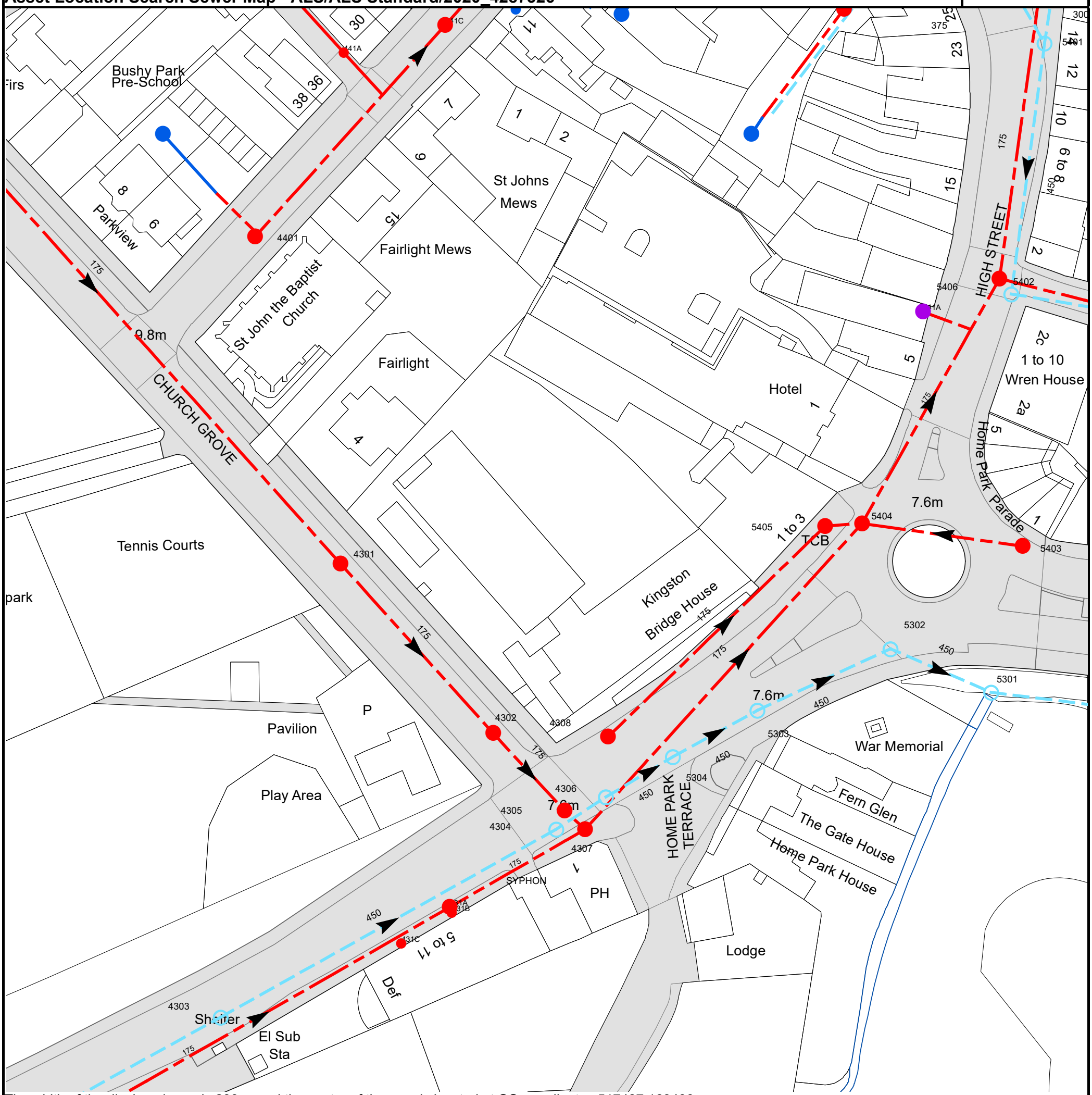
APPENDIX B

Thames Water Record Drawings

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4287326



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 517487,169400

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
441C	n/a	n/a
541A	n/a	n/a
4301	n/a	n/a
5403	n/a	n/a
5405	n/a	n/a
5404	n/a	n/a
5402	n/a	n/a
5406	n/a	n/a
4401	n/a	n/a
44ZY	n/a	n/a
54ZT	n/a	n/a
441A	n/a	n/a
5401	n/a	n/a
54ZY	n/a	n/a
441B	n/a	n/a
54ZR	n/a	n/a
4303	7.23	5.39
431C	n/a	n/a
431B	n/a	n/a
431A	n/a	n/a
4307	7.55	5.43
4304	7.46	5.19
4305	n/a	n/a
4306	7.49	5.18
5304	7.53	5.11
4308	7.61	5.48
4302	n/a	n/a
5303	n/a	n/a
5301	n/a	n/a
5302	n/a	n/a

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ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

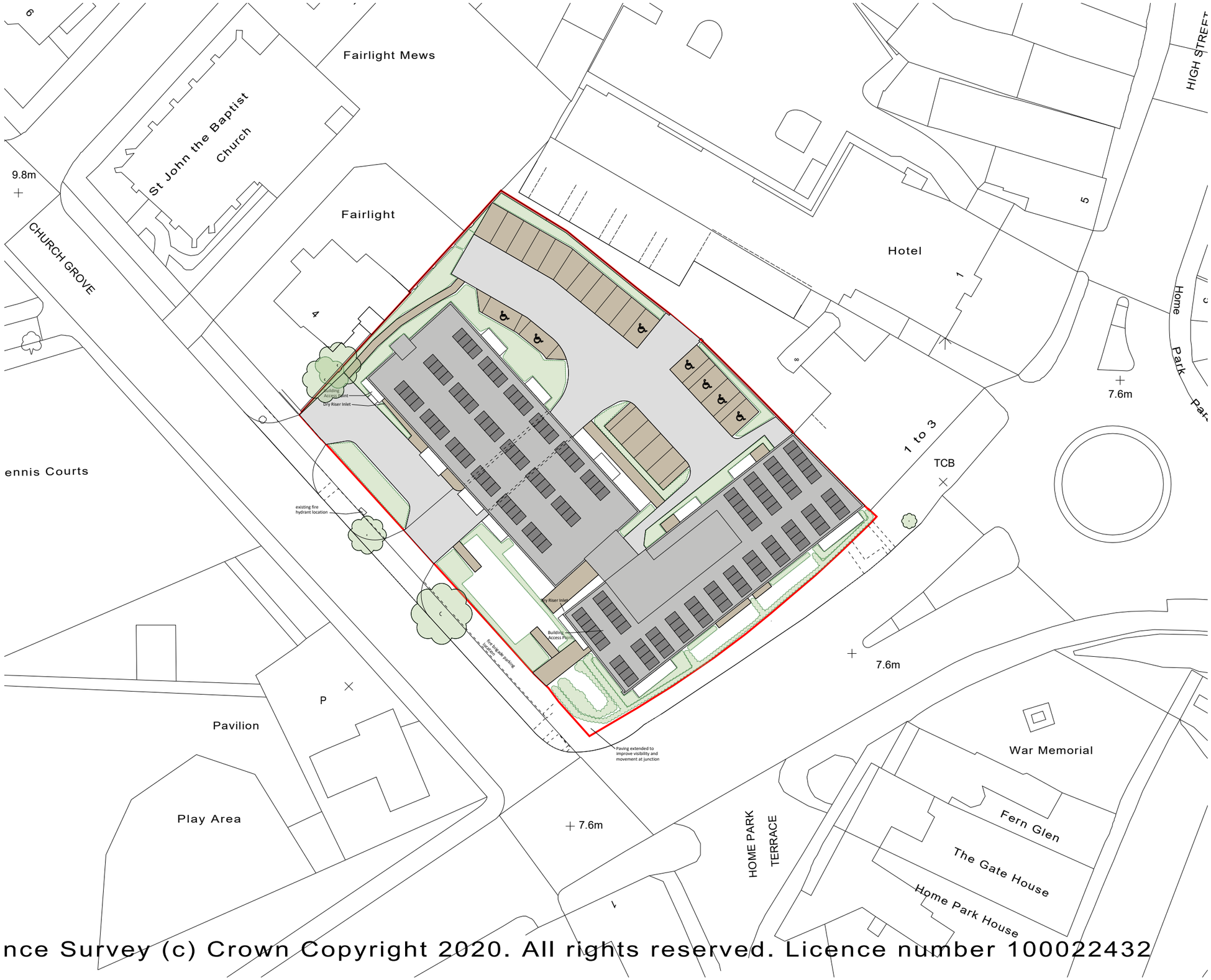
Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

APPENDIX C

Drawings FLU.1191.3.10 – Proposed Site Layout



Rev	Date	Description

Fluent
ARCHITECTURAL DESIGN SERVICES

FLUENT
ARCHITECTURAL DESIGN SERVICES
69-71 Windmill Road, Sunbury,
Middlesex, TW16 7DT
Tel: 0800 0438838
E-mail: info@fluent-ads.co.uk
Web: fluent-ads.co.uk

Kingston Bridge House
Church Grove, Hampton Wick

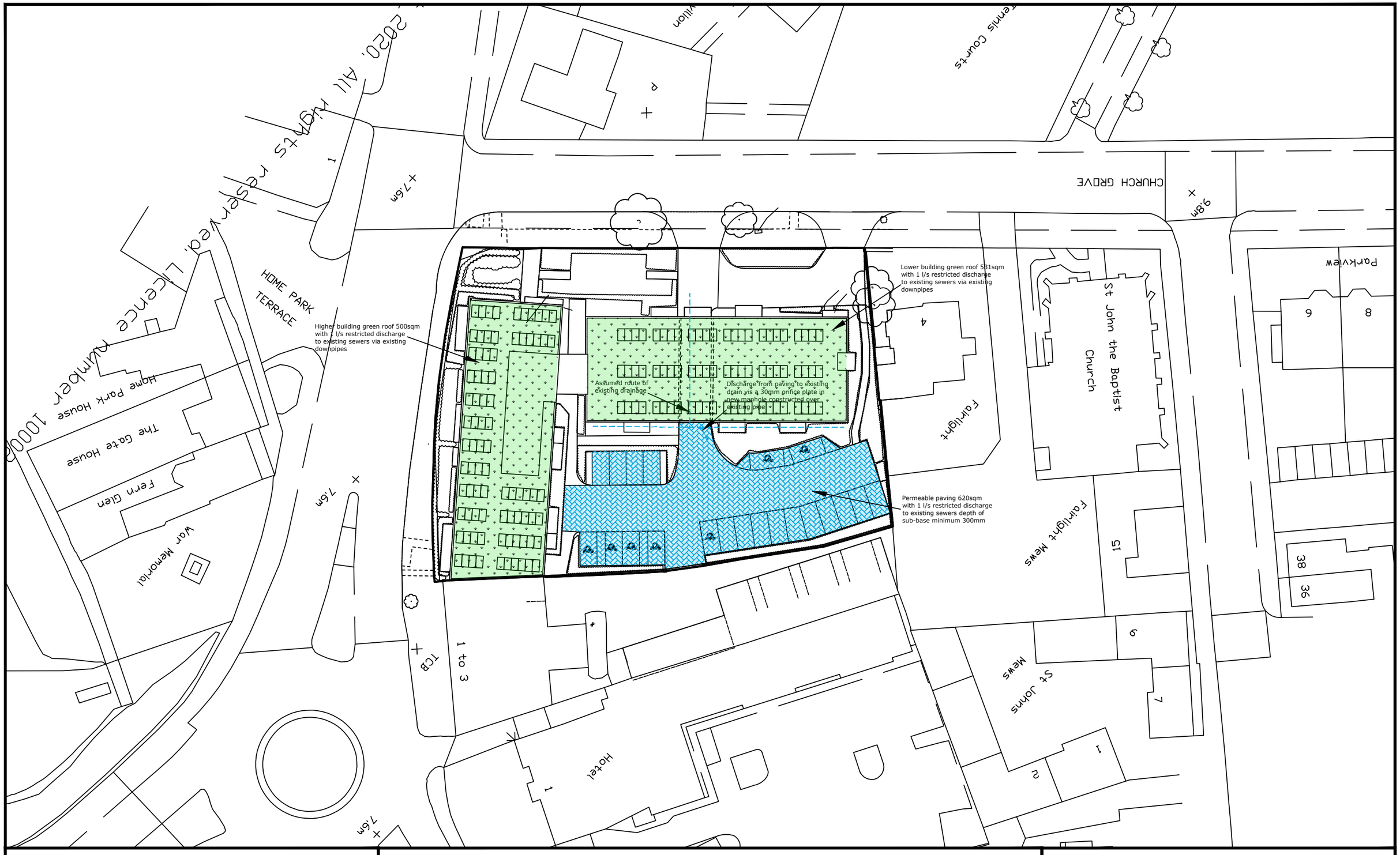
Proposed Site Plan

0 10 20

Scale	1:500 @ A3
Dwg No.	FLU.1191.3.10
Date	07.10.20
Rev	H
Drawn	N.Millin

APPENDIX D

Drawing 201345/DS/01 – Propsoed SuDS layout



Westcombe Group

Kingston Bridge House
Hampton Wick

Drainage Strategy

SCALE	DRAWN BY	PRJ No.	DWG No.
1:200	MK	201345	201345/DS/01 Rev A

LANMOR Consulting
Civil Engineers & Transport Planning
Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
www.lanmor.co.uk

Microdrainage Calulations

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 600 Urban 0.000
Area (ha) 0.277 Soil 0.300 Region Number Region 6

Results l/s

QBAR Rural 0.4
QBAR Urban 0.4

Q100 years 1.3

Q1 year 0.4
Q30 years 1.0
Q100 years 1.3

Summary of Results for 1 year Return Period

Half Drain Time : 100 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	99.473	0.023	0.0	0.1	0.1	0.6	O K
30 min Summer	99.488	0.038	0.0	0.3	0.3	1.5	O K
60 min Summer	99.497	0.047	0.0	0.3	0.3	2.4	O K
120 min Summer	99.503	0.053	0.0	0.4	0.4	3.0	O K
180 min Summer	99.506	0.056	0.0	0.4	0.4	3.3	O K
240 min Summer	99.508	0.058	0.0	0.4	0.4	3.5	O K
360 min Summer	99.510	0.060	0.0	0.4	0.4	3.7	O K
480 min Summer	99.510	0.060	0.0	0.4	0.4	3.8	O K
600 min Summer	99.510	0.060	0.0	0.4	0.4	3.7	O K
720 min Summer	99.509	0.059	0.0	0.4	0.4	3.6	O K
960 min Summer	99.507	0.057	0.0	0.4	0.4	3.4	O K
1440 min Summer	99.503	0.053	0.0	0.4	0.4	2.9	O K
2160 min Summer	99.497	0.047	0.0	0.3	0.3	2.3	O K
2880 min Summer	99.492	0.042	0.0	0.3	0.3	1.8	O K
4320 min Summer	99.486	0.036	0.0	0.2	0.2	1.4	O K
5760 min Summer	99.482	0.032	0.0	0.2	0.2	1.1	O K
7200 min Summer	99.479	0.029	0.0	0.2	0.2	0.9	O K
8640 min Summer	99.477	0.027	0.0	0.2	0.2	0.7	O K
10080 min Summer	99.475	0.025	0.0	0.1	0.1	0.6	O K
15 min Winter	99.480	0.030	0.0	0.2	0.2	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	31.271	0.0	0.6	19
30 min Summer	20.316	0.0	1.7	33
60 min Summer	12.800	0.0	2.9	62
120 min Summer	7.899	0.0	4.2	108
180 min Summer	5.927	0.0	5.1	138
240 min Summer	4.828	0.0	5.7	170
360 min Summer	3.597	0.0	6.7	238
480 min Summer	2.909	0.0	7.3	306
600 min Summer	2.468	0.0	7.8	374
720 min Summer	2.157	0.0	8.2	440
960 min Summer	1.744	0.0	8.9	568
1440 min Summer	1.294	0.0	9.7	820
2160 min Summer	0.960	0.0	10.5	1168
2880 min Summer	0.776	0.0	10.8	1528
4320 min Summer	0.575	0.0	11.0	2248
5760 min Summer	0.465	0.0	10.7	2944
7200 min Summer	0.395	0.0	10.4	3680
8640 min Summer	0.345	0.0	10.2	4408
10080 min Summer	0.308	0.0	10.1	5144
15 min Winter	31.271	0.0	1.0	18

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	99.494	0.044	0.0	0.3	0.3	2.0	O K
60 min Winter	99.504	0.054	0.0	0.4	0.4	3.0	O K
120 min Winter	99.510	0.060	0.0	0.4	0.4	3.8	O K
180 min Winter	99.513	0.063	0.0	0.4	0.4	4.1	O K
240 min Winter	99.514	0.064	0.0	0.4	0.4	4.3	O K
360 min Winter	99.515	0.065	0.0	0.4	0.4	4.4	O K
480 min Winter	99.514	0.064	0.0	0.4	0.4	4.3	O K
600 min Winter	99.512	0.062	0.0	0.4	0.4	4.1	O K
720 min Winter	99.511	0.061	0.0	0.4	0.4	3.9	O K
960 min Winter	99.507	0.057	0.0	0.4	0.4	3.4	O K
1440 min Winter	99.500	0.050	0.0	0.4	0.4	2.6	O K
2160 min Winter	99.492	0.042	0.0	0.3	0.3	1.8	O K
2880 min Winter	99.487	0.037	0.0	0.3	0.3	1.4	O K
4320 min Winter	99.480	0.030	0.0	0.2	0.2	1.0	O K
5760 min Winter	99.476	0.026	0.0	0.1	0.1	0.7	O K
7200 min Winter	99.474	0.024	0.0	0.1	0.1	0.6	O K
8640 min Winter	99.471	0.021	0.0	0.1	0.1	0.5	O K
10080 min Winter	99.469	0.019	0.0	0.1	0.1	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	20.316	0.0	2.3	32
60 min Winter	12.800	0.0	3.6	60
120 min Winter	7.899	0.0	5.1	116
180 min Winter	5.927	0.0	6.1	144
240 min Winter	4.828	0.0	6.8	182
360 min Winter	3.597	0.0	7.9	258
480 min Winter	2.909	0.0	8.6	332
600 min Winter	2.468	0.0	9.2	402
720 min Winter	2.157	0.0	9.7	470
960 min Winter	1.744	0.0	10.5	604
1440 min Winter	1.294	0.0	11.5	850
2160 min Winter	0.960	0.0	12.5	1188
2880 min Winter	0.776	0.0	13.0	1532
4320 min Winter	0.575	0.0	13.5	2248
5760 min Winter	0.465	0.0	13.5	2992
7200 min Winter	0.395	0.0	13.2	3672
8640 min Winter	0.345	0.0	12.8	4328
10080 min Winter	0.308	0.0	12.5	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Model Details

Storage is Online Cover Level (m) 100.000

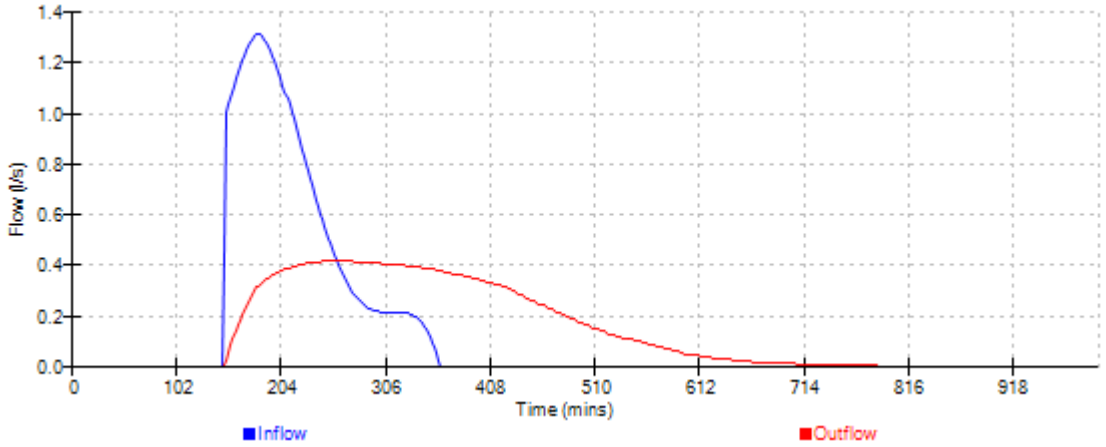
Porous Car Park Structure

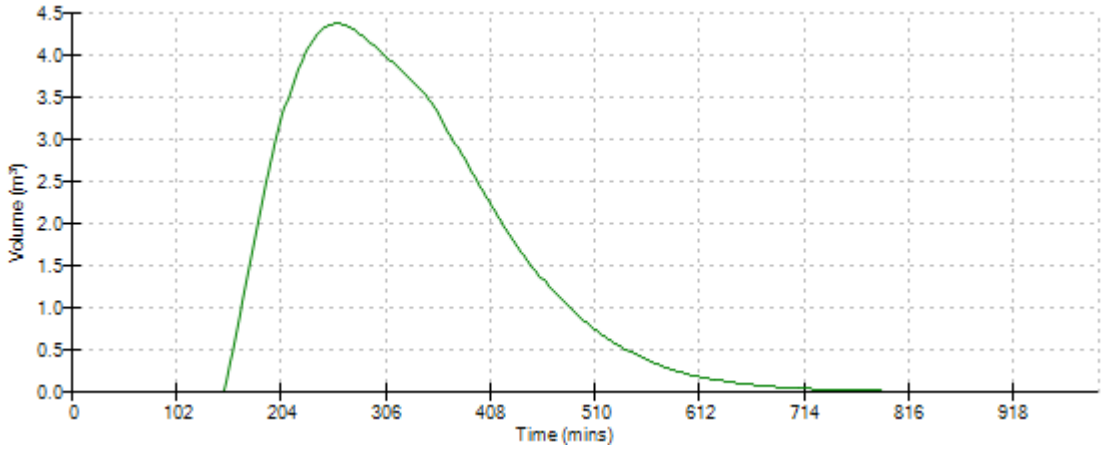
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.0
Membrane Percolation (mm/hr)	1000	Length (m)	44.0
Max Percolation (l/s)	171.1	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.450	Cap Volume Depth (m)	0.300

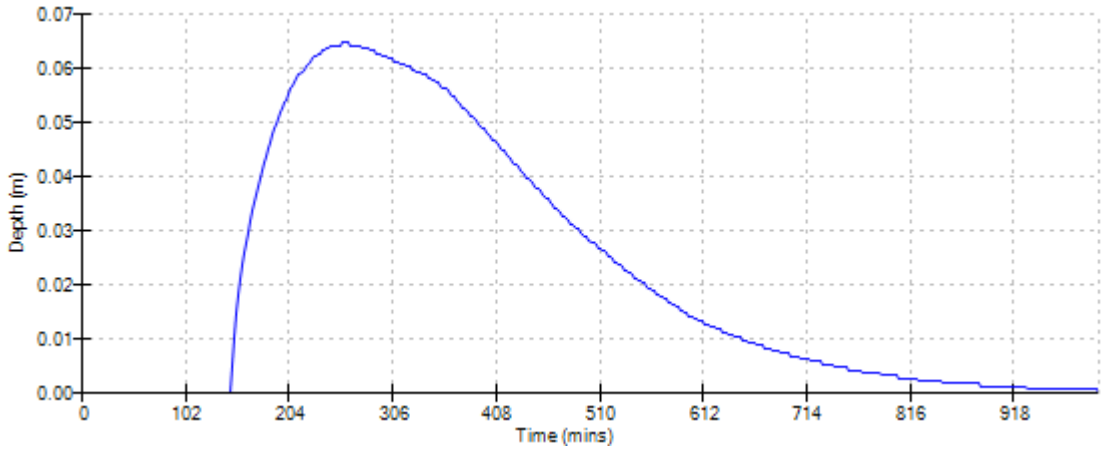
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.450

Event: 360 min Winter







Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.806	0.006	0.0	3.1	Flood Risk
30 min Summer	99.808	0.008	0.0	4.0	Flood Risk
60 min Summer	99.810	0.010	0.0	5.1	Flood Risk
120 min Summer	99.812	0.012	0.0	6.2	Flood Risk
180 min Summer	99.813	0.013	0.0	6.9	Flood Risk
240 min Summer	99.814	0.014	0.0	7.4	Flood Risk
360 min Summer	99.815	0.015	0.1	8.0	Flood Risk
480 min Summer	99.816	0.016	0.1	8.4	Flood Risk
600 min Summer	99.816	0.016	0.1	8.7	Flood Risk
720 min Summer	99.817	0.017	0.1	8.9	Flood Risk
960 min Summer	99.817	0.017	0.1	9.1	Flood Risk
1440 min Summer	99.818	0.018	0.1	9.4	Flood Risk
2160 min Summer	99.818	0.018	0.1	9.7	Flood Risk
2880 min Summer	99.819	0.019	0.1	9.8	Flood Risk
4320 min Summer	99.819	0.019	0.1	9.8	Flood Risk
5760 min Summer	99.818	0.018	0.1	9.7	Flood Risk
7200 min Summer	99.818	0.018	0.1	9.5	Flood Risk
8640 min Summer	99.818	0.018	0.1	9.3	Flood Risk
10080 min Summer	99.817	0.017	0.1	9.1	Flood Risk
15 min Winter	99.807	0.007	0.0	3.5	Flood Risk
30 min Winter	99.808	0.008	0.0	4.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	31.271	0.0	0.6	19
30 min Summer	20.316	0.0	1.0	34
60 min Summer	12.800	0.0	2.3	64
120 min Summer	7.899	0.0	3.1	124
180 min Summer	5.927	0.0	3.7	184
240 min Summer	4.828	0.0	4.1	242
360 min Summer	3.597	0.0	4.8	362
480 min Summer	2.909	0.0	5.2	482
600 min Summer	2.468	0.0	5.6	600
720 min Summer	2.157	0.0	6.0	720
960 min Summer	1.744	0.0	6.5	818
1440 min Summer	1.294	0.0	7.1	1050
2160 min Summer	0.960	0.0	10.6	1448
2880 min Summer	0.776	0.0	11.3	1844
4320 min Summer	0.575	0.0	12.0	2640
5760 min Summer	0.465	0.0	15.7	3456
7200 min Summer	0.395	0.0	16.5	4184
8640 min Summer	0.345	0.0	17.0	4928
10080 min Summer	0.308	0.0	17.3	5656
15 min Winter	31.271	0.0	0.8	19
30 min Winter	20.316	0.0	1.2	34

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.811	0.011	0.0	5.7	Flood Risk
120 min Winter	99.813	0.013	0.0	6.9	Flood Risk
180 min Winter	99.814	0.014	0.1	7.7	Flood Risk
240 min Winter	99.816	0.016	0.1	8.2	Flood Risk
360 min Winter	99.817	0.017	0.1	9.0	Flood Risk
480 min Winter	99.818	0.018	0.1	9.4	Flood Risk
600 min Winter	99.818	0.018	0.1	9.7	Flood Risk
720 min Winter	99.819	0.019	0.1	9.9	Flood Risk
960 min Winter	99.819	0.019	0.1	10.1	Flood Risk
1440 min Winter	99.820	0.020	0.1	10.4	Flood Risk
2160 min Winter	99.820	0.020	0.1	10.6	Flood Risk
2880 min Winter	99.820	0.020	0.1	10.6	Flood Risk
4320 min Winter	99.819	0.019	0.1	10.3	Flood Risk
5760 min Winter	99.819	0.019	0.1	9.9	Flood Risk
7200 min Winter	99.818	0.018	0.1	9.6	Flood Risk
8640 min Winter	99.817	0.017	0.1	9.2	Flood Risk
10080 min Winter	99.817	0.017	0.1	8.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	12.800	0.0	2.7	64
120 min Winter	7.899	0.0	3.7	122
180 min Winter	5.927	0.0	4.3	180
240 min Winter	4.828	0.0	4.8	238
360 min Winter	3.597	0.0	5.6	354
480 min Winter	2.909	0.0	6.2	468
600 min Winter	2.468	0.0	6.6	580
720 min Winter	2.157	0.0	7.0	686
960 min Winter	1.744	0.0	7.5	876
1440 min Winter	1.294	0.0	8.3	1094
2160 min Winter	0.960	0.0	12.1	1552
2880 min Winter	0.776	0.0	13.0	1988
4320 min Winter	0.575	0.0	13.8	2812
5760 min Winter	0.465	0.0	17.8	3632
7200 min Winter	0.395	0.0	18.7	4400
8640 min Winter	0.345	0.0	19.3	5184
10080 min Winter	0.308	0.0	19.6	5952

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.053

Time (mins) From:	To:	Area (ha)
0	4	0.053

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

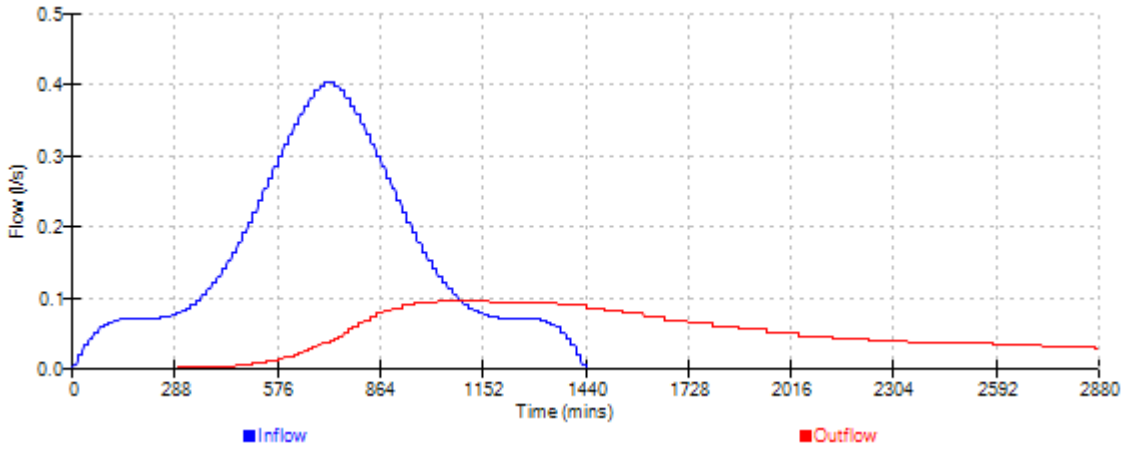
Invert Level (m) 99.800

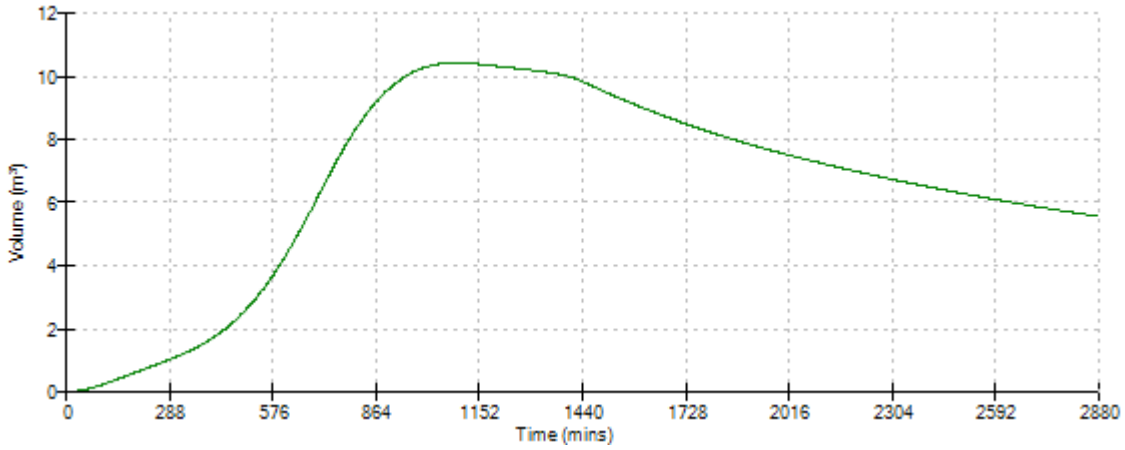
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	531.0	0.200	531.0

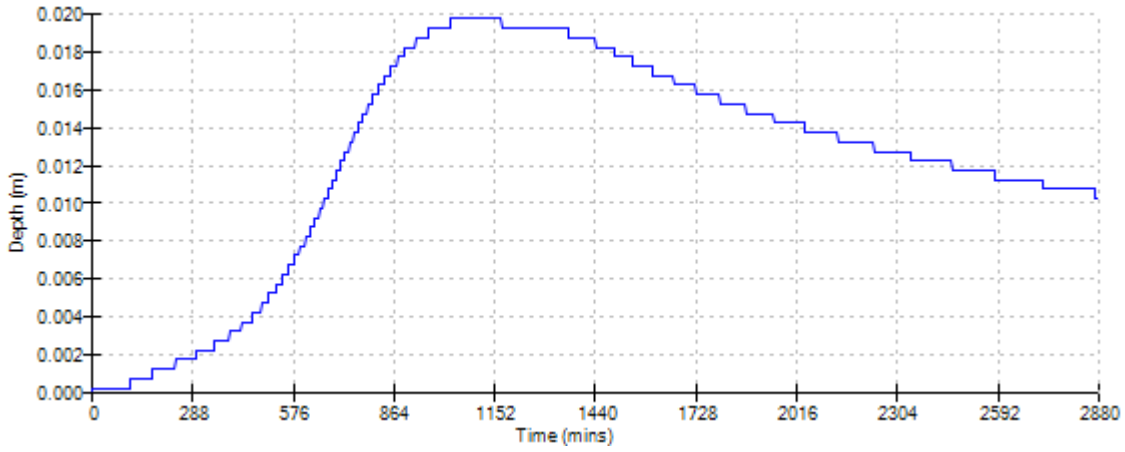
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.800

Event: 1440 min Winter







Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.806	0.006	0.0	2.9	Flood Risk
30 min Summer	99.808	0.008	0.0	3.8	Flood Risk
60 min Summer	99.810	0.010	0.0	4.8	Flood Risk
120 min Summer	99.812	0.012	0.0	5.8	Flood Risk
180 min Summer	99.813	0.013	0.0	6.5	Flood Risk
240 min Summer	99.814	0.014	0.0	6.9	Flood Risk
360 min Summer	99.815	0.015	0.1	7.6	Flood Risk
480 min Summer	99.816	0.016	0.1	7.9	Flood Risk
600 min Summer	99.816	0.016	0.1	8.1	Flood Risk
720 min Summer	99.817	0.017	0.1	8.3	Flood Risk
960 min Summer	99.817	0.017	0.1	8.5	Flood Risk
1440 min Summer	99.818	0.018	0.1	8.8	Flood Risk
2160 min Summer	99.818	0.018	0.1	9.1	Flood Risk
2880 min Summer	99.818	0.018	0.1	9.2	Flood Risk
4320 min Summer	99.818	0.018	0.1	9.1	Flood Risk
5760 min Summer	99.818	0.018	0.1	9.0	Flood Risk
7200 min Summer	99.818	0.018	0.1	8.8	Flood Risk
8640 min Summer	99.817	0.017	0.1	8.6	Flood Risk
10080 min Summer	99.817	0.017	0.1	8.4	Flood Risk
15 min Winter	99.807	0.007	0.0	3.3	Flood Risk
30 min Winter	99.809	0.009	0.0	4.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	31.271	0.0	0.6	19
30 min Summer	20.316	0.0	1.0	34
60 min Summer	12.800	0.0	2.2	64
120 min Summer	7.899	0.0	3.0	124
180 min Summer	5.927	0.0	3.6	184
240 min Summer	4.828	0.0	4.0	242
360 min Summer	3.597	0.0	4.6	362
480 min Summer	2.909	0.0	5.1	482
600 min Summer	2.468	0.0	5.5	600
720 min Summer	2.157	0.0	5.8	714
960 min Summer	1.744	0.0	6.2	810
1440 min Summer	1.294	0.0	6.9	1026
2160 min Summer	0.960	0.0	10.1	1428
2880 min Summer	0.776	0.0	10.8	1844
4320 min Summer	0.575	0.0	11.5	2636
5760 min Summer	0.465	0.0	14.9	3408
7200 min Summer	0.395	0.0	15.7	4176
8640 min Summer	0.345	0.0	16.2	4928
10080 min Summer	0.308	0.0	16.4	5656
15 min Winter	31.271	0.0	0.8	19
30 min Winter	20.316	0.0	1.2	34

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.811	0.011	0.0	5.3	Flood Risk
120 min Winter	99.813	0.013	0.0	6.5	Flood Risk
180 min Winter	99.814	0.014	0.1	7.2	Flood Risk
240 min Winter	99.816	0.016	0.1	7.8	Flood Risk
360 min Winter	99.817	0.017	0.1	8.4	Flood Risk
480 min Winter	99.818	0.018	0.1	8.8	Flood Risk
600 min Winter	99.818	0.018	0.1	9.1	Flood Risk
720 min Winter	99.818	0.018	0.1	9.2	Flood Risk
960 min Winter	99.819	0.019	0.1	9.4	Flood Risk
1440 min Winter	99.819	0.019	0.1	9.7	Flood Risk
2160 min Winter	99.820	0.020	0.1	9.9	Flood Risk
2880 min Winter	99.820	0.020	0.1	9.8	Flood Risk
4320 min Winter	99.819	0.019	0.1	9.5	Flood Risk
5760 min Winter	99.818	0.018	0.1	9.1	Flood Risk
7200 min Winter	99.818	0.018	0.1	8.8	Flood Risk
8640 min Winter	99.817	0.017	0.1	8.5	Flood Risk
10080 min Winter	99.817	0.017	0.1	8.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	12.800	0.0	2.6	64
120 min Winter	7.899	0.0	3.6	122
180 min Winter	5.927	0.0	4.2	180
240 min Winter	4.828	0.0	4.7	238
360 min Winter	3.597	0.0	5.4	354
480 min Winter	2.909	0.0	6.0	468
600 min Winter	2.468	0.0	6.4	578
720 min Winter	2.157	0.0	6.7	686
960 min Winter	1.744	0.0	7.3	866
1440 min Winter	1.294	0.0	8.0	1082
2160 min Winter	0.960	0.0	11.6	1532
2880 min Winter	0.776	0.0	12.4	1960
4320 min Winter	0.575	0.0	13.2	2772
5760 min Winter	0.465	0.0	16.9	3584
7200 min Winter	0.395	0.0	17.8	4328
8640 min Winter	0.345	0.0	18.4	5096
10080 min Winter	0.308	0.0	18.6	5848

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.050

Time (mins) From:	To:	Area (ha)
0	4	0.050

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

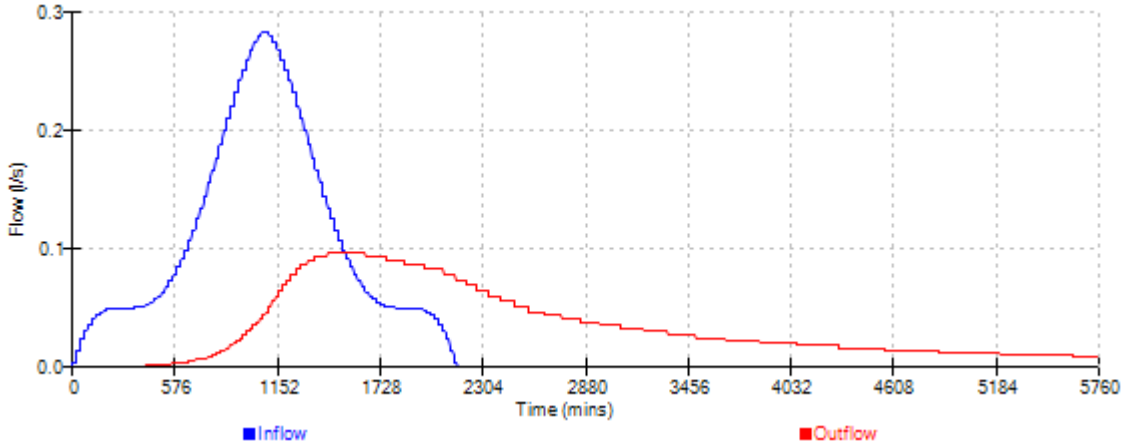
Invert Level (m) 99.800

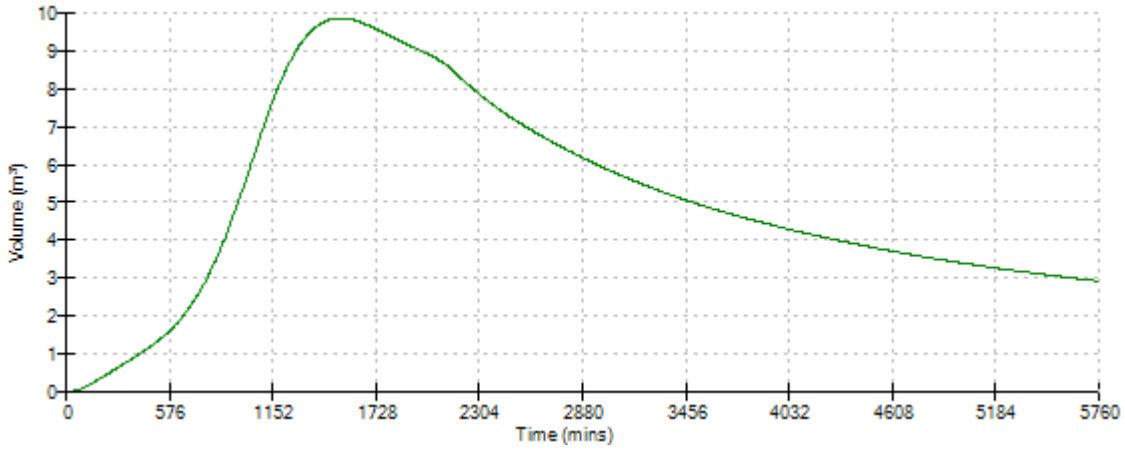
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	500.0	0.200	500.0

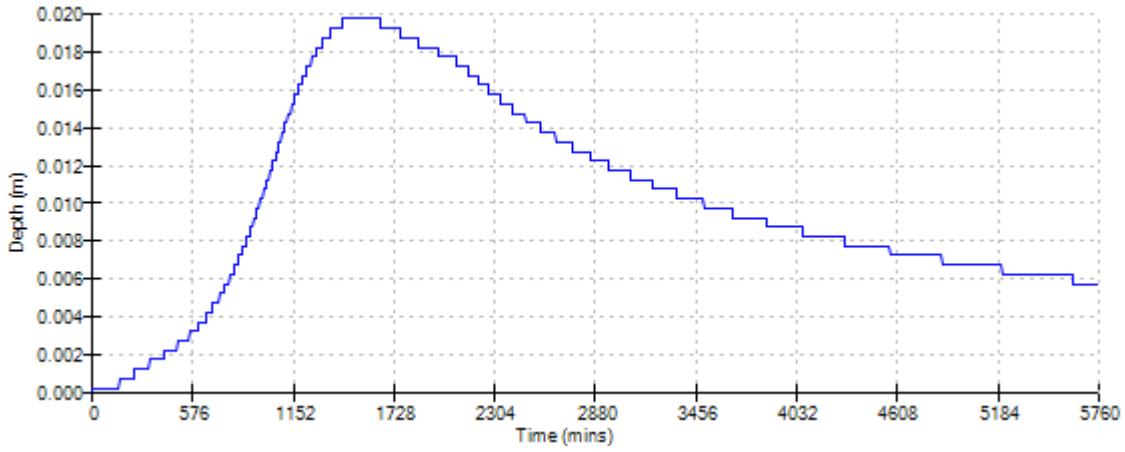
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.800

Event: 2160 min Winter







Summary of Results for 30 year Return Period

Half Drain Time : 235 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	99.524	0.074	0.0	0.5	0.5	5.7	O K
30 min Summer	99.538	0.088	0.0	0.5	0.5	8.1	O K
60 min Summer	99.550	0.100	0.0	0.5	0.5	10.3	O K
120 min Summer	99.559	0.109	0.0	0.6	0.6	12.0	O K
180 min Summer	99.562	0.112	0.0	0.6	0.6	12.5	O K
240 min Summer	99.562	0.112	0.0	0.6	0.6	12.6	O K
360 min Summer	99.563	0.113	0.0	0.6	0.6	12.7	O K
480 min Summer	99.562	0.112	0.0	0.6	0.6	12.6	O K
600 min Summer	99.561	0.111	0.0	0.6	0.6	12.4	O K
720 min Summer	99.559	0.109	0.0	0.6	0.6	12.1	O K
960 min Summer	99.555	0.105	0.0	0.6	0.6	11.4	O K
1440 min Summer	99.547	0.097	0.0	0.5	0.5	9.8	O K
2160 min Summer	99.536	0.086	0.0	0.5	0.5	7.8	O K
2880 min Summer	99.527	0.077	0.0	0.5	0.5	6.2	O K
4320 min Summer	99.513	0.063	0.0	0.4	0.4	4.1	O K
5760 min Summer	99.502	0.052	0.0	0.4	0.4	2.9	O K
7200 min Summer	99.495	0.045	0.0	0.3	0.3	2.1	O K
8640 min Summer	99.491	0.041	0.0	0.3	0.3	1.7	O K
10080 min Summer	99.488	0.038	0.0	0.3	0.3	1.5	O K
15 min Winter	99.530	0.080	0.0	0.5	0.5	6.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.734	0.0	6.0	18
30 min Summer	49.733	0.0	8.6	33
60 min Summer	30.811	0.0	11.4	62
120 min Summer	18.530	0.0	14.3	120
180 min Summer	13.620	0.0	16.0	176
240 min Summer	10.901	0.0	17.2	202
360 min Summer	7.944	0.0	19.0	262
480 min Summer	6.344	0.0	20.3	330
600 min Summer	5.326	0.0	21.3	398
720 min Summer	4.615	0.0	22.2	468
960 min Summer	3.679	0.0	23.5	604
1440 min Summer	2.670	0.0	25.4	866
2160 min Summer	1.936	0.0	27.1	1252
2880 min Summer	1.540	0.0	28.1	1612
4320 min Summer	1.114	0.0	29.3	2332
5760 min Summer	0.885	0.0	29.7	3008
7200 min Summer	0.740	0.0	29.7	3680
8640 min Summer	0.640	0.0	29.4	4408
10080 min Summer	0.565	0.0	28.9	5144
15 min Winter	76.734	0.0	7.0	18

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 Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.545	0.095	0.0	0.5	0.5	9.5	O K
60 min Winter	99.559	0.109	0.0	0.6	0.6	12.0	O K
120 min Winter	99.570	0.120	0.0	0.6	0.6	14.0	O K
180 min Winter	99.573	0.123	0.0	0.6	0.6	14.6	O K
240 min Winter	99.574	0.124	0.0	0.6	0.6	14.7	O K
360 min Winter	99.573	0.123	0.0	0.6	0.6	14.6	O K
480 min Winter	99.571	0.121	0.0	0.6	0.6	14.3	O K
600 min Winter	99.569	0.119	0.0	0.6	0.6	13.9	O K
720 min Winter	99.566	0.116	0.0	0.6	0.6	13.3	O K
960 min Winter	99.560	0.110	0.0	0.6	0.6	12.2	O K
1440 min Winter	99.548	0.098	0.0	0.5	0.5	9.9	O K
2160 min Winter	99.532	0.082	0.0	0.5	0.5	7.1	O K
2880 min Winter	99.520	0.070	0.0	0.4	0.4	5.1	O K
4320 min Winter	99.502	0.052	0.0	0.4	0.4	2.8	O K
5760 min Winter	99.492	0.042	0.0	0.3	0.3	1.8	O K
7200 min Winter	99.487	0.037	0.0	0.3	0.3	1.4	O K
8640 min Winter	99.483	0.033	0.0	0.2	0.2	1.1	O K
10080 min Winter	99.480	0.030	0.0	0.2	0.2	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.733	0.0	10.0	33
60 min Winter	30.811	0.0	13.1	62
120 min Winter	18.530	0.0	16.4	118
180 min Winter	13.620	0.0	18.3	174
240 min Winter	10.901	0.0	19.7	226
360 min Winter	7.944	0.0	21.7	280
480 min Winter	6.344	0.0	23.2	356
600 min Winter	5.326	0.0	24.3	432
720 min Winter	4.615	0.0	25.3	506
960 min Winter	3.679	0.0	26.8	652
1440 min Winter	2.670	0.0	29.0	924
2160 min Winter	1.936	0.0	31.1	1300
2880 min Winter	1.540	0.0	32.4	1672
4320 min Winter	1.114	0.0	33.9	2336
5760 min Winter	0.885	0.0	34.7	2992
7200 min Winter	0.740	0.0	34.9	3672
8640 min Winter	0.640	0.0	34.9	4392
10080 min Winter	0.565	0.0	34.6	5144

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Model Details

Storage is Online Cover Level (m) 100.000

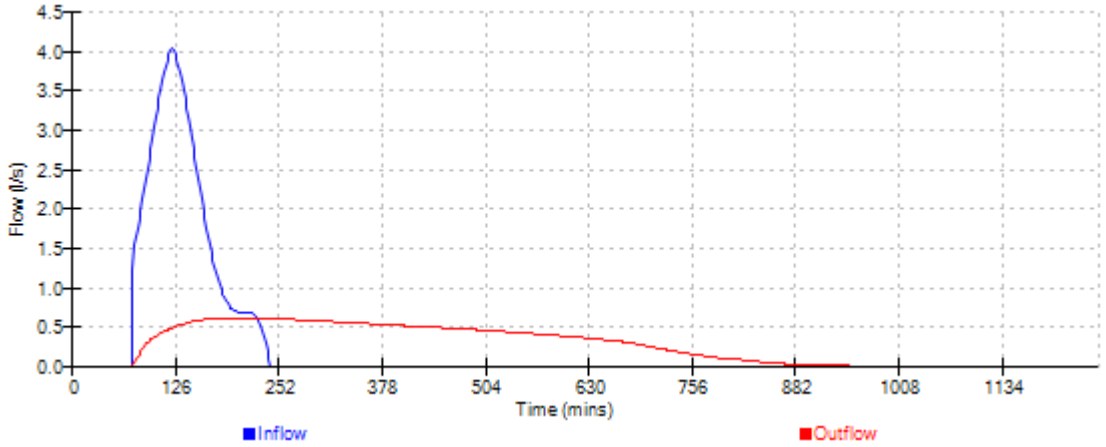
Porous Car Park Structure

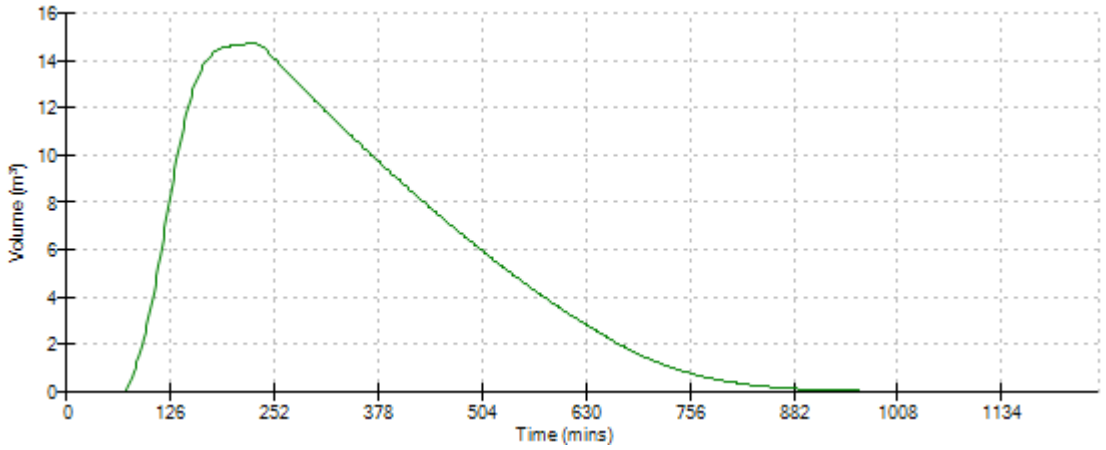
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.0
Membrane Percolation (mm/hr)	1000	Length (m)	44.0
Max Percolation (l/s)	171.1	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.450	Cap Volume Depth (m)	0.300

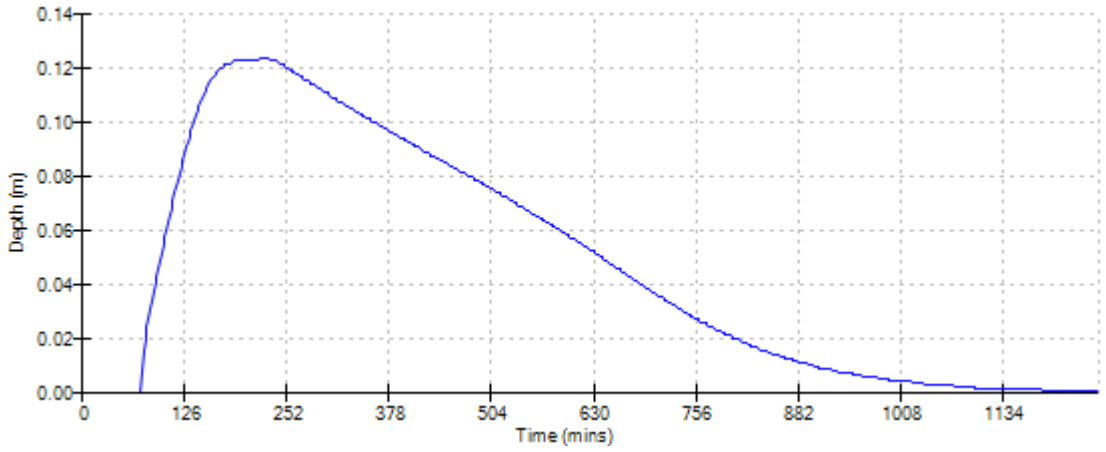
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.450

Event: 240 min Winter







Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.814	0.014	0.1	7.6	Flood Risk
30 min Summer	99.818	0.018	0.1	9.8	Flood Risk
60 min Summer	99.823	0.023	0.1	12.1	Flood Risk
120 min Summer	99.827	0.027	0.2	14.2	Flood Risk
180 min Summer	99.829	0.029	0.2	15.4	Flood Risk
240 min Summer	99.830	0.030	0.2	16.1	Flood Risk
360 min Summer	99.832	0.032	0.2	16.9	Flood Risk
480 min Summer	99.833	0.033	0.2	17.3	Flood Risk
600 min Summer	99.833	0.033	0.2	17.5	Flood Risk
720 min Summer	99.833	0.033	0.2	17.6	Flood Risk
960 min Summer	99.834	0.034	0.2	17.8	Flood Risk
1440 min Summer	99.834	0.034	0.2	18.0	Flood Risk
2160 min Summer	99.834	0.034	0.2	18.0	Flood Risk
2880 min Summer	99.833	0.033	0.2	17.7	Flood Risk
4320 min Summer	99.832	0.032	0.2	16.9	Flood Risk
5760 min Summer	99.830	0.030	0.2	16.1	Flood Risk
7200 min Summer	99.829	0.029	0.2	15.4	Flood Risk
8640 min Summer	99.828	0.028	0.2	14.7	Flood Risk
10080 min Summer	99.827	0.027	0.2	14.2	Flood Risk
15 min Winter	99.816	0.016	0.1	8.5	Flood Risk
30 min Winter	99.821	0.021	0.1	11.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.734	0.0	2.8	19
30 min Summer	49.733	0.0	4.3	34
60 min Summer	30.811	0.0	8.0	64
120 min Summer	18.530	0.0	10.1	124
180 min Summer	13.620	0.0	11.4	182
240 min Summer	10.901	0.0	12.4	242
360 min Summer	7.944	0.0	13.7	362
480 min Summer	6.344	0.0	14.7	480
600 min Summer	5.326	0.0	15.5	550
720 min Summer	4.615	0.0	16.1	600
960 min Summer	3.679	0.0	17.0	714
1440 min Summer	2.670	0.0	18.1	980
2160 min Summer	1.936	0.0	23.9	1384
2880 min Summer	1.540	0.0	25.2	1788
4320 min Summer	1.114	0.0	26.3	2592
5760 min Summer	0.885	0.0	31.5	3352
7200 min Summer	0.740	0.0	32.7	4112
8640 min Summer	0.640	0.0	33.5	4848
10080 min Summer	0.565	0.0	33.8	5648
15 min Winter	76.734	0.0	3.4	19
30 min Winter	49.733	0.0	5.1	34

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.825	0.025	0.1	13.5	Flood Risk
120 min Winter	99.830	0.030	0.2	15.9	Flood Risk
180 min Winter	99.832	0.032	0.2	17.2	Flood Risk
240 min Winter	99.834	0.034	0.2	18.0	Flood Risk
360 min Winter	99.836	0.036	0.2	18.9	Flood Risk
480 min Winter	99.836	0.036	0.2	19.4	Flood Risk
600 min Winter	99.837	0.037	0.3	19.6	Flood Risk
720 min Winter	99.837	0.037	0.3	19.6	Flood Risk
960 min Winter	99.837	0.037	0.3	19.8	Flood Risk
1440 min Winter	99.837	0.037	0.3	19.8	Flood Risk
2160 min Winter	99.836	0.036	0.2	19.2	Flood Risk
2880 min Winter	99.835	0.035	0.2	18.6	Flood Risk
4320 min Winter	99.833	0.033	0.2	17.3	Flood Risk
5760 min Winter	99.830	0.030	0.2	16.1	Flood Risk
7200 min Winter	99.829	0.029	0.2	15.1	Flood Risk
8640 min Winter	99.827	0.027	0.2	14.3	Flood Risk
10080 min Winter	99.826	0.026	0.1	13.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	30.811	0.0	9.3	62
120 min Winter	18.530	0.0	11.7	122
180 min Winter	13.620	0.0	13.2	180
240 min Winter	10.901	0.0	14.2	238
360 min Winter	7.944	0.0	15.7	350
480 min Winter	6.344	0.0	16.9	462
600 min Winter	5.326	0.0	17.7	566
720 min Winter	4.615	0.0	18.4	650
960 min Winter	3.679	0.0	19.5	738
1440 min Winter	2.670	0.0	20.8	1040
2160 min Winter	1.936	0.0	27.2	1476
2880 min Winter	1.540	0.0	28.5	1904
4320 min Winter	1.114	0.0	29.9	2724
5760 min Winter	0.885	0.0	35.6	3520
7200 min Winter	0.740	0.0	36.9	4312
8640 min Winter	0.640	0.0	37.8	5096
10080 min Winter	0.565	0.0	38.2	5848

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.053

Time (mins) From:	To:	Area (ha)
0	4	0.053

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

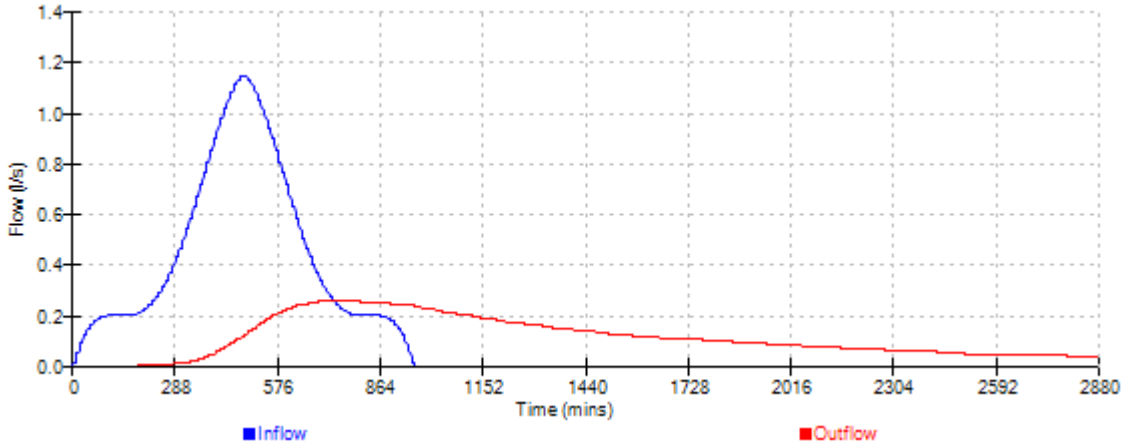
Invert Level (m) 99.800

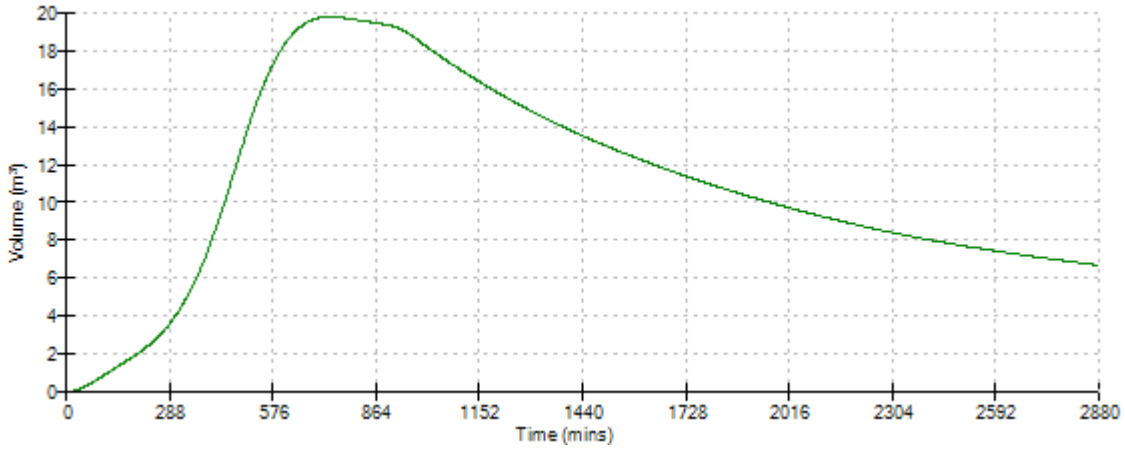
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	531.0	0.200	531.0

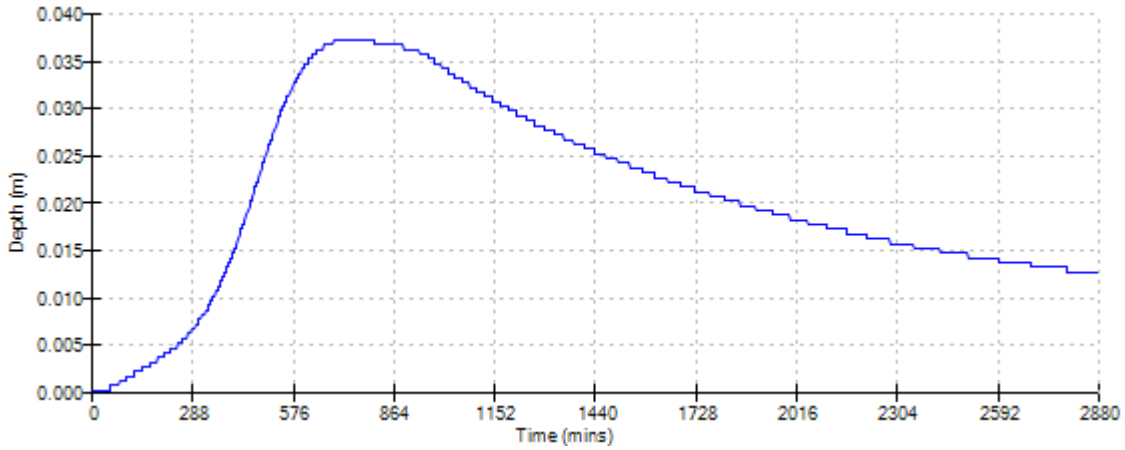
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.800

Event: 960 min Winter







Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.814	0.014	0.1	7.2	Flood Risk
30 min Summer	99.819	0.019	0.1	9.3	Flood Risk
60 min Summer	99.823	0.023	0.1	11.4	Flood Risk
120 min Summer	99.827	0.027	0.2	13.4	Flood Risk
180 min Summer	99.829	0.029	0.2	14.5	Flood Risk
240 min Summer	99.830	0.030	0.2	15.1	Flood Risk
360 min Summer	99.832	0.032	0.2	15.9	Flood Risk
480 min Summer	99.832	0.032	0.2	16.2	Flood Risk
600 min Summer	99.833	0.033	0.2	16.3	Flood Risk
720 min Summer	99.833	0.033	0.2	16.5	Flood Risk
960 min Summer	99.833	0.033	0.2	16.7	Flood Risk
1440 min Summer	99.834	0.034	0.2	16.8	Flood Risk
2160 min Summer	99.833	0.033	0.2	16.7	Flood Risk
2880 min Summer	99.833	0.033	0.2	16.4	Flood Risk
4320 min Summer	99.831	0.031	0.2	15.6	Flood Risk
5760 min Summer	99.830	0.030	0.2	14.9	Flood Risk
7200 min Summer	99.828	0.028	0.2	14.2	Flood Risk
8640 min Summer	99.827	0.027	0.2	13.6	Flood Risk
10080 min Summer	99.826	0.026	0.1	13.0	Flood Risk
15 min Winter	99.816	0.016	0.1	8.0	Flood Risk
30 min Winter	99.821	0.021	0.1	10.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.734	0.0	2.8	19
30 min Summer	49.733	0.0	4.2	34
60 min Summer	30.811	0.0	7.7	64
120 min Summer	18.530	0.0	9.7	124
180 min Summer	13.620	0.0	11.0	182
240 min Summer	10.901	0.0	11.9	242
360 min Summer	7.944	0.0	13.2	360
480 min Summer	6.344	0.0	14.1	480
600 min Summer	5.326	0.0	14.8	526
720 min Summer	4.615	0.0	15.4	588
960 min Summer	3.679	0.0	16.4	704
1440 min Summer	2.670	0.0	17.4	968
2160 min Summer	1.936	0.0	22.8	1384
2880 min Summer	1.540	0.0	23.9	1784
4320 min Summer	1.114	0.0	25.1	2592
5760 min Summer	0.885	0.0	29.9	3344
7200 min Summer	0.740	0.0	31.0	4112
8640 min Summer	0.640	0.0	31.7	4840
10080 min Summer	0.565	0.0	32.0	5552
15 min Winter	76.734	0.0	3.3	19
30 min Winter	49.733	0.0	5.0	33

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.825	0.025	0.1	12.7	Flood Risk
120 min Winter	99.830	0.030	0.2	15.0	Flood Risk
180 min Winter	99.832	0.032	0.2	16.2	Flood Risk
240 min Winter	99.834	0.034	0.2	16.9	Flood Risk
360 min Winter	99.835	0.035	0.2	17.7	Flood Risk
480 min Winter	99.836	0.036	0.2	18.1	Flood Risk
600 min Winter	99.837	0.037	0.3	18.3	Flood Risk
720 min Winter	99.837	0.037	0.3	18.3	Flood Risk
960 min Winter	99.837	0.037	0.3	18.5	Flood Risk
1440 min Winter	99.837	0.037	0.3	18.4	Flood Risk
2160 min Winter	99.836	0.036	0.2	17.9	Flood Risk
2880 min Winter	99.834	0.034	0.2	17.2	Flood Risk
4320 min Winter	99.832	0.032	0.2	15.9	Flood Risk
5760 min Winter	99.830	0.030	0.2	14.8	Flood Risk
7200 min Winter	99.828	0.028	0.2	13.9	Flood Risk
8640 min Winter	99.826	0.026	0.1	13.1	Flood Risk
10080 min Winter	99.825	0.025	0.1	12.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	30.811	0.0	8.9	62
120 min Winter	18.530	0.0	11.2	122
180 min Winter	13.620	0.0	12.6	180
240 min Winter	10.901	0.0	13.6	236
360 min Winter	7.944	0.0	15.1	350
480 min Winter	6.344	0.0	16.2	458
600 min Winter	5.326	0.0	17.0	560
720 min Winter	4.615	0.0	17.7	584
960 min Winter	3.679	0.0	18.7	732
1440 min Winter	2.670	0.0	20.0	1036
2160 min Winter	1.936	0.0	25.8	1472
2880 min Winter	1.540	0.0	27.2	1900
4320 min Winter	1.114	0.0	28.5	2720
5760 min Winter	0.885	0.0	33.7	3512
7200 min Winter	0.740	0.0	34.9	4256
8640 min Winter	0.640	0.0	35.8	5024
10080 min Winter	0.565	0.0	36.2	5848

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.050

Time (mins) From:	To:	Area (ha)
0	4	0.050

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

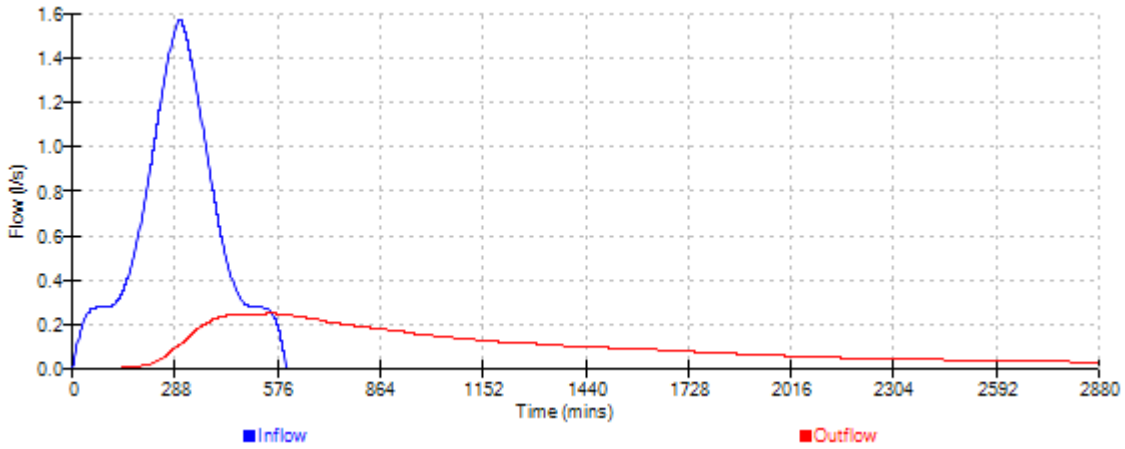
Invert Level (m) 99.800

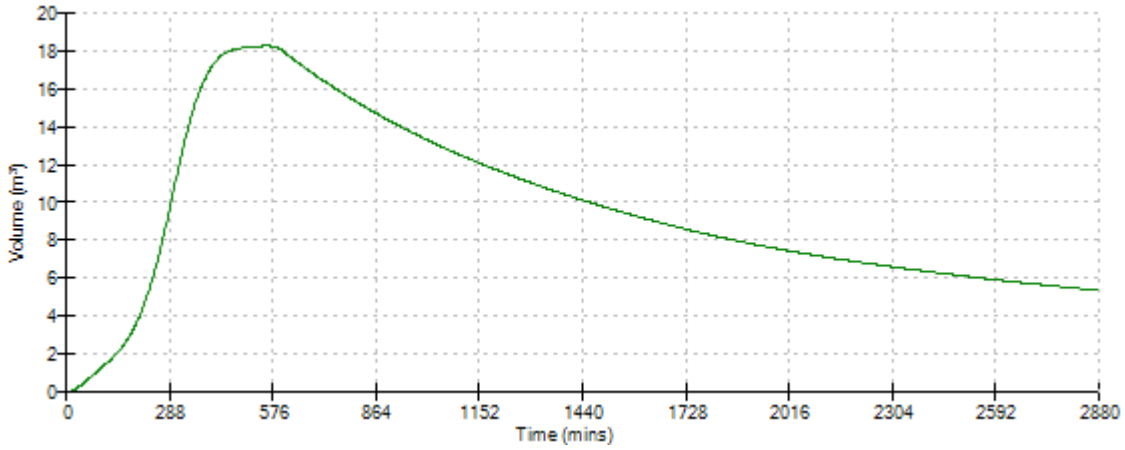
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	500.0	0.200	500.0

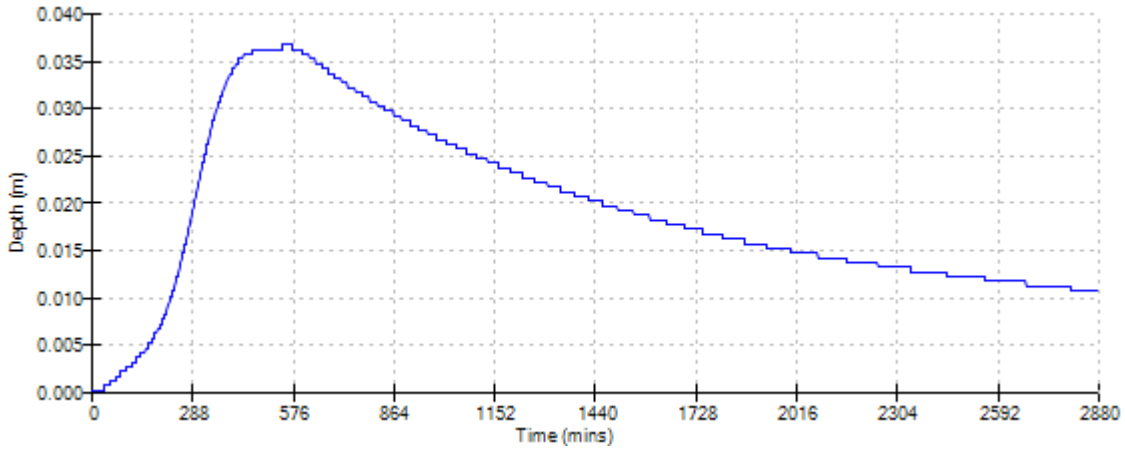
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.800

Event: 600 min Winter







Summary of Results for 100 year Return Period

Half Drain Time : 289 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	99.539	0.089	0.0	0.5	0.5	8.4	O K
30 min Summer	99.557	0.107	0.0	0.6	0.6	11.7	O K
60 min Summer	99.574	0.124	0.0	0.6	0.6	14.7	O K
120 min Summer	99.586	0.136	0.0	0.7	0.7	17.1	O K
180 min Summer	99.591	0.141	0.0	0.7	0.7	17.8	O K
240 min Summer	99.591	0.141	0.0	0.7	0.7	17.9	O K
360 min Summer	99.591	0.141	0.0	0.7	0.7	17.9	O K
480 min Summer	99.590	0.140	0.0	0.7	0.7	17.7	O K
600 min Summer	99.588	0.138	0.0	0.7	0.7	17.4	O K
720 min Summer	99.586	0.136	0.0	0.7	0.7	17.0	O K
960 min Summer	99.581	0.131	0.0	0.6	0.6	16.0	O K
1440 min Summer	99.570	0.120	0.0	0.6	0.6	14.1	O K
2160 min Summer	99.556	0.106	0.0	0.6	0.6	11.5	O K
2880 min Summer	99.545	0.095	0.0	0.5	0.5	9.4	O K
4320 min Summer	99.528	0.078	0.0	0.5	0.5	6.4	O K
5760 min Summer	99.515	0.065	0.0	0.4	0.4	4.5	O K
7200 min Summer	99.506	0.056	0.0	0.4	0.4	3.3	O K
8640 min Summer	99.499	0.049	0.0	0.3	0.3	2.5	O K
10080 min Summer	99.494	0.044	0.0	0.3	0.3	2.0	O K
15 min Winter	99.547	0.097	0.0	0.5	0.5	9.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	99.621	0.0	8.7	19
30 min Summer	65.104	0.0	12.3	33
60 min Summer	40.510	0.0	16.0	62
120 min Summer	24.352	0.0	19.8	122
180 min Summer	17.844	0.0	22.0	180
240 min Summer	14.229	0.0	23.5	218
360 min Summer	10.307	0.0	25.7	278
480 min Summer	8.201	0.0	27.3	340
600 min Summer	6.863	0.0	28.6	410
720 min Summer	5.931	0.0	29.6	478
960 min Summer	4.707	0.0	31.3	616
1440 min Summer	3.394	0.0	33.6	880
2160 min Summer	2.444	0.0	35.7	1276
2880 min Summer	1.934	0.0	37.1	1644
4320 min Summer	1.388	0.0	38.6	2376
5760 min Summer	1.096	0.0	39.3	3064
7200 min Summer	0.913	0.0	39.4	3752
8640 min Summer	0.785	0.0	39.3	4488
10080 min Summer	0.691	0.0	38.9	5144
15 min Winter	99.621	0.0	10.1	18

Summary of Results for 100 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	99.567	0.117	0.0	0.6	0.6	13.5	O K
60 min Winter	99.586	0.136	0.0	0.7	0.7	16.9	O K
120 min Winter	99.601	0.151	0.0	0.7	0.7	19.7	O K
180 min Winter	99.606	0.156	0.0	0.7	0.7	20.6	O K
240 min Winter	99.607	0.157	0.0	0.7	0.7	20.8	O K
360 min Winter	99.605	0.155	0.0	0.7	0.7	20.5	O K
480 min Winter	99.603	0.153	0.0	0.7	0.7	20.2	O K
600 min Winter	99.600	0.150	0.0	0.7	0.7	19.6	O K
720 min Winter	99.597	0.147	0.0	0.7	0.7	19.0	O K
960 min Winter	99.589	0.139	0.0	0.7	0.7	17.6	O K
1440 min Winter	99.574	0.124	0.0	0.6	0.6	14.7	O K
2160 min Winter	99.554	0.104	0.0	0.6	0.6	11.1	O K
2880 min Winter	99.539	0.089	0.0	0.5	0.5	8.3	O K
4320 min Winter	99.517	0.067	0.0	0.4	0.4	4.7	O K
5760 min Winter	99.502	0.052	0.0	0.4	0.4	2.8	O K
7200 min Winter	99.493	0.043	0.0	0.3	0.3	1.9	O K
8640 min Winter	99.488	0.038	0.0	0.3	0.3	1.5	O K
10080 min Winter	99.485	0.035	0.0	0.2	0.2	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	65.104	0.0	14.1	33
60 min Winter	40.510	0.0	18.3	62
120 min Winter	24.352	0.0	22.5	118
180 min Winter	17.844	0.0	25.0	176
240 min Winter	14.229	0.0	26.7	230
360 min Winter	10.307	0.0	29.2	290
480 min Winter	8.201	0.0	31.0	366
600 min Winter	6.863	0.0	32.5	442
720 min Winter	5.931	0.0	33.7	518
960 min Winter	4.707	0.0	35.5	664
1440 min Winter	3.394	0.0	38.2	950
2160 min Winter	2.444	0.0	40.7	1344
2880 min Winter	1.934	0.0	42.4	1728
4320 min Winter	1.388	0.0	44.4	2420
5760 min Winter	1.096	0.0	45.4	3104
7200 min Winter	0.913	0.0	45.8	3744
8640 min Winter	0.785	0.0	45.9	4416
10080 min Winter	0.691	0.0	45.8	5144

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Model Details

Storage is Online Cover Level (m) 100.000

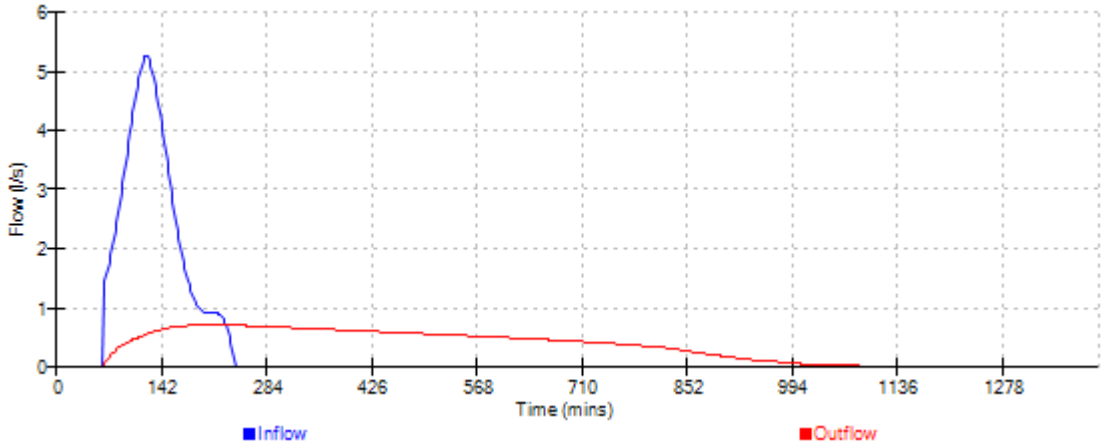
Porous Car Park Structure

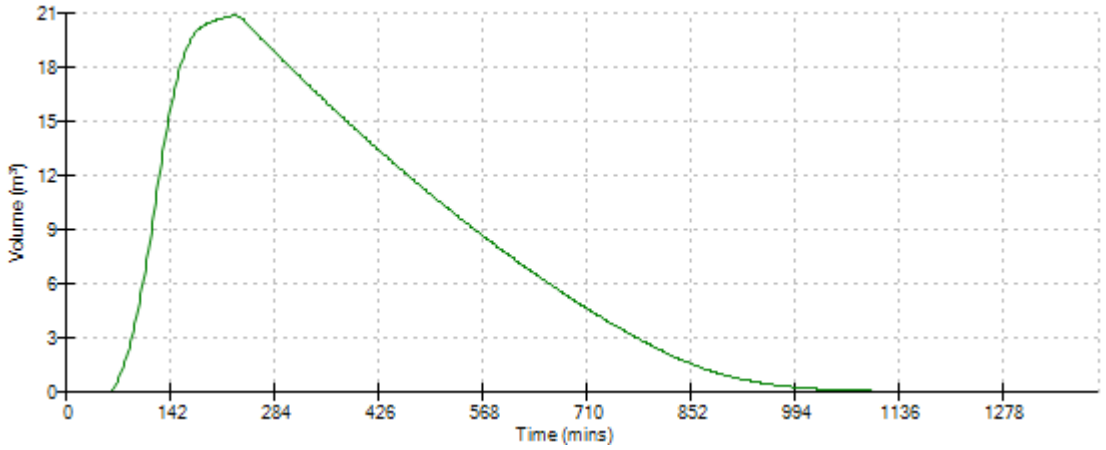
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.0
Membrane Percolation (mm/hr)	1000	Length (m)	44.0
Max Percolation (l/s)	171.1	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.450	Cap Volume Depth (m)	0.300

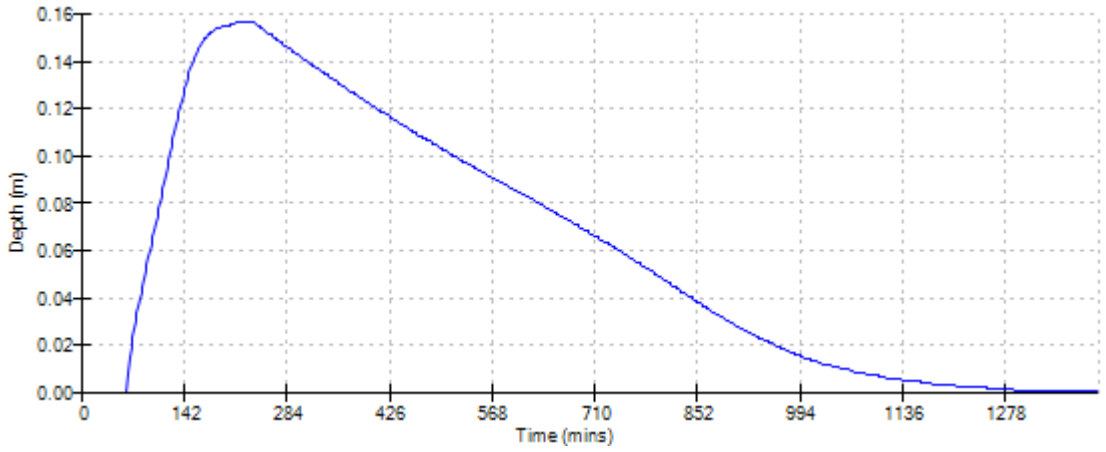
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.450

Event: 240 min Winter







Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.819	0.019	0.1	9.9	Flood Risk
30 min Summer	99.824	0.024	0.1	12.8	Flood Risk
60 min Summer	99.830	0.030	0.2	15.8	Flood Risk
120 min Summer	99.835	0.035	0.2	18.6	Flood Risk
180 min Summer	99.838	0.038	0.3	20.0	Flood Risk
240 min Summer	99.839	0.039	0.3	20.8	Flood Risk
360 min Summer	99.841	0.041	0.3	21.6	Flood Risk
480 min Summer	99.841	0.041	0.3	21.9	Flood Risk
600 min Summer	99.842	0.042	0.3	22.1	Flood Risk
720 min Summer	99.842	0.042	0.3	22.2	Flood Risk
960 min Summer	99.842	0.042	0.3	22.3	Flood Risk
1440 min Summer	99.842	0.042	0.3	22.4	Flood Risk
2160 min Summer	99.841	0.041	0.3	22.0	Flood Risk
2880 min Summer	99.840	0.040	0.3	21.4	Flood Risk
4320 min Summer	99.838	0.038	0.3	20.2	Flood Risk
5760 min Summer	99.836	0.036	0.2	19.1	Flood Risk
7200 min Summer	99.834	0.034	0.2	18.0	Flood Risk
8640 min Summer	99.832	0.032	0.2	17.2	Flood Risk
10080 min Summer	99.831	0.031	0.2	16.4	Flood Risk
15 min Winter	99.821	0.021	0.1	11.0	Flood Risk
30 min Winter	99.827	0.027	0.2	14.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	99.621	0.0	4.3	19
30 min Summer	65.104	0.0	6.4	34
60 min Summer	40.510	0.0	11.4	64
120 min Summer	24.352	0.0	14.3	122
180 min Summer	17.844	0.0	16.0	182
240 min Summer	14.229	0.0	17.1	242
360 min Summer	10.307	0.0	18.8	360
480 min Summer	8.201	0.0	20.0	476
600 min Summer	6.863	0.0	21.0	516
720 min Summer	5.931	0.0	21.7	574
960 min Summer	4.707	0.0	22.9	694
1440 min Summer	3.394	0.0	24.2	966
2160 min Summer	2.444	0.0	31.0	1368
2880 min Summer	1.934	0.0	32.4	1784
4320 min Summer	1.388	0.0	33.8	2552
5760 min Summer	1.096	0.0	39.5	3344
7200 min Summer	0.913	0.0	40.8	4104
8640 min Summer	0.785	0.0	41.6	4840
10080 min Summer	0.691	0.0	42.0	5552
15 min Winter	99.621	0.0	5.1	19
30 min Winter	65.104	0.0	7.5	33

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.833	0.033	0.2	17.7	Flood Risk
120 min Winter	99.839	0.039	0.3	20.8	Flood Risk
180 min Winter	99.842	0.042	0.3	22.4	Flood Risk
240 min Winter	99.844	0.044	0.3	23.3	Flood Risk
360 min Winter	99.846	0.046	0.3	24.2	Flood Risk
480 min Winter	99.846	0.046	0.3	24.7	Flood Risk
600 min Winter	99.847	0.047	0.3	24.8	Flood Risk
720 min Winter	99.847	0.047	0.3	24.8	Flood Risk
960 min Winter	99.847	0.047	0.3	24.9	Flood Risk
1440 min Winter	99.846	0.046	0.3	24.5	Flood Risk
2160 min Winter	99.844	0.044	0.3	23.5	Flood Risk
2880 min Winter	99.842	0.042	0.3	22.4	Flood Risk
4320 min Winter	99.839	0.039	0.3	20.5	Flood Risk
5760 min Winter	99.836	0.036	0.2	18.9	Flood Risk
7200 min Winter	99.833	0.033	0.2	17.6	Flood Risk
8640 min Winter	99.831	0.031	0.2	16.5	Flood Risk
10080 min Winter	99.829	0.029	0.2	15.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	40.510	0.0	13.1	62
120 min Winter	24.352	0.0	16.4	120
180 min Winter	17.844	0.0	18.3	178
240 min Winter	14.229	0.0	19.6	236
360 min Winter	10.307	0.0	21.5	350
480 min Winter	8.201	0.0	22.9	460
600 min Winter	6.863	0.0	24.0	562
720 min Winter	5.931	0.0	24.8	592
960 min Winter	4.707	0.0	26.1	732
1440 min Winter	3.394	0.0	27.6	1038
2160 min Winter	2.444	0.0	35.1	1472
2880 min Winter	1.934	0.0	36.7	1900
4320 min Winter	1.388	0.0	38.3	2684
5760 min Winter	1.096	0.0	44.5	3464
7200 min Winter	0.913	0.0	46.0	4256
8640 min Winter	0.785	0.0	47.0	5016
10080 min Winter	0.691	0.0	47.4	5760

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.053

Time (mins) From:	To:	Area (ha)
0	4	0.053

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

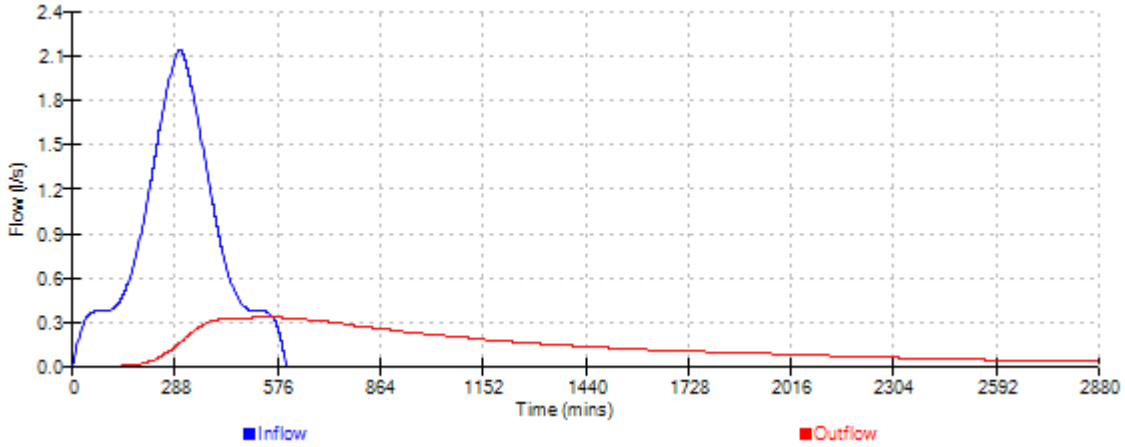
Invert Level (m) 99.800

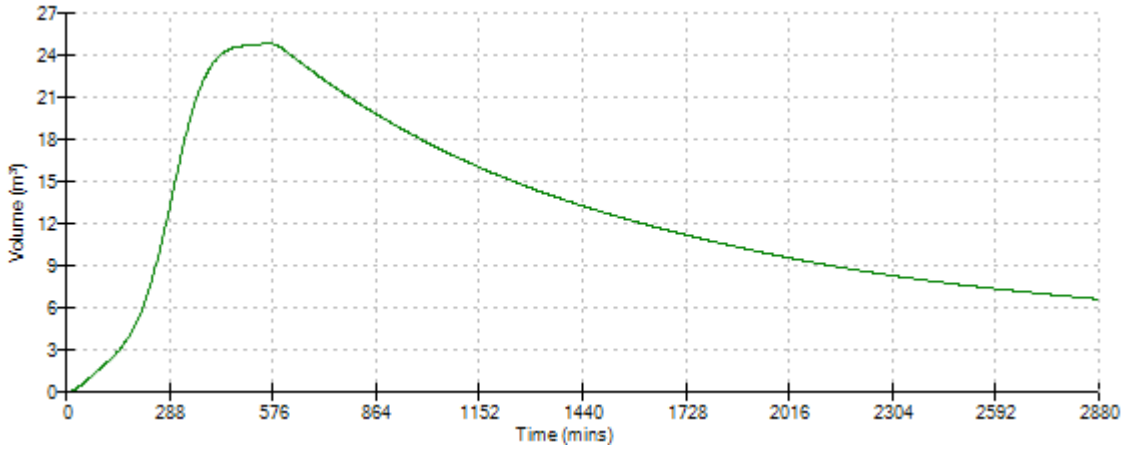
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	531.0	0.200	531.0

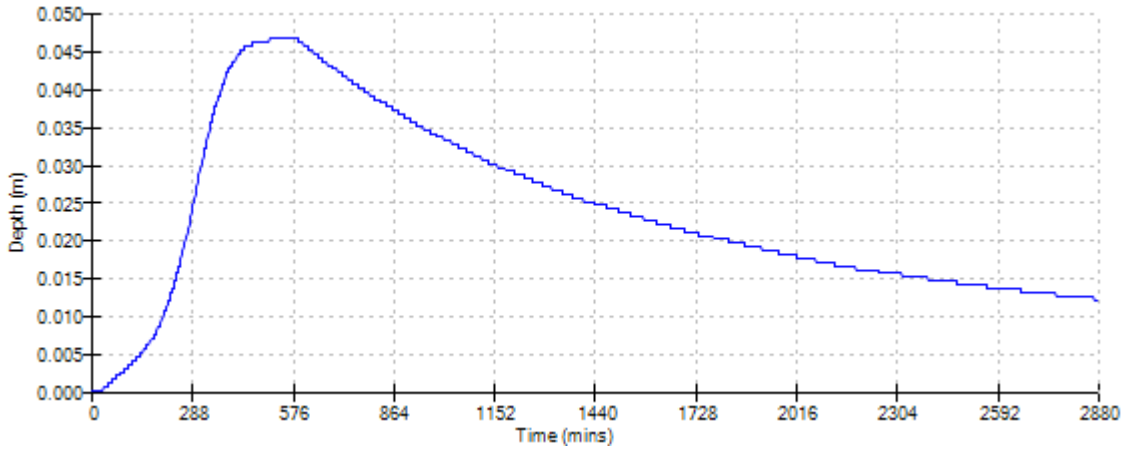
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.800

Event: 600 min Winter







Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.819	0.019	0.1	9.3	Flood Risk
30 min Summer	99.824	0.024	0.1	12.1	Flood Risk
60 min Summer	99.830	0.030	0.2	14.9	Flood Risk
120 min Summer	99.835	0.035	0.2	17.5	Flood Risk
180 min Summer	99.838	0.038	0.3	18.8	Flood Risk
240 min Summer	99.839	0.039	0.3	19.5	Flood Risk
360 min Summer	99.840	0.040	0.3	20.2	Flood Risk
480 min Summer	99.841	0.041	0.3	20.5	Flood Risk
600 min Summer	99.841	0.041	0.3	20.6	Flood Risk
720 min Summer	99.841	0.041	0.3	20.7	Flood Risk
960 min Summer	99.842	0.042	0.3	20.9	Flood Risk
1440 min Summer	99.842	0.042	0.3	20.9	Flood Risk
2160 min Summer	99.841	0.041	0.3	20.5	Flood Risk
2880 min Summer	99.840	0.040	0.3	19.9	Flood Risk
4320 min Summer	99.837	0.037	0.3	18.7	Flood Risk
5760 min Summer	99.835	0.035	0.2	17.6	Flood Risk
7200 min Summer	99.833	0.033	0.2	16.6	Flood Risk
8640 min Summer	99.832	0.032	0.2	15.8	Flood Risk
10080 min Summer	99.830	0.030	0.2	15.1	Flood Risk
15 min Winter	99.821	0.021	0.1	10.4	Flood Risk
30 min Winter	99.827	0.027	0.2	13.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	99.621	0.0	4.2	19
30 min Summer	65.104	0.0	6.2	34
60 min Summer	40.510	0.0	10.9	64
120 min Summer	24.352	0.0	13.7	122
180 min Summer	17.844	0.0	15.3	182
240 min Summer	14.229	0.0	16.4	242
360 min Summer	10.307	0.0	18.0	360
480 min Summer	8.201	0.0	19.2	460
600 min Summer	6.863	0.0	20.1	506
720 min Summer	5.931	0.0	20.8	566
960 min Summer	4.707	0.0	22.0	684
1440 min Summer	3.394	0.0	23.3	954
2160 min Summer	2.444	0.0	29.5	1364
2880 min Summer	1.934	0.0	30.8	1760
4320 min Summer	1.388	0.0	32.2	2552
5760 min Summer	1.096	0.0	37.4	3336
7200 min Summer	0.913	0.0	38.7	4040
8640 min Summer	0.785	0.0	39.5	4840
10080 min Summer	0.691	0.0	39.8	5552
15 min Winter	99.621	0.0	5.0	19
30 min Winter	65.104	0.0	7.3	33

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.833	0.033	0.2	16.7	Flood Risk
120 min Winter	99.839	0.039	0.3	19.6	Flood Risk
180 min Winter	99.842	0.042	0.3	21.0	Flood Risk
240 min Winter	99.844	0.044	0.3	21.8	Flood Risk
360 min Winter	99.845	0.045	0.3	22.7	Flood Risk
480 min Winter	99.846	0.046	0.3	23.1	Flood Risk
600 min Winter	99.846	0.046	0.3	23.1	Flood Risk
720 min Winter	99.846	0.046	0.3	23.2	Flood Risk
960 min Winter	99.846	0.046	0.3	23.2	Flood Risk
1440 min Winter	99.846	0.046	0.3	22.8	Flood Risk
2160 min Winter	99.844	0.044	0.3	21.8	Flood Risk
2880 min Winter	99.841	0.041	0.3	20.7	Flood Risk
4320 min Winter	99.838	0.038	0.3	18.9	Flood Risk
5760 min Winter	99.835	0.035	0.2	17.3	Flood Risk
7200 min Winter	99.832	0.032	0.2	16.1	Flood Risk
8640 min Winter	99.830	0.030	0.2	15.1	Flood Risk
10080 min Winter	99.828	0.028	0.2	14.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	40.510	0.0	12.6	62
120 min Winter	24.352	0.0	15.7	120
180 min Winter	17.844	0.0	17.5	178
240 min Winter	14.229	0.0	18.8	236
360 min Winter	10.307	0.0	20.6	350
480 min Winter	8.201	0.0	21.9	458
600 min Winter	6.863	0.0	22.9	556
720 min Winter	5.931	0.0	23.8	578
960 min Winter	4.707	0.0	25.0	728
1440 min Winter	3.394	0.0	26.5	1026
2160 min Winter	2.444	0.0	33.3	1452
2880 min Winter	1.934	0.0	34.9	1876
4320 min Winter	1.388	0.0	36.4	2680
5760 min Winter	1.096	0.0	42.1	3464
7200 min Winter	0.913	0.0	43.5	4248
8640 min Winter	0.785	0.0	44.5	5008
10080 min Winter	0.691	0.0	44.9	5752

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.050

Time (mins) From:	To:	Area (ha)
0	4	0.050

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

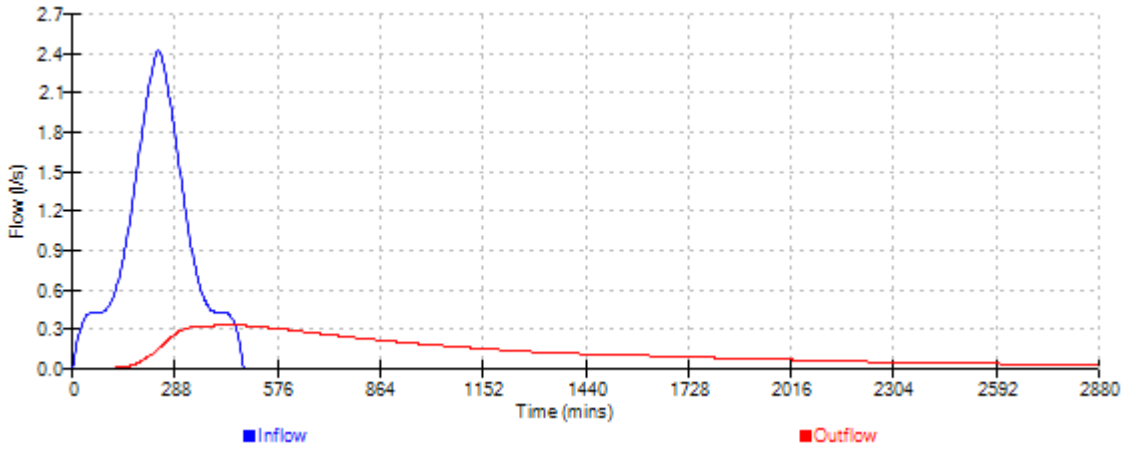
Invert Level (m) 99.800

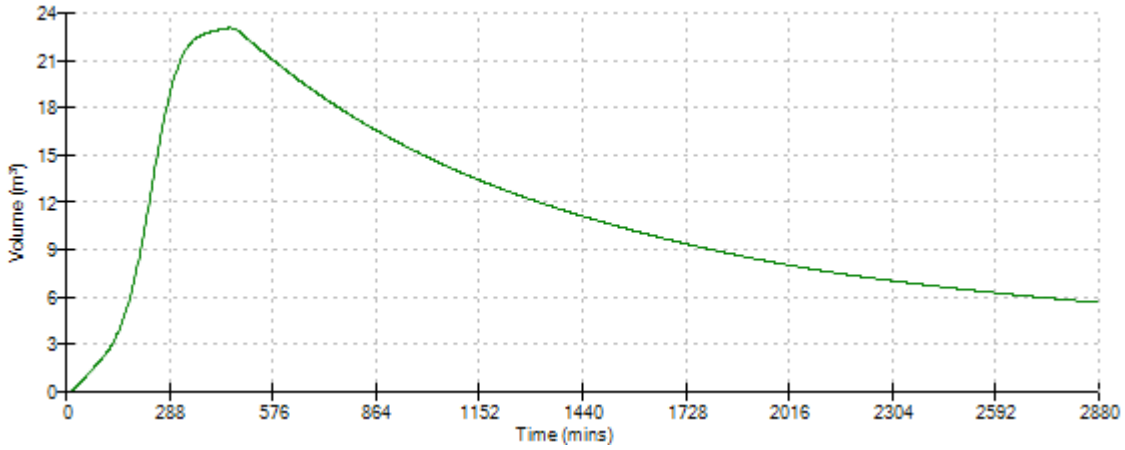
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	500.0	0.200	500.0

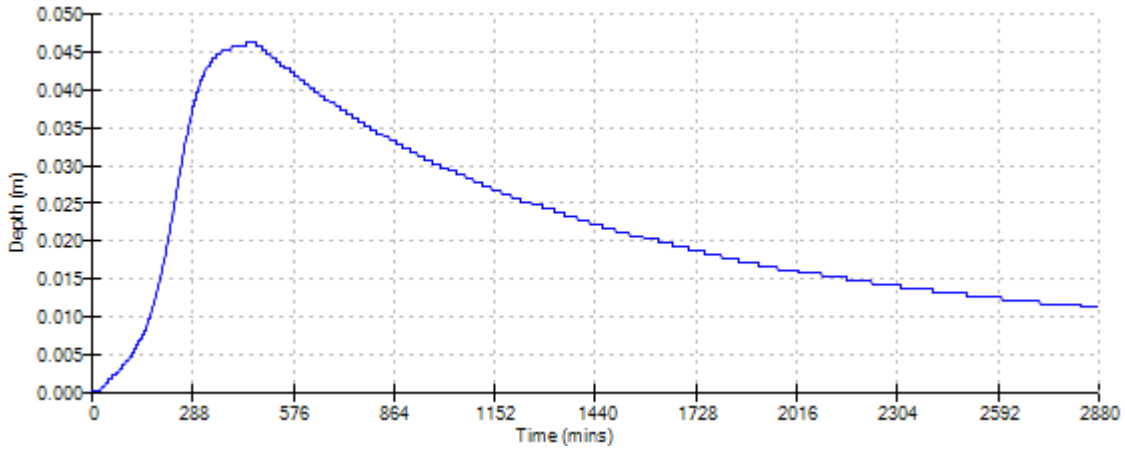
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.800

Event: 480 min Winter







Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 368 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	99.564	0.114	0.0	0.6	0.6	13.0	O K
30 min Summer	99.590	0.140	0.0	0.7	0.7	17.7	O K
60 min Summer	99.613	0.163	0.0	0.7	0.7	22.1	O K
120 min Summer	99.633	0.183	0.0	0.8	0.8	25.7	O K
180 min Summer	99.640	0.190	0.0	0.8	0.8	27.0	O K
240 min Summer	99.642	0.192	0.0	0.8	0.8	27.4	O K
360 min Summer	99.642	0.192	0.0	0.8	0.8	27.3	O K
480 min Summer	99.640	0.190	0.0	0.8	0.8	27.0	O K
600 min Summer	99.638	0.188	0.0	0.8	0.8	26.7	O K
720 min Summer	99.636	0.186	0.0	0.8	0.8	26.2	O K
960 min Summer	99.630	0.180	0.0	0.8	0.8	25.1	O K
1440 min Summer	99.616	0.166	0.0	0.7	0.7	22.6	O K
2160 min Summer	99.598	0.148	0.0	0.7	0.7	19.3	O K
2880 min Summer	99.583	0.133	0.0	0.6	0.6	16.4	O K
4320 min Summer	99.560	0.110	0.0	0.6	0.6	12.1	O K
5760 min Summer	99.543	0.093	0.0	0.5	0.5	9.0	O K
7200 min Summer	99.531	0.081	0.0	0.5	0.5	6.8	O K
8640 min Summer	99.521	0.071	0.0	0.4	0.4	5.3	O K
10080 min Summer	99.513	0.063	0.0	0.4	0.4	4.2	O K
15 min Winter	99.575	0.125	0.0	0.6	0.6	15.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.469	0.0	13.4	19
30 min Summer	91.145	0.0	18.4	33
60 min Summer	56.713	0.0	23.6	62
120 min Summer	34.093	0.0	29.0	122
180 min Summer	24.982	0.0	32.1	180
240 min Summer	19.920	0.0	34.3	240
360 min Summer	14.430	0.0	37.4	300
480 min Summer	11.481	0.0	39.7	360
600 min Summer	9.608	0.0	41.5	426
720 min Summer	8.303	0.0	43.1	494
960 min Summer	6.590	0.0	45.5	634
1440 min Summer	4.752	0.0	49.0	908
2160 min Summer	3.421	0.0	52.3	1300
2880 min Summer	2.707	0.0	54.6	1696
4320 min Summer	1.944	0.0	57.5	2424
5760 min Summer	1.535	0.0	59.2	3168
7200 min Summer	1.278	0.0	60.1	3824
8640 min Summer	1.099	0.0	60.6	4576
10080 min Summer	0.968	0.0	60.8	5248
15 min Winter	139.469	0.0	15.3	18

Summary of Results for 100 year Return Period (+40%)

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	99.603	0.153	0.0	0.7	0.7	20.2	O K
60 min Winter	99.630	0.180	0.0	0.8	0.8	25.2	O K
120 min Winter	99.653	0.203	0.0	0.8	0.8	29.4	O K
180 min Winter	99.662	0.212	0.0	0.8	0.8	31.0	O K
240 min Winter	99.665	0.215	0.0	0.8	0.8	31.6	O K
360 min Winter	99.664	0.214	0.0	0.8	0.8	31.4	O K
480 min Winter	99.661	0.211	0.0	0.8	0.8	30.9	O K
600 min Winter	99.658	0.208	0.0	0.8	0.8	30.4	O K
720 min Winter	99.655	0.205	0.0	0.8	0.8	29.7	O K
960 min Winter	99.646	0.196	0.0	0.8	0.8	28.0	O K
1440 min Winter	99.626	0.176	0.0	0.8	0.8	24.5	O K
2160 min Winter	99.600	0.150	0.0	0.7	0.7	19.7	O K
2880 min Winter	99.579	0.129	0.0	0.6	0.6	15.8	O K
4320 min Winter	99.549	0.099	0.0	0.5	0.5	10.2	O K
5760 min Winter	99.529	0.079	0.0	0.5	0.5	6.6	O K
7200 min Winter	99.515	0.065	0.0	0.4	0.4	4.4	O K
8640 min Winter	99.504	0.054	0.0	0.4	0.4	3.0	O K
10080 min Winter	99.496	0.046	0.0	0.3	0.3	2.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	91.145	0.0	21.0	33
60 min Winter	56.713	0.0	26.9	62
120 min Winter	34.093	0.0	32.8	120
180 min Winter	24.982	0.0	36.3	176
240 min Winter	19.920	0.0	38.8	232
360 min Winter	14.430	0.0	42.3	336
480 min Winter	11.481	0.0	44.9	380
600 min Winter	9.608	0.0	47.0	456
720 min Winter	8.303	0.0	48.7	534
960 min Winter	6.590	0.0	51.5	684
1440 min Winter	4.752	0.0	55.4	978
2160 min Winter	3.421	0.0	59.3	1384
2880 min Winter	2.707	0.0	62.0	1788
4320 min Winter	1.944	0.0	65.5	2512
5760 min Winter	1.535	0.0	67.6	3232
7200 min Winter	1.278	0.0	69.0	3896
8640 min Winter	1.099	0.0	69.8	4584
10080 min Winter	0.968	0.0	70.3	5240

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.063

Time (mins) From:	To:	Area (ha)
0	4	0.063

Model Details

Storage is Online Cover Level (m) 100.000

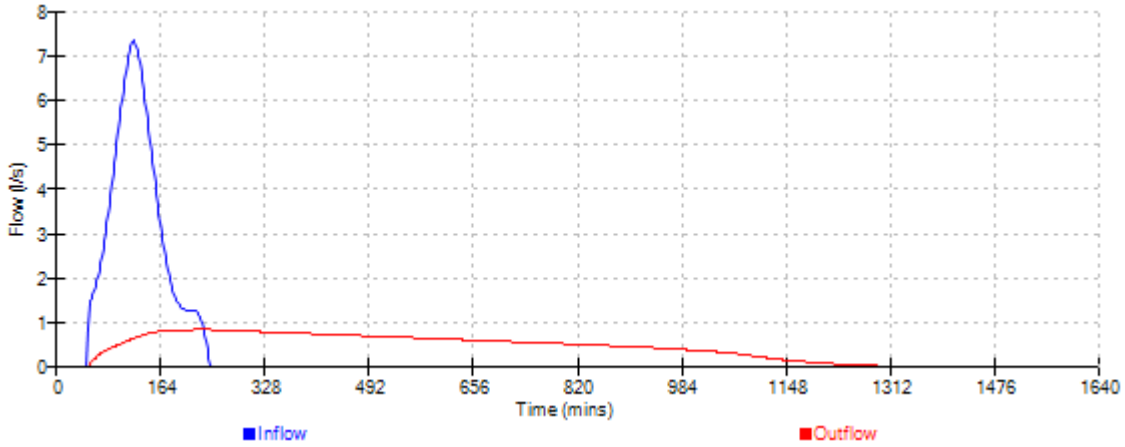
Porous Car Park Structure

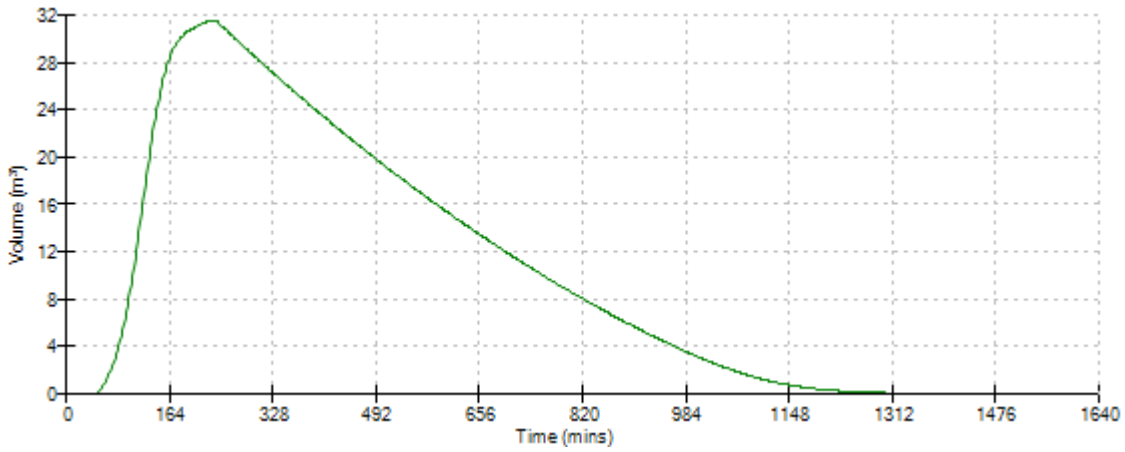
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.0
Membrane Percolation (mm/hr)	1000	Length (m)	44.0
Max Percolation (l/s)	171.1	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.450	Cap Volume Depth (m)	0.300

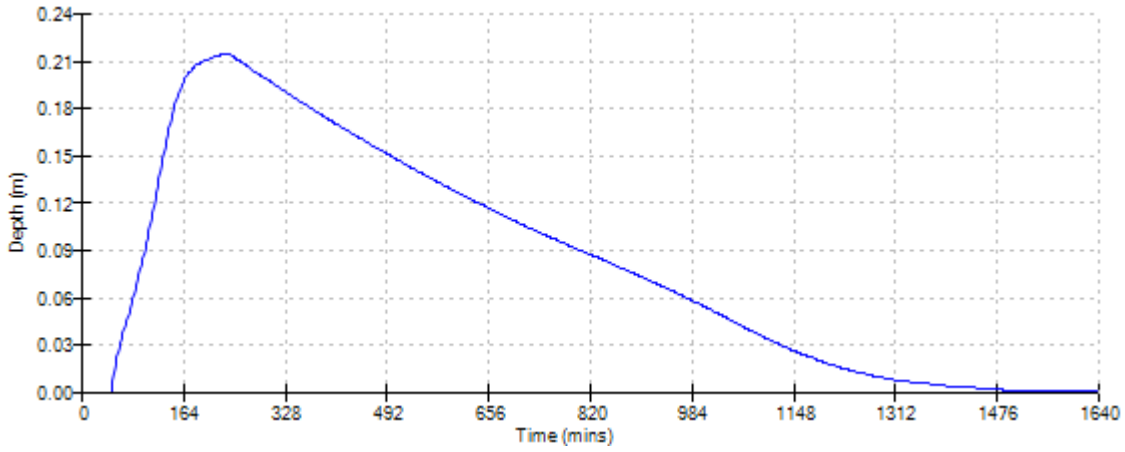
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.450

Event: 240 min Winter







Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.826	0.026	0.1	13.8	Flood Risk
30 min Summer	99.834	0.034	0.2	17.9	Flood Risk
60 min Summer	99.841	0.041	0.3	22.0	Flood Risk
120 min Summer	99.849	0.049	0.3	25.9	Flood Risk
180 min Summer	99.852	0.052	0.4	27.9	Flood Risk
240 min Summer	99.855	0.055	0.4	29.0	Flood Risk
360 min Summer	99.857	0.057	0.4	30.2	Flood Risk
480 min Summer	99.858	0.058	0.4	30.7	Flood Risk
600 min Summer	99.858	0.058	0.4	30.9	Flood Risk
720 min Summer	99.858	0.058	0.4	31.0	Flood Risk
960 min Summer	99.859	0.059	0.4	31.2	Flood Risk
1440 min Summer	99.859	0.059	0.4	31.1	Flood Risk
2160 min Summer	99.857	0.057	0.4	30.4	Flood Risk
2880 min Summer	99.855	0.055	0.4	29.4	Flood Risk
4320 min Summer	99.851	0.051	0.4	27.2	Flood Risk
5760 min Summer	99.847	0.047	0.3	25.2	Flood Risk
7200 min Summer	99.844	0.044	0.3	23.5	Flood Risk
8640 min Summer	99.842	0.042	0.3	22.1	Flood Risk
10080 min Summer	99.840	0.040	0.3	21.0	Flood Risk
15 min Winter	99.829	0.029	0.2	15.4	Flood Risk
30 min Winter	99.838	0.038	0.3	20.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.469	0.0	7.1	19
30 min Summer	91.145	0.0	10.2	34
60 min Summer	56.713	0.0	17.2	64
120 min Summer	34.093	0.0	21.3	122
180 min Summer	24.982	0.0	23.7	182
240 min Summer	19.920	0.0	25.4	242
360 min Summer	14.430	0.0	27.8	360
480 min Summer	11.481	0.0	29.5	480
600 min Summer	9.608	0.0	30.8	546
720 min Summer	8.303	0.0	31.9	600
960 min Summer	6.590	0.0	33.5	720
1440 min Summer	4.752	0.0	35.2	982
2160 min Summer	3.421	0.0	44.6	1388
2880 min Summer	2.707	0.0	46.7	1788
4320 min Summer	1.944	0.0	48.9	2592
5760 min Summer	1.535	0.0	56.2	3344
7200 min Summer	1.278	0.0	58.1	4104
8640 min Summer	1.099	0.0	59.4	4832
10080 min Summer	0.968	0.0	60.0	5544
15 min Winter	139.469	0.0	8.3	19
30 min Winter	91.145	0.0	11.8	33

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.846	0.046	0.3	24.7	Flood Risk
120 min Winter	99.855	0.055	0.4	29.0	Flood Risk
180 min Winter	99.859	0.059	0.4	31.3	Flood Risk
240 min Winter	99.861	0.061	0.4	32.6	Flood Risk
360 min Winter	99.864	0.064	0.4	34.0	Flood Risk
480 min Winter	99.865	0.065	0.4	34.7	Flood Risk
600 min Winter	99.866	0.066	0.4	35.0	Flood Risk
720 min Winter	99.866	0.066	0.4	35.0	Flood Risk
960 min Winter	99.866	0.066	0.4	34.9	Flood Risk
1440 min Winter	99.865	0.065	0.4	34.4	Flood Risk
2160 min Winter	99.862	0.062	0.4	32.8	Flood Risk
2880 min Winter	99.858	0.058	0.4	31.0	Flood Risk
4320 min Winter	99.852	0.052	0.4	27.6	Flood Risk
5760 min Winter	99.847	0.047	0.3	24.7	Flood Risk
7200 min Winter	99.842	0.042	0.3	22.6	Flood Risk
8640 min Winter	99.840	0.040	0.3	21.0	Flood Risk
10080 min Winter	99.837	0.037	0.3	19.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	19.7	62
120 min Winter	34.093	0.0	24.3	120
180 min Winter	24.982	0.0	27.0	180
240 min Winter	19.920	0.0	28.9	238
360 min Winter	14.430	0.0	31.5	352
480 min Winter	11.481	0.0	33.4	462
600 min Winter	9.608	0.0	34.9	570
720 min Winter	8.303	0.0	36.1	670
960 min Winter	6.590	0.0	37.9	752
1440 min Winter	4.752	0.0	39.7	1054
2160 min Winter	3.421	0.0	50.3	1496
2880 min Winter	2.707	0.0	52.7	1932
4320 min Winter	1.944	0.0	55.3	2728
5760 min Winter	1.535	0.0	63.1	3512
7200 min Winter	1.278	0.0	65.3	4248
8640 min Winter	1.099	0.0	66.9	4984
10080 min Winter	0.968	0.0	67.7	5744

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.053

Time (mins) From:	To:	Area (ha)
0	4	0.053

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

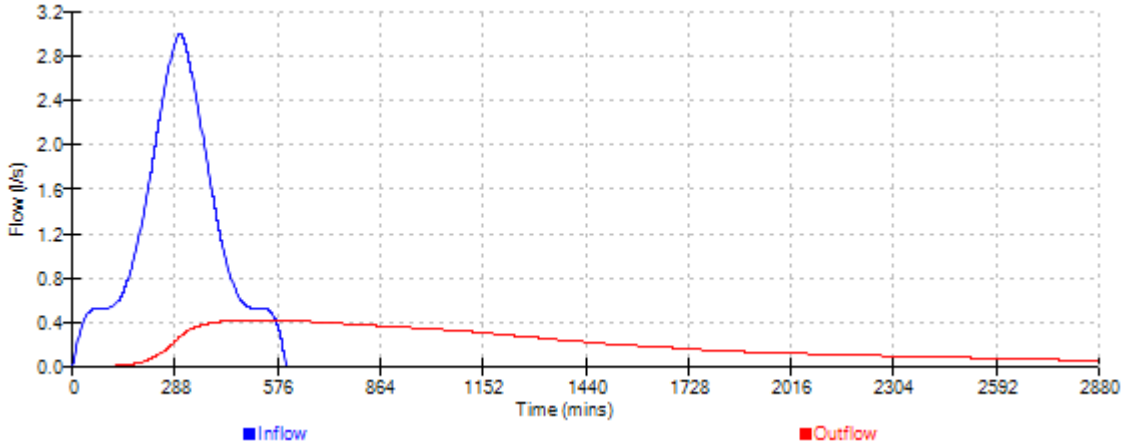
Invert Level (m) 99.800

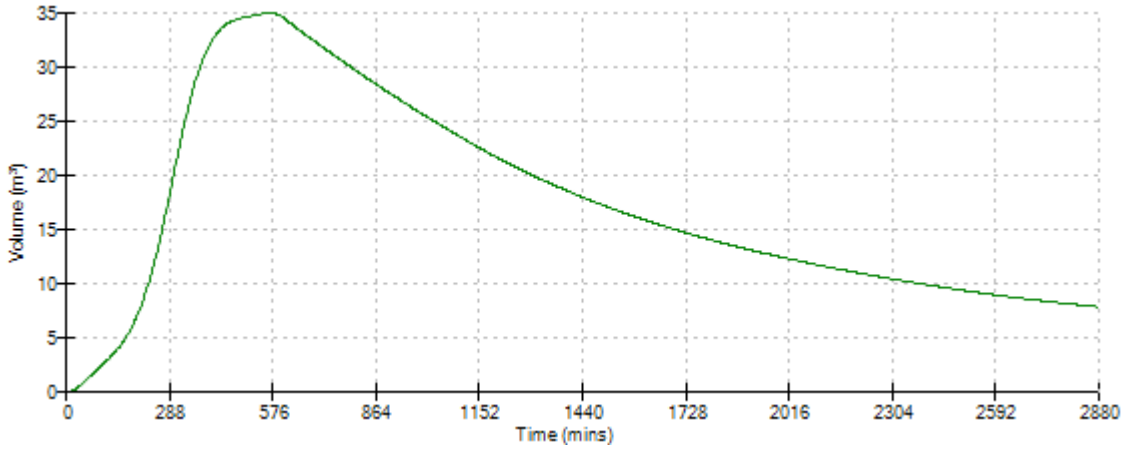
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	531.0	0.200	531.0

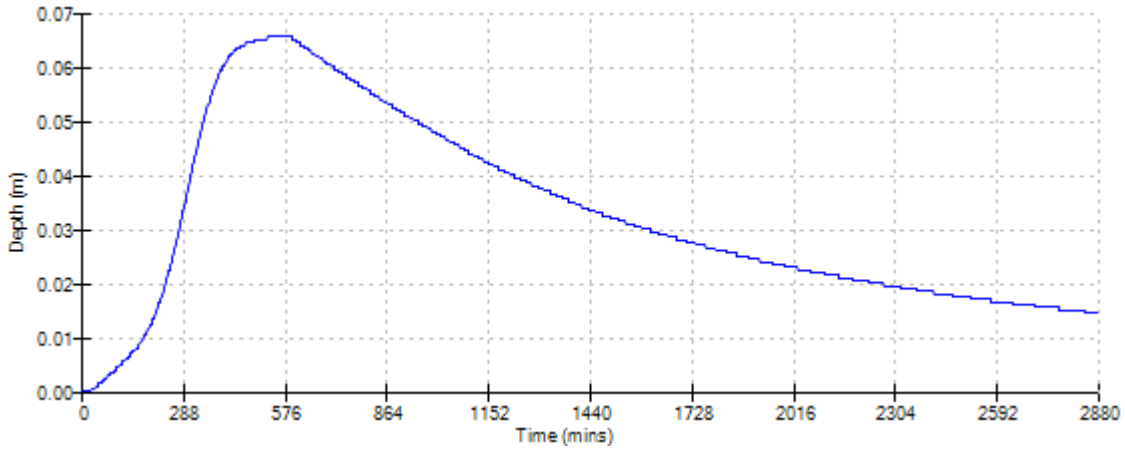
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.800

Event: 600 min Winter







Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.826	0.026	0.1	13.0	Flood Risk
30 min Summer	99.834	0.034	0.2	16.9	Flood Risk
60 min Summer	99.842	0.042	0.3	20.8	Flood Risk
120 min Summer	99.849	0.049	0.3	24.4	Flood Risk
180 min Summer	99.852	0.052	0.4	26.2	Flood Risk
240 min Summer	99.854	0.054	0.4	27.2	Flood Risk
360 min Summer	99.857	0.057	0.4	28.3	Flood Risk
480 min Summer	99.857	0.057	0.4	28.7	Flood Risk
600 min Summer	99.858	0.058	0.4	28.8	Flood Risk
720 min Summer	99.858	0.058	0.4	29.0	Flood Risk
960 min Summer	99.858	0.058	0.4	29.1	Flood Risk
1440 min Summer	99.858	0.058	0.4	29.0	Flood Risk
2160 min Summer	99.856	0.056	0.4	28.2	Flood Risk
2880 min Summer	99.854	0.054	0.4	27.2	Flood Risk
4320 min Summer	99.850	0.050	0.4	25.0	Flood Risk
5760 min Summer	99.846	0.046	0.3	23.1	Flood Risk
7200 min Summer	99.843	0.043	0.3	21.5	Flood Risk
8640 min Summer	99.841	0.041	0.3	20.3	Flood Risk
10080 min Summer	99.839	0.039	0.3	19.3	Flood Risk
15 min Winter	99.829	0.029	0.2	14.6	Flood Risk
30 min Winter	99.838	0.038	0.3	18.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.469	0.0	6.9	19
30 min Summer	91.145	0.0	9.9	34
60 min Summer	56.713	0.0	16.5	64
120 min Summer	34.093	0.0	20.4	122
180 min Summer	24.982	0.0	22.7	182
240 min Summer	19.920	0.0	24.3	242
360 min Summer	14.430	0.0	26.5	360
480 min Summer	11.481	0.0	28.2	478
600 min Summer	9.608	0.0	29.5	522
720 min Summer	8.303	0.0	30.5	582
960 min Summer	6.590	0.0	32.1	702
1440 min Summer	4.752	0.0	33.9	970
2160 min Summer	3.421	0.0	42.3	1384
2880 min Summer	2.707	0.0	44.4	1788
4320 min Summer	1.944	0.0	46.5	2552
5760 min Summer	1.535	0.0	53.1	3336
7200 min Summer	1.278	0.0	55.0	4040
8640 min Summer	1.099	0.0	56.2	4760
10080 min Summer	0.968	0.0	56.8	5544
15 min Winter	139.469	0.0	8.0	19
30 min Winter	91.145	0.0	11.5	33

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.846	0.046	0.3	23.2	Flood Risk
120 min Winter	99.855	0.055	0.4	27.3	Flood Risk
180 min Winter	99.859	0.059	0.4	29.4	Flood Risk
240 min Winter	99.861	0.061	0.4	30.6	Flood Risk
360 min Winter	99.864	0.064	0.4	31.9	Flood Risk
480 min Winter	99.865	0.065	0.4	32.5	Flood Risk
600 min Winter	99.865	0.065	0.4	32.6	Flood Risk
720 min Winter	99.865	0.065	0.4	32.6	Flood Risk
960 min Winter	99.865	0.065	0.4	32.5	Flood Risk
1440 min Winter	99.864	0.064	0.4	31.9	Flood Risk
2160 min Winter	99.861	0.061	0.4	30.3	Flood Risk
2880 min Winter	99.857	0.057	0.4	28.5	Flood Risk
4320 min Winter	99.850	0.050	0.4	25.2	Flood Risk
5760 min Winter	99.845	0.045	0.3	22.5	Flood Risk
7200 min Winter	99.841	0.041	0.3	20.6	Flood Risk
8640 min Winter	99.838	0.038	0.3	19.1	Flood Risk
10080 min Winter	99.836	0.036	0.2	18.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	18.9	62
120 min Winter	34.093	0.0	23.3	120
180 min Winter	24.982	0.0	25.8	180
240 min Winter	19.920	0.0	27.6	236
360 min Winter	14.430	0.0	30.1	350
480 min Winter	11.481	0.0	32.0	462
600 min Winter	9.608	0.0	33.4	566
720 min Winter	8.303	0.0	34.6	656
960 min Winter	6.590	0.0	36.3	742
1440 min Winter	4.752	0.0	38.2	1050
2160 min Winter	3.421	0.0	47.7	1492
2880 min Winter	2.707	0.0	50.1	1904
4320 min Winter	1.944	0.0	52.6	2720
5760 min Winter	1.535	0.0	59.7	3464
7200 min Winter	1.278	0.0	61.8	4184
8640 min Winter	1.099	0.0	63.3	4936
10080 min Winter	0.968	0.0	64.1	5744

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.050

Time (mins) From:	To:	Area (ha)
0	4	0.050

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

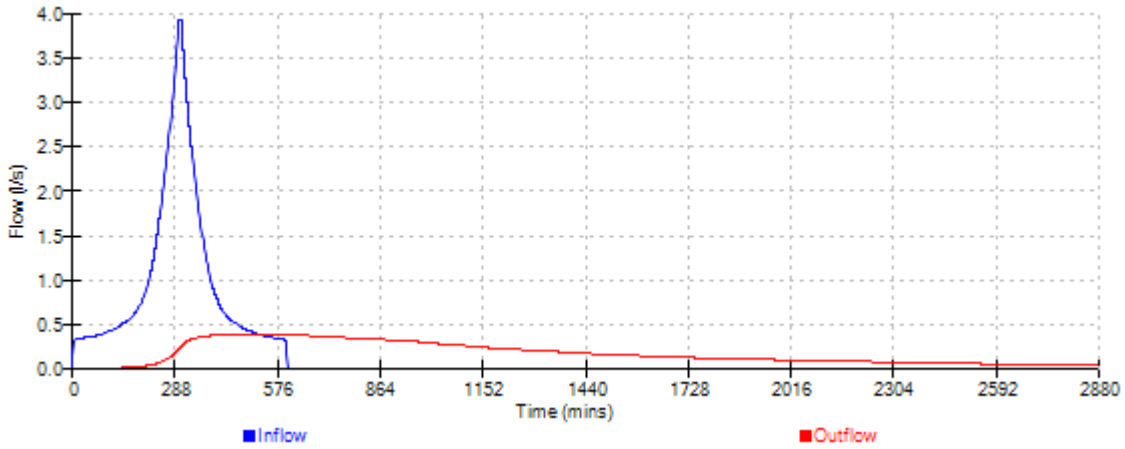
Invert Level (m) 99.800

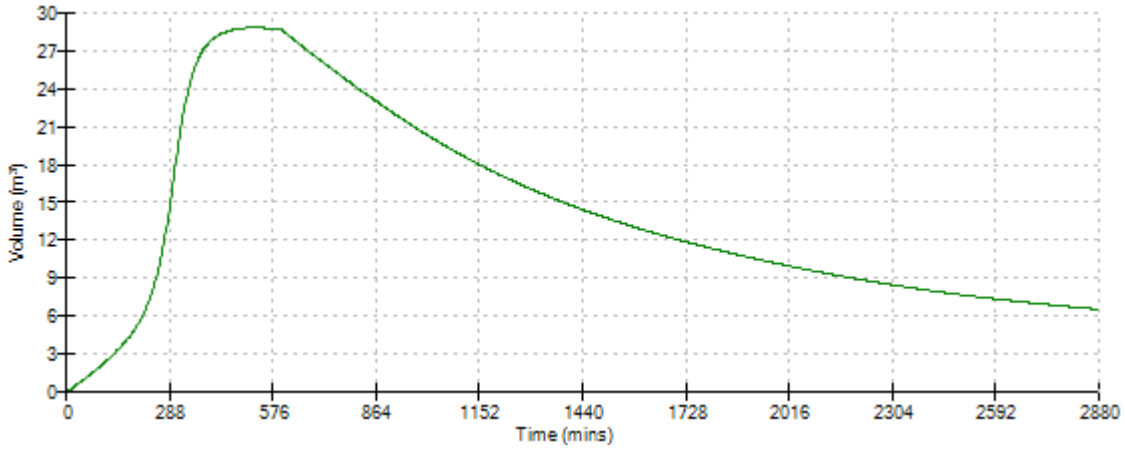
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	500.0	0.200	500.0

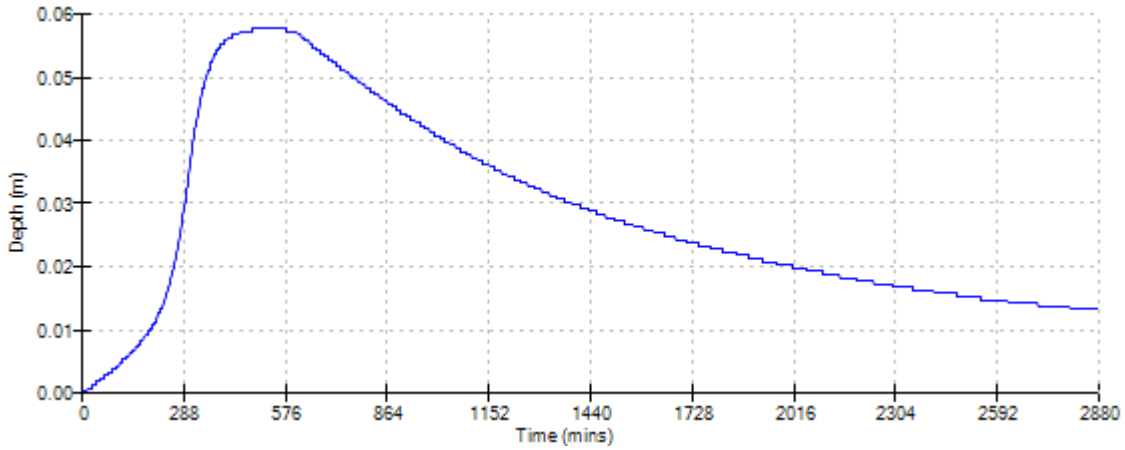
Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 99.800

Event: 600 min Summer







Drainage Proforma

LONDON BOROUGH OF RICHMOND UPON THAMES

GREATERLONDONAUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Kingston Bridge House
Address & post code	at Kingston Bridge house, Church Road, Hampton Wick, KT1 4AG
OS Grid ref. (Easting, Northing)	E 517487 N 169400
LPA reference (if applicable)	
Brief description of proposed work	Conversion of exisitng building from student accomodation to residential apartments
Total site Area	2,780 m^2
Total existing impervious area	2,550 m^2
Total proposed impervious area	0 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	no
Existing drainage connection type and location	Sewer
Designer Name	
Designer Position	
Designer Company	

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Kempton Park Gravels
Bedrock geology classification	London Clay
Site infiltration rate	- m/s
Depth to groundwater level	- m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	Y
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	N	N
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	Y	Y
7 discharge rainwater to the combined sewer.	N	N

2c. Proposed Discharge Details

Proposed discharge location	Existing conection to sewer
Has the owner/regulator of the discharge location been consulted?	No

3. Drainage Strategy

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.4			
1 in 1	0.4	26.1	24	0.6
1 in 30	1	51.1	52	1.2
1 in 100	1.3	51.2	68	1.3
1 in 100 + CC			99	1.6
Climate change allowance used		40%		
3b. Principal Method of Flow Control		orifice		

3c. Proposed SuDS Measures			
	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	1031	1031	206
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	620	620	57
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		0
Total	**1651**	**1651**	**263**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	section 2.2
Drainage hierarchy (2b)	section 4.2
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix B
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	section 4
Proposed SuDS measures & specifications (3b)	section 4.2
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix C
Detailed drainage design drawings, including exceedance flow routes	n/a
Detailed landscaping plans	Appendix C
Maintenance strategy	section 5
Demonstration of how the proposed SuDS measures improve:	n/a
a) water quality of the runoff?	Greenroof / permable paving
b) biodiversity?	Greenroof
c) amenity?	