



Consulting Civil Engineers

Surface Water Drainage Strategy Report

Land to the rear of Longacres, Maypole Lane, Yapton, Arundel

For

Mr & Mrs Boffee

Rev - P

Reference **C2024**

Date **15th March 2022**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	15.03.22	Initial Issue	LH	CS

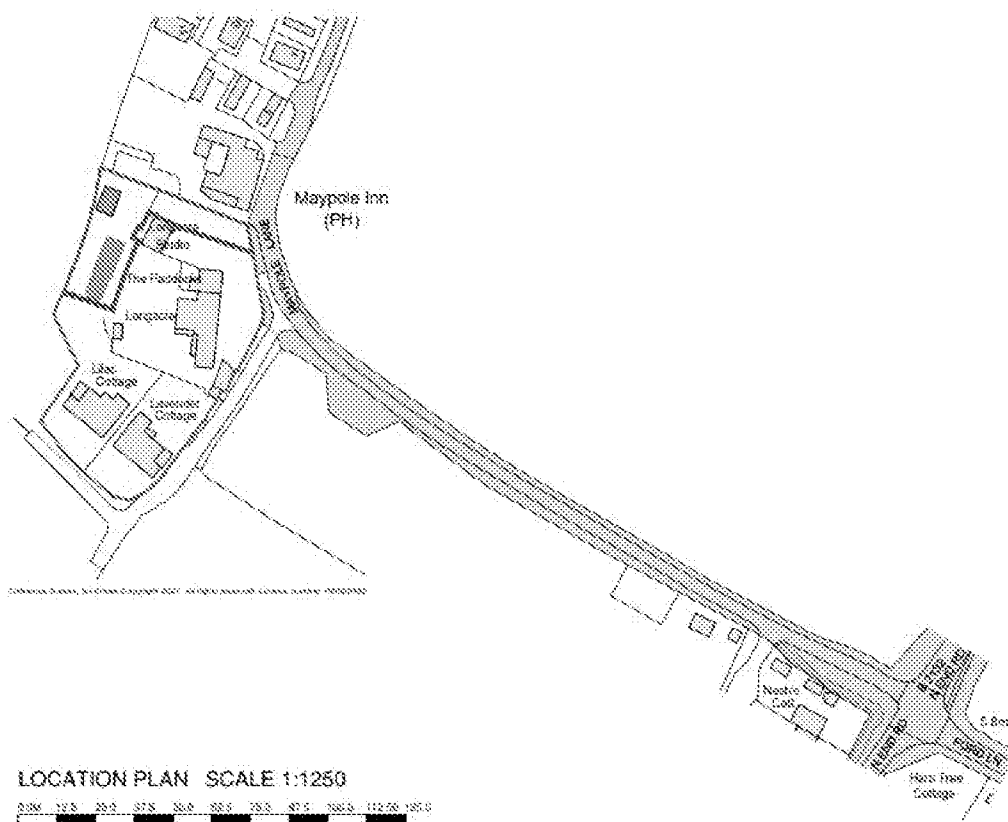
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1 Introduction

- 1.1.1 CGS Civils Ltd have been appointed by Mr & Mrs Boffee to undertake a drainage strategy report for a proposed development at Land to the rear of Longacres, Maypole in Yapton, Arundel.
- 1.1.2 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk onsite and elsewhere.
- 1.1.3 The existing site consists of a tarmacked storage area to the rear of Longacres. The proposed development will consist of the development of a new dwelling and detached garage.
- 1.1.4 The proposed development is located as OS Grid Reference SU 97761 04157 and has the post code BN18 0DP.
- 1.1.5 The total green line boundary is approximately 0.11 Ha and the proposed development will result in a total of 0.04 Ha of impermeable area, 0.016 Ha of which is roof areas and the other 0.024 Ha will be hard paved areas.
- 1.1.6 The proposed site will make use of an existing access located along Maypole Lane. The site is flanked by Greenfields and residential properties..
- 1.1.7 The proposed site plan can be found in **Appendix A**.

Fig 1. Site Location



2 Site Geology

2.1 British Geological Survey information

- 2.1.1 The British Geological Survey confirms the bedrock geology to be made up of Lewes Nodular Chalk Formation, Seaford Chalk Formation, Culver Chalk and Porstdown Chalk Formation. The BGS website also confirms the superficial deposits to be made up of River Terrace Deposits, which consists of Sand, Silt and Clay.
- 2.1.2 The British Geological survey also holds records of historical boreholes near the site which give some insight into the ground geology.
- Borehole SU90SE56 (Located approx. 215m North of the site) – Sand

Fig 2. British Geological Survey



2.2 Geological Assessment

- 2.2.1 An infiltration test to BRE365 was carried out by CGS Civils on 17th March 2022. The test consisted of the excavation and filling of a trial pit with water followed by timing how long it takes to drain away. The infiltration test yielded a recorded rate of $1.59 \times 10^{-5} \text{m/s}$ which is considered a fair rate and sufficient enough to consider the use of soakaways.

3 Existing Drainage

- 3.1.1 It is not currently known how the existing site discharges surface water runoff, however due to site levels it is presumed that all runoff follows site levels and drains to ground.

4 Proposed Drainage Strategy

4.1 SuDS Hierarchy

- 4.1.1 All options for the destination of run-off generated on site have been assessed in line with the SuDS hierarchy as set out in Building Regulations Part H document and DEFRA's Draft National Standards for SuDS.

Discharge Destination	
Discharge to Ground	Yes – At a recorded rate of $1.59 \times 10^{-5} \text{m/s}$
Discharge to Watercourse	N/A
Discharge to Surface Water Sewer	N/A
Discharge to Other Sewer	N/A

4.2 Surface Water Drainage

- 4.2.1 In order to follow the SuDS hierarchy, the use of soakaways was investigated and an infiltration test to BRE365 was carried out on site by CGS Civils on 17th March 2022. The test yielded a recorded rate of $1.59 \times 10^{-5} \text{m/s}$. It is therefore determined that the use of soakaways is viable and all surface water runoff is to be discharged to ground via infiltration. All roof areas are to be collected into a positive drainage network before being discharged to ground via a geocellular soakaway which has been designed to the recorded infiltration rate and to cater for the 1 in 100-year +40% storm. All hard paved areas are to freely drain to ground via infiltration through the use of a porous constructed surface.
- 4.2.2 Hydraulic calculations have been carried out which can be found at **Appendix C**.

4.3 Water Quality

- 4.3.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution.
- 4.3.2 Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals, and various organic and inorganic contaminants) Therefore the first 5-10mm of rainfall should be adequately treated with SuDS.
- 4.3.3 The new SuDS Manual (Ciria C753, November 2015) introduces slightly different approach compared to the previous version for the water quality management of surface water. The Manual describes risks posed by the surface water runoff to the receiving environment as a function of:
- The pollution hazard at a particular site (i.e., the pollution source)
 - The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels
 - The sensitivity of the receiving environment
- 4.3.4 The EA website indicates that the site does not lie within a Source Protection Zone.
- 4.3.5 The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

Fig 5. Approaches to Water Quality Risk Management

Table 26.1 Approaches to Water Quality Risk Management			
Design method	Hazard Characterisation	Risk Reduction	
		For Surface Water	For Groundwater
Simple Index Approach	Simple pollution hazard indices based on land use (Table 26.2)	Simple SuDS hazard mitigation indices (Table 26.3)	Simple SuDS hazard mitigation indices (Table 26.4)
Risk Screening	Factors characterising traffic density and extent of infiltration likely to occur (Table 26.5)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (Table 26.5)
Detailed Risk Assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in even mean discharge concentrations and total annual load reductions delivered by the system	

- 4.3.6 As per Table 26.1 Simple Index approach will be used as a design method for this site.
- 4.3.7 Table 26.2 will provide hazard classification of different land uses. The land uses for the surface water drainage for this site are.
- Residential Roofs
 - Individual Property driveways and residential car parks
- 4.3.8 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following must be achieved for the surface running off the site.

Total SuDS mitigation index $\geq$ pollution hazard index

- 4.3.9 Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual;

Fig 6. Pollution Hazard Indices for Different Land Use Classifications

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 (e.g., cul-de-sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., 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	High	0.8	0.8	0.9

4.3.10 From Table 26.2 the following information is tabulated in Table 1

Table 1: Pollution hazard index and destination of runoff for the proposed site

Table 1: Pollution Hazard Index and Destination of runoff for the proposed Site					
Land Use	Destination of Runoff	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roof	Ground Water	Very Low	0.2	0.2	0.05
Individual driveways, residential car parks and low traffic roads	Ground water	Low	0.5	0.4	0.4

4.3.11 The SuDS mitigation index will be obtained from Table 26.4 (for groundwater) of the SuDS manual.

Figure 7 Indicative SuDS Mitigation Indices for discharges to ground waters.

4.3.12 SuDS mitigation index are tabulated in Table 5 as followed.

Table 26.4 Indicative SuDS mitigation indices for discharges to groundwater			
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good containment attenuation potential of at least 300mm in depth	0.6	0.5	0.6
A soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, i.e., graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20mm gravel) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth.	0.4	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 2: SuDS mitigation index

Runoff Source	Destination of Runoff	Mitigation Indices				
		Mitigation Index Source	Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Individual driveways, residential car parks and low traffic roads	Ground water	Table 26.4	Permeable Pavement	0.7	0.6	0.7

4.3.13 The above analysis demonstrates that the SuDS devices within the design will mitigate any pollution present within the surface water system.

5 Maintenance

5.1 Introduction

- 5.1.1 During construction, the Contractor will be responsible for maintaining the drainage and SuDS (Sustainable Drainage Systems). Upon handover, the occupier will take on the responsibility of these duties as laid out in this report.
- 5.1.2 The maintenance schedule for the proposed development will be split down into two separate categories; SuDS features and regular private drainage.

5.2 SuDS at Land to the rear of Longacres, Maypole Lane, Yapton

- 5.2.1 As listed above, in section 5.1.2, the SuDS features used on site will be **Geocellular Soakaway and permeable pavement**
- 5.2.2 The SuDS features have been designed for easy maintenance and comprise:
- Regular Day-to-Day care – litter collection, regular gardening to control vegetation growth and checking inlets where water enters the SuDS features
 - Occasional tasks – checking the SuDS features and removing any silt that builds up in the SuDS feature
 - Remedial work – repairing damage where necessary

5.3 SuDS Drainage Maintenance Specification

5.3.1 Soakaway

In order to maintain the functioning of the attenuation tanks, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for attenuation storage tanks		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae, or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from per-treatment structures and/or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents, and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

5.3.2 Permeable Paving

In order to maintain the functioning of the permeable paving, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for permeable paving		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	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 surface 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 or management using glyphosate applied directly into the weeds by an applicator rather than spraying	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 50mm of level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rate and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

5.4 General Drainage Maintenance Specification

5.4.1 Inlet Structures and Inspection Chambers

- Inlet structures such as rainwater downpipes, road gullies and channel drains should be free from obstruction at all times to all free flow through the SuDS
- Inspection Chambers and Rodding Eyes are used on bends or where pipes come together. They allow access and cleaning to the system if necessary.

Inlet Structures and Inspection Chambers	
Regular Maintenance	Frequency
Inlet Structures	
Inspect rainwater downpipes, channel drains and road gullies, removing obstructions and silt as necessary. Check that there is no physical damage.	Monthly
Strim vegetation 1m min surround to structures and keep area free from silt and debris	
Inspection Chambers and below ground control chambers.	
Remove cover and inspect, ensuring that the water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.	Annually
Undertake inspection after leaf fall in Autumn	
Occasional Maintenance	
Check topsoil levels are 20mm above edges of chambers to avoid mower damage.	As necessary
Remedial Work	
Repair physical damage if necessary	As required

5.4.2 Below ground drainage pipes

- Below ground drainage pipes convey water to the SuDS system. They should always be free from obstruction to allow free flow.

Below Ground Drainage Pipes	
Regular Maintenance	Frequency
Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually or as required
Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks.	Monthly or as required
Remedial Work	
Repair physical damage if necessary	As required
Monitoring	
Inspect all inlets, outlets and vents to ensure that they are in good conditions and operating as designed.	Annually
Survey inside of pipe runs for sediment build up and remove if necessary.	Every 5 years or as required

6 Summary and Conclusions

- 6.1.1 CGS Civils has been instructed by Mr & Mrs Boffee to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for the development of a single domestic property with associated access and a detached garage.
- 6.1.2 The Surface Water will discharge to ground via infiltration at a recorded rate of $1.59 \times 10^{-5} \text{m/s}$. All roof areas are to be collected into a positive drainage network before being discharged to ground via infiltration through the use of a geocellular soakaway. All hard paved areas are to freely drain to ground through the use of a porous constructed surface.
- 6.1.3 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water drainage can be achieved for the proposed development.

7 Appendices

7.1 Appendix A – Site Plan



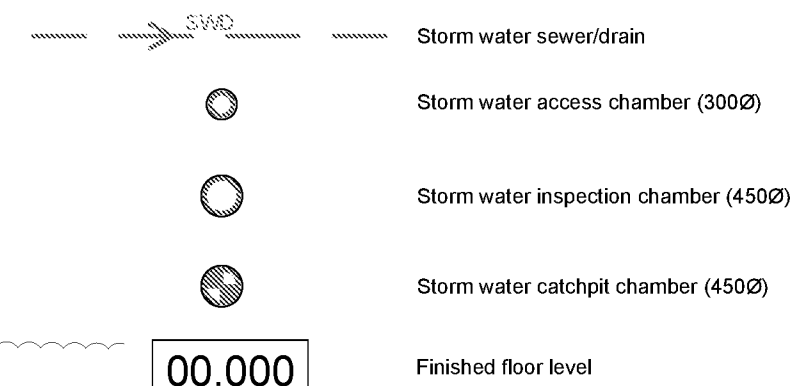
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7.2 **Appendix B – Drainage Layout**

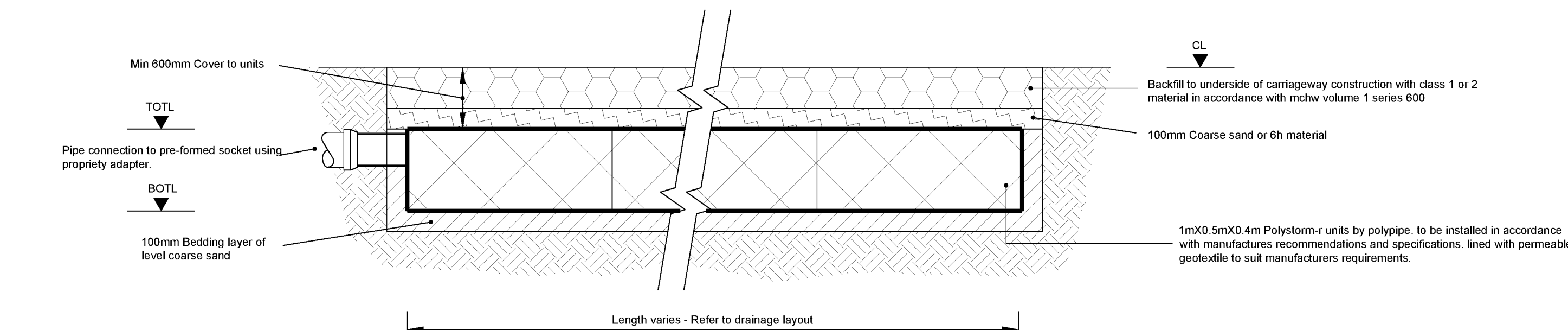
DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
FFL ASSUMED – TBC BY ARCHITECT

PROPOSED FEATURES



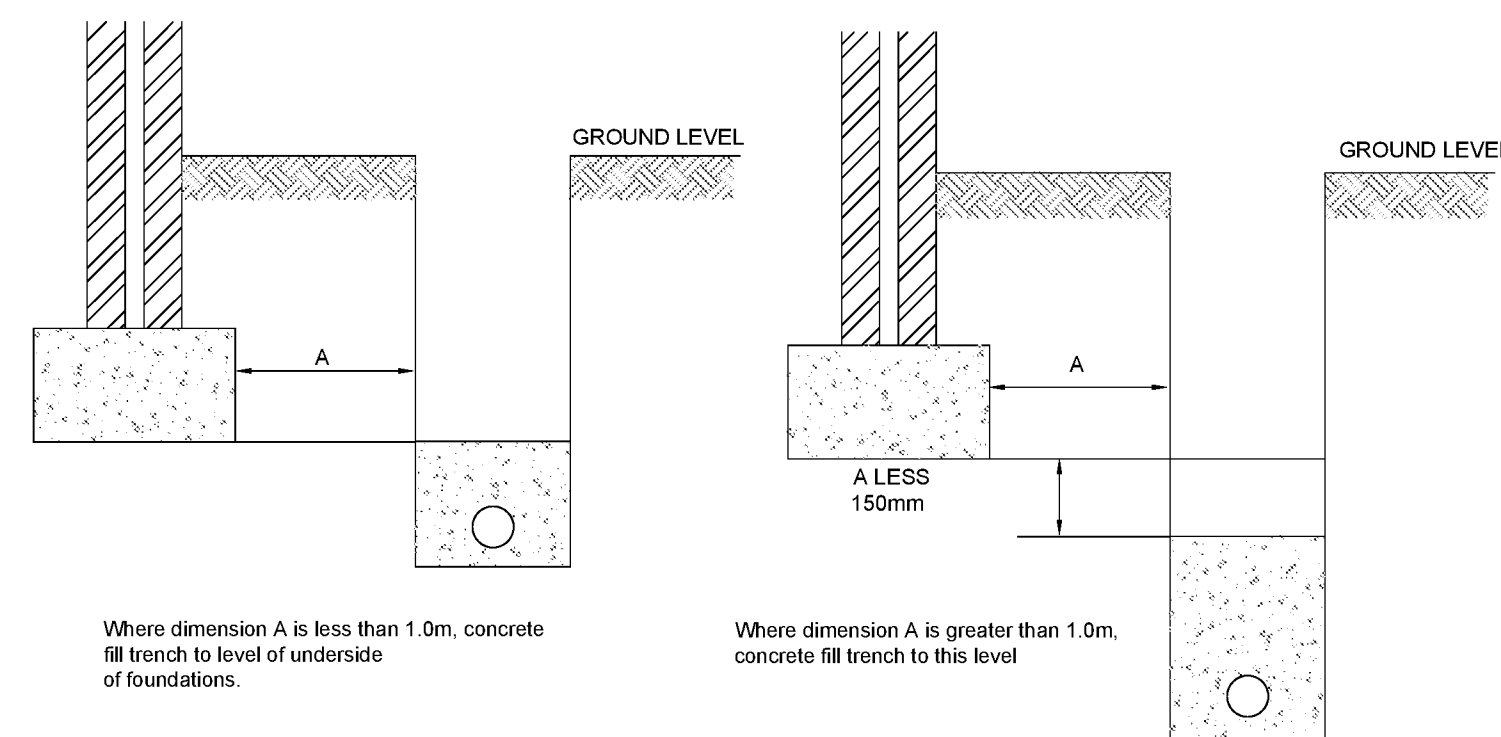
ABBREVIATIONS

- MH - MANHOLE
IC - INSPECTION CHAMBER
AC - ACCESS CHAMBER
CP - CATCHPIT
BC - BRAKE CHAMBER
RE - RODDING EYE
IL - INVERT LEVEL
SL - SUMP LEVEL
CL - COVER LEVEL

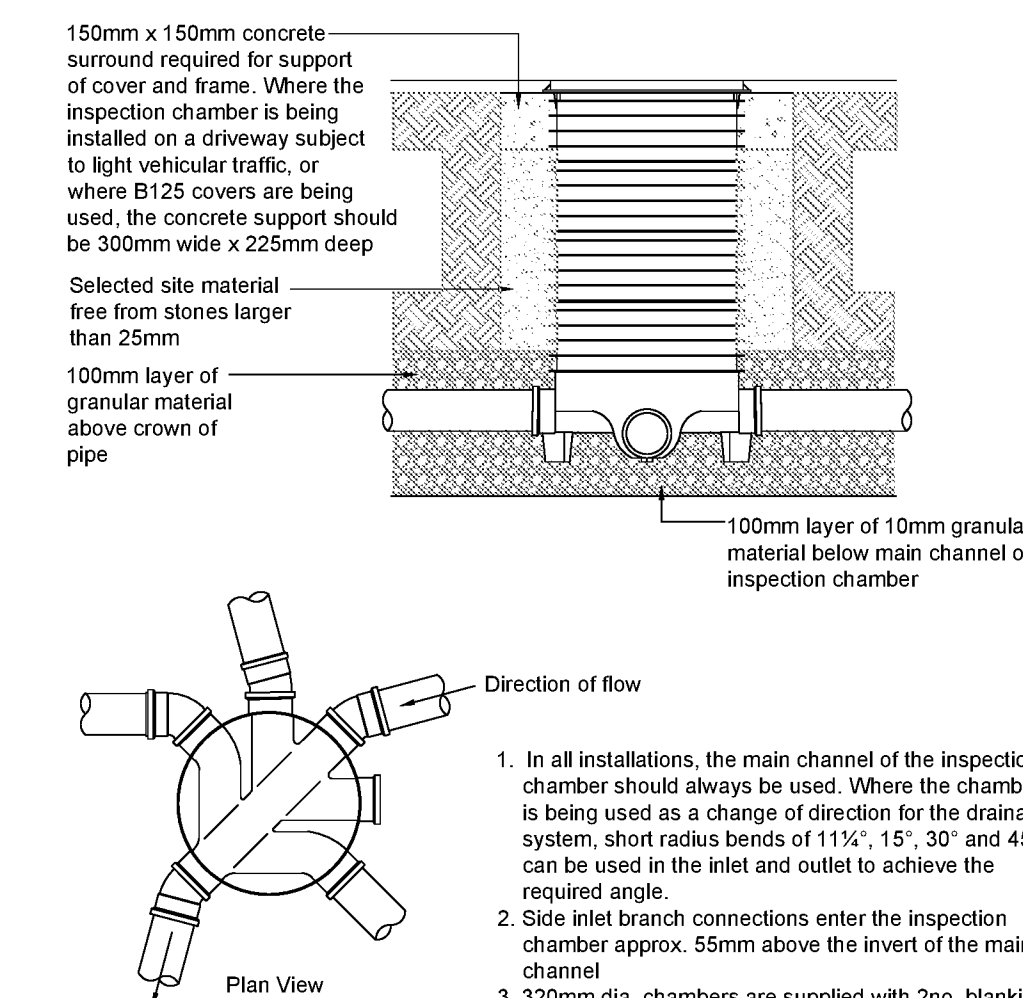


0.4m deep

All storage tank drainage works shall be carried out in accordance with the specifications, method statements and recommendations of Polypipe

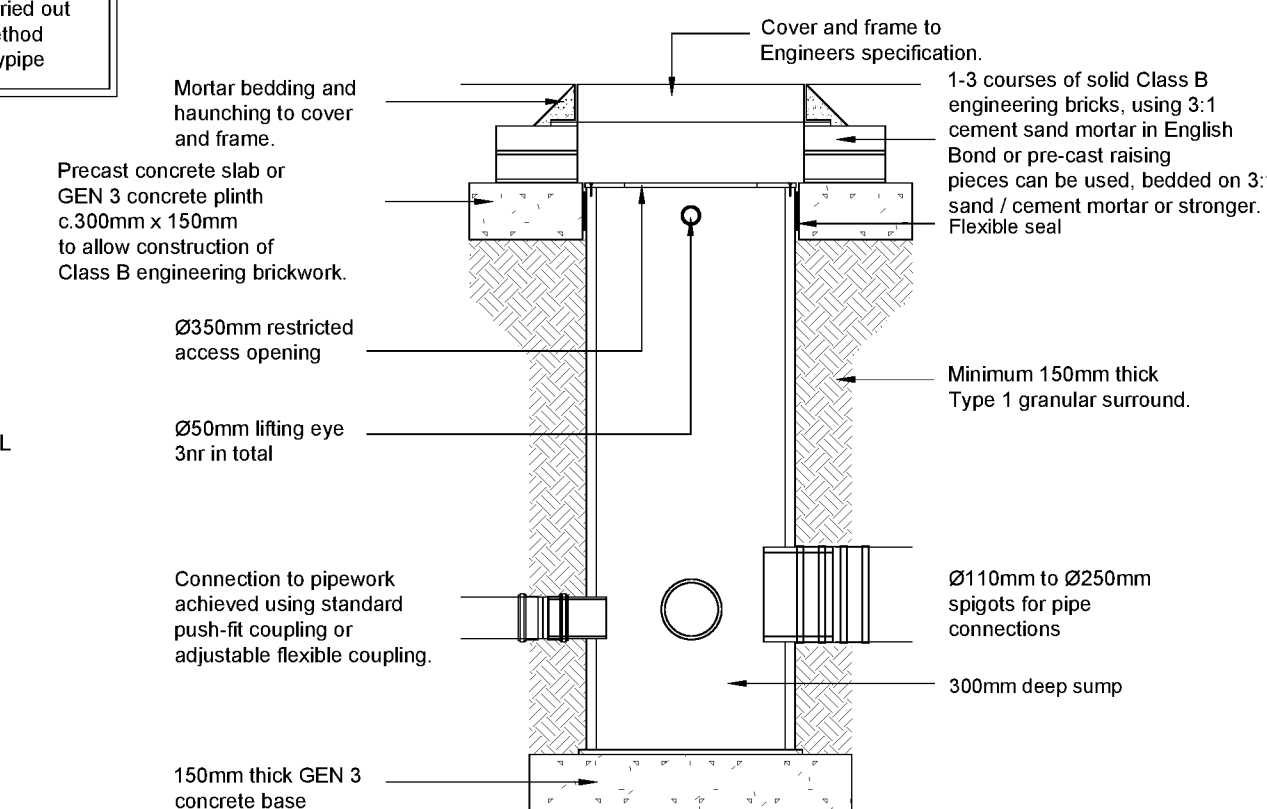


Pipes near buildings

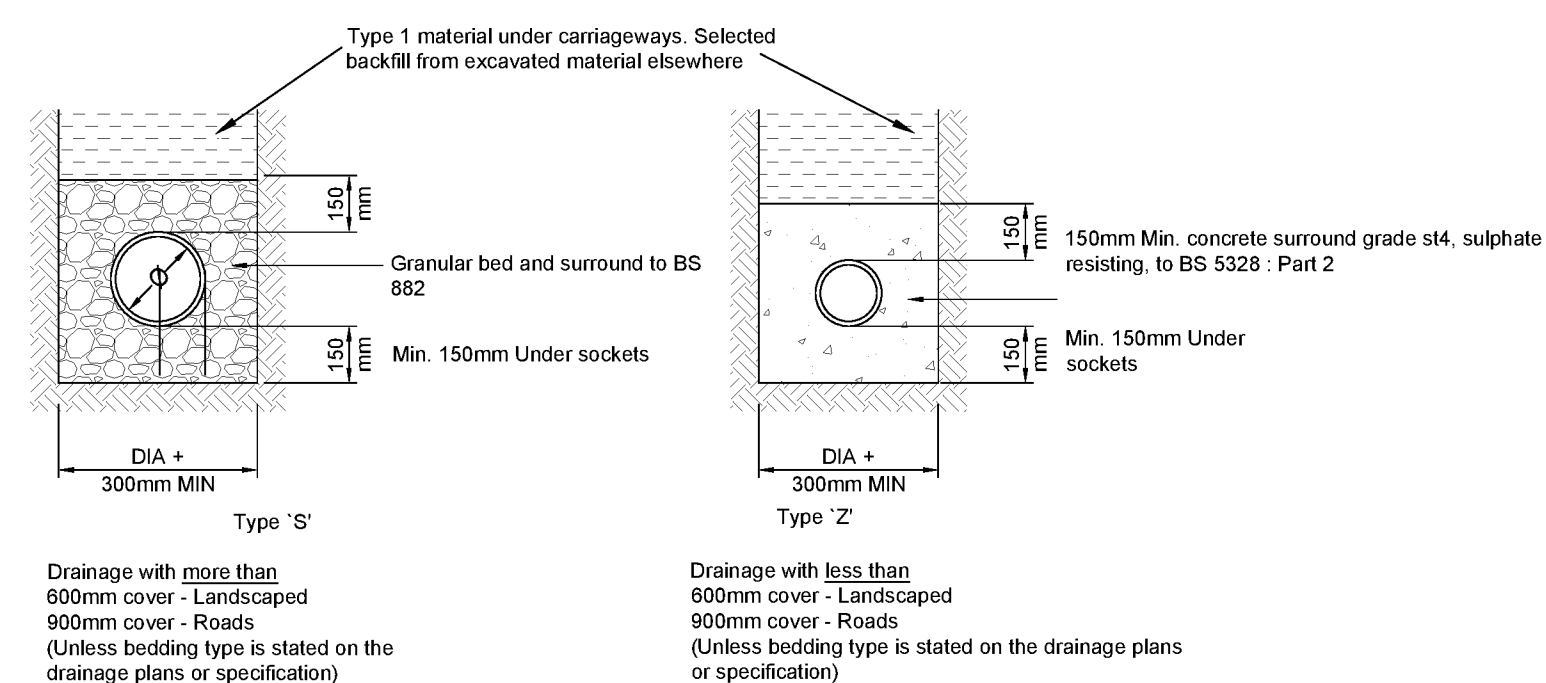
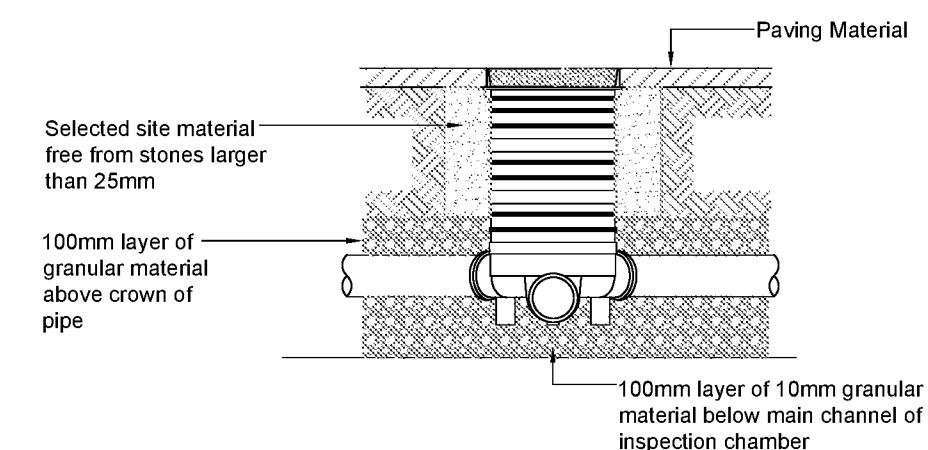


Pipe bedding details in private Areas

CONSTRUCTION DETAILS 1:20



300mmØ SHALLOW INSPECTION CHAMBER DETAIL



1. DO NOT SCALE FROM THIS DRAWING. REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
2. ALL DIMENSIONS IN MILLIMETERS AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
4. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
5. BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE REQUIRED. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
6. ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNHILL CORNER OF THE CONSTRUCTION. THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SUFFICIENT TO SOFFIT UPON OTHERWISE DESTROYED BY THE ENGINEER, IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
7. COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
8. ALL UN-REFERENCED PIPES ARE ASSUMED TO BE 100mm DIA
9. ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO EN 196 AND BS5911 PART 1.
10. ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE SETTED WITHIN OF THE BUILDING GRADINGS AND FRAMES TO BS EN24, UNLESS OTHERWISE STATED.
11. ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION. WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
12. ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
13. THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
14. STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPE LAID AT THE SAME GRADIENT AS THE UP OR DOWN DRAIN PIPE.
15. IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUB SOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
16. NO PRIVATE AREAS ARE TO DRAIN OUTTO ADAPTABLE AREAS AND VICE VERSA.
17. ALL EXISTING MANHOLE COVER'S, GULLIES, ETC. ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
18. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT.
19. UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE RECEIVED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION.
20. MANHOLE AND CHAMBER COVER GRADES:

- 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
- 'B125' IN ALL DRIVEWAYS
- 'C250' IN PRIVATE PARKING AREAS
- 'D400' IN CARRIAGEWAY/ACCESS ROAD



PL = PLANNING	Shall <u>not</u> be used for contract or construction purposes
P = PRELIMINARY	Shall <u>not</u> be used for contract or construction purposes
T = TENDER	Shall not be used for construction purposes
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

P.	22.03.22	PRELIMINARY ISSUE	LN	CS	CS
REV	DATE	DESCRIPTION	BY	CHK	APP
 Consulting Civil Engineers					
CLIENT					
MR & MRS BOFFEE					
ARCHITECT					
PHILIPS SURVEYORS					
JOB TITLE					
LONGACRE, MAYPOLE LANE YAPTON, ARUNDEL					
DRAWING TITLE					
SURFACE WATER DRAINAGE STRATEGY					
DRAWN		ENGINEER		CHECKED	APPROVED
LH		C SLADE		CS	CS
DATE			SCALE @ A1		
MARCH 2022			1:100		
JOB No.		STATUS		DRAWING No.	
C2024		PL		100	
				REV.	
				PL-	

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DESIGN SUBJECT TO THE APPROVAL OF:
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BUILDING CONTROL



Prefixed to drawing numbers shall signify the following:-	
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P-	22.03.22	PRELIMINARY ISSUE	LH	CS	CS
REV	DATE	DESCRIPTION	BY	CHK	APP
 CGS civils Consulting Civil Engineers					
CLIENT MR & MRS BOFFEE					
ARCHITECT PHILIPS SURVEYORS					
JOB TITLE LONGACRE, MAYPOLE LANE YAPTON, ARUNDEL					
DRAWING TITLE IMPERMEABLE AREAS PLAN					
DRAWN LH		ENGINEER C SLADE		CHECKED CS	APPROVED CS
DATE MARCH 2022		SCALE @ A1 1:100			
JOB No: C2024		STATUS PL		DRAWING No: 400	
				REV PL-	

FOR PLANNING ONLY

7.3 **Appendix C – Surface Water Calculations**

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S2	0.015	5.00	7.350	500	-3.332	10.613	0.755
SA1	0.000		7.200	150	0.750	14.636	0.900

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S2	SA1	5.731	0.600	6.595	6.300	0.295	19.4	150	5.04	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.295	40.6	2.0	0.605	0.750	0.015	0.0	23	1.192

Node SA1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.05724	Invert Level (m)	6.200	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.05724	Time to half empty (mins)	320	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	9.000	Number Required	1
Porosity	0.95	Pit Length (m)	2.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2	10	6.619	0.024	2.1	0.0143	0.0000	OK
120 minute winter	SA1	98	6.278	-0.022	0.7	1.3421	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	S2	1.000	SA1	2.1	1.178	0.051	0.0101
120 minute winter	SA1	Infiltration		0.2			

Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2	10	6.629	0.034	4.1	0.0202	0.0000	OK
180 minute winter	SA1	168	6.364	0.064	0.9	2.7991	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	S2	1.000	SA1	4.1	1.419	0.100	0.0165
180 minute winter	SA1	Infiltration		0.2			

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2	10	6.634	0.039	5.2	0.0229	0.0000	OK
240 minute winter	SA1	228	6.423	0.123	1.0	3.8084	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	S2	1.000	SA1	5.2	1.510	0.127	0.0196
240 minute winter	SA1	Infiltration		0.2			

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S2	296	7.014	0.419	1.3	0.2488	0.0000	SURCHARGED
360 minute winter	SA1	296	7.014	0.714	1.3	6.8614	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
360 minute winter	S2	1.000	SA1	1.3	0.891	0.032	0.1009
360 minute winter	SA1	Infiltration		0.2			

7.4 Appendix D – Borehole Logs

D Strata log

Geological classification (BSG code)	Description of strata	Thickness in	Depth (distance of surface) in
	- sandy topsoil - sand - clay, chalk and flint - chalk and flint	1.5 0.5 3 17	1.5 2 5 22
	(continue on separate page if necessary)		
	Other comments (for example, gas encountered, water encountered)		

E Completing this form

How long did it take you to fill in this form?

For Official use only

Date received (DD/MM/YYYY)	File	Consent number	BSG reference number
Accession number	Wellmaster number	SCB number	BSR
UK MS	Purpose	BSG reference number	
Copy number	Retained by		

7.5 **Appendix E – Soakage Test Results and Groundwater monitoring**

Ref: C2024

Phil Wiltshire
Philips Surveyors

17th March 2022**Re: Longacre, Yapton – Soakaway Testing – Infiltration Test Result Summary**

Dear Phil

The following investigation was carried out at the above location in accordance with our quotation.

1. Site Works

The purpose of the investigation was to supply soakaway test data in general accordance with BRE document 365 (Soakaway Design) at one location which would be the approximate intended location for a possible infiltration device to serve a new dwelling.

In addition to the soakaway test pit, a borehole was dug to a depth of 1.5m using a hand auger. This was covered and monitored over 48 hours and remained dry.

The appended drawing illustrates the position of the test pit. The BRE365 pit was excavated to a depth of 0.9m in line with the approximate depth of the proposed soakaway.

The testing commenced on 17th March 2022 with three tests being undertaken in accordance with BRE 365.

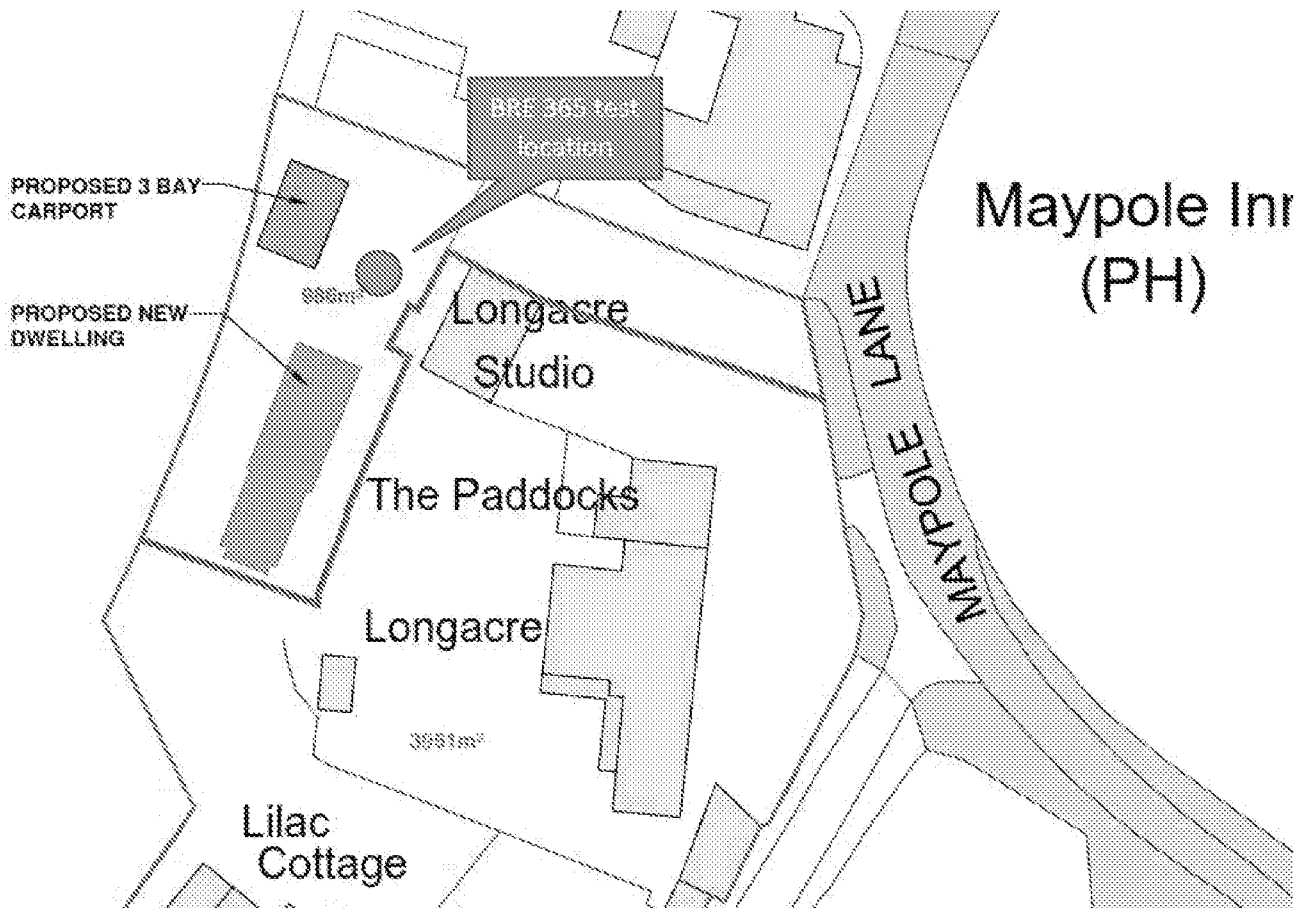
2. BRE 365 Soakaway Test Findings

Testing of the sub soils which was noted as Silty sandy clay produced a BRE 365 design infiltration rate of **1.59x10⁻⁵m/s**. This rate was the slowest taken from all three tests. This is considered a good rate and will likely be suitable for most infiltration devices.

3. BRE 365 Soakaway Test Results

Test Pit No	Infiltration Rate (1-3 Tests)			Depth of Test	Soil Type
SAT1	2.01x10 ⁻⁵ m/s	1.67x10 ⁻⁵ m/s	1.59x10⁻⁵m/s	0.9m	Silty sandy clay

Appendix A – Soakaway Test Location Plan



Appendix B – Site Photographs





Consulting Civil Engineers

Appendix C – Soakaway Test Results

Richard Cobden House, Lion Street, Chichester, West Sussex, PO19 1LW



Consulting Civil Engineers

Job: Longacre, Yapton - Test 1

Infiltration Calculator

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

V_{p75-25} = Effective storage volume between 75% and 25% effective depth

a_{p50} = Internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} = The time for the water level to fall from 75% to 25% effective depth

f = Infiltration rate

Trial pit width	=	0.3
Trial pit depth	=	0.9
Trial pit length	=	1

a_{p50} =

1.32

 m/squared

t_{p75-25} =

5100

 seconds

V_{p75-25} =

0.135

 m/cubed

F =

2.01E-05



Job: Longacre, Yapton - Test 2

Infiltration Calculator

$$f = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

V_{p75-25} = Effective storage volume between 75% and 25% effective depth

ap_{50} = Internal surface area of the trial pit up to 50% effective depth and including the base area

tp_{75-25} = The time for the water level to fall from 75% to 25% effective depth

f = Infiltration rate

Trial pit width	=	0.3
Trial pit depth	=	0.9
Trial pit length	=	1

ap_{50} =

1.32

 m/squared

tp_{75-25} =

6120

 seconds

V_{p75-25} =

0.135

 m/cubed

F =

1.67E-05



Job: Longacre, Yapton - Test 3

Infiltration Calculator

$$f = \frac{V_{p75-25}}{ap_{50} \times tp_{75-25}}$$

V_{p75-25} = Effective storage volume between 75% and 25% effective depth

ap_{50} = Internal surface area of the trial pit up to 50% effective depth and including the base area

tp_{75-25} = The time for the water level to fall from 75% to 25% effective depth

f = Infiltration rate

Trial pit width	=	0.3
Trial pit depth	=	0.9
Trial pit length	=	1

ap_{50} =

1.32

 m/squared

tp_{75-25} =

6420

 seconds

V_{p75-25} =

0.135

 m/cubed

F =

1.59E-05