Scott White and Hookins

Scott White and Hookins
Harman House
Andover Road
Winchester
Hampshire
SO23 7BS

T +44 (0)1962 844855
info@swh.co.uk

Land at Winchester Road, Boorley Green

Drainage and Flood Risk Statement December 2024

SO-2977-03-CE-RP-0500

Revision 05

Prepared by: Ian Llewellyn

Revision 01 – 02 July 2024
Revision 02 – 17 July 2024
Revision 03 – 25 July 2024
Revision 04 – 29 November 2024
Revision 05 – 13 December 2024
Revision 06 - March 2025

Structural Engineering
Civil Engineering
CDM Consultants
Sustainability and BREEAM
Traffic and Transport
Flood Risk Assessments
Highway Engineering
Event Engineering

1.1 Development

The development proposals comprise of a new residential apartment building and is located on a brownfield site. The proposed apartment building contains 52 retirement units and 2 houses located to the east which both have direct access from Winchester Road. The existing site is located in the grounds of Oak Cottage, Boorley Green. The site is made up of an access off Winchester Road into an existing overgrown hard standing area and a couple of old sheds. The remainder of the site is an open field once used in part as an orchard and with tree stumps and existing trees. The site is flanked on three sides by mature trees and hedgerows and by Winchester Road to the east. Based on the utility information on the topographical survey, there are no existing drainage networks within the existing site, there is an existing Southern Water foul sewer located on the northern side of Winchester Road but no evidence for surface water runs. There are two watercourse ditches to the north either side of an existing public footpath. There is an existing pipe in the north-western corner of the site which connects the two ditches together. The majority of existing rainwater discharges to these existing ditches through natural overland flow and groundwater flow.

1.2 Location

The site is located to the west of Winchester Road, Boorley Green, Hampshire, SO32 2UA. Grid Reference SU 450470 114825 and is approximately 0.910ha in area.

Figure 1 Site location plan (wider area)

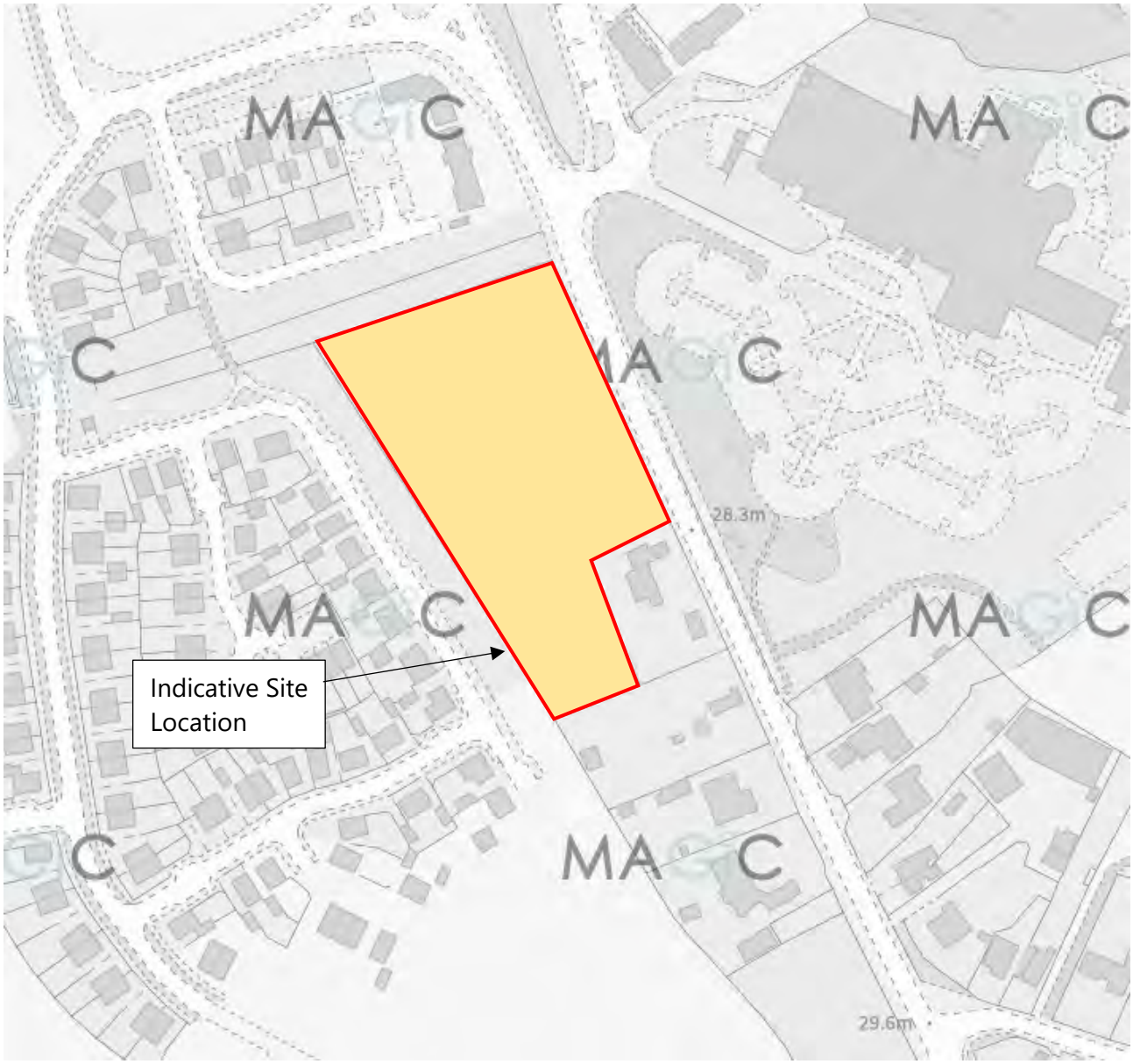


Figure 2 Site location plan (local area)

Winchester Road slopes downwards from the south to north. The existing site is generally flat but is higher in the south at 27.78m AOD to the northwest corner at 27.21m AOD. See **Appendix A** for the existing topographical survey which covers the site.

1.3 Flooding

The proposed development classed as 'More Vulnerable' scheme under table 2 of the NPPF. The site is located in Flood Zone 1. Sequential test and exception tests are therefore not required.

	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
FZ1					
FZ2		ETR			
FZ3a	ETR		ETR		
FZ3b	ETR				

Green – Development appropriate.
Red- Development not permitted.
ETR – Exception test required to allow development.

This report considers the flood risk to the proposed development and the impact that the development will have in relation to flooding of adjacent areas and watercourses. It also considers any limits relating to flooding that are likely to be imposed to allow the development to be undertaken and recommends Sustainable Urban Drainage systems (SUDS) to control surface water runoff.

This report takes into account outline requirements of NPPF and local policies and is based on information received from the Environment Agency (EA) website, Eastleigh Council and Southern Water – see **Appendix C** for sewer maps.

Eastleigh Borough Council have a level 1 Local plan strategic flood risk assessment undertaken by Aecom dated 2023 and 2024. The recently adopted Local Plan contains a policy addressing Flood Risk and Sustainable Drainage Systems (Policy DM5). This report shows how the proposal meets the requirements of the Local Plan

2.0 Surface Water Strategy

Ridge undertook a ground condition study site investigation [ref: 5024854-RDG-XX-ST-DOC-C-00GC01] Issued in June 2024 on behalf of McCarthy Stone. BGS borehole date confirms the overlying ground is shallow topsoil and made ground. Underneath is a layer of Wittering Formation bedrock comprising of clay and silt. Five machine excavated infiltration tests were performed in June 2024 within proposed soft landscaping and car parking. These tests were carried out to a depth between 0.65m and 2.25mbgl in accordance with BRE digest 365 standards. **Appendix B** shows the location of the trial pits and infiltration results.

Groundwater was encountered within the majority of the boreholes and found to be at a depth of 0.8m to 1.7m bgl at an approximate level of 26.50-26.80mAOD. Due to the presence of groundwater and the lack of suitable infiltration results from the site investigation, discharge of surface water via infiltration devices such as swales or basins is not feasible, however the site has an existing ditch along the northern boundary.
This ditch provides drainage from the undeveloped site and has suitable capacity within it to accommodate the proposed controlled discharge from the site.

2.1 Drainage Catchment Areas

For the purposes of this planning report, we have provided an indicative drainage proposal for the whole site split into two areas as follows.

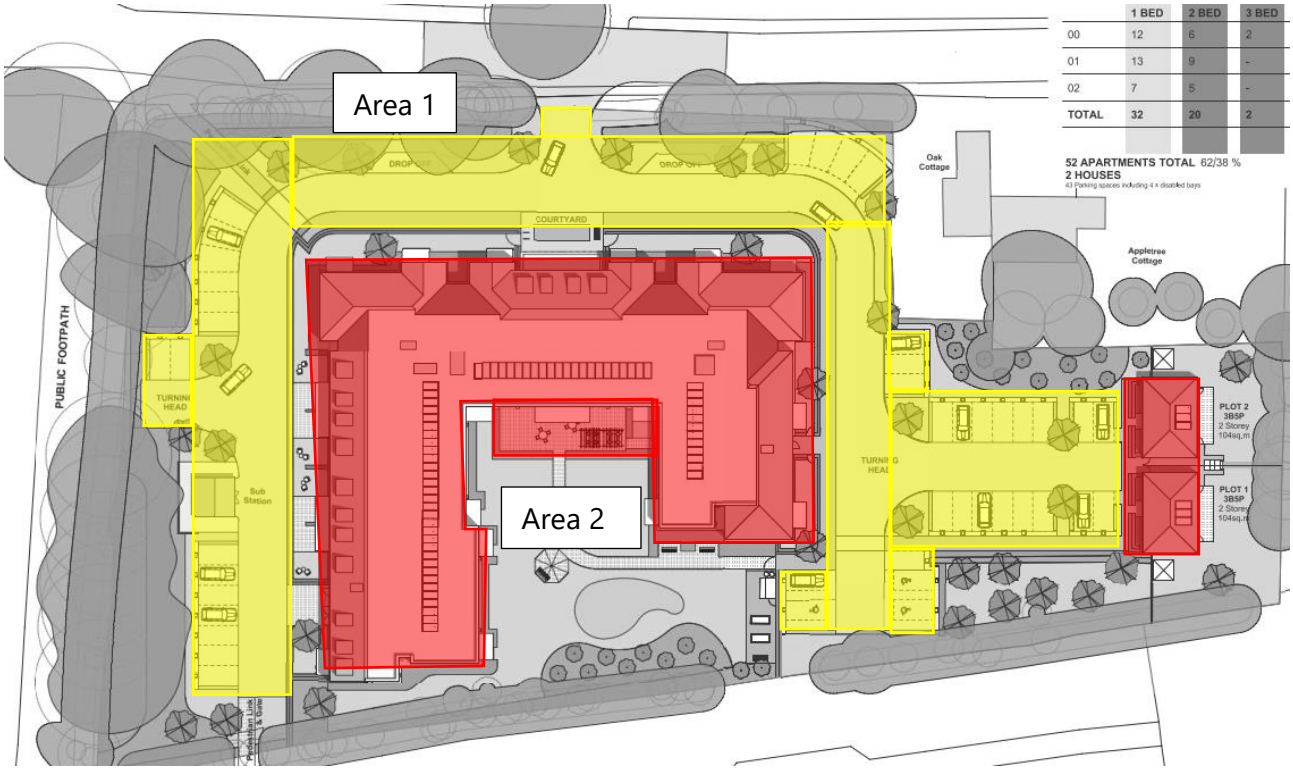


Figure 4 - Site Drainage Areas

2.1.1 Area 1 (yellow)

Area 1 covers the proposed access road and parking spaces for the proposed McCarthy Stone independent retirement living apartment building. The drainage strategy for the car park is for surface water to fall towards the parking spaces or new gullies. Surface water falling towards the parking spaces will infiltrate into the permeable sub-base via the permeable block pavers. Water from the gullies will discharge directly into the permeable sub-base via distribution units. The surface water within the permeable sub-base discharges to the perforated pipe laid at the bottom of the sub-base and this is connected to the attenuation crates and discharges to the existing ditch north of the site boundary via a Hydrobrake chamber controlling the discharge rate to existing greenfield runoff rates. A swale is provided prior to existing ditch to aid water treatment which is discussed in further detail in section 2.5.

Area 1 Access Road and Parking Area	2488 m^2	**0.249 ha**

2.1.2 Area 2 (red)

Area 2 covers the proposed impermeable roof area which is based on the main ground floor level plus the two houses located on the southern end of the site. The impermeable roof area drains via rainwater downpipes into a lined cellular crated attenuation tank located under the access road on the northern side of the building. This connects into the Hydrobrake chamber providing a controlled flow as identified from Area 1.

Area 2 Impermeable Roof Area	2167 m^2	**0.217 ha**

2.2 Existing Surface Water Drainage

The existing site slopes from a high point in the southeast to a low point in the northwest corner. The current site does not consist of any surface water drainage networks except for a shallow depression along the eastern boundary of the site which forms in a ditch along the northern boundary of the site. Beyond the northern boundary there is a public footpath and a more formalised ditch/watercourse flowing in an east-west direction.

In the northwest corner of the development site the northern boundary ditch appears to end with a 225mm diameter culverted pipe passing under the public footpath and discharging directly into the adjacent watercourse.

The invert level of the pipe has been surveyed and confirmed to be 25.75mAOD. This confirms the pipe is located at the lowest point of the site – see adjacent image.

For developments on greenfield sites surface water runoff it is to be kept at greenfield runoff rates.

The greenfield flows are as follows:

5 l/s/ha = overall site area 0.901ha = 4.51 l/s
5 l/s/ha = proposed impermeable area 0.466ha = 2.3 l/s
QBAR flow = 2.4l/s
1 in 1 year flow = 2.0l/s
1 in 30 year flow = 5.4l/s
1 in 100 year flow =7.6l/s

Existing / Greenfield runoff rates calculations can be found in **Appendix D**

It is proposed to limit discharge to the existing ditch to just below the Qbar rate at 2.4 l/s

2.3 Drainage Storage

2.3.1 The overall drainage network has been assessed as a complex attenuation storage device within Microdrainage with a further Network check undertaken within Site 3D. The system is set up with a single flow control device limiting the flow off site to the ditch to 2.2 l/s.

2.3.2 Attenuation storage is provided by a combination of the deep cellular crate attenuation tank below the car park and the permeable car park sub-base at the higher level.

2.3.3 The complex attenuation calculation assumes the attenuation is shared between both devices and the volume of storage is shared according to the water level in the system. Orifice plates are located within the manholes which form the perforated pipe below the car park sub-base and these aid to control the flow and manage the water level across the permeable sub-base attenuation.

2.3.4 Calculations demonstrate in a 1 in 100 year event plus climate change allowance the peak water level reaches the top of the permeable sub-base. This is below the car park cover level ensuring there is no ponding and the building is safe.

Open Graded Sub-base

This is open graded sub-base across the extent of the car park designed to comprise an area of 7 x 320m = 2240m^2 with a minimum depth of 350mm, resulting in an overall storage capacity of 1920 x 0.35 x 0.3 porosity = 235.2m^3.

Cellular System

This is a cellular crate attenuation tank located below the access road with approximately 800mm cover above the crates.

The overall size of the crates are to be 5m x 25m x 0.8m deep to provide an overall storage capacity = 95m^3

An indicative drainage layout is provided in **Appendix E.** Indicative construction details have also been provided within Appendix E which shows the intended road build-up, showing the impermeable layer at the base forming the attenuation, and perforated pipe to aid discharge from the permeable sub-base.

The drainage has been designed using Microdrainage Source control and Site 3D Network modelling and is in **Appendix F**. The systems have been checked for a 1 in 100-year event with 45% climate change allowance and has a half drain period less than 24hrs. The network model confirms a small volume of flooding will occur in a 1 in 100 year event plus climate change however the depth will be very shallow and will not impact upon the proposed building.

2.4 Flotation Assessment

2.4.1 Due to the presence of groundwater on site the attenuation crates will need to be surrounded with an impermeable membrane to prevent water ingress and the underside of the permeable sub-base car park will be lined with an impermeable membrane.

2.4.2 Groundwater levels vary across the site from 26.42mAOD to 27.26mAOD. These levels were taken in March 2024 after a particularly wet winter and would it would reasonable to assume these would be at or close to the likely peak levels on the site.

2.4.3 In proximity to the proposed attenuation tank the peak groundwater level was recorded as 26.75mAOD.

The proposed cellular attenuation storage invert level is 26.00mAOD with top of crates at 26.80mAOD.

For the purposes of design assume a worst case scenario of groundwater level at the top of the cellular crates and an empty storage.

Uplift due to groundwater = 10kN/m^3 x 0.8m height = 8kN/m^2

Based on proposed car park construction detail the ground level during the construction works will be 27.610mAOD over the attenuation storage. The build up over the cellular crates will comprise of following

- 110mm base course tarmac – weight = 20kN/m^3 x 0.11m height = 2.2kN/m^2
- 350mm permeable sub-base stone – weight = 21kN/m^3 x 0.35m height = 7.35kN/m^2
- 400mm soil – weight = 18kN/m^3 x 0.4m height = 7.2kN/m^2
- Total weight above tank = 16.75kN/m^2 therefore factor of safety on uplift = 2.09

Groundworks contractor to maintain dewatering on site during the construction of the cellular crates and until the construction running surface is completed.

The invert level of the car park permeable sub-base is typically 27.20mAOD which is generally above the measured groundwater level on site. Should any pockets of ground water be found during the

formation of the car park sub-base, dewatering will be required until the full depth sub-base has been installed which will provide adequate ballast against uplift.

Whilst the invert level of permeable sub-base is above the groundwater level, the depth of the proposed perforated pipe varies, becoming deeper towards the attenuation tank. Lowest invert of the perforated pipe is 26.230mAOD and so there will likely be 1m maximum depth of the perforated pipe below the groundwater level.

Providing the pipe is installed whilst dewatering works are being undertaken, or the pipe is installed filled with water, the perforated pipe can be backfilled with the permeable sub-base material which will provide sufficient weight to prevent uplift.

2.5 Surface Water Quality

Table 26.2 in CIRIA 753 provides classifications for pollution hazard indices for different land uses.

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 (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg 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[1]	High	0.8[2]	0.8[2]	0.9[2]

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[5]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 26.2 shows the development falls within the low hazard level.

Table 26.3 shows the mitigation indices for systems discharging to surface waters.

Ideally infiltration trenches are the most suitable form of mitigation for low hazard levels. However, due to the constraints of the site, this is not feasible. Roof drainage is collected via catchpits and a Downstream Defender device will be provided prior to the attenuation tank to provide the mitigation for discharge from the building. The access road is graded to permeable surfacing in the parking areas or to gullies which discharge directly in to the sub-base, with the permeable sub-base providing the appropriate mitigation indices as set out in Table 26.3.

Where gullies have been located within the access road, these gullies will discharge directly into the permeable sub-base via distribution units. The water will then be treated within the sub-base prior to flowing into the perforated pipe and ultimately off-site via the attenuation tank and flow control device.

Hazard mitigation indices calculations are set out below

Residential car parks

Residential car park pollution hazard (see Table 26.2) – TSS 0.5, Metals 0.4 and Hydrocarbons 0.4

Mitigation – Permeable pavement and sub-base – Mitigation indices (Table 26.3) – TSS 0.7, Metals 0.6 and Hydrocarbons 0.7

Mitigation exceeds the pollution hazard indices therefore the Simple Index Approach is satisfied for the residential road.

Building roof area

Residential roof pollution hazard (see Table 26.2) – TSS 0.3, Metals 0.2 and Hydrocarbons 0.05

Mitigation – Downstream Defender Vortex – Mitigation indices (see proprietary data below) – TSS 0.3, Metals 0.2 and Hydrocarbons 0.2

Model	Downstream Defender® Select Mitigation Indices [(a)(b)]		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons (Oils)
Vortex	0.3	0.2	0.2

Mitigation exceeds the pollution hazard indices therefore the Simple Index Approach is satisfied for the building roof area.

In line with Eastleigh Borough Council Local Plan Policy DM6, there is a requirement for additional naturalised treatment to be provided from the proposed development. It is proposed to form a vegetated swale within the north-west corner of the site with the controlled discharge from the Hydrobrake discharging into the swale via a headwall. The outlet from the swale will discharge into the existing ditch and culverted pipe previously identified.
The purpose of the vegetated swale is to provide additional treatment in line with the EBC Local Plan and the swale has been assumed to not provide any benefits with regards the hydraulic design, hence why this feature is not included within the design calculations.

The layout and features of the vegetated swale align with the guidance provided within the SUDs Manual and provide further treatment benefits above the pollution hazard mitigation outlined above.

2.6 Surface Water Maintenance

2.6.1 The table below provides information in relation to the required inspections and maintenance for long term management of the surface water strategy. The Maintenance will be provided by a private maintenance company.

2.6.2 All those responsible for maintenance should take appropriate health, safety and welfare precautions for all activities including lone working, if relevant, and risk assessments should always be undertaken. The sites infrastructure Health and Safety File should be consulted before carrying out any works either inside or outside of the development's boundary and information regarding the location of existing utilities passed on to operatives.

2.6.3 The requirements of the Health and Safety at Work Act 1974 and The Construction (Design and Management) Regulations 2015 should be adhered to and any residual risks identified in the Health and Safety File should be managed and information passed on the maintenance operatives through task specific risk assessments.

2.6.4 There are three types of maintenance activities associated with surface water drainage systems.

The SuDS Manual, CIRIA C753, defines these as:

- Regular Maintenance – 'basic tasks undertaken on a frequent and predictable schedule' including vegetation management, litter and debris removal, and inspections.'
- Occasional Maintenance – 'tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).'
- Remedial Maintenance – 'intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.'

Operation and Maintenance Activity	SuDs Component		
	Piped Network / Inspection Chambers	Cellular / Modular Storage	Permeable Pavement
Regular Maintenance			
Inspection	■	■	■
Litter and debris removal	■	□	■
Grass cutting		□	□
Weed and invasive plant control			□
Occasional Maintenance			
Sediment management	■	■	■
Vacuum sweeping and brushing			■
Remedial Maintenance			
Structure rehabilitation/ repair	□	□	□
Infiltration surface reconditioning			□
■ **Will be required**	□ **May be required**		

Extract from The SuDs Manual Table 32.1 : Typical key SuDs components operation and maintenance activities

Piped Network/Chambers Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then six monthly
	Debris removal from catchment surface / gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair / rehabilitation of gratings, inlets and outlets	As required
Monitoring	Inspect / check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed	Annually and after large storm events
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of features or pipework is required.	As required

Cellular Storage Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then annually.
	Remove debris from catchment surface (where may cause risks to performance)	Monthly
	Remove debris from catchment surface (where may cause risks to performance)	Annually or as required
Remedial Maintenance	Repair / rehabilitate inlets, outlets, 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 and after large storm events
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of storage units is required.	As required
The SuDS Manual Table 21.3: Operation and maintenance requirements for attenuation storage tanks		

Maintenance of the vegetated swale will comprise of standard grass moving and vegetation maintenance. This should be undertaken on a regular basis as part of any general mowing and landscaping works as part of the development site – typically every two to four weeks depending on the seasonal weather.
Grass and vegetation should be kept to a minimum length of 4-6 inches to ensure it does not fold over during excessive water flow although the flow is expected to be minimal.
Grass and plant cuttings should be disposed of offsite to remove any potential pollutants.

2.7 Surface Water Exceedance Flows

2.7.1 The proposed surface water drainage system has been designed to accommodate runoff during storm events up to the 1 in 100 annual probability event including climate change. In excess of this it is possible that the design standard for the system will be exceeded.

2.7.2 To ensure that in an exceedance event any flooding does not affect properties or discharge from the development, flows will be managed on site. This will be achieved in the same way as the existing site drains, by following the natural topography on the site, flowing in a south to north direction.

2.7.3 Any exceedance flows will discharge from the permeable sub-base on the northern edge of the site, flowing away from the proposed building and following the natural levels to the existing ditch on the northern edge of the site. Site levels are designed to direct flows away from the buildings and towards areas such as access roads, car parking or formal landscaping where temporarily shallow flooding can occur. The drainage plan shown enclosed in **Appendix H** has been annotated to show the flood exceedance routes away from the building and towards the north-western corner of the site.

3.0 Potential Flood Risk

3.1 Fluvial Flooding (overtopping of watercourses)

There are no main rivers in the local vicinity of the site. The ordinary watercourse along the northern boundary does not present a fluvial flood risk. Floodplain mapping provided by the Environment Agency (EA) indicates that the site is wholly within Flood Zone 1. Flood zone 1 is defined as comprising 'land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%)'. See extract of flood maps in **Appendix G**.

Site levels range from 28.05 on the north-eastern boundary down to 26.35 in the north-west corner of the site. The EA flood map enclosed in **Appendix G** demonstrates the site is at low risk of flooding and is located a significant distance from any areas of flood risk.

3.2 Surface Water Flooding

The surface water flood map shows the site is at very low risk of surface water flooding with low risk of surface water flooding occurring in the ditch on the northern boundary which would be expected as the existing natural drainage route for the site. The definitions for each surface water flood risk category are defined in the Table below:

Risk of flooding	**Probability**
Very low	< 1 in 1000 (0.1%)
Low	1 in 1000 (0.1%) - 1 in 100 (1%).
Medium	1 in 100 (1%) - 1 in 30 (3.3%)
High	>1 in 30 (3.3%)

The surface water velocity map in a low-risk scenario shows there are no overland flow routes near or through the boundary or the site.

The surface water flood depth map shown in **Appendix G**.

3.3 Groundwater Flooding

The SI carried out for the site recorded groundwater strikes within majority of the sampling locations and further monitoring has been undertaken. This indicated groundwater to generally be found between 0.8m and 1.7m bgl.

The Strategic Flood Risk Assessment produced by Eastleigh Borough Council provides mapping on groundwater mapping for areas susceptible to groundwater flooding. The development site is located in an area considered to have less than 25% chance of groundwater flooding with the BGS mapping stating "limited potential for groundwater flooding to occur".

The proposed development will provide a new positive drainage system to drain the overall site as per the existing natural arrangement. The nature of the new drainage system will

not increase the risk of groundwater flooding and it would be considered the overall risk of groundwater flooding to be low on site and the proposed drainage strategy provides adequate mitigation for the building.

3.4 Reservoir Flooding

Given the lack of any known significant reservoirs within the local area, as expected the EA flood maps show the site is at no risk of reservoir flooding.

3.5 Sewer Flooding

There are foul sewers within the site. There is no risk of sewers flooding.

3.6 Historical Flooding

There are no historical records of flooding at this site.

4.0 Foul Drainage

4.1 The indicative foul sewer drainage strategy comprises of a gravity network which discharges from the ground floor to a foul pumping station located on the eastern side of the building. From the foul pumping station the foul water is pumped to the Southern Water sewer located on Winchester Road as shown on the drainage strategy drawing located in **Appendix E:**

4.2 Foul Water loads

The indicative gravity fed system is to be designed in accordance with the guidance document: British Water Flows and Loads. The following table provides the required loadings.

Table of Loadings for Sewage Treatment Systems

Per person / activity / day (unless otherwise specified)	FLOW	BOD	Ammonia as N
DOMESTIC DWELLINGS (Grams)	(Litres)	(Grams)	
Standard residential	150	60	8
Mobile home type caravans with full services	150	60	8

4.2.1 Proposed foul sewer calculations are based on the standard residential flow rate indicated in the table above plus the average number of occupants in each unit.

52 apartment units
2 x 3 bed houses

Total occupancy = 52 + (2 x 5) = 62 persons

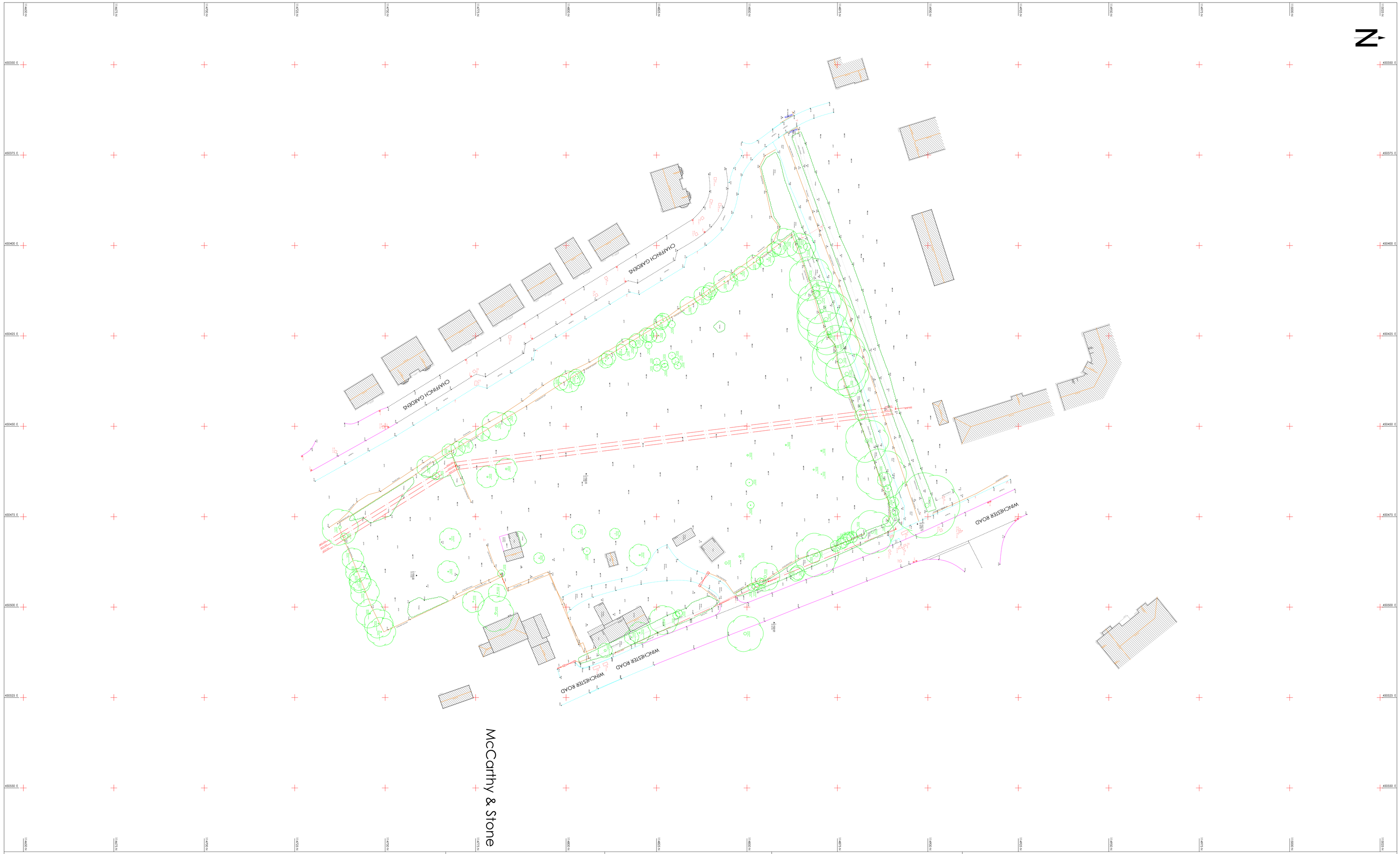
62 units x 150 litres per day = 9,300 litres per day (9.30m^3)

9300 / 24 hours = **387.5 litres per hour**
387.50 / 60 minutes = **6.46 litres per minute**
6.46 / 60 seconds = **0.108 litres per second**

A capacity check enquiry has been submitted to Southern Water and we await the results.

4.2.2 The proposed pump station will need to incorporate storage to accommodate 24 hours of foul flow – 9.3m^3.

Appendix A
Existing Topographical Survey



Redline Surveys

callum@redlinesurveys.co.uk
mobile: 07956 017 168

steve@redlinesurveys.co.uk
mobile: 07557 332 421

info@redlinesurveys.co.uk
www.redlinesurveys.co.uk

Client:
McCarthy & Stone

Survey at:
Winchester Road
Boorley Green
SO32 2DH

Plot 1. 24- 09
Date: 19/01/2024
Rev Date: 08/11/2024
Scale 1 : 500 A1
Desc: Topographical Survey

Comp by: T. Garde
Surveyed by: T. Garde

All data has been recorded using a Trimble R12i GPS system

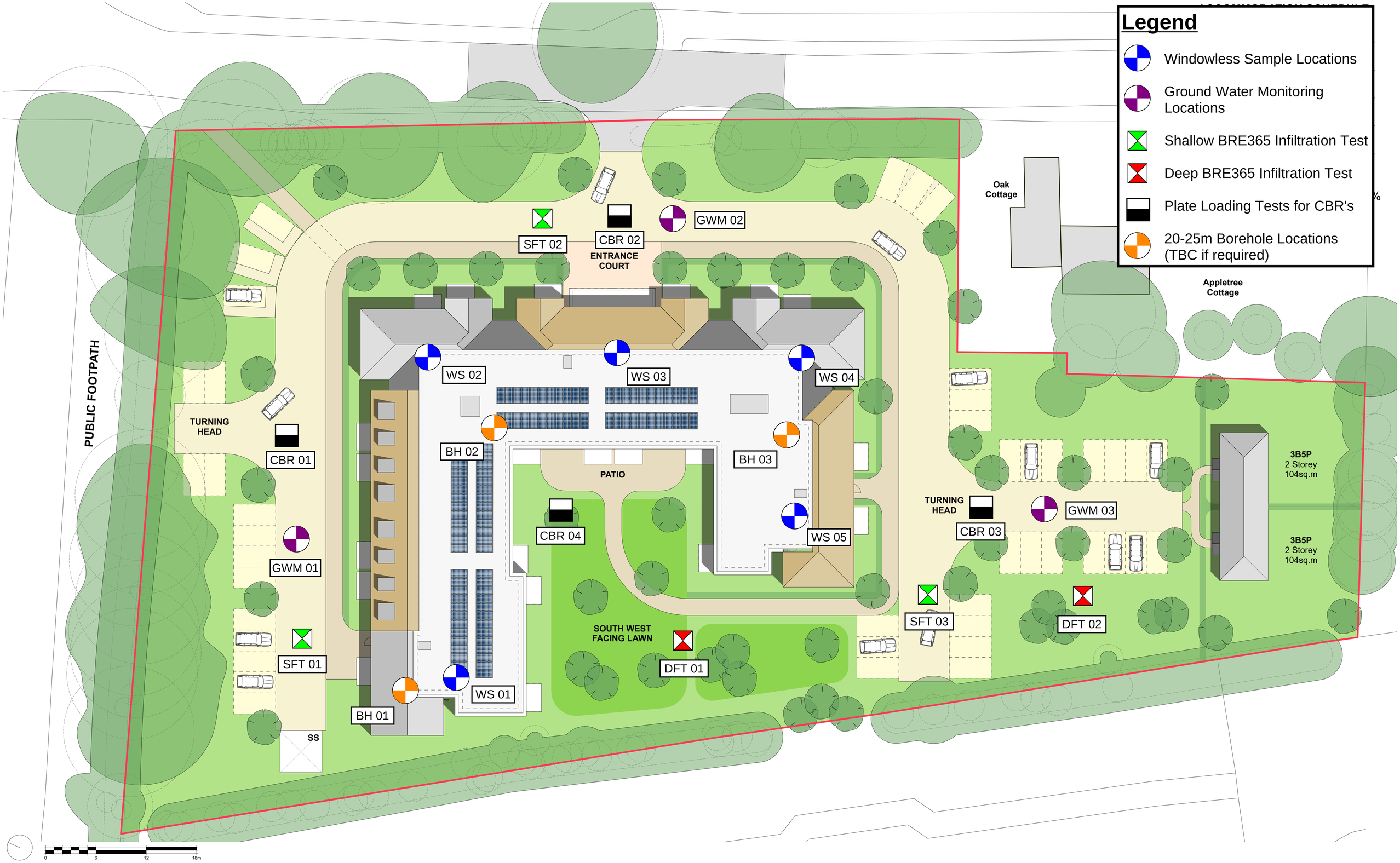
All levels relative to OSBM

the contents of this drawing are copyright

Symbols & Linetypes

- Manhole types
- Gully
- Lamp post
- Telegraph Pole
- Electric Pole
- Gas Cover
- Water Cover
- Electric Cover
- British Telecom
- Traverse Station
- Sign
- Tree
- Hedge
- Overhead Wire
- Building
- Wall
- Kerb
- Drop Kerb
- Footpath
- Ridge
- Step
- Fence

Appendix B
Site Investigation report



McCARTHY STONE
life, well lived

Rev	Description	Date	DB	CB

PROPOSED SITE LAYOUT (ROOF)

PROJECT	JOB NO
Boorley Green	24.013
SCALE	**DATE**
1/200 @ A1	February 2024
DRAWN BY/CHECKED BY	**REVISION**
CK / SK	
DWG#	
SO_2977_02_AC_010	

hgp

© HGP Architects Ltd.
Furzehall Farm, Wickham Road
Fareham, Hampshire, PO16 7JH
01329 283 225
email@hgp-architects.co.uk
hgp-architects.co.uk

Soakaway Test Results & Soil Infiltration Rate

Site: Boorley Green

Project: 5018440 **Hole ID:** SFT01 **Test** 1

Date:25/3/2024

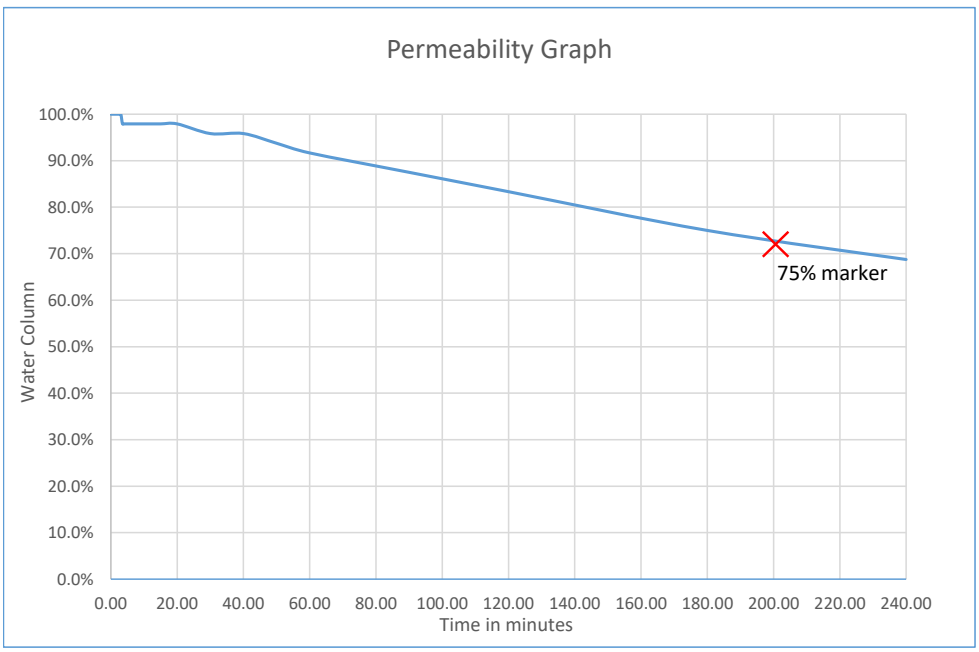
Time in minutes	Depth in metres to water surface	Depth in metres of water	Percentage of water depth at start
0.00	0.170	0.48	100.0%
0.25	0.170	0.48	100.0%
0.50	0.170	0.48	100.0%
0.73	0.170	0.48	100.0%
1.00	0.170	0.48	100.0%
1.50	0.170	0.48	100.0%
2.00	0.170	0.48	100.0%
2.50	0.170	0.48	100.0%
3.00	0.170	0.48	100.0%
3.50	0.180	0.47	97.9%
4.00	0.180	0.47	97.9%
4.50	0.180	0.47	97.9%
5.00	0.180	0.47	97.9%
6.00	0.180	0.47	97.9%
7.00	0.180	0.47	97.9%
8.00	0.180	0.47	97.9%
9.00	0.180	0.47	97.9%
10.00	0.180	0.47	97.9%
15.00	0.180	0.47	97.9%
20.00	0.180	0.47	97.9%
30.00	0.190	0.46	95.8%
40.00	0.190	0.46	95.8%
50.00	0.200	0.45	93.8%
60.00	0.210	0.44	91.7%
90.00	0.230	0.42	87.5%
120.00	0.250	0.40	83.3%
180.00	0.290	0.36	75.0%
240.00	0.320	0.33	68.8%
10.00	**0.940**	**-0.29**	**-60.4%**

Notes: Testing non-compliant with BRE Digest 365 due to access restrictions to the proposed test areas.

Pit Size		Time in mins	
Length	1.65	180	75%
Width	0.35		25%
Depth	0.65		

invalid 25% and/or 75% times

Infiltration Rate from75%-25% **not valid m/s**



Soakaway Test Results & Soil Infiltration Rate

Site: Boorley Green

Project: 5018440 **Hole ID:** SFT01-**02** **Test** 2

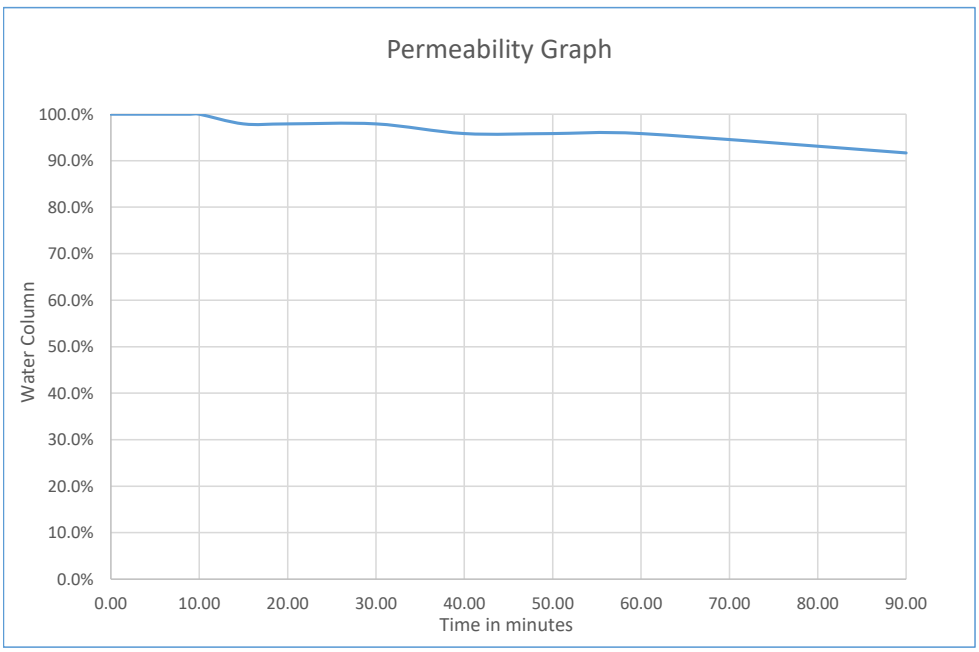
Date:25/3/2024

Time in minutes	Depth in metres to water surface	Depth in metres of water	Percentage of water depth at start
0.00	0.170	0.48	100.0%
0.25	0.170	0.48	100.0%
0.50	0.170	0.48	100.0%
0.73	0.170	0.48	100.0%
1.00	0.170	0.48	100.0%
1.50	0.170	0.48	100.0%
2.00	0.170	0.48	100.0%
2.50	0.170	0.48	100.0%
3.00	0.170	0.48	100.0%
3.50	0.170	0.48	100.0%
4.00	0.170	0.48	100.0%
4.50	0.170	0.48	100.0%
5.00	0.170	0.48	100.0%
6.00	0.170	0.48	100.0%
7.00	0.170	0.48	100.0%
8.00	0.170	0.48	100.0%
9.00	0.170	0.48	100.0%
10.00	0.170	0.48	100.0%
15.00	0.180	0.47	97.9%
20.00	0.180	0.47	97.9%
30.00	0.180	0.47	97.9%
40.00	0.190	0.46	95.8%
50.00	0.190	0.46	95.8%
60.00	0.190	0.46	95.8%
90.00	0.210	0.44	91.7%
17.00	**0.890**	**-0.24**	**-50.0%**

Notes: Testing non-compliant with BRE Digest 365 due to access restrictions to the proposed test areas.

Pit Size		Time in mins	
Length	1.65		75%
Width	0.35		25%
Depth	0.65		

Infiltration Rate from75%-25% **not valid m/s**



Soakaway Test Results & Soil Infiltration Rate

Site: Boorley Green

Project: 5018440 **Hole ID:** SFT02-01 **Test** 1

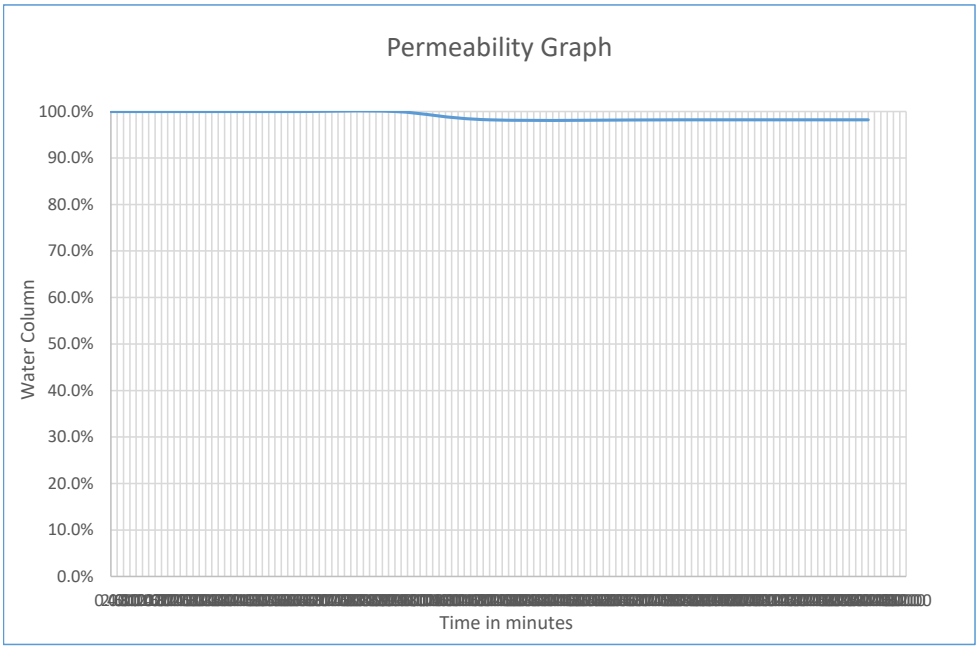
Date:25/3/2024

Time in minutes	Depth in metres to water surface	Depth in metres of water	Percentage of water depth at start
0.00	0.260	0.56	100.0%
0.25	0.260	0.56	100.0%
0.50	0.260	0.56	100.0%
0.73	0.260	0.56	100.0%
1.00	0.260	0.56	100.0%
1.50	0.260	0.56	100.0%
2.00	0.260	0.56	100.0%
2.50	0.260	0.56	100.0%
3.00	0.260	0.56	100.0%
3.50	0.260	0.56	100.0%
4.00	0.260	0.56	100.0%
4.50	0.260	0.56	100.0%
5.00	0.260	0.56	100.0%
6.00	0.260	0.56	100.0%
7.00	0.260	0.56	100.0%
8.00	0.260	0.56	100.0%
9.00	0.260	0.56	100.0%
10.00	0.260	0.56	100.0%
15.00	0.260	0.56	100.0%
20.00	0.260	0.56	100.0%
30.00	0.260	0.56	100.0%
40.00	0.260	0.56	100.0%
50.00	0.260	0.56	100.0%
60.00	0.260	0.56	100.0%
90.00	0.260	0.56	100.0%
120.00	0.270	0.55	98.2%
180.00	0.270	0.55	98.2%
240.00	0.270	0.55	98.2%
25.00	**0.880**	**-0.06**	**-10.7%**

Notes: Testing non-compliant with BRE Digest 365 due to access restrictions to the proposed test areas.

Pit Size		Time in mins	
Length	0.35		75%
Width	0.35		25%
Depth	0.82		

Infiltration Rate from75%-25% **not valid m/s**



Soakaway Test Results & Soil Infiltration Rate

Site: Boorley Green

Project: 5018440 **Hole ID:** SFT03-01 **Test** 1

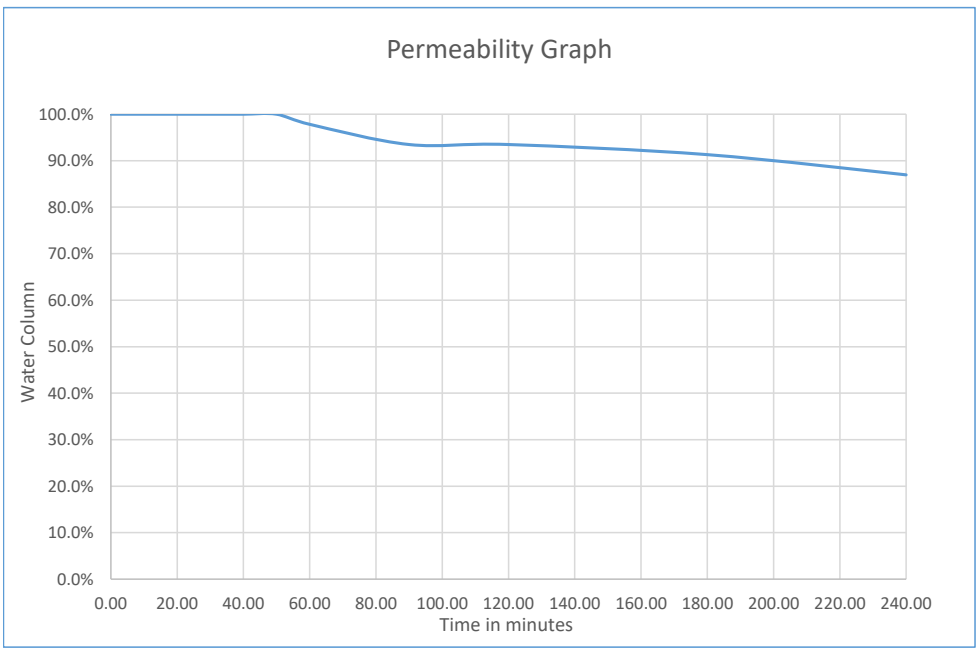
Date:25/3/2024

Time in minutes	Depth in metres to water surface	Depth in metres of water	Percentage of water depth at start
0.00	0.190	0.46	100.0%
0.25	0.190	0.46	100.0%
0.50	0.190	0.46	100.0%
0.73	0.190	0.46	100.0%
1.00	0.190	0.46	100.0%
1.50	0.190	0.46	100.0%
2.00	0.190	0.46	100.0%
2.50	0.190	0.46	100.0%
3.00	0.190	0.46	100.0%
3.50	0.190	0.46	100.0%
4.00	0.190	0.46	100.0%
4.50	0.190	0.46	100.0%
5.00	0.190	0.46	100.0%
6.00	0.190	0.46	100.0%
7.00	0.190	0.46	100.0%
8.00	0.190	0.46	100.0%
9.00	0.190	0.46	100.0%
10.00	0.190	0.46	100.0%
15.00	0.190	0.46	100.0%
20.00	0.190	0.46	100.0%
30.00	0.190	0.46	100.0%
40.00	0.190	0.46	100.0%
50.00	0.190	0.46	100.0%
60.00	0.200	0.45	97.8%
90.00	0.220	0.43	93.5%
120.00	0.220	0.43	93.5%
180.00	0.230	0.42	91.3%
240.00	0.250	0.40	87.0%
13.00	**0.820**	**-0.17**	**-37.0%**

Notes: Testing non-compliant with BRE Digest 365 due to access restrictions to the proposed test areas.

Pit Size		**Time in mins**	
Length	0.35		75%
Width	0.35		25%
Depth	0.65		

Infiltration Rate from75%-25% **not valid m/s**



Soakaway Test Results & Soil Infiltration Rate

Site: Boorley Green

Project: 5018440 **Hole ID:** SF203 **Test** 1

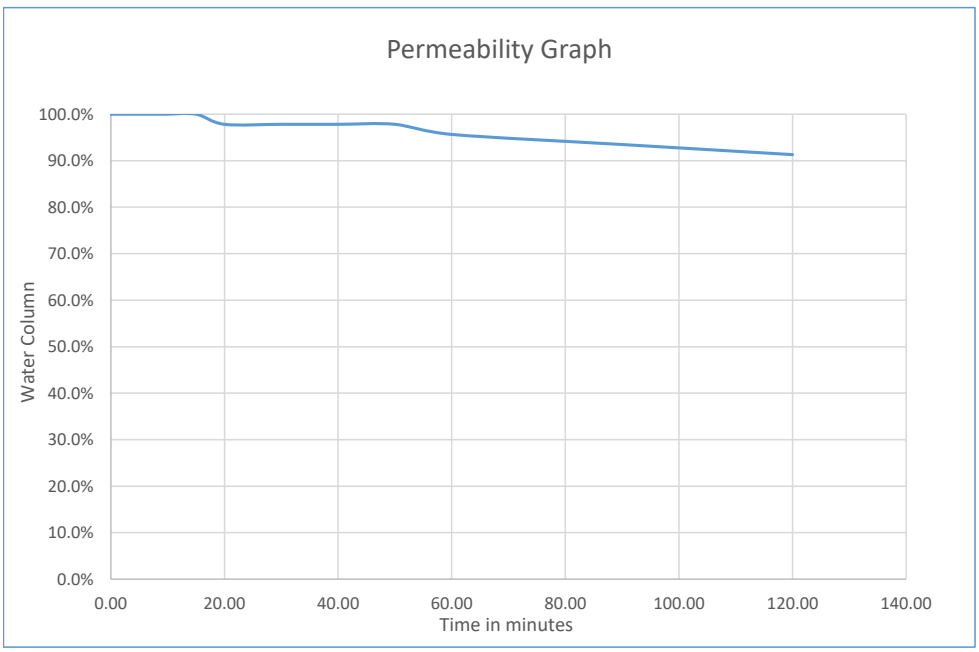
Date:25/3/2024

Time in minutes	Depth in metres to water surface	Depth in metres of water	Percentage of water depth at start
0.00	0.190	0.46	100.0%
0.25	0.190	0.46	100.0%
0.50	0.190	0.46	100.0%
0.73	0.190	0.46	100.0%
1.00	0.190	0.46	100.0%
1.50	0.190	0.46	100.0%
2.00	0.190	0.46	100.0%
2.50	0.190	0.46	100.0%
3.00	0.190	0.46	100.0%
3.50	0.190	0.46	100.0%
4.00	0.190	0.46	100.0%
4.50	0.190	0.46	100.0%
5.00	0.190	0.46	100.0%
6.00	0.190	0.46	100.0%
7.00	0.190	0.46	100.0%
8.00	0.190	0.46	100.0%
9.00	0.190	0.46	100.0%
10.00	0.190	0.46	100.0%
15.00	0.190	0.46	100.0%
20.00	0.200	0.45	97.8%
30.00	0.200	0.45	97.8%
40.00	0.200	0.45	97.8%
50.00	0.200	0.45	97.8%
60.00	0.210	0.44	95.7%
90.00	0.220	0.43	93.5%
120.00	0.230	0.42	91.3%
120.00	**0.650**	**0.00**	**0.0%**

Notes: Testing non-compliant with BRE Digest 365 due to access restrictions to the proposed test areas.

Pit Size		Time in mins	
Length	0.35		75%
Width	0.35		25%
Depth	0.65		

Infiltration Rate from75%-25% **not valid m/s**



Soakaway Test Results & Soil Infiltration Rate

Site: Boorley Green

Project: 5018440 **Hole ID:** DFT01 **Test** 1

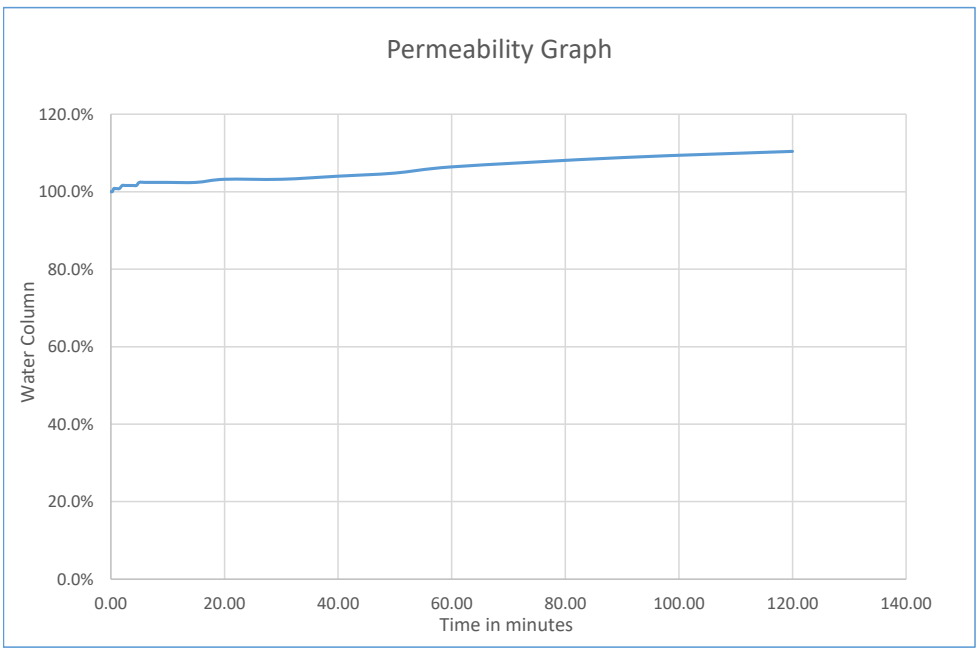
Date:25/3/2024

Time in minutes	Depth in metres to water surface	Depth in metres of water	Percentage of water depth at start
0.00	1.050	1.25	100.0%
0.25	1.050	1.25	100.0%
0.50	1.040	1.26	100.8%
0.73	1.040	1.26	100.8%
1.00	1.040	1.26	100.8%
1.50	1.040	1.26	100.8%
2.00	1.030	1.27	101.6%
2.50	1.030	1.27	101.6%
3.00	1.030	1.27	101.6%
3.50	1.030	1.27	101.6%
4.00	1.030	1.27	101.6%
4.50	1.030	1.27	101.6%
5.00	1.020	1.28	102.4%
6.00	1.020	1.28	102.4%
7.00	1.020	1.28	102.4%
8.00	1.020	1.28	102.4%
9.00	1.020	1.28	102.4%
10.00	1.020	1.28	102.4%
15.00	1.020	1.28	102.4%
20.00	1.010	1.29	103.2%
30.00	1.010	1.29	103.2%
40.00	1.000	1.30	104.0%
50.00	0.990	1.31	104.8%
60.00	0.970	1.33	106.4%
90.00	0.940	1.36	108.8%
120.00	0.920	1.38	110.4%
120.00	**2.300**	**0.00**	**0.0%**

Notes: Testing non-compliant with BRE Digest 365 due to access restrictions to the proposed test areas.

Pit Size		Time in mins	
Length	0.35		75%
Width	0.35		25%
Depth	2.30		

Infiltration Rate from75%-25% **not valid m/s**



Soakaway Test Results & Soil Infiltration Rate

Site: Boorley Green

Project: 5018440 **Hole ID:** DFT02 **Test** 1

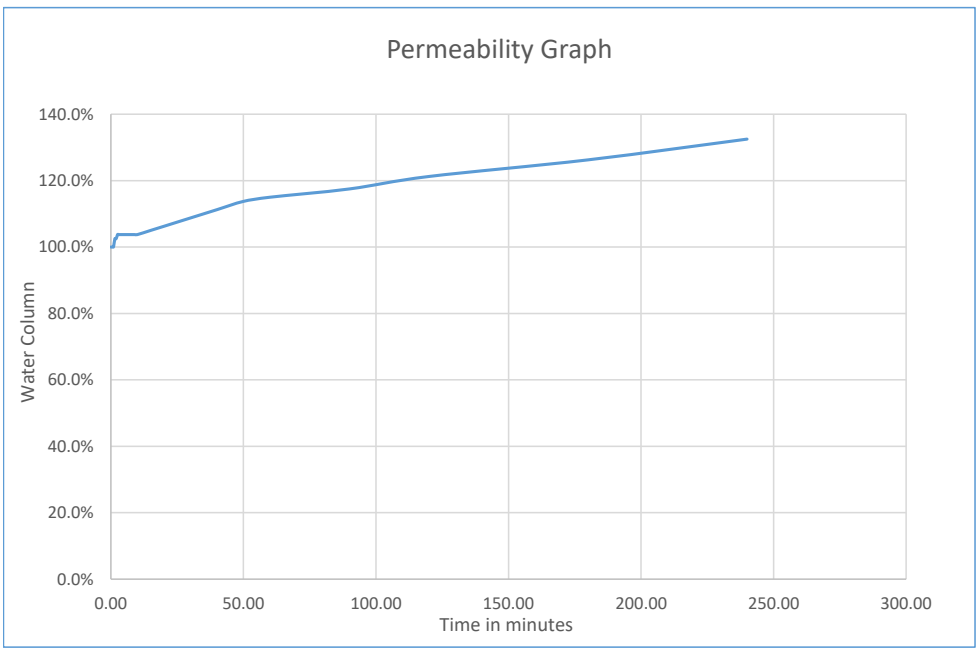
Date:25/3/2024

Time in minutes	Depth in metres to water surface	Depth in metres of water	Percentage of water depth at start
0.00	1.000	0.80	100.0%
0.25	1.000	0.80	100.0%
0.50	1.000	0.80	100.0%
0.73	1.000	0.80	100.0%
1.00	1.000	0.80	100.0%
1.50	0.980	0.82	102.5%
2.00	0.980	0.82	102.5%
2.50	0.970	0.83	103.8%
3.00	0.970	0.83	103.8%
3.50	0.970	0.83	103.8%
4.00	0.970	0.83	103.8%
4.50	0.970	0.83	103.8%
5.00	0.970	0.83	103.8%
6.00	0.970	0.83	103.8%
7.00	0.970	0.83	103.8%
8.00	0.970	0.83	103.8%
9.00	0.970	0.83	103.8%
10.00	0.970	0.83	103.8%
15.00	0.960	0.84	105.0%
20.00	0.950	0.85	106.3%
30.00	0.930	0.87	108.8%
40.00	0.910	0.89	111.3%
50.00	0.890	0.91	113.8%
60.00	0.880	0.92	115.0%
90.00	0.860	0.94	117.5%
120.00	0.830	0.97	121.3%
180.00	0.790	1.01	126.3%
240.00	0.740	1.06	132.5%
10.00	**0.630**	**1.17**	**146.3%**

Notes: Testing non-compliant with BRE Digest 365 due to access restrictions to the proposed test areas. Collapsed from 2m. Water level before fill .1m

Pit Size		Time in mins	
Length	0.35		75%
Width	0.35		25%
Depth	1.80		

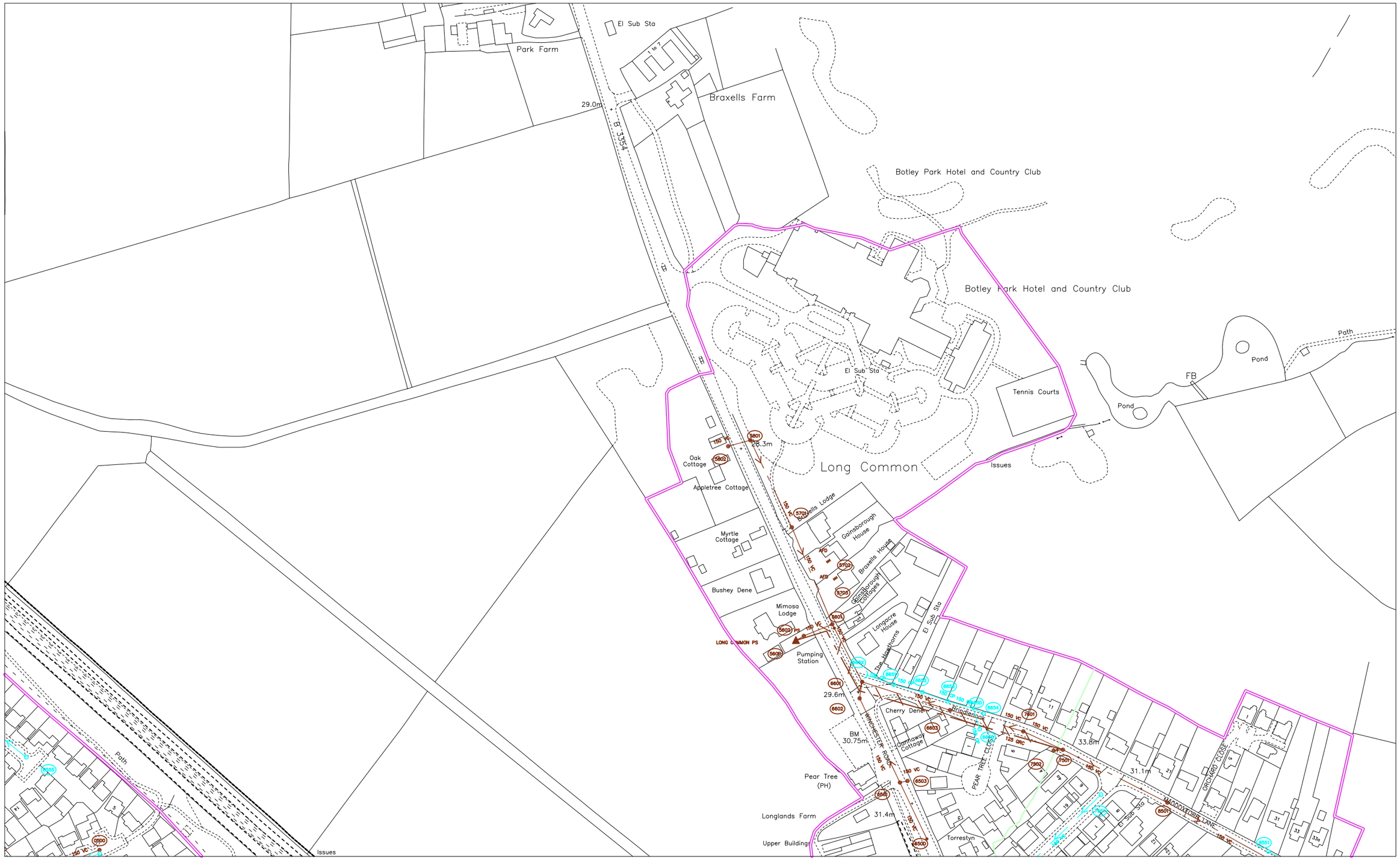
Infiltration Rate from75%-25% **not valid m/s**



Appendix C
Sewer maps

SEWER RECORDS PAGE 1 OF 2

115103



114525

450024

450968

O.S. REF. SU5014NW	Drawn by: yadavsa	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determnined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement
	Scale: 1:2500	
Title: 287084_Oak Cottage, Winchester	Date: 29/03/2018	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.

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Southern Water

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	
0500X	22.57	20.6	150	VC	CIRC	
0550X	22.46	20.97	225	VC	CIRC	
0555X	24.1	22.9	300	CP	CIRC	
5601X	28.56	25.71	150	VC	CIRC	
5602X	28.22	25.51	100	VC	CIRC	
560PX	28.28	25.43	125	GRC	CIRC	
5701X	27.85	26.19	150	VC	CIRC	
5801X	27.63	26.6	150	VC	CIRC	
5802X	28.02	26.8	150	VC	CIRC	
6501X	31.06	29.23	150	VC	CIRC	
6503X	31.2	29.41	150	VC	CIRC	
650DX	31.15	29.63	150	VC	CIRC	
6601X	29.55	27.57	150	VC	CIRC	
6602X	29.59	27.79	150	VC	CIRC	
6603X	30.94	29.19	150	VC	CIRC	
6651X	29.73	29.11	150	CP	CIRC	
6652X	30.24	29.52	150	CP	CIRC	
6653X	30.86	30.05	150	CP	CIRC	
6654X	31.54		150	CP	CIRC	
6655X	32.18		150	CP	CIRC	
665DX			150	CP	CIRC	
7501X	33.99	32.23	150	VC	CIRC	*
7501Y	33.99	32.39	150	VC	CIRC	*
7502X	33.94		150	VC	CIRC	
7551X	32.38	31.42	150	VC	CIRC	
7601X	33.27	31.39	150	VC	CIRC	
8501X	29.4	27.7	150	VC	CIRC	
8551X	24.36	23.74	150	CP	CIRC	

Node	Cover	Invert	Size	Material	Shape

Node	Cover	Invert	Size	Material	Shape

Node	Cover	Invert	Size	Material	Shape

LEGEND - SEWERS

LINE STYLES / COLOURS

- Brown: Foul
- Foul Syphon Sewer
- Foul Vacuum Main
- Foul Rising Main
- Red: Combined
- Combined Syphon Sewer
- Combined Rising Main
- Lateral Drain
- Orange: Building Over Agreement Area
- Dark Blue: Treated Effluent
- Purple: Sludge
- Sewer Catchment
- Section 104 Area
- Light Blue: Surface Water
- Surface Water Rising Main
- Yellow: Private
- Green: Access Shaft
- Decommissioned

MATERIALS

AK	Alkathene
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
XXX	Other
ZZZ	Unknown

- Manhole (SW)
- Manhole (F&C)
- LH: Lamp hole (SW)
- LH: Lamp hole (F&C)
- Pumping Station (SW)
- Pumping Station (F&C)
- Side entry manhole (SW)
- Side entry Manhole (F&C)
- BS: Blind shaft (SW)
- BS: Blind shaft (F&C)
- EJ: Ejector station (SW)
- EJ: Ejector station (F&C)
- WT: Watertight door (SW)
- WT: Watertight door (F&C)
- FC: Flushing ch. Manhole (SW)
- FC: Flushing ch. Manhole (F&C)
- FC: Flushing ch. Node (SW)
- FC: Flushing ch. Node (F&C)
- DC: Demarcation Chamber

- WO: Washout (SW)
- WO: Washout (F&C)
- RE: Rodding Eye (SW)
- RE: Rodding Eye (F&C)
- GP: Gauging point (SW)
- GP: Gauging point (F&C)
- IC: Intercept chamber (SW)
- IC: Intercept chamber (F&C)
- ST: Storm Tank (SW)
- ST: Storm Tank (F&C)
- VC: Vortex chamber (SW)
- VC: Vortex chamber (F&C)
- ASP: Label ellipse
- Dummy/S24 manhole
- Outfall
- PK: Penstock chamber
- DB: Damboards
- SO: Storm Overflow
- Backdrop manhole

- Other (s)
- Other
- Change in sewer (s)
- Change in sewer
- Reflux valve
- Flap valve
- Cascade
- AN: Anode
- Valve
- Closed Valve
- Air Valve
- HB: Hatch box (SW)
- HB: Hatch box (F&C)
- Direction arrow
- EM: Emptying valve
- CP: Catchpit
- S: Soakaway
- Inlet
- BP: Balancing Pond

- WTW: Wastewater treatment works
- MTW: Marine treatment works
- Outfall headworks
- VT: Vent
- VE: Vent column
- TST: Tidal storage tank
- Blank end
- Head of Public Sewer
- MPS: Micro Pumping Station

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

NODE REFERENCING SYSTEM

1st digit: hundred metre easting identifier
2nd digit: hundred metre northing identifier
3rd digit: sewer type identifier
0-4 = Foul/Combined
5-9 = Surface Water
4th digit: next sequential node

Drawn by:	yadavsa	Southern Water
Title:	287084_Oak Cottage, Winchester	
Date:	29/03/2018	

Appendix D
Existing Site / Greenfield runoff rates

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.465	Urban	0.000
SAAR (mm)	800	Region Number	Region 7

Results	**l/s**
QBAR Rural	2.4
QBAR Urban	2.4
Q100 years	7.6
Q1 year	2.0
Q30 years	5.4
Q100 years	7.6

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Appendix E
Indicative Proposed Drainage Layout

Key

- Site Boundary
- +21.500 Building finished floor level
- Existing FW manhole, Plastic Inspection Chamber
- Proposed SW manhole, Plastic Inspection Chamber
- Proposed FW manhole, Plastic Inspection Chamber
- Existing SW sewer
- Existing FW sewer
- Proposed SW sewer pipe
- Proposed FW gravity sewer
- Proposed SW connection
- Proposed FW connection
- Proposed SW Pumped Rising Main
- Proposed FW Pumped Rising Main
- RE SW Rodding Eye
- RE FW Rodding Eye
- g Road gully to discharge to perforated pipe
- gully Internal Gully with 100Ø Outlet
- du Surface water discharge to sub-base via distribution unit
- svp/ss Soil Vent Pipe / Stub Stack
- rwp Rainwater downpipe
- +27.620 Proposed level
- Open graded 10mm to 63mm crushed angular stone sub-base with 30% void space for attenuation under access road
- Open graded 10mm to 63mm crushed angular stone sub-base with 30% void space for attenuation under parking spaces.
- Block paving - Vehicular entrance access
- Permeable Asphalt footpath, No dig construction within RPA
- Asphalt footpath
- Concrete flag paving - Patio
- Block paving - Pedestrian
- Compacted limestone chippings to growing gardens with pin kerb edge
- Gravel strip
- Linear drainage slot drain channel at communal threshold
- Linear drainage channel at edge of balcony connected to drainage network.
- 10mm gap applied to channel in patio slab area.

Notes

GENERAL

- This drawing is to be read in conjunction with all relevant Engineers and Architects drawings and with the Specification.
- For setting out refer to Architects drawings.
- All dimensions are in millimetres and levels are in metres unless noted otherwise.
- Contractor to take all relevant dimensions on site. Any discrepancies to be advised to the Engineer.
- Contractor to check/scan for services prior to construction to avoid any damage during works.
- This drawing is based on HGP Architects site layout plan SO-2977-02-AC-010 - dated February 2024.
- Tree constraints taken from survey provided by Keen Consulting dated January 2024.
- Topographical survey provided by Redline Surveys dated January 2024.

DRAINAGE

- Any information given on this drawing regarding existing services is believed to be correct. The contractor must check this information and determine the nature and location of other existing services from the various statutory authorities before commencing excavation works.
- Drainage works to be constructed in accordance with BS EN 752 and Approved Document H
- All soft spots and unacceptable material encountered in drainage excavations is to be removed and replaced with granular material to the requirements of the building control officer.
- Pipes to be installed to manufacturers recommendations.
- Pipes under buildings to be laid to a fall of 1:60 minimum unless noted otherwise. Internal level of pipes to be 4.20m (50mm below blinding + 90° bend). Refer to structural detail drawings for detailed slab construction make-up layers and levels.
- Plastic plain wall pipes to be PVC-U to BS EN 1401-1, class SN4, with flexible joints, Kitemark certified. Structured wall plastic pipes to be to WIS 04-35-01, Kitemark certified
- Clay pipes to be vitrified clay to BS EN 295-1, with flexible joints, Kitemark certified. Clayware pipes must be extra strength classification protected in accordance with the specified details.
- Concrete pipes to be precast concrete to BS 5911-1 and BS EN 1916, with flexible joints.
- Bedding of pipes to be in accordance with approved document H1.
- Rocker pipes with flexible joints are to be provided at a distance of 150mm and 750mm from the face of construction to manholes, where pipes pass above, below or through ground beams or foundations; at gully connections and soil stack ends.
- Manhole access covers are to be located at the outgoing side of manholes.
- Cover levels are to be fixed on site to suit finished levels. Covers and frames to BS EN124, Grade D to be used in areas subject to heavy vehicular loading, Grade C in areas subject to light vehicular loading and Grade B to be used elsewhere.
- All external pipes to be 150Ø unless noted otherwise.
- All internal pipes to be 100Ø unless noted otherwise.
- Manhole positions coordinates are indicated on the SWH manhole schedule 0502 and to be confirmed by SWH prior to setting out on site.
- Access points to be located at base of all rwps and svps.
- All gullies to be trapped
- Positions of SVP's and RWP's should be read in conjunction with Architects drawings.

PRELIMINARY - NOT FOR CONSTRUCTION

Rev.	Amendment	Drn.	Chkd.	Appd.	Date
P09	Stage 3 - Revised Landscaper's layout 17.02.25	RD	GM	IL	03.03.25
P08	Stage 3 - Revised Landscape architects layout	RD	BC	IL	12.12.24
P07	Stage 3 - Outfall location amended following discussions	RD	NC	IL	28.11.24
P06	Stage 3 - Revised site layout	RD	BC	IL	25.07.24
P05	Stage 3 - Revised site boundary	RD	BC	IL	17.07.24
P04	Stage 3 - Drainage updated to suit site layout	RD	BC	IL	02.07.24
P03	Updated to suit client requirements	RD	TK	TK	11.03.24
P02	Preliminary Issue - Foul sewer outfall via Oak Cottage omitted.	TK	TK	TK	26.02.24
P01	Preliminary Issue	TK	TK	TK	23.02.24

Project

Winchester Road, Boorley Green

Drawing

Drainage Strategy Layout

Client

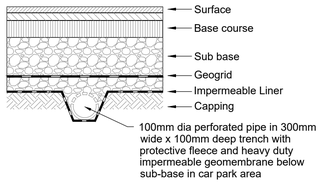
McCARTHY STONE
Life, well lived

Scott White and Hookins
Structural Engineering | Civil Engineering | Sustainability and BREEAM | CDM Consultancy

Harman House, Andover Road, Winchester, Hampshire SO23 7BS
T: +44 (0)1962 844855 W: www.swh.co.uk E: info@swh.co.uk

Scale at A1 - 1:250

SO-2977-03-CE-0500 - P09



Surface Course
40mm HRA35/14F Surf 40/60 to BS EN 13108-4

Binder Course
50mm AC20 dense bin 40/60 to BS EN 13108-1

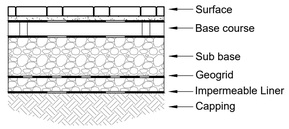
Base Course
110mm AC32 dense base 40/60 to BS EN 13108-1

Sub-base
350mm min granular sub-base lined open graded 10mm - 63mm clean angular crushed stone to clause 803 of highway agency specification, rolled and consolidated in accordance with clause 802 of Highway England's specification. Thickness based on minimum requirements for hydraulic design, refer to drainage layout and landscaper level drawings. Provide 600mm wide Triax TX 160 centered over perforated pipes in pipe locations. Impermeable Liner below sub base.

Capping
6F2 material to be laid on top of existing site levels based on values in table to CBR plate testing. Detail to be read in conjunction with highway specification notes, existing site level plan.

Impermeable Asphalt Parking Bay Aisle

(1:20)



Ground workers to install up to base course level across car park aisles and spaces for site set up and construction vehicles.

Binder and surface courses to be laid during finishing works.

Paving Course
200 x 100 x 60mm Concrete paving blocks to Architects details.

Laying Course
30mm thickness of well compacted sharp sand (maximum 3% silt and clay by weight, not more than 10% retained on 5mm sieve) to BS 882. Provide Treetex T300 Geotextile separation fabric below laying course.

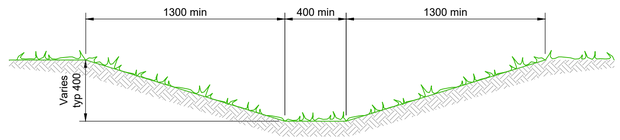
Base Course
110mm AC32 dense base 40/60 to BS EN 13108-1
100/150 Pen paving grade bitumen Inbitex
Geotextile separation fabric above running course. 75mmØ @ 2000crs cored holes filled with laying course material

Sub-base
350mm min granular sub-base lined open graded 10mm - 63mm clean angular crushed stone to clause 803 of highway agency specification, rolled and consolidated in accordance with clause 802 of Highway England's specification. Thickness based on minimum requirements for hydraulic design, refer to drainage layout and landscaper level drawings. Provide 600mm wide Triax TX 160 centered over perforated pipes in pipe locations. Impermeable Liner below sub base.

Capping
6F2 material to be laid on top of existing site levels based on values in table to CBR plate testing. Detail to be read in conjunction with highway specification notes, existing site level plan.

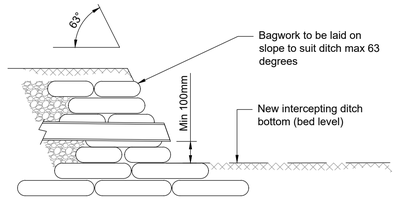
Permeable Block paved parking bays and pedestrian areas

(1:20)



Section Through Swale

(1:20)



NOTES

1. Dimensions are in millimeters unless otherwise stated
2. Bag sizes nominally 500x300x120
3. Bags to be hessian and filled with ST4 concrete
4. 12mm dia, mild steel dowel bars to be driven diagonally and vertically through bags to secure the courses, bars cut to suit location and are to pass through not less than 4 bags. min length 450mm
5. All ST mix concrete to be specification for Highway Works, clause 2602
6. Standard size of headwall, is 1 meters long by 0.9 meters high. Adjust to suit ditch.

Bagwork Headwall

(1:20)

Notes

GENERAL

- This drawing is to be read in conjunction with all relevant Engineers and Architects drawings and with the Specification.
- For setting out refer to Architects and Landscape Architects drawings.
- All dimensions are in millimetres and levels are in metres unless noted otherwise.
- Contractor to take all relevant dimensions on site. Any discrepancies to be advised to the Engineer.
- Contractor to check/scan for services prior to construction to avoid any damage during works.
- Refer to Terrafirma Landcape Architects drawings for external works details.

PRELIMINARY - NOT FOR CONSTRUCTION

Rev.	Amendment	Drn.	Chkd.	Appd.	Date
P01	Preliminary Issue	RD	GM	IL	11.12.24

Project

Wincehster Road, Boorley Green

Drawing

External Works Details

Client

McCARTHY STONE
Life, well lived

Scott White and Hookins
Structural Engineering
Civil Engineering
Sustainability and BREEAM
CDM Consultancy

Harman House, Andover Road, Winchester, Hampshire SO23 7BS
T: +44 (0)1962 844855 W: www.swh.co.uk E: info@swh.co.uk

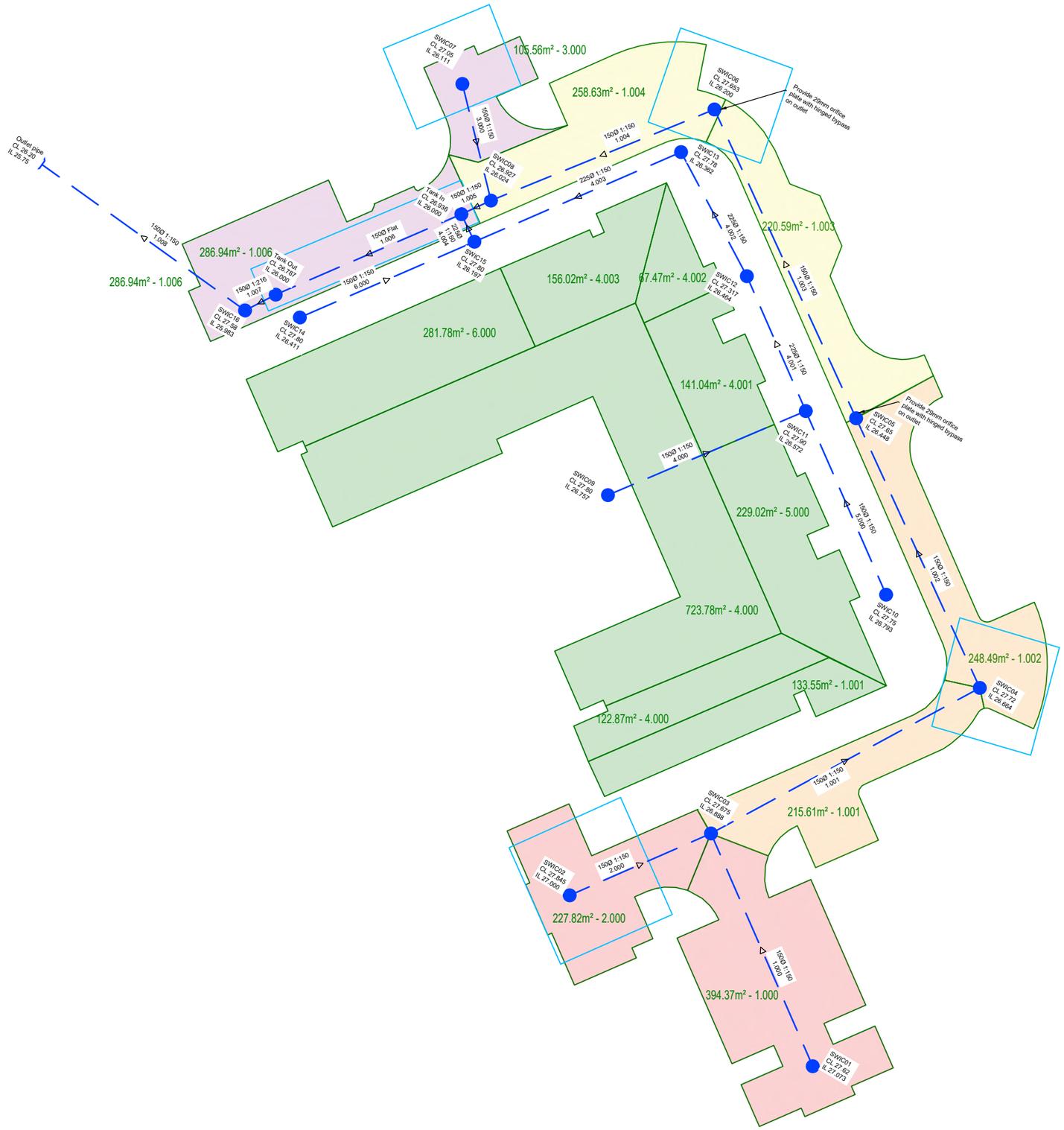
Scale at A1 - 1:20

SO-2977-03-CE-0610 - P01

Appendix F
Microdrainage calculations

Notes

NOTE: MODEL DOES NOT ALLOW FOR INCREASED TIME OF ENTRY BETWEEN GULLIES AND PERFORATED PIPES



WORK IN PROGRESS - INFORMATION ONLY

P01	Preliminary Issue	RD	BC	IL	22.11.24
Rev.	Amendment	Drn.	Chkd.	Appd.	Date

Winchester Road, Boorley Green
Drainage Schematic Layout

Scott White and Hookins
Structural Engineering | Civil Engineering | Sustainability and BREEAM | CDM Consultancy

Scale at A3 1: 500

SO-2977-03-CE-0505-P01

DO NOT SCALE FROM THIS DRAWING

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
SWIC1	0.039	1.350	Type C	27.620	27.073	0.397	450482.812	114765.978
SWIC2	0.023	1.350	Type C	27.845	27.000	0.695	450456.193	114784.677
SWIC3	0.035	1.350	Type C	27.675	26.888	0.637	450471.670	114791.448
SWIC4	0.025	1.350	Type C	27.720	26.664	0.906	450501.113	114807.378
SWIC5	0.022	1.350	Type C	27.650	26.448	1.052	450487.564	114836.883
SWIC6	0.026	1.350	Type C	27.653	26.200	1.303	450472.044	114870.680
SWIC7	0.011	1.350	Type C	27.050	26.111	0.789	450444.441	114873.469
SWIC8	0.000	1.350	Type C	26.927	26.024	0.753	450447.569	114860.708
SWIC9	0.085	1.350	Type C	27.800	26.757	0.893	450460.383	114828.472
SWIC10	0.023	1.350	Type C	27.750	26.793	0.807	450490.849	114817.579
SWIC11	0.014	1.350	Type C	27.900	26.572	1.150	450482.047	114837.676
SWIC12	0.007	1.350	Type C	27.317	26.464	0.627	450475.598	114852.435
SWIC13	0.016	1.350	Type C	27.780	26.362	1.193	450468.391	114866.012
SWIC14	0.028	1.350	Type C	27.800	26.411	1.239	450426.636	114847.909
SWIC15	0.000	1.350	Type C	27.800	26.197	1.378	450445.759	114856.200
TANK IN	0.029	1.350	Type C	26.936	26.000	0.786	450444.330	114859.219
TANK OUT	0.000	1.350	Type C	26.787	26.000	0.637	450423.994	114850.411
SWIC16	0.000	1.350	Type C	27.580	25.983	1.447	450420.635	114848.682
HEADWALL	0.000	0.000	Type C	26.200	25.800	0.250	450398.403	114864.642

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)
1.000	SWIC1	27.073	SWIC3	26.888	Circ	0.15mØ	27.800	150.0	0.600	0.397
2.000	SWIC2	27.000	SWIC3	26.888	Circ	0.15mØ	16.893	150.0	0.600	0.695
1.001	SWIC3	26.888	SWIC4	26.664	Circ	0.15mØ	33.477	150.0	0.600	0.637
1.002	SWIC4	26.664	SWIC5	26.448	Circ	0.15mØ	32.467	150.0	0.600	0.906
1.003	SWIC5	26.448	SWIC6	26.200	Circ	0.15mØ	37.190	150.0	0.600	1.052
1.004	SWIC6	26.200	SWIC8	26.024	Circ	0.15mØ	26.429	150.0	0.600	1.303
3.000	SWIC7	26.111	SWIC8	26.024	Circ	0.15mØ	13.139	150.0	0.600	0.789
1.005	SWIC8	26.024	TANK IN	26.000	Circ	0.15mØ	3.564	150.0	0.600	0.753
4.000	SWIC9	26.757	SWIC11	26.600	Circ	0.15mØ	23.537	150.0	0.600	0.893
5.000	SWIC10	26.793	SWIC11	26.647	Circ	0.15mØ	21.940	150.0	0.600	0.807
4.001	SWIC11	26.572	SWIC12	26.464	Circ	0.225mØ	16.106	150.0	0.600	1.103
4.002	SWIC12	26.464	SWIC13	26.362	Circ	0.225mØ	15.371	150.0	0.600	0.627
4.003	SWIC13	26.362	SWIC15	26.197	Circ	0.225mØ	24.668	150.0	0.600	1.193
6.000	SWIC14	26.411	SWIC15	26.272	Circ	0.15mØ	20.843	150.0	0.600	1.239
4.004	SWIC15	26.197	TANK IN	26.175	Circ	0.225mØ	3.340	150.0	0.600	1.378
1.006	TANK IN	26.000	TANK OUT	26.000	Circ	0.15mØ	22.162		0.600	0.786
1.007	TANK OUT	26.000	SWIC16	25.983	Circ	0.15mØ	3.778	215.9	0.600	0.637
1.008	SWIC16	25.983	HEADWALL	25.800	Circ	0.15mØ	27.368	150.0	0.600	1.447

Outfall Details

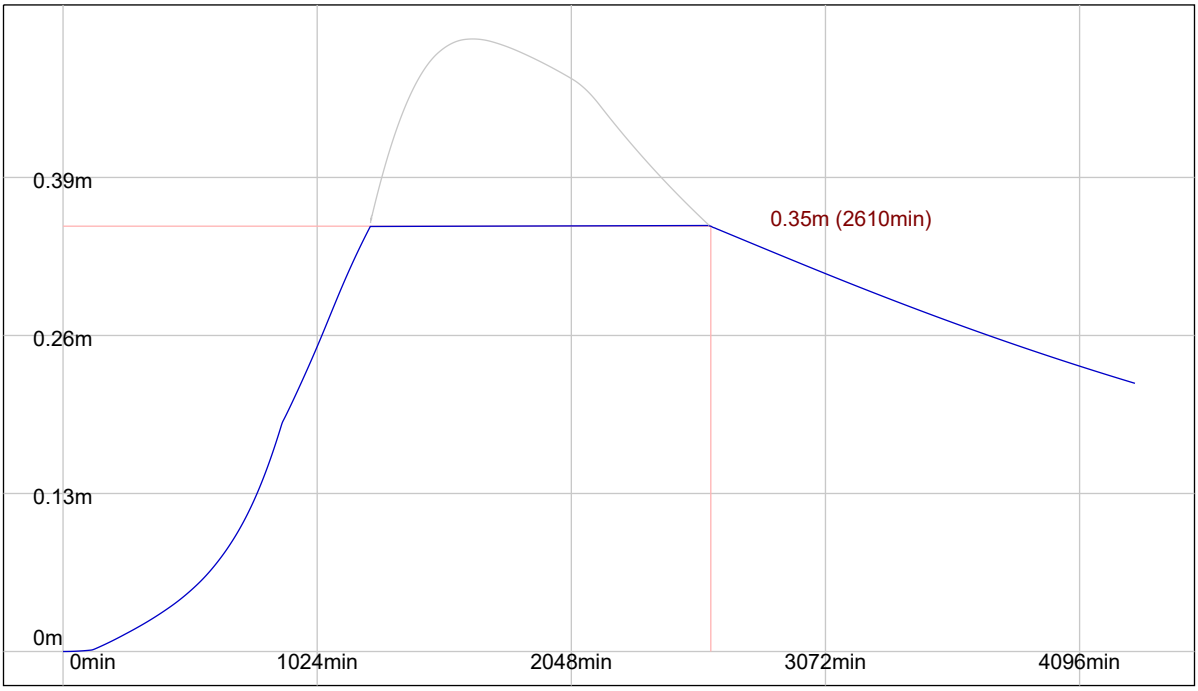
Outfall Manhole HEADWALL : Free Discharge

Flow Control Details

Tank Structure at Manhole SWIC2

Tank Invert (m)	Tank Height (m)	Void Ratio (%)	Area (m2)	Effective Area (m2) Area x Void Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
27.000	0.350	100.00	187.079	187.079	65.478	0.00000000	0.00000000	2.00

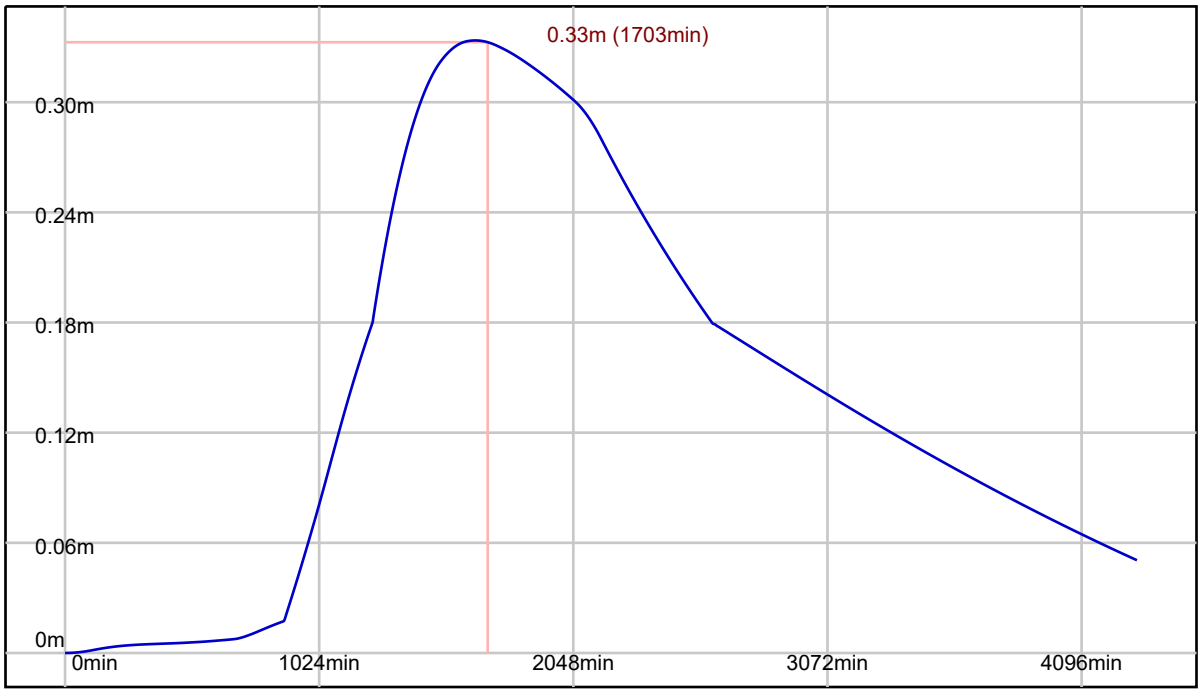
Tank at SWIC2 (100Yr+45% 2160Min Winter)



Tank Structure at Manhole SWIC4

Tank Invert (m)	Tank Height (m)	Void Ratio (%)	Area (m2)	Effective Area (m2) Area x Void Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
26.664	0.350	100.00	138.460	138.460	48.461	0.00000000	0.00000000	2.00

Tank at SWIC4 (100Yr+45% 2160Min Winter)



Controls within Manhole SWIC5

Orifice Control

Invert Offset (m)	Orifice Diameter (m)	Discharge Coeff
0.000	0.029	0.600

Controls within Manhole SWIC6

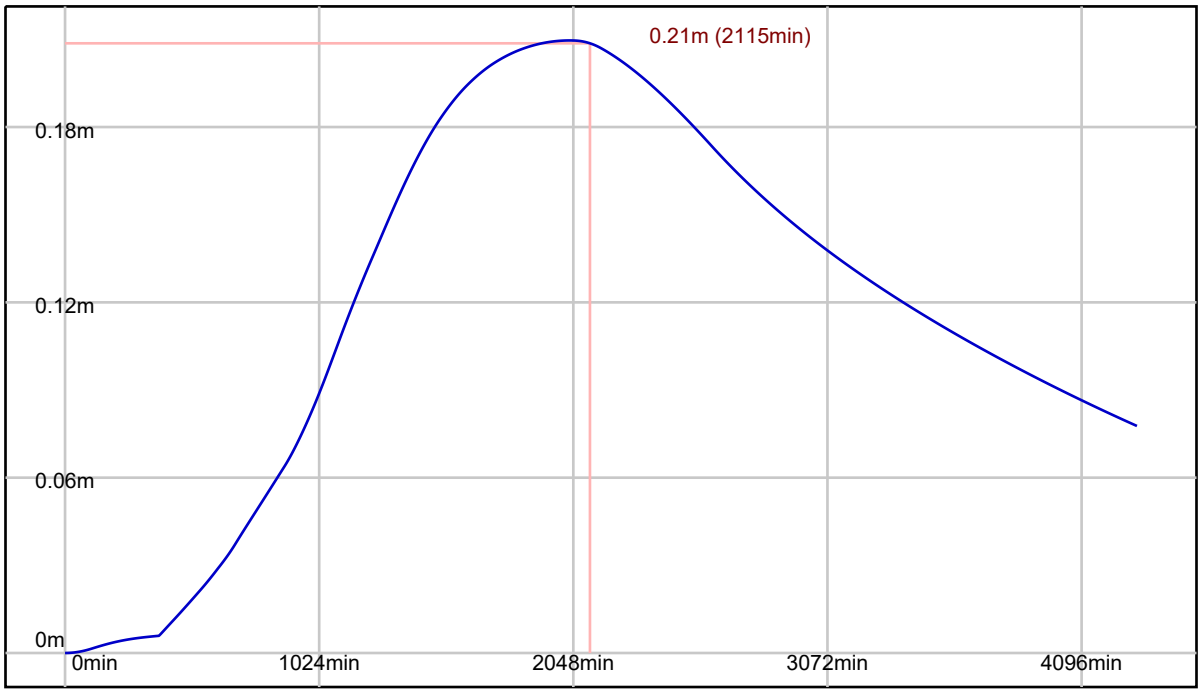
Orifice Control

Invert Offset (m)	Orifice Diameter (m)	Discharge Coeff
0.000	0.029	0.600

Tank Structure at Manhole SWIC6

Tank Invert (m)	Tank Height (m)	Void Ratio (%)	Area (m2)	Effective Area (m2) Area x Void Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
26.200	0.350	100.00	142.846	142.846	49.996	0.00000000	0.00000000	2.00

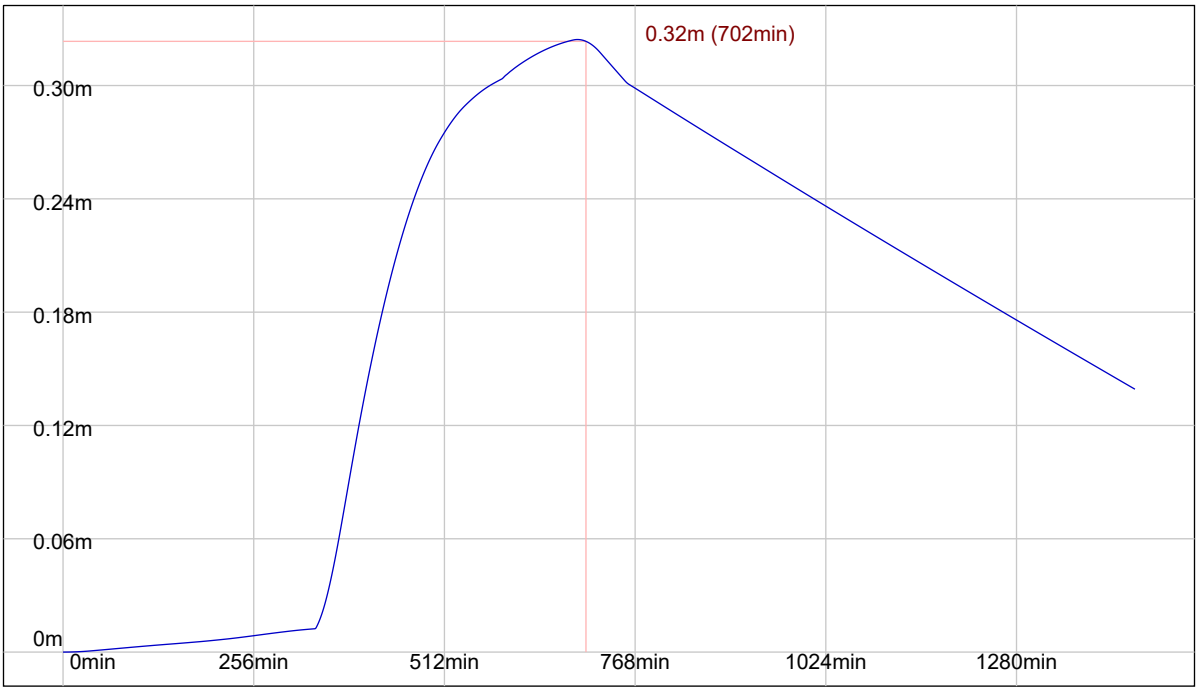
Tank at SWIC6 (100Yr+45% 2160Min Winter)



Tank Structure at Manhole SWIC7

Tank Invert (m)	Tank Height (m)	Void Ratio (%)	Area (m2)	Effective Area (m2) Area x Void Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
26.111	0.350	100.00	118.830	118.830	41.591	0.00000000	0.00000000	2.00

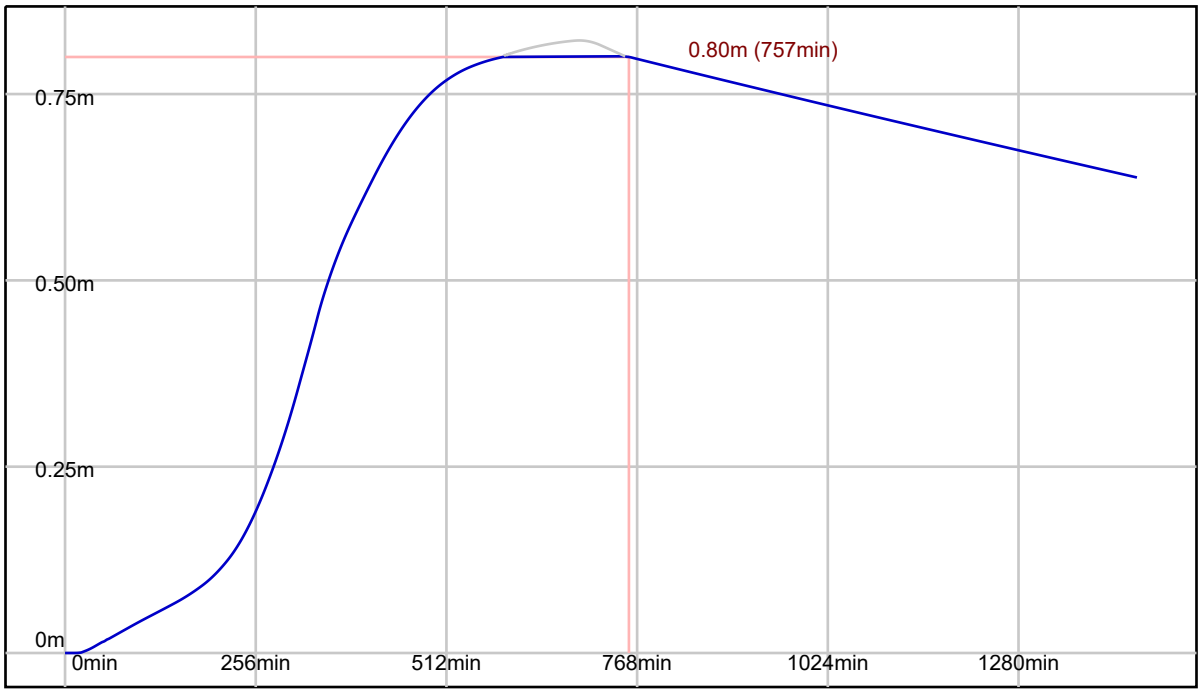
Tank at SWIC7 (100Yr+45% 720Min Winter)



Tank Structure at Manhole TANK OUT

Tank Invert (m)	Tank Height (m)	Void Ratio (%)	Area (m2)	Effective Area (m2) Area x Void Ratio	Max Storage (m3) Effective Area x Height	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
26.000	0.800	95.00	124.922	118.675	94.940	0.00000000	0.00000000	2.00

Tank at TANK OUT (100Yr+45% 720Min Winter)

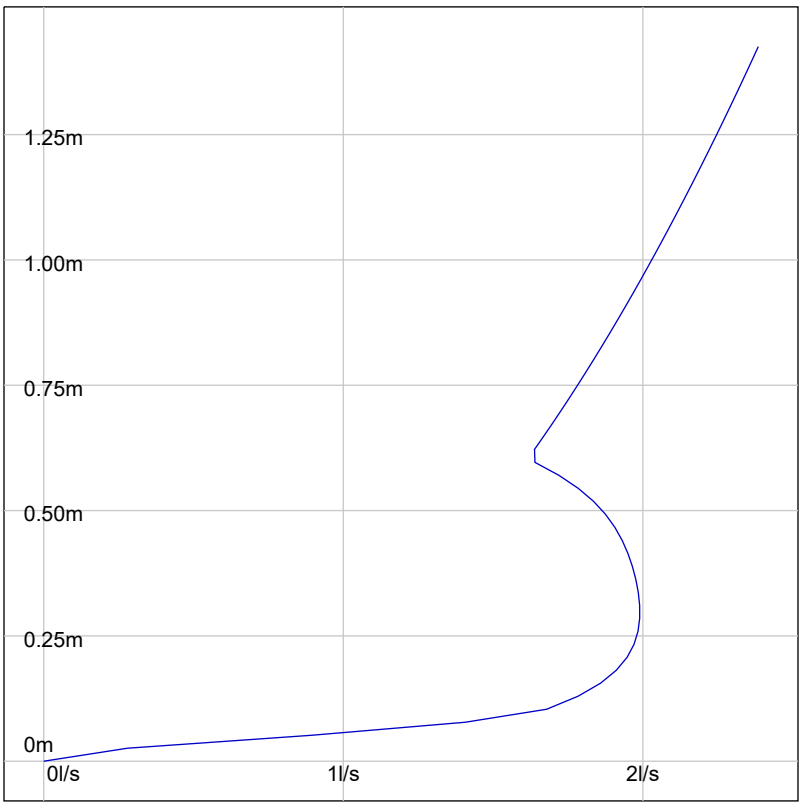


Controls within Manhole SWIC16

Hydro-Brake® Optimum Control at Manhole SWIC16

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0068-2200-1200-2200	1.200	2.200	0.000	0.297	1.990	0.602	1.615

Hydro-Brake® Optimum Control at SWIC16



Simulation Settings

FSR: M5-60=19.60, R=0.35, Locale=England and Wales

Summer (Cv: 0.75), Winter (Cv: 0.84)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Periods (yrs) + Climate Change: (1, +0%), (30, +0%), (100, +45%)

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
1Yr 15Min Winter	34.290	0.00	3.41	30Yr 720Min Winter	4.968	0.00	0.92
1Yr 15Min Summer	34.290	0.00	3.27	30Yr 960Min Summer	4.002	0.00	0.89
1Yr 30Min Winter	22.213	0.00	2.82	30Yr 960Min Winter	4.002	0.00	0.83
1Yr 30Min Summer	22.213	0.00	3.08	30Yr 1440Min Summer	2.946	0.00	0.78
1Yr 60Min Winter	13.942	0.00	2.38	30Yr 1440Min Winter	2.946	0.00	0.69
1Yr 60Min Summer	13.942	0.00	2.60	30Yr 2160Min Summer	2.165	0.00	0.74
1Yr 120Min Winter	8.631	0.00	2.03	30Yr 2160Min Winter	2.165	0.00	0.62
1Yr 120Min Summer	8.631	0.00	2.24	30Yr 2880Min Summer	1.739	0.00	0.70
1Yr 180Min Summer	6.515	0.00	2.06	30Yr 2880Min Winter	1.739	0.00	0.60
1Yr 180Min Winter	6.515	0.00	1.88	30Yr 4320Min Summer	1.275	0.00	0.60
1Yr 240Min Summer	5.343	0.00	1.95	30Yr 4320Min Winter	1.275	0.00	0.54
1Yr 240Min Winter	5.343	0.00	1.78	30Yr 5760Min Summer	1.022	0.00	0.52
1Yr 360Min Summer	4.029	0.00	1.83	30Yr 5760Min Winter	1.022	0.00	0.47
1Yr 360Min Winter	4.029	0.00	1.65	30Yr 7200Min Summer	0.861	0.00	0.46
1Yr 480Min Summer	3.296	0.00	1.73	30Yr 7200Min Winter	0.861	0.00	0.41
1Yr 480Min Winter	3.296	0.00	1.56	30Yr 8640Min Summer	0.749	0.00	0.42
1Yr 600Min Summer	2.820	0.00	1.64	30Yr 8640Min Winter	0.749	0.00	0.38
1Yr 600Min Winter	2.820	0.00	1.50	30Yr 10080Min Summer	0.666	0.00	0.39
1Yr 720Min Summer	2.483	0.00	1.60	30Yr 10080Min Winter	0.666	0.00	0.36
1Yr 720Min Winter	2.483	0.00	1.44	100Yr+45% 15Min Summer	133.566	0.00	2.96
1Yr 960Min Summer	2.031	0.00	1.50	100Yr+45% 15Min Winter	133.566	0.00	2.73
1Yr 960Min Winter	2.031	0.00	1.36	100Yr+45% 30Min Summer	89.751	0.00	2.77
1Yr 1440Min Winter	1.531	0.00	1.28	100Yr+45% 30Min Winter	89.751	0.00	2.79
1Yr 1440Min Summer	1.531	0.00	1.40	100Yr+45% 60Min Summer	57.527	0.00	2.62
1Yr 2160Min Winter	1.154	0.00	1.18	100Yr+45% 60Min Winter	57.527	0.00	2.54
1Yr 2160Min Summer	1.154	0.00	1.26	100Yr+45% 120Min Summer	35.570	0.00	2.26
1Yr 2880Min Summer	0.945	0.00	1.19	100Yr+45% 120Min Winter	35.570	0.00	2.23
1Yr 2880Min Winter	0.945	0.00	1.09	100Yr+45% 180Min Summer	26.435	0.00	2.09
1Yr 4320Min Summer	0.714	0.00	0.94	100Yr+45% 180Min Winter	26.435	0.00	2.09
1Yr 4320Min Winter	0.714	0.00	0.88	100Yr+45% 240Min Summer	21.253	0.00	1.95
1Yr 5760Min Summer	0.585	0.00	0.78	100Yr+45% 240Min Winter	21.253	0.00	1.99
1Yr 5760Min Winter	0.585	0.00	0.74	100Yr+45% 360Min Summer	15.642	0.00	1.75
1Yr 7200Min Summer	0.501	0.00	0.68	100Yr+45% 360Min Winter	15.642	0.00	1.81
1Yr 7200Min Winter	0.501	0.00	0.65	100Yr+45% 480Min Summer	12.566	0.00	1.58
1Yr 8640Min Summer	0.442	0.00	0.62	100Yr+45% 480Min Winter	12.566	0.00	1.66
1Yr 8640Min Winter	0.442	0.00	0.57	100Yr+45% 600Min Summer	10.594	0.00	1.43
1Yr 10080Min Winter	0.397	0.00	0.51	100Yr+45% 600Min Winter	10.594	0.00	1.52
1Yr 10080Min Summer	0.397	0.00	0.62	100Yr+45% 720Min Summer	9.210	0.00	1.36
30Yr 15Min Summer	71.142	0.00	2.88	100Yr+45% 720Min Winter	9.210	0.00	1.39
30Yr 15Min Winter	71.142	0.00	2.95	100Yr+45% 960Min Summer	7.377	0.00	1.12
30Yr 30Min Summer	47.349	0.00	2.73	100Yr+45% 960Min Winter	7.377	0.00	1.16
30Yr 30Min Winter	47.349	0.00	2.68	100Yr+45% 1440Min Summer	5.385	0.00	0.56
30Yr 60Min Summer	30.183	0.00	2.35	100Yr+45% 1440Min Winter	5.385	0.00	0.67
30Yr 60Min Winter	30.183	0.00	2.33	100Yr+45% 2160Min Summer	3.923	0.00	0.52
30Yr 120Min Summer	18.669	0.00	1.95	100Yr+45% 2160Min Winter	3.923	0.00	0.42
30Yr 120Min Winter	18.669	0.00	2.01	100Yr+45% 2880Min Summer	3.129	0.00	0.37
30Yr 180Min Summer	13.931	0.00	1.70	100Yr+45% 2880Min Winter	3.129	0.00	0.34
30Yr 180Min Winter	13.931	0.00	1.77	100Yr+45% 4320Min Summer	2.271	0.00	0.37
30Yr 240Min Summer	11.258	0.00	1.50	100Yr+45% 4320Min Winter	2.271	0.00	0.33
30Yr 240Min Winter	11.258	0.00	1.58	100Yr+45% 5760Min Summer	1.807	0.00	0.34
30Yr 360Min Summer	8.339	0.00	1.18	100Yr+45% 5760Min Winter	1.807	0.00	1.01
30Yr 360Min Winter	8.339	0.00	1.26	100Yr+45% 7200Min Summer	1.513	0.00	0.47
30Yr 480Min Summer	6.731	0.00	1.11	100Yr+45% 7200Min Winter	1.513	0.00	2.57
30Yr 480Min Winter	6.731	0.00	1.01	100Yr+45% 8640Min Summer	1.310	0.00	0.28
30Yr 600Min Summer	5.696	0.00	1.05	100Yr+45% 8640Min Winter	1.310	0.00	0.50

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
30Yr 600Min Winter	5.696	0.00	0.96	100Yr+45% 10080Min Winter	1.160	0.00	0.38
30Yr 720Min Summer	4.968	0.00	0.98	100Yr+45% 10080Min Summer	1.160	0.00	0.27

Simulation Results

Return Period Yrs: 1.0

Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWIC1	7200 min Winter	4421	27.180	0.108	0.080		OK
SWIC2	7200 min Winter	4416	27.180	0.180	0.047		Surcharged
SWIC3	7200 min Winter	4405	27.180	0.293	0.200		Surcharged
SWIC4	180 min Winter	121	27.187	0.017	0.464		Surcharged
SWIC5	120 min Winter	70	27.192	0.744	0.913		Surcharged
SWIC6	960 min Winter	677	27.152	0.049	0.326		Surcharged
SWIC7	120 min Winter	84	26.508	0.008	0.212		Surcharged
SWIC8	15 min Winter	11	26.463	0.439	0.251		Surcharged
SWIC9	15 min Winter	8	26.864	0.107	12.938		OK
SWIC10	15 min Winter	8	26.842	0.049	3.499		OK
SWIC11	15 min Winter	9	26.673	0.102	17.914		OK
SWIC12	15 min Winter	9	26.570	0.106	19.043		OK
SWIC13	15 min Winter	9	26.474	0.112	21.452		OK
SWIC14	15 min Winter	8	26.466	0.055	4.306		OK
SWIC15	15 min Winter	11	26.463	0.266	18.055		Surcharged
TANK IN	15 min Winter	11	26.460	0.460	20.689		Surcharged
TANK OUT	240 min Winter	187	26.187	0.187	1.899		Surcharged
SWIC16	240 min Winter	187	26.187	0.204	1.884		Surcharged
HEADWALL	240 min Winter	188	25.836	0.036	1.884		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	7200 min Winter	4421	SWIC1	SWIC3	0.129	0.031	0.110	0.008	OK
2.000	4320 min Winter	4550	SWIC2	SWIC3	0.150	0.004	0.078	0.005	Surcharged
1.001	180 min Winter	121	SWIC3	SWIC4	0.084	0.000	0.000	0.000	OK
1.002	180 min Winter	121	SWIC4	SWIC5	0.084	0.034	0.335	0.023	OK
1.003	960 min Winter	677	SWIC5	SWIC6	0.100	0.036	0.387	0.027	OK
1.004	600 min Winter	469	SWIC6	SWIC8	0.080	0.328	0.311	0.022	OK
3.000	120 min Winter	84	SWIC7	SWIC8	0.079	0.022	0.213	0.015	OK
1.005	15 min Summer	15	SWIC8	TANK IN	0.150	0.222	3.922	0.272	Surcharged
4.000	15 min Winter	9	SWIC9	SWIC11	0.105	0.949	12.511	0.867	OK
5.000	15 min Winter	9	SWIC10	SWIC11	0.049	0.675	3.379	0.234	OK
4.001	15 min Winter	9	SWIC11	SWIC12	0.104	1.011	18.074	0.427	OK
4.002	15 min Winter	9	SWIC12	SWIC13	0.109	1.009	19.213	0.454	OK
4.003	15 min Winter	10	SWIC13	SWIC15	0.167	0.950	21.418	0.506	OK
6.000	15 min Winter	12	SWIC14	SWIC15	0.101	0.711	4.138	0.287	OK
4.004	15 min Winter	10	SWIC15	TANK IN	0.225	1.040	20.874	0.494	OK
1.006	120 min Winter	78	TANK IN	TANK OUT	0.150	0.716	10.010		Surcharged
1.007	240 min Winter	169	TANK OUT	SWIC16	0.150	0.197	1.889	0.158	Surcharged
1.008	240 min Winter	188	SWIC16	HEADWALL	0.036	0.571	1.884	0.131	OK

Return Period Yrs: 30.0

Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWIC1	15 min Winter	9	27.375	0.302	11.773		Flood Risk
SWIC2	2160 min Winter	1659	27.255	0.255	0.068		Surcharged
SWIC3	15 min Winter	9	27.263	0.376	21.795		Surcharged
SWIC4	2160 min Winter	1661	27.255	0.085	0.364		Surcharged
SWIC5	30 min Winter	18	27.261	0.814	4.819		Surcharged
SWIC6	2160 min Winter	1725	27.195	0.092	0.490		Surcharged
SWIC7	30 min Winter	25	26.563	0.063	0.831		Surcharged
SWIC8	15 min Winter	11	26.691	0.667	13.344		Flood Risk
SWIC9	15 min Winter	10	27.208	0.451	21.045		Surcharged
SWIC10	15 min Winter	11	26.894	0.101	4.384		OK
SWIC11	15 min Winter	11	26.882	0.310	26.233		Surcharged
SWIC12	15 min Winter	11	26.843	0.379	27.384		Surcharged
SWIC13	15 min Winter	11	26.803	0.441	30.159		Surcharged
SWIC14	15 min Winter	11	26.742	0.331	5.394		Surcharged
SWIC15	15 min Winter	11	26.724	0.527	35.269		Surcharged
TANK IN	15 min Winter	11	26.710	0.710	40.484		Flood Risk
TANK OUT	360 min Winter	328	26.479	0.479	1.912		Surcharged
SWIC16	360 min Winter	328	26.478	0.496	1.914		Surcharged
HEADWALL	960 min Summer	842	25.837	0.037	1.989		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	9	SWIC1	SWIC3	0.150	0.643	11.371	0.788	Surcharged
2.000	120 min Winter	138	SWIC2	SWIC3	0.150	0.025	0.435	0.030	Surcharged
1.001	2160 min Winter	1661	SWIC3	SWIC4	0.118	0.042	0.417	0.029	OK
1.002	2160 min Winter	2160	SWIC4	SWIC5	0.118	0.028	0.393	0.027	OK
1.003	2160 min Winter	1725	SWIC5	SWIC6	0.121	0.028	0.430	0.030	OK
1.004	2160 min Winter	1725	SWIC6	SWIC8	0.081	0.488	0.490	0.034	OK
3.000	30 min Winter	28	SWIC7	SWIC8	0.107	0.653	8.318	0.576	OK
1.005	15 min Winter	18	SWIC8	TANK IN	0.150	0.579	10.226	0.709	Surcharged
4.000	30 min Summer	17	SWIC9	SWIC11	0.150	1.218	20.973	1.453	Surcharged
5.000	15 min Winter	11	SWIC10	SWIC11	0.126	0.792	7.105	0.492	OK
4.001	30 min Summer	18	SWIC11	SWIC12	0.225	1.110	30.781	0.728	OK
4.002	15 min Winter	9	SWIC12	SWIC13	0.225	1.055	29.554	0.699	OK
4.003	15 min Winter	11	SWIC13	SWIC15	0.225	1.006	29.905	0.707	OK
6.000	15 min Winter	8	SWIC14	SWIC15	0.150	0.730	6.698	0.464	Surcharged
4.004	15 min Winter	12	SWIC15	TANK IN	0.225	1.051	35.312	0.835	OK
1.006	30 min Winter	22	TANK IN	TANK OUT	0.150	1.756	27.790		Surcharged
1.007	60 min Winter	40	TANK OUT	SWIC16	0.150	0.333	2.207	0.184	Surcharged
1.008	960 min Summer	842	SWIC16	HEADWALL	0.037	0.580	1.989	0.138	OK

Return Period Yrs: 100.0

Climate Change %: 45

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWIC1	15 min Winter	8	27.620	0.547	23.419	1.043	Flood
SWIC2	2160 min Winter	1651	27.504	0.504	0.126		Flood Risk
SWIC3	2160 min Winter	1651	27.504	0.616	0.535		Flood Risk
SWIC4	2160 min Winter	1653	27.504	0.334	0.669		Surcharged
SWIC5	2160 min Winter	1653	27.503	1.055	0.791		Flood Risk
SWIC6	2160 min Winter	2032	27.313	0.210	0.774		Surcharged
SWIC7	720 min Winter	691	26.824	0.324	0.056		Surcharged
SWIC8	15 min Winter	10	26.885	0.861	21.668		Flood Risk
SWIC9	15 min Winter	9	27.800	1.043	47.424	3.515	Flood
SWIC10	15 min Winter	11	27.403	0.611	8.207		Surcharged
SWIC11	15 min Winter	11	27.353	0.782	38.562		Surcharged
SWIC12	15 min Winter	11	27.267	0.803	41.198		Flood Risk
SWIC13	15 min Winter	11	27.173	0.811	46.896		Surcharged
SWIC14	15 min Winter	10	27.099	0.688	13.122		Surcharged
SWIC15	15 min Winter	10	26.978	0.780	59.014		Surcharged
TANK IN	15 min Winter	10	26.936	0.936	72.136	2.818	Flood
TANK OUT	720 min Winter	690	26.822	0.822	1.838		Flood Risk
SWIC16	720 min Winter	691	26.822	0.839	1.838		Surcharged
HEADWALL	4320 min Summer	3634	25.837	0.037	1.989		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	30 min Winter	18	SWIC1	SWIC3	0.150	0.951	16.811	1.165	Surcharged
2.000	600 min Winter	395	SWIC2	SWIC3	0.150	0.045	0.793	0.055	Surcharged
1.001	600 min Winter	396	SWIC3	SWIC4	0.150	0.193	3.411	0.236	Surcharged
1.002	960 min Winter	962	SWIC4	SWIC5	0.150	0.042	0.740	0.051	Surcharged
1.003	1440 min Winter	1101	SWIC5	SWIC6	0.150	0.045	0.800	0.055	Surcharged
1.004	2160 min Winter	2032	SWIC6	SWIC8	0.083	0.494	0.774	0.054	OK
3.000	30 min Winter	39	SWIC7	SWIC8	0.150	0.807	14.078	0.975	Surcharged
1.005	15 min Winter	23	SWIC8	TANK IN	0.150	0.908	16.048	1.112	Surcharged
4.000	15 min Winter	7	SWIC9	SWIC11	0.150	1.772	31.321	2.170	Surcharged
5.000	15 min Winter	8	SWIC10	SWIC11	0.150	0.815	9.788	0.678	Surcharged
4.001	15 min Winter	7	SWIC11	SWIC12	0.225	1.129	40.052	0.947	OK
4.002	15 min Winter	11	SWIC12	SWIC13	0.225	1.100	41.305	0.977	OK
4.003	15 min Winter	11	SWIC13	SWIC15	0.225	1.185	47.105	1.114	OK
6.000	15 min Winter	10	SWIC14	SWIC15	0.150	0.784	13.849	0.960	Surcharged
4.004	15 min Winter	11	SWIC15	TANK IN	0.225	1.485	59.059	1.396	OK
1.006	30 min Winter	19	TANK IN	TANK OUT	0.150	1.989	34.421		Surcharged
1.007	15 min Winter	15	TANK OUT	SWIC16	0.150	0.474	2.349	0.196	Surcharged
1.008	7200 min Winter	4617	SWIC16	HEADWALL	0.037	0.580	1.989	0.138	OK

Summary of Results for 30 year Return Period (+40%)

Half Drain Time : 1015 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	26.618	0.618	0.0	1.7	1.7	73.4	O K
30 min Summer	27.208	1.208	0.0	1.9	1.9	100.7	O K
60 min Summer	27.251	1.251	0.0	2.0	2.0	129.6	O K
120 min Summer	27.295	1.295	0.0	2.0	2.0	158.8	O K
180 min Summer	27.319	1.319	0.0	2.0	2.0	174.8	O K
240 min Summer	27.334	1.334	0.0	2.0	2.0	184.9	O K
360 min Summer	27.352	1.352	0.0	2.0	2.0	197.4	O K
480 min Summer	27.362	1.362	0.0	2.0	2.0	204.2	O K
600 min Summer	27.367	1.367	0.0	2.0	2.0	207.5	O K
720 min Summer	27.369	1.369	0.0	2.0	2.0	208.6	O K
960 min Summer	27.368	1.368	0.0	2.0	2.0	208.1	O K
1440 min Summer	27.362	1.362	0.0	2.0	2.0	203.9	O K
2160 min Summer	27.348	1.348	0.0	2.0	2.0	194.4	O K
2880 min Summer	27.332	1.332	0.0	2.0	2.0	183.9	O K
4320 min Summer	27.301	1.301	0.0	2.0	2.0	163.0	O K
5760 min Summer	27.272	1.272	0.0	2.0	2.0	143.3	O K
7200 min Summer	27.245	1.245	0.0	2.0	2.0	125.4	O K
8640 min Summer	27.223	1.223	0.0	1.9	1.9	110.2	O K
10080 min Summer	27.205	1.205	0.0	1.9	1.9	98.4	O K
15 min Winter	26.705	0.705	0.0	1.7	1.7	83.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	98.523	0.0	74.1	23
30 min Summer	65.580	0.0	102.0	37
60 min Summer	41.816	0.0	134.3	66
120 min Summer	25.877	0.0	168.7	126
180 min Summer	19.319	0.0	190.0	184
240 min Summer	15.620	0.0	205.5	244
360 min Summer	11.565	0.0	228.9	362
480 min Summer	9.336	0.0	246.6	482
600 min Summer	7.902	0.0	260.9	600
720 min Summer	6.892	0.0	272.7	720
960 min Summer	5.551	0.0	289.2	830
1440 min Summer	4.087	0.0	286.6	1082
2160 min Summer	3.004	0.0	356.5	1476
2880 min Summer	2.413	0.0	379.9	1900
4320 min Summer	1.770	0.0	413.4	2720
5760 min Summer	1.419	0.0	438.0	3512
7200 min Summer	1.195	0.0	456.5	4256
8640 min Summer	1.040	0.0	471.7	5016
10080 min Summer	0.924	0.0	484.1	5744
15 min Winter	98.523	0.0	84.3	22

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	27.229	1.229	0.0	1.9	1.9	114.3	O K
60 min Winter	27.277	1.277	0.0	2.0	2.0	147.0	O K
120 min Winter	27.327	1.327	0.0	2.0	2.0	180.3	O K
180 min Winter	27.355	1.355	0.0	2.0	2.0	198.9	O K
240 min Winter	27.372	1.372	0.0	2.0	2.0	210.9	O K
360 min Winter	27.395	1.395	0.0	2.1	2.1	226.2	O K
480 min Winter	27.408	1.408	0.0	2.1	2.1	235.1	O K
600 min Winter	27.416	1.416	0.0	2.1	2.1	240.2	O K
720 min Winter	27.420	1.420	0.0	2.1	2.1	242.9	O K
960 min Winter	27.421	1.421	0.0	2.1	2.1	243.7	O K
1440 min Winter	27.412	1.412	0.0	2.1	2.1	237.4	O K
2160 min Winter	27.393	1.393	0.0	2.1	2.1	224.6	O K
2880 min Winter	27.370	1.370	0.0	2.0	2.0	209.0	O K
4320 min Winter	27.322	1.322	0.0	2.0	2.0	176.8	O K
5760 min Winter	27.277	1.277	0.0	2.0	2.0	146.6	O K
7200 min Winter	27.238	1.238	0.0	2.0	2.0	120.6	O K
8640 min Winter	27.208	1.208	0.0	1.9	1.9	100.6	O K
10080 min Winter	26.747	0.747	0.0	1.7	1.7	88.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	65.580	0.0	115.4	37
60 min Winter	41.816	0.0	151.8	66
120 min Winter	25.877	0.0	190.3	124
180 min Winter	19.319	0.0	214.2	182
240 min Winter	15.620	0.0	231.5	240
360 min Winter	11.565	0.0	257.7	356
480 min Winter	9.336	0.0	277.3	472
600 min Winter	7.902	0.0	292.3	584
720 min Winter	6.892	0.0	301.4	696
960 min Winter	5.551	0.0	302.6	912
1440 min Winter	4.087	0.0	299.5	1154
2160 min Winter	3.004	0.0	401.8	1604
2880 min Winter	2.413	0.0	428.4	2072
4320 min Winter	1.770	0.0	466.6	2940
5760 min Winter	1.419	0.0	495.4	3752
7200 min Winter	1.195	0.0	517.0	4536
8640 min Winter	1.040	0.0	534.9	5264
10080 min Winter	0.924	0.0	549.7	6256

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.466

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.266	4	8	0.200

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Model Details

Storage is Online Cover Level (m) 27.700

Complex Structure

Cellular Storage

Invert Level (m) 26.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	125.0	125.0	0.801	0.0	173.0
0.800	125.0	173.0			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	320.0
Max Percolation (l/s)	622.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	27.200	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0063-2200-1600-2200
Design Head (m)	1.600
Design Flow (l/s)	2.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	63
Invert Level (m)	26.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	2.2
Flush-Flo™	0.279	1.7
Kick-Flo®	0.565	1.4
Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

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Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	1.9	3.000	2.9	7.000	4.4
0.200	1.7	1.400	2.1	3.500	3.2	7.500	4.5
0.300	1.7	1.600	2.2	4.000	3.4	8.000	4.6
0.400	1.6	1.800	2.3	4.500	3.5	8.500	4.8
0.500	1.5	2.000	2.4	5.000	3.7	9.000	4.9
0.600	1.4	2.200	2.5	5.500	3.9	9.500	5.0
0.800	1.6	2.400	2.6	6.000	4.1		
1.000	1.8	2.600	2.7	6.500	4.2		

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 1380 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	27.211	1.211	0.0	1.9	1.9	102.5	O K
30 min Summer	27.268	1.268	0.0	2.0	2.0	140.9	O K
60 min Summer	27.329	1.329	0.0	2.0	2.0	181.8	O K
120 min Summer	27.391	1.391	0.0	2.1	2.1	223.1	O K
180 min Summer	27.424	1.424	0.0	2.1	2.1	245.5	O K
240 min Summer	27.444	1.444	0.0	2.1	2.1	259.3	O K
360 min Summer	27.471	1.471	0.0	2.1	2.1	277.3	O K
480 min Summer	27.487	1.487	0.0	2.1	2.1	287.9	O K
600 min Summer	27.496	1.496	0.0	2.1	2.1	294.0	O K
720 min Summer	27.501	1.501	0.0	2.1	2.1	297.3	O K
960 min Summer	27.502	1.502	0.0	2.1	2.1	298.1	O K
1440 min Summer	27.492	1.492	0.0	2.1	2.1	291.6	O K
2160 min Summer	27.473	1.473	0.0	2.1	2.1	278.7	O K
2880 min Summer	27.453	1.453	0.0	2.1	2.1	265.1	O K
4320 min Summer	27.414	1.414	0.0	2.1	2.1	239.1	O K
5760 min Summer	27.378	1.378	0.0	2.1	2.1	214.9	O K
7200 min Summer	27.345	1.345	0.0	2.0	2.0	192.2	O K
8640 min Summer	27.314	1.314	0.0	2.0	2.0	171.6	O K
10080 min Summer	27.286	1.286	0.0	2.0	2.0	152.6	O K
15 min Winter	27.232	1.232	0.0	2.0	2.0	116.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.071	0.0	102.9	23
30 min Summer	88.761	0.0	139.3	37
60 min Summer	56.919	0.0	187.0	66
120 min Summer	35.224	0.0	233.8	126
180 min Summer	26.199	0.0	261.6	186
240 min Summer	21.078	0.0	280.9	244
360 min Summer	15.506	0.0	307.8	364
480 min Summer	12.458	0.0	315.8	484
600 min Summer	10.503	0.0	317.3	602
720 min Summer	9.132	0.0	318.2	722
960 min Summer	7.315	0.0	321.1	960
1440 min Summer	5.341	0.0	318.6	1198
2160 min Summer	3.891	0.0	467.9	1564
2880 min Summer	3.104	0.0	495.5	1968
4320 min Summer	2.253	0.0	531.7	2808
5760 min Summer	1.793	0.0	563.5	3624
7200 min Summer	1.501	0.0	584.7	4392
8640 min Summer	1.300	0.0	602.4	5184
10080 min Summer	1.151	0.0	617.0	5944
15 min Winter	132.071	0.0	116.3	22

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	27.296	1.296	0.0	2.0	2.0	159.4	O K
60 min Winter	27.365	1.365	0.0	2.0	2.0	205.6	O K
120 min Winter	27.434	1.434	0.0	2.1	2.1	252.6	O K
180 min Winter	27.473	1.473	0.0	2.1	2.1	278.3	O K
240 min Winter	27.497	1.497	0.0	2.1	2.1	294.4	O K
360 min Winter	27.529	1.529	0.0	2.2	2.2	316.0	O K
480 min Winter	27.549	1.549	0.0	2.2	2.2	329.3	O K
600 min Winter	27.561	1.561	0.0	2.2	2.2	337.6	O K
720 min Winter	27.569	1.569	0.0	2.2	2.2	342.7	O K
960 min Winter	27.575	1.575	0.0	2.2	2.2	346.9	O K
1440 min Winter	27.567	1.567	0.0	2.2	2.2	341.6	O K
2160 min Winter	27.542	1.542	0.0	2.2	2.2	324.9	O K
2880 min Winter	27.515	1.515	0.0	2.1	2.1	306.6	O K
4320 min Winter	27.458	1.458	0.0	2.1	2.1	268.5	O K
5760 min Winter	27.403	1.403	0.0	2.1	2.1	231.8	O K
7200 min Winter	27.353	1.353	0.0	2.0	2.0	197.7	O K
8640 min Winter	27.308	1.308	0.0	2.0	2.0	167.5	O K
10080 min Winter	27.268	1.268	0.0	2.0	2.0	140.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.761	0.0	147.7	37
60 min Winter	56.919	0.0	210.8	66
120 min Winter	35.224	0.0	263.0	124
180 min Winter	26.199	0.0	293.7	182
240 min Winter	21.078	0.0	312.9	242
360 min Winter	15.506	0.0	322.9	358
480 min Winter	12.458	0.0	326.2	474
600 min Winter	10.503	0.0	330.0	590
720 min Winter	9.132	0.0	333.8	704
960 min Winter	7.315	0.0	334.9	928
1440 min Winter	5.341	0.0	326.9	1354
2160 min Winter	3.891	0.0	526.5	1688
2880 min Winter	3.104	0.0	557.6	2136
4320 min Winter	2.253	0.0	567.6	3032
5760 min Winter	1.793	0.0	635.7	3912
7200 min Winter	1.501	0.0	660.5	4688
8640 min Winter	1.300	0.0	681.2	5528
10080 min Winter	1.151	0.0	698.5	6248

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.466

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.266	4	8	0.200

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Model Details

Storage is Online Cover Level (m) 27.700

Complex Structure

Cellular Storage

Invert Level (m) 26.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	125.0	125.0	0.801	0.0	173.0
0.800	125.0	173.0			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	320.0
Max Percolation (l/s)	622.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	27.200	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0063-2200-1600-2200
Design Head (m)	1.600
Design Flow (l/s)	2.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	63
Invert Level (m)	26.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	2.2
Flush-Flo™	0.279	1.7
Kick-Flo®	0.565	1.4
Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

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Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	1.9	3.000	2.9	7.000	4.4
0.200	1.7	1.400	2.1	3.500	3.2	7.500	4.5
0.300	1.7	1.600	2.2	4.000	3.4	8.000	4.6
0.400	1.6	1.800	2.3	4.500	3.5	8.500	4.8
0.500	1.5	2.000	2.4	5.000	3.7	9.000	4.9
0.600	1.4	2.200	2.5	5.500	3.9	9.500	5.0
0.800	1.6	2.400	2.6	6.000	4.1		
1.000	1.8	2.600	2.7	6.500	4.2		

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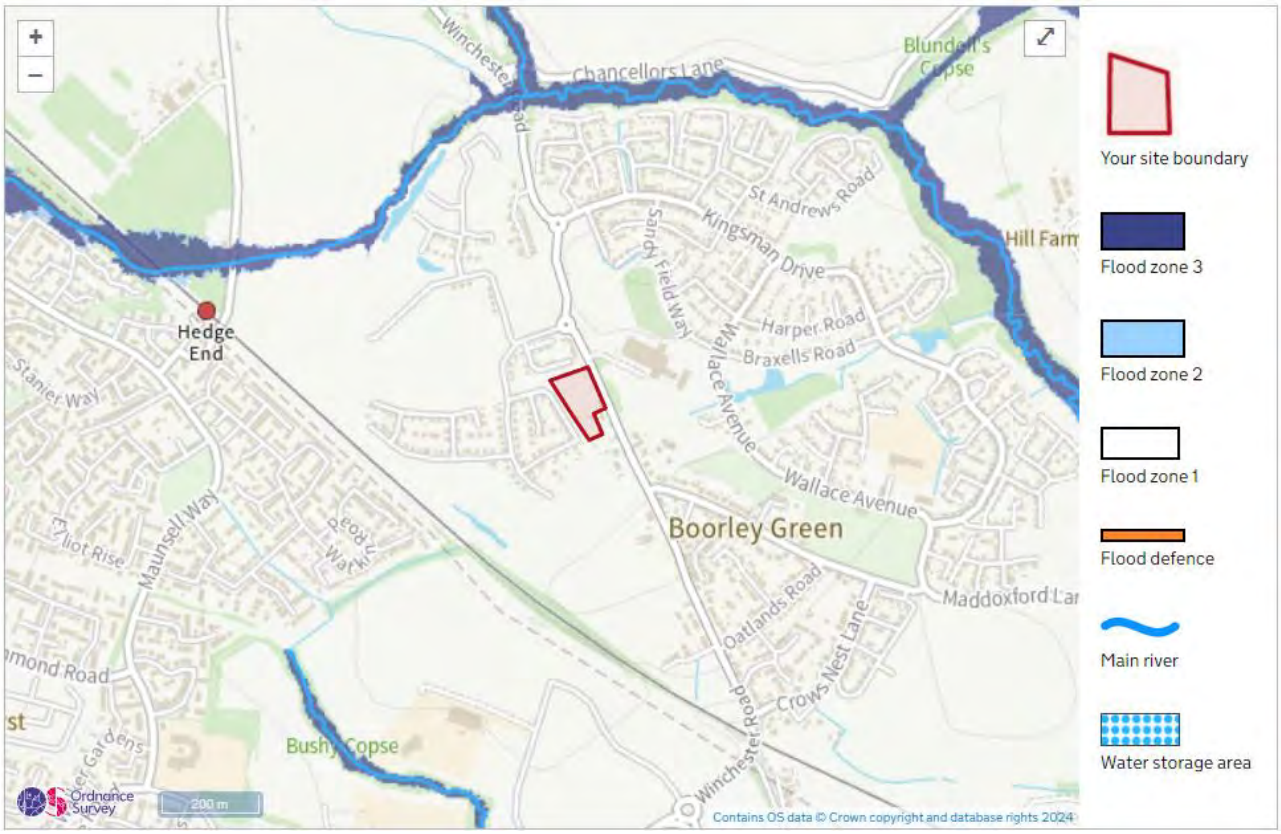
Appendix G
Flood Map Extracts

Flood Map for Planning



Low Probability (Flood Zone 1) means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

Medium Probability (Flood Zone 2) means that each year this area has a chance of flooding of between 0.1% and 1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

High Probability (Flood Zone 3) means that each year this area has a chance of flooding of greater than 1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

Surface Water Flooding

Flood Map – Surface Water

Flood risk from surface water

Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

High risk means that each year this area has a chance of flooding of greater than 3.3%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Appendix H
Flood Exceedance Routes

Key

- Site Boundary
- +21.500 Building finished floor level
- Existing FW manhole, Plastic Inspection Chamber
- Proposed SW manhole, Plastic Inspection Chamber
- Proposed FW manhole, Plastic Inspection Chamber
- Existing SW sewer
- Existing FW sewer
- Proposed SW sewer pipe
- Proposed FW gravity sewer
- Proposed SW connection
- Proposed FW connection
- Proposed SW Pumped Rising Main
- Proposed FW Pumped Rising Main
- RE SW Rodding Eye
- RE FW Rodding Eye
- g Road gully to discharge to perforated pipe
- gully Internal Gully with 100Ø Outlet
- du Surface water discharge to sub-base via distribution unit
- svp/ss Soil Vent Pipe / Stub Stack
- rwp Rainwater downpipe
- +27.620 Proposed level
- Open graded 10mm to 63mm crushed angular stone sub-base with 30% void space for attenuation under access road
- Open graded 10mm to 63mm crushed angular stone sub-base with 30% void space for attenuation under parking spaces.
- Block paving - Vehicular entrance access
- Permeable Asphalt footpath, No dig construction within RPA
- Asphalt footpath
- Concrete flag paving - Patio
- Block paving - Pedestrian
- Compacted limestone chippings to growing gardens with pin kerb edge
- Gravel strip
- Linear drainage slot drain channel at communal threshold
- Linear drainage channel at edge of balcony connected to drainage network.
- 10mm gap applied to channel in patio slab area.

DO NOT SCALE FROM THIS DRAWING

Notes

GENERAL

- This drawing is to be read in conjunction with all relevant Engineers and Architects drawings and with the Specification.
- For setting out refer to Architects drawings.
- All dimensions are in millimetres and levels are in metres unless noted otherwise.
- Contractor to take all relevant dimensions on site. Any discrepancies to be advised to the Engineer.
- Contractor to check/scan for services prior to construction to avoid any damage during works.
- This drawing is based on HGP Architects site layout plan SO-2977-02-AC-010 - dated February 2024.
- Tree constraints taken from survey provided by Keen Consulting dated January 2024.
- Topographical survey provided by Redline Surveys dated January 2024.

DRAINAGE

- Any information given on this drawing regarding existing services is believed to be correct. The contractor must check this information and determine the nature and location of other existing services from the various statutory authorities before commencing excavation works.
- Drainage works to be constructed in accordance with BS EN 752 and Approved Document H
- All soft spots and unacceptable material encountered in drainage excavations is to be removed and replaced with granular material to the requirements of the building control officer.
- Pipes to be installed to manufacturers recommendations.
- Pipes under buildings to be laid to a fall of 1:60 minimum unless noted otherwise. Internal level of pipes to be 4.20m (50mm below blinding + 90° bend). Refer to structural detail drawings for detailed slab construction make-up layers and levels.
- Plastic plain wall pipes to be PVC-U to BS EN 1401-1, class SN4, with flexible joints, Kitemark certified. Structured wall plastic pipes to be to WIS 04-35-01, Kitemark certified
- Clay pipes to be vitrified clay to BS EN 295-1, with flexible joints, Kitemark certified. Clayware pipes must be extra strength classification protected in accordance with the specified details.
- Concrete pipes to be precast concrete to BS 5911-1 and BS EN 1916, with flexible joints.
- Bedding of pipes to be in accordance with approved document H1.
- Rocker pipes with flexible joints are to be provided at a distance of 150mm and 750mm from the face of construction to manholes, where pipes pass above, below or through ground beams or foundations; at gully connections and soil stack ends.
- Manhole access covers are to be located at the outgoing side of manholes.
- Cover levels are to be fixed on site to suit finished levels. Covers and frames to BS EN124, Grade D to be used in areas subject to heavy vehicular loading, Grade C in areas subject to light vehicular loading and Grade B to be used elsewhere.
- All external pipes to be 150Ø unless noted otherwise.
- All internal pipes to be 100Ø unless noted otherwise.
- Manhole positions coordinates are indicated on the SWH manhole schedule 0502 and to be confirmed by SWH prior to setting out on site.
- Access points to be located at base of all rwps and svps.
- All gullies to be trapped
- Positions of SVP's and RWP's should be read in conjunction with Architects drawings.

PRELIMINARY - NOT FOR CONSTRUCTION

Rev.	Amendment	Drn.	Chkd.	Appd.	Date
P09	Stage 3 - Revised Landscaper's layout 17.02.25	RD	GM	IL	03.03.25
P08	Stage 3 - Revised Landscape architects layout	RD	BC	IL	12.12.24
P07	Stage 3 - Outfall location amended following discussions	RD	NC	IL	28.11.24
P06	Stage 3 - Revised site layout	RD	BC	IL	25.07.24
P05	Stage 3 - Revised site boundary	RD	BC	IL	17.07.24
P04	Stage 3 - Drainage updated to suit site layout	RD	BC	IL	02.07.24
P03	Updated to suit client requirements	RD	TK	TK	11.03.24
P02	Preliminary Issue - Foul sewer outfall via Oak Cottage omitted.	TK	TK	TK	26.02.24
P01	Preliminary Issue	TK	TK	TK	23.02.24

Project

Winchester Road, Boorley Green

Drawing

Drainage Strategy Layout

Client

McCARTHY STONE
Life, well lived

Scott White and Hookins
Structural Engineering | Civil Engineering | Sustainability and BREEAM | CDM Consultancy

Harman House, Andover Road, Winchester, Hampshire SO23 7BS
T: +44 (0)1962 844855 W: www.swh.co.uk E: info@swh.co.uk

Scale at A1 - 1:250

SO-2977-03-CE-0500 - P09