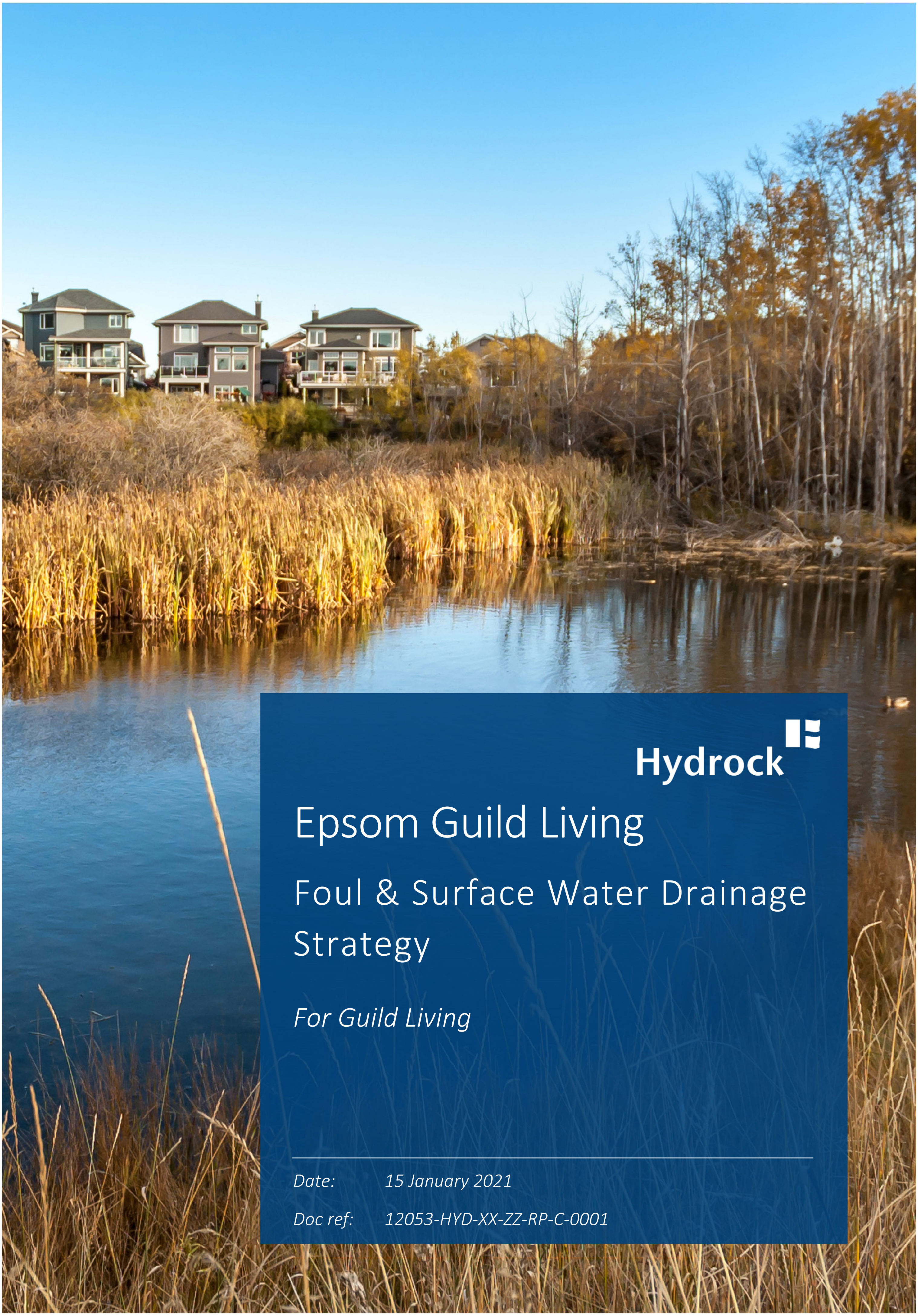

Hydrock

Epsom Guild Living

Foul & Surface Water Drainage Strategy

For Guild Living

Date: *15 January 2021*

Doc ref: *12053-HYD-XX-ZZ-RP-C-0001*

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DOCUMENT CONTROL SHEET

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Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above-named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

CONTENTS

Introduction

Hydrock Consultants have been appointed by Guild Living to carry out a drainage strategy report for the approval of Surrey County Council Lead Local Flood Authority (LLFA). The proposed drainage strategy will be in accordance with both national guidelines and will incorporate a 'best practise' approach in reducing the impact of the flooding caused by the new development.

The report is based upon sewer asset information provided by the sewerage undertakers Thames Water in relation to assets within the vicinity of the development site. The report highlights the key stakeholders in terms of ownership and maintenance to ensure the drainage system is kept well maintained and reduce the risk of failure. Should the network fail at any point, clearly defined ownership liabilities will ensure that problems can quickly be rectified thereby reducing the impact of potential damage caused by flooding.

The information received is summarised within this report. In the event that the information is relied upon and is subsequently found to be incorrect, Hydrock Consultants Ltd accepts no responsibility for any direct and/or consequential loss that may occur as a result.

0.1 References

Appendix A - Topographical Survey - 3 Sixty - 18385-04.

Appendix B - Landscape Architects Layouts - 596_p_00_100 P03

Appendix C - Sewer Asset Map - Commercial Drainage Water Search - 2018_3808735.

Appendix D - Existing Drainage Layout - 12053-HYD-00-ZZ-SK-7701

Appendix E - Existing / Proposed Catchment Areas - 12053-HYD-00-ZZ-SK-7702 / 7703.

Appendix F - Calculations.

Appendix G - Overland Flow Routes - 12053-HYD-00-ZZ-SK-C-7704.

Appendix H - Drainage Strategy - 12053-HYD-00-ZZ-DR-7000.

Appendix J - Correspondence - Thames Water Planning Liaison & Surrey Drainage and Flooding Team.

Appendix K - Constraints Plan / Calculations - 12053-HYD-00-ZZ-SK-C-7705.

Appendix L - TT Pumps O&M documentation.

Appendix M - Supporting Surrey County Council Information

0.2 References / Design Codes

- BS EN 752 - Drain and Sewer Systems Outside Buildings.
- Building Regulations Approved Document Part H - Drainage and waste disposals.
- Local Water Authority requirements.
- CIRIA C753 - SuDS Manual.
- National Planning Policy Framework (NPPF).
- DEFRA Non-Statutory Technical Standards for Sustainable Drainage.

1. SITE INFORMATION

1.1 Site Referencing Information

Site Address	Epsom & St Heller University Hospital
	Woodcote Green Road
	KT18 7EG
	National Grid Reference 520430, 159764

1.2 Existing Situation

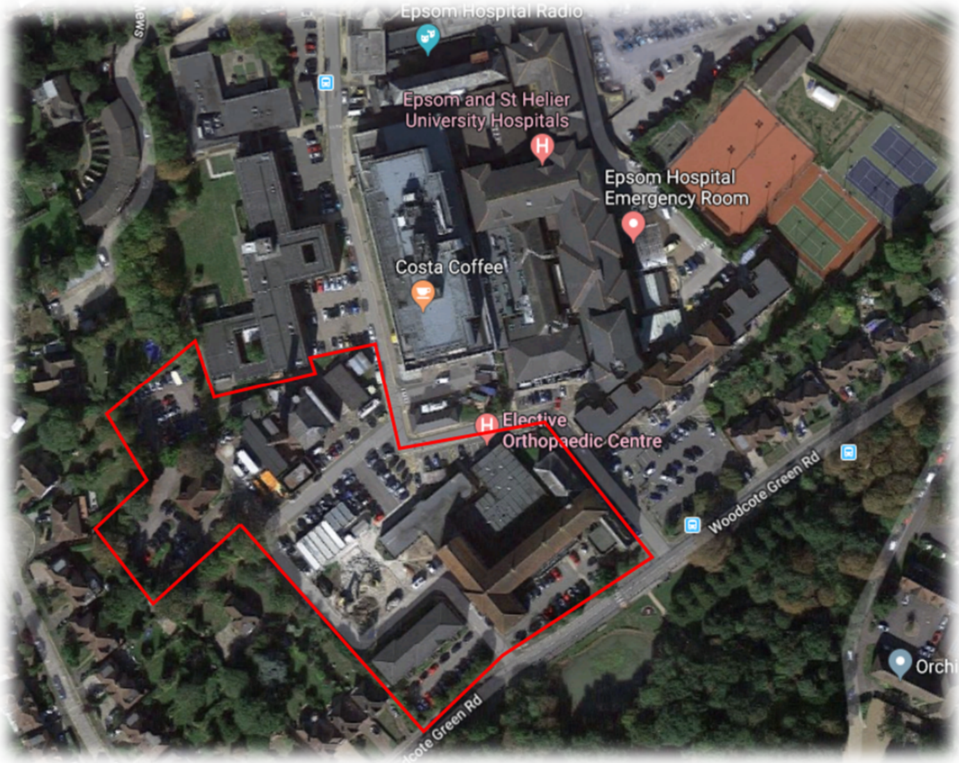
The site is located approximately 1km south west of the town centre of Epsom, Surrey. The overall site comprises the majority of the central and northern part of the Epsom hospital site and is situated along Woodcote Green Road. The site comprises part of an operational hospital facility with associated buildings and infrastructure, including several working hospital wards, offices, portacabins, and associated infrastructure such as generators. The boundary is bordered to the east and north by the hospital, with residential development to the west.

1.3 Topography

A detailed topographical survey has been undertaken which shows the site is generally flat and is located at approximately 59.00m Above Ordnance Datum (AOD). The site slopes from the western boundary (approximately 62.70m AOD) towards the centre of the site (approximately 60.00m AOD). The eastern boundary ties into an existing road at a relativity flat level (approximately 59.20m AOD). The site ties into an existing road (Woodcote Green) and an existing access at approximately 60.20m AOD.

See Appendix A for topographical layout.

Epsom Guild Living - Aerial Photo (Google maps)



1.4 Development proposals

Demolition of the existing hospital buildings, accommodation block and associated structures and redevelopment of the site to provide a new care community for older people arranged in two buildings, comprising 267 care residences, 10 care apartments and 28 care suites proving transitional care, together with ancillary communal and support services Use Class C2, 24 key worker units Use Class C3, children's nursery Use Class E, as well as associated back of house and service areas, car and cycle parking, altered vehicular and pedestrian access, landscaping, private amenity space and public open space.

See Appendix B for architect's layout.

1.5 Ground Conditions

See below extract from Arcadis Geotechnical assessment:

According to the British Geological Survey Geoindex and the Envirocheck Geology Datasheet obtained for the Phase 1 Desk Study the north western side of the site is underlain by the London Clay Formation, comprising Clay and Silt. The eastern part of the site is underlain by the Lambeth Group formerly known as the Reading Beds, comprising clay, silt and sand. According to the geological cross section lines provided on the published BGS Map sheet of Reigate, the bedrock (London Clay and Lambeth Group) appears to be dipping gently towards the north west. These strata (London Clay and Lambeth Group) that outcrop on the site are in turn underlain by Thanet Sands and then Chalk, at greater depth.

Superficial deposits directly underlie the majority of the site and cut across the solid geology. These are River Terrace Deposits, comprising sand and gravel which extend northwards from the site. In the north western corner of the site no superficial deposits are indicated to be present.

Refer to 20180924_Epsom Hospital_Phase 2 Geo-Environmental and Geotechnical Assessment for further information.

1.6 Hydrology, Hydrogeology & Flood Risk

See below extract from Arcadis Geotechnical assessment:

The Envirocheck Report indicates that the bedrock is a Secondary A aquifer. The River Terrace Deposits are defined as having permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. *The site is not located within a groundwater Source Protection Zone (SPZ). There are no recorded groundwater abstraction licences within 1km of the site.*

Based on the topography and the published geological maps, the direction of groundwater flow within the River Terrace Deposits is expected to be towards the north. Groundwater flow within the Lambeth Group is conceived to be more likely to be towards the north west, based on the inferred dip direction of the bedrock.

Refer to 20180924_Epsom Hospital_Phase 2 Geo-Environmental and Geotechnical Assessment for further information.

2. SURFACE WATER MANAGEMENT STRATEGY

2.1 Pre-Development Surface Water Drainage

Public sewer records have been obtained from Thames Water which show that there are no public sewers within the site boundary. The nearest public surface water sewer (675mm diameter) is located to the south of the site in Woodcote Green Road. The sewer flows in an easterly direction and is assumed to continue following the road to the junction 300m away from the site.

See Appendix C for sewer asset map.

Existing private surface water sewers within the site collect run-off from existing roofs / paved areas which convey through the site via a combined system which discharges at five locations around the site (one to the north and four to the south). All existing private drainage within the boundary will be made redundant during the works, with only four of the five existing connection points to remain live.

See Appendix D for existing drainage layout.

2.2 Post-Development Surface Water Drainage

Surface water run-off from the new development will be collected by way of rainwater pipes, gullies and drainage channels into a dedicated below ground surface water drainage system which will discharge to an existing connection point south of the site (Location E). Flows will be controlled at a restricted rate via a Hydro-Brake and be attenuated in the form of a below ground tank and permeable paving storage sub-base.

Due to the FFL's required to satisfy building heights for planning a package pump station will be required downstream of the Hydro-Brake to discharge to the higher onsite connection point.

Where applicable, the surface water management strategy has incorporated the recommendations of the 'Non-Technical Standards for Sustainable Drainage' and general 'good practice' in terms of providing a Sustainable Drainage System (SuDS) which does not adversely impact on flood risk either within the site of beyond the development boundary.

2.3 Run-off Destinations

The discharge of surface water run-off has been considered in accordance with the hierarchical approach:

2.3.1 Interception

Proposals will incorporate filter strips and permeable paving, which are expected to provide some interception of surface water run-off either by evaporation or evapotranspiration.

2.3.2 Infiltration

The ground conditions, are deemed unsuitable for infiltrating to ground and therefore infiltration has not been considered as the primary means for surface water disposal for the new development. See section 1.5 for further details.

2.3.3 Surface water body

The only surface water body within the vicinity is an existing pond across the other side of Woodcote Green Road which is assumed to be sized sufficiently for adjacent developments. Additionally, if storage was available, any works across Woodcote Green Road it is anticipated to cause major disruption. Therefore, considering both points, this approach has not been considered.

2.3.4 To dedicated surface water sewer (public, highways or otherwise)

There is no surface water sewer within 400m+ of the site therefore this approach has not been considered.

2.3.5 To a combined sewer

Surface water from the site will follow the current situation of the site and discharge to the existing combined 675mm dia sewer network situated in Woodcote Green Road.

2.4 Brownfield Discharge Rates

Extract from Surrey - Sustainable Drainage Systems SuDS Planning Advice:

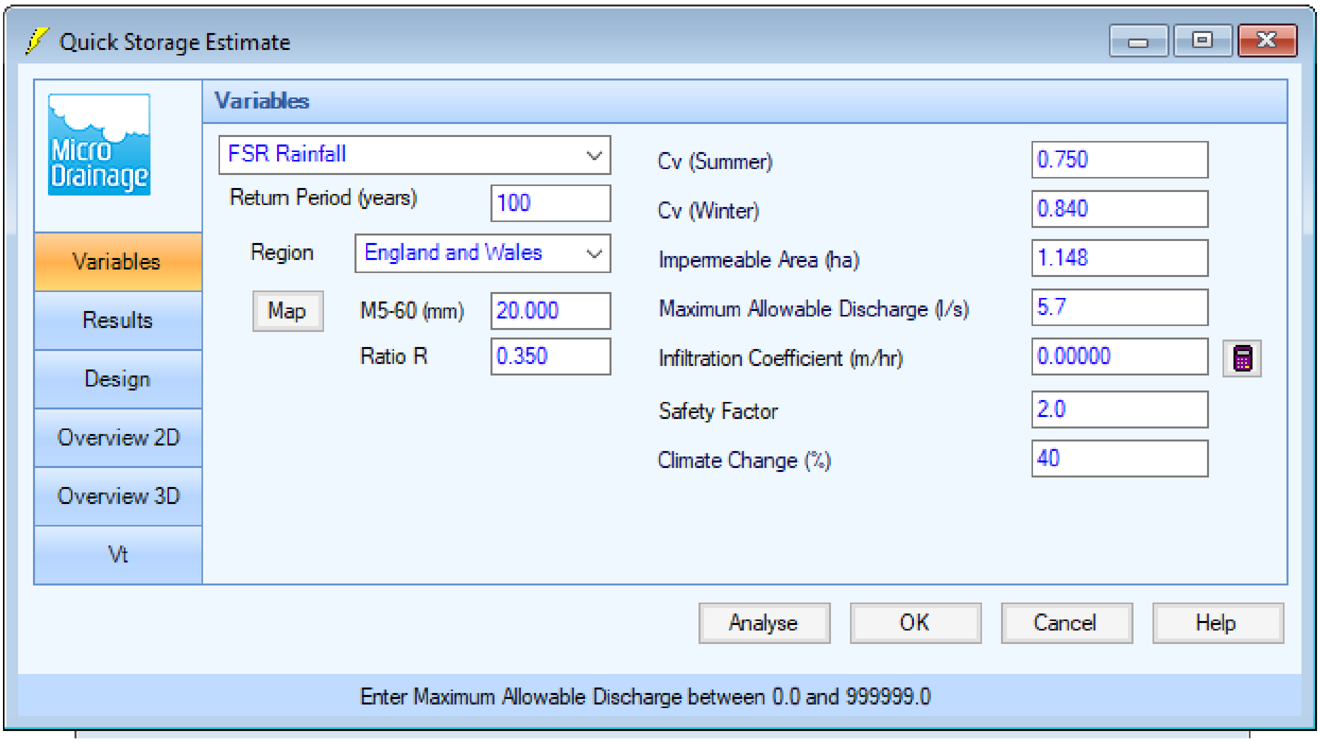
"Brownfield sites should be limited as close to greenfield rates as is reasonably practicable. If greenfield rates cannot be achieved, clear written evidence must be submitted as to why a lower rate cannot be achieved. Information will be considered on a site by site basis. For brownfield sites robust justification could include; analysis of storage requirements required to achieve greenfield runoff rates in comparison to a site area, a cost analysis, spatial or level constraints."

Due to the nature of the existing development and its current arrangement, the peak run-off for this site cannot be designed as close as reasonably practicable to the greenfield runoff rates. These points are outlined below:

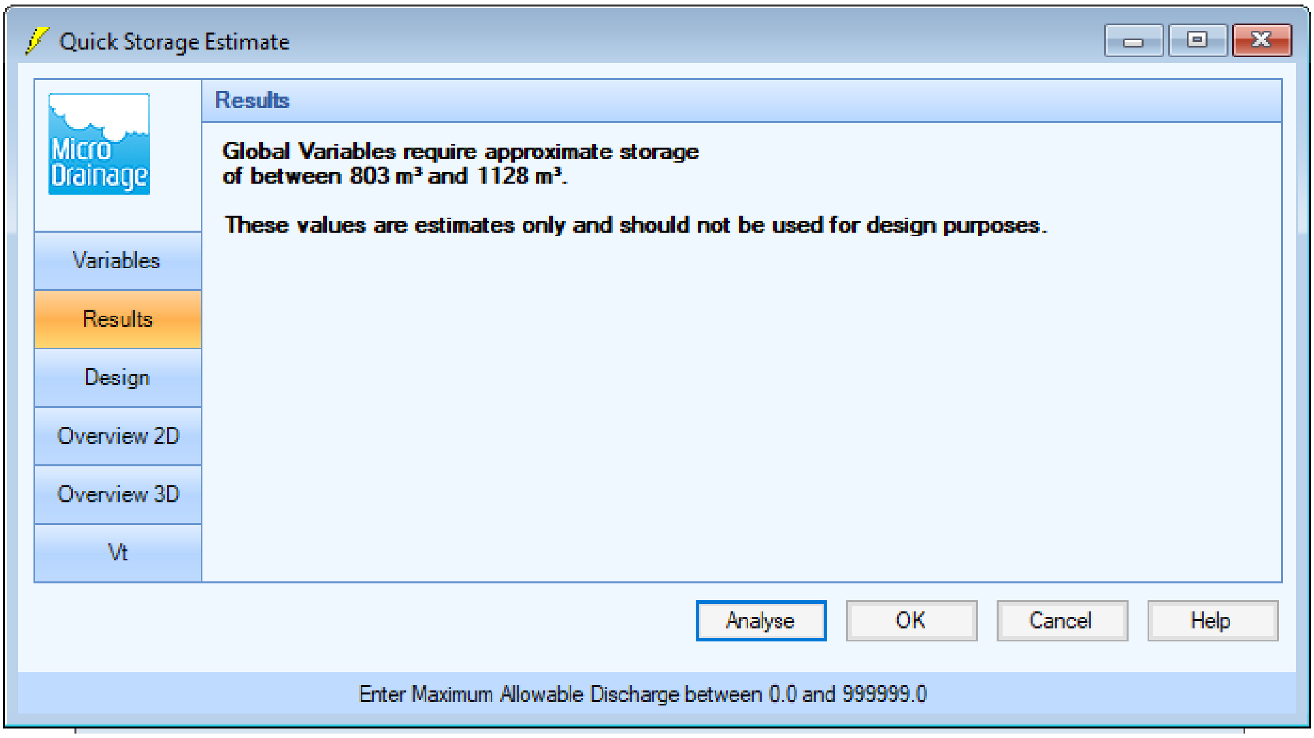
2.4.1 Storage requirements to achieve Greenfield

A quick storage estimate was undertaken to gain an understanding of the approximate volume required for the site if the rate was set at QBar (outlined further in section 2.7.4).

Output shows that between 787m³ and 1106m³ of storage will be required for the site.



As these values are estimates, further source control calculations were carried out (see Appendix K):



<u>Summary</u>

Permeable paving sub-base: <u>2770m^2</u> x 1m deep = 831m^3 of storage.

Geo-cellular tank: <u>860m^2</u> x 1m deep = 860m^3 of storage.

The calculations show the disproportionate amount of storage required, relevant to the size of the site.

2.4.2 Spatial constraints

The majority of the green areas within the site are unable to accommodate above ground SuDS as the site is constrained due to levels, green areas around the perimeter need to bank down to be able to tie-in to the adjacent sites.

A spatial constraint drawing has been produced to show the size of the tank in relation to the Q1 and Greenfield run-off rate storage requirements.

See Appendix K for constraints plan.

Subsequent to the points above, it is considered unfeasible for this site to reduce to the Greenfield run-off rates (QBar), therefore further analysis will need to be outlined to confirm what rate is considered close as reasonably practical to the current constraints.

See section 2.7.4 for continued proposals on proposed rates.

2.5 Selecting SuDS Techniques

All opportunities to implement green/traditional SuDS, have been considered as far as reasonably practicable.

Hierarchy	Description	Setting	Required area	Implemented
Green roofs	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated.	No. Have been considered however are not in keeping with the architects' requirements for the building.
Rainwater harvesting	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (underground or above ground).	No. Have been considered however are not in keeping with the architects' requirements.
Soakaway	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open space	Dependent on runoff volumes, water table and soils.	No. Site deemed unsuitable for infiltrating to ground.
Filter strip	Filter strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	Open space	Minimum length 5m.	Yes. Considered and are implemented at the edge of footpaths where suitable
Permeable paving	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street / open space	Can typically drain double its area.	Yes. Considered and will be used as the primary method of surface water attenuation.
Bioretention area	A vegetated area with gravel and sand layers below designated to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.	Street / open space	Typically, surface area is 5-10% of drained area with storage below.	No. Have been considered however are not in keeping with the architects' requirements.

Swale	Swales are shallow depressions designed to convoy and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	Street / open space	Account for width to allow safe maintenance typically 2–3 metres wide.	No. Have been considered however are not in keeping with the architects' requirements.
Hardscape storage	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	Street / open space	Could be above or below ground and sized to storage need.	No. Have been considered however are not in keeping with the architects' requirements.
Pond / Basin	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Open space	Dependent on runoff volumes and soils.	No. Have been considered however are not in keeping with the architects' requirements.
Wetland	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	Open space	Typically, 5–15% drainage area to provide good treatment.	No. There is minimal green space available to incorporate wetlands.
Underground storage	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Open space	Dependent on runoff volumes and soils.	<u>Yes.</u> <u>Will be utilised along with permeable paving to reduce area necessary beneath paving.</u>

2.6 Point of Connection / Discharge Location

The development is collected around the site by an existing network, which ultimately connects to five points (Locations A to E). One connection point (Location A) discharges north of the site which is assumed to connect into the main offsite hospital network. The other four remaining points (Location B to E) discharge south of the site into the existing 675mm dia. combined sewer running along Woodcote Green Road.

Further CCTV drainage investigation will confirm the exact connectivity and point of discharge of all the existing drainage connection points discharging from the site.

The new development will utilise three of the five existing connection points.

(Locations E) will be used as the surface water discharge point.

See Appendix D for existing drainage layout.

2.7 Flow Rate Run-off Control

An assessment has been made of the pre-development surface water flows and volumes based on the following rainfall and site characteristics for the site.

Site Characteristics	
SAAR (mm)	820
Soil	0.150
Region	8

Rainfall Characteristics	
M5-60	21.000
Ratio R	0.350
CV (Summer)	0.750
CV (Winter)	0.840

2.7.1 Pre-Development surface water run-off catchments

Discharge to existing offsite networks are anticipated to come from the following run-off catchments:

Pre-Development Drainage Catchments		
Catchment	Discharge Location	Catchment Area (m2)
1	Location A	6400
2	Location B	562
3	Location C	173
4	Location D	3474
5	Location E	1720
6	Offsite	2369
Total		14,698m^2

2.7.2 Post-Development surface water run-off catchments

Discharge to proposed discharge points are to come from the following run-off catchments:

Post-Development Drainage Catchments		
Catchment	Discharge Location	Catchment Area (m2)
1	Location A	Zero (to become foul only)
2	Location B	Zero (to become redundant)
3	Location C	Zero (to become redundant)
4	Location D	Zero (to become foul only)
5	Location E	11,298
Total		11,485m^2

The post development catchment areas offer a reduction due to increased landscaped areas.

See Appendix E for catchment layouts.

2.7.3 *Pre-development run-off rates*

Discharge to existing offsite networks are anticipated to come from the following run-off catchments:

Pre-Development Drainage Capacity Check							
Catchment	Discharge Location	Catchment Area (m2)	Existing Pipe Size	Pre-Development Storm (Pipe Cap)	Pre-Development Storm (MRM)		
					1yr	30yr	100yr
1	Location A	6400	150mm@1:100	14 l/s	54	133	171
2	Location B	562	TBC@1:15	45 l/s	4.7	11.7	15
3	Location C	173	TBC@1:7	55 l/s	1.5	3.6	4.6
4	Location D	3474	150mm@1:55	23 l/s	29.3	72.4	93
5	Location E	1720	225mm@1:30	92 l/s	14.5	35.8	46
Total				229 l/s	104	256	329

Calculating the system using the modified rational method (MRM) and highlighting the existing pipe capacity the table currently shows the networks cannot accommodate any storm in excess of the 30yr return period. It is assumed that any additional storms will exceed the network and flood on site and surrounding area. It is anticipated run off will find its way to the main networks via off site gullies and channels, therefore increasing capacity to other offsite systems.

2.7.4 *Post-development run-off rates*

Due to the constraints outlined in section 2.5 it is considered unfeasible to restrict to the Greenfield run-off rates. Reviewing the current options, it is felt that matching the existing Brownfield Q1 with 50% betterment would be a practical rate to work with given the spatial constraints presented on the site. The table below shows the Greenfield rates, current brownfield rates, the new proposed rate of 52 l/s and the difference in flow reduction between existing rates and the proposed:

Peak Discharge Rates				
	Greenfield (l/s)	Brownfield (l/s) (MRM)	Proposed Rates (l/s)	Difference (Prop - Exist)
QBar	5.7			
1 in 1	4.8	104	52	52
1 in 30	12.9	256	52	206
1 in 100	18.1	329	52	277
1 in 100 plus 40%	N/A	N/A	52	N/A

The site will therefore offer a betterment of 52 l/s in the Q1 and 277 l/s in the Q100.

The peak discharge table shows that the proposed rate is a substantial betterment on the current existing rates (min 50% betterment), therefore it is considered 52 l/s is the rate which can be as close as reasonably practicable to the greenfield runoff rate from this development. It is also confirmed that the figure does not exceed the rate of discharge from the development prior to redevelopment for that event.

Further to above, as the proposal is to discharge to the combined system and not discharge to a watercourse / to ground, it can be confirmed the site will not adversely affect flood risk with the rates proposed.

2.8 Volumetric run-off control

In accordance with current guidance where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in100 year, 6-hour rainfall event should never exceed the greenfield runoff volume for the same event.

Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

The development site is currently brownfield covering 1.469ha with approximately 1.469ha of impermeable surfacing. Under the current development proposals, the impermeable area of the site will be reduced to approximately 1.485ha and, therefore, the overall rate and volume of surface water runoff from the site during a 1 in 100-year storm event will be reduced.

2.9 Flood Storage Attenuation

It is anticipated that in order to match the existing pipe capacity (plus 50% betterment) rates for the new development flows will need to be restricted with sustainable attenuation methods to gain a balance, before the water is released into the site wide system at a controlled rate.

Source control has been carried out using MicroDrainage based on the following parameters:

1. Attenuate volume from the agreed flow rate at existing (Location E) plus betterment of 52 l/s.

2. Provide attenuation storage for the 100-year rainfall event plus 40% climate change.

Volume = 379m³ required.

3. Restricted flow by a Hydro-Brake or similar to assist in minimising upstream storage.

4. Provide a package pump station to discharge to higher outfall levels.

See Appendix F for source control calculations.

The drainage system will be designed so that flooding does not occur during the 1 in 100-year rainfall event in any part of the building, or in any utility plant susceptible to water.

An allowance for 40% climate change is to be incorporated into the surface water drainage design.

2.10 Exceedance flow management

In the event that flows from rainfall exceed the 1 in 100-year rainfall event, surface water run-off will be directed via exceedance routes away from the buildings to localised areas e.g. car park, thereby not increasing flood risk to critical infrastructure.

See Appendix G for flood exceedance routes.

2.11 Water quality treatment

The development is considered to be ‘low risk’ for surface water pollution.

It is anticipated that during construction adequate provisions will be put in place to ensure that any construction silts, spillages will be prevented from the entering the downstream ditch network.

In accordance with Environment Agency Document PPG3 an oil interceptor will be implemented to car park and road areas.

Gullies and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network.

Consideration will be given to both during construction and post-development water quality treatment to ensure that water quality is not impacted during the construction works:

2.11.1 Quality of Surface Water Run-off: Post-Development

In accordance with Environment Agency Document PPG3 the proposed as the car park is less than 50 spaces or 800m2 it is considered to be 'low risk' in terms of pollution to the surface water network and as such an oil interceptor is deemed to be required.

Gully's and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network.

2.11.2 Quality of Surface Water Run-off: During Construction

It is anticipated that during construction adequate provisions will be put in place to ensure the existing drainage is protected to prevent material which could have a negative impact on water quality entering the system.

2.12 Design Standards

All materials and products relating to the below ground drainage system shall be specified in accordance with their intended use and meet all relevant British Standards and BBA accreditations.

In accordance with best practice storm drainage will be designed to the following performance criteria:

Pipes running under full conditions with no surcharge	-	1 in 2-year storm return period
No flooding	-	1 in 30-year storm return period
Extreme flooding to be retained on site	-	1 in 100-year storm return period

2.13 Summary

It is considered that the drainage strategy report has demonstrated compliance with both the recommendations for the 'Non-Technical Standards for Sustainable Drainage' and current national standards by using attenuation as the primary method of surface water disposal.

See Appendix H for drainage strategy.

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3. FOUL WATER MANAGEMENT STRATEGY

3.1 Pre-Development Foul Water Drainage

See Section 2.1 for public sewer information.

Existing private foul water sewers within the site collects flows from existing stack points / gully's and conveys through the site via a combined system which discharges at five locations around the site (one to the north and four to the south). All existing private drainage will be made redundant during the works with only two existing connection points to remain.

See Appendix C for sewer asset map.

See Appendix D for existing drainage layout.

3.2 Post-Development Foul Water Drainage

Foul drainage for the new development will be via conventional gravity pipe system which connects into the existing off-site public network via a pump station and rising main at the penultimate manholes. The site will be spilt into north and south foul catchments, with the northern development connecting at the northwest boundary into the existing 150mm foul sewer (Location A), and the southern development connecting into the existing 150mm diameter foul sewer in Woodcote Green Road (Location D).

Due to the FFL's required to satisfy building heights for planning, package pump stations will be required to discharge to the higher onsite connection points.

The foul drainage system will be designed in accordance with Building Regulations Approved Document H and the relevant British Standards.

The foul drainage within the development boundary serves only the development and will be maintained by the owner / management company. A schedule of maintenance activities which ensure the drainage is kept in good working order will be produced and submitted as part of the 'Health & Safety' documentation.

In the absence of detailed number of discharged units and appliances, calculation have been derived from SFA 7th Edition.

Residential units = <u>669 units.</u>

Using Flows and Loads 4 Code of Practise, the flows calculate as:

- 669 x 350 = 234,150
- 234,150 x 6 DWF = 1,404,900
- 1,404,900 / 24 = 58,537
- 58,537 / 3600 = 16.5l/s
- 16.5 / 2 = 8.25 l/s

<u>Location A = 8.25 l/s</u>

<u>Location D = 8.25 l/s</u>

Thames have advised that the flow of 16.5 l/s can be used for the site.

See Appendix J for correspondence with Thames Water.

4. MAINTENANCE & OWNERSHIP

The key elements of the foul and surface water drainage system will require periodic maintenance to prevent failure of the system and/or a reduction in capacity of the networks as a whole and the following matrix therefore sets out the various drainage items to be maintained, identifies who is responsible and the frequency of maintenance.

It is anticipated that the drainage within the development will be maintained privately by a management company appointed by the owner / occupier.

4.1 Responsibility Matrix

Ownership & Maintenance Responsibility Matrix			
Responsibility	Feature	Maintenance	Frequency
Owner / Occupier Appointed Management Company	Private Drains	Inspection	CCTV survey every 5-10 years.
		Regular Maintenance	Jet clean system fully every 5-10 years. (Recommend prior to CCTV drainage survey is)
		Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.
	Discharge orifice manholes/flow control devices	Inspection	Quarterly
		Regular Maintenance	Remove silt and debris as necessary to prevent build up.
	Gullies / Drainage Channels	Inspection	Quarterly
		Regular Maintenance	Remove silt and debris as necessary to prevent build up.
	Permeable Paving (Refer to specialist)	Inspection	Within 3 months of installation then annually
		Regular Maintenance	Sweep surface to remove debris and contamination 1-2 times a year, typically after leaf fall in autumn.
		Occasional Maintenance	Removal of weeds. As required.
		Remedial Measures	Remediate areas of rutting and depressions. As required. Replace broken / damaged blocks. As required. Rehabilitate surface with sweeping and reapplication of clean gritstone. As required.
	Tank / Interceptors	Inspection	Quarterly
		Regular Maintenance	Remove silt and debris as necessary to prevent build up.
		Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.
	Pump Stations	In accordance with suppliers' recommendations. For the example O&M see Appendix L.	
	Reference should be made to the manufacturer recommendations where applicable		

See Appendix L for TT Pumps O&M documentation.

The following information should be passed to the development operator to ensure that future maintenance is carried out in a safe and proper manner.

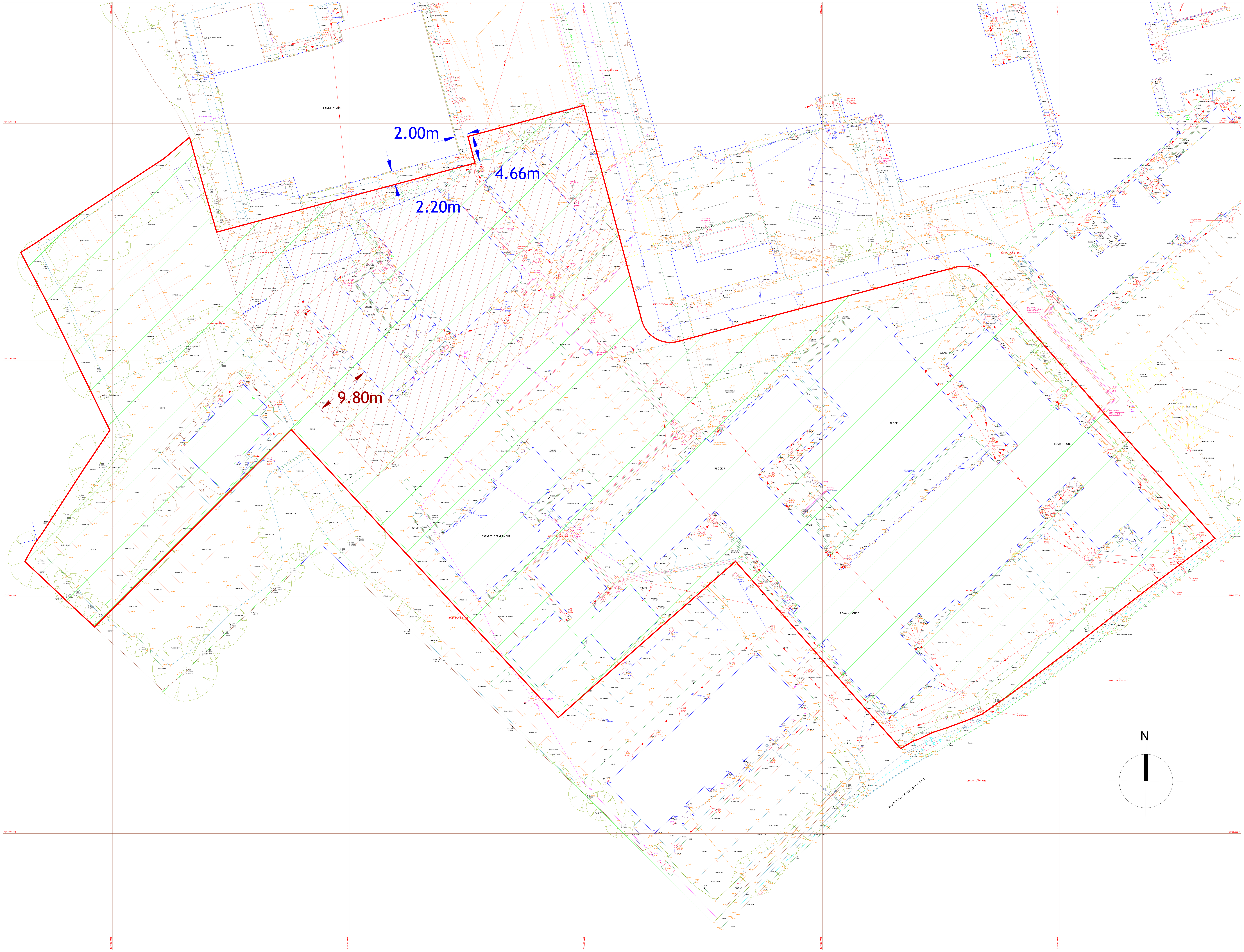
A formal review of the risks should be undertaken on an annual basis.

Operation	Risks	Mitigating Measures
Access to manholes for Inspection and Maintenance.	1. Confined spaces	1. Entry to confined space to be minimised and, where unavoidable, to be carried out by appropriately trained personnel
Removal of silt from outfall	1. Risk to members of the public 2. Open Water	1. Access to hazardous areas by members of the public to be prohibited. 2. To be carried out by appropriately trained personnel
Removal of silt from drainage channel	1. Risk to members of the public	1. Access to hazardous areas by members of the public to be prohibited

All inspection and maintenance works should take into consideration the implications of 'lone working'. An assessment should be carried out and the risks mitigated accordingly.

Appendix A

Topographical Survey



Rev	Date	By	Amendment

LEGEND

ABBREVIATIONS

B	BOLLARD	MH	MANHOLE
BOE	BRICK ON EDGE	O/H	OVER HEAD
BOX.	BOXING	P	POST
BT	BRITISH TELECOM	P/L	PAVEMENT LIGHT
B/W	BRICK WALL	RAD	RADIATOR
CATV	CABLE TELEVISION	RE	RODDING EYE
CF	CEILING FALL	RS	ROAD SIGN
CL	COVER LEVEL	RSJ	ROLLED STEEL JOIST
CONC	CONCRETE FINISH	RSS	ROLLED STEEL STANCHION
COU	COVER ORIGIN UNKNOWN	RWP	RAIN WATER PIPE
CPD	CUPBOARD	SC	STOP COCK
DK	DROP KERB	SP	SIGN POST
DL	DERIVED LEVEL	SVP	SOIL VENT PIPE
ELEC.	ELECTRICAL	TL	TRAFFIC LIGHT
ER	EARTHING ROD	TN	TREE NUMBER
F/B	FLOWER BED	TP	TELEPHONE POLE
FAR	FLAT ASPHALT ROOF	UTL	UNABLE TO LIFT
G	GULLY	VP	VENT PIPE
GV	GAS VALVE	VTF	VINYL TILED FLOOR
HLW	HIGH LEVEL WINDOW	WC	WATER CLOSET
IC	INSPECTION COVER	WHB	WASH HAND BASIN
L/L	LOW LEVEL	WV	WATER VALVE
LP	LAMP POST	Ø	DIAMETER

OVERHEAD DETAIL

BARRIER OR FENCE

CHANGE IN SURFACE

GATE

SURVEY STATION

HEIGHTS

C	HEIGHT FROM FLOOR TO CILL
H	HEIGHT FROM CILL TO HEAD
SP	HEIGHT FROM FLOOR TO SPRING OF ARCH
AH	HEIGHT FROM FLOOR TO HEAD OF ARCH
2890	HEIGHT TO CEILING, BEAM OR DOOR
S/C	STRUCTURAL CEILING HEIGHT
F/C	FALSE CEILING HEIGHT
DL	DEDUCED LEVEL DERIVED FROM PLUS MEASUREMENTS

TREES

Ø DIAMETER(mm)
S SPREAD(mm) diameter
H HEIGHT(mm)
ALL TREE HEIGHTS SHOWN IN (mm)

SURVEY CONTROL STATION SCHEDULE

STN	EASTING	NORTHING	LEVEL
9001	520384.298	159829.239	59.261
9002	520359.689	159814.557	59.532
9003	520326.002	159798.495	60.760
9008	520355.279	159958.576	58.796
9009	520395.081	160031.058	56.637
9010	520442.051	159985.910	56.747
9011	520464.505	159899.378	58.591
9012	520495.357	159829.786	58.637
9013	520466.912	159807.117	58.622
9014	520452.229	159798.368	58.920
9015	520394.515	159789.829	59.254
9016	520496.447	159726.165	59.607
9018	520446.275	159709.181	60.016
9019	520375.611	159750.521	59.734
9020	520358.679	159736.682	59.787
9021	520318.075	159786.454	61.013
9022	520368.996	159890.862	59.177

SURVEY GRID IS RELATED TO ORDNANCE SURVEY NATIONAL GRID AND LEVEL DATUM BY GPS OBSERVATIONS

PLEASE NOTE
THIS DRAWING IS BASED UPON DRAWING 18385-01 REV B WHICH IS THE FULL SITE TOPOGRAPHIC AND BURIED SERVICES SURVEY

LEVELS ARE RELATED TO ORDNANCE SURVEY BENCH MARK

BY MEANS OF GPS OBSERVATIONS TO CONTROL STATIONS WHERE A MEAN VALUE HAS BEEN OBTAINED

3sixty measurement
LONDON
SOUTH BANK HOUSE, BLACK PRINCE ROAD
LONDON SE1 7SJ
Tel: 020 7637 2930
Fax: 020 7637 2931
E-mail: info@3sixtymeasurement.co.uk
Website:www.3sixtymeasurement.co.uk

Client: EPSOM & ST HELIER UNIVERSITY HOSPITAL NHS TRUST

Project: EPSOM GENERAL HOSPITAL DORKING ROAD, EPSOM KT18 7EG

Drawing: SITE PLAN - PLOT 2A

Date	Scale	Drawn by	Checked by
SEPT 2018	A0@1:200	ACW	GAJ

Project No	Drawing No	Revision
18385	-04	

Appendix B

Landscape Architects Layout

GENERAL NOTES.

All dimensions to be checked prior to commencement of any works, and/or preparation of any shop drawings on site.
Any dimensional discrepancies and alterations to be referred to the designer.

DO NOT SCALE FROM THIS DRAWING.

KEY

- Existing trees retained
- Proposed Trees.
- Proposed Multi-stem Tree
- Paving type 1
- Paving type 2
- Paving type 3
- Paving type 4
- Paving type 5
- Paving type 6
- Paving type 7
- Paving type 8
- Paving type 9
- Paving type 10 tactile studs
- Paving type 12
- Proposed Planting
- Proposed boundary Planting
- Feature hedge
- Lawn
- Seating units
- Picnic Benches
- Spill out furniture
- Bike Stands
- Boulder
- Bollards
- Railing
- Tree grille type 1
- Tree grille type 2

0m 5m 10m 20m

Scale 1:100 @A0

Iss	Date	Issue notes	Drawn By	Checked By	Approved By
P03	05.01.21	Stage 3 Issued for coordination	JW	EE	AS
P01	22.12.20	Stage 2 Issued for coordination	EE	EE	AS
P01	31.03.19	Stage 2 Issued for coordination	EE	EE	AS

ANDY STURGEON DESIGN
7 Marlborough Place, Brighton BN1 1UB
Tel: 01273 672575 info@andysturgeon.com www.andysturgeon.com

project no.	drawing no.	issue
656	_P_00_100	P03

client: Guild Living

project: Epsom
Guild Living

drawing: Ground Floor Masterplan

scale: 1:200@A0
1:400@A2

Appendix C

Sewer Asset Map

Based on the Ordnance Survey Map with the
sanction of the Controller of H.M Stationary
Office License Number 10019345

CDWS/CDWS Standard/2018_3808735

0 10 20 40 60 80
Meters

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

Scale:	1:1789
Width:	500m
Printed By:	dshivaji
Print Date:	07/06/2018
Map Centre:	520385,159765
Grid Reference:	TQ2059NW

Comments:

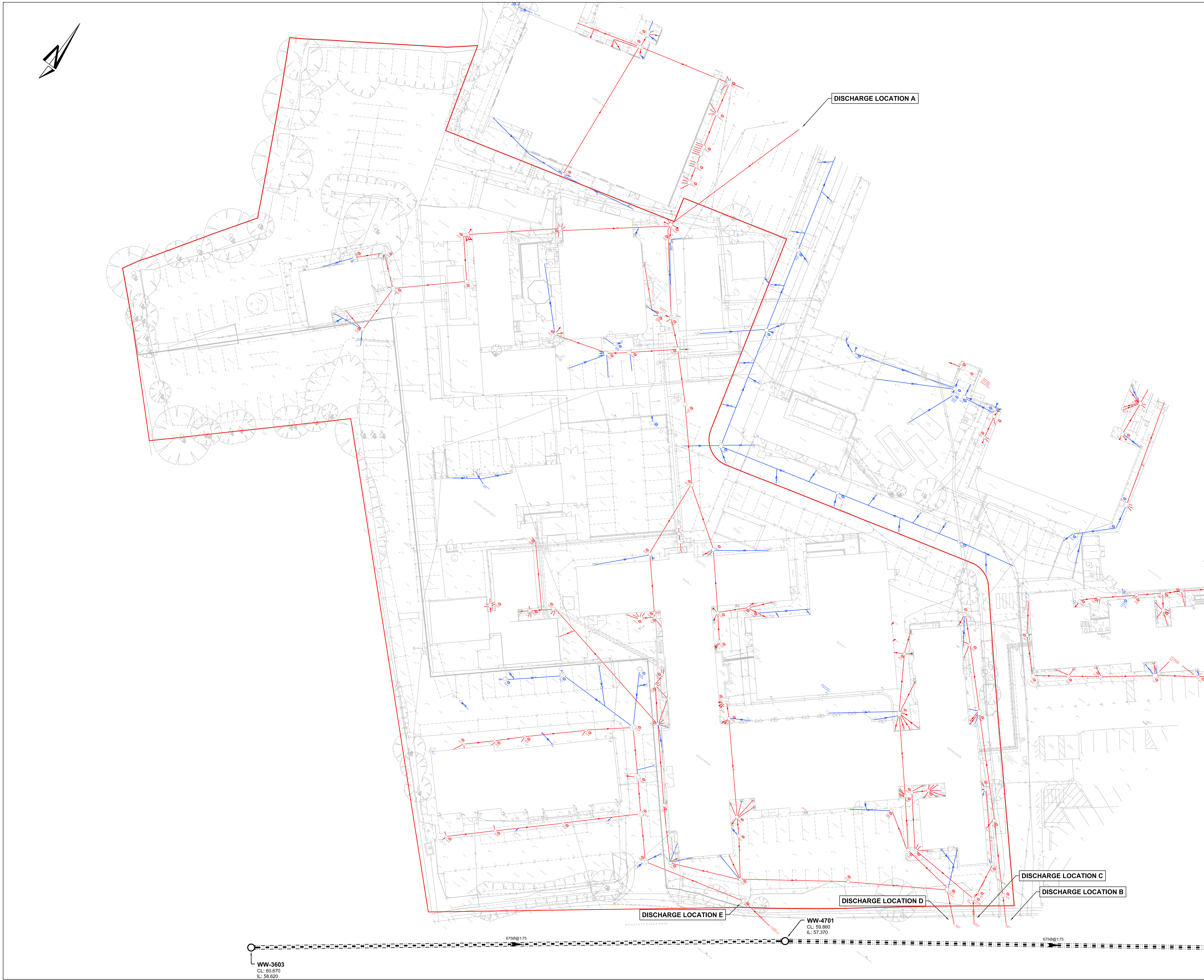
CDWS/CDWS Standard/2018_3808735

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
4701	59.86	57.37
5702	58.65	56.11
5704	60.34	59.32
5706	60.52	59.71
5709	60.92	60.21
6801	57.7	54.92
4501	61.41	60.59
4503	62.97	61.82
551B		
5501	65.49	63.45
3604	60.81	59.02
36YY		
4601	61.05	59.06
5603	61.31	59.41
5605	62.53	61.5
5607	62.15	60.44
5609	61.22	59.86
5611	60.93	60.51
5708	60.92	60.31
281A		
2903	61.77	60.02
3901	58.99	56.02
3902	57.84	54.04
201A		
1701	65.79	64.77
1703	64.63	63
251B		
2501	66.15	63.93
2603	65.02	63.65
2502	64.23	62.18
2604	63.16	61.01
3602	61.38	59.32
3502	61.56	59.52
1905	62.37	59.47
2901	61.93	58.67
191C		
191A		
1805	64.39	62.59
2801	63.57	62.62
5701	59.34	56.91
5703	60.42	58.49
5705	60.47	59.55
5707	60.74	59.93
5710	60.94	60.25
6802	58.37	55.69
4502	62.45	60.07
451A		
551A		
36YZ		
3603	60.67	58.62
36YX		
5601	61.16	59.03
5604	62.14	60.49
5606	62.41	60.54
5608	61.73	60.25
5610	60.93	59.55
5612	64.64	62.94
6601	65.23	62.4
2904	61.64	57.85
2905	60.25	56.95
391A		
3001	57.86	55.07
1601	67.99	65.46
1702	64.46	63.66
251A		
2601	64.76	63.35
2602	64.87	64.12
2701	63.95	62.33
2503	63.58	61.46
3601	61.54	59.57
371A		
36ZP		
1904	62.35	59.85
2902	62.01	60.68
191B		
1903	61.56	60.26
1704	64.52	63.21

Appendix D

Existing Drainage Layout



KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.
3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
4. All levels are shown in metres above Ordnance Datum (m AOD).

REV	REVISION NOTES/COMMENTS					
P02	LOCATION E ADDED - THAMES WATER SEWER					
	J.MAGEE	30/07/19	J.MAGEE	30/07/19	J.MAGEE	30/07/19
P01	PRELIMINARY ISSUE					
	J.MAGEE	30/07/19	J.MAGEE	30/07/19	J.MAGEE	30/07/19
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

Hydrock
Merchants' House North
Wapping Road
Bristol
BS1 4RW
t: +44 (0)117 945 9225
e: bristolcentral@hydrock.com

CLIENT
GUILD LIVING

PROJECT
EPSOM HOSPITAL
LATER LIVING DEVELOPMENT

TITLE
EXISTING DRAINAGE LAYOUT

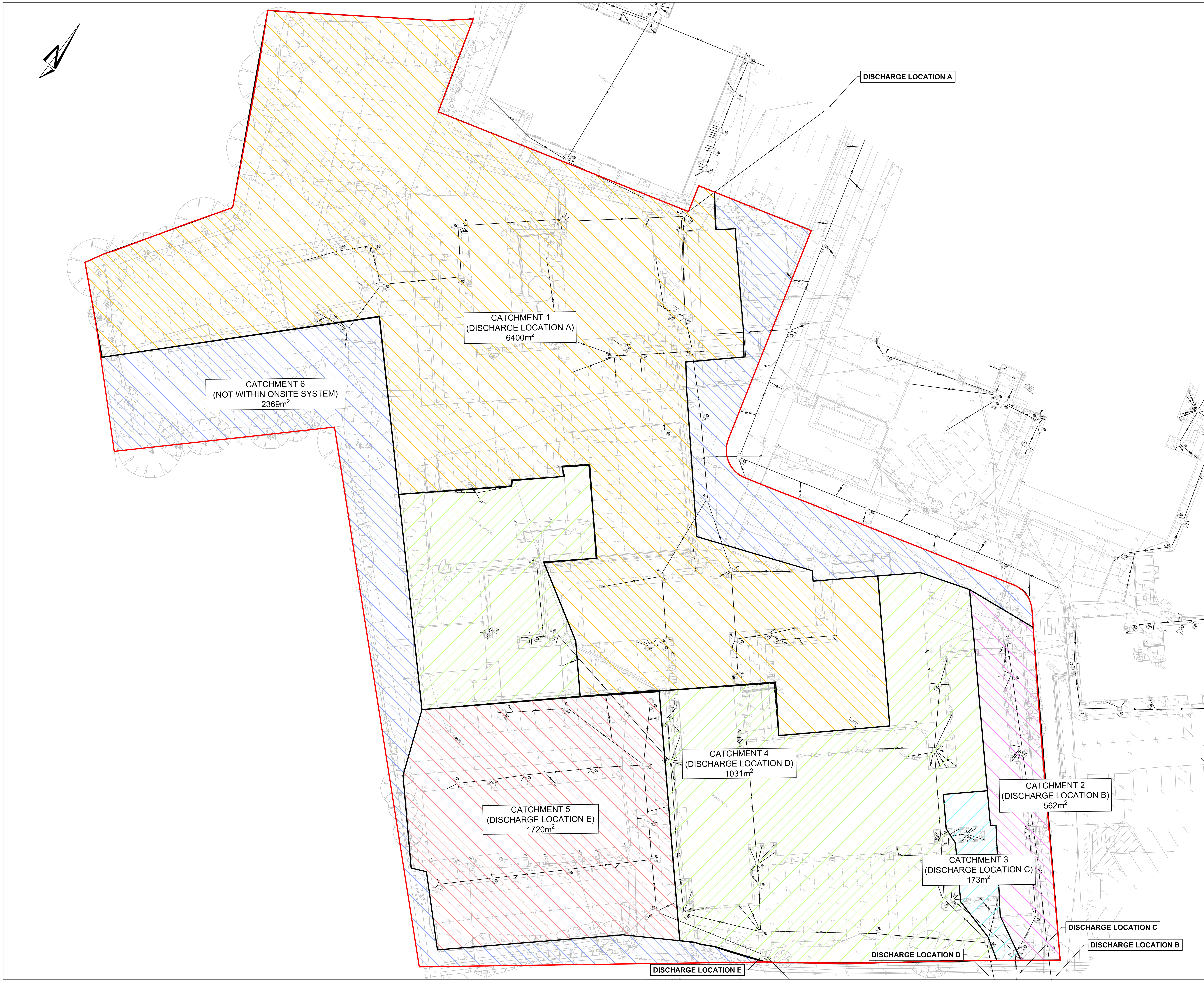
HYDROCK PROJECT NO.	SCALE @ A1
C-12053-C	NTS

STATUS DESCRIPTION	STATUS
INFORMATION	S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
12053-HYD-00-ZZ-SK-C-7701	P02

Appendix E

Existing / Proposed Catchment Areas



KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
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3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
4. All levels are shown in metres above Ordnance Datum (m AOD).

REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P02	ZONES AMENDED					
	W.SANDERCOCK	10/09/19	J.MAGEE	10/09/19	J.MAGEE	10/09/19
P01	PRELIMINARY ISSUE					
	W.SANDERCOCK	16/08/19	J.MAGEE	16/08/19	J.MAGEE	16/08/19

Hydrock
Merchants' House North
Wapping Road
Bristol
BS1 4RW
t: +44 (0)117 945 9225
e: bristolcentral@hydrock.com

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GUILD LIVING

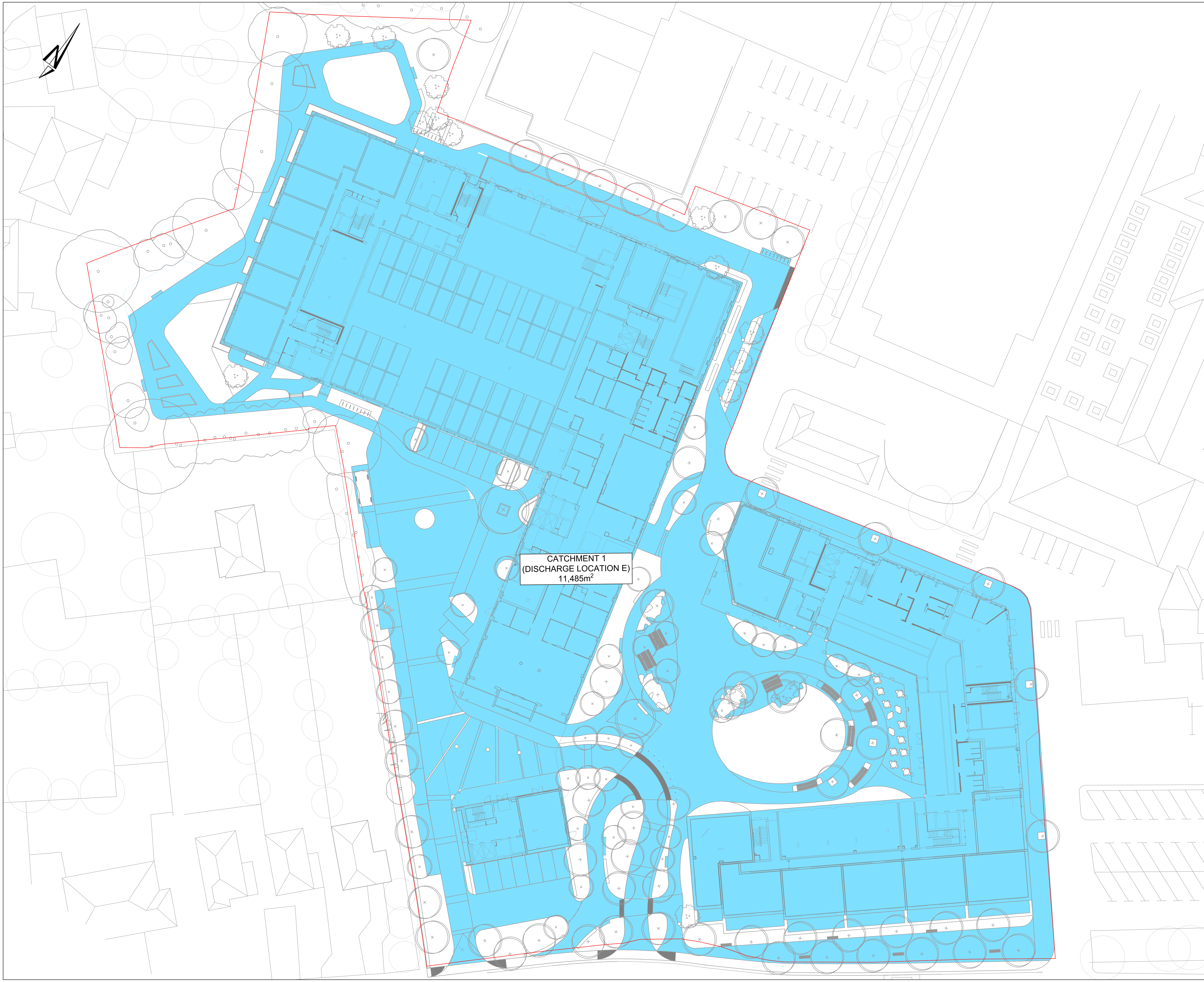
PROJECT
EPSOM HOSPITAL
LATER LIVING DEVELOPMENT

TITLE
EXISTING CATCHMENTS

HYDROCK PROJECT NO.	SCALE @ A1
C-12053-C	NTS

STATUS DESCRIPTION	STATUS
INFORMATION	S2

DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
12053-HYD-00-ZZ-SK-C-7702	P02



KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.
3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
4. All levels are shown in metres above Ordnance Datum (m AOD).

REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P03	LAYOUT UPDATED					
	J.MAGEE	06/01/21	J.MAGEE	06/01/21	-	06/01/21
P02	NEW LAYOUT ADDED					
	A.TODD	20/12/19	R.JACK	20/12/19	R.JACK	20/12/19
P01	PRELIMINARY ISSUE					
	J.MAGEE	12/12/19	J.MAGEE	12/12/19	R.JACK	12/12/19

Hydrock

Merchants' House North
Wapping Road
Bristol
BS1 4RW
t: +44 (0)117 945 9225
e: bristolcentral@hydrock.com

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PROJECT
EPSOM HOSPITAL
LATER LIVING DEVELOPMENT

TITLE
PROPOSED CATCHMENTS

HYDROCK PROJECT NO.	SCALE @ A1
C-12053-C	NTS

STATUS DESCRIPTION	STATUS
INFORMATION	S2

DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
12053-HYD-00-ZZ-DR-C-7703	P03

Appendix F

Calculations

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 70 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	58.284	0.284	0.0	52.0	52.0	221.5	O K
30 min Summer	58.366	0.366	0.0	52.0	52.0	285.6	O K
60 min Summer	58.414	0.414	0.0	52.0	52.0	323.2	O K
120 min Summer	58.410	0.410	0.0	52.0	52.0	320.3	O K
180 min Summer	58.385	0.385	0.0	52.0	52.0	300.5	O K
240 min Summer	58.355	0.355	0.0	52.0	52.0	277.5	O K
360 min Summer	58.300	0.300	0.0	52.0	52.0	234.7	O K
480 min Summer	58.250	0.250	0.0	51.8	51.8	195.0	O K
600 min Summer	58.205	0.205	0.0	51.5	51.5	159.9	O K
720 min Summer	58.167	0.167	0.0	51.0	51.0	130.1	O K
960 min Summer	58.110	0.110	0.0	49.9	49.9	85.6	O K
1440 min Summer	58.055	0.055	0.0	42.4	42.4	42.7	O K
2160 min Summer	58.015	0.015	0.0	33.6	33.6	11.7	O K
2880 min Summer	58.000	0.000	0.0	28.8	28.8	0.0	O K
4320 min Summer	58.000	0.000	0.0	20.9	20.9	0.0	O K
5760 min Summer	58.000	0.000	0.0	16.6	16.6	0.0	O K
7200 min Summer	58.000	0.000	0.0	13.9	13.9	0.0	O K
8640 min Summer	58.000	0.000	0.0	12.0	12.0	0.0	O K
10080 min Summer	58.000	0.000	0.0	10.7	10.7	0.0	O K
15 min Winter	58.325	0.325	0.0	52.0	52.0	254.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.851	0.0	282.9	23
30 min Summer	88.566	0.0	380.5	35
60 min Summer	56.713	0.0	487.3	60
120 min Summer	35.004	0.0	604.1	92
180 min Summer	25.973	0.0	669.0	126
240 min Summer	20.877	0.0	720.2	160
360 min Summer	15.365	0.0	793.0	226
480 min Summer	12.341	0.0	848.7	290
600 min Summer	10.402	0.0	895.0	352
720 min Summer	9.042	0.0	934.5	410
960 min Summer	7.241	0.0	997.0	524
1440 min Summer	5.284	0.0	1091.3	758
2160 min Summer	3.848	0.0	1192.1	1112
2880 min Summer	3.068	0.0	1268.0	0
4320 min Summer	2.226	0.0	1380.0	0
5760 min Summer	1.771	0.0	1463.4	0
7200 min Summer	1.483	0.0	1532.7	0
8640 min Summer	1.284	0.0	1592.3	0
10080 min Summer	1.137	0.0	1644.6	0
15 min Winter	131.851	0.0	317.5	23

Summary of Results for 100 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	58.422	0.422	0.0	52.0	52.0	329.9	O K
60 min Winter	58.486	0.486	0.0	52.0	52.0	379.5	O K
120 min Winter	58.482	0.482	0.0	52.0	52.0	376.5	O K
180 min Winter	58.442	0.442	0.0	52.0	52.0	345.3	O K
240 min Winter	58.396	0.396	0.0	52.0	52.0	309.3	O K
360 min Winter	58.309	0.309	0.0	52.0	52.0	241.1	O K
480 min Winter	58.231	0.231	0.0	51.7	51.7	180.4	O K
600 min Winter	58.167	0.167	0.0	51.0	51.0	130.5	O K
720 min Winter	58.118	0.118	0.0	50.1	50.1	92.2	O K
960 min Winter	58.067	0.067	0.0	44.7	44.7	52.2	O K
1440 min Winter	58.018	0.018	0.0	34.5	34.5	14.2	O K
2160 min Winter	58.000	0.000	0.0	26.1	26.1	0.0	O K
2880 min Winter	58.000	0.000	0.0	20.8	20.8	0.0	O K
4320 min Winter	58.000	0.000	0.0	15.1	15.1	0.0	O K
5760 min Winter	58.000	0.000	0.0	12.0	12.0	0.0	O K
7200 min Winter	58.000	0.000	0.0	10.0	10.0	0.0	O K
8640 min Winter	58.000	0.000	0.0	8.7	8.7	0.0	O K
10080 min Winter	58.000	0.000	0.0	7.7	7.7	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.566	0.0	427.3	36
60 min Winter	56.713	0.0	545.1	62
120 min Winter	35.004	0.0	673.8	100
180 min Winter	25.973	0.0	751.9	138
240 min Winter	20.877	0.0	803.7	174
360 min Winter	15.365	0.0	890.4	244
480 min Winter	12.341	0.0	951.0	306
600 min Winter	10.402	0.0	1002.9	366
720 min Winter	9.042	0.0	1045.8	420
960 min Winter	7.241	0.0	1116.5	530
1440 min Winter	5.284	0.0	1222.8	766
2160 min Winter	3.848	0.0	1335.8	0
2880 min Winter	3.068	0.0	1420.2	0
4320 min Winter	2.226	0.0	1545.5	0
5760 min Winter	1.771	0.0	1639.0	0
7200 min Winter	1.483	0.0	1716.6	0
8640 min Winter	1.284	0.0	1783.4	0
10080 min Winter	1.137	0.0	1842.0	0

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.148

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	4	0.377	4	8	0.377	8	12	0.377	12	16	0.018

Model Details

Storage is Online Cover Level (m) 59.500

Complex Structure

Cellular Storage

Invert Level (m) 58.000 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	200.0	0.0	0.501	0.0	0.0
0.500	200.0	0.0			

Cellular Storage

Invert Level (m) 58.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.30
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1970.0	0.0	0.501	0.0	0.0
0.500	1970.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0293-5200-1500-5200
Design Head (m)	1.500
Design Flow (l/s)	52.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	293
Invert Level (m)	57.800
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	52.0
Flush-Flo™	0.508	52.0
Kick-Flo®	1.071	44.2
Mean Flow over Head Range	-	43.8

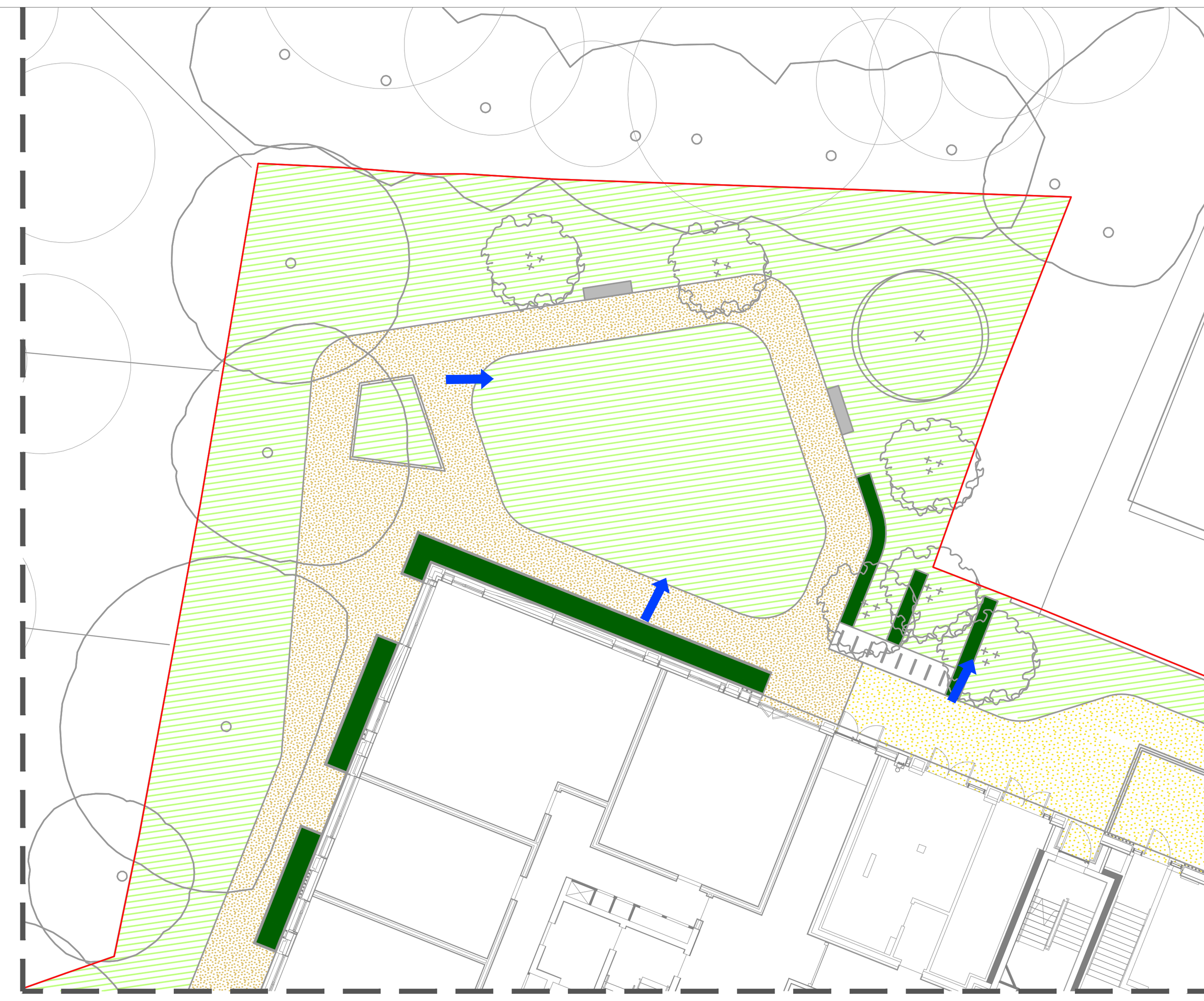
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

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	9.0	1.200	46.7	3.000	72.7	7.000	109.8
0.200	30.2	1.400	50.3	3.500	78.3	7.500	113.5
0.300	49.6	1.600	53.6	4.000	83.6	8.000	117.2
0.400	51.5	1.800	56.8	4.500	88.5	8.500	120.7
0.500	52.0	2.000	59.7	5.000	93.2	9.000	124.1
0.600	51.7	2.200	62.5	5.500	97.6	9.500	127.4
0.800	50.3	2.400	65.2	6.000	101.8		
1.000	46.8	2.600	67.8	6.500	105.9		

Appendix G

Overland Flow Routes



KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.
3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
4. All levels are shown in metres above Ordnance Datum (m AOD).

Key

Overland flow route

REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P03	LAYOUT UPDATED					
	J.MAGEE	06/01/21	J.MAGEE	06/01/21	-	06/01/21
P02	NEW LAYOUT ADDED					
	A.TODD	20/12/19	R.JACK	20/12/19	R.JACK	20/12/19
P01	PRELIMINARY ISSUE					
	A.TODD	03/12/19	J.MAGEE	03/12/19	J.MAGEE	03/12/19

Hydrock
Merchants' House North
Wapping Road
Bristol
BS1 4RW
t: +44 (0)117 945 9225
e: bristolcentral@hydrock.com

CLIENT
GUILD LIVING

PROJECT
EPSOM HOSPITAL
LATER LIVING DEVELOPMENT

TITLE
OVERLAND FLOW ROUTES

HYDROCK PROJECT NO. C-12053-C

SCALE @ A1 1:250

STATUS DESCRIPTION INFORMATION

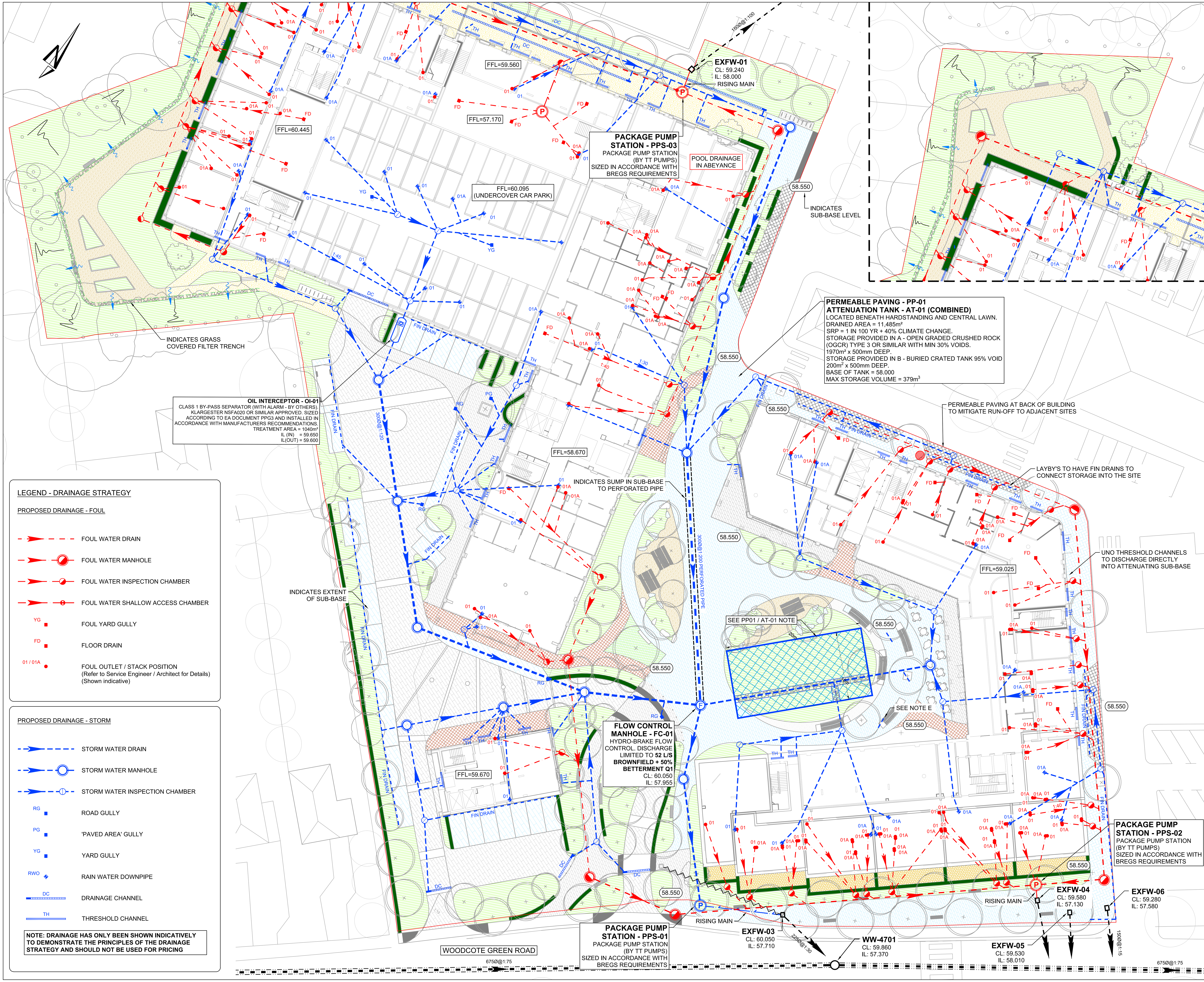
STATUS S2

DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 12053-HYD-00-ZZ-DR-C-7704

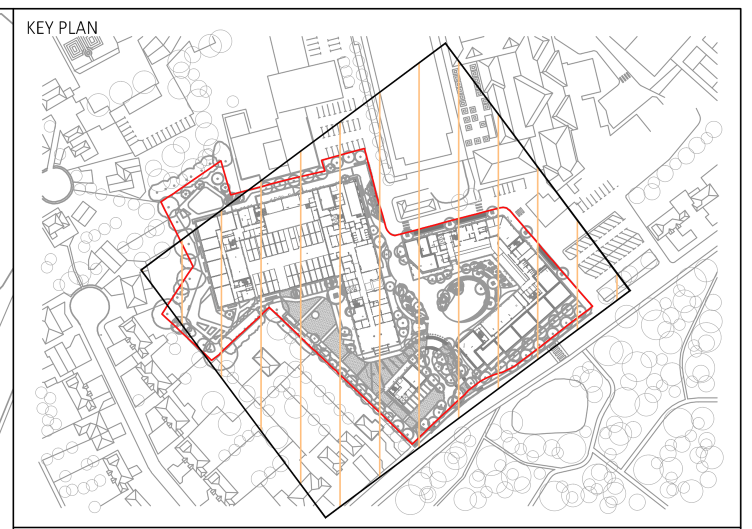
REVISION P03

Appendix H

Drainage Strategy Layout



KEY PLAN



NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.
3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
4. All levels are shown in metres above Ordnance Datum (m AOD).
5. All private drainage to comply with current Building Regulations, BS EN-752 Drain and Sewer systems outside Buildings and other relevant British Standards and Codes of Practices.
6. Drainage pipework routes under building footprint will require Co-ordination with foundations.
7. Final foul pipe connection routes and manholes are subject to confirmation of above ground drainage design discharge points at ground level by others to allow final pipe sizes, configuration and connections.
8. Door threshold drainage channel requirements to be advised by others.
9. Surface water drainage RWP locations to be confirmed by Architect.
10. External levels shown on this drawing relating to the civils, drainage works etc are to be confirmed on receipt of final external levels drawing (by others).
11. Foul drainage shown indicative subject to detailed design.

REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P05	FFL'S DROPPED. DRAINAGE UPDATED TO SUIT					
	J.MAGEE	15/01/21	J.MAGEE	15/01/21	-	15/01/21
P04	LAYOUT UPDATED					
	J.MAGEE	06/01/21	J.MAGEE	06/01/21	-	06/01/21
P03	LAYOUT UPDATED					
	J.MAGEE	30/03/20	J.MAGEE	30/03/20	R.JACK	30/03/20
P02	PRELIMINARY ISSUE					
	A.TODD	20/12/19	R.JACK	20/12/19	R.JACK	20/12/19
P01	PRELIMINARY ISSUE					
	J.MAGEE	12/12/19	J.MAGEE	12/12/19	R.JACK	12/12/19

Hydrock
Merchants' House North
Wapping Road
Bristol
BS1 4RW
t: +44 (0)117 945 9225
e: bristolcentral@hydrock.com

CLIENT
GUILD LIVING

PROJECT
EPSOM HOSPITAL
LATER LIVING DEVELOPMENT

TITLE
DRAINAGE STRATEGY

HYDROCK PROJECT NO.	SCALE @ A1
C-12053-C	1:250

STATUS DESCRIPTION	STATUS
PLANNING	S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
12053-HYD-00-ZZ-DR-C-7000	P05

Appendix J

Correspondence

Mr Jason Magee
Hydrock
By email to JasonMagee@hydrock.com

Wastewater pre-planning
Our ref DS6064489–DTS 62970

11 September 2019

Pre-planning enquiry: Epsom Hospital, Dorking Rd, Epsom, Surrey, KT18 7EG

Dear Mr Magee,

Thank you for providing information on your Redevelopment of Hospital into retirement. For Connection 1 to the north into 380mm foul sewer in Dorking Rd; Existing: Surf and foul water sewer connections draining 6400sqm surface and 201 hospital beds by gravity. Proposed: no surface water discharge and 335 beds retirement by gravity. Connection 2 to the South into 675mm foul at Woodcote Green; Existing 5,929sqm surface and 468 hospital beds by gravity. Proposed 334 retirement beds and same surface water drainage regime as before (5,929sqm)

Foul Water

We're pleased to confirm that there will be sufficient foul water capacity in our sewerage network to serve your development, so long as your phasing follows the timescale you've suggested.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

Surface Water

We confirm that there will be sufficient capacity in our sewerage network to accept the surface water discharge rate provided as part of the enquiry, however this does not preclude the requirement as set out by Policy 5.13 of the London Plan. Management of surface water from the site should follow policy 5.13 of the London Plan, development should 'aim to achieve greenfield run-off rates' utilising Sustainable Drainage and where this is not possible information explaining why it is not possible should be provided to both the LLFA and Thames Water. Typically greenfield run off rates of 5l/s/ha should be aimed for using the drainage hierarchy. The hierarchy lists the preference for surface water disposal as follows; Store Rainwater for later use > Use infiltration techniques, such as porous surfaces in non-clay areas > Attenuate rainwater in ponds or open water features for gradual release > Discharge rainwater direct to a watercourse > Discharge rainwater direct to a surface water sewer/drain > Discharge rainwater to the combined sewer.

To reduce flood risk from the sewers, the developer should aim to achieve greenfield runoff rates and at least 50% reduction for all storm events

What happens next?

You’ll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Please note that we may contact you if we need to carry out any network modelling associated with this. The modelling would be done at our cost and within your timescales.

Please make sure you submit your connection application, giving us at least 21 days’ notice of the date you wish to make your new connection/s.

If you’ve any further questions, please contact me on the numbers below.

Yours sincerely

Jose Varela

Developer Services – Adoptions Engineer   Mobile 07747 640250 Landline 02035 778753
jose.varela@thameswater.co.uk   Clearwater Court, Vastern Road, Reading, RG1 8DB

Find us online at developers.thameswater.co.uk

Appendix K

Constraints Plan / Calculations

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1227 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	58.331	0.331	0.0	5.7	5.7	273.3	O K
30 min Summer	58.442	0.442	0.0	5.7	5.7	364.3	O K
60 min Summer	58.558	0.558	0.0	5.7	5.7	460.2	O K
120 min Summer	58.672	0.672	0.0	5.7	5.7	554.4	O K
180 min Summer	58.731	0.731	0.0	5.7	5.7	603.4	O K
240 min Summer	58.767	0.767	0.0	5.7	5.7	633.0	O K
360 min Summer	58.813	0.813	0.0	5.7	5.7	670.3	O K
480 min Summer	58.835	0.835	0.0	5.7	5.7	689.2	O K
600 min Summer	58.845	0.845	0.0	5.7	5.7	697.5	O K
720 min Summer	58.847	0.847	0.0	5.7	5.7	699.0	O K
960 min Summer	58.836	0.836	0.0	5.7	5.7	689.4	O K
1440 min Summer	58.791	0.791	0.0	5.7	5.7	652.7	O K
2160 min Summer	58.737	0.737	0.0	5.7	5.7	608.3	O K
2880 min Summer	58.684	0.684	0.0	5.7	5.7	564.4	O K
4320 min Summer	58.583	0.583	0.0	5.7	5.7	481.2	O K
5760 min Summer	58.491	0.491	0.0	5.7	5.7	405.3	O K
7200 min Summer	58.409	0.409	0.0	5.7	5.7	337.7	O K
8640 min Summer	58.336	0.336	0.0	5.7	5.7	277.1	O K
10080 min Summer	58.272	0.272	0.0	5.7	5.7	224.8	O K
15 min Winter	58.372	0.372	0.0	5.7	5.7	306.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.851	0.0	278.8	19
30 min Summer	88.566	0.0	374.8	34
60 min Summer	56.713	0.0	480.1	64
120 min Summer	35.004	0.0	592.8	124
180 min Summer	25.973	0.0	659.5	184
240 min Summer	20.877	0.0	707.4	242
360 min Summer	15.365	0.0	781.1	362
480 min Summer	12.341	0.0	836.1	482
600 min Summer	10.402	0.0	881.3	602
720 min Summer	9.042	0.0	903.3	722
960 min Summer	7.241	0.0	898.8	960
1440 min Summer	5.284	0.0	877.4	1282
2160 min Summer	3.848	0.0	1172.9	1664
2880 min Summer	3.068	0.0	1248.3	2020
4320 min Summer	2.226	0.0	1357.7	2772
5760 min Summer	1.771	0.0	1440.0	3576
7200 min Summer	1.483	0.0	1508.9	4328
8640 min Summer	1.284	0.0	1566.8	5096
10080 min Summer	1.137	0.0	1618.5	5752
15 min Winter	131.851	0.0	312.3	19

Summary of Results for 100 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	58.496	0.496	0.0	5.7	5.7	409.4	O K
60 min Winter	58.628	0.628	0.0	5.7	5.7	518.1	O K
120 min Winter	58.760	0.760	0.0	5.7	5.7	627.0	O K
180 min Winter	58.829	0.829	0.0	5.7	5.7	684.1	O K
240 min Winter	58.872	0.872	0.0	5.7	5.7	719.0	O K
360 min Winter	58.927	0.927	0.0	5.7	5.7	764.9	O K
480 min Winter	58.958	0.958	0.0	5.7	5.7	790.4	O K
600 min Winter	58.975	0.975	0.0	5.7	5.7	804.5	O K
720 min Winter	58.983	0.983	0.0	5.7	5.7	811.1	O K
960 min Winter	58.982	0.982	0.0	5.7	5.7	810.3	O K
1440 min Winter	58.944	0.944	0.0	5.7	5.7	779.1	O K
2160 min Winter	58.868	0.868	0.0	5.7	5.7	716.4	O K
2880 min Winter	58.806	0.806	0.0	5.7	5.7	665.0	O K
4320 min Winter	58.655	0.655	0.0	5.7	5.7	540.4	O K
5760 min Winter	58.505	0.505	0.0	5.7	5.7	416.9	O K
7200 min Winter	58.379	0.379	0.0	5.7	5.7	312.6	O K
8640 min Winter	58.273	0.273	0.0	5.7	5.7	225.2	O K
10080 min Winter	58.187	0.187	0.0	5.7	5.7	154.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.566	0.0	419.9	33
60 min Winter	56.713	0.0	538.1	64
120 min Winter	35.004	0.0	663.8	122
180 min Winter	25.973	0.0	739.0	180
240 min Winter	20.877	0.0	792.2	240
360 min Winter	15.365	0.0	874.8	356
480 min Winter	12.341	0.0	900.6	474
600 min Winter	10.402	0.0	897.1	590
720 min Winter	9.042	0.0	892.9	702
960 min Winter	7.241	0.0	884.0	930
1440 min Winter	5.284	0.0	866.4	1368
2160 min Winter	3.848	0.0	1314.5	1732
2880 min Winter	3.068	0.0	1397.4	2192
4320 min Winter	2.226	0.0	1521.1	3072
5760 min Winter	1.771	0.0	1612.9	3864
7200 min Winter	1.483	0.0	1689.4	4608
8640 min Winter	1.284	0.0	1755.2	5352
10080 min Winter	1.137	0.0	1813.3	5960

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.130

Time From:	**(mins) To:**	**Area (ha)**
0	4	1.130

Model Details

Storage is Online Cover Level (m) 59.500

Cellular Storage Structure

Invert Level (m) 58.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.30
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	2750.0	0.0	1.001	0.0	0.0
1.000	2750.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0105-5700-1500-5700
Design Head (m)	1.500
Design Flow (l/s)	5.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	57.800
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.7
Flush-Flo™	0.446	5.7
Kick-Flo®	0.915	4.5
Mean Flow over Head Range	-	5.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	5.1	3.000	7.9	7.000	11.8
0.200	5.1	1.400	5.5	3.500	8.5	7.500	12.2
0.300	5.5	1.600	5.9	4.000	9.0	8.000	12.5
0.400	5.7	1.800	6.2	4.500	9.5	8.500	12.9
0.500	5.7	2.000	6.5	5.000	10.0	9.000	13.3
0.600	5.6	2.200	6.8	5.500	10.5	9.500	13.6
0.800	5.1	2.400	7.1	6.000	10.9		
1.000	4.7	2.600	7.4	6.500	11.4		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1227 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	58.329	0.329	0.0	5.7	5.7	273.3	O K
30 min Summer	58.438	0.438	0.0	5.7	5.7	364.3	O K
60 min Summer	58.554	0.554	0.0	5.7	5.7	460.2	O K
120 min Summer	58.667	0.667	0.0	5.7	5.7	554.3	O K
180 min Summer	58.726	0.726	0.0	5.7	5.7	603.3	O K
240 min Summer	58.761	0.761	0.0	5.7	5.7	632.9	O K
360 min Summer	58.806	0.806	0.0	5.7	5.7	670.3	O K
480 min Summer	58.829	0.829	0.0	5.7	5.7	689.2	O K
600 min Summer	58.839	0.839	0.0	5.7	5.7	697.6	O K
720 min Summer	58.841	0.841	0.0	5.7	5.7	699.1	O K
960 min Summer	58.830	0.830	0.0	5.7	5.7	689.5	O K
1440 min Summer	58.785	0.785	0.0	5.7	5.7	652.8	O K
2160 min Summer	58.731	0.731	0.0	5.7	5.7	608.0	O K
2880 min Summer	58.678	0.678	0.0	5.7	5.7	563.7	O K
4320 min Summer	58.579	0.579	0.0	5.7	5.7	480.9	O K
5760 min Summer	58.487	0.487	0.0	5.7	5.7	405.1	O K
7200 min Summer	58.406	0.406	0.0	5.7	5.7	337.7	O K
8640 min Summer	58.333	0.333	0.0	5.7	5.7	277.2	O K
10080 min Summer	58.270	0.270	0.0	5.7	5.7	224.8	O K
15 min Winter	58.369	0.369	0.0	5.7	5.7	306.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.851	0.0	278.8	19
30 min Summer	88.566	0.0	374.8	34
60 min Summer	56.713	0.0	480.3	64
120 min Summer	35.004	0.0	592.8	124
180 min Summer	25.973	0.0	659.8	184
240 min Summer	20.877	0.0	706.9	242
360 min Summer	15.365	0.0	781.0	362
480 min Summer	12.341	0.0	836.5	482
600 min Summer	10.402	0.0	881.1	602
720 min Summer	9.042	0.0	903.7	722
960 min Summer	7.241	0.0	899.2	960
1440 min Summer	5.284	0.0	877.9	1282
2160 min Summer	3.848	0.0	1174.0	1664
2880 min Summer	3.068	0.0	1248.3	2016
4320 min Summer	2.226	0.0	1357.4	2772
5760 min Summer	1.771	0.0	1440.4	3576
7200 min Summer	1.483	0.0	1509.0	4328
8640 min Summer	1.284	0.0	1566.7	5096
10080 min Summer	1.137	0.0	1618.4	5752
15 min Winter	131.851	0.0	312.6	19

Summary of Results for 100 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	58.492	0.492	0.0	5.7	5.7	409.4	O K
60 min Winter	58.623	0.623	0.0	5.7	5.7	518.1	O K
120 min Winter	58.754	0.754	0.0	5.7	5.7	627.0	O K
180 min Winter	58.823	0.823	0.0	5.7	5.7	684.1	O K
240 min Winter	58.865	0.865	0.0	5.7	5.7	719.1	O K
360 min Winter	58.920	0.920	0.0	5.7	5.7	764.9	O K
480 min Winter	58.951	0.951	0.0	5.7	5.7	790.5	O K
600 min Winter	58.968	0.968	0.0	5.7	5.7	804.7	O K
720 min Winter	58.976	0.976	0.0	5.7	5.7	811.3	O K
960 min Winter	58.975	0.975	0.0	5.7	5.7	810.5	O K
1440 min Winter	58.938	0.938	0.0	5.7	5.7	779.4	O K
2160 min Winter	58.862	0.862	0.0	5.7	5.7	716.5	O K
2880 min Winter	58.800	0.800	0.0	5.7	5.7	664.9	O K
4320 min Winter	58.649	0.649	0.0	5.7	5.7	539.6	O K
5760 min Winter	58.501	0.501	0.0	5.7	5.7	416.7	O K
7200 min Winter	58.376	0.376	0.0	5.7	5.7	312.6	O K
8640 min Winter	58.271	0.271	0.0	5.7	5.7	225.3	O K
10080 min Winter	58.186	0.186	0.0	5.7	5.7	154.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.566	0.0	419.9	33
60 min Winter	56.713	0.0	537.8	64
120 min Winter	35.004	0.0	664.0	122
180 min Winter	25.973	0.0	739.0	180
240 min Winter	20.877	0.0	792.0	240
360 min Winter	15.365	0.0	874.4	356
480 min Winter	12.341	0.0	900.8	474
600 min Winter	10.402	0.0	897.2	590
720 min Winter	9.042	0.0	892.9	702
960 min Winter	7.241	0.0	884.0	930
1440 min Winter	5.284	0.0	866.3	1368
2160 min Winter	3.848	0.0	1314.6	1732
2880 min Winter	3.068	0.0	1397.7	2192
4320 min Winter	2.226	0.0	1520.7	3072
5760 min Winter	1.771	0.0	1613.4	3864
7200 min Winter	1.483	0.0	1689.5	4608
8640 min Winter	1.284	0.0	1755.1	5352
10080 min Winter	1.137	0.0	1813.1	5960

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.130

Time (mins) From:	**To:**	**Area (ha)**
0	4	1.130

Model Details

Storage is Online Cover Level (m) 59.500

Cellular Storage Structure

Invert Level (m) 58.000 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	875.0	0.0	1.001	0.0	0.0
1.000	875.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0105-5700-1500-5700
Design Head (m)	1.500
Design Flow (l/s)	5.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	57.800
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.7
Flush-Flo™	0.446	5.7
Kick-Flo®	0.915	4.5
Mean Flow over Head Range	-	5.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	5.1	3.000	7.9	7.000	11.8
0.200	5.1	1.400	5.5	3.500	8.5	7.500	12.2
0.300	5.5	1.600	5.9	4.000	9.0	8.000	12.5
0.400	5.7	1.800	6.2	4.500	9.5	8.500	12.9
0.500	5.7	2.000	6.5	5.000	10.0	9.000	13.3
0.600	5.6	2.200	6.8	5.500	10.5	9.500	13.6
0.800	5.1	2.400	7.1	6.000	10.9		
1.000	4.7	2.600	7.4	6.500	11.4		

KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.
3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
4. All levels are shown in metres above Ordnance Datum (m AOD).

REV	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P03	LAYOUT UPDATED	J.MAGEE	06/01/21	J.MAGEE	06/01/21	-	06/01/21
P02	PRELIMINARY ISSUE	A.TODD	20/12/19	R.JACK	20/12/19	R.JACK	20/12/19
P01	PRELIMINARY ISSUE	A.TODD	03/12/19	J.MAGEE	03/12/19	J.MAGEE	03/12/19

Hydrock
Merchants' House North
Wapping Road
Bristol
BS1 4RW
t: +44 (0)117 945 9225
e: bristolcentral@hydrock.com

CLIENT
GUILD LIVING

PROJECT
EPSOM HOSPITAL
LATER LIVING DEVELOPMENT

TITLE
LEVEL AND SPATIAL CONSTRAINTS PLAN

HYDROCK PROJECT NO.	SCALE @ A1
C-12053-C	1:250

STATUS DESCRIPTION	STATUS
INFORMATION	S2

DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
12053-HYD-00-ZZ-SK-C-7705	P03

Appendix L

TT Pumps Operation and Maintenance

10. Operation, Maintenance and Safety Procedures

Package pumping stations can be very hazardous, and appropriate working practices must be followed at all times. The instructions and information given in this manual are as explicit as reasonably practicable and both competence and expertise are necessary in the maintenance of the system.

To ensure reliable and trouble free operation of the system, we strongly recommend that the servicing of the system is only undertaken by experienced and authorised personnel. The operation and maintenance of this system must be carried out in compliance with all current health, safety and welfare legislation.

Sewage pumping stations are safe in operation, however because of the media being pumped, gases such as methane and hydrogen sulphide can build up. It is therefore important that sensible precautions are taken.

Package Stations have been designed to be maintained from the outside of the chamber as the pump(s) and float switches are all fully removable from the chamber.

The following check list should help.

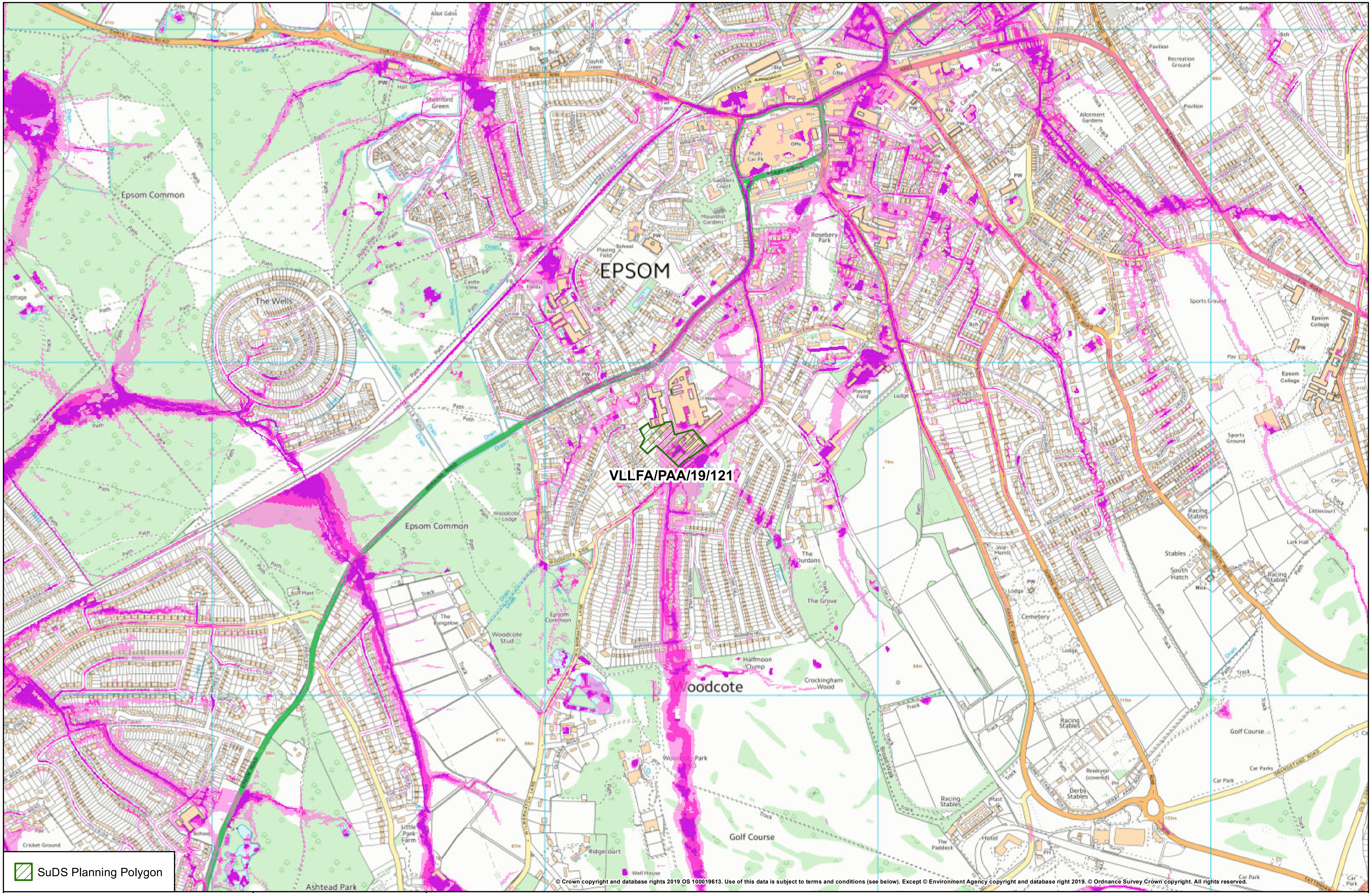
- Never work or maintain a sewage pumping station on your own.
- Isolate the electrical supply before working on a pumping station.
- Never enter the pump chamber under any circumstances unless fully qualified to do so, i.e. confined space trained, using appropriate safety equipment.
- Keep naked flames away from pumping stations.
- Never leave the pump chamber open or unattended.
- Always secure the access cover lid when leaving the pumping station.
- Never use a wander light in or around the pump chamber unless the light is intrinsically safe.
- The Plant/ Equipment must not be used for work for which it is not design intended.

11. Fault Finding Guide

Symptom	Possible Cause	Corrective Action
Pump does not start	Power supply failure or low voltage at motor	Check and rectify power supply, include check for excessive cable length or inoccrect cable size causing voltage drop
	Power not switched on at all points, or connections not secure	Check all switches an cable connections
	Fuse failed or circuit breaker overload	Check fuses / circuit breake
	Control panel overload tripped	Check setting / condition of overload unit-reset / replace. If satisfactory, investigate
	Control panel fault	Investigate and rectify
	Motor fault	Investigate and rectify
	Cable damaged	Replace
	Pump impeller obstructed	Clear
	Level switches obstructed or at incorrect level	Check manual switching satisfactory (except on pumps with integral level switches). Ensure level switches are correctly set and free to operate
Pump does not stop	Level switches obstructed	Ensure switches are free to operate
	Control panel fault	Investigate and rectify
Pump starts and stops repeatedly	Level switches obstructed or at incorrect level	Clear or reset
	Power supply fault	Investigate and rectify, including check for voltage drop on starting
	Pump impeller obstructed or faulty	Clear
	Non-return valve(s) obstructed or faulty, allowing back flow when pump stops	Clear or repair / replace
Pump starts but overload protection trips	Overload setting incorrect	Check setting / condition - reset / replace. If satisfactory, investigate cause - do not reset continually
	Power supply fault	Investigate and rectify, including check for voltage drop on starting
	Connections faulty	Investigate and rectify
	Pump impeller obstructed	Clear
Pump runs but gives no output or reduced output	Discharge obstructed	Clear pipework
	Valve(s) partly or fully closed or obstructed	Open or clear valves
	Discharge leak in pumping chamber	Secure discharge connections
	Pump impeller obstructed	Clear
	Pump impeller worn	Replace
	Pump air locked	Release air
	Pump wrong rotation	Rectify electrical connections (3 phasemotor only)
	Incorrect pump selection	Re-assess system
	Pump impeller obstructed	Clear
Pump runs but noisy or vibrates	Pump / impeller air locked	Release air
	Pump impeller worn or damaged, or pump shaft damaged	Investigate and replace as necessary

Appendix M

Supporting Surrey County Council Information



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Created by: ADD NAME
Department: Strategic Network Resilience
Printed on: 29/10/2019

Original Size A3
0 150 300 Metres

Pre App for Guild Later Living, Woodcote Green
Surface Water Flood Risk
For use in reference to the Flood Risk Report only.

SURREY
COUNTY COUNCIL

Detailed Flood Risk Report Guild Later Living, Woodcote Green

07 November 2019

SURREY

Detailed Flood Risk Report

Purpose of Report

This document has been prepared for the purpose of providing flood risk information for a specific site; either to aid in the development of a planning application or for flood risk management. The information provided is that which is which is available to Surrey County Council at the time and may include specific guidance e for Planners and Developers about Sustainable Drainage. Surrey County Council gives no guarantee that any flood risk information provided is100% accurate, or exhaustive; it is solely the information we currently hold.

The applicant is advised that there will need to be additional discussions with the County Council as Highway Authority in respect of any drainage proposals for proposed highway works under Section 278 or proposed adoption of new roads under Section 38 of the 1980 Highway Act. Consenting for the discharge of surface water to Ordinary Watercourses should also be directed to the County Council under the Land Drainage Act (1991).

Document History

This report relates to the following enquiry/pre-application request/planning application as:

SCC Application ID	Other ref if applicable	Version	Originator	Date	Reviewer	Date
0	VLLFA/PAA /19/121	0.1	LJ	29/10/2019	AD	29/10/2019

Glossary

The table below defines some of the frequently used terminology for your general information.

Acronym/Term	Definition
Annual Probability	Flood events are defined according to their likelihood of occurrence. The term 'annual probability of flooding' is used, meaning the chance of a particular flood occurring in any one year. This can be expressed as a percentage. For example, a flood with an annual probability of 1 in 100 can also be referred to as a flood with a 1% annual probability. This means that every year there is a 1% chance that this magnitude flood could occur.
Flood Zone 1	Area with a low probability of flooding from rivers (< 1 in 1,000 annual chance of flooding).
Flood Zone 2	Area with a medium probability of flooding from rivers (1 in 100 – 1 in 1,000 annual chance of flooding).
Flood Zone 3	Area with a high probability of flooding from rivers (> 1 in 100 annual chance of flooding).
Fluvial flooding	Exceedance of the flow capacity of river channels (whether this is a Main River or an Ordinary Watercourse), leading to overtopping of the river banks and inundation of the surrounding land. Climate change is expected to increase the risk of fluvial flooding in the future.
Infiltration SuDS	These are sustainable drainage systems which facilitate the infiltration of surface water into the ground. Once in the ground, the water percolates through the subsurface to the groundwater.
Groundwater flooding	Emergence of groundwater at the surface (and subsequent overland flows) or into subsurface voids as a result of abnormally high groundwater flows, the introduction of an obstruction to groundwater flow and / or the rebound of previously depressed groundwater levels.
Main River	Main rivers are usually larger streams and rivers, but some of them are smaller watercourses of local significance. Main Rivers indicate those watercourses for which the Environment Agency is the relevant risk management authority.

Ordinary Watercourse	Ordinary Watercourses are displayed in the mapping as the detailed river network. An ordinary watercourse is any watercourse (excluding public sewers) that is not a Main River, and the Lead Local Flood Authority or Internal Drainage Board are the relevant risk management authority.
Other sources of flood risk	Flooding from canals, reservoirs (breach or overtopping) and failure of flood defences.
Sewer flooding	Flooding from sewers is caused by exceedance of sewer capacity and / or a blockage in the sewer network. In areas with a combined sewer network system there is a risk that land and infrastructure could be flooded with contaminated water. In cases where a separate sewer network is in place, sites are not sensitive to flooding from the foul sewer system.
SFRA	Strategic Flood Risk Assessment
SWMP	Surface Water Management Plan
SuDS	Sustainable Drainage Systems
Surface water flooding	Intense rainfall exceeds the available infiltration capacity and / or the drainage capacity leading to overland flows and surface water flooding. Climate change is expected to increase the risk of surface water flooding in the future. This source is also referred to as pluvial flooding.
Tidal flooding	Propagation of high tides and storm surges up tidal river channels, leading to overtopping of the river banks and inundation of the surrounding land.
RoFSW	Risk of Flooding from Surface Water. The data shows areas at risk of flooding from surface water, for three flooding return periods (1 in 30, 1 in 100 and 1 in 1000), and the depth, velocity, hazard and flow direction associated with that flooding. It also includes; data on the models used to develop the maps and information that describes the suitable uses of the data.

Data Sources

The following sources of data have been used in preparing this report and its associated mapping:

- Geology- Bedrock and Superficial Deposits (British Geological Survey- 50,000 scale digital)
- Soilscapes (Cranfield University- http://www.landis.org.uk/soilscapes/)
- SuDS Suitability (British Geological Survey)
- Surface Water Flood Risk
    - Risk of Flooding from Surface Water (RoFSW) (Environment Agency)
- Groundwater
    - Susceptibility to Groundwater Flooding (British Geological Survey)
- Historic Flood Evidence
    - Historic Flood Map (Environment Agency)
    - Wetspots (Surrey County Council)
    - Property Flooding Database (Surrey County Council)
    - Historic Flooding Incidents Database (Surrey County Council)

Site Flood Risk Information

Groundwater

Risk & Evidence

The area of interest is located within an area which is classed as having a potential for groundwater flooding to occur at the surface. This is based on a conceptual understanding of the regional geology and hydrogeology and is therefore only an indication of where geological conditions could enable groundwater flooding to occur. It does not indicate hazard or risk and it does not provide any information on the depth to which groundwater flooding may occur or the likelihood of the occurrence of an event of a particular magnitude. This information should not be used on its own to make planning decisions at any scale, particularly site scale, or to indicate the risk of groundwater flooding.

Implications/Considerations for Planning

The site has a very high susceptibility to groundwater flooding. It is recommended that the following actions are considered as part of the planning application;
• Is there on site monitoring of groundwater levels?
• Is the development planning to discharge to the ground? If so, this may not be appropriate and appropriate site based investigations should be undertaken.

Surface Water

Risk & Evidence

The area of interest is shown to be at risk of surface water flooding in the following return period events; 1 in 30, 1 in 100 and 1 in 1000. The surface water flood extents are not appropriate to be used in assessing flood risk at an individual property level. In addition, the methods used to derive the flood extents are based on modelled design rainfall (i.e. not observed patterns of rainfall) and consequently this information cannot definitively show that an area of land or property is, or is not, at risk of flooding.
The RoFSW have been created from the Environment Agency's nationally produced surface water flood mapping, and appropriate locally produced mapping from Lead Local Flood Authorities such as Surrey County Council. This means that in different areas, the flood extents have varying levels of suitability scales for viewing or assessing. This area's information is only suitable for assessing flood risk at a 'town to street' scale. This scale is suitable for identifying which parts of towns or streets are at risk, or which towns or streets have the most risk. It is likely to be reliable for a local area, but not individual properties.

Implications/Considerations for Planning

In areas at risk of surface water flooding, the following sections outline considerations for the appropriate management of surface water, based on the information provided to Surrey County Council.

Historical Flooding

Risk & Evidence

The Historic Flood Map shows that there is no record of this area being previously flooded by rivers, groundwater or a combination of these sources. However this does not necessarily mean that flooding has not occurred, just that it has not been reported and/or recorded within the Historical Flood Map dataset.

Wetspots indicate the approximate location of known previous flooding on the highway. There is a wetspot near to the area of interest and this highlights that there has been historic flooding in the vicinity. If you would like to find out more about these local wetspots, please visit the Surrey County Council Wetspots Interactive Map: http://new.surreycc.gov.uk/maps/surrey-interactive-map. You can find the wetspots under the 'Roads and Transport' drop down to the right hand side of the map.

According to Surrey County Council's Property Flooding Database, there have been previous instances of property flooding nearby, either internally or externally. The instances of property flooding occurred in Winter 2013/14. Property flooding is sensitive information and this is why more specific details on the location of flooding cannot be provided. Whilst this dataset is the most comprehensive record of property flooding in Surrey, there may be instances of property flooding which were not reported and therefore are not recorded in this dataset.

Surrey County Council's Historic Flooding Incident Database highlights all reported, non point location specific, flooding incidents e.g. example road was flooded. The data indicates that there is a nearby location which has previously reported flooding.

Implications/Considerations for Planning

In areas which have been previously affected by flooding, the following should be considered:

- Is there a safe access/egress route demonstrated?
- Is there an evacuation plan in place?
- Have resilience/resistance measures been considered in the design?

SuDS Suitability

The selection of SuDS should be considered in the early stages of design. The selection criteria, as set out by The SuDS manual (CIRIA C697, 2007), provides a good framework for doing this.

Potential for Infiltration SuDS

Surrey County Council is licensed to use the Infiltration SuDS Data produced by the British Geological Survey. This data was produced after the Pitt Review (2007) and aims to encourage the appropriate use of SuDS. By utilising SuDS, the reliance on traditional piped systems is reduced, and the sustainable management of water is encouraged.
The Infiltration SuDS data is used to make a preliminary assessment of the suitability of the subsurface for infiltration SuDS. This data is not a replacement for a soakaway test or site investigation.

The suitability of utilising infiltration SuDS techniques has been summarised for the application site below.

Constraints to Infiltration

There are very significant constraints indicated at the site for the use of infiltration SuDS and a significant potential for one or more geohazards associated with facilitating infiltration. A full appraisal of ground conditions is necessary and the site investigation should consider whether the potential for or the consequences of infiltration are significant.

Drainage Potential

There is a very significant potential for one or more geohazards associated with infiltration. Only install infiltration SuDS if the potential for or the consequences of infiltration are considered not to be significant.

Stability of Ground

Ground instability problems are probably present. Increased infiltration may result in ground instability. Before installing infiltration SuDS consider the potential for or the consequences of infiltration on ground stability.

Groundwater Vulnerability

The groundwater may be vulnerable to contamination. Where surface water is being infiltrated into the ground, this water should be free of contaminants. Before installing infiltration SuDS, consider the risks associated with the transport of contaminants to the groundwater. Check previous land use and potential for the presence of contaminated ground.

Superficial Deposit Permeability

Superficial deposits are likely to be free-draining. It is recommended that the infiltration rate is quantified via an infiltration/soakaway test.

Bedrock Permeability

The bedrock permeability is spatially variable, but likely to permit moderate infiltration. It is recommended that the infiltration rate is quantified via an infiltration/soakaway test.

Proposed Approach

Drainage and Discharge Methods

Some areas of the site may be suitable for infiltration based SuDS techniques however ground conditions and groundwater levels should be fully investigated through intrusive ground investigations and should be provided to support any Planning Application made in respect of the site.

A hierarchical approach should be taken to the discharge of surface water from the site.

- Option 1 - to ground;
- Option 2 - attenuation and discharge to adjacent watercourse;
- Option 3 - attenuation and discharge to surface water sewer.

Any surface water discharged from the site should be restricted to the existing greenfield run-off rate applied to the impermeable area of the site only. Qbar is considered acceptable (applied to the proposed impermeable area only) or a staged discharge approach with greenfield run-off rates applied to the 1 in 1 year, 1 in 30 year and 1 in 100 year events accordingly.

On site attenuation should be provided for the 1 in 100 year + climate change rainfall event. 40% should be applied for climate change for residential development. A lower % for climate change may be considered acceptable for commercial property dependent upon the life span of the development, however sensitivity testing will be required up to the + 40% event. Where appropriate, a 10% allowance for urban creep should be included in the drainage designs.

If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent. More details are available on our website.

Areas of the site have been identified as having a risk of surface water flooding and as such this risk should be fully assessed as part of any Planning Application. More vulnerable development should be placed in areas at lower risk and existing surface water flow routes should be maintained to ensure flood risk is not increased.

SuDS Components

Many schemes deliver the management of water quantity but do not fulfil the four pillars of SuDS design as defined by the SuDS Manual. The manual seeks to encourage schemes that manage the quantity and quality of surface water runoff, provide an amenity that integrates surface water as an attractive part of public space and also enhance biodiversity. Schemes based around the management of quantity alone are purely drainage schemes not SuDS.

The following proposals for SuDS have been put forward as part of the drainage design:
Intrusive ground investigations should be completed to determine ground conditions and assess groundwater levels. All SuDS principles could be affected if groundwater levels are high, and therefore this information should be gathered to inform the drainage strategy.

If soakaways are unsuitable, above ground attenuation of surface water should be considered in the first instance before below ground storage is proposed. If above ground attenuation of surface water is not considered feasible full justification should be provided.

The Applicant should consider the management and maintenance of the proposed SuDS elements and this information should be presented as part of any Planning Application.

Site Development Details: Cross-check

The table below cross-checks the information provided with the planning application, with information easily available to Surrey County Council and provides recommendations on the suitability of the proposed drainage.

Site Details	Description
Bedrock	Clay, Silt and Sand on the majority of the site, on the east side of the site the bedrock is Clay and Silt
Superficial Deposits	Sand and Gravel
Soils	"Soilscapes conveys a summary of the broad regional differences in the soil landscapes of England and Wales. Soilscapes is not intended as a means for supporting detailed assessments, such as land planning applications or site investigations; nor should it be used to support commercial activities. For such applications, a parallel service Soils Site Reporter provides comprehensive reporting for specific locations. Ground investigations should also be evidenced when considering infiltration SuDS. " unclassified
Depth to Water Table (m)	Groundwater is likely to be less than 3 m below the ground surface for at least part of the year. It is recommended that the seasonal variation in groundwater levels are determined. The scale of site specific assessments and evidence of groundwater levels should be appropriate to the size and nature of the proposed development site. This site may not be suitable for infiltration SuDS if the groundwater level reaches <1m below the ground surface.
Discharge method- Sewer (if applicable)	The nearest sewer is more than 50m from the proposed development. This indicates that discharging to the sewer may be feasible. Infiltration SuDs are mandatory unless where evidenced that they are not appropriate (e.g. contaminated land, high ground water levels or land subsidence). If SuDS are not appropriate, then evidence that connecting to the sewer network is appropriate and has been permitted by the water utility company should be provided along with any third part land permissions.
Discharge method- Watercourse (if applicable)	The nearest watercourse is less than 50m from the proposed development. This indicates that discharging to the watercourse may be appropriate. Consideration should be given to the downstream flood risk and water quality of the watercourse. When discharging to watercourses, there should be a minimum of an 8m buffer from any building for access and maintenance.

Recommendations and Summary

Any surface water discharged from the site should be limited to the existing greenfield run-off rate applied to the proposed impermeable area of the site only.

Evidence must be provided to establish the greenfield runoff rate for the site. For previously developed sites, evidence must be provided where the greenfield runoff rate cannot be reasonably practicably achieved.

On site attenuation should be provided for the 1 in 100 year + climate change rainfall event, with a sensitivity check up to the 1 in 100 year (+40% climate change) event if not used already.

SCC Surface water drainage pro-forma should be completed to accompany any future Planning Applications with supporting evidence provided.

If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent. More details are available on our website.

If proposed works result in infiltration of surface water to ground within a Source Protection Zone the Environment Agency will require proof of surface water treatment to achieve water quality standards.

Good Practice Guidance

For all areas within Flood Zone 1 and where the application site is less than 1ha the following guidance should be followed (in addition to that set out above) when considering surface water management and SuDS.

Flood Risk

Please refer to the Environment Agency's Standing Guidance for Flood Risk.

SuDS Suitability and Methods

Please refer to the SuDS advice note and the Evidence Required note on Surrey County Council's website to assist in directing developers and designers to the most appropriate guidance and technical standards.

A non-exhaustive list of references is provided at the end of this document to further assist Planners in informing the planning decision.

References

BRE365. Soakaway Design

Cambridge City Council. 2009. SuDS Design and Adoption Guide. https://www.cambridge.gov.uk/sites/www.cambridge.gov.uk/files/docs/SUDS-Design-and-Adoption-Guide.pdf

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CIRIA. 2006. Designing for exceedance in urban drainage-good practice (C635).

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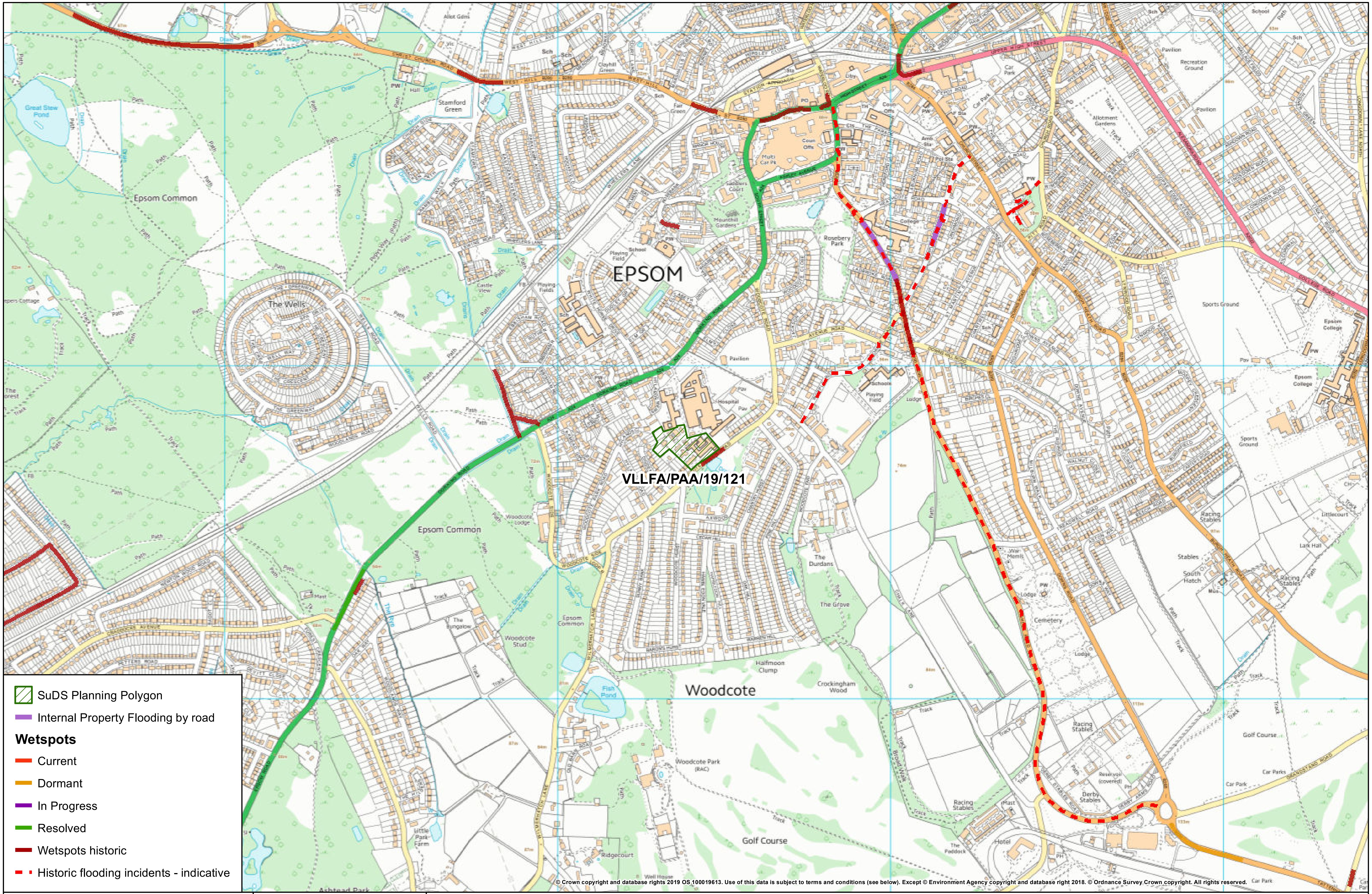
Defra. 2015. Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf



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Printed on: 07/11/2019

Original Size A3
0 150 300 Metres

Pre App for Guild Later Living, Woodcote Green
Historic Flood Evidence
For use in reference to the Flood Risk Report only.

SURREY COUNTY COUNCIL