



Consulting Civil Engineers

Foul and Surface Water Drainage Report

Land Adj. to Mistletoe Farm, Climping BN17 5QZ

For

Tony Ricards

Rev – **P1**

Reference **C1627**

Date **19th March 2021**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	19.03.21	Initial Issue	LH	CS
P1	08.04.21	Site location updated	CS	CS

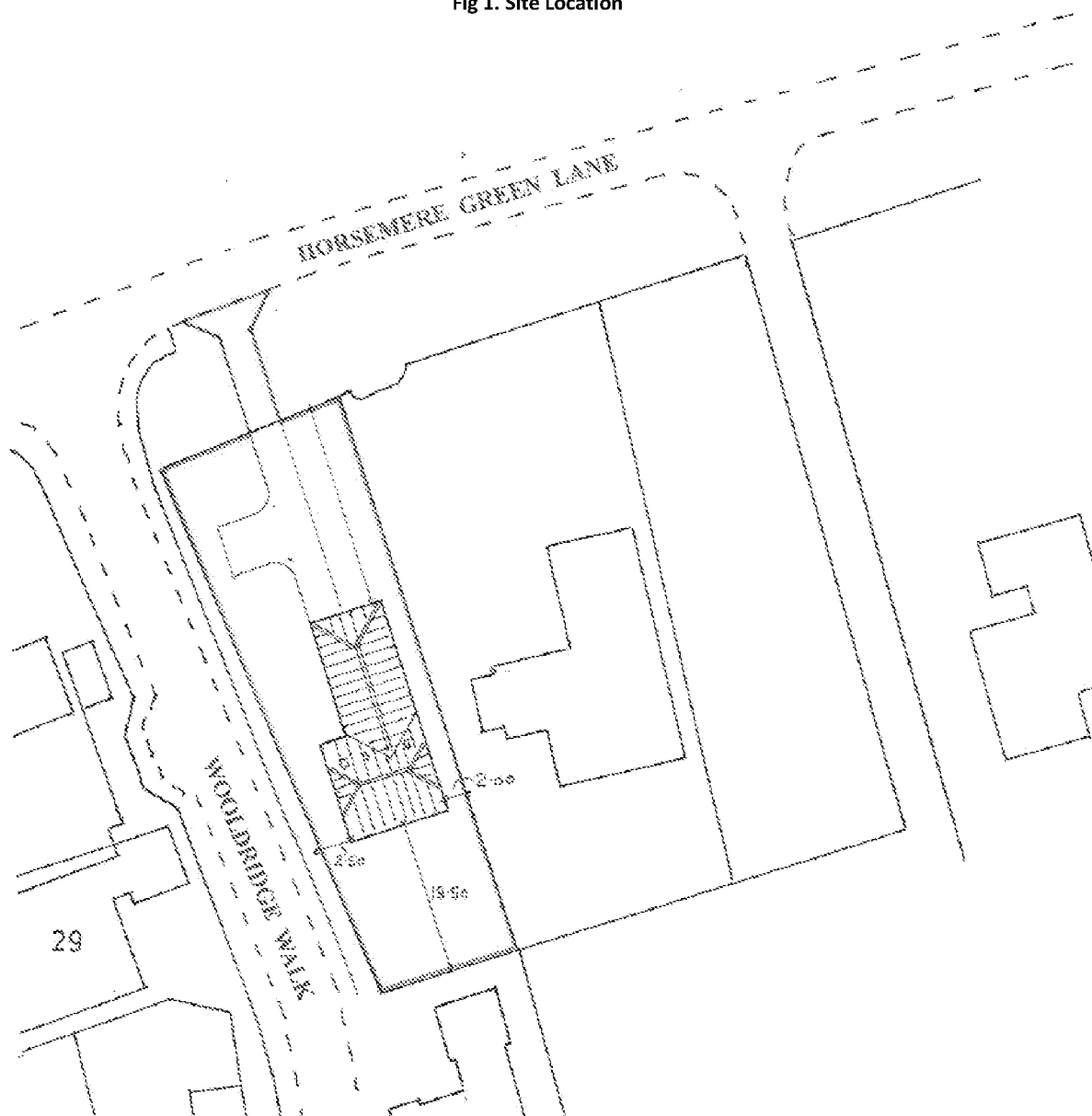
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1 Introduction

- 1.1.1 CGS Civils Ltd have been appointed by Tony Ricards to undertake a drainage strategy report for a proposed development at Land Adj. to Mistletoe Farm, Climping.
- 1.1.2 The purpose of this drainage strategy is to demonstrate how the impermeable area can be satisfactorily drained without increase flood risk onsite and elsewhere.
- 1.1.3 The existing site consists of existing site is currently undeveloped landscaped areas. The proposed development will consist of the erection of a new single residential dwelling with associated access.
- 1.1.4 The proposed site plan can be found in **Appendix A**.

Fig 1. Site Location

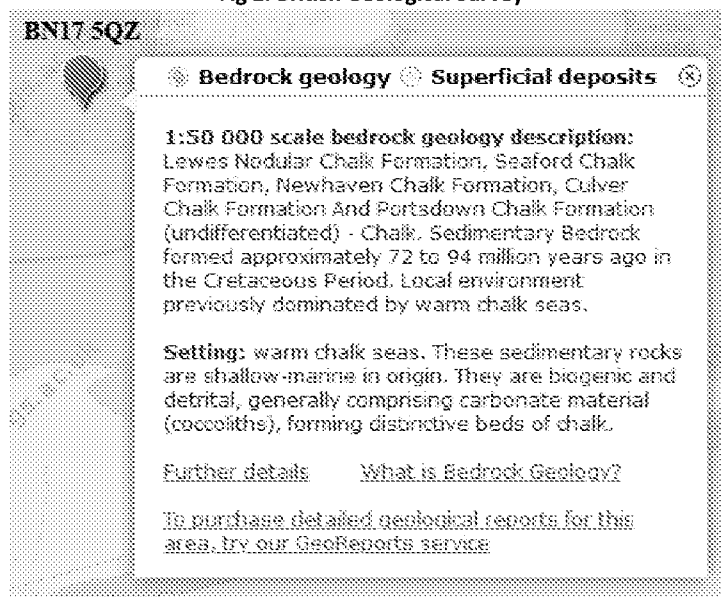


2 Site Geology

2.1 British Geological Survey information

- 2.1.1 The British Geological Survey confirms the bedrock geology to be made up Lewes Nodular Chalk Formation, Seaford Chalk Formation as well as other Chalks; each primarily consisting of Chalk
- 2.1.2 The nearest historical borehole logs from BGS confirm the surrounding areas to be underlain by:
- Borehole SU90SE38 – (Located approx. 200m North West of the site) – Raised Beach Deposits ('Very Clayey' Sand)
- 2.1.3 The borehole logs can be found in **Appendix D**.

Fig 2. British Geological Survey



2.2 Hydrogeology Setting

- 2.2.1 The Environment Agency (EA) mapping service, as provided by Magic Map, indicates the aquifer designation for the bedrock and superficial drift geology and the groundwater vulnerability in the area. The mapping, as included in **Appendix E**, provides the following information for the site:
- 2.2.2 The site will not pose a risk to the groundwater on site as there will be no discharge of any hazardous materials to ground.

Geology Map	Site Description
Aquifer Designation (Bedrock)	Principal
Aquifer Designation (Superficial Drift)	Secondary A
Groundwater Vulnerability	Medium
Groundwater Source Protection Zone	N/A

2.3 Site Geology

- 2.3.1 A soakaway test to BRE 365 was undertaken on site which confirmed the subsoil to be sandy clays. The worst-case infiltration rate was recorded as $9.09 \times 10^{-6} \text{m/s}$ which is a poor to moderate rate.
- 2.3.2 A borehole to monitor groundwater was dug adjacent to the soakaway pit to a depth of 1.5m and monitored over 48 hours. This remained dry throughout.

3 Existing Drainage

- 3.1.1 As the existing site is currently undeveloped landscape, there is no existing drainage on site. There is an existing public foul water sewer owned by Southern Water that runs across the site.

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 recorded rate of $9.09 \times 10^{-6} \text{m/s}$
Discharge to Watercourse	N/A
Discharge to Surface Water Sewer	N/A
Discharge to Other Sewer	N/A

- 4.1.2 Different SuDS Features have been assessed to determine if they are viable to use on site and can be seen in the following table:

SuDS Feature	Beneficial to Environment	Improves Water quality	on low permeable soils (<10-6)	Suitable for Ground Water recharge	Suitable for small sites	Site specific restrictions	Appropriate for site
Wetlands	Y	Y	Y	N	N	Site Constraints	No
Pond	Y	Y	Y	N	N	Site Constraints	No
Detention Basin	Y	Y	Y	N	N	Site Constraints	No
Infiltration Basin	Y	Y	N	Y	N	Site Constraints	No
Soakaway	N	Y	N	Y	Y	None	Yes
Attenuation Tank	N	N	Y	N	Y	None	Yes
Swale	Y	Y	Y	Y	N	Site Constraints	No
Filter Strip	Y	Y	Y	Y	N	Site Constraints	No
Rainwater Harvesting	N	Y	Y	Y	Y	Site Constraints	No
Permeable Paving	N	Y	Y	Y	Y	None	Yes
Green Roof	Y	Y	Y	N	Y	Site Constraints	No
Rain garden	Y	Y	Y	N	N	Site Constraints	No

4.2 Surface Water Drainage

- 4.2.1 Due to the mainly favourable soil properties, it is proposed that all roof and hard paved areas are to be discharged to ground via infiltration. Roof areas will discharge into a geocellular soakaway and the driveway will be of permeable construction i.e. blocks, tarmac or gravel.
- 4.2.2 All infiltration features have been designed to cater for the 1 in 100-year storm + 40%.
- 4.2.3 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
- Low traffic roads

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

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.

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 no 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 later 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 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 (for ground waters) Table 26.3 (for surface waters)	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.

4.4 Foul water drainage

- 4.4.1 The foul water will discharge into the local foul water sewer that runs across site via a new saddle connection. This will be subject to Southern Water approval.

4.5 Construction Phase Drainage

- 4.5.1 It is an offence to cause or knowingly permit the entry of any polluting, poisonous or noxious material in the water environment. If the pollution is serious enough to lower the ecological status of the water body as set out in terms by the Water Framework Directive (2000/60/EC) then prosecution may occur.
- 4.5.2 Remediation of any damage caused will not require the polluter to be prosecuted first. If the water pollution is serious enough to be classed as environmental damage, the damage will require to be remediated such that the area is returned to the condition it would have been in if the damage had not occurred.
- 4.5.3 If any pollution has not been reported or the polluter has not taken actions to prevent any further damage; they would then be causing an offence. Third parties (e.g., Private water supply users, landowners, recreation users and the public) who may be affected by possible damage may also report the risk of any environmental damage to the enforcing authority.
- 4.5.4 The principles of SuDS (Sustainable Drainage Systems) shall be applied to all components of design and construction regarding surface water management. Any design or site works that may impact on the site drainage or the water quality shall:
- Soakaway where soils allow
 - Consider and manage erosion
 - Remove pollutants in surface water
 - Retain any silts on site and prevent silts from discharging to watercourses or drains
 - Keep runoff rates at existing greenfield runoff
 - Prevent accidental spillages reaching watercourse
- 4.5.5 As infiltration on site is viable, the temporary drainage for the development will be in the form of land drains which will discharge into the ground.
- 4.5.6 Pollution will be controlled via the use of catchpit manholes and geotextiles.
- 4.5.7 Any potential hazardous substances will be within a controlled compound with a separate drainage system that will contain a penstock valve / containment kit in the event of a spillage.

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 developer will appoint a maintenance firm to 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 Adj. to Mistletoe Farm, Climping

- 5.2.1 As listed above, in section 5.1.2, the SuDS features used on site will be porous paving and a geocellular soakaway.
- 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 5.3.1 – 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 5.3.2 – Operation and Maintenance Requirements for permeable		
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 allow 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
Trim 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.

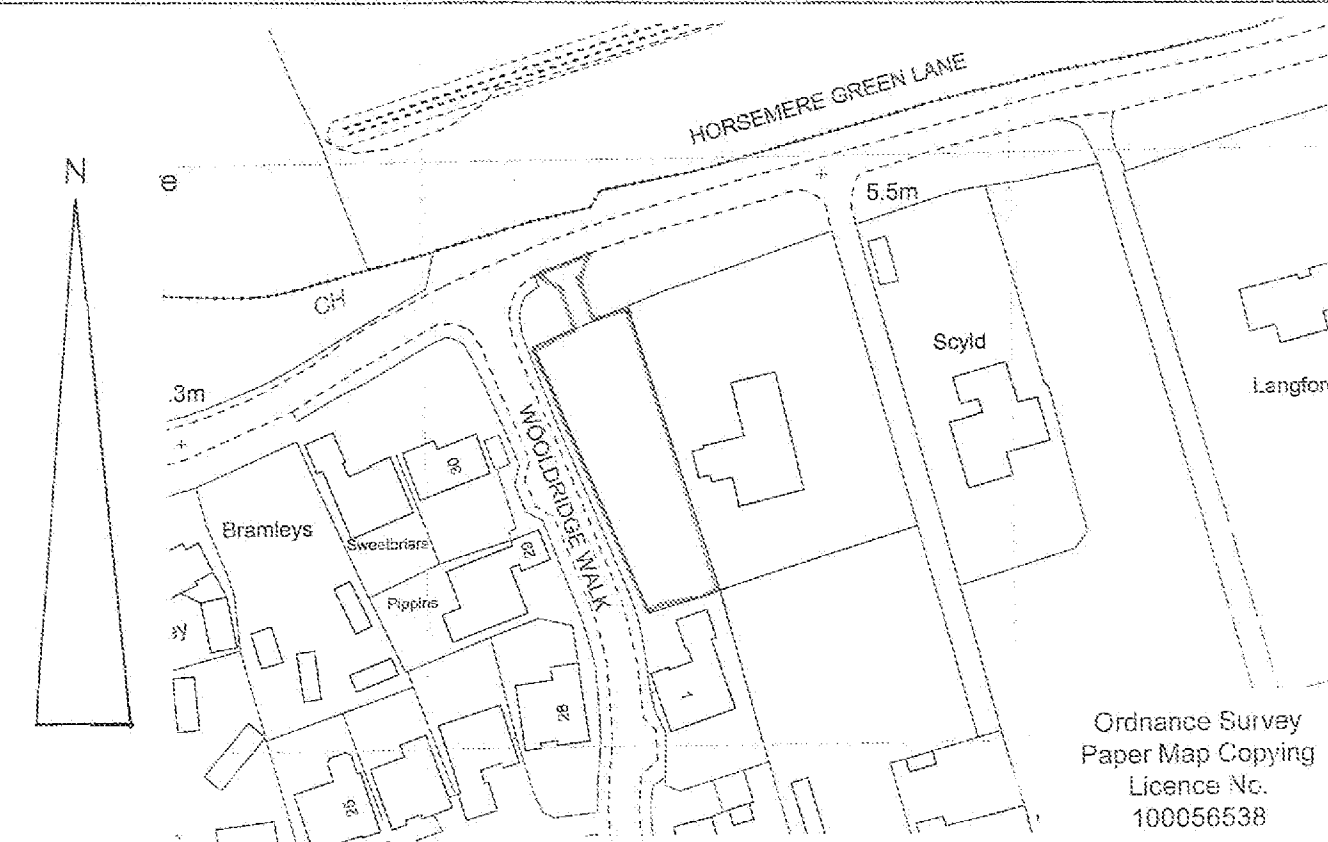
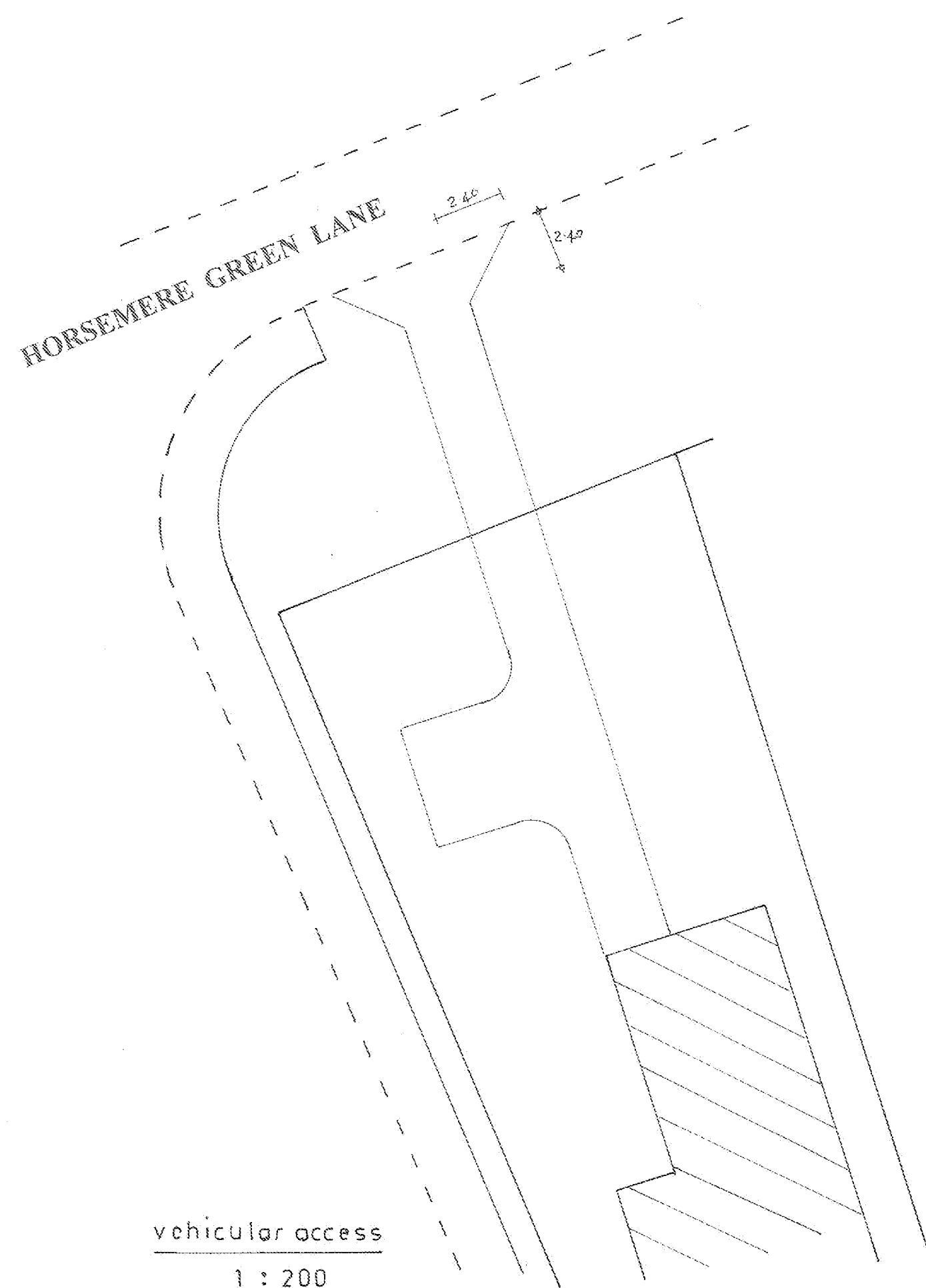
Below Ground Drainage Pipes	
Regular Maintenance	Frequency
Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Remove sediment 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 Tony Ricards to produce a Drainage statement under Nation Planning Policy Framework (NPPF) to support the Planning Application for the development of a new single residential dwelling.
- 6.1.2 The Surface Water will discharge to ground via infiltration at a recorded rate of **9.09x10⁻⁶m/s**.
- 6.1.3 The Foul water will discharge into the local foul water sewer.
- 6.1.4 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water and foul drainage can be achieved for the proposed development.

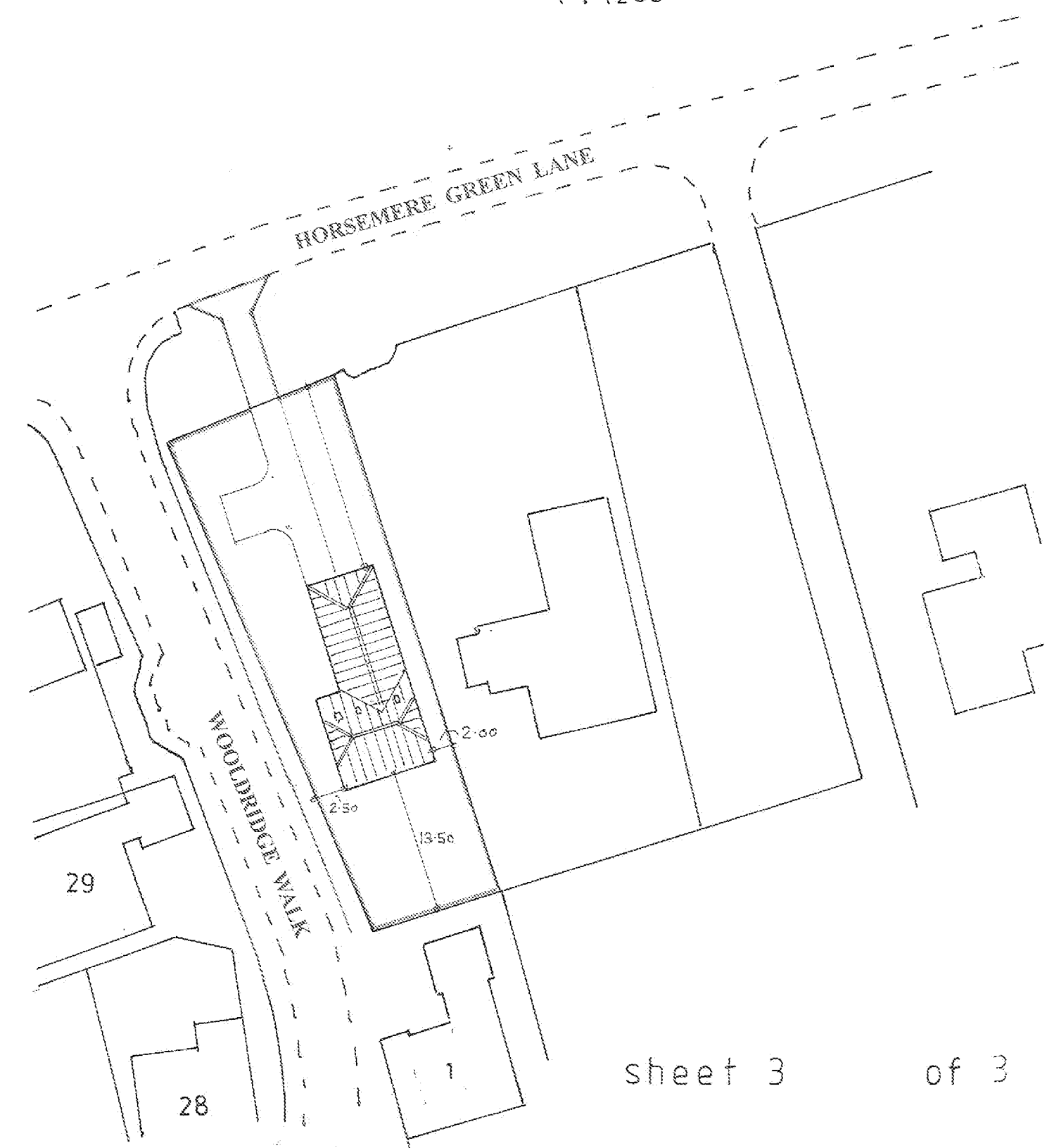
7 Appendices

7.1 Appendix A – Site Plan



location plan

1 : 1250



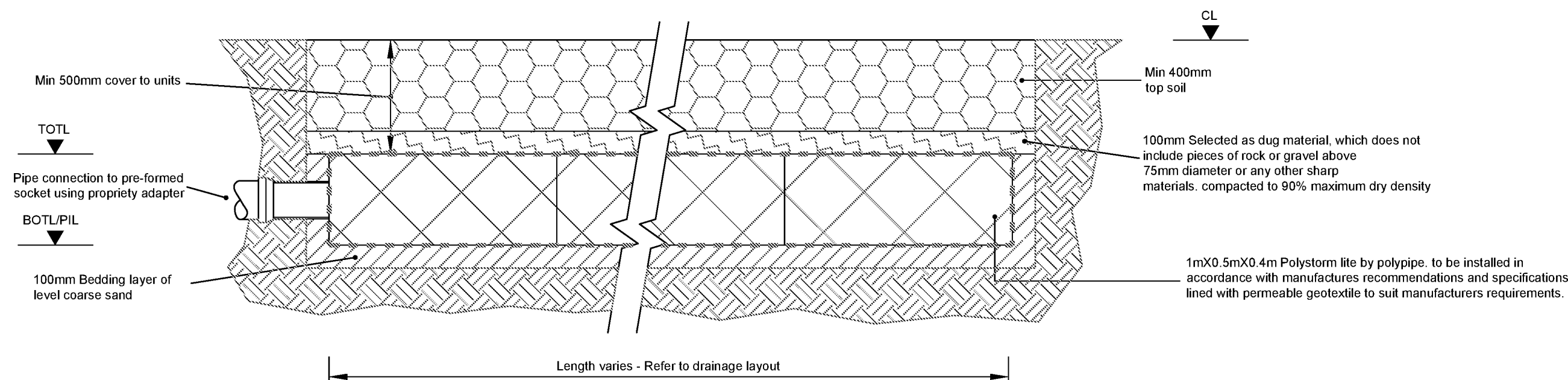
sheet 3 of 3

Proposed

PROPOSED DETACHED DWELLING AT ADJ. 'MISTLETOE FARM', HORSEMER GREEN LANE,
CLIPPING FOR MR. & MRS. A. RICARDS.

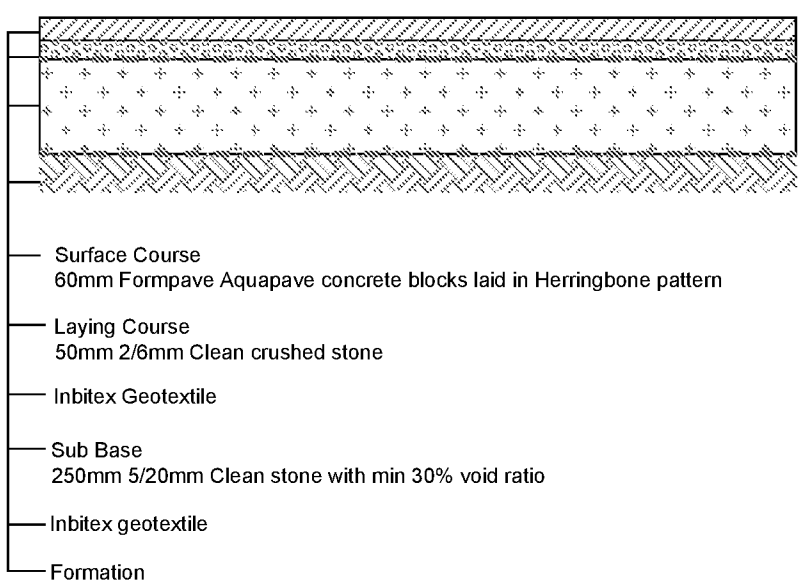
Bryan Butcher
Rainbow Cottage
Nyetimber Lane
Bognor Regis PO21 3JX
01243 266871
07973 233442
bryan.butcher@btinternet.com
www.bryanbutcher.com

7.2 **Appendix B – Drainage Layout**

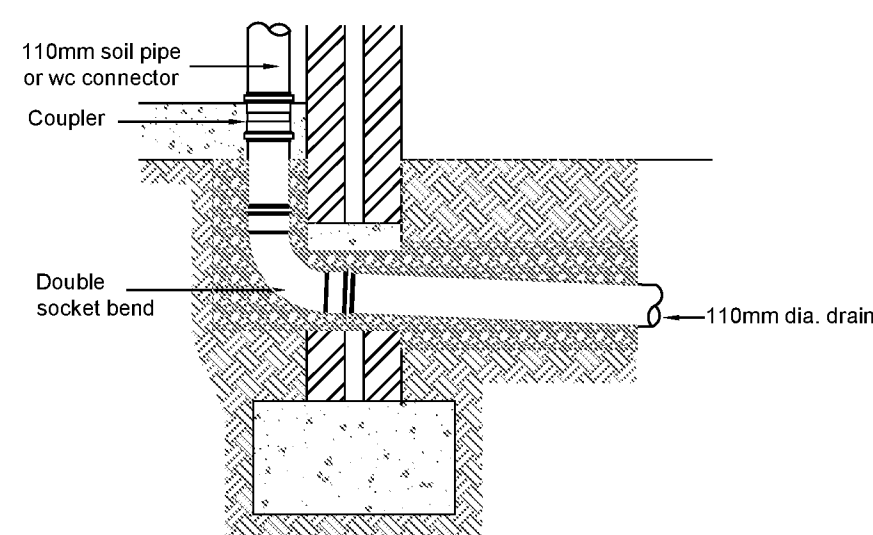


Trench soakaway using Polystorm Lite Geomodular units
Landscaped areas only
 0.4m deep

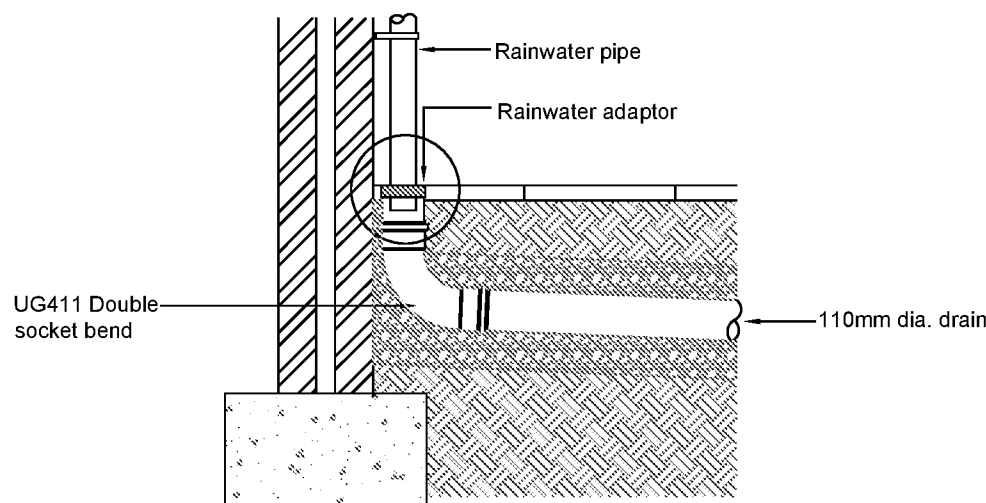
All storage tank drainage works shall be carried out in accordance with the specifications, method statements and recommendations of Polypipe



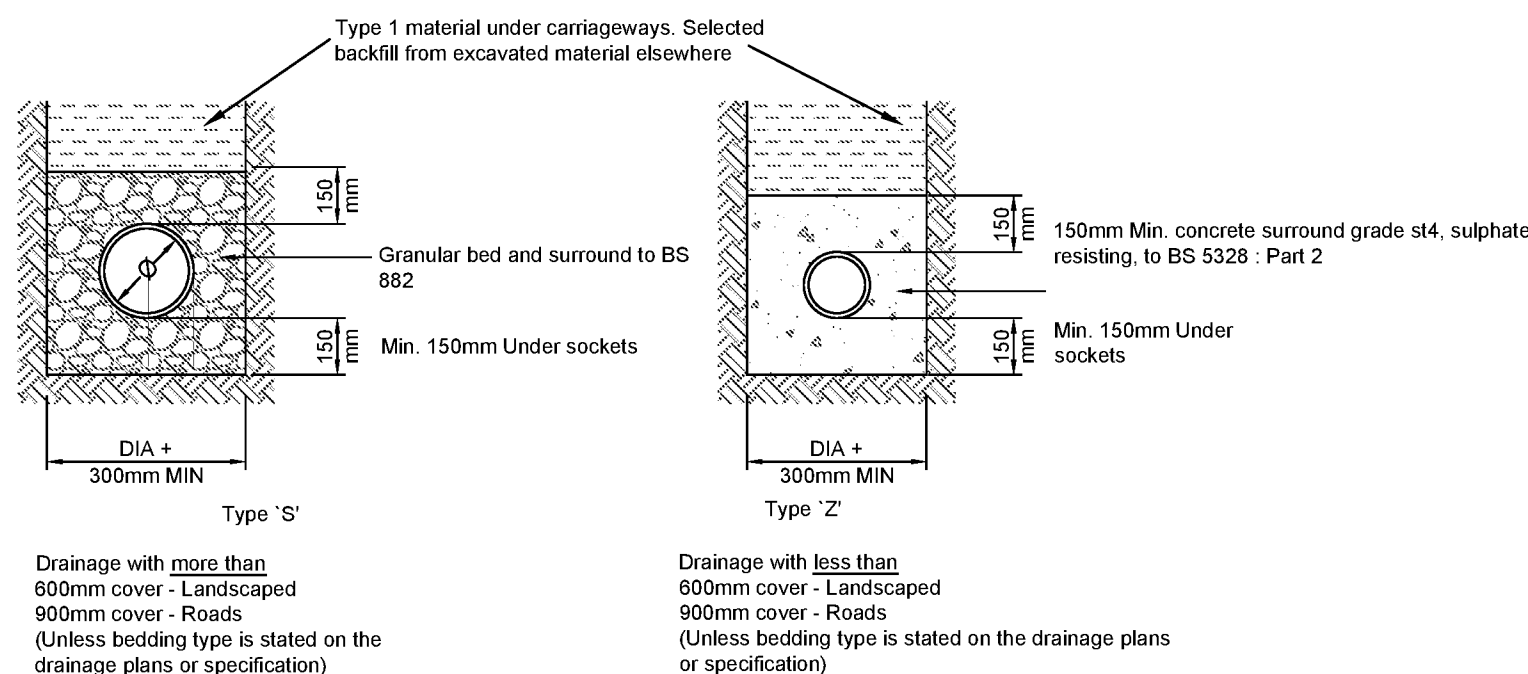
Formpave permeable block paving private driveway construction
 To be read in accordance with Formpave details and specification



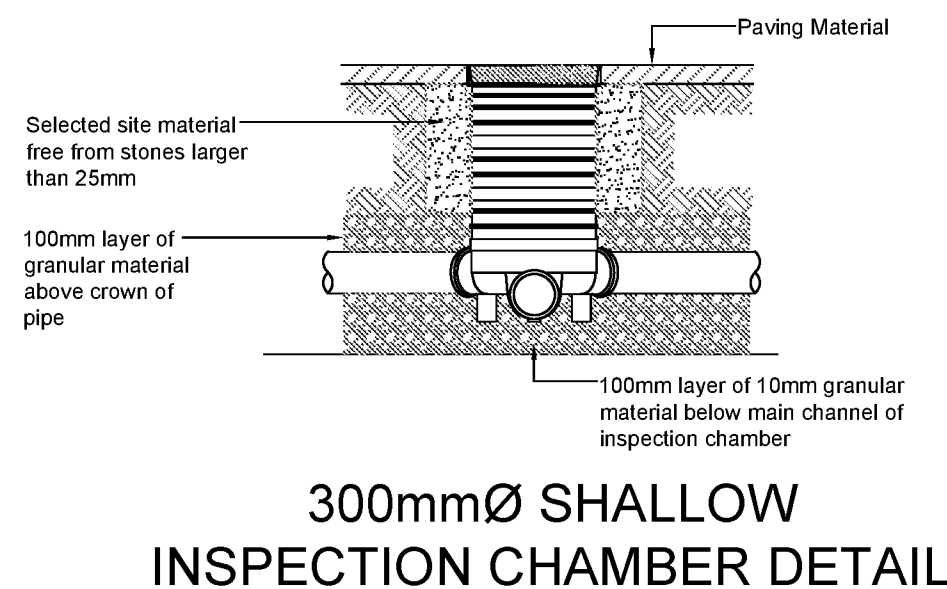
Soil pipe / wc connection



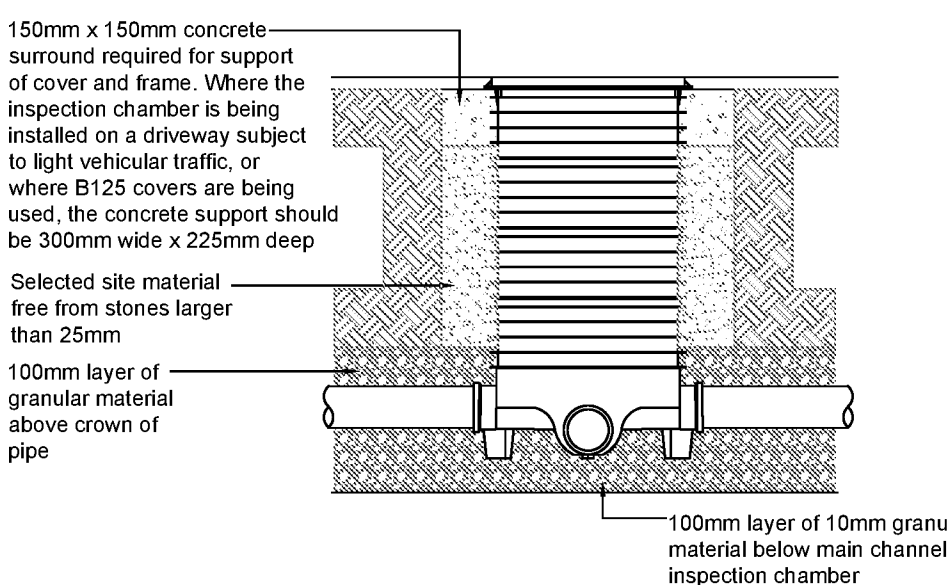
Rainwater pipe connection



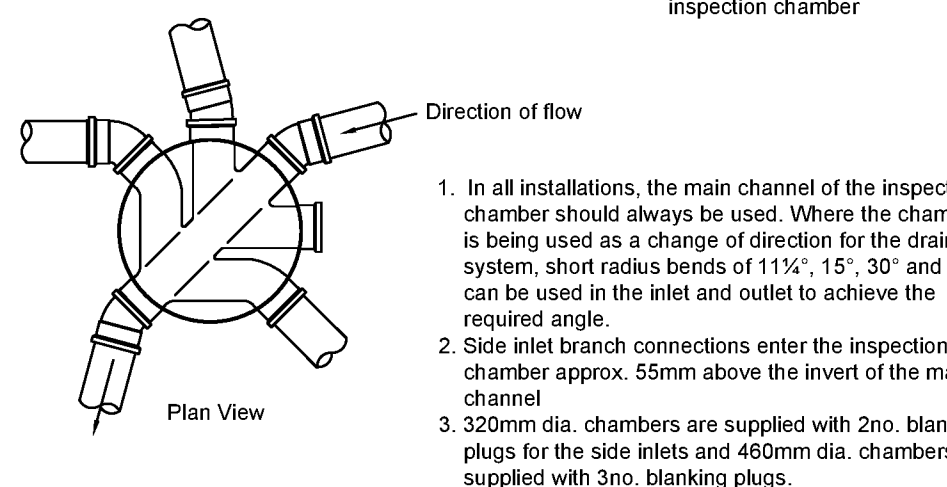
Pipe bedding details in private Areas



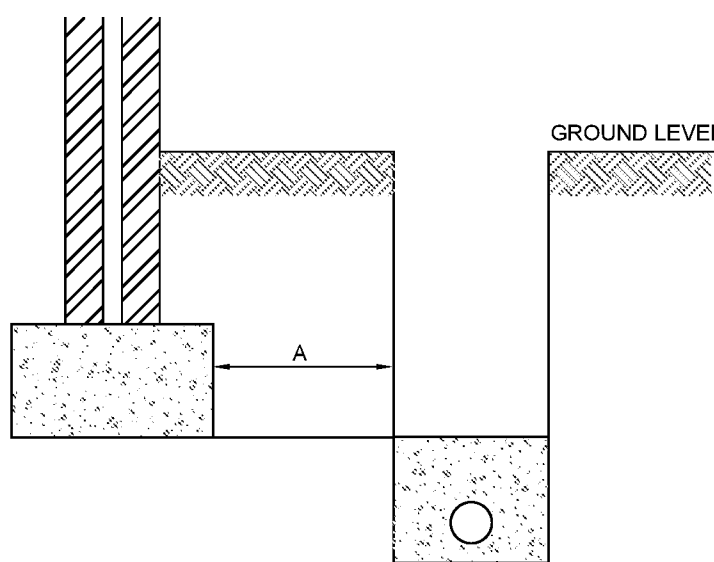
300mmØ SHALLOW INSPECTION CHAMBER DETAIL



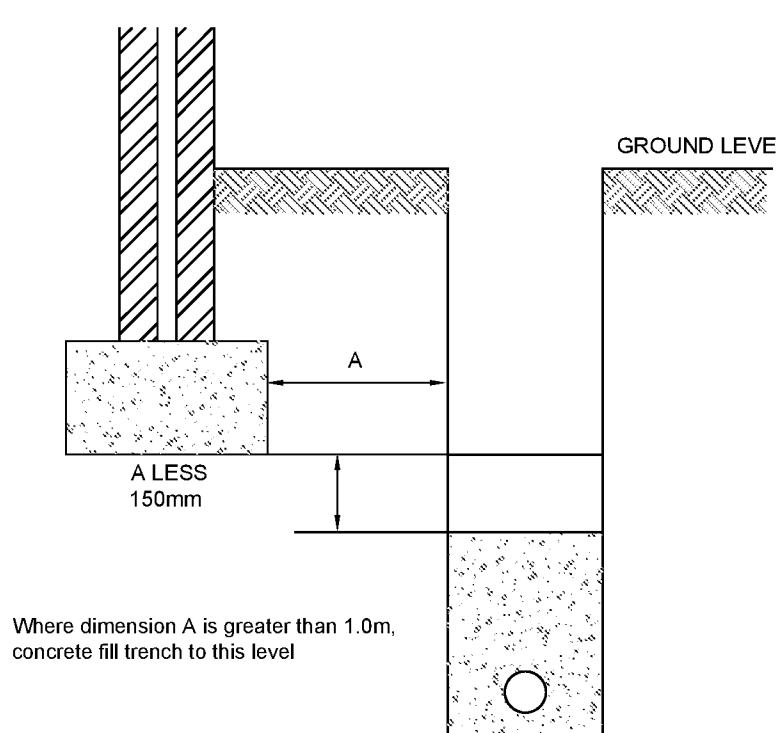
460mmØ INSPECTION CHAMBER DETAIL



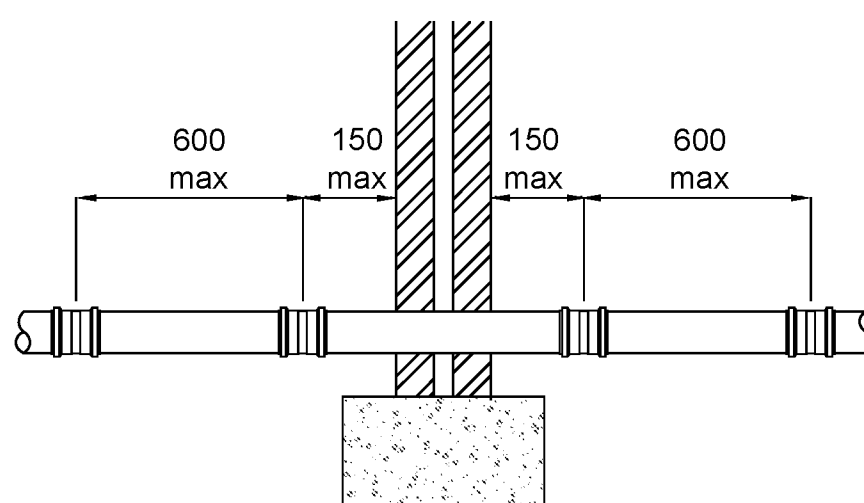
1. In all installations, the main channel of the inspection chamber should always be used. Where the chamber is being used as a change of direction for the drainage system, short radius bends of 115°, 15°, 30° and 45° can be used in the inlet and outlet to achieve the required angle.
2. Side inlet branch connections enter the inspection chamber approx. 55mm above the invert of the main channel.
3. 320mm dia. chambers are supplied with 2no. blanking plugs for the side inlets and 460mm dia. chambers are supplied with 3no. blanking plugs.



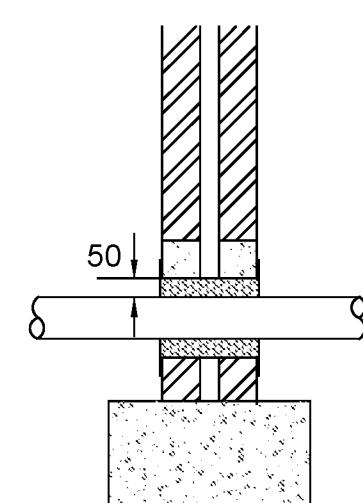
Pipes near buildings



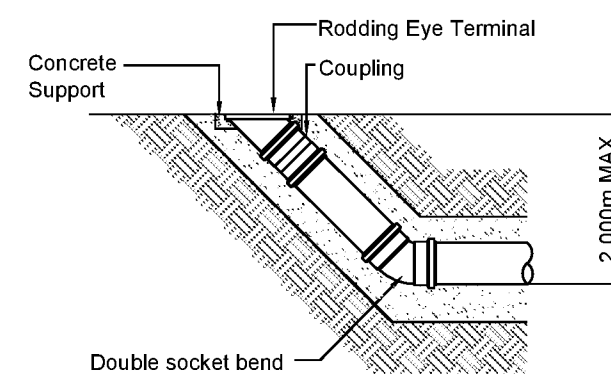
Pipes near buildings



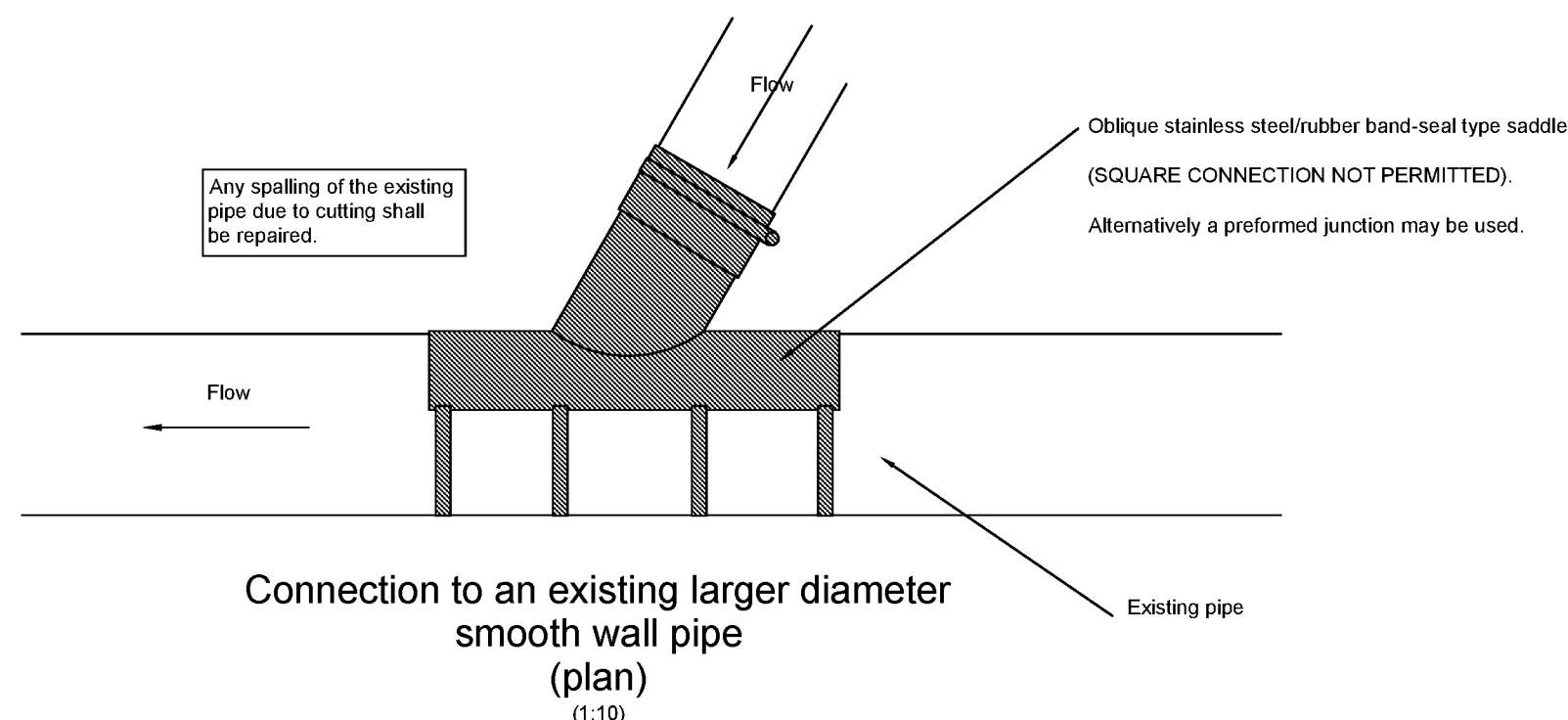
Pipes through wall detail



Pipes through wall with lintel detail



Rodding eye detail



Connection to an existing larger diameter smooth wall pipe (plan)
 (1:10)

PRELIMINARY

P-	26.03.21	PRELIMINARY ISSUE	LH	CS	CS
REV	DATE	DESCRIPTION	BY	CHK	APP
CLIENT	TONY RICARDS				
ARCHITECT	BRYAN BUTCHER				
JOB TITLE	MISTLETOE FARM CLIMPING				
DRAWING TITLE	DRAINAGE DETAILS				
DRAWN	LH	ENGINEER	C SLADE	CHECKED	CS
DATE	MARCH 2021	SCALE @ A1	1:20	APPROVED	CS
JOB No.	C1627	STATUS	P	DRAWING No.	300
REV.	P-				

7.3 **Appendix C – Surface Water Calculations**

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	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)	0.600
Ratio-R	0.400	Preferred Cover Depth (m)	0.350
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)
S1	0.005	5.00	5.750	300	-49.842	77.741	0.450
S2			5.750	450	-45.701	67.104	0.642
S3	0.005	5.00	5.750	450	-40.288	69.251	0.875
S4	0.005	5.00	5.750	300	-41.694	89.361	0.450
S5			5.750	450	-34.666	71.481	0.773
SAT			5.600	100	-38.524	64.720	0.807

Links

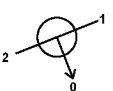
Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	11.415	0.600	5.300	5.108	0.192	59.5	100	5.19	50.0
1.001	S2	S3	5.823	0.600	5.108	4.875	0.233	25.0	100	5.25	50.0
1.002	S3	SAT	4.862	0.600	4.875	4.793	0.082	59.3	100	5.50	50.0
2.000	S4	S5	19.212	0.600	5.300	4.977	0.323	59.5	100	5.32	50.0
2.001	S5	S3	6.048	0.600	4.977	4.875	0.102	59.3	100	5.42	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	1.001	7.9	0.7	0.350	0.542	0.005	0.0	20	0.610
1.001	1.550	12.2	0.7	0.542	0.775	0.005	0.0	16	0.827
1.002	1.002	7.9	2.0	0.775	0.707	0.015	0.0	35	0.841
2.000	1.000	7.9	0.7	0.350	0.673	0.005	0.0	20	0.610
2.001	1.002	7.9	0.7	0.673	0.775	0.005	0.0	20	0.611

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S1	-49.842	77.741	5.750	0.450	300		0	1.000	5.300	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S2	-45.701	67.104	5.750	0.642	450		1 1.000	5.108	100
							0 1.001	5.108	100
S3	-40.288	69.251	5.750	0.875	450		1 2.001	4.875	100
							2 1.001	4.875	100
							0 1.002	4.875	100
S4	-41.694	89.361	5.750	0.450	300		0 2.000	5.300	100
S5	-34.666	71.481	5.750	0.773	450		1 2.000	4.977	100
							0 2.001	4.977	100
SAT	-38.524	64.720	5.600	0.807	100		1 1.002	4.793	100

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

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 %)
30	0	0	0
100	40	0	0

Node SAT Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.700	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.03272	Time to half empty (mins)	3801	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	8.000	Number Required	1
Porosity	0.95	Pit Length (m)	3.000		

Results for 30 year Critical Storm Duration... Lowest mass balance: 86.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	5.333	0.033	1.7	0.0098	0.0000	OK
15 minute winter	S2	10	5.133	0.025	1.7	0.0040	0.0000	OK
1440 minute winter	S3	930	4.962	0.087	0.3	0.0239	0.0000	OK
15 minute winter	S4	10	5.332	0.032	1.7	0.0094	0.0000	OK
15 minute winter	S5	11	5.008	0.031	1.7	0.0050	0.0000	OK
1440 minute winter	SAT	930	4.962	0.169	0.3	5.9835	0.0000	OK

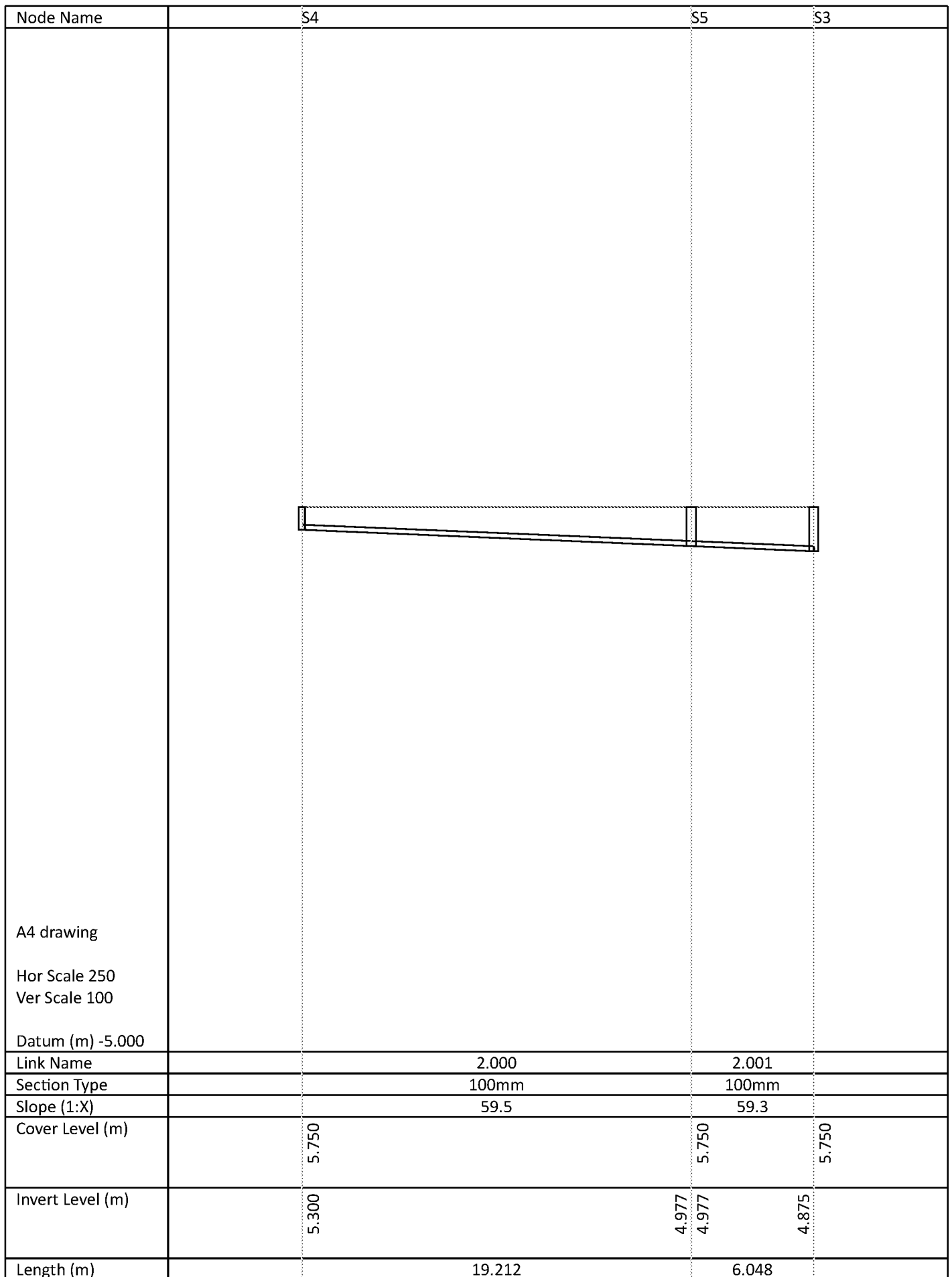
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	S1	1.000	S2	1.7	0.882	0.213	0.0218
15 minute winter	S2	1.001	S3	1.7	0.498	0.136	0.0197
1440 minute winter	S3	1.002	SAT	0.3	0.476	0.038	0.0367
15 minute winter	S4	2.000	S5	1.7	0.794	0.213	0.0404
15 minute winter	S5	2.001	S3	1.7	0.454	0.211	0.0222
1440 minute winter	SAT	Infiltration		0.0			

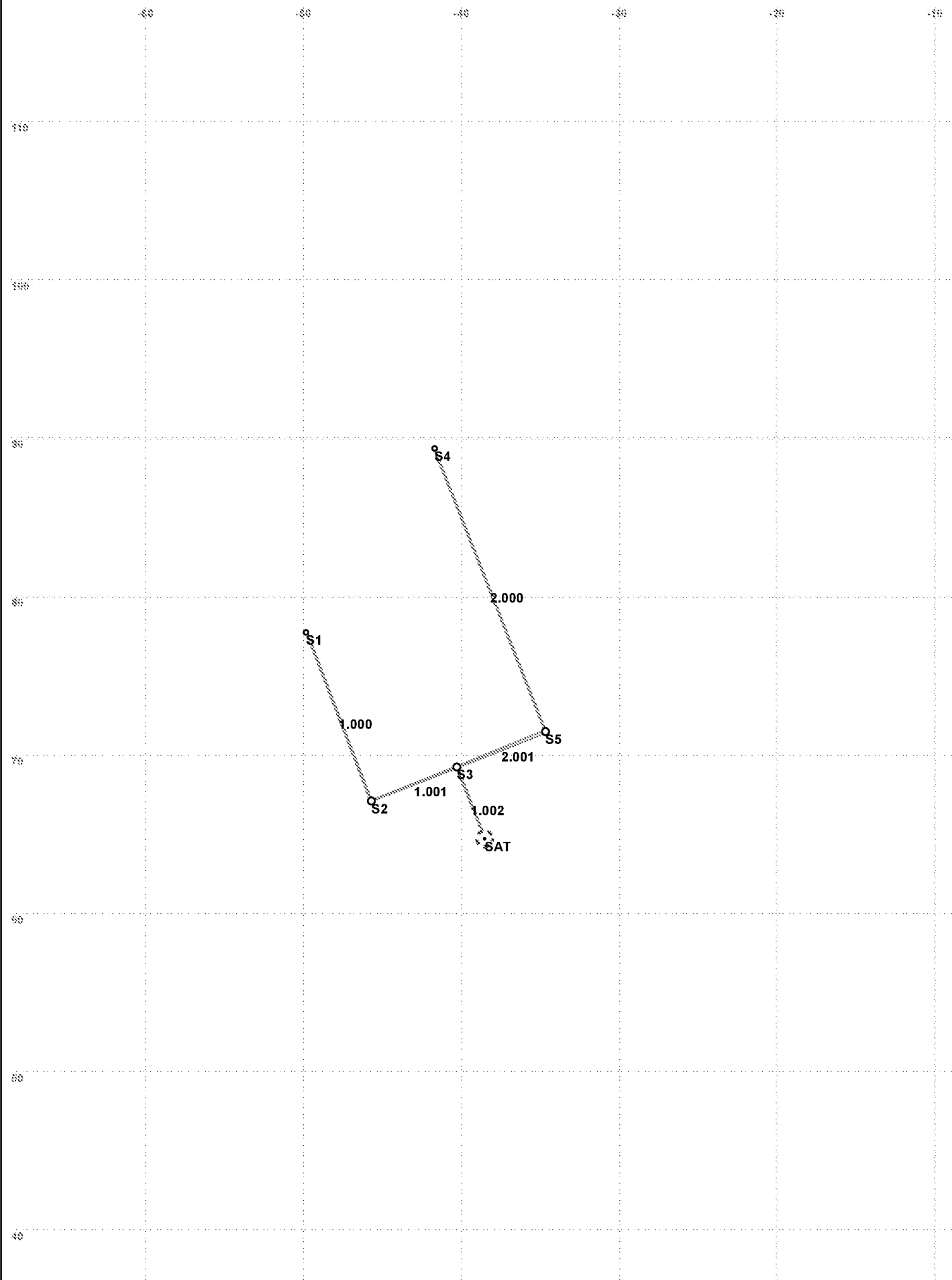
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 86.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S1	555	5.531	0.231	0.3	0.0677	0.0000	FLOOD RISK
600 minute winter	S2	555	5.531	0.423	0.3	0.0673	0.0000	FLOOD RISK
600 minute winter	S3	555	5.531	0.656	0.9	0.1791	0.0000	FLOOD RISK
600 minute winter	S4	555	5.531	0.231	0.3	0.0677	0.0000	FLOOD RISK
600 minute winter	S5	555	5.531	0.554	0.3	0.0881	0.0000	FLOOD RISK
600 minute winter	SAT	555	5.531	0.738	0.9	9.1373	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute winter	S1	1.000	S2	0.3	0.536	0.038	0.0893
600 minute winter	S2	1.001	S3	0.3	0.306	0.025	0.0456
600 minute winter	S3	1.002	SAT	0.9	0.476	0.108	0.0380
600 minute winter	S4	2.000	S5	0.3	0.481	0.038	0.1503
600 minute winter	S5	2.001	S3	0.3	0.276	0.038	0.0473
600 minute winter	SAT	Infiltration		0.0			

Node Name	S1	S2	S3	SAT
A4 drawing Hor Scale 250 Ver Scale 100 Datum (m) -5.000				
	Link Name	1.000	1.001	1.002
	Section Type	100mm	100mm	100mm
	Slope (1:X)	59.5	25.0	59.3
	Cover Level (m)	5.750	5.750	5.750
	Invert Level (m)	5.300	5.108	4.875
	Length (m)	11.415	5.823	4.862





7.4 **Appendix D – Borehole Logs**

Surface level +5.7 m
Water struck at +3.7 m
August 1981

Overburden 1.7 m
Mineral 3.2 m
Waste 1.2 m
Bedrock 1.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Bricksarth	Silt, clayey, yellowish brown, with peat particles and a few small flint pebbles	1.0	1.2
Raised Beach Deposits (younger)	a 'Very clayey' sand with a few flint pebbles Sand: fine with medium and trace of coarse Finess: silt, brown	0.3	2.0
	b 'Very clayey' sandy gravel Gravel: coarse and fine, angular to subrounded; flint (some white and porous) with some chalk and traces of other rock fragments Sand: fine and medium with some coarse Finess: silt, brown to 4.0 m, chalky below	2.9	4.9
	Silt, pale olive, sandy, very chalky, with pebbles of chalk and some larger nodular flints	0.9	5.8
	c 'Very clayey' gravel Gravel: coarse (angular flint) with fine (chalk with some flint) Sand: fine and medium with coarse Finess: silt, chalky	0.3	6.1
Upper Chalk	Chalk, soft, rubbly, weathered at top	1.7+	7.8

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages								
	Fines	Sand	Gravel		Fines			Gravel					
					-4	+4-12	+12-20	+20-30	+30-40	+40-60	+60-75	+75 mm	
a	31	66	3	1.7-2.0	31	84	11	1	1	2	0		
b	23	55	20	2.0-3.0	21	43	21	7	3	7	0		
				3.0-4.0	17	30	28	9	0	3	4		
				4.0-4.9	20	32	10	6	8	20	4		
				Mean	25	28	30	7	7	18	3		
c	21	29	50	5.8-6.1	21	11	10	8	14	23	8		
a+b	36	57	17	1.7-4.9	26	31	19	7	4	9	2		
a+b+c	25	54	21	Mean	35	28	18	7	7	11	3		

7.5 **Appendix E – Magic Map from Environment Agency**



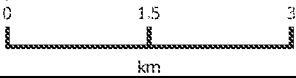
Legend

Aquifer Designation Map (Bedrock)
(England)

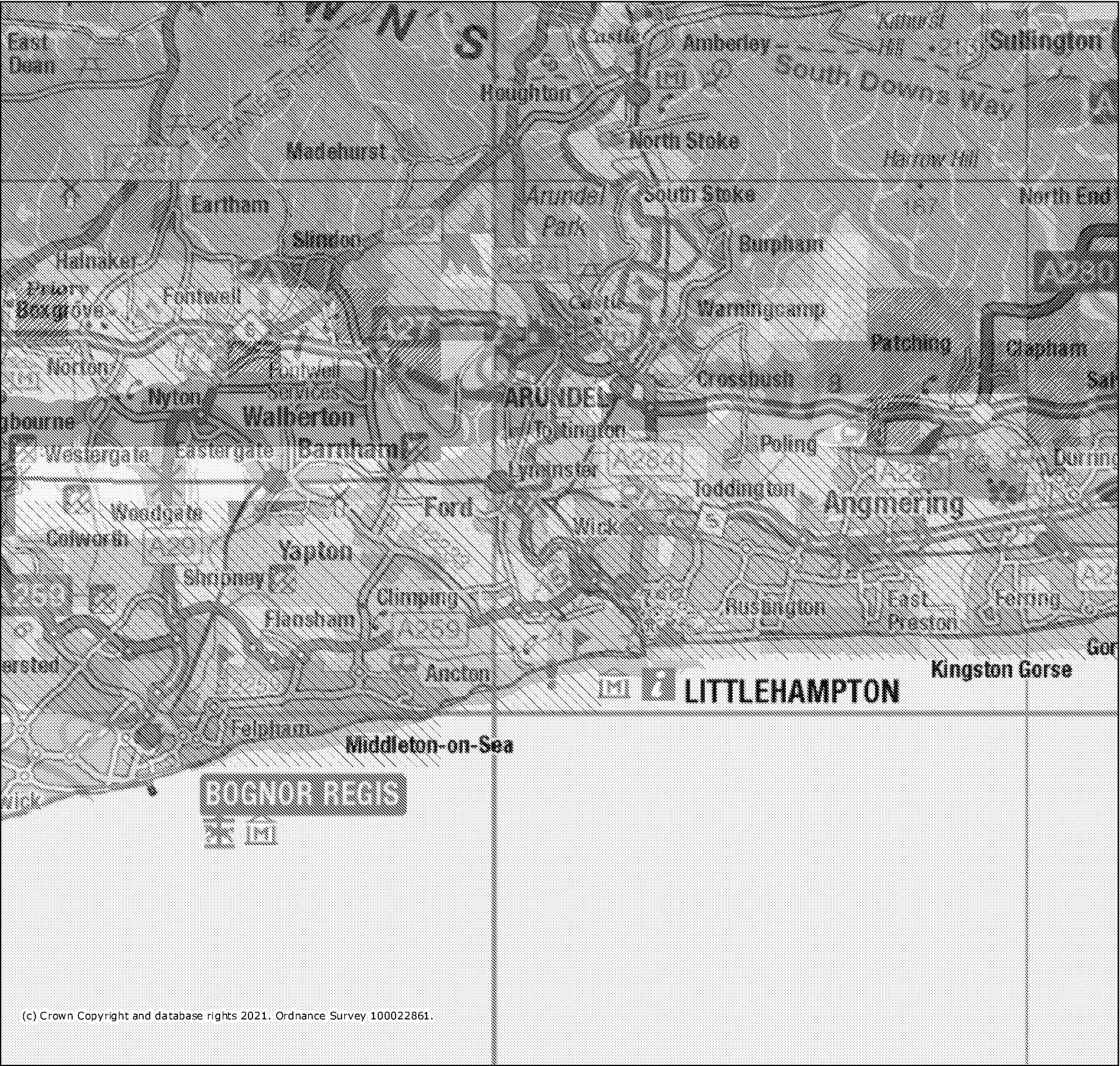
- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unproductive

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Projection = OSGB36
xmin = 487700
ymin = 89360
xmax = 514700
ymax = 117400



Map produced by MAGIC on 19 March, 2021.
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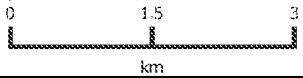


Legend

Groundwater Vulnerability Map (England)

- Local Information
- Soluble Rock Risk
- High
- Medium - High
- Medium
- Medium - Low
- Low
- Unproductive

Projection = OSGB36
xmin = 487700
ymin = 89360
xmax = 514700
ymax = 117400



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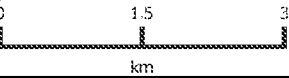


Legend

Aquifer Designation Map (Superficial Drift) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unknown (lakes+landslip)
- Unproductive

Projection = OSGB36
xmin = 487700
ymin = 89360
xmax = 514700
ymax = 117400



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7.6 **Appendix F – Soakaway Test report**

Ref: CS/C1627

Tony Ricards

29th March 2021**Re: Mistletoe Farm, Climping – Soakaway Testing – Infiltration Test Result Summary**

Dear Tony

The following investigation was carried out at the above location as per our fee proposal.

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 single residential dwelling.

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

The testing commenced at 09:30 with three tests being undertaken in accordance with BRE 365. Weather was noted to be intermittent rain.

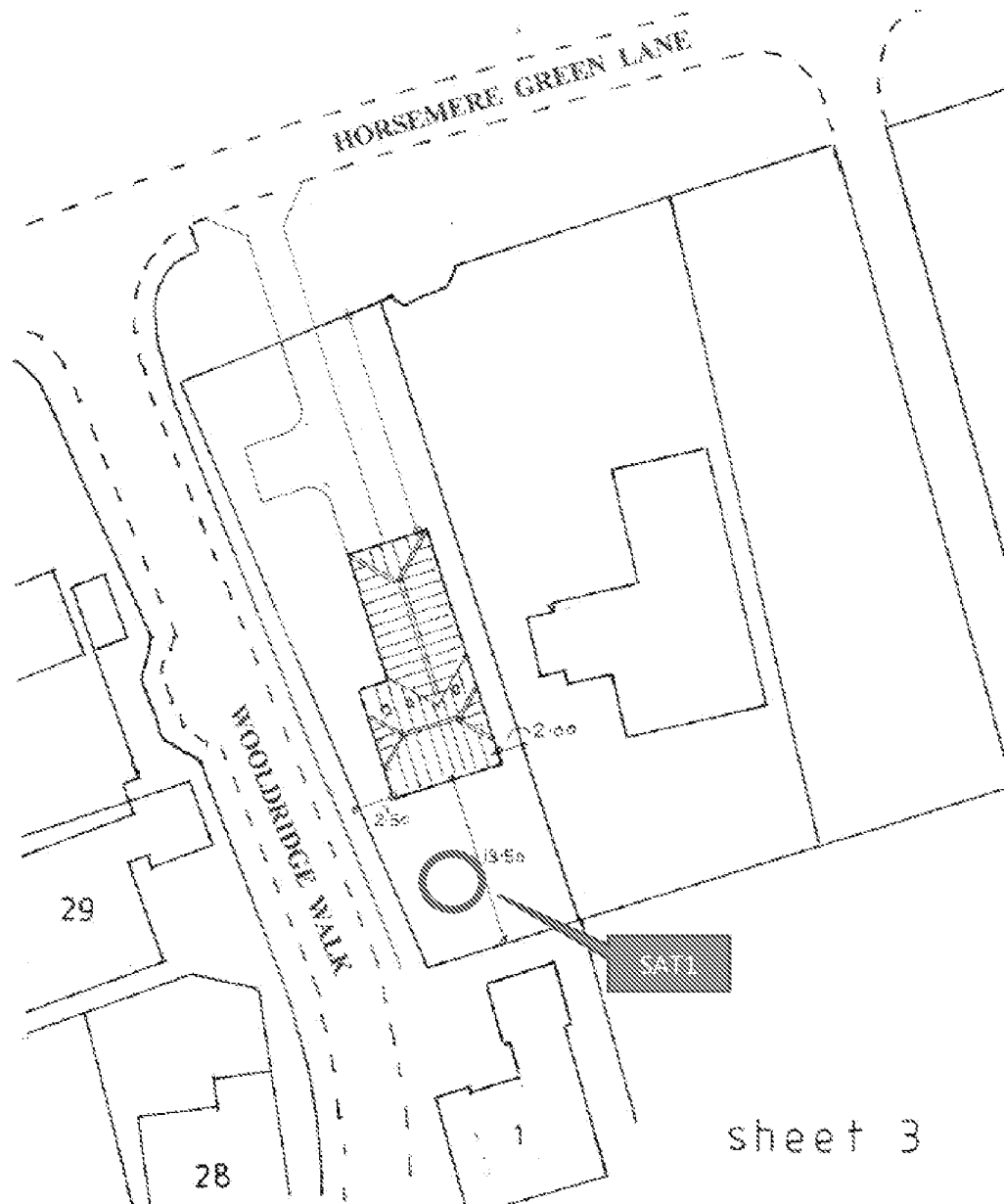
2. BRE 365 Soakaway Test Findings

Testing of the sub soils which was noted as sandy clay produced a BRE 365 design infiltration rate of **9.09x10⁻⁶m/s** at a depth of 0.9mbgl. This rate was the slowest taken from all three tests. This is considered a moderate rate and will likely be suitable for all types of infiltration devices.

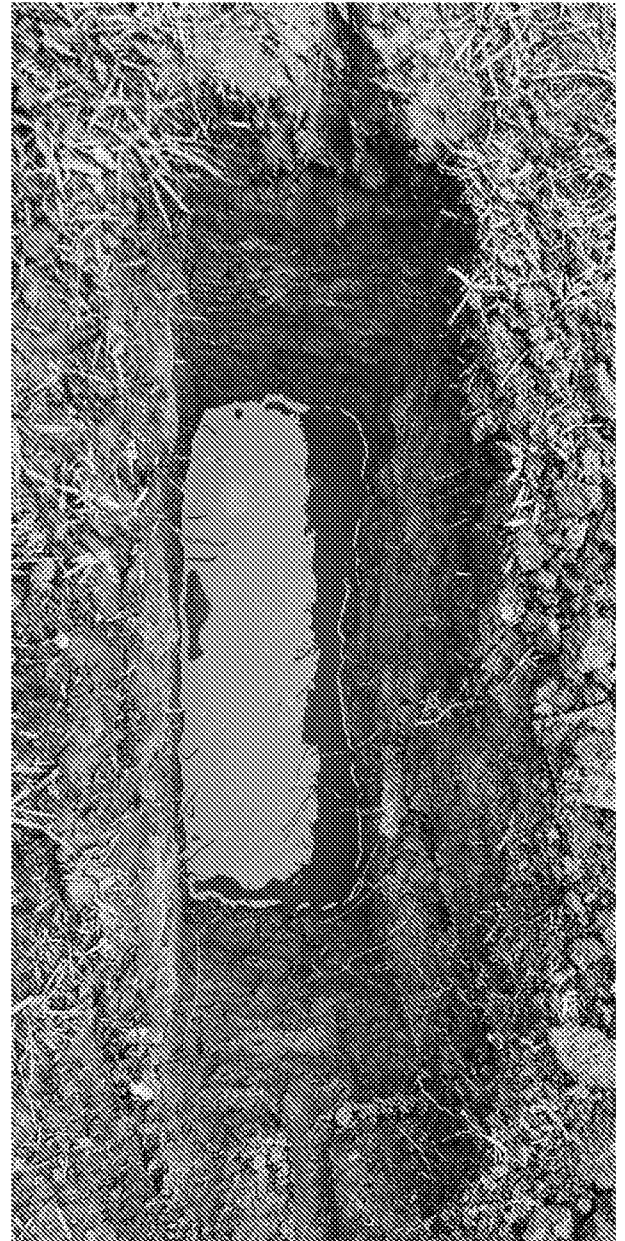
3. BRE 365 Soakaway Test Results

Test Pit No	Infiltration Rate (1-3 Tests)			Depth of Test	Soil Type
SAT1	1.33x10 ⁻⁵ m/s	1.12x10 ⁻⁵ m/s	9.09x10⁻⁶m/s	0.9m	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



Job: Mistletoe Farm, Climping - 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} =

7700

 seconds

V_{p75-25} =

0.135

 m/cubed

F =

1.33E-05



Job: Mistletoe Farm, Climping - Test 2

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} =

9150

 seconds

V_{p75-25} =

0.135

 m/cubed

F =

1.12E-05



Job: Mistletoe Farm, Climping - Test 3

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} =

11250

 seconds

V_{p75-25} =

0.135

 m/cubed

F =

9.09E-06