



Canham
Consulting

Drainage Strategy

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Site: Land Adjacent to Merchiston, Blakes Lane, Wargrave,
RG10 9TA
Client: Nick & Emma Herbert
Prepared By: Olly Gardiner
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P02	Revised in line with comments	OG	MH	MH	20.07.2026

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1 INTRODUCTION

Canham Consulting Ltd have been commissioned by Nick & Emma Herbert to produce a Drainage Strategy in support of a planning application for the construction of a single residential dwelling at Blakes Lane, Wargrave, RG10 9TA. A plan of the development can be found in Appendix B.

This report follows the guidance set out in National Planning Policy Framework (NPPF), the National Planning Policy Guidance (NPPG), alongside other relevant Local Authority policies and guidance notes from authorities such as the Environment Agency (EA), Anglian Water, CIRIA, The SuDS Manual (C753) and Norfolk County Council's Guidance on SuDS (Sustainable Drainage Systems) Design.

2 DEVELOPMENT DESCRIPTION & LOCATION

2.1 Type of Development with Location

The proposed development consists of the construction of a single dwelling located at Blakes Lane Wargrave, RG10 9TA. The site location is indicated below on Figure 1 and is centred on Grid Reference SU 80470 78617.



Figure 1: Site Location Plan

The existing site is surrounded by residential dwellings, green areas, woodland and agricultural farmland. As it stands, the site is currently vacant and unused.

3 CLIMATE CHANGE

Climate change factors, as defined by NPPF Technical Guidance, should be applied to the peak rainfall intensity.

National Guidance on Flood Risk Assessments and climate change allowances, shown in Table 2 of the guidance

(<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>), shows that in small and urban catchments, a central level of 20% and upper end of 40% peak rainfall intensity allowance should be used to assess the range of impacts.

For the purposes of this report, it is proposed that a conservative approach is considered and that a climate change factor of +45% is utilised on all drainage calculations.

4 DETAILED DEVELOPMENT PROPOSAL

4.1 Introduction

The proposal is for the construction of a single dwelling at Blakes Lane, Wargrave, R10 9TA. The proposed development area of the site falls from the northwest to southeast, and a drainage ditch runs adjacent to the southern boundary. Drainage on site will be designed to convey surface water away from the proposed dwellings and not impose on adjacent sites.

4.2 Proposed Surface Water Drainage Strategy

4.2.1 SuDS Hierarchy

When deciding what SuDS options are appropriate for a development, it is important to understand how the site will drain. The LLFA has the following surface water drainage hierarchy that developers must follow:

- Rainwater harvesting (including a combination of green and blue roofs);
- Infiltration techniques and green roofs;
- Rainwater attenuation in open water features for gradual release;
- Rainwater discharge direct to a watercourse (unless not appropriate);
- Rainwater attenuation above ground (including blue roofs);
- Rainwater attenuation below ground;
- Rainwater discharge to a surface water sewer or drain; and
- Rainwater discharge to a combined sewer.

Reviewing the above list from the top down, there is scope in exploring the potential for each of the potential discharge solutions, but the prime focus as a drainage strategy, with the priority being to enable self-sufficient function, would be to seek a discharge directly to a watercourse.

As part of the solution, we will need to protect any groundwater source protection zones which may exist at or near to the site. Surface water will need to be treated to a suitable level before leaving the site to ensure that there are no adverse environmental impacts resulting from the proposed development and the discharge of any surface water.

There is no need for rainwater on site, and a green or blue roof would not fit in with the architecture in the local area. An excavation was made on site and filled with water, which didn't drain away. BGS Borehole maps determined that the ground consists of clayey silty soils with low permeability. This deemed an infiltration discharge solution unfeasible. Rainwater attenuation in open water features requires a large footprint to store water; this is not feasible given the space constraints on site and land use. Given that there is a ditch running along the southern boundary of the property, it has been deemed that discharging directly to a watercourse is the most appropriate discharge solution, in line with the SuDS hierarchy.

Table 26.1 of the SuDS Manual (C753) indicates that a simple index approach is suitable for assessing the risk to groundwater.

4.2.2 SuDS Selection

The inability to infiltrate limits the number and range of SuDS which we can incorporate into the design. The suitability of the SuDS detailed within Table 7.1 of the SuDS Manual has been considered for the proposed development. Table 2 below summarises this information.

Component Type	Collection Mechanism	Design Criteria						Suitable	Reason
		Water Quantity			Water Quality	Amenity	Biodiversity		
		Peak Run off Rate	Runoff Volume						
			Small	Large Events					
Rainwater Harvesting Systems	P		●	●		●		N	Prohibitively expensive and lack of space.
Green Roofs	S	○	●		●	●	●	N	
Soakaway	P	●	●	●	●	●	●	N	Poor infiltration.
Catchpits	P				●			Y	Will be included.
Proprietary Treatment Systems	P				●			N	Unnecessary due to treatment in the proposed network.
Filter Strips	L		●		●	○	○	N	Lack of available space.
SuDS Planter	L	●	●	●	●	●	●	Y	No need due to other treatment methods.
Filter Drains	L	●			●	○	○	Y	Will be incorporated against external paved areas.
Swales	L	●	●	●	●	●	●	N	Lack of Space.
Bio-retention Systems	P	●	●	●	●	●	●	N	Lack of Space.
Trees	P	●	●		●	●	●	N	Lack of Space.
Pervious Surfacing	S	●	●	●	●	○	○	Y	Will be used to support attenuation and treatment.
Attenuation Storage Tanks	P	●						Y	An attenuation tank will be used to store water.
Detention Basins	P	●	●		●	●	●	N	Lack of space.
Ponds and Wetlands	P	●			●	●	●	N	

Key: P = Point, L=Lateral, S=Surface, ●=Likely Valuable Contribution, ○=Some potential contribution

Table 1: SuDS Component Assessment

Table 1 above demonstrates the available SuDS for the site. Surface water from buildings will be collected via rainwater downpipes and directed to either the filter drains or the traditional piped network. Flows will then be conveyed to catch pits, which will remove silt and larger particles that enter the network before water is conveyed to a flow control chamber, which will restrict flows to a maximum discharge rate of 5.2l/s using the minimal permissible orifice plate, with a 50mm

diameter, to reduce the rate of discharge to the ditch whilst maintaining functionality. Before discharge, surface water will be pumped south as there is not enough fall to reach the ditch at a suitable invert level. A gravity solution was originally considered; however, given the site levels and the constraint presented by the root protection areas, it appears a gravity solution is not reasonably achievable. The proposed surface water drainage layout, calculations and details can be seen in Appendix C & D.

Surface water landing on the permeable paved driveway will be collected in the sub-base, which will provide attenuation. The permeable sub-base is proposed to be underlain by a collector drain, which will direct flows downstream to the wider network. The hardstanding paved areas at the back of the dwelling will fall towards a filter drain, which helps to provide treatment before discharge.

The SuDS selected have been designed in line with SuDS Manual guidance and account for a 1 in 100-year storm with a 45% allowance for climate change. The results of the calculations are as outlined in Appendix C.

4.2.3 Design Assumptions

The drainage design is included in Appendix C. As noted above, given the site levels and constraints for the root protection areas, a gravity-based solution is unfeasible. Therefore, the preferred method for discharge of the surface water is via pumping to the ditch running adjacent to the back garden of the property. The permeable surfaced areas will store water in the subbase before entering a collector drain and discharging into the surface water network. On that basis, to enable a design solution, we have established the following design assumptions:

- Traditional downpipes via filter drains and permeable paving to the below-ground surface water drainage network.
- Hardstanding areas in the driveway to be constructed in permeable surfacing.
- Hardstanding areas at the rear of the property will be directed to a filter drain.
- Silt traps to be provided as part of the drainage system to ensure effective removal of silt and fine particles from the flows to prevent potential build-up within downstream elements.
- Runoff coefficient (CV) of 1 is used within calculations.
- Factor of safety in accordance with Table 25.2 of SuDS Manual 2015 taken as 2 based on site area and consequences of failure (minor damage to external areas).
- Demonstration of no flooding in a 1 in 100-year event plus 45% climate change, with half drain times well below 24 hours.
- All new drainage installations have been designed in accordance with the current Building Regulations – Part H.

4.2.4 SuDS Design

Table 26.1 of the SuDS Manual (C753) indicates that a simple index approach is suitable for assessing the risk to groundwater. Table 26.2 indicates the pollution indices associated with different land uses. Table 2 below summarises the pollution indices that are relevant for the proposed development.

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydro-carbons
Private Driveways	Low	0.5	0.4	0.4
Residential Roofs	Very Low	0.2	0.2	0.05

Table 2: Pollution Hazard Indices

Table 4 below compares the level of treatment offered by the proposed SuDS elements associated with the proposed surface water strategy (outlined above) against the pollution indices shown above in Table 3. Table 4 indicates the appropriate treatment as sufficient for those pollution hazard indices outlined in Table 3.

	Total Suspended Solids	Metals	Hydro-carbons
Residential Roofs	0.2	0.2	0.05
Filter Drain	0.4	0.4	0.4
Suitable Level of Treatment?	Yes	Yes	Yes
Private Driveways	0.5	0.4	0.4
Permeable Pavement	0.7	0.6	0.7
Suitable Level of Treatment?	Yes	Yes	Yes

Table 3: Indices Suitability

The information presented above shows that the proposed SuDS will treat the surface water from each area beyond requirements, prior to discharge. The details for the drainage infrastructure are included in the drawings, which can be found in Appendix D. The details are relevant to the drainage strategy and calculations provided.

4.2.5 Four Pillars

We can demonstrate how we have addressed the four pillars of SuDS design across our drainage strategy as outlined below in Table 6:

Pillar	Demonstration of Pillar
<i>Water Quantity – Control the quantity of runoff</i>	The quantity of water leaving the site will be considerably reduced as water will be discharged at a restricted rate, which provides betterment to the existing unrestricted discharge from the site.
<i>Water Quality – Manage the quality of the runoff</i>	The solutions have been demonstrated to address the pollution mitigation indices as outlined within the SuDS Manual, accounting for the various sources and methods deployed.
<i>Amenity – Create and sustain better places for people</i>	The proposals will reduce the impact of surface water runoff on adjacent sites.
<i>Biodiversity – Create and sustain better places for nature</i>	The proposed drainage on site will reduce the impact of water on the surrounding land. Therefore, improving the environment for plants and wildlife.

Table 4: Four Pillars of SuDS Design

4.3 Drainage Drawings

The proposed drainage design is outlined in drawing ref 260327-CCL-XX-XX-DR-C-4000, included in Appendix C. All new drainage installations have been designed in accordance with the current Building Regulations – Part H and in line with the Anglian Water requirements, as defined by the current details outlined in Design and Construction Guidance published by Water UK. The construction details can be seen in Appendix D, outlining the specification of the drainage components.

5 FLOOD RISK MANAGEMENT MEASURES

Due to the construction of additional impermeable areas, mitigation measures will be required relating to drainage, which tie in with current requirements for SuDS. It is therefore proposed that the following flood risk management measures will be undertaken as part of the proposed scheme.

5.1 Level Strategy

To mitigate the flood risk presented by overland flow, the external ground levels will fall away from building entrances. This will ensure that should the drainage system fail, the flood flow paths will flow away from the buildings.

5.2 SuDS Maintenance

SuDS schemes require more maintenance than traditional drainage piped systems, and as such, it is imperative that a suitable maintenance regime is established to ensure that the features are maintained and function as required.

A pumped method of discharge requires additional maintenance compared to a traditional gravity system. To maintain long-term reliability in the network, it is important that the pump manufacturer's maintenance schedule is followed to prolong the life of the pump and the network. It is proposed that a twin pump be specified to ensure that if one pump fails, the network will still function efficiently as intended without backing up the network.

A maintenance strategy has been completed for the site, outlining the maintenance requirements. This Maintenance Strategy can be found in Appendix E.

In terms of responsibility for the maintenance of the SuDS, it is proposed that the owner, is responsible for the maintenance of the SuDS or a specialist to maintain the SuDS provision in line with the Maintenance Strategy.

5.3 RESIDUAL RISKS

The residual risks to the development are considered as:

5.3.1 Lack of Maintenance

As mentioned above in Section 5.2.

The proposed levels regime means that should the SuDS fail through lack of maintenance, then the areas which will flood will be non-critical areas.

5.3.2 Construction Surface Water Run-Off

During construction, the SuDS will not be installed, and therefore the contractor will account for exceedance events and contaminated surface water runoff. This is necessary to suitably manage surface water onsite during construction and to prevent construction related pollution entering the ground.

5.3.3 Exceedance Event

Should a rainfall event greater than the 1-in-100-year, plus climate change event occur, then surface water flooding may occur. The levels are designed to ensure that building thresholds are kept safe from flooding.

6 SUMMARY

The proposal is for the construction of a single dwelling at Blakes Lane, Wargrave, R10 9TA. The proposed development area of the site falls from the northwest to the southeast, and a drainage ditch runs adjacent to the southern boundary. Drainage on site will be designed to convey surface water away from the proposed dwellings and not impinge on adjacent sites.

The ground conditions indicate that infiltration is not feasible, and therefore an alternative method of discharge to the ditch adjacent to the back garden has been established, working through the SuDS hierarchy from top down.

It has been deemed that a pumped system is necessary due to the constraints from the root protection areas and inadequate fall to the ditch. Therefore, the network is designed to function as follows:

Surface water from buildings will be collected via rainwater downpipes and directed to either the filter drains or the traditional piped network. Flows will then be conveyed to catch pits, which will remove silt and larger particles that enter the network before water is conveyed to a flow control chamber, which will restrict flows to a maximum discharge rate of 5.2l/s using the minimal permissible orifice plate, with a 50mm diameter, to reduce the rate of discharge to the ditch whilst maintaining functionality. Before discharge, surface water will be pumped south as there is not enough fall to reach the ditch at a suitable invert level.

The proposed surface water drainage layout, calculations and details can be seen in Appendix C & D.

Surface water landing on the permeable paved driveway will be collected in the sub-base, which will provide attenuation. The permeable sub-base is proposed to be underlain by a collector drain, which will direct flows downstream to the wider network. The hardstanding paved areas at the back of the dwelling will fall towards a filter drain, which helps to provide treatment prior to discharge.

The levels will be designed to ensure that building thresholds are kept safe from flooding.

A pumped method of discharge requires additional maintenance compared to a traditional gravity system. To maintain long-term reliability in the network, it is important that the pump manufacturer's maintenance schedule is followed to prolong the life of the pump and the network. It is proposed that a twin pump be specified to ensure that if one pump fails, the network will still function efficiently as intended without backing up the network.

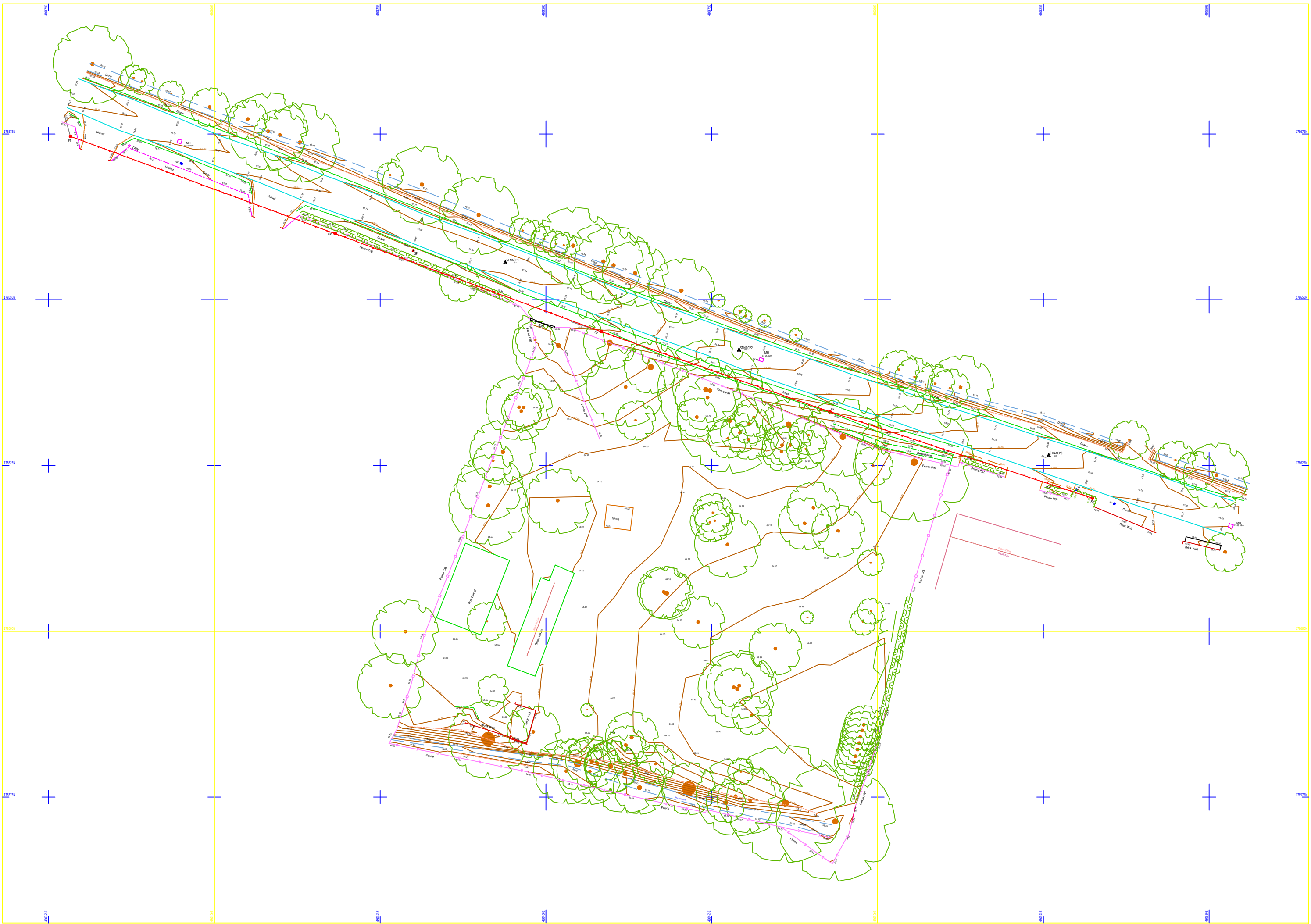
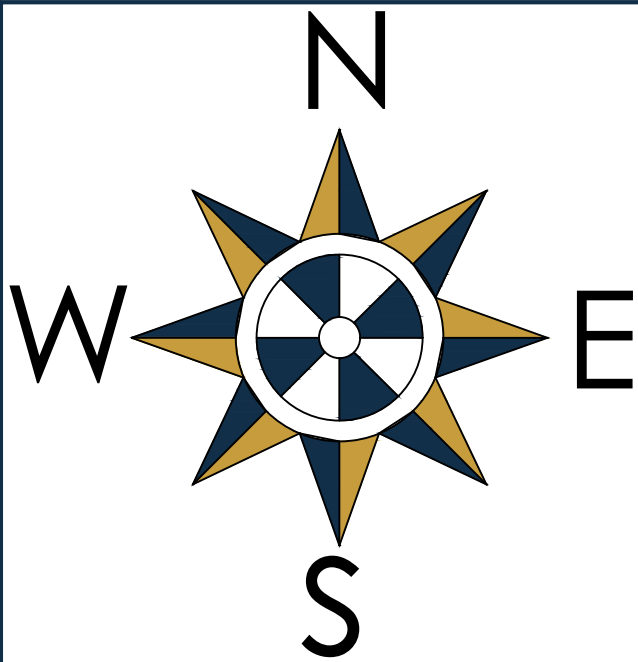
The responsibility for the continuous operation and maintenance of the SuDS will fall on the owner or a maintenance company acting on their behalf.



Appendices

Appendix A

Tree & Topographical Survey



Notes:

AV	Air Valve	FH	Fire Hydrant	SP	Sign Post
BB	Bottom Bank	FP	Footpath	STAY	Stay
BH	Bore Hole	G	Gully Grate	SV	Sluice Valve
BL	Lit Bollard	GAS	Gas Valve	TAC	Tactile Paving
BOL	Bollard	Hedge	Hedge	TB	Top Bank
BIN	Bin	IL	Invert Level	TL	Traffic Light
BS	Bus Stop	KO	Kerb Outlet	TOK	Top Of Kerb
Bushes	Bushes Line	LP	Lamp Post	TP	Telegraph Pole
BT	BT Box	MH	Manhole	TRK	Track
CAB	Cabinet	MP	Marker Post	TS	Traffic MH
CHNL	Channel	P/W	Partition Wall	VENT	Vent
CL	Centreline	PBOX	Post Box	W	Water Cover
CONC	Concrete	POST	Post	WO	Wash Out
COLUMN	Column	RE	Rodding Eye	YL	Yellow Line
DB	Ditch Bottom	Ridge	Ridge Level	FHR	Heras Fence
DCHNL	Drainage Channel	RP	Reflector Post	FPL	Palisade
Door	Door	SETTS	Granite Setts	FPR	Post & Rail
EEB	Electric MH Cover	SF	Safety Fence	FPW	Post & Wire
EP	Electric Pole	FCB	Close Boarded	RAIL	Railings
ER	Earth Rod	FCL	Chain Link		
Feed	Feeder Pillar	FHD	Hoarding		

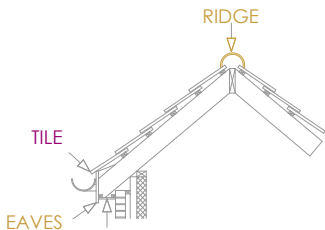
Features

Fences	FCB 1.8m	Front Face Of Fence
Walls	Wall 1.2m	Front Face Of Wall
Hedges	Hedge 1.3m	Average root line shown.
Overhead Line	OKL	Position Of Cable At Pole (No Sag)

Services

Foul Water MH	0.22m	FW MH	Pipe position and alignment is indicative only.
Surface Water MH	0.37m	SW MH	

Building Heights



Survey Methodology & Positioning
This survey was undertaken primarily using a Trimble R12 GNSS receiver, supplemented by a Trimble S6 Total Station where required. All positions are accurately referenced to the Ordnance Survey National Grid via GNSS observations to the OS Active Network, applying the latest transformations (OSTN15/OSGM15). All levels relate to Ordnance Survey Datum (Newlyn), with vertical control established using the same OS Active Network and transformations (OSTN15/OSGM15).
Note on GNSS accuracy (Trimble R12 RTK/Network RTK performance):
Horizontal: 8 mm + 0.5 ppm RMS
Vertical: 15 mm + 0.5 ppm RMS
These represent the manufacturer's specified residuals/achievable precisions under typical conditions for network RTK operations (as used with the OS Active Network). Actual field performance may vary depending on factors such as satellite geometry, atmospheric conditions, multipath, and site-specific obstructions.
All dimensions are in metres unless otherwise stated.

Accuracy & Use of Data
Critical dimensions and measurements must be taken from the original digital data and verified with the surveyor before reliance in design, construction, or other works. Printed copies may contain scaling/plotting tolerances; always refer to digital files for precision. No liability is accepted for errors arising from misuse, scaling from prints, or application beyond the survey's intended purpose and specified accuracy.

Any discrepancies should be notified to the surveyor in writing without delay.

Drainage & Services Limitations
No confined-space entry was attempted. Invert depths, estimated pipe sizes, and flow directions were recorded only for active, visible drainage runs at the time of survey. Manually immovable covers are marked MH (UT); hydraulic lifting was not included in the scope.

Drainage connections between covers are estimated and unverified. All runs, sizes, connections, and flows must be confirmed by dye testing, radio detection, CCTV survey, or consultation with the local drainage authority before any design or construction commences.

Hidden or buried inspection covers may exist (obscured by vegetation, surfacing, etc.). A comprehensive CCTV drainage survey or authority consultation is recommended to identify any such features.

Underground services are shown based solely on visible surface indicators (covers, markings); no tracing, lifting of utility covers, or excavation was performed. Specialist utility surveys are advised for confirmation.

General Disclaimers
No liability is accepted for any direct, indirect, or consequential loss arising from inaccuracies, omissions, or reliance on this data for unintended purposes. The survey reflects site conditions at the time of visit; changes thereafter are not accounted for.
Safe site access, permissions, and notification of hazards remain the client's responsibility.



ACP LAND SURVEYS
10 Tagg Way
Norfolk
NR13 6SQ
07453 334072
www.acplandsurveys.co.uk



DRAWN:

AP

Scale At A1

1:500

DATE:

16.02.26

REVISION:

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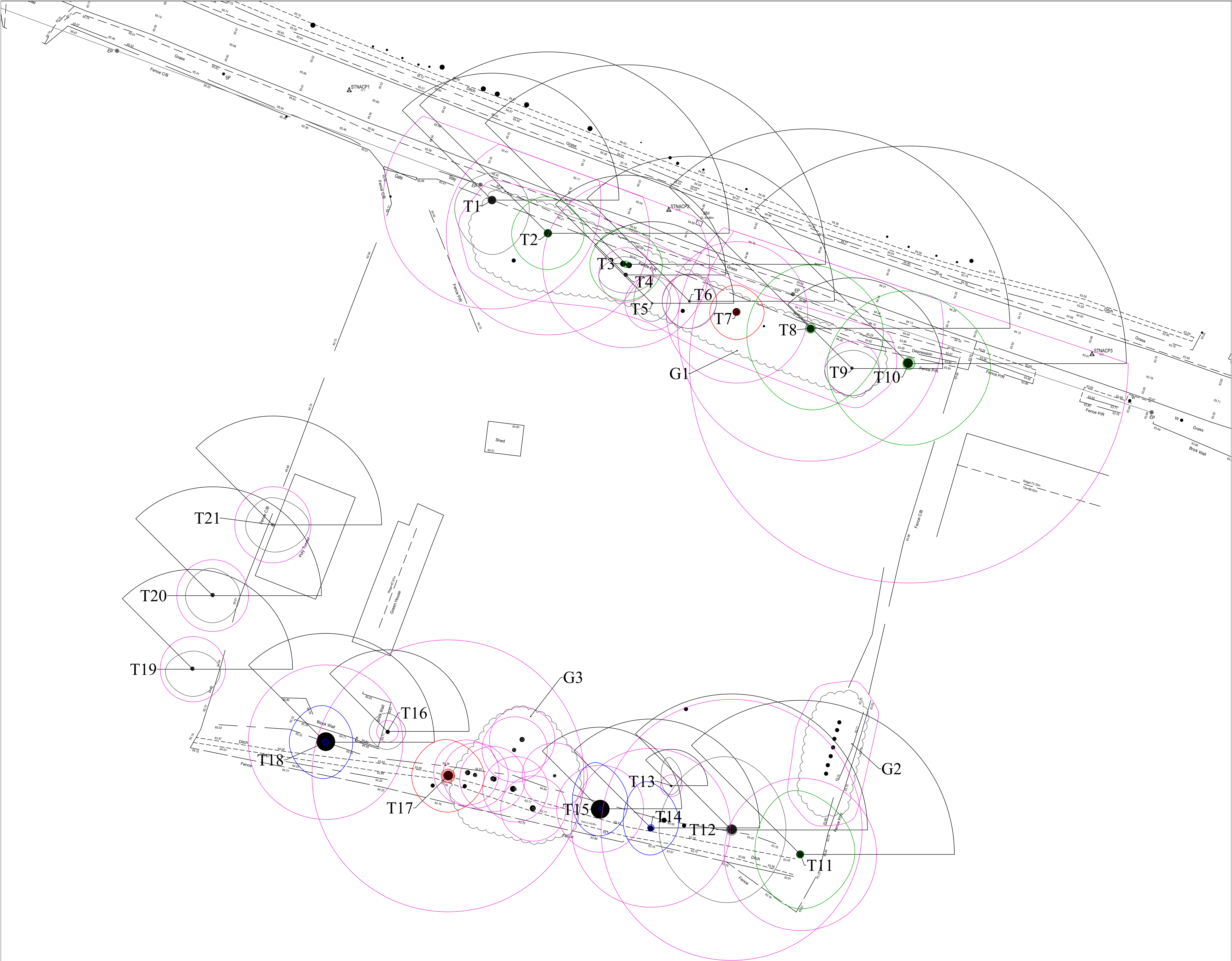
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Wargrave**

TITLE

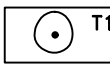
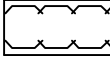
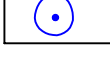
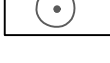
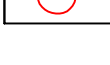
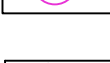
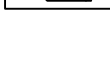
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Overview**

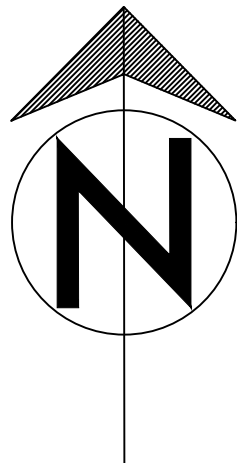
DRAWING NO:

1316 - 014



KEY

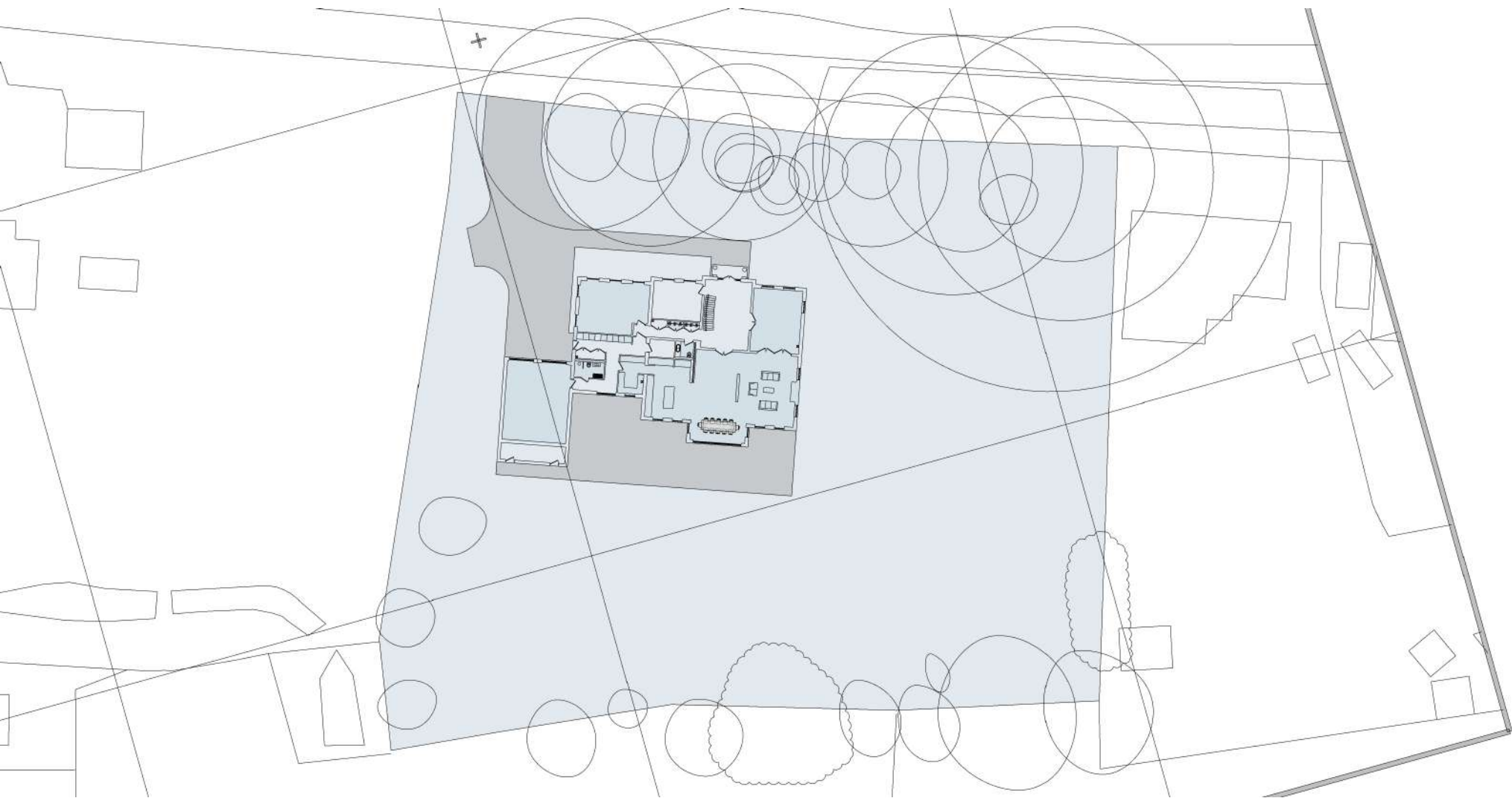
-  T1 Existing Tree colour referenced in accordance with BS 5837 2005.
-  Existing hedge or group. colour coded as above in accordance with BS 5837.
-  Green - Cat A Trees of high quality and value
-  Blue - Cat B Trees of moderate quality and value
-  Grey - Cat C Trees of low quality and value
-  Red - Cat U Trees that are dead or showing signs of irreversible decline
-  Root Protection Area as calculated in accordance with BS 5837
-  Shade pattern as to BS:5837.



REV.		DATE		INITIALS		DETAILS			
CLIENT Queenswood Homes						DWG. TITLE Tree Constraints Plan			
SITE: Blakes Ln, Wargrave									
DRAWN BY SPM		CHECKED BY SPM		SCALE 1:200 WAI		DATE March 2026		DWG NO. OAS_26-601-TS02	
								REV. -	

Appendix B

Proposed Development Plan



Appendix C Causeway Flow Calculations

1. THE DRAWINGS, DESIGN AND ALL INFORMATION CONTAINED THEREIN ARE THE SOLE COPYRIGHT OF CANHAM CONSULTING LTD AND ANY REPRODUCTION IS FORBIDDEN UNLESS PERMISSION IS OBTAINED IN WRITING.
2. ALL DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT CIVIL / STRUCTURAL ENGINEERING DRAWINGS, THE PROJECT SPECIFICATION AND DRAWINGS PRODUCED BY THE ARCHITECTS, SERVICE ENGINEERS AND LANDSCAPE ARCHITECTS.
3. FOR SETTING OUT OF BUILDINGS REFER TO THE ARCHITECTS DRAWINGS AND DETAILS.
4. ANY DISCREPANCIES BETWEEN THE INFORMATION GIVEN BY THE ENGINEER, AND THAT PROVIDED BY OTHERS, MUST BE REFERRED TO THE ENGINEER BEFORE THE AFFECTED WORKS PROCEED.
5. DIMENSIONS MUST NOT BE SCALED FROM THE ENGINEER'S DRAWINGS.
6. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
7. DIMENSIONS MARKED * ARE SUBJECT TO CONFIRMATION BY SITE MEASUREMENT BEFORE CONSTRUCTION PROCEEDS.
8. THE CONTRACTOR IS TO ENSURE THE STABILITY OF EACH ELEMENT AND THE STABILITY OF THE OVERALL CONSTRUCTION UNTIL THE WORKS ARE COMPLETE.
9. ALL DESIGNS, CONNECTIONS, WORKMANSHIP AND MATERIAL ARE TO COMPLY WITH THE CURRENT BUILDING REGULATIONS AND THE LATEST RELEVANT BRITISH STANDARD SPECIFICATION AND CODES OF PRACTICE OR OTHERWISE BE TO THE SPECIFIC WRITTEN APPROVAL OF THE ENGINEER.
10. INSPECTIONS MADE BY THE LOCAL AUTHORITY, SHALL BE ARRANGED BY THE CONTRACTOR TO SUIT HIS PROGRAMME. ANY COST ARISING OUT OF FAILING TO CARRY OUT THE WORK TO THE SATISFACTION OF THE LOCAL AUTHORITY WILL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
11. THE CONTRACTOR MUST MAKE THEMSELVES AWARE OF THE EXISTING UTILITIES / SERVICES LOCATED WITHIN AND ADJACENT TO THE SITE. ANY EXCAVATIONS ARE TO BE UNDERTAKEN UNTIL THE UTILITY COMPANIES HAVE BEEN INFORMED / CO-ORDINATED WITH. DIAL-BEFORE-YOU-DIG ADVICE IS FOLLOWED AND THE AREA IS CAT SCANNED. ALL UTILITY COMPANY GUIDELINES AND HEALTH & SAFETY PROCEDURES MUST BE STRICTLY FOLLOWED.
12. FOR SIZE AND LOCATION OF ALL SERVICES REFER TO THE SERVICE ENGINEER'S AND ARCHITECT'S DRAWINGS.
13. THE PROPOSED SITE LAYOUT SHOWN ON THIS DRAWING IS BASED UPON THE DRAWING RECEIVED 09.07.2026, TITLED 'WARGRAVE HARD STANDING'
14. THE TOPOGRAPHICAL INFORMATION REPRODUCED ON THIS DRAWING IS SHOWN FOR CO-ORDINATION AND DESIGN PURPOSES ONLY AND TAKEN FROM THE ACP LAND SURVEYS DRAWING 1316 - 014, DATED 16.02.2026. LIABILITY FOR THIS INFORMATION REMAINS WITH ACP LAND SURVEYS; CANHAM CONSULTING LTD CANNOT ACCEPT ANY LIABILITY FOR THE CONTENT AND ACCURACY OF THE TOPOGRAPHIC SURVEY.

1. ALL PIPES BELOW GROUND TO BE 100mm DIAMETER (UNLESS NOTED OTHERWISE).
2. ALL PIPE GRADIENTS TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT H.
3. ALL MATERIALS, WORKMANSHIP, ETC, TO COMPLY WITH BUILDING REGULATIONS.
4. INSPECTION CHAMBERS TO BE TURTLE ENVIRO ACCESSO, OR SIMILAR APPROVED.
5. THE LOCATION, NUMBER AND SIZES OF ALL RAINWATER DOWNPIPES ARE TO BE CONFIRMED BY THE ARCHITECT.
6. FOR MANHOLE DETAILS REFER TO CANHAM CONSULTING LTD DRAWINGS 260327-CCL-XX-XX-DR-C-4900.
7. FOR PIPE BEDDING CLASS, TRENCH BACK-FILL AND REINSTATEMENT DETAILS, REFER TO CANHAM CONSULTING LTD DRAWING 260327-CCL-XX-XX-DR-C-4900.
8. CLASS S BEDDING & SURROUND TO BE USED WHEN DEPTH TO SOFFIT OF PIPE IS EQUAL TO OR GREATER THAN 1.2m IN TRAFFICKED AREAS AND 0.9m IN NON-TRAFFICKED AREAS. OTHERWISE CLASS Z BEDDING DETAIL TO BE USED.
9. CANHAM CONSULTING LTD MUST BE INFORMED IMMEDIATELY OF ANY ALTERATIONS / DEVIATIONS IDENTIFIED ON SITE FROM THE INFORMATION SHOWN ON THIS DRAWING.
10. THE CONTRACTOR MUST CONFIRM THE CONNECTION INVERT LEVELS AND DETAILS OF ALL EXISTING PIPES AND MANHOLES ONTO WHICH NEW CONNECTIONS SHALL BE MADE **PRIOR TO ANY CONSTRUCTION**. CANHAM CONSULTING LTD MUST BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BETWEEN THE INFORMATION PROVIDED ON THIS DRAWING AND INFORMATION DETERMINED ON SITE. THE CONNECTION MUST REMAIN AS SOFFIT TO SOFFIT.

	PROPOSED PRIVATE FILTER DRAIN
	PROPOSED PRIVATE SURFACE WATER PIPE
	PROPOSED PRIVATE PERFORATED SURFACE WATER PIPE
	PROPOSED PRIVATE SURFACE WATER INSPECTION CHAMBER
	PROPOSED PRIVATE SURFACE WATER PUMPED RISING MAIN
	PROPOSED RAINWATER DOWNPIPE
	PROPOSED RODDING EYE
	PROPOSED PRIVATE SURFACE WATER HEADWALL
	PROPOSED PRIVATE SURFACE WATER FLOW CONTROL INSPECTION CHAMBER
	PROPOSED PRIVATE ATTENUATION TANK (CRATE SYSTEM)
	PROPOSED PERMEABLE PAVING
	PROPOSED HARDSTANDING AREAS

SCALE 1:100m



0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

SCALE BAR FOR INFORMATION ONLY

P02	16.07.2026	UPDATED WITH REVISED TOPO	OG	MH
P01	13.07.2026	PRELIMINARY ISSUE	OG	MH
rev	date	details	drawn	check



+44 (0)1603 430650 | clientservice@canhamconsulting.co.uk | www.canhamconsulting.co.uk
client
NICK & EMMA HERBERT

architec

project
LAND ADJACENT TO MERCHISTON, BLAKES LANE,
WARGRAVCE, RG10 9TA

title

PROPOSED PRIVATE DRAINAGE
SURFACE WATER
GENERAL ARRANGEMENT

CCL ref:	drawn	design	checked	scale	size	date
260327	OG	OG	MH	1:100	A1 (P)	13.07.2020

S3 - SUITABLE FOR REVIEW & COMMENT

drawing number	revision
260327-CCL-XX-XX-DR-C-4000	P02

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THIS DESIGN IS PRODUCED IN ACCORDANCE WITH THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015 INCORPORATING THE APPROVED CODE OF PRACTICE, REGULATIONS 2, 9 AND 11, THOSE RELATING TO THE DESIGN WITHOUT THE AUTHORITY OF CANHAM CONSULTING LTD SHOULD BE AWAKE THEY MAY ALSO ASSUME RESPONSIBILITY FOR THOSE DUTIES

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1440	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
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	40	0	0
100	40	0	0

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	0.75
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	9.000
CV	1.000	Preferred Cover Depth (m)	0.700
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	70.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
1		5.00	65.469	300	480452.957	178645.739	0.869	64.600
2			64.867	450	480448.441	178633.686	0.961	63.906
3	0.006	5.00	64.609	450	480449.297	178623.009	0.850	63.759
4	0.010	5.00	64.923		480452.593	178632.197	1.229	63.694
5			64.945		480455.369	178631.201	1.271	63.674
6			64.635		480468.443	178626.512	1.054	63.581
7	0.009	5.00	64.486	600	480480.125	178622.322	1.063	63.423
8		5.00	64.050	600	480474.000	178599.324	1.566	62.484
9	0.009	5.00	64.247	600	480472.118	178600.000	1.773	62.474
10	0.007	5.00	64.512	600	480446.638	178609.138	2.158	62.354
11			64.650	300	480444.670	178603.651	2.322	62.328
12			64.975	300	480431.042	178589.725	0.770	64.205
12_OUT			65.083	300	480431.042	178585.530	0.920	64.163

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	1	2	12.871	0.600	64.600	63.956	0.644	20.0	100	5.12	70.0
1.001	2	4	4.411	0.600	63.906	63.694	0.212	20.8	150	5.16	70.0
2.000	3	4	9.761	0.600	63.759	63.694	0.065	150.0	150	5.20	70.0
1.002	4	5	2.949	0.600	63.694	63.674	0.020	150.0	150	5.26	70.0
1.003	5	6	13.889	0.600	63.674	63.581	0.093	150.0	150	5.54	70.0
1.004	6	7	12.411	0.600	63.581	63.498	0.083	150.0	150	5.79	70.0
1.005	7	9	23.715	0.600	63.423	62.474	0.949	25.0	225	5.95	70.0
3.000	8	9	2.000	0.600	62.484	62.474	0.010	200.0	225	5.04	70.0
1.006	9	10	27.069	0.600	62.474	62.354	0.120	225.0	225	6.47	70.0
1.007	10	11	5.829	0.600	62.354	62.328	0.026	225.0	100	6.66	70.0

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	1.734	13.6	0.0	0.769	0.811	0.000	0.0	0	0.000
1.001	2.217	39.2	0.0	0.811	1.079	0.000	0.0	0	0.000
2.000	0.818	14.5	1.5	0.700	1.079	0.006	0.0	33	0.528
1.002	0.818	14.5	3.9	1.079	1.121	0.016	0.0	54	0.698
1.003	0.818	14.5	3.9	1.121	0.904	0.016	0.0	54	0.698
1.004	0.818	14.5	3.9	0.904	0.838	0.016	0.0	54	0.698
1.005	2.627	104.5	6.3	0.838	1.548	0.025	0.0	37	1.464
3.000	0.921	36.6	0.0	1.341	1.548	0.000	0.0	0	0.000
1.006	0.867	34.5	18.7	1.548	1.933	0.074	0.0	118	0.885
1.007	0.509	4.0	20.5	2.058	2.222	0.081	0.0	100	0.522

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)
1.008	11	12	19.485	0.600	62.328	64.205	-1.877	-10.4	100	30.00	70.0
1.009	12	12_OUT	4.195	0.600	64.205	64.163	0.042	99.9	100	30.00	70.0

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)
1.008	0.005	0.0	20.5	2.222	0.670	0.081	0.0	100	0.000
1.009	0.769	6.0	20.5	0.670	0.820	0.081	0.0	100	0.790

Pipeline Schedule

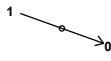
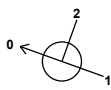
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	12.871	20.0	100	PRIV_PIPE	65.469	64.600	0.769	64.867	63.956	0.811
1.001	4.411	20.8	150	PRIV_PIPE	64.867	63.906	0.811	64.923	63.694	1.079
2.000	9.761	150.0	150	PRIV_PIPE	64.609	63.759	0.700	64.923	63.694	1.079
1.002	2.949	150.0	150	PRIV_PIPE	64.923	63.694	1.079	64.945	63.674	1.121
1.003	13.889	150.0	150	FILTER_DRAIN	64.945	63.674	1.121	64.635	63.581	0.904
1.004	12.411	150.0	150	FILTER_DRAIN	64.635	63.581	0.904	64.486	63.498	0.838
1.005	23.715	25.0	225	PRIV_PIPE	64.486	63.423	0.838	64.247	62.474	1.548
3.000	2.000	200.0	225	PRIV_PIPE	64.050	62.484	1.341	64.247	62.474	1.548
1.006	27.069	225.0	225	FILTER_DRAIN	64.247	62.474	1.548	64.512	62.354	1.933
1.007	5.829	225.0	100	PRIV_PIPE	64.512	62.354	2.058	64.650	62.328	2.222
1.008	19.485	-10.4	100	PRIV_PIPE	64.650	62.328	2.222	64.975	64.205	0.670
1.009	4.195	99.9	100	PRIV_PIPE	64.975	64.205	0.670	65.083	64.163	0.820

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	300	Manhole	PRIV_MANHOLE	2	450	Manhole	PRIV_MANHOLE
1.001	2	450	Manhole	PRIV_MANHOLE	4		Junction	
2.000	3	450	Manhole	PRIV_MANHOLE	4		Junction	
1.002	4		Junction		5		Junction	
1.003	5		Junction		6		Junction	
1.004	6		Junction		7	600	Manhole	PRIV_MANHOLE
1.005	7	600	Manhole	PRIV_MANHOLE	9	600	Manhole	PRIV_MANHOLE
3.000	8	600	Manhole	PRIV_MANHOLE	9	600	Manhole	PRIV_MANHOLE
1.006	9	600	Manhole	PRIV_MANHOLE	10	600	Manhole	PRIV_MANHOLE
1.007	10	600	Manhole	PRIV_MANHOLE	11	300	Manhole	PRIV_MANHOLE
1.008	11	300	Manhole	PRIV_MANHOLE	12	300	Manhole	PRIV_MANHOLE
1.009	12	300	Manhole	PRIV_MANHOLE	12_OUT	300	Manhole	PRIV_MANHOLE

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	480452.957	178645.739	65.469	0.869	300		0	1.000	64.600	100
2	480448.441	178633.686	64.867	0.961	450		1	1.000	63.956	100
							0	1.001	63.906	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
3	480449.297	178623.009	64.609	0.850	450		0	2.000	63.759	150
4	480452.593	178632.197	64.923	1.229			1 2 0	2.000 1.001 1.002	63.694 63.694 63.694	150 150 150
5	480455.369	178631.201	64.945	1.271			1 0	1.002 1.003	63.674 63.674	150 150
6	480468.443	178626.512	64.635	1.054			1 0	1.003 1.004	63.581 63.581	150 150
7	480480.125	178622.322	64.486	1.063	600		1 0	1.004 1.005	63.498 63.423	150 225
8	480474.000	178599.324	64.050	1.566	600		0	3.000	62.484	225
9	480472.118	178600.000	64.247	1.773	600		1 2 0	3.000 1.005 1.006	62.474 62.474 62.474	225 225 225
10	480446.638	178609.138	64.512	2.158	600		1 0	1.006 1.007	62.354 62.354	225 100
11	480444.670	178603.651	64.650	2.322	300		1 0	1.007 1.008	62.328 62.328	100 100
12	480431.042	178589.725	64.975	0.770	300		1 0	1.008 1.009	64.205 64.205	100 100
12_OUT	480431.042	178585.530	65.083	0.920	300		1	1.009	64.163	100

SuDS Carriers

Link	US Node	DS Node	Link Type	Base Inf Coef (m/hr)	Sides Inf Coef (m/hr)	Safety Factor	Time to Half Empty (mins)
1.003	5	6	FILTER_DRAIN	0.00000	0.00000	2.0	1
1.004	6	7	FILTER_DRAIN	0.00000	0.00000	2.0	1
1.006	9	10	FILTER_DRAIN	0.00000	0.00000	2.0	1

Node 10 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.987	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	5.2		
Invert Level (m)	62.354	Diameter (m)	0.050		

Node 11 Online Pump Control

Flap Valve	x	Invert Level (m)	62.328	Switch off depth (m)	0.001
Replaces Downstream Link	✓	Switch on depth (m)	0.002		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	5.200	2.000	5.200	4.000	5.200	6.000	5.200	8.000	5.200
1.000	5.200	3.000	5.200	5.000	5.200	7.000	5.200	9.000	5.200

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	65.109	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.250
Safety Factor	1.5	Width (m)	5.400	Inf Depth (m)	
Porosity	0.35	Length (m)	10.000		

Node 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	64.518	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.250
Safety Factor	1.5	Width (m)	4.900	Inf Depth (m)	
Porosity	0.35	Length (m)	10.000		

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	64.249	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.250
Safety Factor	1.5	Width (m)	4.200	Inf Depth (m)	
Porosity	0.35	Length (m)	10.000		

Node 8 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	62.484	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	72	Inf Depth (m)	
Safety Factor	1.5	Pit Width (m)	5.000	Number Required	1
Porosity	0.95	Pit Length (m)	5.000		

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.150

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	101.453	28.708	30 year +40% CC 360 minute summer	50.794	13.071
2 year 15 minute winter	71.195	28.708	30 year +40% CC 360 minute winter	33.017	13.071
2 year 30 minute summer	64.862	18.354	30 year +40% CC 480 minute summer	39.294	10.384
2 year 30 minute winter	45.517	18.354	30 year +40% CC 480 minute winter	26.106	10.384
2 year 60 minute summer	42.759	11.300	30 year +40% CC 600 minute summer	31.642	8.655
2 year 60 minute winter	28.408	11.300	30 year +40% CC 600 minute winter	21.620	8.655
2 year 120 minute summer	31.504	8.326	30 year +40% CC 720 minute summer	27.769	7.442
2 year 120 minute winter	20.931	8.326	30 year +40% CC 720 minute winter	18.663	7.442
2 year 180 minute summer	25.943	6.676	30 year +40% CC 960 minute summer	22.203	5.847
2 year 180 minute winter	16.864	6.676	30 year +40% CC 960 minute winter	14.708	5.847
2 year 240 minute summer	21.244	5.614	30 year +40% CC 1440 minute summer	15.400	4.127
2 year 240 minute winter	14.114	5.614	30 year +40% CC 1440 minute winter	10.350	4.127
2 year 360 minute summer	16.699	4.297	100 year +40% CC 15 minute summer	535.238	151.454
2 year 360 minute winter	10.855	4.297	100 year +40% CC 15 minute winter	375.606	151.454
2 year 480 minute summer	13.255	3.503	100 year +40% CC 30 minute summer	352.440	99.728
2 year 480 minute winter	8.806	3.503	100 year +40% CC 30 minute winter	247.326	99.728
2 year 600 minute summer	10.859	2.970	100 year +40% CC 60 minute summer	235.952	62.355
2 year 600 minute winter	7.420	2.970	100 year +40% CC 60 minute winter	156.761	62.355
2 year 720 minute summer	9.652	2.587	100 year +40% CC 120 minute summer	143.216	37.848
2 year 720 minute winter	6.487	2.587	100 year +40% CC 120 minute winter	95.150	37.848
2 year 960 minute summer	7.856	2.069	100 year +40% CC 180 minute summer	108.823	28.004
2 year 960 minute winter	5.204	2.069	100 year +40% CC 180 minute winter	70.738	28.004
2 year 1440 minute summer	5.612	1.504	100 year +40% CC 240 minute summer	85.155	22.504
2 year 1440 minute winter	3.772	1.504	100 year +40% CC 240 minute winter	56.575	22.504
30 year +40% CC 15 minute summer	416.295	117.797	100 year +40% CC 360 minute summer	63.725	16.399
30 year +40% CC 15 minute winter	292.137	117.797	100 year +40% CC 360 minute winter	41.423	16.399
30 year +40% CC 30 minute summer	270.646	76.584	100 year +40% CC 480 minute summer	49.218	13.007
30 year +40% CC 30 minute winter	189.927	76.584	100 year +40% CC 480 minute winter	32.699	13.007
30 year +40% CC 60 minute summer	180.481	47.696	100 year +40% CC 600 minute summer	39.576	10.825
30 year +40% CC 60 minute winter	119.907	47.696	100 year +40% CC 600 minute winter	27.040	10.825
30 year +40% CC 120 minute summer	112.203	29.652	100 year +40% CC 720 minute summer	34.682	9.295
30 year +40% CC 120 minute winter	74.545	29.652	100 year +40% CC 720 minute winter	23.308	9.295
30 year +40% CC 180 minute summer	86.066	22.148	100 year +40% CC 960 minute summer	27.641	7.278
30 year +40% CC 180 minute winter	55.945	22.148	100 year +40% CC 960 minute winter	18.310	7.278
30 year +40% CC 240 minute summer	67.655	17.879	100 year +40% CC 1440 minute summer	19.096	5.118
30 year +40% CC 240 minute winter	44.948	17.879	100 year +40% CC 1440 minute winter	12.834	5.118

Results for 2 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 summer	1	1	64.600	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	1	63.906	0.000	0.0	0.0000	0.0000	OK
15 minute summer	3	10	63.785	0.026	1.0	0.0042	0.0000	OK
15 minute summer	4	10	63.736	0.042	2.6	0.0000	0.0000	OK
15 minute summer	5	10	63.716	0.042	2.5	0.0000	0.0000	OK
15 minute summer	6	11	63.624	0.043	2.5	0.0383	0.0000	OK
15 minute summer	7	11	63.453	0.030	4.0	0.0085	0.0000	OK
180 minute summer	8	120	62.646	0.162	2.6	3.8998	0.0000	OK
180 minute summer	9	120	62.646	0.172	3.0	0.0488	0.0000	OK
180 minute summer	1.006:50%	120	62.646	0.232	2.7	0.6912	0.0000	SURCHARGED
180 minute summer	10	120	62.646	0.292	1.9	1.0122	0.0000	SURCHARGED
180 minute winter	11	136	62.331	0.003	2.3	0.0002	0.0000	OK
120 minute summer	12	86	64.244	0.039	2.6	0.0028	0.0000	OK
240 minute summer	12_OUT	148	64.199	0.036	1.7	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	1	1.000	2	0.0	0.000	0.000	0.0000	
15 minute summer	2	1.001	4	0.0	0.000	0.000	0.0090	
15 minute summer	3	2.000	4	1.0	0.321	0.068	0.0301	
15 minute summer	4	1.002	5	2.5	0.624	0.176	0.0120	
15 minute summer	5	1.003	6	2.5	0.627	0.174	0.0565	
15 minute summer	6	1.004	7	2.5	0.613	0.173	0.0507	
15 minute summer	7	1.005	9	4.0	0.700	0.038	0.2677	
180 minute summer	8	3.000	9	-2.6	-0.358	-0.070	0.0633	
180 minute summer	9	1.006	1.006:50%	1.0	0.214	0.028	0.4899	
180 minute summer	9	1.006	10	1.5	0.251	0.044	0.5383	
180 minute summer	10	1.007	11	2.4	0.520	0.593	0.0230	
180 minute winter	11	Pump	12	2.6				
120 minute summer	12	1.009	12_OUT	1.7	0.642	0.282	0.0114	13.5

Results for 30 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
15 minute summer	1	1	64.600	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	1	63.906	0.000	0.0	0.0000	0.0000	OK
15 minute summer	3	10	63.813	0.054	4.1	0.0086	0.0000	OK
15 minute summer	4	10	63.788	0.094	10.6	0.0000	0.0000	OK
15 minute summer	5	10	63.768	0.094	10.5	0.0000	0.0000	OK
15 minute summer	6	11	63.677	0.096	10.4	0.1884	0.0000	OK
15 minute summer	7	11	63.483	0.060	16.4	0.0170	0.0000	OK
120 minute summer	8	84	63.402	0.918	14.9	19.2716	0.0000	SURCHARGED
120 minute summer	9	86	63.402	0.928	15.8	0.2625	0.0000	SURCHARGED
120 minute summer	1.006:50%	84	63.402	0.988	11.9	3.8938	0.0000	SURCHARGED
120 minute summer	10	86	63.401	1.047	6.3	4.4406	0.0000	SURCHARGED
120 minute winter	11	94	62.499	0.171	10.0	0.0121	0.0000	SURCHARGED
30 minute summer	12	28	64.285	0.080	5.2	0.0057	0.0000	OK
30 minute summer	12_OUT	28	64.234	0.071	5.2	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	1	1.000	2	0.0	0.000	0.000	0.0000	
15 minute summer	2	1.001	4	0.0	0.000	0.000	0.0256	
15 minute summer	3	2.000	4	4.1	0.470	0.282	0.0847	
15 minute summer	4	1.002	5	10.5	0.904	0.726	0.0343	
15 minute summer	5	1.003	6	10.4	0.907	0.721	0.1624	
15 minute summer	6	1.004	7	10.3	0.880	0.713	0.1454	
15 minute summer	7	1.005	9	16.4	0.684	0.157	0.5724	
120 minute summer	8	3.000	9	-14.9	-0.471	-0.406	0.0795	
120 minute summer	9	1.006	1.006:50%	-5.8	0.280	-0.167	0.5383	
120 minute summer	9	1.006	10	5.7	0.331	0.165	0.5383	
120 minute summer	10	1.007	11	9.7	1.613	2.422	0.0456	
120 minute winter	11	Pump	12	5.2				
30 minute summer	12	1.009	12_OUT	5.2	0.816	0.861	0.0267	30.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	64.600	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	1	63.906	0.000	0.0	0.0000	0.0000	OK
120 minute summer	3	88	63.901	0.142	2.3	0.0226	0.0000	OK
120 minute summer	4	88	63.901	0.207	5.9	0.0000	0.0000	SURCHARGED
120 minute summer	5	88	63.901	0.227	5.9	0.0000	0.0000	SURCHARGED
120 minute summer	6	88	63.900	0.319	5.9	1.1075	0.0000	SURCHARGED
120 minute summer	7	88	63.900	0.477	9.5	1.4662	0.0000	SURCHARGED
120 minute summer	8	88	63.899	1.415	18.8	19.4125	0.0000	SURCHARGED
120 minute summer	9	88	63.899	1.425	20.1	0.4034	0.0000	SURCHARGED
120 minute summer	1.006:50%	88	63.899	1.485	15.1	6.0148	0.0000	SURCHARGED
120 minute summer	10	88	63.898	1.544	12.7	6.7006	0.0000	SURCHARGED
120 minute summer	11	106	62.790	0.462	10.5	0.0328	0.0000	SURCHARGED
15 minute summer	12	18	64.285	0.080	5.2	0.0057	0.0000	OK
15 minute summer	12_OUT	18	64.234	0.071	5.2	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	1	1.000	2	0.0	0.000	0.000	0.0000	
15 minute summer	2	1.001	4	0.0	0.000	0.000	0.0314	
120 minute summer	3	2.000	4	2.3	0.411	0.159	0.1701	
120 minute summer	4	1.002	5	5.9	0.786	0.408	0.0519	
120 minute summer	5	1.003	6	5.9	0.775	0.408	0.2445	
120 minute summer	6	1.004	7	5.9	0.772	0.408	0.2185	
120 minute summer	7	1.005	9	9.5	0.516	0.091	0.9432	
120 minute summer	8	3.000	9	-18.8	-0.538	-0.515	0.0795	
120 minute summer	9	1.006	1.006:50%	-7.5	0.263	-0.217	0.5383	
120 minute summer	9	1.006	10	10.6	0.342	0.307	0.5383	
120 minute summer	10	1.007	11	10.5	1.547	2.635	0.0456	
120 minute summer	11	Pump	12	5.2				
15 minute summer	12	1.009	12_OUT	5.2	0.824	0.861	0.0267	30.7

Water Quality (TSS)

Node	Treatment	Effectiveness	SuDS Component	Mitigation TSS	Cumulative TSS
1	Carpark	1.0	Pond	0.700	0.000
2	Carpark	1.0	Pond	0.700	0.000
4	Carpark	1.0	Pond	0.700	0.000
6	Link 1.003	1.0	Filter Drain	0.400	0.000
7	Link 1.004	1.0	Filter Drain	0.400	0.000
8	Soakaway	1.0	Bioretention System	0.800	0.000
10	Link 1.006	1.0	Filter Drain	0.400	0.000
12_OUT					0.000

Water Quality (Metals)

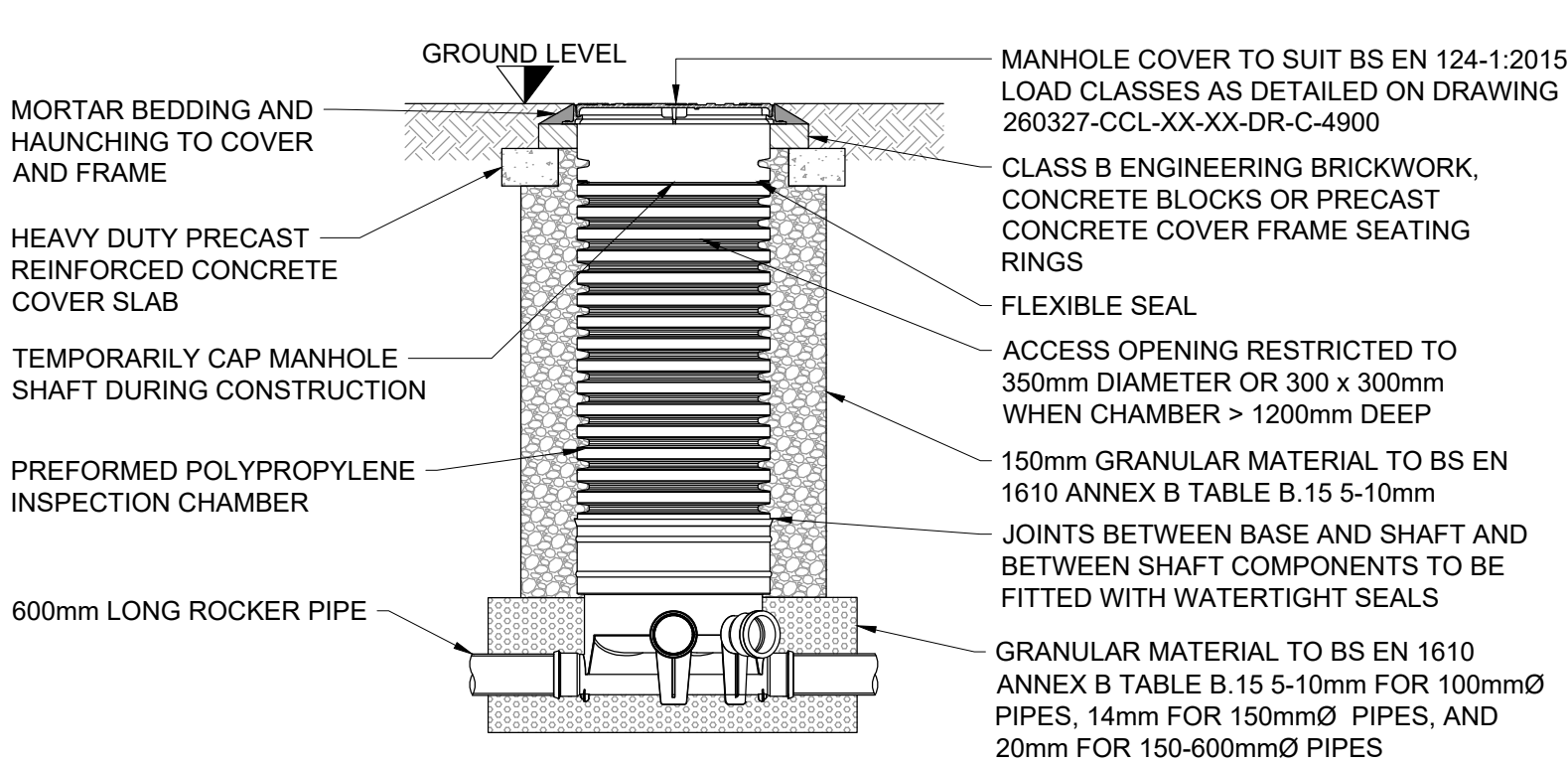
Node	Treatment	Effectiveness	SuDS Component	Mitigation Metals	Cumulative Metals
1	Carpark	1.0	Pond	0.700	0.000
2	Carpark	1.0	Pond	0.700	0.000
4	Carpark	1.0	Pond	0.700	0.000
6	Link 1.003	1.0	Filter Drain	0.400	0.000
7	Link 1.004	1.0	Filter Drain	0.400	0.000
8	Soakaway	1.0	Bioretention System	0.800	0.000
10	Link 1.006	1.0	Filter Drain	0.400	0.000
12_OUT					0.000

Water Quality (Hydrocarbons)

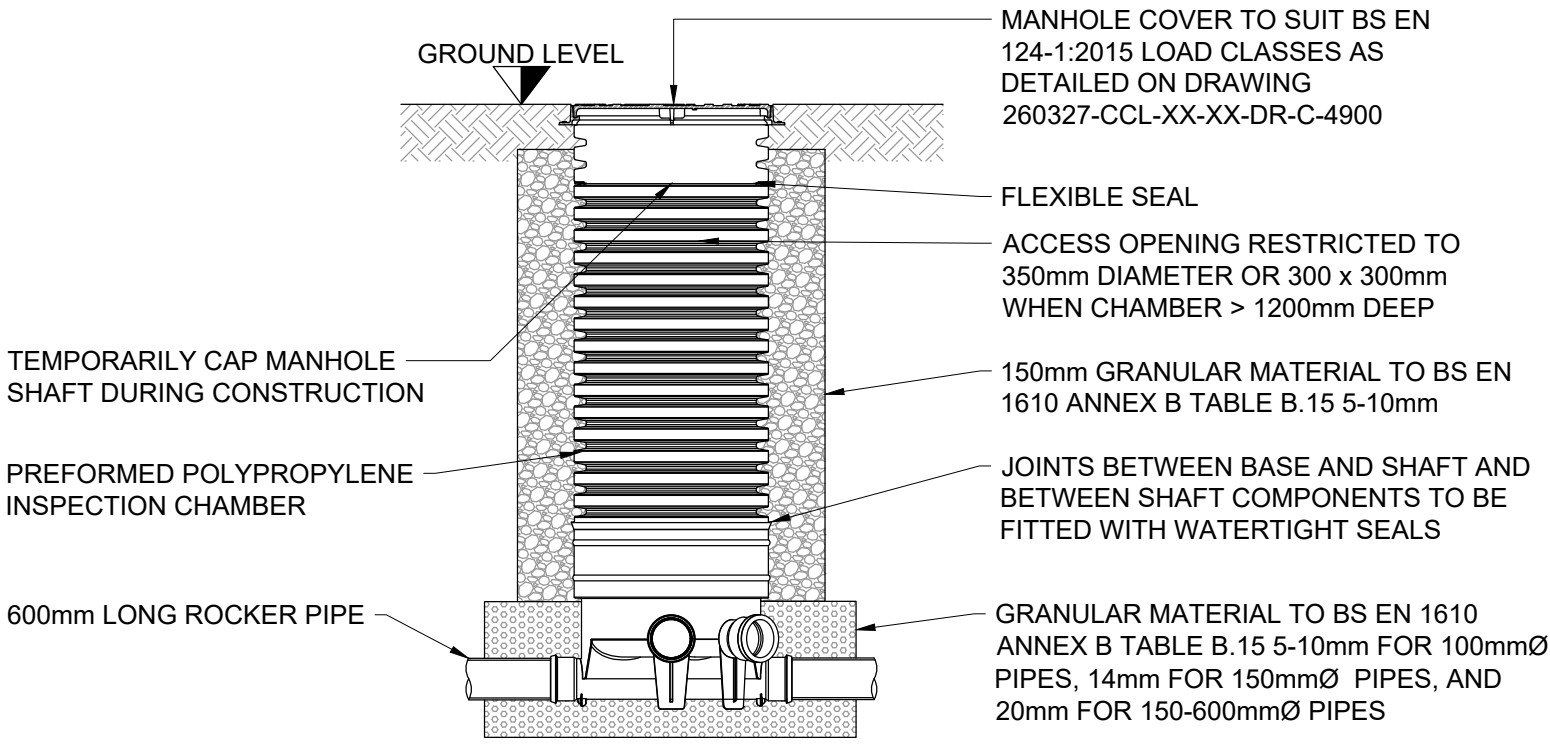
Node	Treatment	Effectiveness	SuDS Component	Mitigation Hydrocarbons	Cumulative Hydrocarbons
1	Carpark	1.0	Pond	0.500	0.000
2	Carpark	1.0	Pond	0.500	0.000
4	Carpark	1.0	Pond	0.500	0.000
6	Link 1.003	1.0	Filter Drain	0.400	0.000
7	Link 1.004	1.0	Filter Drain	0.400	0.000
8	Soakaway	1.0	Bioretention System	0.800	0.000
10	Link 1.006	1.0	Filter Drain	0.400	0.000
12_OUT					0.000

Appendix D

Construction Details

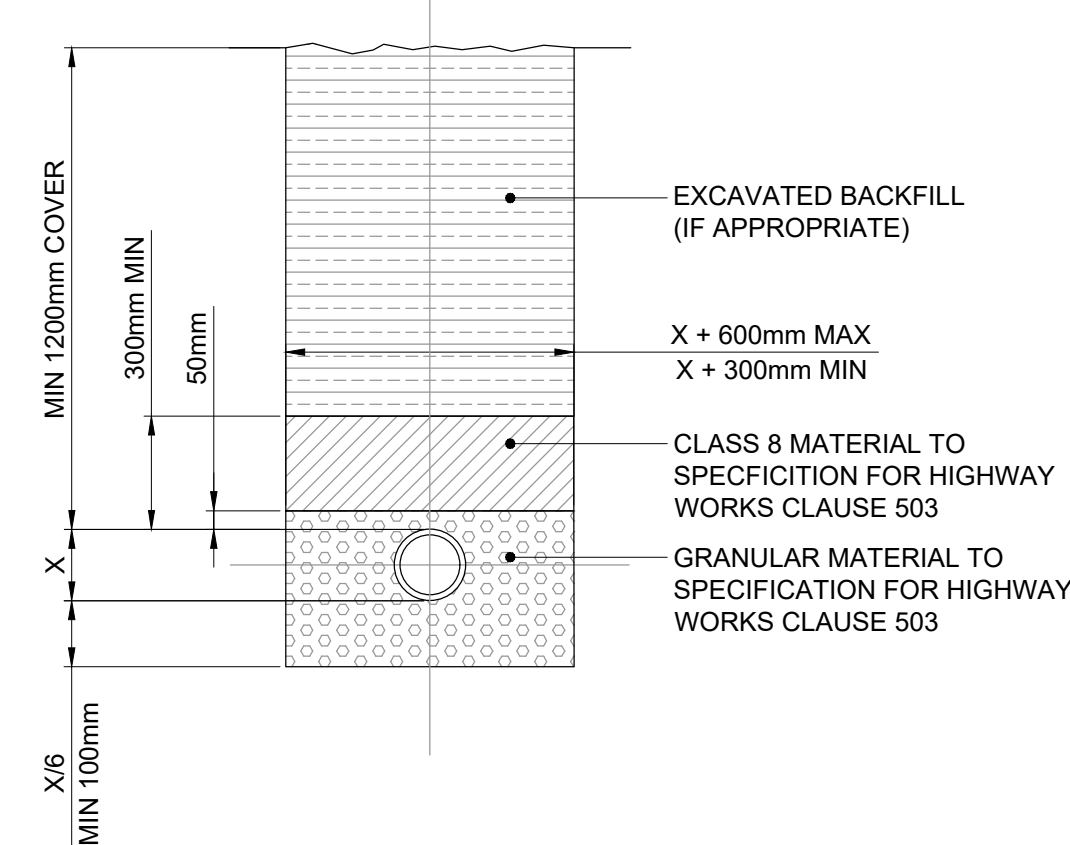
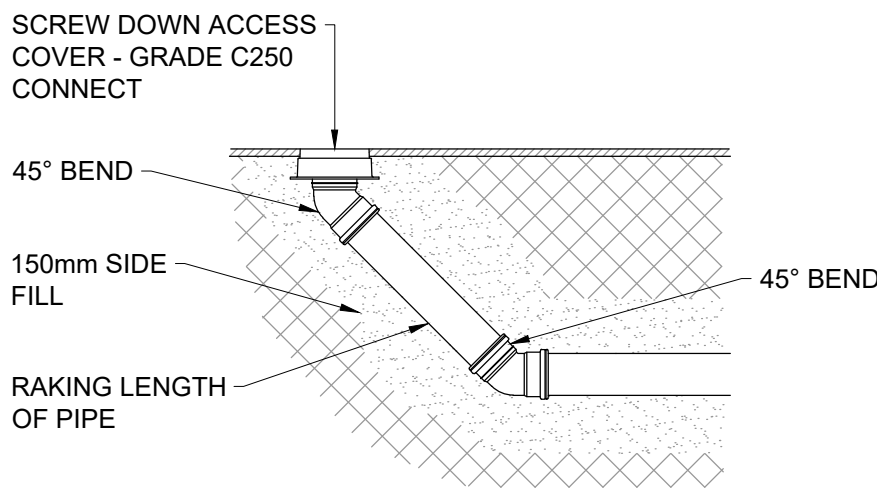


TYPICAL TURTLE ENVIRO INSPECTION CHAMBER DETAIL
INSPECTION CHAMBER IN TRAFFICKED AREAS
SCALE 1:20

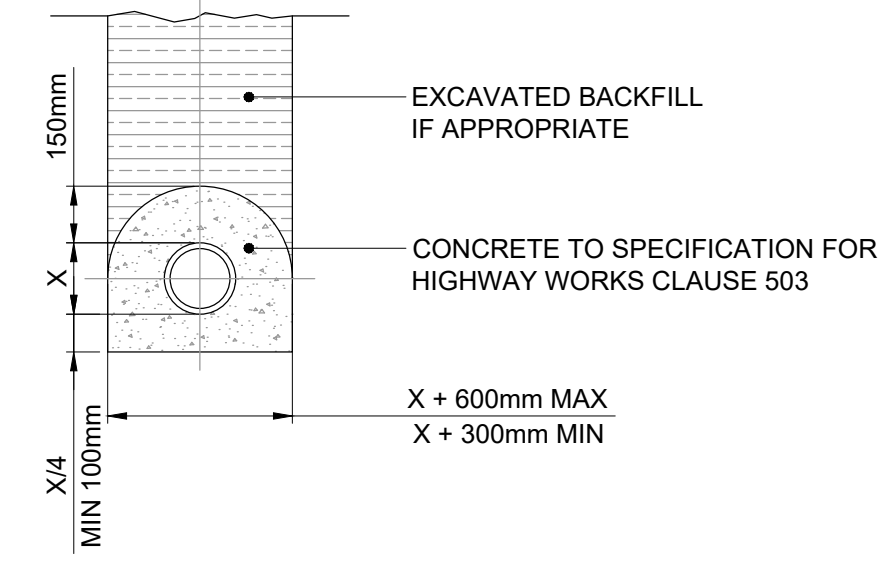


TYPICAL TURTLE ENVIRO INSPECTION CHAMBER DETAIL
INSPECTION CHAMBER IN SOFT LANDSCAPED AREAS
SCALE 1:20

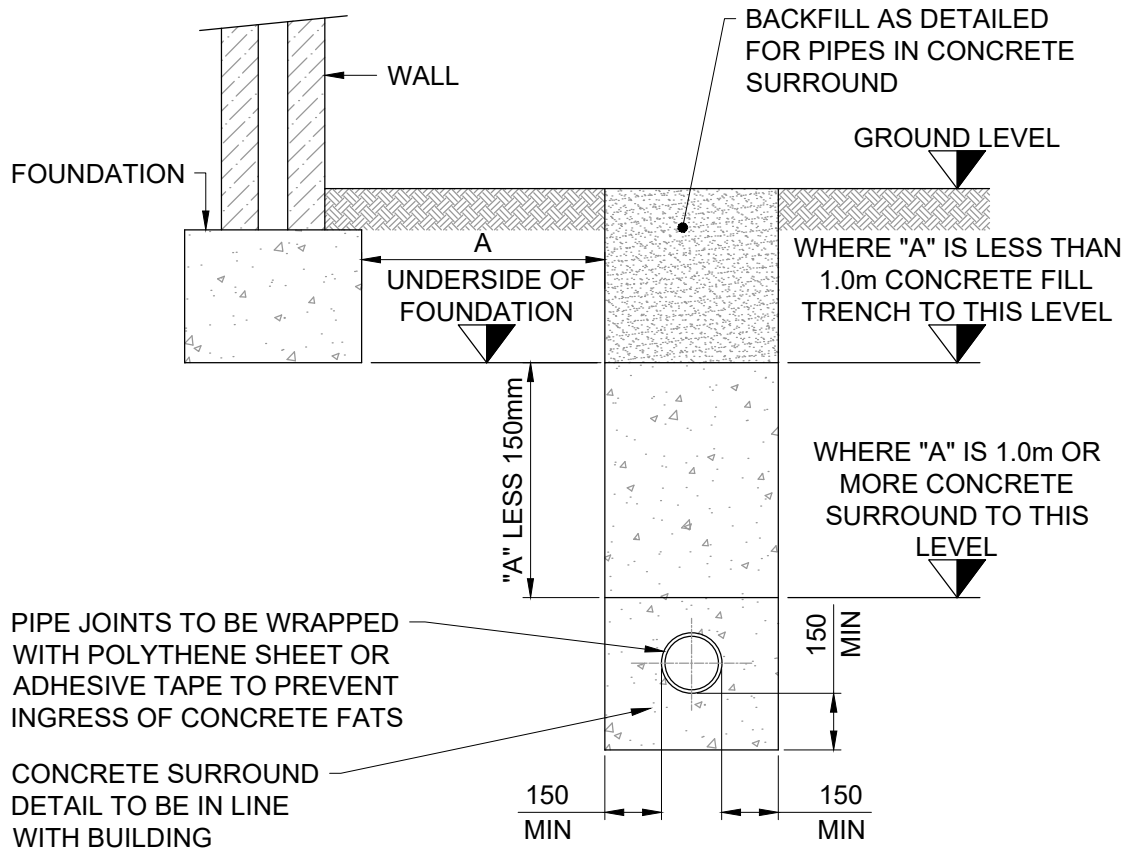
RODDING EYE
NOT TO SCALE



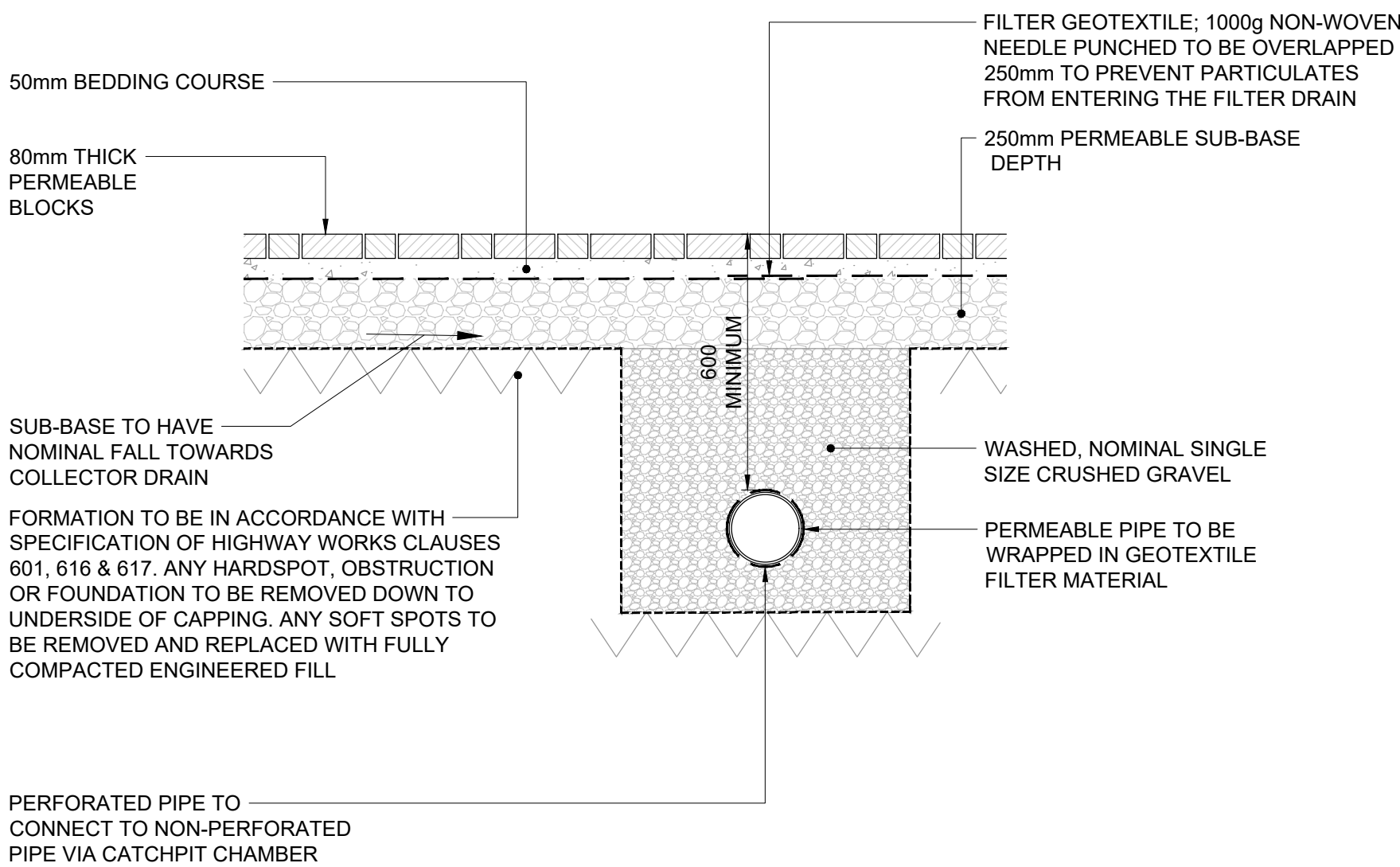
CLASS S BEDDING (PIPES UP TO 600mm)
PIPES WITH VEHICLE LOADING
NOT TO SCALE



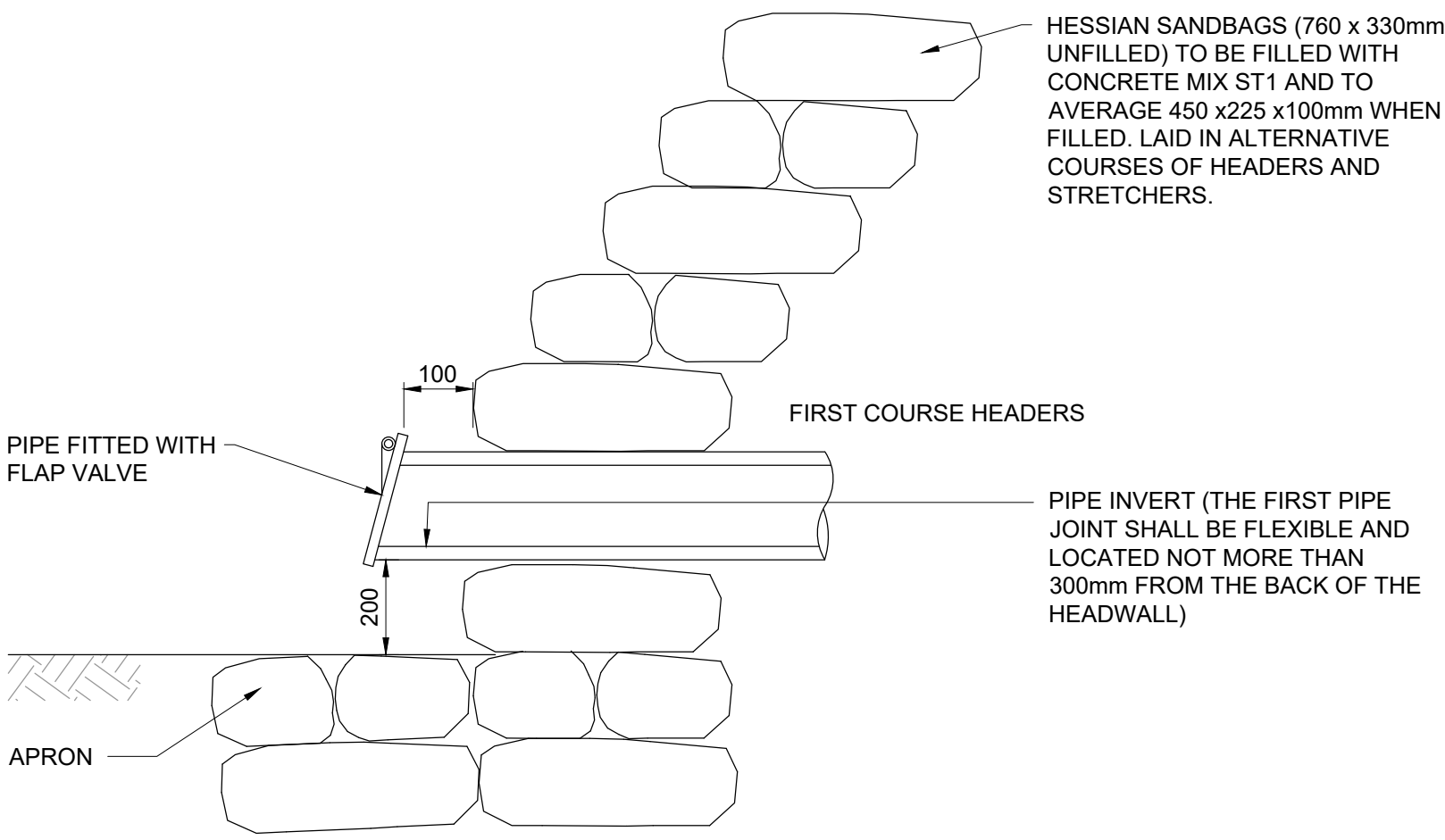
CLASS Z BEDDING (PIPES UP TO 600mm)
PIPES WITH VEHICLE LOADING
NOT TO SCALE



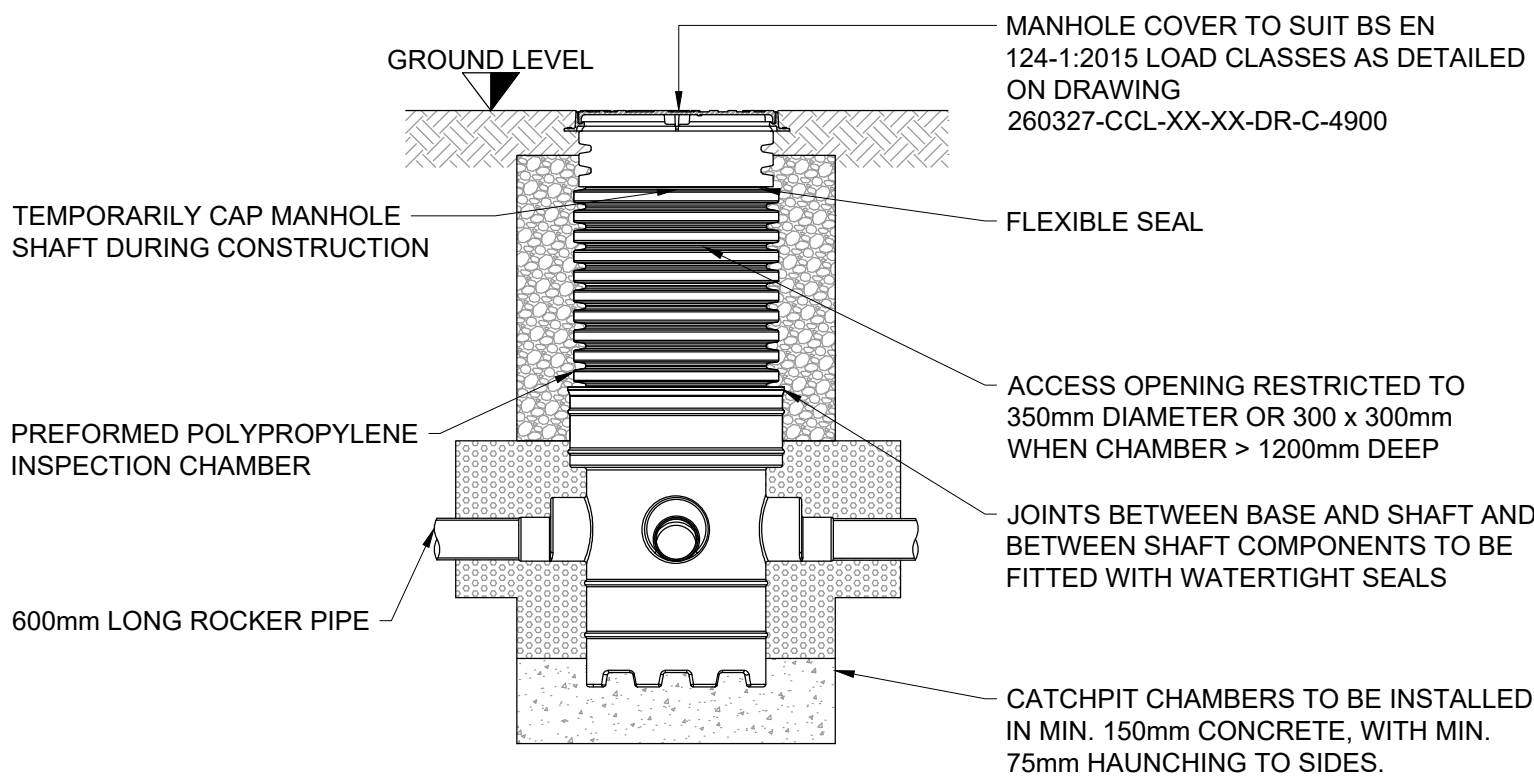
PIPE RUNS NEAR BUILDINGS
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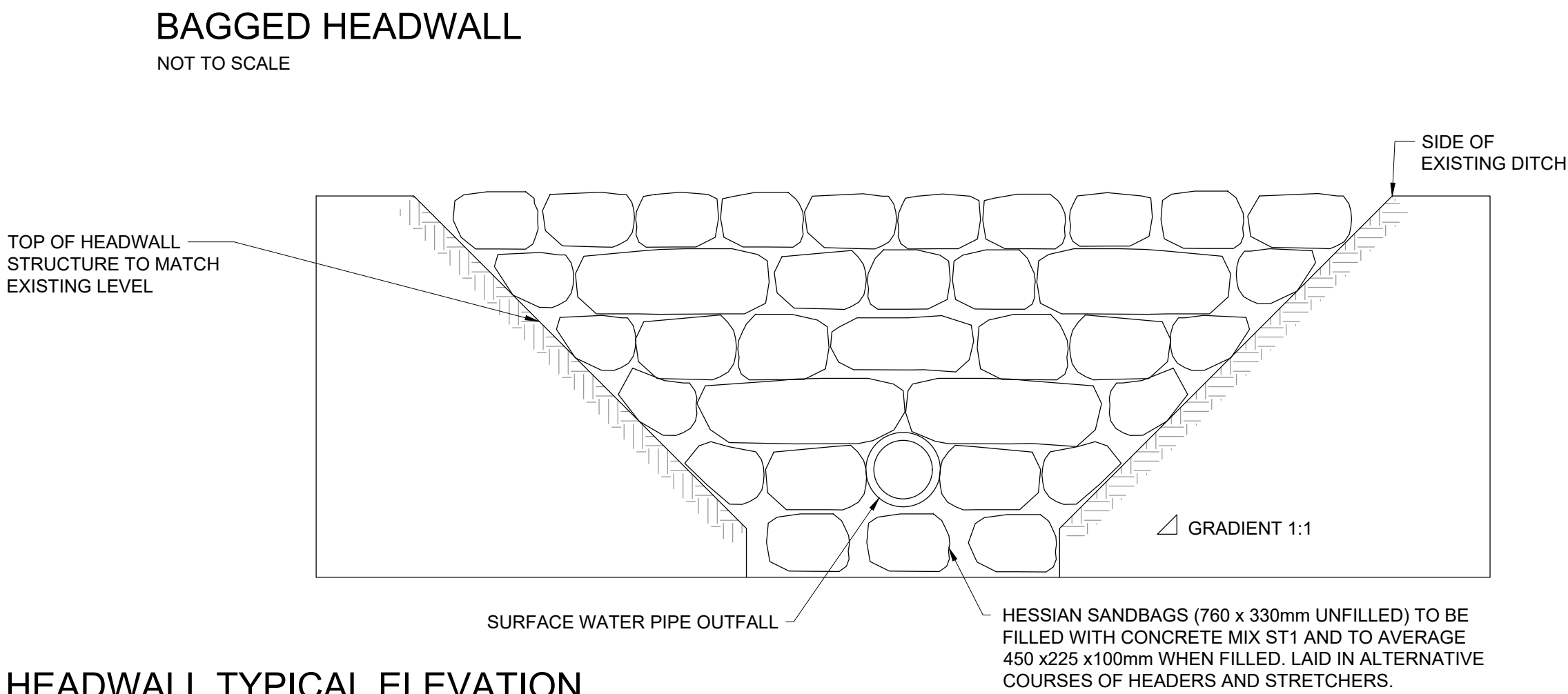
PERMEABLE PAVING / COLLECTOR DRAIN DETAIL
SCALE 1:20



BAGGED HEADWALL
NOT TO SCALE



TYPICAL TURTLE ENVIRO CATCHPIT DETAIL
CATCHPIT CHAMBER IN SOFT LANDSCAPED AREAS
SCALE 1:20



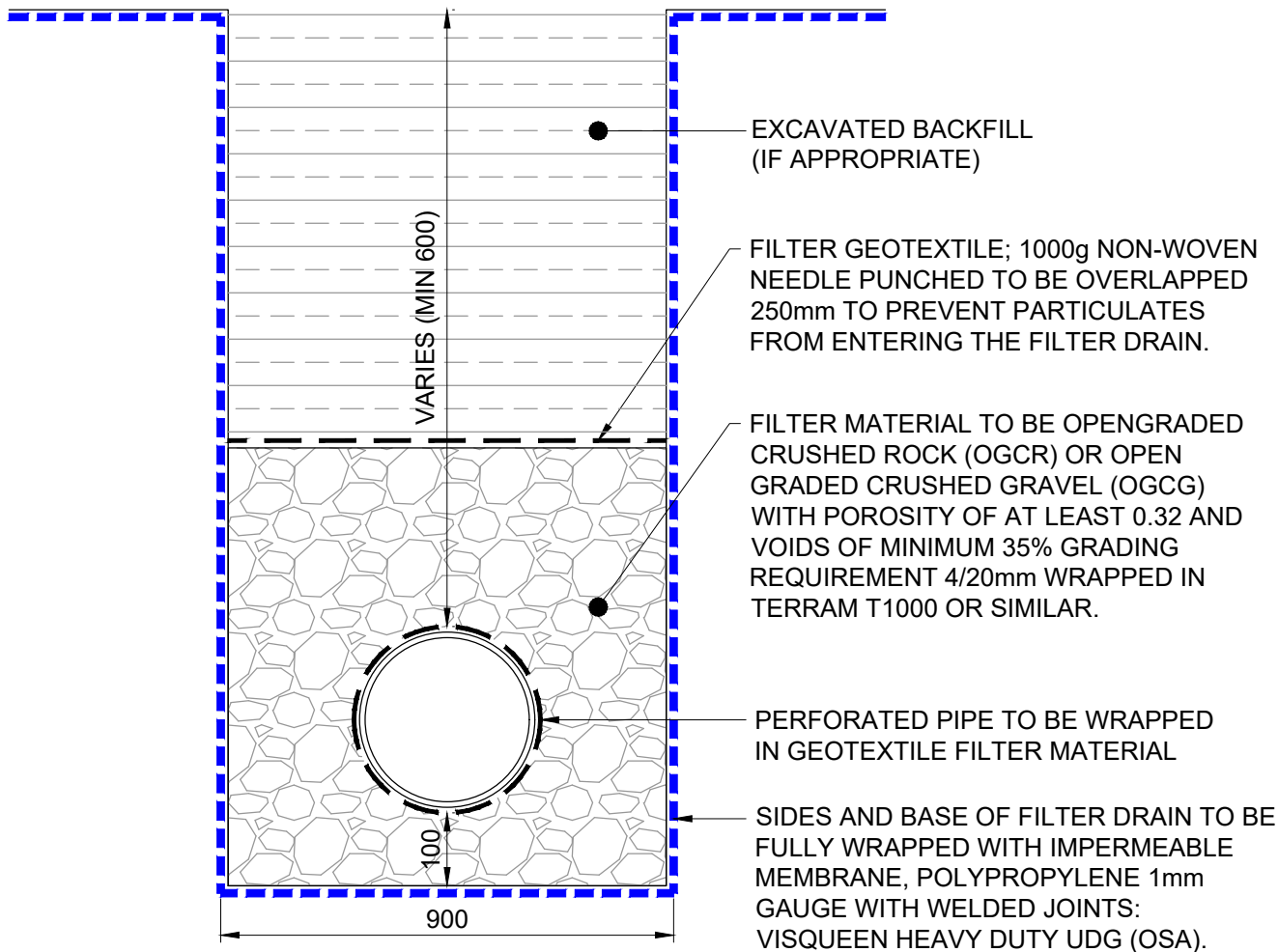
HEADWALL TYPICAL ELEVATION
NOT TO SCALE

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NON-INFILTRATING FILTER DRAIN DETAIL
SCALE 1:10

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P01	13.07.2026	PRELIMINARY ISSUE	OG	MH
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client
NICK & EMMA HERBERT

architect

project
LAND ADJACENT TO MERCHISTON, BLAKES LANE, WARGRAVCE, RG10 9TA

title
**PROPOSED PRIVATE DRAINAGE:
SURFACE WATER
CONSTRUCTION DETAILS SHEET 1 OF 2**

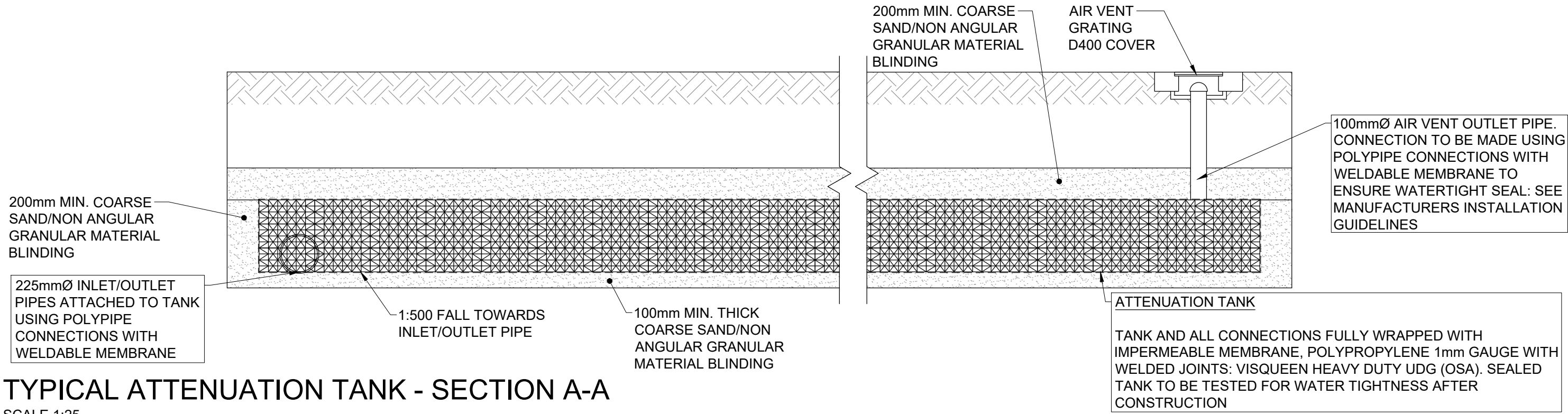
CCL ref:	drawn	design	checked	scale	size	date
260327	OG	OG	MH	AS SHOWN	A1 (P)	13.07.2026

status:
S3 - SUITABLE FOR REVIEW & COMMENT

drawing number	revision
260327-CCL-XX-XX-DR-C-4900	P02

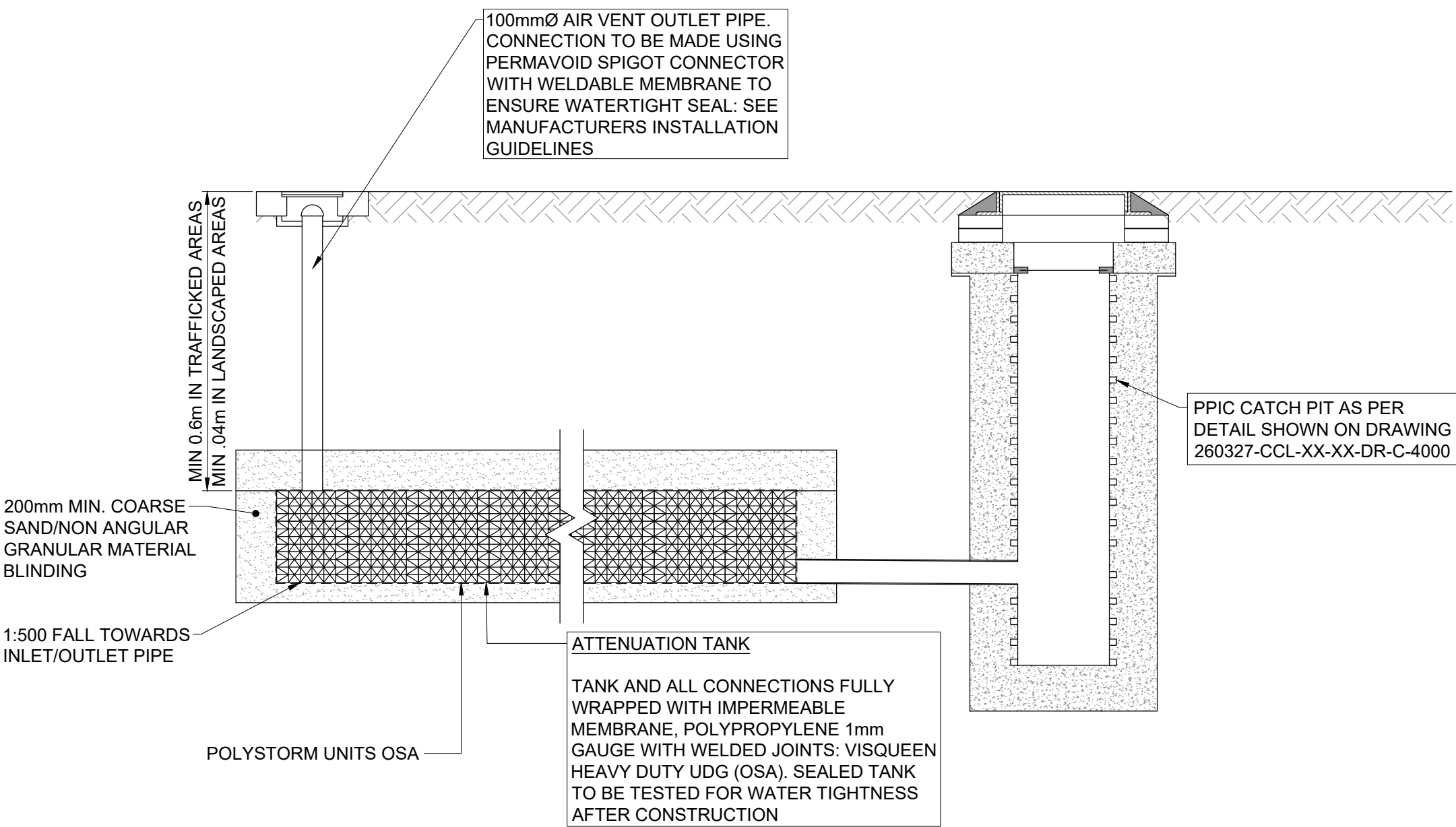
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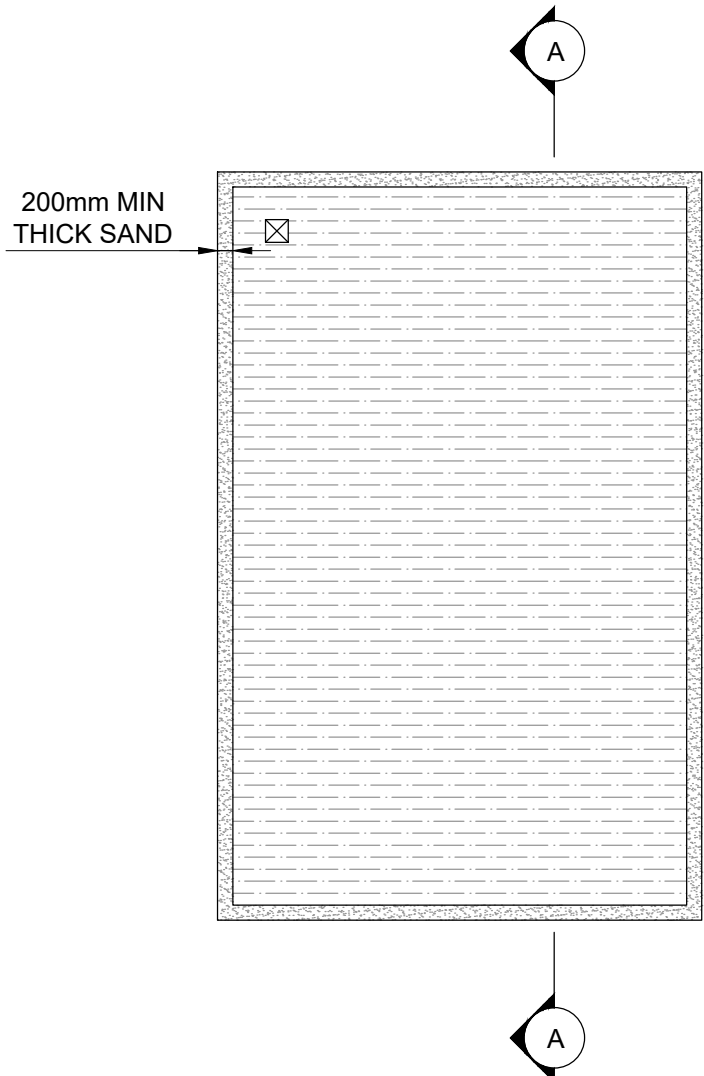
TYPICAL ATTENUATION TANK - SECTION A-A

SCALE 1:25



TYPICAL ATTENUATION TANK & CATCHPIT CONNECTION

SCALE 1:25



TYPICAL ATTENUATION TANK PLAN

1:100

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NICK & EMMA HERBERT

architect

project
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**PROPOSED PRIVATE DRAINAGE:
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CONSTRUCTION DETAILS SHEET 2 OF 2**

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260327-CCL-XX-XX-DR-C-4910	P02

Appendix E
Maintenance & Management Strategy



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Maintenance Strategy

Project Ref: 260327
Document Ref: 260327-CCL-XX-XX-RP-C-1100
Site: Land Adjacent to Merchiston, Blakes Lane, Wargrave,
RG10 9TA
Client: Nick & Emma Herbert
Prepared By: Olly Gardiner
Date of Report: 19.07.2026
Revision: P02
Status Code: S3 – Ready for Review & Comment

Document Issue Record

The table below provides a record of document issue and revision history:

Revisions					
Rev	Description	Prepared By	Checked By	Approved By	Date
P1	Preliminary Issue	OG	MH	MH	13.07.2026
P2	Revised in line with comments	OG	MH	MH	19.07.2026

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Appendices

Appendix A - SuDS Maintenance Inspection Checklist

1 INTRODUCTION

This SuDS Operation and Maintenance Strategy has been produced in line with the recommendations of the CIRIA SuDS Manual (C753) and includes a number of extracts from that document.

For further information please refer to the full document, which can be downloaded free of charge at:

http://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

In addition to the recommendations in this manual, please also refer to the specific maintenance guidelines provided by the manufacturers of any proprietary products that have been used in the construction of the SuDS.

2 SUDS COMPONENTS WITHIN THE DEVELOPMENT

The development contains a number of SuDS components that will require on-going inspection and maintenance. The primary components are as follows:

- **Package Pumping Station** (A system which will pump surface water from one location to another, when there isn't enough fall via gravity);
- **Permeable Paving** (a surface suitable for pedestrian and/or vehicular traffic, that provides a treatment medium and allows rainwater to be temporarily stored and infiltrate into the ground);
- **Catch Pit** (chambers to facilitate the collection of sediment);
- **Attenuation Tank** (a purpose-built tank, designed to store rainwater in high intensity storms);
- **Filter Drain** (a linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage. For treatment of surface water)
- **Pipes** (used to convey water within the drainage network)

3 SUMMARY OF DESIGN INTENT

The proposal is for the construction of a single dwelling at Blakes Lane, Wargrave, R10 9TA. The proposed development area of the site falls from the northwest to the southeast, and a drainage ditch runs adjacent to the southern boundary. Drainage on site will be designed to convey surface water away from the proposed dwellings and not impinge on adjacent sites.

The ground conditions indicate that infiltration is not feasible, and therefore an alternative method of discharge to the ditch adjacent to the back garden has been established, working through the SuDS hierarchy from top down.

Surface water from buildings will be collected via rainwater downpipes and directed to either the filter drains or the traditional piped network. Flows will then be conveyed to catch pits, which will remove silt and larger particles that enter the network before water is conveyed to a flow control chamber, which will restrict flows to a maximum discharge rate of 5.2l/s using the minimal permissible orifice plate, with a 50mm diameter, to reduce the rate of discharge to the ditch whilst maintaining functionality. Before discharge, surface water will be pumped south as there is not enough fall to reach the ditch at a suitable invert level.

The proposed surface water drainage layout, calculations and details can be seen in Appendix C & D.

Surface water landing on the permeable paved driveway will be collected in the sub-base, which will provide attenuation. The permeable sub-base is proposed to be underlain by a collector drain, which will direct flows downstream to the wider network. The hardstanding paved areas at the back of the dwelling will fall towards a filter drain, which helps to provide treatment prior to discharge.

4 INSPECTIONS

As part of the ongoing management of most SuDS components, there is a need for regular inspections to ensure that blockages, silt and excess litter are not adversely affecting the component or scheme. It is important that this is carried out and time is allowed for corrective action to be taken.

Routine inspections should be carried out once a month for most components, particularly for the first year after installation. This frequency can then be reviewed (and if appropriate, reduced). It is proposed that either the individual property owners or a maintenance company operating on their behalf will maintain the proposed permeable paving. It is proposed that Anglian Water or a maintenance company operating on their behalf will maintain all other SuDS associated with the proposed development.

Recurring attendance by the same person ensures monitoring of the drainage system, a rapid response to problems and “ownership” of the SuDS components. The inspections should be recorded on a maintenance record.

5 OPERATION AND MAINTENANCE REQUIREMENTS FOR THE PACKAGE PUMPING STATION

The maintenance requirements of the package pumping station are subject to the specific package pumping station chosen to be installed. It is recommended that the manufactures recommendations for maintaining the package pumping station are satisfied.

6 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 manufacturers' 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 50 mm of the 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, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

7 OPERATION AND MAINTENANCE REQUIREMENTS FOR CATCHPIT

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Removal of litter and debris.	6 monthly.
Occasional Maintenance	Change of filter media.	As required.
	Removal of sediment, oil, grease and floatables.	As required.
Remedial Actions	Clear perforated pipework blockages.	As required.
Monitoring	Inspect for evidence of poor operation.	Six monthly.
	Inspect filter media and establish appropriate replacement frequencies.	Six monthly.
	Inspect sediment accumulation rates and establish appropriate replacement frequencies.	Monthly during first half year of operation, then every six months.

8 OPERATION AND MAINTENANCE REQUIREMENTS FOR ORIFICE FLOW CONTROL CHAMBER

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Removal of litter and debris.	6 monthly.
	Removal of sediment, grease and floatables.	As required.
Remedial Actions	Clear perforated pipework blockages.	As required.
Monitoring	Inspect for evidence of poor operation.	Six monthly.
	Inspect and establish appropriate maintenance frequencies.	Six monthly.
	Inspect debris accumulation rates and establish appropriate maintenance frequencies.	Monthly during first half year of operation, then every six months.

9 OPERATION AND MAINTENANCE REQUIREMENTS FOR ATTENUATION TANK

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 risk to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment, algae or other matter, remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-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

10 OPERATION AND MAINTENANCE REQUIRED FOR FILTER DRAINS

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods	As required
	At locations with higher pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

11 OPERATION AND MAINTENANCE REQUIREMENTS FOR PIPES

The drainage network has been designed to ensure the pipes are at self-cleansing velocities. However maintenance measures are still prudent and the below table shows the suggested inspection and maintenance requirements.

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove debris or silt from the system	Annually, or as required
Remedial Actions	High pressure jetting to clean pipe network	As required
Monitoring	Inspect catchpits and chambers for silt build-up	Monthly for 3 months, then annually

13 EMERGENCY ACTION IN CASE OF SPILLAGES

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore, small spillages of substances that are known to be harmful to the environment should be removed where possible using soak mats as recommended by the Environment Agency, with residual spillage allowed to bioremediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or closely woven fabric.)

Contact the Environment Agency immediately on the following number.

24-hour incident hotline – 0800 80 70 60

Or if less urgent contact the regional office:

Iceni House, Cobham Road, Ipswich, Suffolk, IP3 9JD. Tel. 03708506506

Queries regarding a design feature – In the event of a concern or failure of a SuDS design feature contact:

Canham Consulting

Second Floor, 69-75 Thorpe Road, Norwich, NR1 1UA

T: (01603) 430650

E: clientservice@canhamconsulting.co.uk

W: www.canhamconsulting.co.uk

Appendices

Appendix A
SuDS Maintenance Inspection Checklist

Project Name: Land Adjacent to Merchiston, Blakes Lane, Wargrave, RG10 9TA

CCL Ref: 260327

Maintenance Strategy | P1

Appendix A – SuDS Maintenance Inspection Checklist								
General Information								
Site ID								
Site location and co-ordinates (GIS if appropriate)								
Elements forming the SuDS scheme			Approved drawing reference(s)					
Inspection frequency			Approved specification reference					
Type of development			Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)					
Inspection date								
	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date completed
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								

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Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes , state depth (mm) and extent. Is removal required? If yes , state waste disposal requirements and confirm, that all waste management requirements have been complied with (consult environmental regulator)								
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?								
Does permeable or porous surfacing require sweeping to remove silt?								
System blockages and litter build-up								
Is there evidence of litter accumulation in the system? If yes , is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Vegetation								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes , state action required								
Infrastructure								
Are any check dams or weirs in good condition?								

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Maintenance Strategy | P1

Is there evidence of any accidental damage to the system (eg wheel ruts?)								
Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
Other observations								
Information appended (eg photos)								
Suitability of current maintenance regime								
Continue as current								
Increase maintenance								
Decrease maintenance								
Next inspection								
Proposed date for next inspection								



Canham
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