LANMOR Consulting

Civil Engineers & Transport Planners

Winkfield Men's Club

Flood Risk Assessment

October 2023

231724/FRA/AG/KBL/01

LANMOR Consulting

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APPENDICES

1 INTRODUCTION

1.1 General

1.1.1 Lanmor Consulting Ltd has been appointed to complete a flood risk assessment for the proposed residential development at Chavey Down Road, Winkfield Row, Bracknell, RG42 6LY. Figure 1.1 below shows the location of the site.

Figure 1.1 – Site Location

1.1.2 This report describes the existing site conditions, development proposals and implications of flooding on the site as described in the governments guidance document; National Planning Policy Framework (NPPF) and its technical guidance. This report will consider the following:

- Development proposals;
- Sources of flooding and flood defences;
- Flooding extents, depth and climate change predictions;
- Impact of flooding on the development;
- Dangers presented by flooding.

1.1.3 This report has been prepared in accordance with the requirements of the governments National Planning Policy Framework (NPPF) and its planning practice guidance and will demonstrate that the proposed development will be safe and will not increase the risk of flooding in the surrounding area.

1.1.4 This report will also consider the proposed drainage regime for the site. It will assess the site's current Greenfield runoff rate, suitable methods of discharging the runoff from the development and set the drainage strategy for the proposed development, including discharge rates and any requirements for attenuation.

2 BASELINE CONDITIONS

2.1 Existing Site

2.1.1 The site is located in Winkfield, Bracknell off Chavey Down Road. The site is currently occupied by a two-storey building used as a club. The nearest source of fluvial flooding to the development is from The Cut to the north approximately 630m from the development site.

2.1.2 A copy of the topographical survey of the site is included in Appendix A as drawing 1558/2.

2.2 Regional Geology

2.2.1 The British Geological Survey (BGS) indicates that the location of the site is underlain by London Clay Formation - Clay, silt and sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period. No superficial deposits have been recorded across the site.

2.3 Proposed Development

2.3.1 The proposed development seeks permission for the demolition of the existing building and construction 3 new residential houses with parking to the middle of the site and new access onto Chavey Down Road. The proposed layout for the development is included in Appendix A as drawing 3181.PLN.101

3 SOURCES OF FLOODING

3.1 Fluvial/Tidal Flooding

3.1.1 Since the site is located well within Flood Zone 1, detailed flood information could not be obtained from the Environment Agency (EA). The National Planning Policy Framework (NPPF) defines the flood zones as the following:

- Zone 1: 'Low Probability': This comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.

- Zone 2: 'Medium Probability' – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

- Zone 3a: 'High Probability' – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (≥1%) or a 1 in 200 or greater annual probability of sea flooding (≥0.5%) in any year.

- Zone 3b: 'The Functional Floodplain' – This zone comprises of land where water must flow or be stored in times of flood. The SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA) including water conveyance routes.

3.1.2 The most significant source of fluvial flooding to the application site is from The Cut however this is over 600m from the site and the site not at risk of flooding from The Cut and is shown to be within Flood Zone 1. This is defined as land assessed as having a less than 1 in 1000 annual probability of river flooding. Figure 3.1 below shows the location of the site with regards to its proximity to the flood zones, as defined by the Environment Agency.

Figure 3.1 – EA Fluvial Flood Map

3.1.3 The map indicates that there are no flood zone 2 or flood zone 3 areas within the immediate vicinity of the site and that the site therefore sits within fluvial Flood Zone 1.

3.2 Surface Water Flooding

3.2.1 The surface water flood mapping provided by the EA is the best available source of national information on surface water flooding. It is a starting point for understanding patterns and probability of surface water flooding. The EA accept that the mapping has limitations and state that *'these maps cannot definitively show that an area of land or property is, or is not, at risk of flooding, and the maps are not suitable for use at an individual property level'.*

3.2.2 Figure 3.2 below indicates the extent of surface water flooding in the area for a 1 in 100-year storm event, as determined by the EA.

Figure 3.2 – EA Surface Water Flood Map

3.2.3 The EA flood maps show that the site is at not at risk of surface water flooding. The above surface water map indicates that the site and surrounding area would not be at risk of surface water flooding in a 1 in 100-year event.

3.3 Flooding from Reservoirs

3.3.1 The EA flood mapping shows that the site is at very low risk of reservoir flooding, including the scenario where rivers are also in flood conditions.

4 DEVELOPMENT VULNERABILITY AND SEQUENTIAL TEST

4.1 Development Vulnerability Classification

4.1.1 The proposed development consists of 3 residential properties. Under Annex 3 of the NPPF and Planning Practical Guidance, the development would be classified as a building used for dwelling houses and therefore considered to have a "More Vulnerable" use.

4.2 Flood Probability

4.2.1 The main source of fluvial flooding to the site is from The Cut to the north. The is within Flood Zone 1 so ha probability of flooding of 0.1% or a 1 in 1000 years

4.3 Sequential Test

4.3.1 The principal of the sequential test is to assess locations and to prioritise development in areas at less risk of flooding. The NPPF suggests that Regional Planning Bodies and Local Planning Authorities should ensure their spatial strategies include a broad consideration of flood risk. Strategic Flood Risk Assessments (SFRA) refine information on the probability of flooding, taking other sources of flooding and the impacts of climate change into account. They provide the basis for applying the sequential test.

The proposed development is considered to be a more vulnerable use in a low flood risk area (zone 1) and therefore the proposals meet the requirements of the sequential test to locate developments to areas at less risk of flooding.

5 MODELLED FLOOD LEVELS AND CLIMATE CHANGE

5.1 Modelled Flood Levels

5.1.1 The nearest source of fluvial flooding to the development is The Cut, located approximately 630m to the north of the site. Given the distance of the site from the nearest source of fluvial flooding, the EA were unable to provide flood level data for this site.

5.1.2 They were able to confirm that the site is located within fluvial Flood Zone 1, so has a probability of 0.1% or less of flooding from rivers.

5.2 Climate Change Allowances

5.2.1 The Environment Agency have published new climate change allowances. The allowance to be implemented is based on the management catchment area, flood zone and site vulnerability. The site is within Flood Zone 1, so no allowance needs to be considered. However, even if the climate change allowance were factored in the site would still be some distance from Flood Zones 2 and 3.

5.3 Development Impact on Flooding

5.3.1 The EA flood maps show the site to be within Flood Zone 1, so the development will not have any impact on the free flow of flood waters or result in the loss of flood storage volumes for an event with a probability of 1.0% +CC or greater.

5.4 Impact on Development

5.4.1 As the development is located well above the flood level for an event with a probability of 1.0% +CC or greater, it will not be at risk of flooding from a flood event with a probability of 1.0% AEP +CC and will not put residents at risk.

5.5 Safe Access

5.5.1 Since the proposed development will not be at risk from flooding for an event with a probability of 1.0% AEP +CC, a safe access route can be provided to and from the development site at all times. The residual risk is considered minimal as the site is located in Flood Zone 1.

6 PROPOSED DRAINAGE STRATEGY

6.1 Existing Drainage

6.1.1 In order to establish the existing drainage regime for the site, Thames Water sewer records have been obtained. These indicate that there is an adopted sewer which runs along Chevey Down Road to the east of the site.

6.1.2 The topographical survey of the site pick up a number of manholes to the north of the existing building. These collect runoff from the roof / hardstanding and the foul discharges from the building. There is no evidence of any soakaways or SuDS features on site.

6.2 Proposed Foul Drainage

6.2.1 Wastewater from the proposed properties will be collected by a network of pipes and discharged to the existing on-site sewer connecting to the adopted sewer in the road.

6.3 Proposed Surface Water Drainage

6.3.1 With regards to discharge of surface water runoff from the development, the SuDS hierarchy has been considered when designing the drainage strategy for the site. The proposed properties will have pitched roofs and so green/blue roof attenuation is not a viable option and has been discounted.

6.3.2 Rainwater harvesting was also considered as a means of reusing surface water runoff within the building. However, these systems require a separate network of pipes within the property, as well as tanks and pumps to store the rainwater and then distribute it through the building. It was considered impractical to implement rainwater harvesting systems on the site due to site constraints and the excessive cost for the development.

6.3.3 In addition, for these systems to be successfully implemented there must be sufficient demand for water reuse otherwise this may lead to water quality issues. Furthermore, rainwater harvesting tanks should not be included in the assessment of attenuation required to store runoff from a development as there is no guarantee that the tank will be sufficiently empty to receive another storm.

6.3.4 Should the rainwater harvesting tank be full at the start of the storm, it will not be able to receive any more runoff, therefore additional storage of a similar size would be required to cater for all storm events and the rainwater harvesting tank will provide no benefit in terms of attenuation. For those reasons, and the excessive cost of providing the system, this method has been discounted.

6.3.5 Next on the Sustainable Drainage Hierarchy is the use of ground infiltration techniques such as soakaways and infiltration basins. The geology in the area is known to be London Clay so infiltration is likely to be poor.

6.3.6 Two infiltration tests were conducted on site to the first to the far west of the site in the soft landscaped area, after a period of 24hrs the water had only dropped approximately 200mm of the 1m filled depth (unable to calculate infiltration rate). The second next to the west side of the existing building. The second trial pit was abandoned before testing as ground water was encountered at a depth of 1.2m. For these reasons, soakaways and permeable paving have been discounted. Permeable paving could however be used for the parking area although this will only act as storage.

6.3.7 Discharge to a nearby watercourse is the next option on the Sustainable Drainage Hierarchy, however as the proposed development is not situated near any suitable watercourse, discharging via this method would not be a viable option and so has been discounted.

6.3.8 Next on the hierarchy is discharging to a surface water sewer and attenuating the flows. There is an existing drainage network on site and an adopted sewer in the road. It is therefore proposed that this is the most viable and sustainable method of surface water drainage and will be adopted for this strategy.

6.3.9 The proposed drainage will therefore employ the use of permeable paving for the driveway, infiltration is not possible so the paving will only provide storage.

6.3.10 NPPF and PPG guidance on climate change allowances recommends that rainfall intensities should be increased to take into account the affects of climate change. The level of allowance depends on site location, vulnerability, and lifetime. For more vulnerable uses with a life expectancy of 100 years should use the upper end allowance.

6.3.11 The site is located in the Maidenhead and Sunbury Management Catchment area, its is more vulnerable use with a 100 year lifetime. Therefore, based on the DEFRA website for climate change allowances the "upper end allowance" of 40% should be included in the drainage design.

6.3.12 Under current policy discharge rates from new developments on brownfield sites should be restricted to as near greenfield as possible and never exceed the existing brownfield rate. The greenfield discharge rates for the site have been estimated using microdrainage. The discharge rates are tabulated below, the greenfield rate is so low that it is not possible to achieve this without the future risk of blockages, therefore the discharge will be restricted by a 30mm orifice to a maximum rate of 1.8l/s.

Return Period	Greenfield Runoff Rate l/s	Brownfield Runoff Rate l/s
Qbar	0.2	n/a
1in1	0.2	8.5
1in 30	0.4	19.2
1in100	0.6	26.1

Table 6.1 – Runoff Rates

6.3.13 The runoff from the roof areas will be directed to the sub base of the paved areas. The subbase will attenuate the runoff from the roofs and paved areas and discharge to the terminal manhole located over the existing outfall on the site's boundary.

6.3.14 An orifice in the final manhole will control the discharge flow from permeable paving sub base to the adopted sewer in the road at a maximum discharge rate of 1.8 l/s. The full calculations for each return period are included in Appendix C.

6.3.15 Drawing 231724/DS/01 included in Appendix B, shows an indicative drainage layout for the development. Drainage calculations have been undertaken to determine the thickness of the sub base needed to accommodate runoff from a 1 in 100 year return period plus 40% climate change. To accommodate the above storm a 500mm thick sub base is required.

7 SUDS TREATMENT

7.1.1 As part of the CIRIA SuDS Manual C753, Section 26 provides guidance regarding methods for managing pollution risks from surface water runoff. Part of the assessment is to determine which land use classification the proposed development falls under, Table 26.1 of the CIRIA Report C753 sets the approaches to water quality risk management. For this site the Simple Index Approach will be used.

7.1.2 Table 26.2 in C753 reproduced as Table 7.1, show the potential hazard associated with different land uses the hazard indices. The development will consist of residential houses, it is concluded that the site should be classed within the sections shown in Table 7.1 below.

7.1.3 The roofs of the residential buildings are considered to have a "very low" pollution hazard, generating 0.2 total suspended solids, 0.2 metals and 0.05 hydro-carbons. The access and parking area is considered to have a "low" pollution hazard, generating 0.5 total suspended solids, 0.4 metals and 0.4 hydro-carbons.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Table 7.1 – CIRIA SuDS Manual C753 (Land use classifications)

7.1.4 The proposed development will incorporate permeable paving for storage and of runoff from the site. Suitable treatment measures offered by SuDS features are set out in CIRA report.

7.1.5 Table 26.3 of C753 reproduced below as Table 7.2 sets out the mitigation indices provided by SuDS features for discharge to surface waters.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 7.2 – CIRIA SuDS Manual C753 (Mitigation Indices to Surface Water)

7.1.6 The permeable paving will provide mitigation of 0.7 for total suspended solids, 0.6 for metals and 0.7 for hydrocarbons. These are all greater than the pollution hazard indices identified in table 7.1 above.

8 SUDS MANAGEMENT & MAINTENANCE

8.1.1 Regular 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.

8.1.2 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".

8.1.3 Regular Maintenance of the drainage and SuDS 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.

8.1.4 The drainage and SuDS elements after an initial inspection following construction should be inspected on a monthly basis for the first 12 months and after large storms, thereafter the following maintenance regime should be applied and adjusted if the 12-month monitoring process has identified any issues.

8.1.5 Following completion of the development, a management company will be set up to manage the development, this will include the drainage and SuDS elements on site. They will be responsible for inspecting and the maintenance of the drainage network, including the SuDS elements.

Permeable Paving

8.1.6 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 8.1 – Permeable Paving Maintenance Schedule

9 SUMMARY AND CONCLUSION

9.1.1 This Flood Risk Assessment and Drainage Strategy has been prepared to identify the potential flood risk and how the proposed development will discharge surface water runoff and foul sewage from the proposed development.

9.1.2 The proposed development will not be subject to flooding as it is in a very low flood risk area from all sources of flooding. The extent of fluvial flooding in the area has been assessed and allowances for climate change factored in and the site is still in a very low flood risk area (Zone 1). It is therefore considered that the site will be safe and free from flood waters for all events with a probability of 1.0% +CC or greater.

9.1.3 As part of the assessment, SuDS was considered for the discharge of surface water runoff from the proposed buildings and parking areas. The proposals will use an attenuation within the paving sub base, that has been sized to ensure that it caters for all events up to and including the 1 in 100 year storm plus 40% climate change allowance. Discharge from the permeable paving will be controlled via an orifice to a maximum rate of 1.8l/s.

9.1.4 This statement clearly demonstrates that the proposed development can be served in terms of discharge of foul and surface water runoff from the site without increasing the risk of flooding in the area. Given the above we can see no reason to preclude development on this site on the grounds of flooding or there being insufficient capacity to deal with the runoff from the proposed development.

APPENDIX A

Drawing 1558/2 – Topographical Survey

Notes

1. Levels in metres relative to Arbitrary Datum situated on STN 1, value 50.00m.

2. Arbitrary Grid.

Key

B	Bollard	P	Post
BL	Bed level	PB	Pillar box
BS	Bus stop	Ret	Retaining
BT	British Telecom	RS	Road sign
CL	Cover level	S	Stump
Dil	Dilapidated	SL	Soffit level
EP	Electricity Pole	SNP	Street name plate
FB	Flower bed	SV	Stop valve
FH	Fire Hydrant	SW	Surface water
FL	Floor level	TCB	Telephone call box
FW	Foul water	Tk	Tank
G	Gully	TP	Telegraph pole
GH	Greenhouse	UC	Under construction
GV	Gas valve	WL	Water level
Ht	Height	WM	Water meter
IC	Inspection cover	WO	Wash out
IL	Invert level	WT	Water trough
KO	Kerb offlet	CATV	Cable television
LP	Lamp post	ER	Earth rod
MH	Manhole	UTL	Unable to lift
Mkr	Marker		

FENCES

B/W	Barbed wire
C/B	Close boarded
C/I	Corrugated iron
Ch/L	Chain link
I/R	Iron railings
Pal	Paling
P/R	Post and rail
P/W	Post and wire

Survey Stations

STN	EASTING	NORTHING	LEVEL	REMARKS
1	500.000	500.000	50.000	NAIL
2	479.157	498.908	50.062	NAIL
3	446.520	490.154	50.054	NAIL
4	452.862	477.147	50.066	NAIL
5	467.767	478.588	50.331	NAIL
6	497.152	511.544	49.762	NAIL

Revisions

REV	DETAILS	DATE

Project
THE WINKFIELD CLUB
WINKFIELD ROW

Job
SITE SURVEY

For
County Homes Bucks Ltd.

By
Developers Land Surveys
17 Bolton Crescent
Windsor
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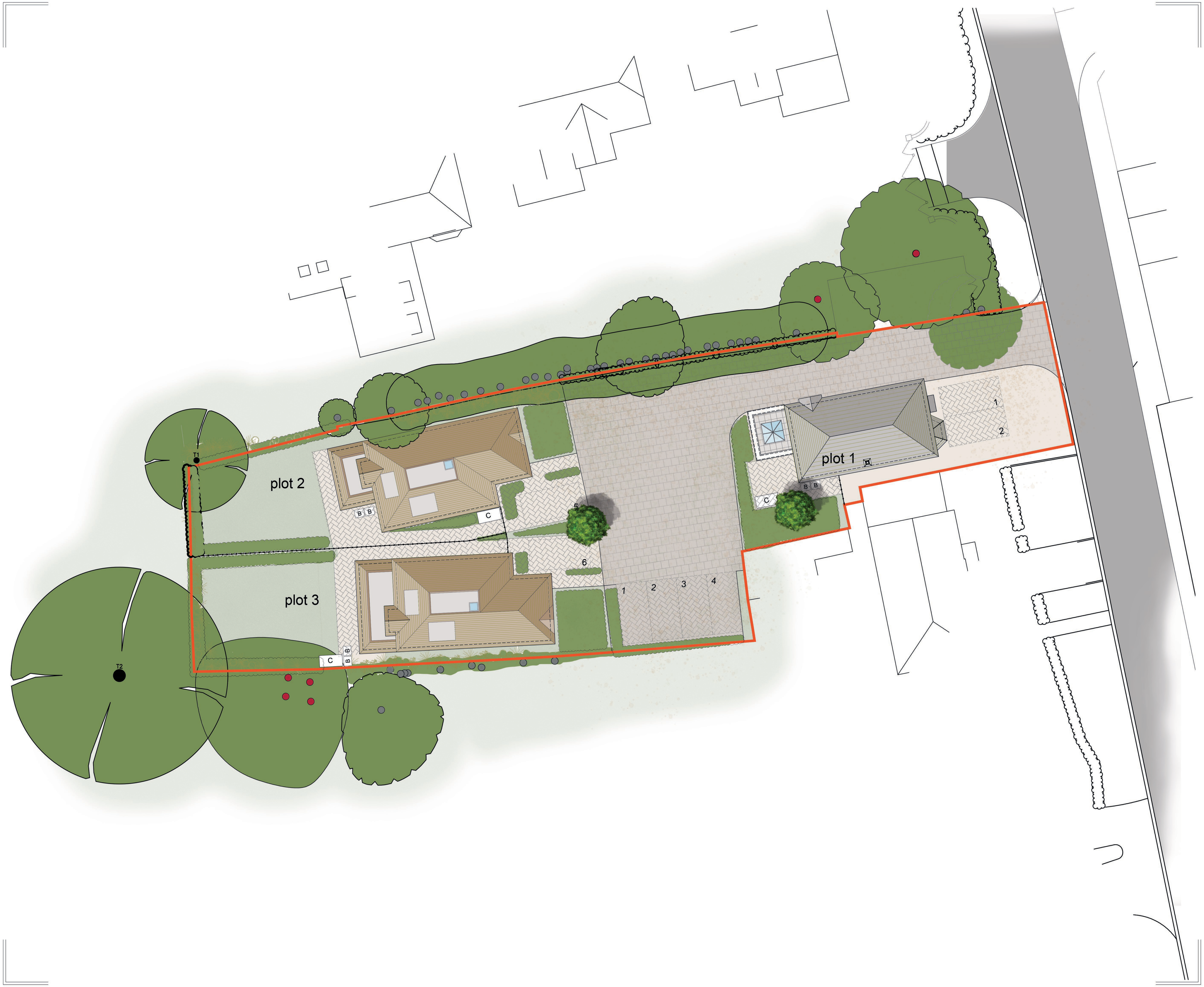
Scale	Drawn	Checked
1:100	WHD	CGF

Date	Drawing No.	Rev.
June 2020	1558/2	

Drawing 3181.PLN.01 – P roposed Site Layout



Notes:

Revision	Date	Description
B	23.10.23	client amendments
A	18.10.23	client amendments

Project:
Winkfield Men's Club
Winkfield

Client:
County Homes Thames Valley Ltd.

Drawing:
Site Layout

Drawing number: 3181.PLN.101

Rev: B

North point:

Drawn by: SE

Date: 03.10.2023

Progress™ Design

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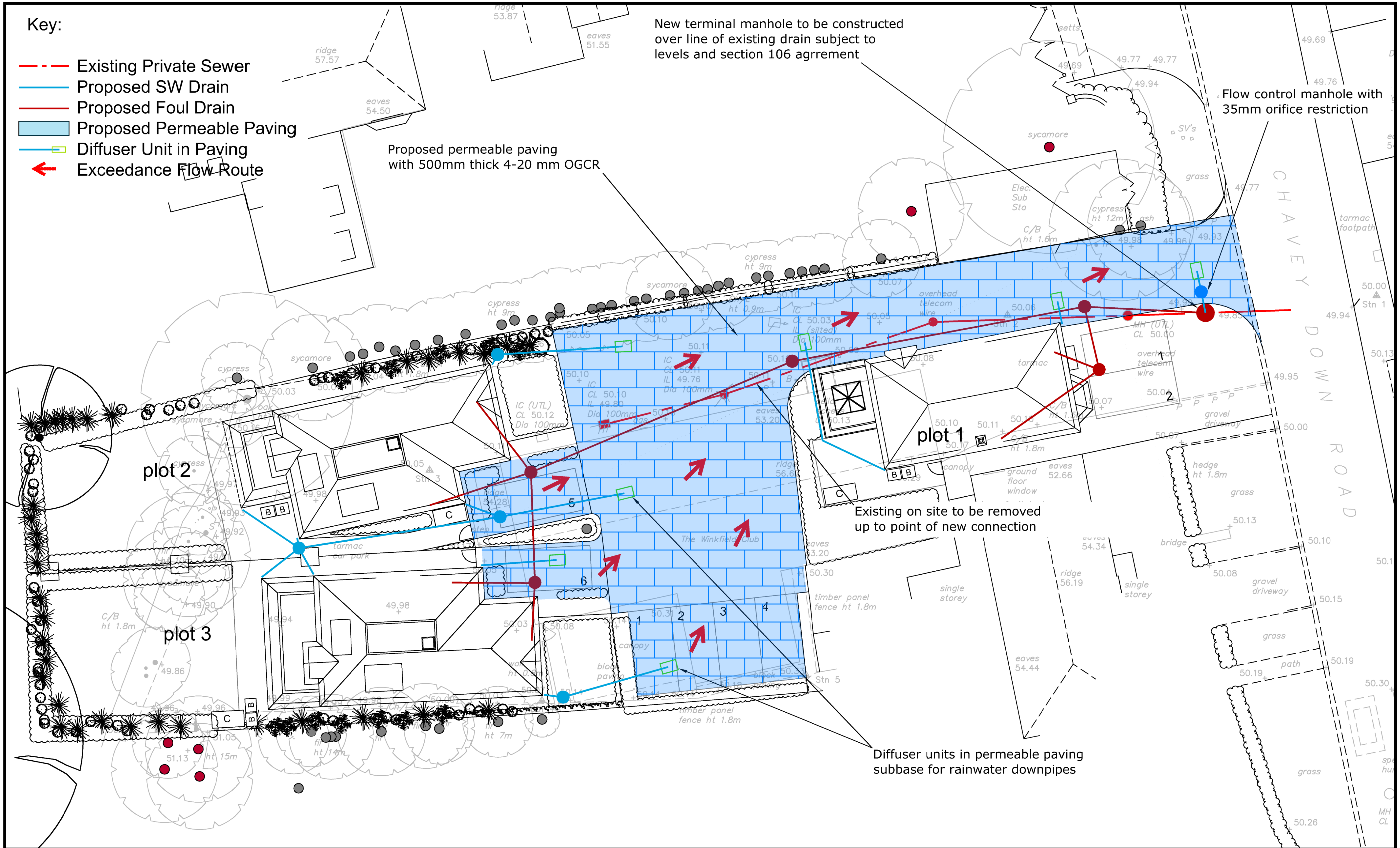
Scale:

1:200 0 5m 10m 15m

A0 A1 A2 A3 A4

APPENDIX B

Drawing 23174/DS/01 – Proposed Drainage Strategy



County Homes Thames Valley Ltd

Winkfield WMC

Proposed Drainge Strategy

SCALE	DRAWN BY	PRJ No.	DWG No.
1:200	OR	231724	231724/DS/01

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APPENDIX C

Microdrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.300
Area (ha)	0.120	Urban	0.000
SAAR (mm)	627	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.2
QBAR Urban	0.2
Q1 year	0.2
Q1 year	0.2
Q30 years	0.4
Q100 years	0.6

Summary of Results for 1 year Return Period

Half Drain Time : 88 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	49.353	0.053	0.0	0.5	0.5	2.4	O K
30 min Summer	49.367	0.067	0.0	0.6	0.6	3.5	O K
60 min Summer	49.380	0.080	0.0	0.6	0.6	4.5	O K
120 min Summer	49.392	0.092	0.0	0.7	0.7	5.4	O K
180 min Summer	49.398	0.098	0.0	0.7	0.7	5.9	O K
240 min Summer	49.401	0.101	0.0	0.7	0.7	6.1	O K
360 min Summer	49.402	0.102	0.0	0.7	0.7	6.2	O K
480 min Summer	49.401	0.101	0.0	0.7	0.7	6.1	O K
600 min Summer	49.398	0.098	0.0	0.7	0.7	5.9	O K
720 min Summer	49.395	0.095	0.0	0.7	0.7	5.7	O K
960 min Summer	49.389	0.089	0.0	0.7	0.7	5.2	O K
1440 min Summer	49.378	0.078	0.0	0.6	0.6	4.4	O K
2160 min Summer	49.366	0.066	0.0	0.6	0.6	3.5	O K
2880 min Summer	49.358	0.058	0.0	0.5	0.5	2.8	O K
4320 min Summer	49.348	0.048	0.0	0.4	0.4	2.1	O K
5760 min Summer	49.343	0.043	0.0	0.4	0.4	1.7	O K
7200 min Summer	49.340	0.040	0.0	0.3	0.3	1.4	O K
8640 min Summer	49.337	0.037	0.0	0.3	0.3	1.2	O K
10080 min Summer	49.335	0.035	0.0	0.3	0.3	1.1	O K
15 min Winter	49.358	0.058	0.0	0.5	0.5	2.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	28.658	0.0	2.6	18
30 min Summer	19.411	0.0	4.0	32
60 min Summer	12.872	0.0	5.7	60
120 min Summer	8.400	0.0	7.9	90
180 min Summer	6.523	0.0	9.3	124
240 min Summer	5.423	0.0	10.5	160
360 min Summer	4.159	0.0	12.2	228
480 min Summer	3.446	0.0	13.6	296
600 min Summer	2.979	0.0	14.7	362
720 min Summer	2.645	0.0	15.7	426
960 min Summer	2.193	0.0	17.4	552
1440 min Summer	1.681	0.0	20.0	806
2160 min Summer	1.290	0.0	23.0	1168
2880 min Summer	1.070	0.0	25.3	1528
4320 min Summer	0.821	0.0	28.8	2208
5760 min Summer	0.677	0.0	31.3	2944
7200 min Summer	0.584	0.0	33.2	3672
8640 min Summer	0.517	0.0	34.9	4408
10080 min Summer	0.467	0.0	36.3	5136
15 min Winter	28.658	0.0	3.1	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	49.375	0.075	0.0	0.6	0.6	4.1	O K
60 min Winter	49.390	0.090	0.0	0.7	0.7	5.3	O K
120 min Winter	49.403	0.103	0.0	0.7	0.7	6.2	O K
180 min Winter	49.408	0.108	0.0	0.8	0.8	6.7	O K
240 min Winter	49.410	0.110	0.0	0.8	0.8	6.8	O K
360 min Winter	49.408	0.108	0.0	0.8	0.8	6.7	O K
480 min Winter	49.404	0.104	0.0	0.8	0.8	6.3	O K
600 min Winter	49.399	0.099	0.0	0.7	0.7	6.0	O K
720 min Winter	49.394	0.094	0.0	0.7	0.7	5.6	O K
960 min Winter	49.385	0.085	0.0	0.7	0.7	4.9	O K
1440 min Winter	49.370	0.070	0.0	0.6	0.6	3.7	O K
2160 min Winter	49.355	0.055	0.0	0.5	0.5	2.6	O K
2880 min Winter	49.348	0.048	0.0	0.4	0.4	2.0	O K
4320 min Winter	49.340	0.040	0.0	0.3	0.3	1.5	O K
5760 min Winter	49.336	0.036	0.0	0.3	0.3	1.1	O K
7200 min Winter	49.333	0.033	0.0	0.2	0.2	1.0	O K
8640 min Winter	49.330	0.030	0.0	0.2	0.2	0.8	O K
10080 min Winter	49.329	0.029	0.0	0.2	0.2	0.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	19.411	0.0	4.7	31
60 min Winter	12.872	0.0	6.6	58
120 min Winter	8.400	0.0	9.0	96
180 min Winter	6.523	0.0	10.6	134
240 min Winter	5.423	0.0	11.9	172
360 min Winter	4.159	0.0	13.8	246
480 min Winter	3.446	0.0	15.4	316
600 min Winter	2.979	0.0	16.7	384
720 min Winter	2.645	0.0	17.8	450
960 min Winter	2.193	0.0	19.7	580
1440 min Winter	1.681	0.0	22.7	826
2160 min Winter	1.290	0.0	26.1	1188
2880 min Winter	1.070	0.0	28.7	1528
4320 min Winter	0.821	0.0	32.7	2248
5760 min Winter	0.677	0.0	35.6	2944
7200 min Winter	0.584	0.0	37.9	3672
8640 min Winter	0.517	0.0	39.9	4400
10080 min Winter	0.467	0.0	41.5	5128

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)	20.100	Shortest Storm (mins)	15
Ratio R	0.311	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.073

Time From:	(mins) To:	Area (ha)
0	4	0.073

Model Details

Storage is Online Cover Level (m) 49.950

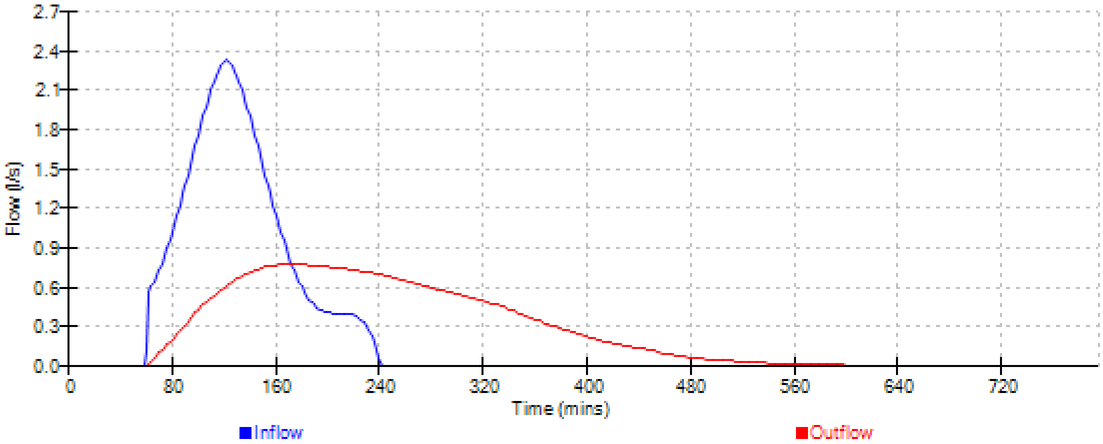
Porous Car Park Structure

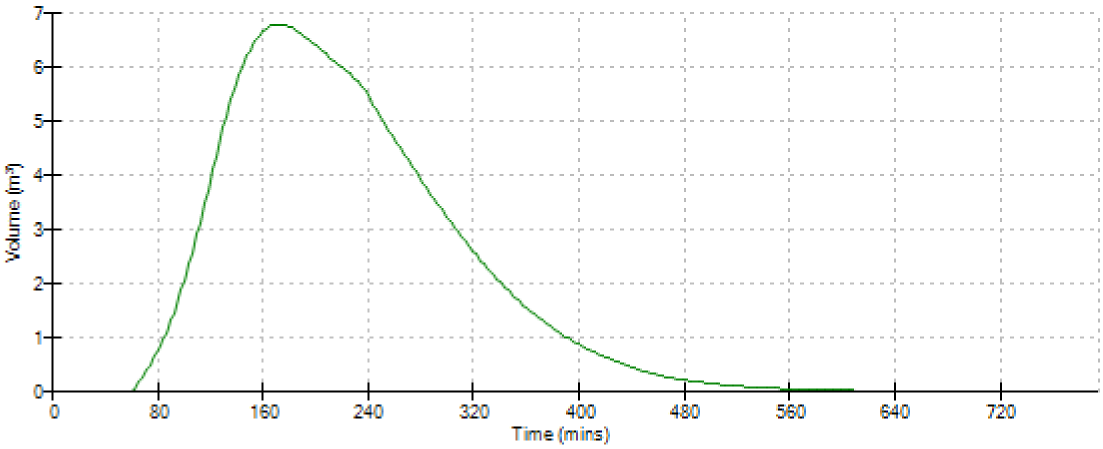
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	21.3
Max Percolation (l/s)	71.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.300	Cap Volume Depth (m)	0.500

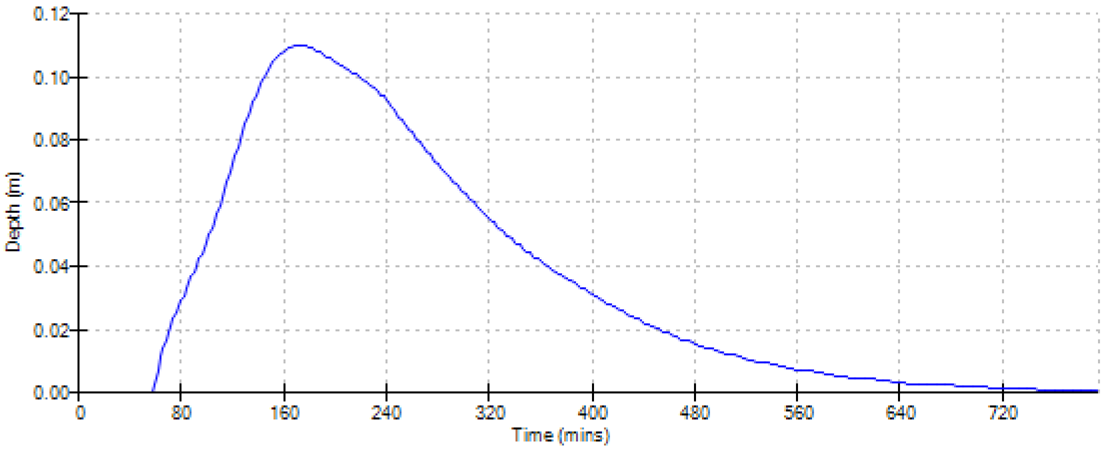
Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 49.300

Event: 240 min Winter







Summary of Results for 30 year Return Period

Half Drain Time : 147 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	49.424	0.124	0.0	0.8	0.8	7.8	O K
30 min Summer	49.461	0.161	0.0	1.0	1.0	10.7	O K
60 min Summer	49.496	0.196	0.0	1.1	1.1	13.4	O K
120 min Summer	49.519	0.219	0.0	1.1	1.1	15.2	O K
180 min Summer	49.527	0.227	0.0	1.2	1.2	15.8	O K
240 min Summer	49.531	0.231	0.0	1.2	1.2	16.1	O K
360 min Summer	49.531	0.231	0.0	1.2	1.2	16.1	O K
480 min Summer	49.527	0.227	0.0	1.2	1.2	15.7	O K
600 min Summer	49.520	0.220	0.0	1.2	1.2	15.3	O K
720 min Summer	49.513	0.213	0.0	1.1	1.1	14.7	O K
960 min Summer	49.499	0.199	0.0	1.1	1.1	13.6	O K
1440 min Summer	49.473	0.173	0.0	1.0	1.0	11.6	O K
2160 min Summer	49.443	0.143	0.0	0.9	0.9	9.3	O K
2880 min Summer	49.421	0.121	0.0	0.8	0.8	7.6	O K
4320 min Summer	49.391	0.091	0.0	0.7	0.7	5.4	O K
5760 min Summer	49.373	0.073	0.0	0.6	0.6	4.0	O K
7200 min Summer	49.361	0.061	0.0	0.5	0.5	3.1	O K
8640 min Summer	49.354	0.054	0.0	0.5	0.5	2.5	O K
10080 min Summer	49.349	0.049	0.0	0.4	0.4	2.1	O K
15 min Winter	49.438	0.138	0.0	0.9	0.9	9.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	70.207	0.0	8.3	18
30 min Summer	47.627	0.0	11.7	32
60 min Summer	30.968	0.0	15.6	62
120 min Summer	19.507	0.0	20.0	106
180 min Summer	14.683	0.0	22.7	138
240 min Summer	11.966	0.0	24.8	170
360 min Summer	8.959	0.0	28.0	240
480 min Summer	7.286	0.0	30.4	308
600 min Summer	6.201	0.0	32.4	376
720 min Summer	5.433	0.0	34.0	444
960 min Summer	4.407	0.0	36.8	578
1440 min Summer	3.276	0.0	41.0	836
2160 min Summer	2.431	0.0	45.5	1208
2880 min Summer	1.965	0.0	48.8	1560
4320 min Summer	1.455	0.0	53.8	2292
5760 min Summer	1.176	0.0	57.5	3000
7200 min Summer	0.998	0.0	60.4	3680
8640 min Summer	0.872	0.0	62.9	4408
10080 min Summer	0.779	0.0	65.0	5144
15 min Winter	70.207	0.0	9.5	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	49.481	0.181	0.0	1.0	1.0	12.2	O K
60 min Winter	49.520	0.220	0.0	1.2	1.2	15.3	O K
120 min Winter	49.548	0.248	0.0	1.2	1.2	17.4	O K
180 min Winter	49.556	0.256	0.0	1.2	1.2	18.0	O K
240 min Winter	49.558	0.258	0.0	1.3	1.3	18.2	O K
360 min Winter	49.555	0.255	0.0	1.2	1.2	17.9	O K
480 min Winter	49.546	0.246	0.0	1.2	1.2	17.2	O K
600 min Winter	49.535	0.235	0.0	1.2	1.2	16.4	O K
720 min Winter	49.524	0.224	0.0	1.2	1.2	15.5	O K
960 min Winter	49.502	0.202	0.0	1.1	1.1	13.8	O K
1440 min Winter	49.465	0.165	0.0	1.0	1.0	11.0	O K
2160 min Winter	49.426	0.126	0.0	0.8	0.8	8.0	O K
2880 min Winter	49.400	0.100	0.0	0.7	0.7	6.0	O K
4320 min Winter	49.369	0.069	0.0	0.6	0.6	3.7	O K
5760 min Winter	49.353	0.053	0.0	0.5	0.5	2.5	O K
7200 min Winter	49.347	0.047	0.0	0.4	0.4	1.9	O K
8640 min Winter	49.342	0.042	0.0	0.4	0.4	1.6	O K
10080 min Winter	49.339	0.039	0.0	0.3	0.3	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	47.627	0.0	13.3	32
60 min Winter	30.968	0.0	17.7	60
120 min Winter	19.507	0.0	22.6	114
180 min Winter	14.683	0.0	25.6	144
240 min Winter	11.966	0.0	27.9	182
360 min Winter	8.959	0.0	31.5	258
480 min Winter	7.286	0.0	34.2	334
600 min Winter	6.201	0.0	36.4	404
720 min Winter	5.433	0.0	38.3	476
960 min Winter	4.407	0.0	41.4	614
1440 min Winter	3.276	0.0	46.2	878
2160 min Winter	2.431	0.0	51.2	1252
2880 min Winter	1.965	0.0	55.0	1612
4320 min Winter	1.455	0.0	60.7	2332
5760 min Winter	1.176	0.0	64.9	3000
7200 min Winter	0.998	0.0	68.3	3672
8640 min Winter	0.872	0.0	71.2	4416
10080 min Winter	0.779	0.0	73.6	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)	20.100	Shortest Storm (mins)	15
Ratio R	0.311	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.073

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.073

Model Details

Storage is Online Cover Level (m) 49.950

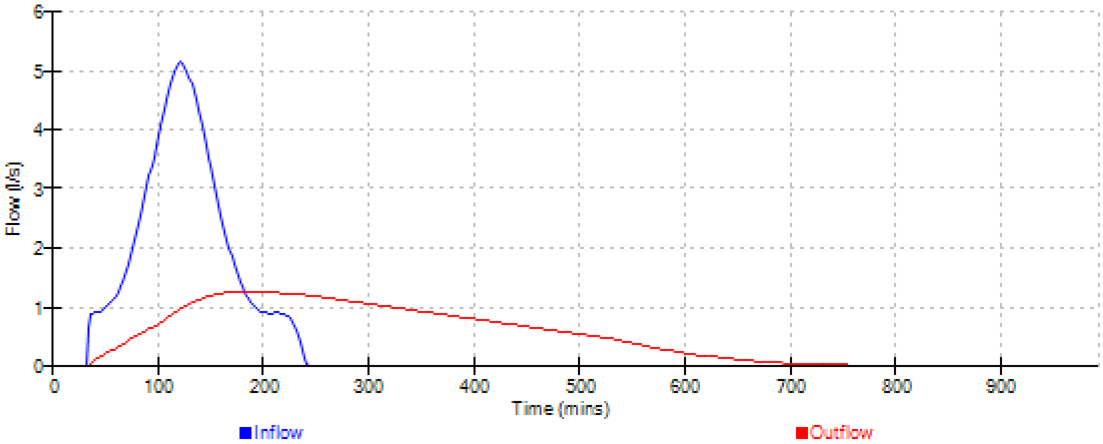
Porous Car Park Structure

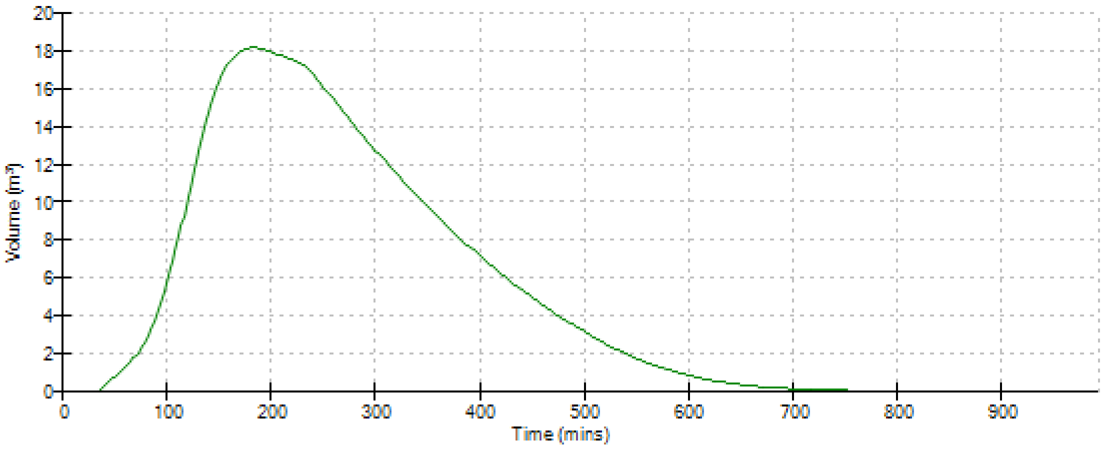
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	21.3
Max Percolation (l/s)	71.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.300	Cap Volume Depth (m)	0.500

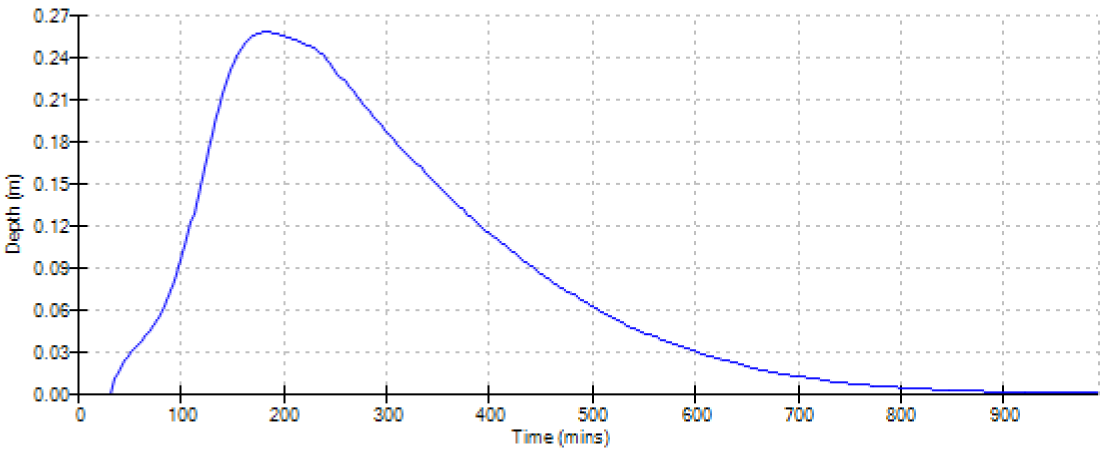
Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 49.300

Event: 240 min Winter







Summary of Results for 100 year Return Period

Half Drain Time : 173 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	49.459	0.159	0.0	1.0	1.0	10.6	O K
30 min Summer	49.511	0.211	0.0	1.1	1.1	14.5	O K
60 min Summer	49.559	0.259	0.0	1.3	1.3	18.3	O K
120 min Summer	49.593	0.293	0.0	1.3	1.3	20.8	O K
180 min Summer	49.602	0.302	0.0	1.4	1.4	21.5	O K
240 min Summer	49.606	0.306	0.0	1.4	1.4	21.8	O K
360 min Summer	49.605	0.305	0.0	1.4	1.4	21.8	O K
480 min Summer	49.600	0.300	0.0	1.4	1.4	21.3	O K
600 min Summer	49.591	0.291	0.0	1.3	1.3	20.7	O K
720 min Summer	49.582	0.282	0.0	1.3	1.3	20.0	O K
960 min Summer	49.563	0.263	0.0	1.3	1.3	18.5	O K
1440 min Summer	49.529	0.229	0.0	1.2	1.2	15.9	O K
2160 min Summer	49.488	0.188	0.0	1.1	1.1	12.8	O K
2880 min Summer	49.458	0.158	0.0	1.0	1.0	10.5	O K
4320 min Summer	49.418	0.118	0.0	0.8	0.8	7.4	O K
5760 min Summer	49.393	0.093	0.0	0.7	0.7	5.5	O K
7200 min Summer	49.377	0.077	0.0	0.6	0.6	4.3	O K
8640 min Summer	49.366	0.066	0.0	0.6	0.6	3.4	O K
10080 min Summer	49.358	0.058	0.0	0.5	0.5	2.8	O K
15 min Winter	49.478	0.178	0.0	1.0	1.0	12.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.861	0.0	11.1	18
30 min Summer	62.270	0.0	15.8	33
60 min Summer	40.718	0.0	21.0	62
120 min Summer	25.603	0.0	26.7	116
180 min Summer	19.150	0.0	30.1	144
240 min Summer	15.523	0.0	32.6	176
360 min Summer	11.537	0.0	36.4	244
480 min Summer	9.329	0.0	39.3	314
600 min Summer	7.904	0.0	41.7	382
720 min Summer	6.898	0.0	43.7	450
960 min Summer	5.558	0.0	46.9	586
1440 min Summer	4.090	0.0	51.7	840
2160 min Summer	3.001	0.0	56.7	1212
2880 min Summer	2.406	0.0	60.4	1584
4320 min Summer	1.760	0.0	65.8	2292
5760 min Summer	1.411	0.0	69.8	3008
7200 min Summer	1.190	0.0	73.0	3744
8640 min Summer	1.035	0.0	75.7	4416
10080 min Summer	0.920	0.0	78.0	5144
15 min Winter	90.861	0.0	12.6	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	49.536	0.236	0.0	1.2	1.2	16.5	O K
60 min Winter	49.592	0.292	0.0	1.3	1.3	20.8	O K
120 min Winter	49.633	0.333	0.0	1.4	1.4	23.9	O K
180 min Winter	49.641	0.341	0.0	1.5	1.5	24.5	O K
240 min Winter	49.644	0.344	0.0	1.5	1.5	24.7	O K
360 min Winter	49.640	0.340	0.0	1.5	1.5	24.4	O K
480 min Winter	49.629	0.329	0.0	1.4	1.4	23.6	O K
600 min Winter	49.615	0.315	0.0	1.4	1.4	22.5	O K
720 min Winter	49.601	0.301	0.0	1.4	1.4	21.4	O K
960 min Winter	49.572	0.272	0.0	1.3	1.3	19.2	O K
1440 min Winter	49.523	0.223	0.0	1.2	1.2	15.5	O K
2160 min Winter	49.470	0.170	0.0	1.0	1.0	11.4	O K
2880 min Winter	49.434	0.134	0.0	0.9	0.9	8.6	O K
4320 min Winter	49.391	0.091	0.0	0.7	0.7	5.3	O K
5760 min Winter	49.368	0.068	0.0	0.6	0.6	3.6	O K
7200 min Winter	49.355	0.055	0.0	0.5	0.5	2.6	O K
8640 min Winter	49.348	0.048	0.0	0.4	0.4	2.0	O K
10080 min Winter	49.344	0.044	0.0	0.4	0.4	1.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	62.270	0.0	17.8	32
60 min Winter	40.718	0.0	23.7	60
120 min Winter	25.603	0.0	30.1	116
180 min Winter	19.150	0.0	33.9	152
240 min Winter	15.523	0.0	36.7	186
360 min Winter	11.537	0.0	41.0	264
480 min Winter	9.329	0.0	44.2	338
600 min Winter	7.904	0.0	46.9	412
720 min Winter	6.898	0.0	49.1	484
960 min Winter	5.558	0.0	52.7	624
1440 min Winter	4.090	0.0	58.1	892
2160 min Winter	3.001	0.0	63.8	1272
2880 min Winter	2.406	0.0	68.0	1640
4320 min Winter	1.760	0.0	74.1	2336
5760 min Winter	1.411	0.0	78.7	3056
7200 min Winter	1.190	0.0	82.4	3744
8640 min Winter	1.035	0.0	85.5	4416
10080 min Winter	0.920	0.0	88.2	5120

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)	20.100	Shortest Storm (mins)	15
Ratio R	0.311	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.073

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.073

Model Details

Storage is Online Cover Level (m) 49.950

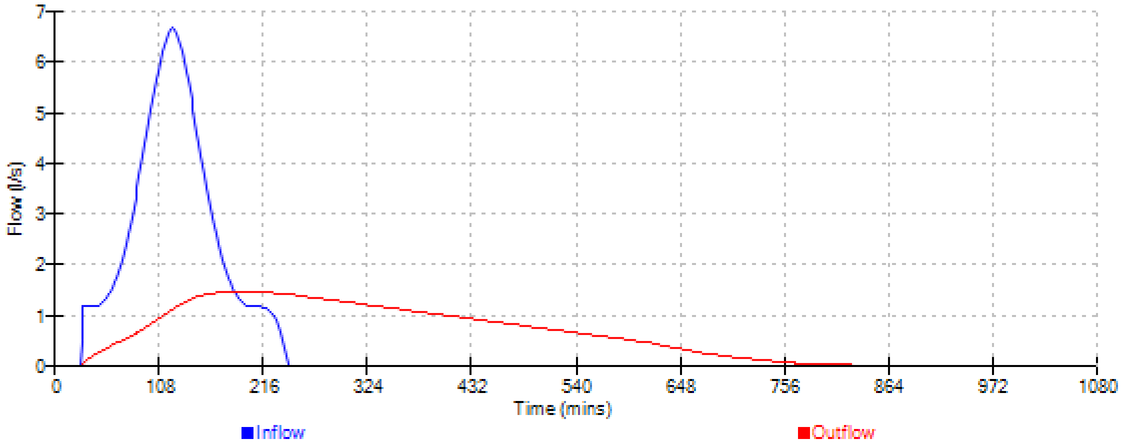
Porous Car Park Structure

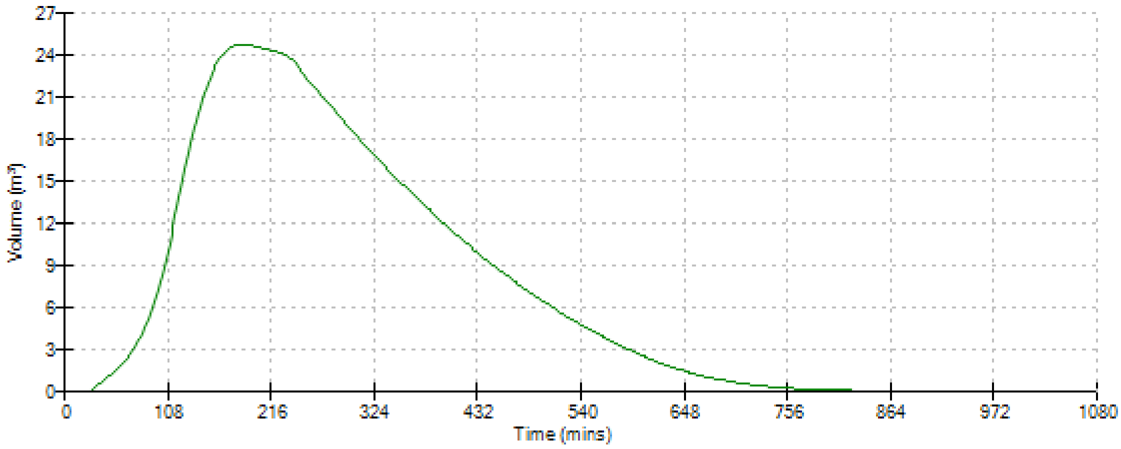
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	21.3
Max Percolation (l/s)	71.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.300	Cap Volume Depth (m)	0.500

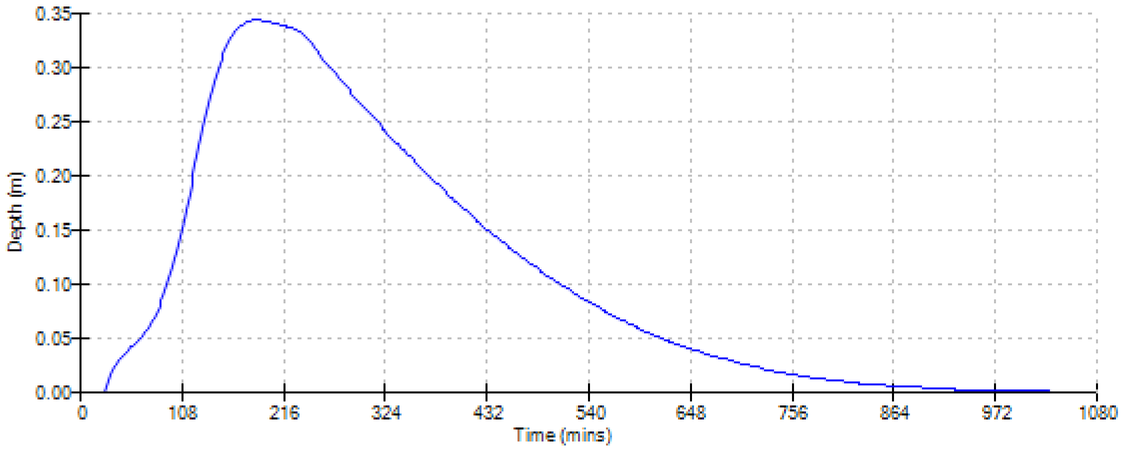
Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 49.300

Event: 240 min Winter







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

Half Drain Time : 205 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	49.522	0.222	0.0	1.2	1.2	15.4	O K
30 min Summer	49.596	0.296	0.0	1.3	1.3	21.0	O K
60 min Summer	49.667	0.367	0.0	1.5	1.5	26.5	Flood Risk
120 min Summer	49.721	0.421	0.0	1.6	1.6	30.6	Flood Risk
180 min Summer	49.735	0.435	0.0	1.7	1.7	31.7	Flood Risk
240 min Summer	49.741	0.441	0.0	1.7	1.7	32.2	Flood Risk
360 min Summer	49.745	0.445	0.0	1.7	1.7	32.5	Flood Risk
480 min Summer	49.740	0.440	0.0	1.7	1.7	32.1	Flood Risk
600 min Summer	49.731	0.431	0.0	1.6	1.6	31.4	Flood Risk
720 min Summer	49.720	0.420	0.0	1.6	1.6	30.6	Flood Risk
960 min Summer	49.696	0.396	0.0	1.6	1.6	28.8	Flood Risk
1440 min Summer	49.651	0.351	0.0	1.5	1.5	25.3	Flood Risk
2160 min Summer	49.595	0.295	0.0	1.3	1.3	21.0	O K
2880 min Summer	49.552	0.252	0.0	1.2	1.2	17.7	O K
4320 min Summer	49.491	0.191	0.0	1.1	1.1	13.0	O K
5760 min Summer	49.452	0.152	0.0	0.9	0.9	10.0	O K
7200 min Summer	49.425	0.125	0.0	0.8	0.8	7.9	O K
8640 min Summer	49.405	0.105	0.0	0.8	0.8	6.5	O K
10080 min Summer	49.391	0.091	0.0	0.7	0.7	5.3	O K
15 min Winter	49.549	0.249	0.0	1.2	1.2	17.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	127.205	0.0	16.1	18
30 min Summer	87.178	0.0	22.6	33
60 min Summer	57.005	0.0	29.9	62
120 min Summer	35.844	0.0	37.9	120
180 min Summer	26.811	0.0	42.7	154
240 min Summer	21.732	0.0	46.2	186
360 min Summer	16.152	0.0	51.6	252
480 min Summer	13.061	0.0	55.7	322
600 min Summer	11.065	0.0	59.0	390
720 min Summer	9.657	0.0	61.8	458
960 min Summer	7.781	0.0	66.4	596
1440 min Summer	5.726	0.0	73.2	854
2160 min Summer	4.202	0.0	80.4	1236
2880 min Summer	3.368	0.0	85.7	1612
4320 min Summer	2.463	0.0	93.5	2336
5760 min Summer	1.976	0.0	99.5	3056
7200 min Summer	1.665	0.0	104.3	3752
8640 min Summer	1.449	0.0	108.3	4496
10080 min Summer	1.288	0.0	111.8	5240
15 min Winter	127.205	0.0	18.2	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	49.632	0.332	0.0	1.4	1.4	23.8	O K
60 min Winter	49.714	0.414	0.0	1.6	1.6	30.1	Flood Risk
120 min Winter	49.778	0.478	0.0	1.7	1.7	35.0	Flood Risk
180 min Winter	49.795	0.495	0.0	1.8	1.8	36.3	Flood Risk
240 min Winter	49.799	0.499	0.0	1.8	1.8	36.7	Flood Risk
360 min Winter	49.800	0.500	0.0	1.8	1.8	36.7	Flood Risk
480 min Winter	49.789	0.489	0.0	1.8	1.8	35.9	Flood Risk
600 min Winter	49.774	0.474	0.0	1.7	1.7	34.7	Flood Risk
720 min Winter	49.756	0.456	0.0	1.7	1.7	33.3	Flood Risk
960 min Winter	49.720	0.420	0.0	1.6	1.6	30.6	Flood Risk
1440 min Winter	49.654	0.354	0.0	1.5	1.5	25.5	Flood Risk
2160 min Winter	49.577	0.277	0.0	1.3	1.3	19.6	O K
2880 min Winter	49.522	0.222	0.0	1.2	1.2	15.4	O K
4320 min Winter	49.452	0.152	0.0	0.9	0.9	10.0	O K
5760 min Winter	49.413	0.113	0.0	0.8	0.8	7.0	O K
7200 min Winter	49.388	0.088	0.0	0.7	0.7	5.1	O K
8640 min Winter	49.373	0.073	0.0	0.6	0.6	3.9	O K
10080 min Winter	49.362	0.062	0.0	0.5	0.5	3.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	87.178	0.0	25.4	32
60 min Winter	57.005	0.0	33.6	60
120 min Winter	35.844	0.0	42.6	118
180 min Winter	26.811	0.0	47.9	170
240 min Winter	21.732	0.0	51.9	194
360 min Winter	16.152	0.0	58.0	270
480 min Winter	13.061	0.0	62.5	346
600 min Winter	11.065	0.0	66.3	422
720 min Winter	9.657	0.0	69.4	494
960 min Winter	7.781	0.0	74.6	636
1440 min Winter	5.726	0.0	82.2	910
2160 min Winter	4.202	0.0	90.3	1296
2880 min Winter	3.368	0.0	96.3	1672
4320 min Winter	2.463	0.0	105.2	2380
5760 min Winter	1.976	0.0	112.0	3112
7200 min Winter	1.665	0.0	117.4	3816
8640 min Winter	1.449	0.0	122.1	4496
10080 min Winter	1.288	0.0	126.1	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)	20.100	Shortest Storm (mins)	15
Ratio R	0.311	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.073

Time From:	(mins) To:	Area (ha)
0	4	0.073

Model Details

Storage is Online Cover Level (m) 49.950

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	21.3
Max Percolation (l/s)	71.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.300	Cap Volume Depth (m)	0.500

Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 49.300

Event: 360 min Winter