

SuDS and Drainage Report

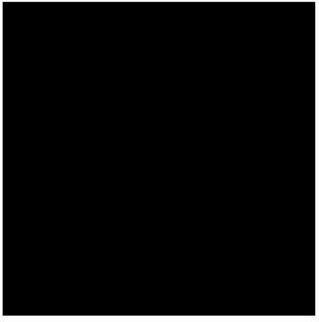
Land Adj The Hollies, Barnham Road, Barnham PO22 0ES

Planning Ref: BN/33/26/PL

Rev: **P6**

Ref: **C3876**

Document Control

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Author	Luke Honeywill	Signature	

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Date	Revision	Author	Approved
05.11.2025	P	LH	CS
13.11.2025	P1	LH	CS
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03.08.2026	P5	LH	CS
24.08.2026	P6	LH	CS

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1 Introduction

- 1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Land Adj The Hollies, Barnham Road in Barnham, West Sussex.
- 1.1.2 The proposed development will consist of the construction of 2 No. dwellings which will be utilised by the adjacent care home.
- 1.1.3 The proposed development is located as OS Grid Reference SU 95757 04556, what3words field.nods.mobile and has the post code PO22 0ES.
- 1.1.4 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk on site and elsewhere, and to clear condition included in decision notice from 03/08/2026, with the planning reference: **BN/33/26/PL**. The condition requires the following to be included:
- An assessment into the potential for disposing of surface water by means of Sustainable Drainage System (SuDS).
 - Specifications for all surface water drainage components and associated infrastructure or flow control mechanisms
 - Details of a management and maintenance plan for the drainage scheme
 - The appropriate Design Storm to be used in the preparation of the drainage design is to be the critical 1 in 100 year return period storm event, plus an allowance of 45% for the predicted effects of climate change and a further 10% for Urban Creep.
 - Calculations for the rainwater harvesting tanks in line with BS EN 16941
 - Modelling of the surface water drainage network with surcharged outfall
- 1.1.5 This document has been prepared with reference to:
- National Planning Policy Framework (NPPF)
 - DEFRA: Sustainable Drainage Systems: Non-Statutory technical standards for sustainable drainage systems
 - DEFRA: National Standards for Sustainable Drainage Systems (SuDS)
 - The SuDS Manual (C753)
 - Building Regulations Document H
 - West Sussex County Council Local Flood Risk Management Strategy

2 The Site

- 2.1.1 The site is currently an undeveloped parcel of land that is sited adjacent to an assisted living residence and encompasses 1355m². The site is constrained by root protected trees and access is to be achieved via an existing access along Barnham Road.
- 2.1.2 The proposed development will consist of the erection of 2 No. C2 Dwellings which will result in a total of 532m² of impermeable areas; of which, 70m² will be constructed from a 'no-dig' permeable surface designed to protect nearby tree roots and 147m² will be constructed from a tanked permeable construction.
- 2.1.3 The development and use of open SuDS features are restricted by the small site area and root protection zones present.

Fig 1. Site Location



3 Executive Summary:

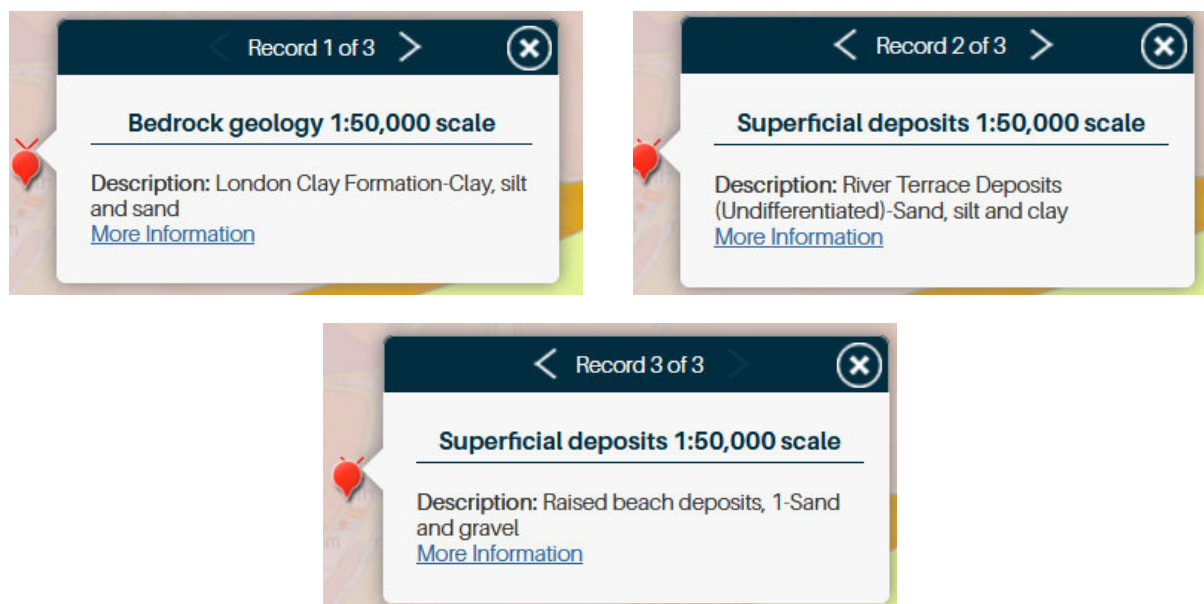
- 3.1.1 The discharge of surface water to ground confirmed to not be suitable after infiltration test failed. Winter groundwater monitoring was carried out in late 2022 and early 2023 which recorded a highest groundwater level of 1.0mgb. Infiltration features are therefore not viable under Arun District Council policy.
- 3.1.2 It is therefore proposed that surface water runoff is to be discharged into an existing surface water sewer located within Market Close at a restricted rate of 0.5l/s. Storage will be supplied within the sub-base of a tanked permeable parking area and within an attenuation tank.
- 3.1.3 The proposed network has been designed to cater for 1 in 100-year +45% CCA storm +10% urban creep.
- 3.1.4 The proposed foul water network is to be connected into the existing foul water system on site via the construction of a new chamber over the existing drain. Remedial works have been carried out on the foul drainage system and it is now flowing freely.

4 Site Geology

4.1 British Geological Survey information

- 4.1.1 Data from the British Geological Survey shows an expected bedrock geology of London Clay Formation. Superficial deposits comprising of River Terrace Deposits and Raised Beach Deposits are expected.
- 4.1.2 The BGS holds records of historical boreholes in the vicinity of the site which may give some insight into the underlying geology.
- Borehole SU90SE54 (Located approx. 170m Southwest of the site) – Clay and sand

Fig 2. British Geological Survey



4.2 Geological Assessment

- 4.2.1 A groundwater monitoring well was installed on site in 2022 and monitoring was conducted during the winter period of late 2022 and early 2023. Further monitoring was undertaken on site during February 2026 to confirm any changes in groundwater levels.
- 4.2.2 During the monitoring window in both 2022-2023 and within February 2026, the highest recorded groundwater level was 1.0mbgl which rules out the use of infiltration on site. Therefore, as per National Standards for SuDS guidelines in addition to Arun DC policy, the use of infiltration features is not possible as there will be insufficient easement between base of infiltration feature and highest groundwater level. See **Appendix F**.
- 4.2.3 In addition to the ground water monitoring, an infiltration test to BRE365 was conducted within February 2023. A trial pit measuring 0.3 x 1m x 0.9m deep was excavated and rapidly filled with water; which failed to drain within a sufficient time period and is therefore considered a failure.
- 4.2.4 Photos of both the groundwater monitoring wells and the infiltration test can be found in Fig 3. Below.

Fig 3. Groundwater Monitoring Well locations and soakaway test photographs



6 Proposed Drainage Strategy

6.1 SuDS Hierarchy

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

Table 1. SuDS Hierarchy

Discharge Destination	
Rainwater Harvesting	Rainwater harvesting has been designed into drainage network.
Interception features	Bio-retention planters and rainwater harvesting are interception features. The tanked permeable paved areas will also act as interception features due to the capillary action of stone.
Discharge to Ground	No – Infiltration test failed and groundwater was recorded at 1.0mbgl.
Discharge to Watercourse	None nearby
Discharge to Surface Water Sewer	Yes – Discharge into surface water sewer within Market Close adjacent to the site. Discharge rate to be restricted to 0.5l/s.
Discharge to Other Sewer	N/A due to above.

6.2 Proposed Hydraulic Calculation Specifications:

Table 2. Hydraulic Calculations

Hydraulic Calculations Settings:	
Rainfall Methodology	FEH-22
Volumetric Run-off Coefficient Cv	1
CV Winter and Summer	1.0
Additional Storage (m ³ / ha)	0.0
Maximum Rainfall (mm/hr)	999
Urban Creep	10%
Storm Period and Climate Change Allowances (CCA)	1 + 45%
	10 + 45%
	30 + 45%
	100 + 45%

Table 3. Flow Control Settings

Flow Control Settings:	
Design head (m)	1.300
Discharge rate (l/s)	0.5
Discharge Coefficient	0.650
Orifice Diameter (m)	0.013

Table 4. Storage Settings

Storage Settings:	
Attenuation Tank	Base Coefficient (m/hr): 0.0000
	Side Coefficient (m/hr): 0.0000
	Factor of Safety: 2
	Porosity: 95%
	Time to Half Empty (mins): -

6.3 Surface Water Drainage

- 6.3.1 Due to the failure on on-site infiltration testing it is confirmed that the discharge of surface water runoff via infiltration is not viable. It is therefore determined that all surface water runoff from the site is to be discharged into an existing surface water sewer located within Market Close at a restricted discharge rate of 0.5l/s which is the minimum practical rate to ensure self-cleansing velocity within the network and reducing the risks of blocking the orifice within the flow control chamber.
- 6.3.2 The hard paved areas are to be constructed from a permeable surface with the sub-base wrapped in an impermeable geomembrane which will allow the permeable paved areas to act as a blanket attenuation tank. Distribution tanks are to be located within the sub-base to allow runoff to convey between the sub-base and the remainder of the surface water network.
- 6.3.3 Rainwater harvesting tanks are to be installed along the drainage network which will allow harvested rainwater to be re-used within the properties. The rainwater harvesting tanks have been sized by GRAF in line with BS EN 16941. A copy of this sizing chart can be found in **Appendix F**.
- 6.3.4 Bioretention planters are also to be utilised within the drainage design which will intercept surface water runoff whilst also providing amenity and biodiversity. Additionally bioretention planters will provide treatment to the surface water and therefore will tackle all 4 pillars of SuDS.
- 6.3.5 An attenuation tank is to be installed to provide the additional storage required to cater for the 1 in 100-year +45% storm + 10% Urban Creep.
- 6.3.6 Greenfield Runoff and Hydraulic calculations have been carried out which can be found at Appendix C. The urban creep has been applied directly to the catchment area on the calculations to accommodate for this increase on roof areas only and not hard paved areas.
- 6.3.7 The proposed discharge to the Southern Water sewer has been agreed in principle by Southern Water who provided the following response:
- “Dear Luke, Thank you for your comments. At this stage, I can confirm that Southern Water has no objections to the proposal, provided that all relevant Southern Water policies and standards are fully adhered to. To progress the application to technical review and for Approval to be granted we require full planning permission, as previously stated”
- 6.3.8 It has also been confirmed that a connection is possible via gravity with the levels of the existing surface water sewer provided on the drainage layout being taken from Southern Water sewer records – See **Appendix E**.

Table 3. Greenfield Runoff Calculations

Storm return period without CCA	Greenfield runoff rate (l/s)	Proposed Discharge Rate (l/s)	Difference (l/s)
Q _{BAR}	0.1	0.5	+ 0.4

1	0.1	0.5	+ 0.4
2	0.1	0.5	+ 0.4
30	1.2	0.5	+ 0.3
100	1.2	0.5	+ 0.3

7 Compliance with National SuDS Standards and Principles

7.1.1 The current national SuDS standards comprise 7 standards supported by 11 design principles. The tables below summarise how the proposed drainage strategy for Land Adj The Hollies responds to these requirements.

Standard	Requirement	Project response
1	Runoff destinations	Rainwater harvesting has been included. Infiltration is not viable and with no nearby watercourses, a connection into a nearby surface water sewer is to be sought.
2	Management of everyday rainfall	Rainfall is managed close to source by rainwater harvesting, bio retention and permeable paving, reducing routine runoff from the site.
3	Management of extreme rainfall and flooding	Roof drainage is directed towards an outfall to the surface water sewer which is to discharge at a restricted rate of 0.5l/s. The network uses storage features sized for the 1 in 100-year +45% climate change storm with 10% urban creep. Any exceedance routes are directed safely away from habitable areas and towards the road.
4	Water quality	Runoff from roofs and parking areas is treated through the SuDS management train. Permeable paving and bio-retention components provide pollutant mitigation in accordance with the simple index approach.
5	Amenity	The drainage strategy uses source control and permeable surfacing integrated within the site layout rather than relying solely on conventional buried drainage. Given the restrictive nature of the site, open SuDS are not considered appropriate. However, the inclusion of SuDS planters will provide amenity benefits.
6	Biodiversity	Given the small nature of the site, it will not be appropriate to utilise open SuDS however, the use of SuDS planters will provide biodiversity benefits.
7	Construction, operation, maintenance and structural integrity	The proposed SuDS components are conventional, buildable and maintainable. Long-term maintenance is addressed within the maintenance schedule and the design respects monitored groundwater levels.

Compliance Table A. Summary of compliance with the 7 national SuDS standards

The proposed drainage design also follows the 11 underpinning principles of the national standards as summarised below.

Principle	Summary	Project response
1	Natural approach to managing water	Surface water is retained and managed on site at source as much as possible in the form of bio-retention and rainwater harvesting.
2	Management train close to source	Varying SuDS features are used together, with re-use and bio-retention planters operating and discharging to source.
3	SuDS approach	The strategy manages runoff quantity, water quality and long-term maintenance in an integrated manner.
4	Early and integrated design	Drainage has been considered alongside site levels, layout, groundwater conditions and the proposed access road arrangement.
5	Site layout informed by drainage	As the proposed parking area is utilised as a storage feature, it has been assessed alongside the drainage network to allow them to integrate successfully.
6	Follow natural drainage routes	The layout allows runoff to be managed in accordance with site topography and infiltration opportunities.
7	Take account of local policy and flood evidence	The design is based on BRE 365 testing, BGS data and current national and local SuDS standards.
8	Early engagement with the authority	The report format and supporting evidence are intended to support planning application.
9	Demonstrate compliance from concept stage	Compliance with the national standards is addressed within this planning-stage drainage strategy rather than deferred entirely to later stages.
10	Show how the standards are met in site design	The report sets out the hierarchy, testing, hydraulic basis, water quality approach in one coordinated document.
11	Consider phasing where relevant	The development is small and not expected to be phased; however, the strategy is capable of being delivered in a single coordinated phase.

Compliance Table B. Summary of compliance with the 11 SuDS design principles

7.2 Water Quality

- 7.2.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution.
- 7.2.2 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.
- 7.2.3 The SuDS Manual (CIRIA C753) describes risks posed to the receiving environment by any proposed drainage discharge.
- 7.2.4 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
- 7.2.5 The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

Table 26.1, (SuDS Manual Section E) from SuDS manual. 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	

- 7.2.6 In accordance with the guidelines above, the Simple Index Approach will be used to determine the water quality requirements for this developments.

7.2.7 Table 26.2 (SuDS Manual Section E) provides hazard classifications that are to be applied to various land uses. The land uses relevant to this development are:

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

7.2.8 To deliver adequate treatment, the selected SuDS components must have a total pollution mitigation index that exceeds the pollution hazard index for each containment type.

Total SuDS mitigation index $\geq$ pollution hazard index

Table 26.2 from SuDS manual. 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
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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

7.2.9 The relevant land uses for this development are highlighted.

7.2.10 Table 26.4 (SuDS Manual Section E) provides indicative SuDS mitigation indices for proposed discharges to groundwater.

Table 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS Components	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	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	0.7	0.7	0.5
Wetland	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 4: SuDS mitigation index

Table 4 Mitigation Indices						
Runoff Source	Destination of Runoff	Mitigation Index Source	Type of SuDS Component	Hazard Index (Table 26.2)		
				Total Suspended Solids (TSS)	Metals	Hydrocarbons
Individual driveways, residential car parks and low traffic roads	Surface water	Table 26.3 (for surface waters)	Permeable Pavement	0.5	0.4	0.4
				Mitigation Indices (Table 26.3)		
				0.7	0.6	0.7
Residential Roofs	Surface water	Table 26.3 (for surface waters)	Bioretention System	Hazard Index (Table 26.2)		
				Total Suspended Solids (TSS)	Metals	Hydrocarbons
				0.2	0.2	0.05
				Mitigation Indices (Table 26.3)		
				0.8	0.8	0.8

7.2.11 This analysis has demonstrated that the SuDS components proposed for this development will adequately mitigate any pollution risks identified during the assessment.

7.3 Foul water drainage

7.3.1 The foul water will discharge into the local foul water sewer via the construction of a new chamber on the existing private foul water drainage on site. The foul water drain discharges into the Southern Water sewer located within Barnham Road.

7.3.2 Due to the location of the site, the foul water sewer discharges into the Lidsey Wastewater Treatment Works (WwTW), which is subject to stricter sewage capacity requirements. It is to be noted that only foul water from the development will discharge into the public foul sewer, ensuring that only domestic wastewater is directed to Lidsey WwTW in accordance with Southern Water's requirements and best practice for sustainable drainage design.

7.3.3 A CCTV drainage survey was carried out on the existing drainage network which recorded a blockage downstream of the proposed connection point. Remedial works have been carried out on the foul system and it is now clear of blockages and flowing freely.

8 Summary and Conclusions

- 8.1.1 CGS Civils has been instructed to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application the construction of 2 No. dwellings that is to be utilised by the adjacent care home.
- 8.1.2 The Surface Water will discharge to an existing surface water sewer located within Market close. The surface water discharge rate is to be restricted to 0.5 l/s and will utilise attenuations tanks and a attenuated sub-base of a car park in order to cater for the 1 in 100-year +45% storm +10% urban creep.
- 8.1.3 The proposed foul water network is to be connected into the existing foul water system on site via the construction of a new chamber over the existing drain. Remedial works have been carried out on the foul system and it is now clear of blockages and flowing freely.
- 8.1.4 This report demonstrates that the foul and surface water drainage measures proposed for this development are suitable and will adequately mitigate the risks identified.
- 8.1.5 A separate, site-specific Maintenance and Management Document has been prepared.

9 Appendices

9.1 Appendix A – Site Plan



Site Plan 1:500 @ A3

10 0 10 20 30 40 50m
1:500

Play
Area

THE CEDARS

The Hollies

Existing Access
to The Hollies

Existing Access Road
post & rail fence

gate

bin store

Existing Access
Retained

Parking
Court

1

2

cycles

cycles

Car

Notes

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3. All dimensions must be checked on site by the contractor prior to commencement of the works.



Client Approval

X	A - Approved				
X	B - Approved with comments				
X	C - Do not use				
Rev.	Revision Note/Purpose of Issue	Drw By	Date	Chk By	Date
P01	Preliminary	AE	30/09/25	CP	30/09/25
P02	Site boundary added, units detached	AE	09/10/25	CP	09/10/25
P03	Tree survey added	CP	13/10/25	CP	13/10/25
P04	Hatching	AE	15/10/25	CP	15/10/25

Client
Elberry Estates Ltd

Job title
**84 Barnham Road
Barnham
West Sussex PO22 0ES**

Drawing title
**Proposed
Block Plan**

Drawn	Date	Checked		Date	Scale at A3			
AE	Sep 25	CJP		Sep 25	1:500			
Job No.	Pro.	Org.	Zone	Level	Type	Role	No.	Rev.
23-087	BHR	MHA	XX	ZZ	DR	A	0042	P05
Purpose of Issue								

PRELIMINARY

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Notes

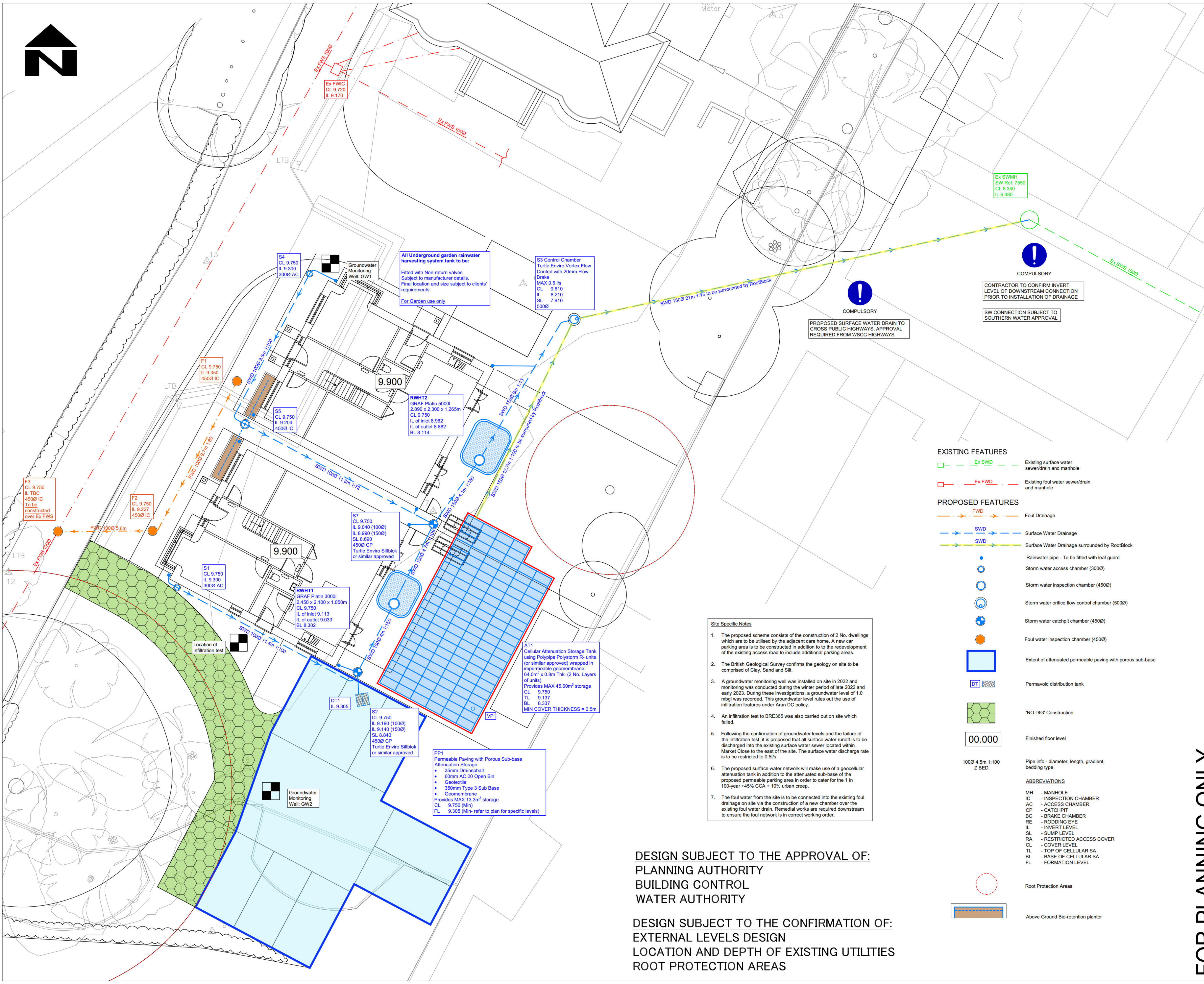
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X	A - Approved
X	B - Approved with comments
X	C - Do not use

Rev.	Revision Note/Purpose of Issue	Drw By	Date	Chk By	Date
P01	Preliminary	AE	30/09/25	CP	30/09/25
P02	Site boundary added, units detached	AE	09/10/25	CP	09/10/25
P03	Tree survey added	CP	13/10/25	CP	13/10/25
P04	Hatching	AE	15/10/25	CP	15/10/25

Client	Elberry Estates Ltd							
Job title	84 Barnham Road Barnham West Sussex PO22 0ES							
Drawing title	Proposed Site Plan							
Drawn	Date	Checked	Date	Scale at A1				
AE	Sep 25	CJP	Sep 25	1:200				
Job No.	Pro.	Org.	Zone	Level	Type	Role	No.	Rev.
23-087	BHR	MHA	XX	00	DR	A	0043	P05
Purpose of Issue								
PRELIMINARY								
Ground Floor 1Bicentennial Building Southern Gate 1 Chichester West Sussex PO19 8EZ t: 01243 774748 e: admin@mharchitects.co.uk www.mharchitects.co.uk Limited Company Registered in England No.0994233								

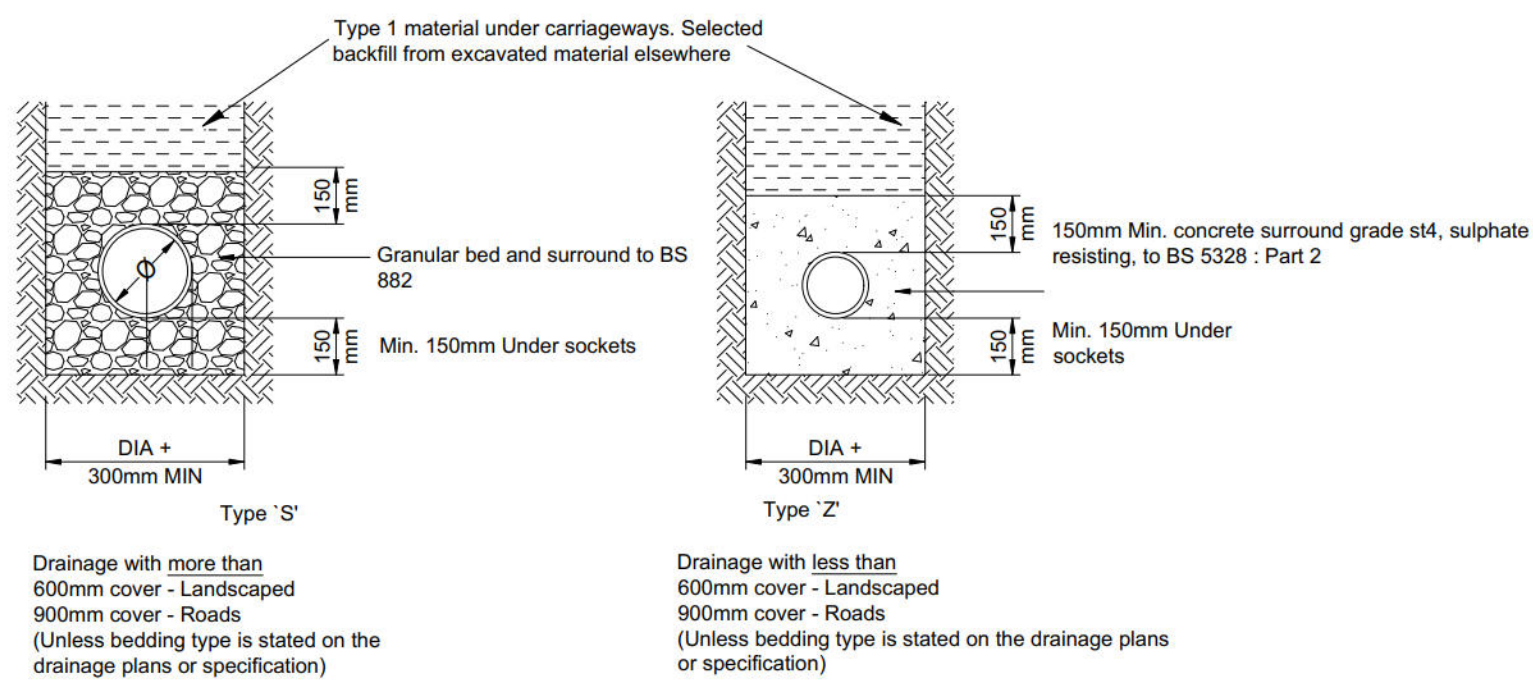
9.2 **Appendix B – Drainage Layout**



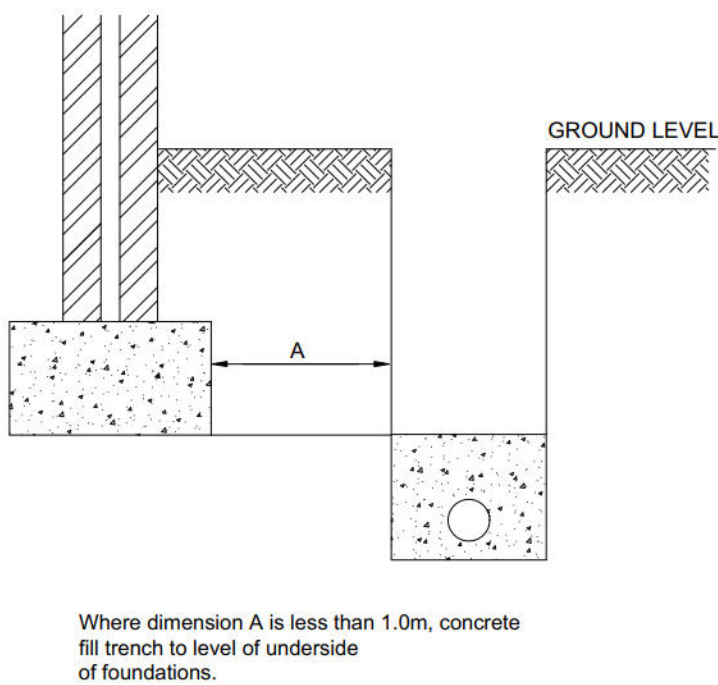
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|--|---|
| Prefixed to drawing numbers shall signify the following- | |
| PL = PLANNING | Shall not be used for contract or construction purposes |
| P = PRELIMINARY | Shall not be used for contract or construction purposes |
| T = TENDER | Shall not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

			
Consulting Civil Engineers			
CLIENT			
ELBERRY PROPERTIES LTD			
ARCHITECT			
MH ARCHITECTS			
JOB TITLE			
LAND ADJ THE HOLLIES BARNHAM			
DRAWING TITLE			
DRAINAGE DESIGN			
DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS
DATE		SCALE @ A1	
NOV 2025		1:100	
JOB No.	STATUS	DRAWING No.	REV.
C3876	P	101	P6

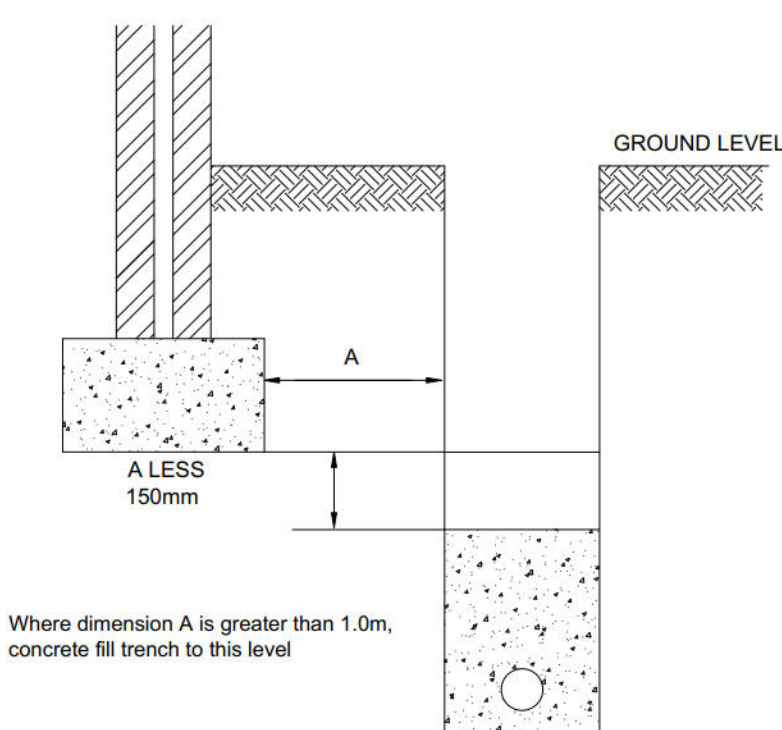
DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
LOCATION AND DEPTH OF EXISTING UTILITIES
ROOT PROTECTION AREAS



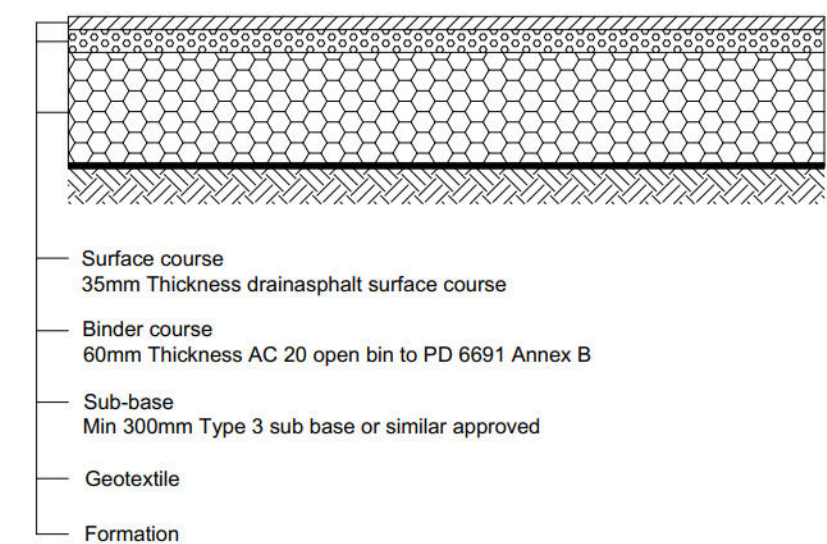
Pipe bedding details in private Areas



Pipes near buildings

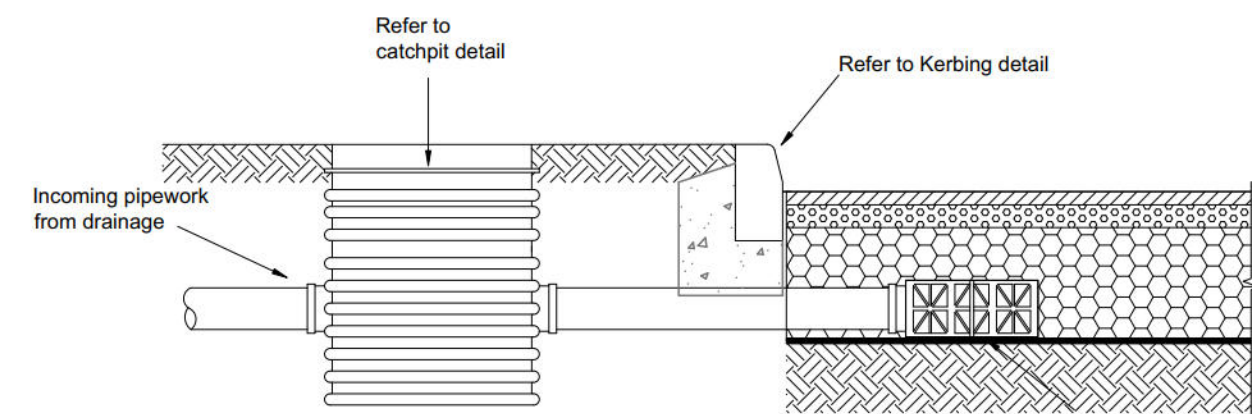


Pipes near buildings



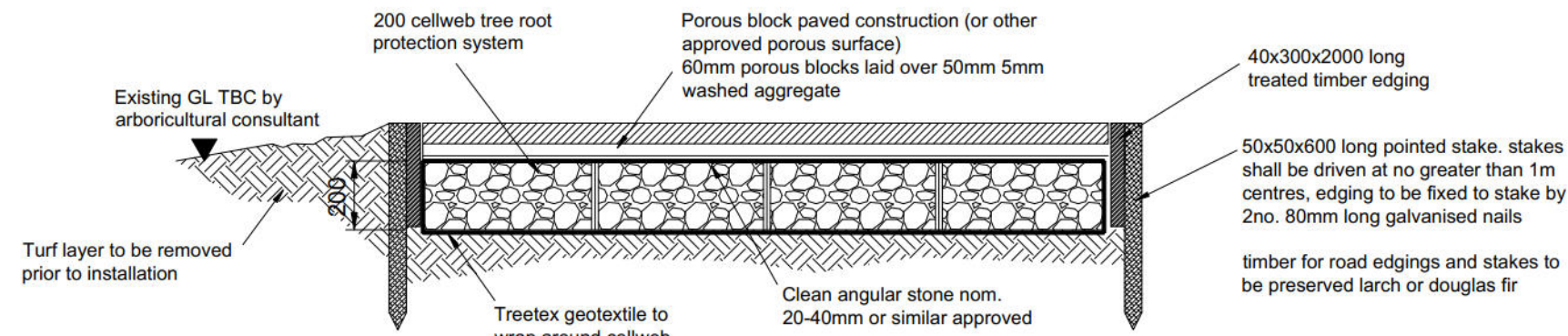
Permeable asphalt construction

To be read in accordance with Aggregate Industries details and specification



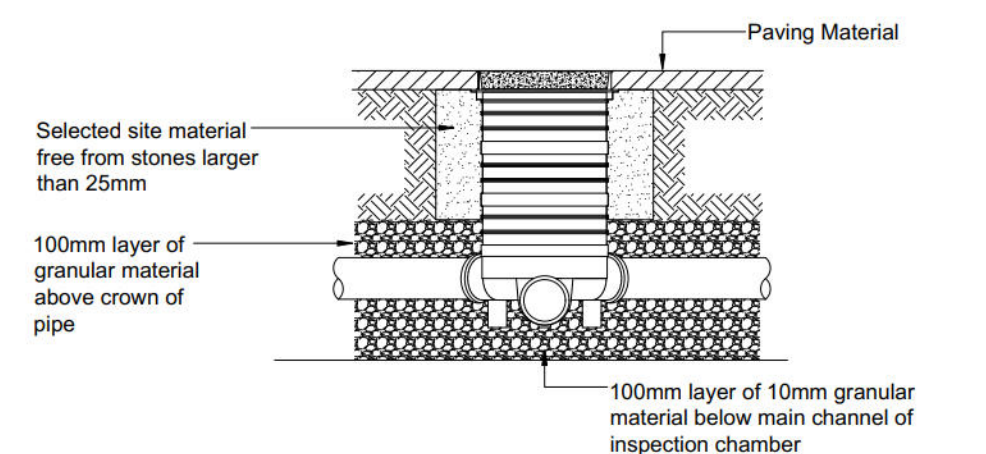
Formpave Diffuser tank construction

Single Unit: 0.354x0.708x0.150m DP

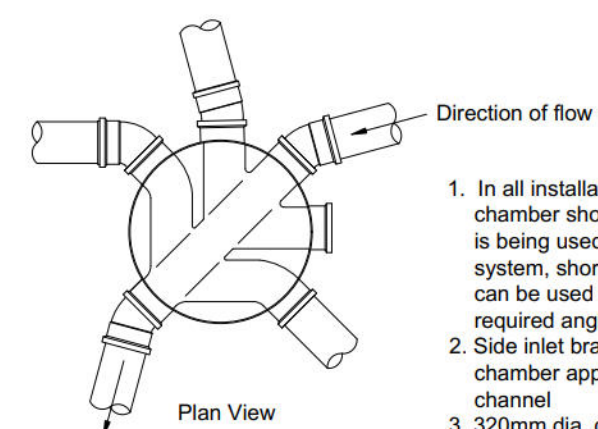
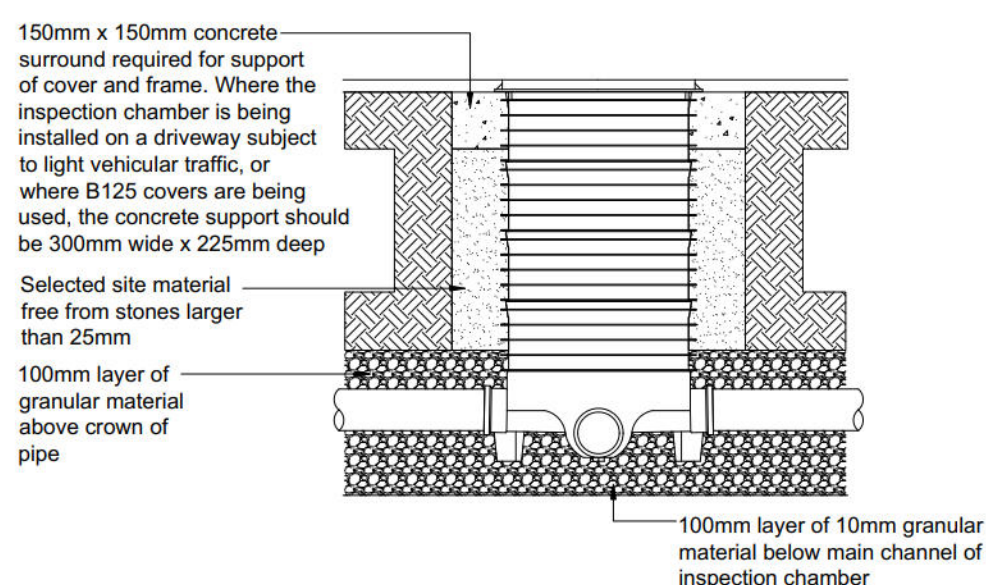


Typical 'no dig' access road construction

subject to detailed design by geosynthetics ltd
to be installed in accordance with geosynthetic ltds installation guide and specification

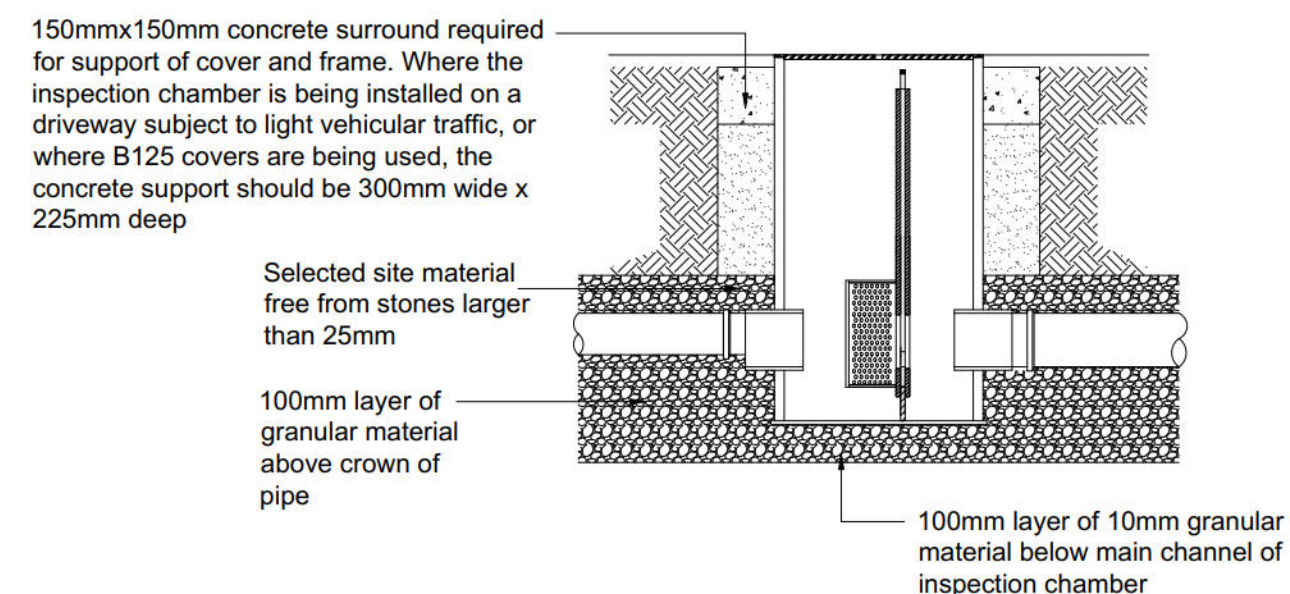


300mmØ SHALLOW INSPECTION CHAMBER DETAIL



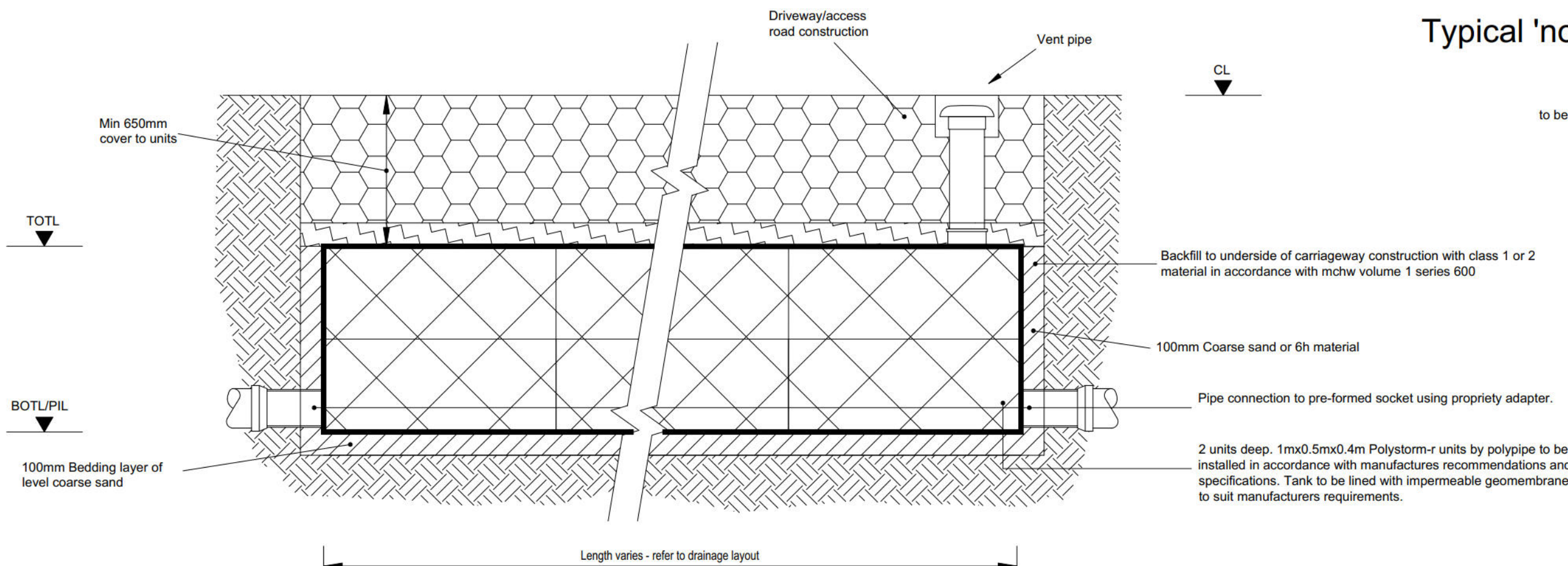
- In all installations, the main channel of the inspection chamber should always be used. Where the chamber is being used as a change of direction for the drainage system, short radius bends of 11½°, 15°, 30° and 45° can be used in the inlet and outlet to achieve the required angle.
- Side inlet branch connections enter the inspection chamber approx. 55mm above the invert of the main channel
- 320mm dia. chambers are supplied with 2no. blanking plugs for the side inlets and 460mm dia. chambers are supplied with 3no. blanking plugs.

460mmØ INSPECTION CHAMBER DETAIL



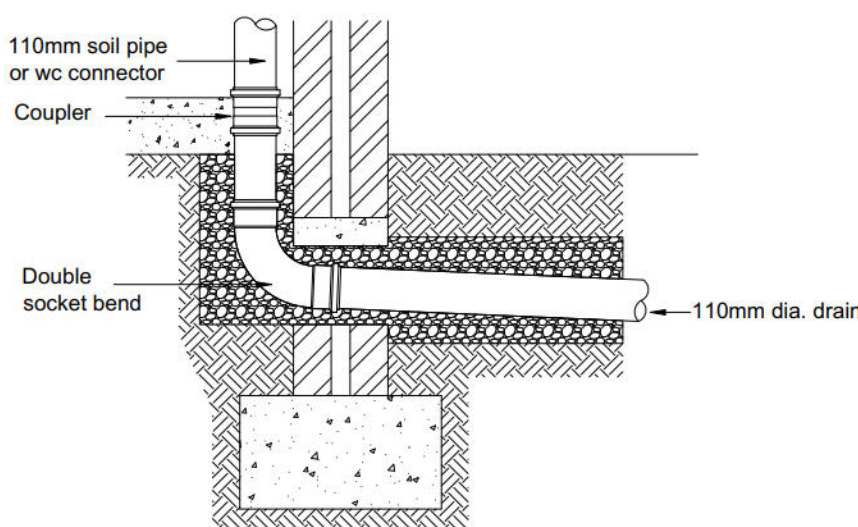
SEL CONTROFLOW 500 ORIFICE CHAMBER

SEL Environmental LTD
Phone: 01254 589987
Email: sales@selenvironmental.com

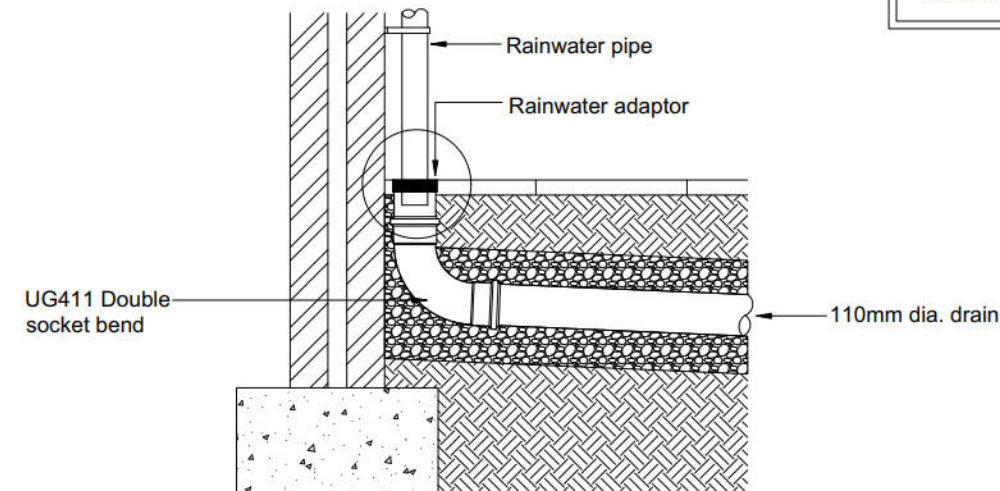


Attenuation tank using polystorm-r geomodular units trafficked areas

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



Soil pipe / wc connection

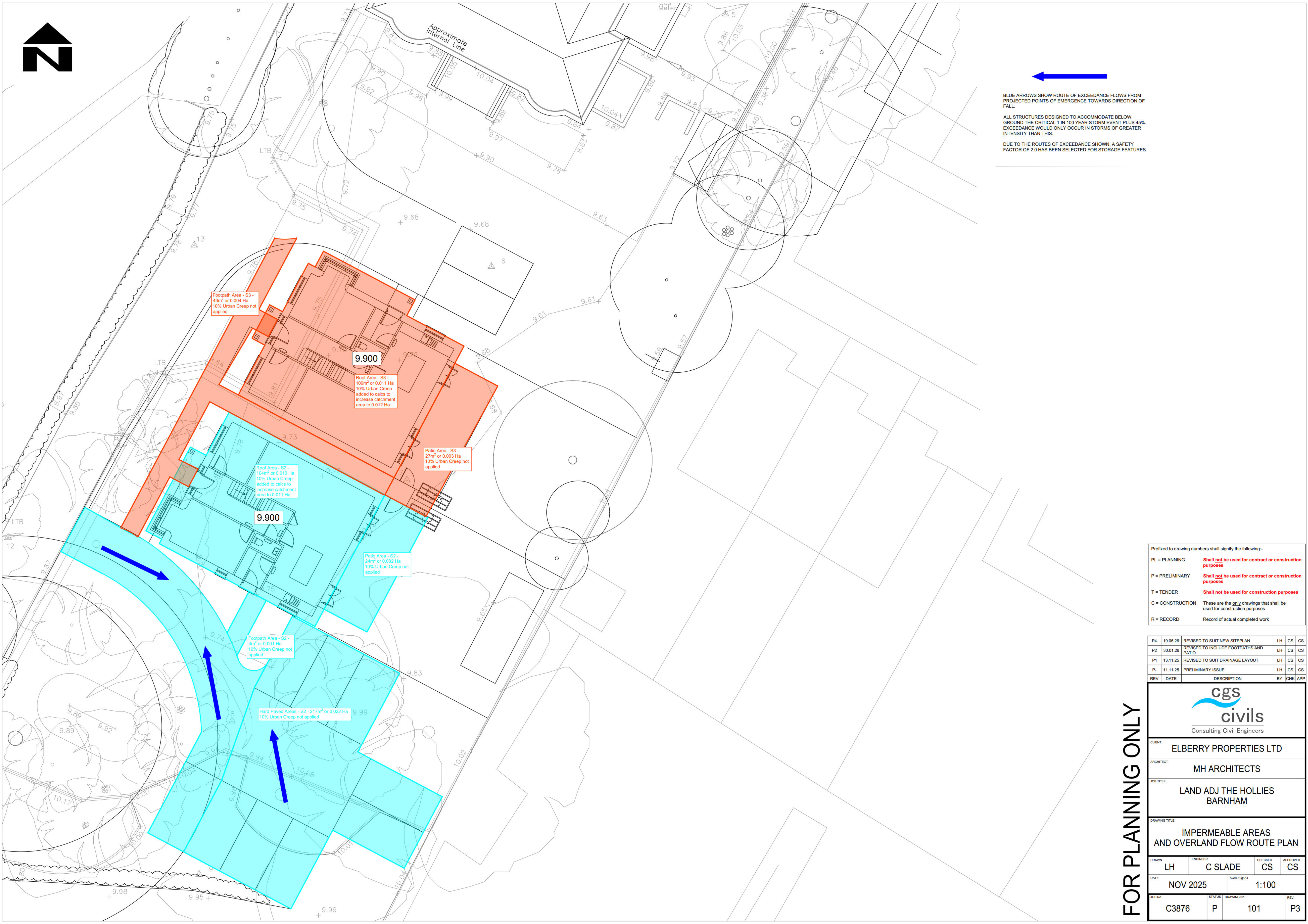


Rainwater pipe connection

Prefixed to drawing numbers shall signify the following:-				
PL = PLANNING	Shall not be used for contract or construction purposes			
P = PRELIMINARY	Shall not 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			

1	31.07.26	PRELIMINARY ISSUE	LH	CS	CS
REV	DATE	DESCRIPTION	BY	CHK	APP
CLIENT	ELBERRY PROPERTIES LTD				
ARCHITECT	MH ARCHITECTS				
JOB TITLE	LAND ADJ THE HOLLIES BARNHAM				
DRAWING TITLE	CONSTRUCTION DETAILS				
DRAWN	LH	ENGINEER	C SLADE	CHECKED	CS
DATE	NOV 2025	SCALE @ A1	1:20		
JOB No.	C3876	STATUS	P	DRAWING No.	301
		REV.	1		

FOR PLANNING ONLY



ALL STRUCTURES DESIGNED TO ACCOMMODATE BELOW
GROUND THE CRITICAL 1 IN 100 YEAR STORM EVENT PLUS 45%
EXCEEDANCE WOULD ONLY OCCUR IN STORMS OF GREATER
INTENSITY THAN THIS.

DUE TO THE ROUTES OF EXCEEDANCE SHOWN, A SAFETY FACTOR OF 2.0 HAS BEEN SELECTED FOR STORAGE FEATURES

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

P4	19.05.26	REVISED TO SUIT NEW SITEPLAN	LH	CS	CS
P2	30.01.26	REVISED TO INCLUDE FOOTPATHS AND PATIO	LH	CS	CS
P1	13.11.25	REVISED TO SUIT DRAINAGE LAYOUT	LH	CS	CS
P-	11.11.25	PRELIMINARY ISSUE	LH	CS	CS
REV	DATE	DESCRIPTION	BY	CHK	APP

 Consulting Civil Engineers			
CLIENT ELBERRY PROPERTIES LTD			
ARCHITECT MH ARCHITECTS			
JOB TITLE LAND ADJ THE HOLLIES BARNHAM			
DRAWING TITLE IMPERMEABLE AREAS AND OVERLAND FLOW ROUTE PLAN			
DRAWN LH	ENGINEER C SLADE	CHECKED CS	APPROVED CS
DATE NOV 2005		SCALE @ A1 1:100	
JOB No. C3876	STATUS P	DRAWING No. 101	REV. P3

FOR PLANNING ONLY

9.3 **Appendix C – Surface Water Calculations**

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.350
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	999.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S2	0.036	5.00	9.750	450	495750.094	104541.613	0.620	9.130
S3	0.019	5.00	9.610	1200	495761.520	104563.110	1.400	8.210
ExSWMH	0.000		8.340	1050	495788.529	104568.165	1.960	6.380

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	S3	24.345	0.600	9.130	8.210	0.920	26.5	150	5.21	55.9
1.001	S3	ExSWMH	27.478	0.600	8.210	6.380	1.830	15.0	150	5.38	55.2

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	1.965	34.7	7.3	0.470	1.250	0.036	0.0	47	1.560
1.001	2.613	46.2	11.0	1.250	1.810	0.055	0.0	50	2.144

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	24.345	26.5	150	Circular	9.750	9.130	0.470	9.610	8.210	1.250
1.001	27.478	15.0	150	Circular	9.610	8.210	1.250	8.340	6.380	1.810

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S2	450	Manhole	Adoptable	S3	1200	Manhole	Adoptable
1.001	S3	1200	Manhole	Adoptable	ExSWMH	1050	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S2	495750.094	104541.613	9.750	0.620	450				
						0	1.000	9.130	150
S3	495761.520	104563.110	9.610	1.400	1200		1	1.000	8.210
						0	1.001	8.210	150
ExSWMH	495788.529	104568.165	8.340	1.960	1050		1	1.001	6.380
									150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	8.210
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	45	0	0	30	45	0	0
10	45	0	0	100	45	0	0

Node S3 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.300	Discharge Coefficient	0.650
Replaces Downstream Link	x	Design Flow (l/s)	0.5		
Invert Level (m)	8.210	Diameter (m)	0.013		

Node S3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	8.337
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	64.0	0.0	0.800	64.0	0.0	0.801	0.0	0.0

Results for 1 year +45% CC Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S2	10	9.174	0.044	6.5	0.0070	0.0000	OK
600 minute winter	S3	555	8.551	0.341	1.4	13.4166	0.0000	SURCHARGED
600 minute winter	ExSWMH	555	6.388	0.008	0.2	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S2	1.000	S3	6.4	0.667	0.186	0.2664	
600 minute winter	S3	1.001	ExSWMH	0.2	0.666	0.005	0.0091	9.2

Results for 10 year +45% CC Critical Storm Duration. Lowest mass balance: 98.99%

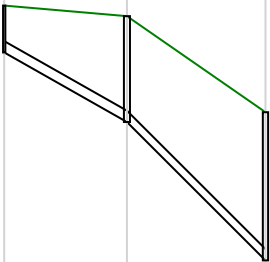
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S2	10	9.209	0.079	19.0	0.0126	0.0000	OK
600 minute winter	S3	585	8.829	0.619	2.7	30.6435	0.0000	SURCHARGED
600 minute winter	ExSWMH	585	6.389	0.009	0.3	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S2	1.000	S3	19.0	1.236	0.546	0.3291	
600 minute winter	S3	1.001	ExSWMH	0.3	0.729	0.006	0.0113	11.9

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 98.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S2	10	9.223	0.093	24.6	0.0148	0.0000	OK
600 minute winter	S3	585	8.965	0.755	3.4	39.0941	0.0000	SURCHARGED
600 minute winter	ExSWMH	585	6.389	0.009	0.3	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S2	1.000	S3	24.5	1.521	0.706	0.3543	
600 minute winter	S3	1.001	ExSWMH	0.3	0.752	0.007	0.0121	13.0

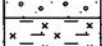
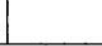
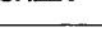
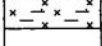
Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.93%

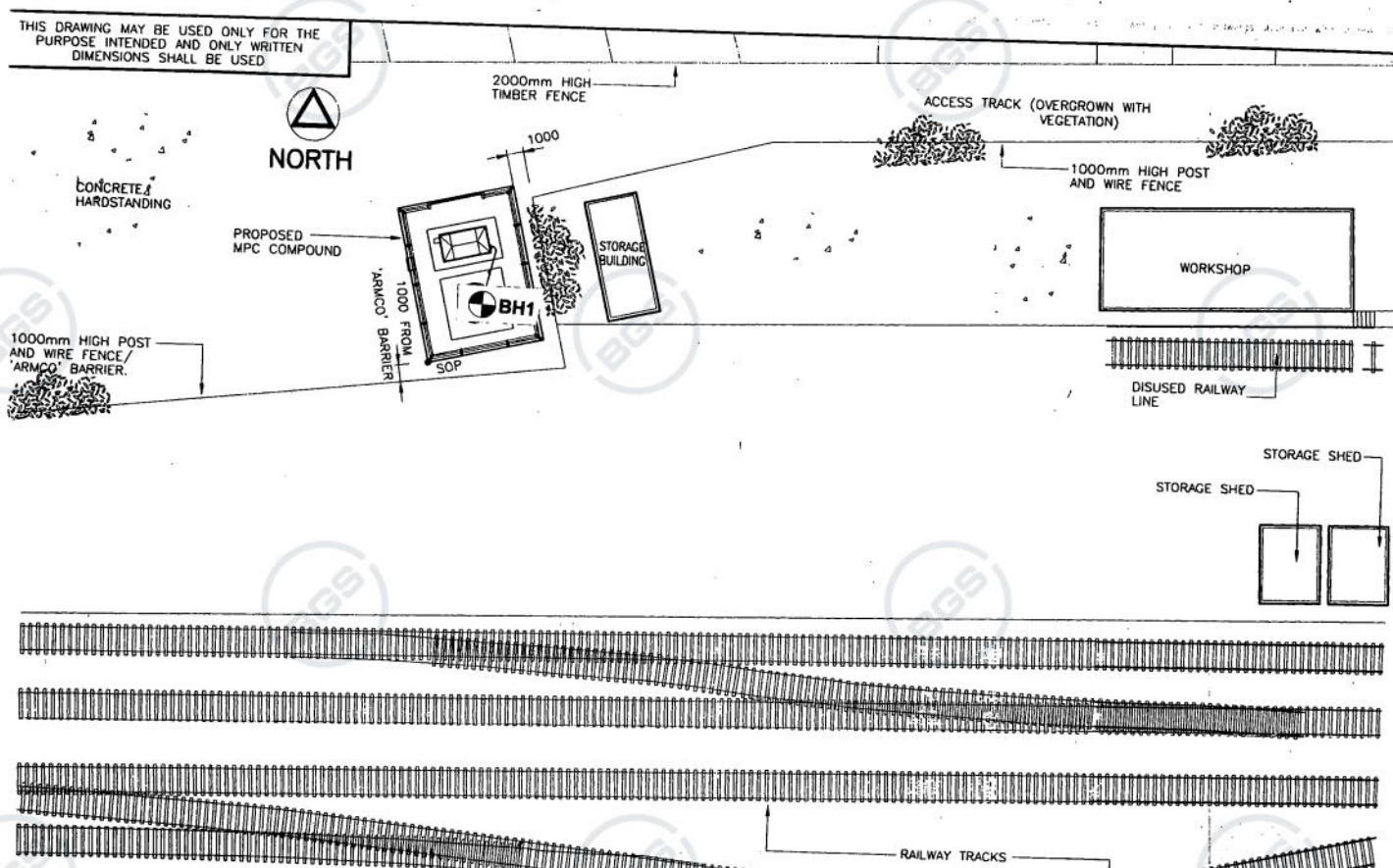
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S2	585	9.252	0.122	2.7	0.0194	0.0000	OK
600 minute winter	S3	585	9.252	1.042	4.1	49.8795	0.0000	SURCHARGED
600 minute winter	ExSWMH	585	6.390	0.010	0.4	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	S2	1.000	S3	2.7	0.225	0.078	0.4013	
600 minute winter	S3	1.001	ExSWMH	0.4	0.792	0.008	0.0135	14.4

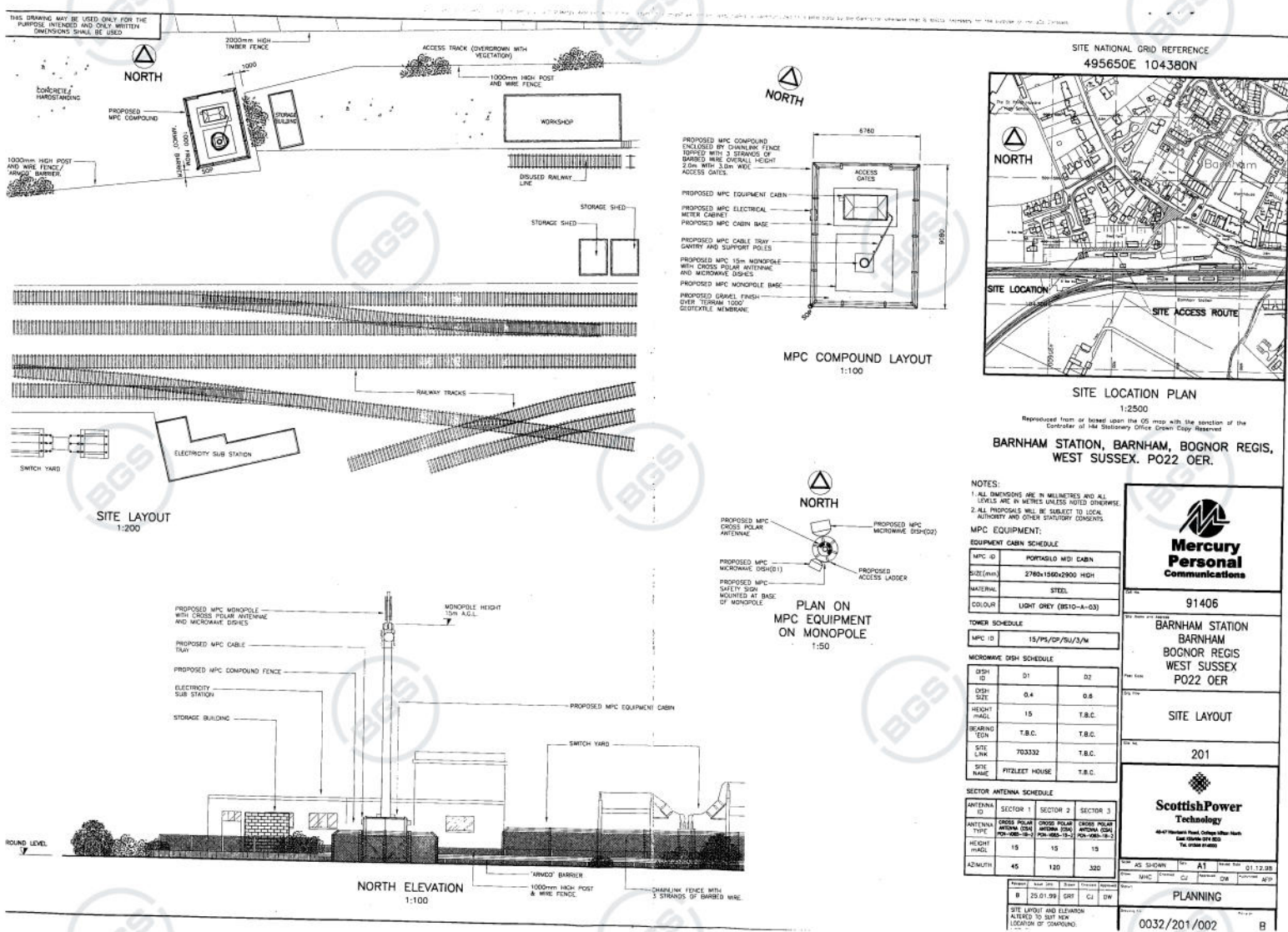
Node Name	S2	S3	ExSWMH
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 2.000 			
Link Name	1.000	1.001	
Section Type	150mm	150mm	
Slope (1:X)	26.5	15.0	
Cover Level (m)	9.750	9.610	8.340
Invert Level (m)	9.130	8.210	6.380
Length (m)	24.345	27.478	

9.4 **Appendix D – Borehole Logs**

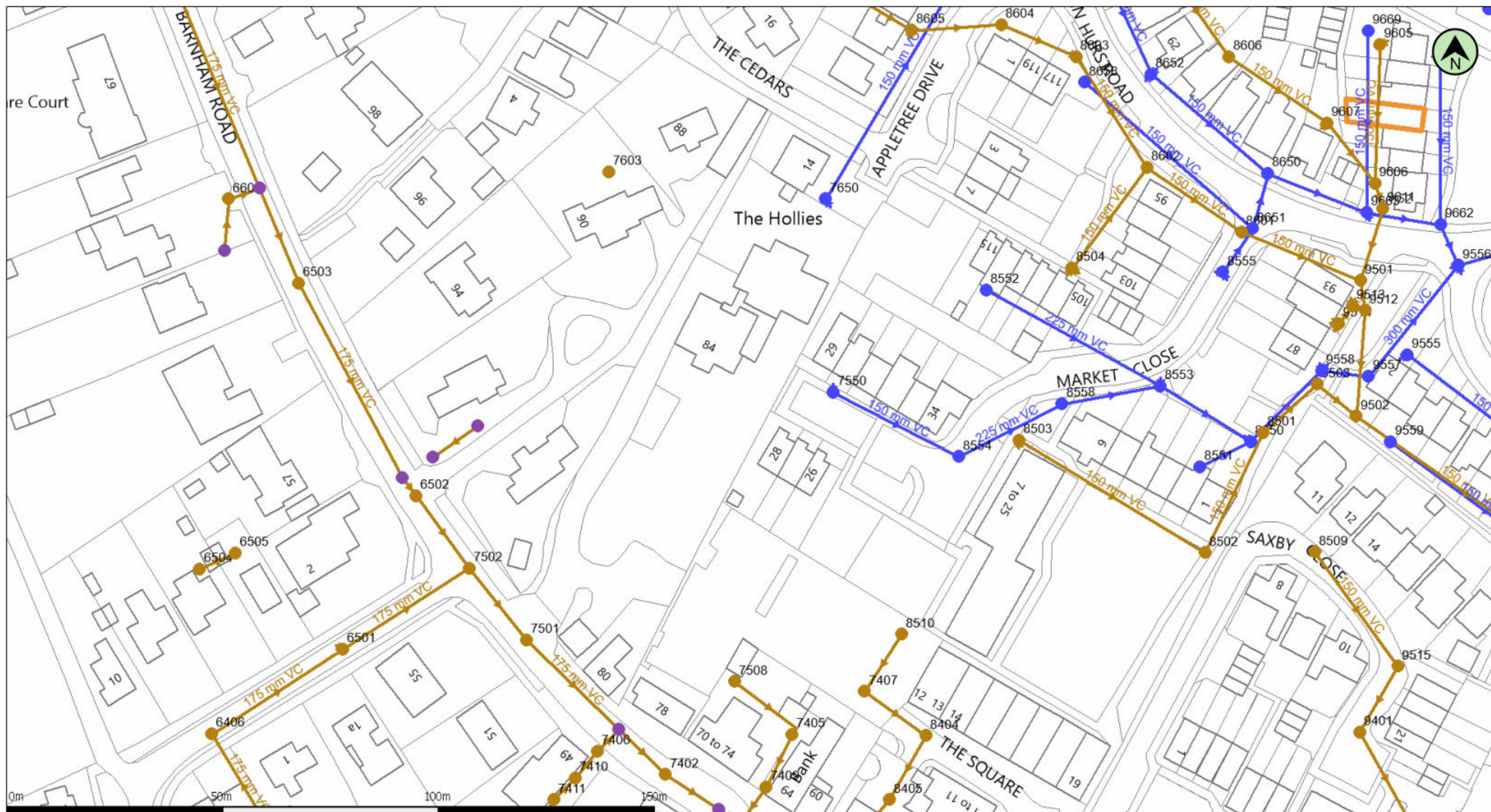


CLIENT SCOTTISH POWER TECHNOLOGY			JOB NO C9984	LOCATION BARNHAM STATION, BOGNOR REGIS	BOREHOLE NO BH1		
DATE FEBRUARY 1999		SCALE 1 to 50	BORING METHOD DYNAMIC SAMPLING			Sheet: 1	
Drilling & Casing Progress	SAMPLE/TEST		SPT N - value or COHESION	DESCRIPTION	O D LEVEL	LEGEND	DEPTH
	Type & No.	Depth(M)					
19TH				MADE GROUND - Concrete.			0.0
				MADE GROUND - Medium dense, fine to coarse sand and gravel.			0.20
				MADE GROUND - Black sandy "silty" clay with some fine to coarse gravel and traces of crushed brick and ash.			0.40
				Stiff light to medium brown/orange sandy CLAY with some fine to coarse gravel and occasional fragments of flint.			0.60
				Generally medium dense, moist, orange clayey/silty SAND with occasional fine gravel and occasional fragments/nodules of flint/chert.			0.80
							1.00
							1.20
							1.40
							1.60
							1.80
							2.00
							2.20
							2.40
							2.60
							2.80
							3.00
							3.20
							3.40
							3.60
							3.80
							4.00
							4.20
							4.40
							4.60
							4.80
							5.00
19TH	U	5.00	> 240.00	Very stiff, moist, dark grey silty CLAY.			4.75
							5.00
DUNELM DRILLING CO				BOREHOLE LOGSHEET			
Water Observations, Remarks, Etc Water ingress noted at 1.00m. Standing level recorded at 1.20m after 40mins. Borehole backfilled to within 3.40m.							





9.5 **Appendix E – Sewer Records**



(c) Crown copyright and database rights 2022 Ordnance Survey 100031673

Date: 03/03/22

Scale: 1:1250

Map Centre: 495770,104564

Data updated: 17/01/22

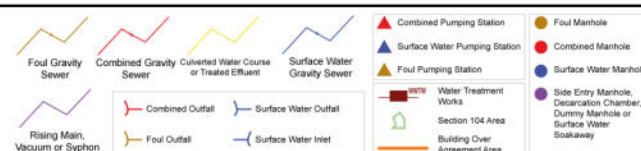
Our Ref: 796472 - 1

Wastewater Plan A4

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



[Redacted]	
84 Barnham Road	
[Redacted]	



Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
6406	F	9.12	6.96	-
6501	F	8.91	6.79	-
6502	F	8.83	5.00	-
6503	F	8.89	5.19	-
6504	F	0.00	0.00	-
6505	F	0.00	0.00	-
6602	F	0.00	0.00	-
7402	F	8.43	4.66	-
7405	F	0.00	0.00	-
7406	F	0.00	0.00	-
7407	F	0.00	0.00	-
7409	F	0.00	0.00	-
7410	F	0.00	0.00	-
7411	F	0.00	0.00	-
7501	F	8.84	4.88	-
7502	F	8.82	4.93	-
7508	F	0.00	0.00	-
7603	F	0.00	0.00	-
8404	F	0.00	0.00	-
8405	F	0.00	0.00	-
8501	F	7.42	5.37	-
8502	F	7.33	5.77	-
8503	F	8.02	6.18	-
8504	F	8.24	6.56	-
8509	F	6.63	4.96	-
8510	F	0.00	0.00	-
8601	F	7.82	5.57	-
8602	F	8.40	5.88	-
8603	F	8.74	6.24	-
8604	F	9.03	6.48	-
8605	F	8.97	6.76	-
8606	F	8.62	7.11	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
9401	F	6.52	4.36	-
9501	F	7.48	5.23	-
9502	F	7.25	4.93	-
9503	F	7.45	5.09	-
9512	F	7.41	5.09	-
9513	F	7.51	6.13	-
9514	F	7.52	6.35	-
9515	F	6.44	4.50	-
9605	F	8.04	6.66	-
9606	F	7.67	5.82	-
9607	F	8.11	6.63	-
9611	F	7.59	5.49	-
7550	S	8.34	6.38	-
7650	S	8.88	8.06	-
8550	S	7.46	5.38	-
8551	S	7.28	7.27	-
8552	S	8.69	8.68	-
8553	S	7.78	5.54	-
8554	S	8.00	5.96	-
8555	S	7.73	6.37	-
8558	S	7.99	5.70	-
8650	S	8.09	6.14	-
8651	S	7.82	6.22	-
8652	S	8.60	6.78	-
8658	S	8.69	6.39	-
9555	S	7.06	6.13	-
9556	S	6.91	4.76	-
9557	S	7.20	5.17	-
9558	S	7.48	5.30	-
9559	S	6.96	6.95	-
9652	S	7.52	7.51	-
9662	S	7.19	5.04	-

9.6 **Appendix F – Groundwater monitoring results**

Groundwater Monitoring



Hole ID	Instrument ID	Instrument Type	Recorded Base of Instrument (mBGL)	Reading			
				Date	Water Level (mBGL)	Water level (mOD)	Ground Level m(OD)
GW1	1	SP	4m	04.10.22	1.60	8.18	9.78
				13.10.22	1.57	8.21	9.78
				27.10.22	1.52	8.26	9.78
				11.11.22	1.45	8.33	9.78
				22.11.22	1.50	8.28	9.78
				12.12.22	1.57	8.21	9.78
				06.01.23	1.48	8.30	9.78
				16.01.23	1.22	8.56	9.78
				30.01.23	1.00	8.78	9.78
				13.02.23	1.04	8.74	9.78
				27.02.23	1.00	8.78	9.78
				09.03.23	1.5	8.28	9.78
				09.01.26	1.24	8.34	9.78
				23.01.26	1.16	8.62	9.78
				05.02.26	1.03	8.75	9.78
				13.02.26	1	8.78	9.78
				20.02.26	1.1	8.68	9.78

GW2	2	SP	4m	04.10.22	1.61	8.33	9.94
				13.10.22	1.54	8.4	9.94
				27.10.22	1.52	8.42	9.94
				11.11.22	1.55	8.39	9.94
				22.11.22	1.68	8.26	9.94
				12.12.22	1.74	8.20	9.94
				06.01.23	1.33	8.61	9.94
				16.01.23	1.32	8.62	9.94
				30.01.23	1.05	8.89	9.94
				13.02.23	1.10	8.84	9.94
				27.02.23	1.04	8.90	9.94
				09.03.23	1.60	8.34	9.94
				09.01.26	1.35	8.59	9.94
				23.01.26	1.2	8.74	9.94
				05.02.26	1.10	8.84	9.94
				13.02.26	1.06	8.88	9.94
				20.02.26	1.00	8.84	9.94

Project: The Hollies, Barnham
 Project No: C3876
 Client: Elberry Properties Ltd

GWM

9.7 **Appendix F – Rainwater harvesting tank sizing calculations**

Created by and for Graf UK Ltd

Quantity:

Designed using BS 8515:2009

Created by and for Graf UK Ltd

Quantity:

Note: For these calculations we assume 5% unless otherwise requested.

where:

η is the hydraulic filter efficiency.

5% of the annual non-potable water demand should be calculated using the equation:

where:

n is the number of persons.

Final recommended tank size in accordance with BS EN 16941-1:2018

5% of annual rainwater yield	=	4261 L
5% of annual non-potable water demand	=	5475 L
Smaller of the two above figures	=	4868 Litres
Closest/Most suitable tank size	=	5,000 Litres

'e' yield coefficient (%) taken from the below table BS EN 16941-1:2018 6.1.2 'Table 2' page 19