



DRAINAGE STRATEGY

BARN ACRE COTTAGE, LODDEN DRIVE,
WARGRAVE, WOKINGHAM, RG10 8HN
MR ALEX GRIFFITHS
MARCH 2025
6297-BARNA -ICS-XX-RP-C-07.001

DRAINAGE STRATEGY

6297-BARNA -ICS-XX-RP-C-07.001

REPORT ISSUE

Revision	Date	Notes
P01	25/03/2025	First Issue

PREPARED BY

R. IREANIUS March 2024

REVIEWED BY

A. LLOYD March 2024

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TABLE OF CONTENTS

1 DRAINAGE STRATEGY	1
APPENDIX A - MAINTENANCE SCHEDULE	3
APPENDIX B - INFILTRATION TESTING	6
APPENDIX C - PERMAFILTER GEOTEXTILE INFORMATION	7
APPENDIX D - DRAINAGE LAYOUT	8
APPENDIX E - DRAINAGE CALCULATIONS	9

1 DRAINAGE STRATEGY

Item	Details
Method of Surface Water Discharge	The surface water drainage design proposed for the new dwellings is to follow the drainage hierarchy to ensure the site reflects the natural flows from the site as closely as possible: 1. Rainwater reuse 2. Infiltration 3. Discharge to Surface Water or a Watercourse 4. Discharge to a Surface Water sewer or a Highway Drain 5. Discharge to a Foul Sewer Surface Water will be discharged into a rainwater garden where it will be able to discharge into the ground. Due to being unable to attain one full meter clearance between the base of the rainwater garden at 33.95mbgl and the peak groundwater level at 33.45m a Permafilter geotextile is required to further improve water quality and add a secondary source of treatment to roof run off. The Primary treatment will occur in the open graded subbase of the rainwater garden. This is thought to be a preferable method than discharging to the watercourse with an attenuated solution as this will provide a slower discharge into the groundwater which will likely enter the watercourse, minimising the risk of downstream flooding due to the development on this site. The water will also receive significantly more treatment with this proposal than with an attenuated proposal as it will pass through open graded subbase, permafilter geotextile and soils before entering the groundwater.
Local Ground Conditions	A site investigation has yet to be undertaken for the site. However, BGS maps indicate the site is underlain by Superficial deposits of: Alluvium - Clay, silt, sand and gravel. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period. With a bedrock of Seaford Chalk Formation and Newhaven Chalk Formation - Chalk. Sedimentary bedrock formed between 89.8 and 72.1 million years ago during the Cretaceous period.
Infiltration Rate	A soakage rate of 3.232×10^{-5} m/s has been calculated with the use of on site BRE365 tests taken by the client. See appendix B.
Surface Water Calculations	The surface water drainage system has been designed for a 1 in 100-year event, plus an allowance of 40% for climate change. Impermeable areas have had an additional 10% added for urban creep in line with Ciria C753. Contributing Areas Roof Areas = 65m²
Ground Water	Ground water was encountered at a level of 33.45m.

Item	Details
Water Quality	A type 3, open graded subbase will be used from primary treatment of the roof run off. Permafilter geotextile will be used for secondary treatment prior to the water discharging to the ground.
Exceedance Flows	The proposed surface water drainage measures will be designed to contain the peak storm event that can be expected for a 1 in 100-year situation. A 40% allowance has already been applied to the site to account for future climate change and a further 10% added to the impermeable areas to allow for urban creep. In the event that the SuDS feature capacity is exceeded the run off will follow the natural flow of the land and drain to the watercourse away from people and property
Fluvial Flood Risk/ Environment Agency Flood Mapping	The site is located within flood zone 2, which is defined as land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (Land shown in light blue on the Flood Map). And flood zone 3 Flood Zone 3, which is defined as land assessed as having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. The garden and dwellings surroundings are located within flood zone 3 with the development being located on slightly higher land in flood zone 2.
SuDS Maintenance	The SuDS systems will be maintained by land owner.
Other	

Appendix A - Maintenance Schedule

Item	Required Maintenance	Frequency
Pipe and chambers	CCTV camera survey, flush, descale, repair as necessary	5 Years or upon poor performance
Pervious Pavements (Gravels)	Inspect gravel for siltation and weed growth	As required or upon poor performance
	Remove Weeds and rake	As required or upon poor performance
	For heavy siltation or petrochemical spills lift surface gravel, wash and replace	As required or upon poor performance
	Stabilise and mow contributing and adjacent areas.	As required.
	Initial inspection.	Monthly for 3 months after installation
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	3-monthly, 48 h after large storms.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.
Rainwater gardens	Litter and debris removal.	Monthly (or as required).
	Grass cutting – to retain grass height within specified design range.	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter and cut back adjacent vegetation where possible.	Annually.
	Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required.	Annually, or if bare soil is exposed over 10 % or more of the swale treatment area.
	Repair erosion or other damage by re-turfing or reseeding.	As required.
	Re-level uneven surfaces and reinstate design levels.	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for > 48 hours.	Monthly, or when required.
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Half yearly.
Silt traps and catchpits	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly

Item	Required Maintenance	Frequency
	Inspection of silt traps and catch pits to assess silt accumulation	Monthly (and after large storms)
	Removal of accumulated silt from silt trap and catch pit sumps	Annually, or as required
	Repair/rehabilitation of inlets, outlet, overflows and vents	As required
	Inspect/check all inlets, outlets, and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

Appendix B - Infiltration Testing

Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Test Reference:	TP1
Site:	Barn Acre
Client:	Alex Griffiths
Test Date:	17/03/2025
Results logged by:	Client

Calculations By:	RJW
Calculation Date:	17/03/2025
Length (m) =	1.00
Width (m) =	0.60
Depth (m) =	1.00



Infrastruct CS Ltd

File ref:	6297-BARNA-13-001-BRE365.xlsx
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First Fill	
Time [Mins]	Test 1 Depth [m]
0.00	0.25
2.00	0.23
4.00	0.45
13.00	0.55
39.00	0.65
59.00	0.75
88.00	0.85

Second Fill	
Time [Mins]	Test 2 Depth [m]
0.00	0.25
2.00	0.35
4.00	0.45
14.00	0.55
35.00	0.65
66.00	0.75
95.00	0.82

Third Fill	
Time [Mins]	Test 3 Depth [m]
0.00	0.25
2.00	0.35
5.00	0.45
17.00	0.55
36.00	0.65
62.00	0.75
102.00	0.85

RESULTS

Volume Vp75 - 25 [m³]	0.18600
Area [m²]= A _{p50}	2.0720
Time t _{p75-25} [s] =	2718
Surface Water Soil infiltration rate [m/s]	3.303E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	8.77
Surface Water Soil infiltration rate [m/hr]	0.119

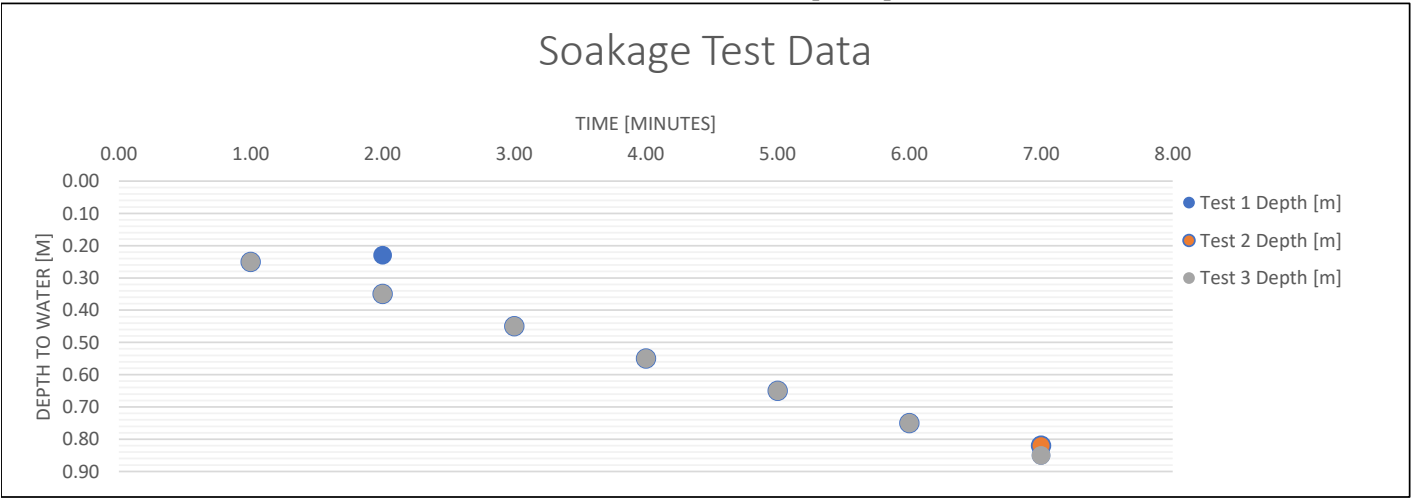
RESULTS

Volume Vp75 - 25 [m³]	0.17100
Area [m²]= A _{p50}	2.0880
Time t _{p75-25} [s] =	2441
Surface Water Soil infiltration rate [m/s]	3.356E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	8.56
Surface Water Soil infiltration rate [m/hr]	0.121

RESULTS

Volume Vp75 - 25 [m³]	0.18000
Area [m²]= A _{p50}	2.0400
Time t _{p75-25} [s] =	2730
Surface Water Soil infiltration rate [m/s]	3.232E-05
Treated Effluent Soil infiltration rate (V _p) [s/mm]	9.10
Surface Water Soil infiltration rate [m/hr]	0.116

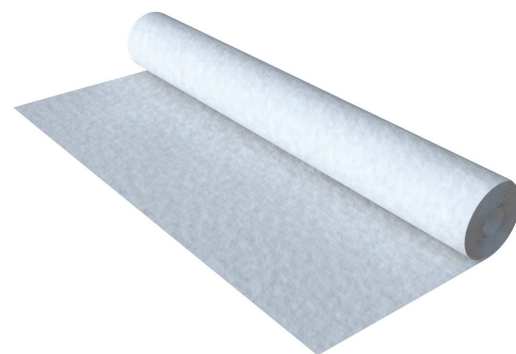
Slowest Soil Infiltration Rate [m/s] = 3.232E-05



Appendix C - Permafilter Geotextile Information

Product code: PV23002

Permafilter Geotextile is a non-woven, dimpled, needle punched geotextile that has been specifically designed for hydrocarbon pollution treatment in sustainable drainage systems (SuDS) and other civil engineering applications.



Applications

Permafilter Geotextile is suitable for a wide range of applications including podium decks, cycle paths, infiltration tanks, tree protection, bio-retention, swales, permeable paving, filter drain and filter strips.

Key Benefits

- Captures residual hydrocarbons
- Removes pollutants by biodegradation
- Enhances water quality when used as part of a source control sustainable drainage system and eliminates the need for end of line petrol/oil interceptors
- 100% recyclable
- Designed to be self-maintaining for the life of the installation

Performance

The dimpled Geotextile comprises a proprietary blend of polyester fibres that incorporates hydrophilic (water attracting and oil repellent) and hydrophobic (oil attracting and water repellent) properties to achieve superior oil retention. Permafilter Geotextile is capable of retaining oil contamination ranging from daily car drip losses up to catastrophic spillages, i.e. originating from car oil-sump failures. The entrapped hydrocarbons are biodegraded by naturally occurring microorganisms providing a self cleansing mechanism.

Installation

Permafilter will be laid to suit site specific requirements. Overlaps shall be a minimum of 300mm or heat sealed. Ensure geotextile is clean and debris free before installing Permavoid.

Technical Support

Detailed guidance and assistance is available.

For further information, please contact our Technical Team on **+44 (0) 1509 615 100** or email civils@polypipe.com or visit www.polypipe.com/civils-technical-hub

ELEMENT	VALUE
PHYSICAL PROPERTIES	
Weight	300g/m ²
Roll length	100m
Roll width	2.4m
Roll weight	72kg
MECHANICAL PROPERTIES	
Tensile strength EN10319 (md/cmd)	9/12kN/m
Static puncture (CBR test) EN12236	1575N
HYDRAULIC PROPERTIES	
Water permeability EN ISO 11058	57 l/m ² /s
OTHER PROPERTIES	
Air permeability	1000 l/m ² /s
Max. oil retention	6L /10m ²
Effluent discharge at max. spacing oil loading	10ppm
Material	Modified polyester

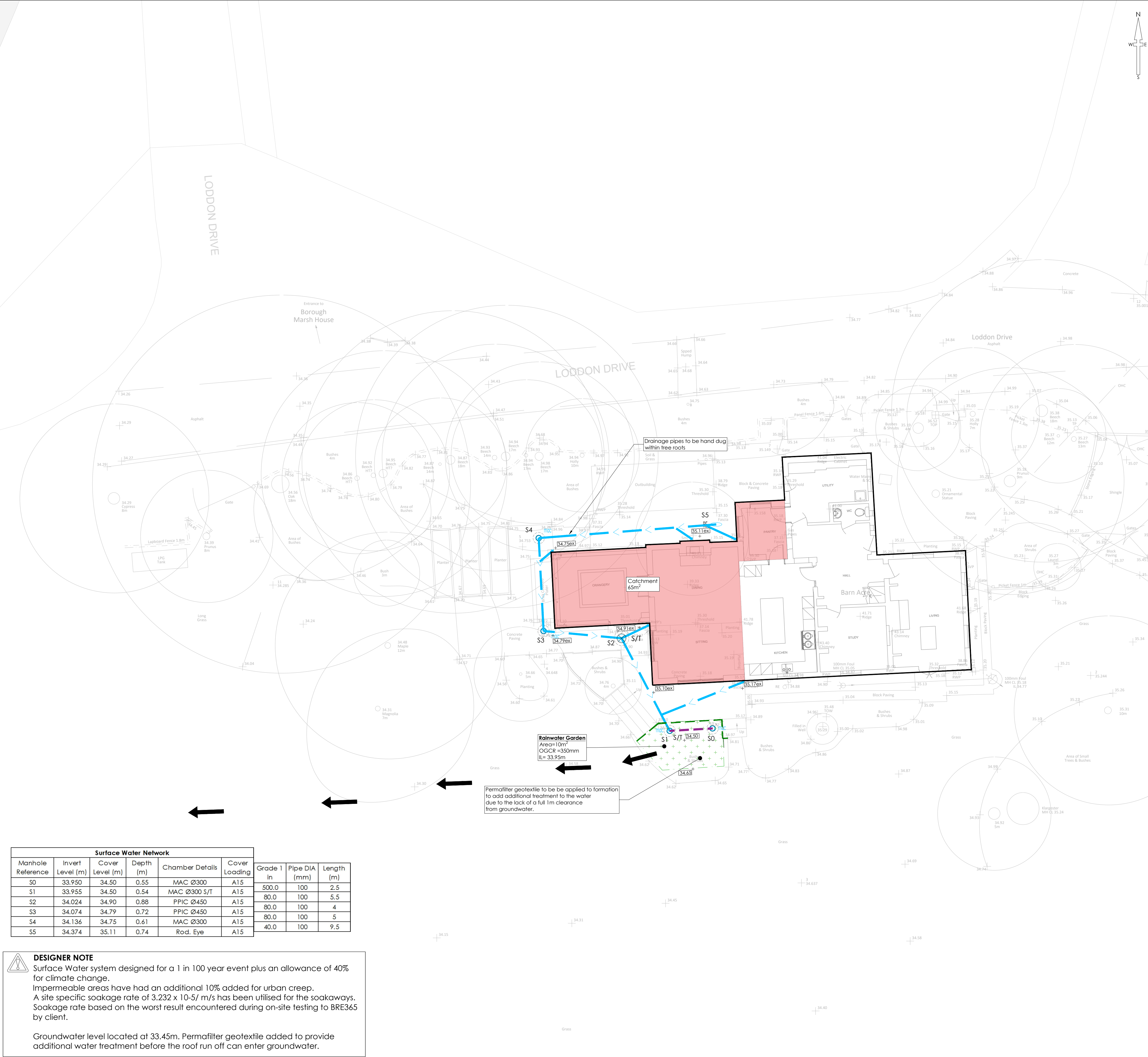
Permafilter Geotextile can be utilised in these SuDS techniques

TECHNIQUES													
Blue-Green roofs	Podium Decks	Trees	Sports Pitches	Cycle Paths	Permeable Paving (sub base & podium)	Bioretention & Rain Gardens	Attenuation Storage Tanks	Infiltration	Swales	Filter Drains	Detention Basins	Ponds & Wetlands	Filter Strips
	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓

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Appendix D - Drainage Layout



DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

BURIED UTILITIES RISK NOTE

- Buried utilities are present on and in the vicinity of the site.
- The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place.
- Any RAMS shall address safe procedures for protection and working in the proximity of services.

Construction Note

It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

All adoptable drainage works to follow the requirements of Water UK - Design and Construction Guide (DCG).

CDM RESIDUAL RISK ITEM

Existing services likely within working area.
Danger to site personnel and general public

CDM RESIDUAL RISK ITEM

Drainage pipes, manhole rings covers and fittings.
Risk of Manual handling injury.

CDM RESIDUAL RISK ITEM

Above Ground activities.
Possibility of objects falling from operations at high level onto persons working or passing below.

CDM RESIDUAL RISK ITEM

Works within confined spaces.

NOTES

- All dimensions and levels are in metres unless otherwise noted
- This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
- This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
- This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
- Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Drainage Key

Sewers

<< <

Surface water drain (private/non adoptable)

Perforated pipe

Chamber Key

PW/SW

MAC

Mini access chamber (mac) - 300mmØ

PPIC

PPIC - 475mmØ*

* General note

(Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

RE

Surface water rodding eye

+

Rain water down pipe (roddable access)

ST

Silt Trap (ST) with removable silt bucket

+

Rainwater garden

FFL

Finished Floor Level (FFL)

→

Exceedance arrow

Impermeable barrier to stop lateral movement of water

Level Key

+ [100.00]

Proposed level

+100.00

Existing survey level (by others)

+ [100.00]ex

Existing level

Surface Water Network						Grade 1 In	Pipe DIA (mm)	Length (m)
Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading			
S0	33.950	34.50	0.55	MAC Ø300	A15	500.0	100	2.5
S1	33.955	34.50	0.54	MAC Ø300 S/T	A15	80.0	100	5.5
S2	34.024	34.90	0.88	PPIC Ø450	A15	80.0	100	4
S3	34.074	34.79	0.72	PPIC Ø450	A15	80.0	100	5
S4	34.136	34.75	0.61	MAC Ø300	A15	40.0	100	9.5
S5	34.374	35.11	0.74	Rod. Eye	A15			

DESIGNER NOTE

Surface Water system designed for a 1 in 100 year event plus an allowance of 40% for climate change.

Impermeable areas have had an additional 10% added for urban creep.

A site specific soakage rate of 3.232 x 10-5/ m/s has been utilised for the soakaways.

Soakage rate based on the worst result encountered during on-site testing to BRE365 by client.

Groundwater level located at 33.45m. Permafilter geotextile added to provide additional water treatment before the roof run off can enter groundwater.

P01

APL

AJG

Initial Issue

25/03/25

REV

DRAWN

CHECK

REVISION COMMENTS

ISSUE DATE

DRAWING TITLE

SHEET NO.

Drainage Design

1/1

PROJECT

Barn Acre Cottage

Loddon Drive, Wargrave

Wokingham, RG10 8HN

CUSTOMER

Infrastruct CS Ltd

SCALE @ A1

1:100

0m

2.5m

5.0m

ENGINEER

APL

DRAFT

NJ

APPROVED

AJG

PROJECT NUMBER

6297

STATUS

S4

ISSUE PURPOSE

TECHNICAL APPROVAL

PROJECT

BARNA

ORIGIN

ICS

PHASE

01

LEVEL

XX

TYPE

DR

ROLE

C

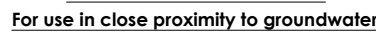
NO.

0200

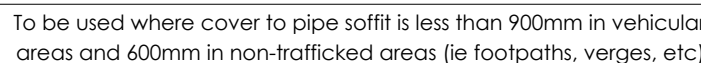
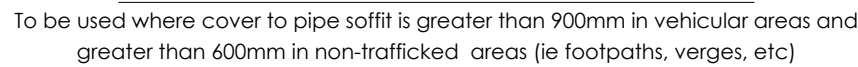
REVISION

P01

6297_BARNA-ICS-01-XX-02-C-0200_Drainage Design



PIPE BEDDING TABLE



GRANULAR BEDDING AND SIDEFILL MATERIAL GRADINGS



- Where chambers are positioned on 90° corners always use the main channel by fitting a 45° angle bend on the inlet and outlet.
- Bends up to a max 45° angle can be used on any inlet
- Heaviest flow should always be directed through the main channel.
- Short steep connections should preferably be connected into a 45° inlet using a bend where necessary.

in buildings up to 3 storeys the rest bend at the base of the soil stack should be 450mm below the invert of the lowest incoming drain. In buildings over 3 storeys this should be increased to 750mm. In buildings over 5 storeys the ground floor drainage connections should have their own connections to the external drain.



P01	APL	A/JG	Initial issue				25/03/25
REV	DRAWN	CHECK	REVISION COMMENTS				ISSUE DATE
DRAWING TITLE						SHEET NO.	
Typical Drainage Details						1/1	
PROJECT							
Barn Acre Cottage Loddon Drive, Wargrave Wokingham, RG10 8HN							
CLIENT			 Infrastruct CS Ltd				
SCALE @ A1 Not To Scale							
PROJ/ECT NUMBER		STATUS		ISSUE PURPOSE			
6297		S4		TECHNICAL APPROVAL			
PROJECT		ORIGIN		PHASE		LEVEL	
BARN A		ICS		01		XX	
DR		C		NO.		REVISION	
0400		P01					

Appendix E - Drainage Calculations

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

Half Drain Time : 123 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	33.568	0.418	0.2	1.9	O K
30 min Summer	33.609	0.459	0.2	2.5	O K
60 min Summer	33.639	0.489	0.2	2.9	O K
120 min Summer	33.647	0.497	0.2	3.0	O K
180 min Summer	33.639	0.489	0.2	2.9	O K
240 min Summer	33.629	0.479	0.2	2.7	O K
360 min Summer	33.610	0.460	0.2	2.5	O K
480 min Summer	33.592	0.442	0.2	2.2	O K
600 min Summer	33.574	0.424	0.2	2.0	O K
720 min Summer	33.557	0.407	0.2	1.8	O K
960 min Summer	33.526	0.376	0.2	1.4	O K
1440 min Summer	33.402	0.252	0.2	0.8	O K
2160 min Summer	33.230	0.080	0.2	0.2	O K
2880 min Summer	33.195	0.045	0.2	0.1	O K
4320 min Summer	33.183	0.033	0.1	0.1	O K
5760 min Summer	33.176	0.026	0.1	0.1	O K
7200 min Summer	33.172	0.022	0.1	0.1	O K
8640 min Summer	33.169	0.019	0.1	0.1	O K
10080 min Summer	33.166	0.016	0.1	0.0	O K
15 min Winter	33.568	0.418	0.2	1.9	O K
30 min Winter	33.609	0.459	0.2	2.5	O K
60 min Winter	33.641	0.491	0.2	2.9	O K
120 min Winter	33.649	0.499	0.2	3.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	132.106	0.0	21
30 min Summer	86.802	0.0	34
60 min Summer	54.368	0.0	62
120 min Summer	32.929	0.0	116
180 min Summer	24.243	0.0	144
240 min Summer	19.399	0.0	176
360 min Summer	14.081	0.0	244
480 min Summer	11.225	0.0	312
600 min Summer	9.408	0.0	378
720 min Summer	8.140	0.0	444
960 min Summer	6.474	0.0	570
1440 min Summer	4.680	0.0	806
2160 min Summer	3.378	0.0	1128
2880 min Summer	2.678	0.0	1464
4320 min Summer	1.927	0.0	2176
5760 min Summer	1.525	0.0	2904
7200 min Summer	1.271	0.0	3672
8640 min Summer	1.095	0.0	4400
10080 min Summer	0.965	0.0	5064
15 min Winter	132.106	0.0	21
30 min Winter	86.802	0.0	34
60 min Winter	54.368	0.0	62
120 min Winter	32.929	0.0	116

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
180 min Winter	33.639	0.489	0.2	2.9	O K
240 min Winter	33.626	0.476	0.2	2.7	O K
360 min Winter	33.598	0.448	0.2	2.3	O K
480 min Winter	33.571	0.421	0.2	2.0	O K
600 min Winter	33.544	0.394	0.2	1.6	O K
720 min Winter	33.520	0.370	0.2	1.3	O K
960 min Winter	33.405	0.255	0.2	0.8	O K
1440 min Winter	33.202	0.052	0.2	0.2	O K
2160 min Winter	33.187	0.037	0.2	0.1	O K
2880 min Winter	33.179	0.029	0.1	0.1	O K
4320 min Winter	33.171	0.021	0.1	0.1	O K
5760 min Winter	33.167	0.017	0.1	0.0	O K
7200 min Winter	33.164	0.014	0.1	0.0	O K
8640 min Winter	33.162	0.012	0.1	0.0	O K
10080 min Winter	33.161	0.011	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
180 min Winter	24.243	0.0	148
240 min Winter	19.399	0.0	186
360 min Winter	14.081	0.0	260
480 min Winter	11.225	0.0	332
600 min Winter	9.408	0.0	400
720 min Winter	8.140	0.0	464
960 min Winter	6.474	0.0	582
1440 min Winter	4.680	0.0	750
2160 min Winter	3.378	0.0	1084
2880 min Winter	2.678	0.0	1456
4320 min Winter	1.927	0.0	2196
5760 min Winter	1.525	0.0	2936
7200 min Winter	1.271	0.0	3472
8640 min Winter	1.095	0.0	4312
10080 min Winter	0.965	0.0	5240

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.007

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 0.004	4	8 0.003

Model Details

Storage is Online Cover Level (m) 34.650

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.11600	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	1.0
Max Percolation (l/s)	2.8	Slope (1:X)	0.0
Safety Factor	1.5	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	33.150	Membrane Depth (m)	0

Tank or Pond

Invert Level (m) 33.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	0.150	10.0

Summary of Results for 100 year Return Period

Half Drain Time : 82 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	33.521	0.371	0.2	1.3	O K
30 min Summer	33.547	0.397	0.2	1.7	O K
60 min Summer	33.563	0.413	0.2	1.9	O K
120 min Summer	33.562	0.412	0.2	1.9	O K
180 min Summer	33.555	0.405	0.2	1.8	O K
240 min Summer	33.546	0.396	0.2	1.6	O K
360 min Summer	33.528	0.378	0.2	1.4	O K
480 min Summer	33.511	0.361	0.2	1.2	O K
600 min Summer	33.483	0.333	0.2	1.0	O K
720 min Summer	33.423	0.273	0.2	0.8	O K
960 min Summer	33.326	0.176	0.2	0.5	O K
1440 min Summer	33.216	0.066	0.2	0.2	O K
2160 min Summer	33.190	0.040	0.2	0.1	O K
2880 min Summer	33.182	0.032	0.1	0.1	O K
4320 min Summer	33.173	0.023	0.1	0.1	O K
5760 min Summer	33.168	0.018	0.1	0.1	O K
7200 min Summer	33.165	0.015	0.1	0.0	O K
8640 min Summer	33.163	0.013	0.1	0.0	O K
10080 min Summer	33.162	0.012	0.1	0.0	O K
15 min Winter	33.521	0.371	0.2	1.3	O K
30 min Winter	33.548	0.398	0.2	1.7	O K
60 min Winter	33.564	0.414	0.2	1.9	O K
120 min Winter	33.562	0.412	0.2	1.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	94.362	0.0	20
30 min Summer	62.001	0.0	33
60 min Summer	38.834	0.0	60
120 min Summer	23.521	0.0	96
180 min Summer	17.317	0.0	130
240 min Summer	13.856	0.0	164
360 min Summer	10.058	0.0	230
480 min Summer	8.018	0.0	296
600 min Summer	6.720	0.0	360
720 min Summer	5.815	0.0	420
960 min Summer	4.624	0.0	536
1440 min Summer	3.343	0.0	752
2160 min Summer	2.413	0.0	1100
2880 min Summer	1.913	0.0	1468
4320 min Summer	1.377	0.0	2168
5760 min Summer	1.089	0.0	2936
7200 min Summer	0.908	0.0	3600
8640 min Summer	0.782	0.0	4328
10080 min Summer	0.689	0.0	5096
15 min Winter	94.362	0.0	20
30 min Winter	62.001	0.0	33
60 min Winter	38.834	0.0	60
120 min Winter	23.521	0.0	100

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
180 min Winter	33.551	0.401	0.2	1.7	O K
240 min Winter	33.538	0.388	0.2	1.5	O K
360 min Winter	33.511	0.361	0.2	1.2	O K
480 min Winter	33.443	0.293	0.2	0.9	O K
600 min Winter	33.352	0.202	0.2	0.6	O K
720 min Winter	33.279	0.129	0.2	0.4	O K
960 min Winter	33.200	0.050	0.2	0.1	O K
1440 min Winter	33.186	0.036	0.2	0.1	O K
2160 min Winter	33.176	0.026	0.1	0.1	O K
2880 min Winter	33.171	0.021	0.1	0.1	O K
4320 min Winter	33.165	0.015	0.1	0.0	O K
5760 min Winter	33.162	0.012	0.1	0.0	O K
7200 min Winter	33.160	0.010	0.0	0.0	O K
8640 min Winter	33.159	0.009	0.0	0.0	O K
10080 min Winter	33.158	0.008	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
180 min Winter	17.317	0.0	138
240 min Winter	13.856	0.0	174
360 min Winter	10.058	0.0	244
480 min Winter	8.018	0.0	310
600 min Winter	6.720	0.0	370
720 min Winter	5.815	0.0	422
960 min Winter	4.624	0.0	494
1440 min Winter	3.343	0.0	734
2160 min Winter	2.413	0.0	1092
2880 min Winter	1.913	0.0	1456
4320 min Winter	1.377	0.0	2180
5760 min Winter	1.089	0.0	2936
7200 min Winter	0.908	0.0	3632
8640 min Winter	0.782	0.0	4248
10080 min Winter	0.689	0.0	5080

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.007

Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)	
0 4	0.004	4 8	0.003

Model Details

Storage is Online Cover Level (m) 34.650

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.11600	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	1.0
Max Percolation (l/s)	2.8	Slope (1:X)	0.0
Safety Factor	1.5	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	33.150	Membrane Depth (m)	0

Tank or Pond

Invert Level (m) 33.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	0.150	10.0

Summary of Results for 30 year Return Period

Half Drain Time : 56 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	33.475	0.325	0.2	1.0	O K
30 min Summer	33.512	0.362	0.2	1.2	O K
60 min Summer	33.520	0.370	0.2	1.3	O K
120 min Summer	33.516	0.366	0.2	1.3	O K
180 min Summer	33.509	0.359	0.2	1.2	O K
240 min Summer	33.501	0.351	0.2	1.1	O K
360 min Summer	33.438	0.288	0.2	0.9	O K
480 min Summer	33.377	0.227	0.2	0.7	O K
600 min Summer	33.326	0.176	0.2	0.5	O K
720 min Summer	33.283	0.133	0.2	0.4	O K
960 min Summer	33.225	0.075	0.2	0.2	O K
1440 min Summer	33.194	0.044	0.2	0.1	O K
2160 min Summer	33.182	0.032	0.1	0.1	O K
2880 min Summer	33.176	0.026	0.1	0.1	O K
4320 min Summer	33.169	0.019	0.1	0.1	O K
5760 min Summer	33.165	0.015	0.1	0.0	O K
7200 min Summer	33.163	0.013	0.1	0.0	O K
8640 min Summer	33.161	0.011	0.0	0.0	O K
10080 min Summer	33.160	0.010	0.0	0.0	O K
15 min Winter	33.475	0.325	0.2	1.0	O K
30 min Winter	33.512	0.362	0.2	1.2	O K
60 min Winter	33.520	0.370	0.2	1.3	O K
120 min Winter	33.514	0.364	0.2	1.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	72.818	0.0	19
30 min Summer	47.427	0.0	32
60 min Summer	29.553	0.0	56
120 min Summer	17.888	0.0	88
180 min Summer	13.200	0.0	122
240 min Summer	10.596	0.0	156
360 min Summer	7.740	0.0	222
480 min Summer	6.194	0.0	284
600 min Summer	5.207	0.0	344
720 min Summer	4.518	0.0	400
960 min Summer	3.609	0.0	510
1440 min Summer	2.626	0.0	734
2160 min Summer	1.909	0.0	1100
2880 min Summer	1.521	0.0	1452
4320 min Summer	1.104	0.0	2168
5760 min Summer	0.879	0.0	2904
7200 min Summer	0.736	0.0	3640
8640 min Summer	0.636	0.0	4296
10080 min Summer	0.563	0.0	5064
15 min Winter	72.818	0.0	19
30 min Winter	47.427	0.0	32
60 min Winter	29.553	0.0	58
120 min Winter	17.888	0.0	94

Infrastruct CS Ltd		Page 2
The Stables High Cogges, Witney Oxfordshire, OX29 6UN	Barn Acre Road Loddon Drive Wokingham	
Date 25/03/2025 15:39 File 6297-BARNA-RAINWATER GARDEN.SRCX	Designed by APL Checked by AJG	
Innovyze	Source Control 2020.1.3	

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
180 min Winter	33.503	0.353	0.2	1.1	O K
240 min Winter	33.459	0.309	0.2	0.9	O K
360 min Winter	33.359	0.209	0.2	0.6	O K
480 min Winter	33.278	0.128	0.2	0.4	O K
600 min Winter	33.221	0.071	0.2	0.2	O K
720 min Winter	33.198	0.048	0.2	0.1	O K
960 min Winter	33.189	0.039	0.2	0.1	O K
1440 min Winter	33.178	0.028	0.1	0.1	O K
2160 min Winter	33.171	0.021	0.1	0.1	O K
2880 min Winter	33.167	0.017	0.1	0.0	O K
4320 min Winter	33.162	0.012	0.1	0.0	O K
5760 min Winter	33.160	0.010	0.0	0.0	O K
7200 min Winter	33.158	0.008	0.0	0.0	O K
8640 min Winter	33.157	0.007	0.0	0.0	O K
10080 min Winter	33.156	0.006	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
180 min Winter	13.200	0.0	130
240 min Winter	10.596	0.0	166
360 min Winter	7.740	0.0	232
480 min Winter	6.194	0.0	290
600 min Winter	5.207	0.0	338
720 min Winter	4.518	0.0	376
960 min Winter	3.609	0.0	496
1440 min Winter	2.626	0.0	738
2160 min Winter	1.909	0.0	1088
2880 min Winter	1.521	0.0	1472
4320 min Winter	1.104	0.0	2200
5760 min Winter	0.879	0.0	2944
7200 min Winter	0.736	0.0	3664
8640 min Winter	0.636	0.0	4408
10080 min Winter	0.563	0.0	4960

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.007

Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:
0	4 0.004	4	8 0.003

Model Details

Storage is Online Cover Level (m) 34.650

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.11600	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	1.0
Max Percolation (l/s)	2.8	Slope (1:X)	0.0
Safety Factor	1.5	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	33.150	Membrane Depth (m)	0

Tank or Pond

Invert Level (m) 33.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	0.150	10.0

Summary of Results for 10 year Return Period

Half Drain Time : 41 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	33.394	0.244	0.2	0.7	O K
30 min Summer	33.446	0.296	0.2	0.9	O K
60 min Summer	33.462	0.312	0.2	0.9	O K
120 min Summer	33.443	0.293	0.2	0.9	O K
180 min Summer	33.413	0.263	0.2	0.8	O K
240 min Summer	33.381	0.231	0.2	0.7	O K
360 min Summer	33.324	0.174	0.2	0.5	O K
480 min Summer	33.276	0.126	0.2	0.4	O K
600 min Summer	33.241	0.091	0.2	0.3	O K
720 min Summer	33.216	0.066	0.2	0.2	O K
960 min Summer	33.197	0.047	0.2	0.1	O K
1440 min Summer	33.185	0.035	0.1	0.1	O K
2160 min Summer	33.176	0.026	0.1	0.1	O K
2880 min Summer	33.171	0.021	0.1	0.1	O K
4320 min Summer	33.165	0.015	0.1	0.0	O K
5760 min Summer	33.162	0.012	0.1	0.0	O K
7200 min Summer	33.160	0.010	0.0	0.0	O K
8640 min Summer	33.159	0.009	0.0	0.0	O K
10080 min Summer	33.158	0.008	0.0	0.0	O K
15 min Winter	33.394	0.244	0.2	0.7	O K
30 min Winter	33.445	0.295	0.2	0.9	O K
60 min Winter	33.458	0.308	0.2	0.9	O K
120 min Winter	33.425	0.275	0.2	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	57.481	0.0	19
30 min Summer	37.139	0.0	31
60 min Summer	23.034	0.0	50
120 min Summer	13.934	0.0	84
180 min Summer	10.304	0.0	118
240 min Summer	8.296	0.0	150
360 min Summer	6.094	0.0	214
480 min Summer	4.894	0.0	272
600 min Summer	4.127	0.0	330
720 min Summer	3.589	0.0	382
960 min Summer	2.878	0.0	492
1440 min Summer	2.107	0.0	736
2160 min Summer	1.542	0.0	1100
2880 min Summer	1.235	0.0	1440
4320 min Summer	0.902	0.0	2196
5760 min Summer	0.722	0.0	2928
7200 min Summer	0.608	0.0	3608
8640 min Summer	0.528	0.0	4352
10080 min Summer	0.468	0.0	5136
15 min Winter	57.481	0.0	19
30 min Winter	37.139	0.0	31
60 min Winter	23.034	0.0	52
120 min Winter	13.934	0.0	90

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
180 min Winter	33.377	0.227	0.2	0.7	O K
240 min Winter	33.330	0.180	0.2	0.5	O K
360 min Winter	33.251	0.101	0.2	0.3	O K
480 min Winter	33.204	0.054	0.2	0.2	O K
600 min Winter	33.194	0.044	0.2	0.1	O K
720 min Winter	33.188	0.038	0.2	0.1	O K
960 min Winter	33.181	0.031	0.1	0.1	O K
1440 min Winter	33.173	0.023	0.1	0.1	O K
2160 min Winter	33.167	0.017	0.1	0.0	O K
2880 min Winter	33.163	0.013	0.1	0.0	O K
4320 min Winter	33.160	0.010	0.0	0.0	O K
5760 min Winter	33.158	0.008	0.0	0.0	O K
7200 min Winter	33.157	0.007	0.0	0.0	O K
8640 min Winter	33.156	0.006	0.0	0.0	O K
10080 min Winter	33.155	0.005	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
180 min Winter	10.304	0.0	124
240 min Winter	8.296	0.0	158
360 min Winter	6.094	0.0	216
480 min Winter	4.894	0.0	260
600 min Winter	4.127	0.0	312
720 min Winter	3.589	0.0	376
960 min Winter	2.878	0.0	496
1440 min Winter	2.107	0.0	736
2160 min Winter	1.542	0.0	1084
2880 min Winter	1.235	0.0	1472
4320 min Winter	0.902	0.0	2132
5760 min Winter	0.722	0.0	2936
7200 min Winter	0.608	0.0	3576
8640 min Winter	0.528	0.0	4304
10080 min Winter	0.468	0.0	5128

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.007

Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)	
0 4 0.004		4 8 0.003	

Model Details

Storage is Online Cover Level (m) 34.650

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.11600	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	1.0
Max Percolation (l/s)	2.8	Slope (1:X)	0.0
Safety Factor	1.5	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	33.150	Membrane Depth (m)	0

Tank or Pond

Invert Level (m) 33.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	0.150	10.0