Willow Way, Sydenham

Surface and Foul Water Drainage Strategy Report

Project No. AC22260

Doc No. AC22260-ABS-XX-XX-RP-C-5800

Revision P01

December 2022

Issue, Revision & Check			
First Issue	16/12/2022		Signed
By	Martin Howell	MEng (Hons)	
Checked	Martin Howell	MEng (Hons)	
Approved	Matthew Woods	BEng (Hons)	

Contents

AC22260: Willow Way, Sydenham – Surface and Foul Water Drainage Strategy Report

1. Introduction

ABSTRUCT Consulting have been appointed by Kitewood Estates Ltd to undertake a drainage strategy for the proposed development to support a planning application, *"Demolition of existing buildings and redevelopment to provide employment floorspace (Use classes E(g)(i)(ii)(iii)) and residential dwellings including affordable housing and amenity space."*

This report incorporates a SUDS assessment and maintenance strategy to assist with the planning application.

The site is located at 21 – 57 Willow Way (Site A), Sydenham, SE26 4QP, ordnance survey grid TQ 350 721. A site location plan has been provided in Appendix A.

The existing site comprises three businesses currently operating, including a vehicle repair / garage, storage / warehouse catering business, and a drinks machine repair / servicing business. The sites contain a mix of single storey and double storey buildings with areas of hardstanding, parking, yard areas and shipping containers interspersed between the buildings. The site is bounded by Willow Way to the west with further light industrial / commercial units to the north, west, and south, and housing to the east.

It is proposed to demolish the existing structures on site and redevelop with a new building comprising commercial spaces with flats over, with an associated parking court to the rear of the building. A proposed site plan can be found in Appendix B.

2. Existing Drainage

The existing site has a number of manhole covers and gullies across the site, as shown on the topographic survey in Appendix C.

The Thames Water sewer records (Appendix D) also show that there is a combined sewer in Willow Way to the west as well as a public sewer entering the site at the southern end of the development, below the existing building. This sewer appears to terminate within the building.

It is therefore assumed that the existing site discharges both foul and surface water to the Thames Water public combined sewer in Willow Way.

3. Proposed Foul Drainage

The proposed development will connect to the Thames Water combined sewer to the west of the development in Willow Way via a new private foul sewer connection to a new adopted manhole built over the existing sewer.

All foul drainage is proposed to discharge under gravity.

A proposed drainage layout can be found in Appendix E.

4. SUDS Assessment

Sustainable Urban Drainage Systems (SUDS) is the philosophy of trying to replicate, as closely as possible, the natural drainage forma a site before development.

There are a number of SUDS features that should be considered for any development and these are set out in a hierarchy. These are summarised along with their suitability for the site in Table 1 overleaf.

The British Geological Society (BGS) mapping for the site shows the site to be underlain by the London Clay Formation, the record of this can be found in Appendix F. Clay soils are typically cohesive and not supportive of infiltration features, and therefore these have been discounted from potential use on this site.

SUDS Feature	Site Specific Notes	Proposed Use
1) Store Rainwater for Later Use		
Rainwater Harvesting	Small roof area compared to number of potential users, therefore of little benefit.	Not proposed for use.
2) Use Infiltration Techniques		
Green Roofs	Large areas of flat roof, some for amenity space, some for plant, etc. Plant areas suitable for use with an extensive system such as sedum, or similar.	Proposed for use.
Soakaways	Site is underlain by London Clay, therefore infiltration unlikely to suitable.	Not proposed for use.
Permeable Paving	Site is underlain by London Clay, therefore infiltration unlikely to be suitable, however a tanked system for the parking bays would be suitable for providing pollution control from the parked vehicles.	Proposed for use as a tanked system discharging to the wider site drainage system.
3) Attenuate Rainwater in Ponds / Open Features for Gradual Release		
Swales / Detention Basins / Ponds	There are no large open areas suitable for surface features within the development.	Not proposed for use.
4) Attenuate Rainwater in Tanks for Gradual Release		
Reduced Discharge and Storage	The existing site is assumed to discharge surface water to the adjacent combined sewer. It is therefore proposed to maintain this connection, albeit at a reduced flow rate with an attenuation tank provided.	Proposed for use.

Table 1 – SUDS Features Summary

Due to the underlying ground strata being unsuitable for infiltration features, it is proposed to discharge surface water to the Thames Water combined sewer in Willow Way at a restricted rate with an attenuation tank provided under the rear parking court to temporarily store the excess surface water volumes in larger storms.

5. Proposed Surface Water Drainage

The pre-development impermeable area of the site is 2,239m² (100%). Post development this will decrease to 1,895m² (84.6%), therefore surface water flows generated by the site will decrease post development.

The post development impermeable area allows for an area of parking which will not be built during the initial development, but installed later as required. However in order to avoid the requirement for any remedial works to the attenuation tank later, this impermeable area has been included in the calculations.

Current guidance is to reduce offsite discharge rates to as close to greenfield runoff rates as possible so as to reduce the flood risk to properties downstream of the development. Greenfield runoff rates for the proposed drained area are given in Table 2 below and calculations supporting these can be found in Appendix G.

Return Period	Greenfield Runoff Rate (ls^{-1})
1:1 year	0.3
1:30 year	0.7
1:100 year	1.0

Table 2 – Greenfield Runoff Rates

Due to the underlying ground strata being London Clay, which is likely to not support infiltration features, it is proposed to discharge surface water to the Thames Water combined sewer in Willow Way at a reduced flow rate.

It is not possible to reduce the offsite flow rate fully to greenfield runoff rates as they are too low and any flow restriction device used needs a practical minimum flow rate so that the orifice is not so small that it is at risk of

being easily blocked, therefore increasing the flood risk on and off site. Therefore offsite flow rates will be restricted to 2ls^{-1} through the use of a Vortex Flow Control Device (Hydrobrake, or similar approved).

Surface water flows will be collected via rainwater pipes, gullies, and permeable paving then conveyed via a gravity surface water drainage system, incorporating an element of below ground attenuation (crates) towards the sewer to the west. A drainage layout can be found in Appendix E showing the proposals.

Temporary storage will be provided within the attenuation tank to balance the volumes prior to discharge to the watercourse up to and including the 1:100 year event with a 40% allowance for climate change which is in accordance with the Environment Agencies recent changes (May 2022), to how Climate Change Allowance is assessed and incorporated within developments. Using the Environment Agencies Climate Change Allowances web page Climate Change Allowance Link the 1% annual exceedance rainfall event for the 2070's Epoch * (upper end allowance) is 40%.

** Environment Agency guidelines state:-*

Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

Table 3 below summarises the pre and post development flow rates showing that offsite flow rates will be reduced post development to at least 10% or better of the existing offsite flow rate.

Return Period	Greenfield Runoff Rate (ls^{-1})	Pre Development Runoff Rate (ls^{-1})	Post Development Runoff Rate (ls^{-1})	% of Pre Development Runoff Rate
1:1 year	0.3	19.9	1.9	9.5%
1:30 year	0.7	48.9	1.9	3.9%
1:100 year	1.0	63.5	2.0	3.1%

Table 3 – Pre / Post Development Offsite Flow Rates

Micro Drainage Calculations supporting the above strategy can be found in Appendix H.

In the event of surface water drainage system failure / exceedance, surface water will flow to the west towards Willow Way and then away from the development, replicating the existing situation, pre development.

It is therefore shown that post development, offsite surface water flows will be suitably managed and controlled to reduce the flood risk both on and off site.

6. Adoption

It is not proposed to offer the new below ground surface water drainage systems to Thames Water for Adoption.

7. Drainage Maintenance

The surface water drainage system serving the development will need to be managed during the lifetime of the development.

The pipework within the site is designed to be self-cleansing in accordance with Part H of the Building Regulations and as such should have no specific maintenance requirements other than general clearance of silts and debris as and when required.

The use of trapped gullies, catchpits, and inspection chambers will allow future access to maintain the system.

Standard typical maintenance associated with any property will be required for the roof water, gullies and channels, typically consisting of ensuring that the system is clear of any leaves or other debris. This should be carried out as required.

Table 4 sets out the various elements of the drainage system and suggested maintenance requirements.

Drainage Element	Inspection Requirements	Maintenance Requirements	Inspection Schedule
Gutters & Rainwater Downpipes	Visual inspection to check for blockages.	Clear and blockages / debris found.	Yearly
Channel Drains and Sump Units	Visual inspection for site / debris.	Clear silt / debris.	Initially after 3 months, then every 6 months.
Pipework	Designed to be self-cleansing, only required if flooding issue occurs, then by specialist CCTV company.	As recommended by specialist CCTV survey company.	When required.
Catchpits	Visual inspection for silt / debris.	Clear silt / debris.	Initially after 3 months, then every 6 months.
Flow Control Chambers	Visual inspection for silt / debris.	Clear silt / debris.	Initially after 3 months, then every 6 months.
Attenuation Tank	CCTV survey to check distributor pipe is clear of debris, visual inspection of surface to check for deformation indicating an issue with the tank below.	Clear silt / debris. Excavation and replacement if required.	Yearly
Permeable Paving	Visual check for debris and weeds.	Remove debris and weeds with powered brush to sweep the surface.	Initially after 3 months, then every 6 months.
Below ground drainage system MUST only be worked on / entered by suitably trained and qualified people using appropriate Health and Safety equipment			

Table 4 – Drainage Maintenance Summary

8. Construction Phase Drainage System

Once appointed, the main contractor as part of their overall responsibilities will prepare the necessary documentation and methodology regarding how they intend to manage the surface water run-off during the main construction works.

9. Conclusion

The existing site is developed with buildings and hardstanding and is 100% impermeable.

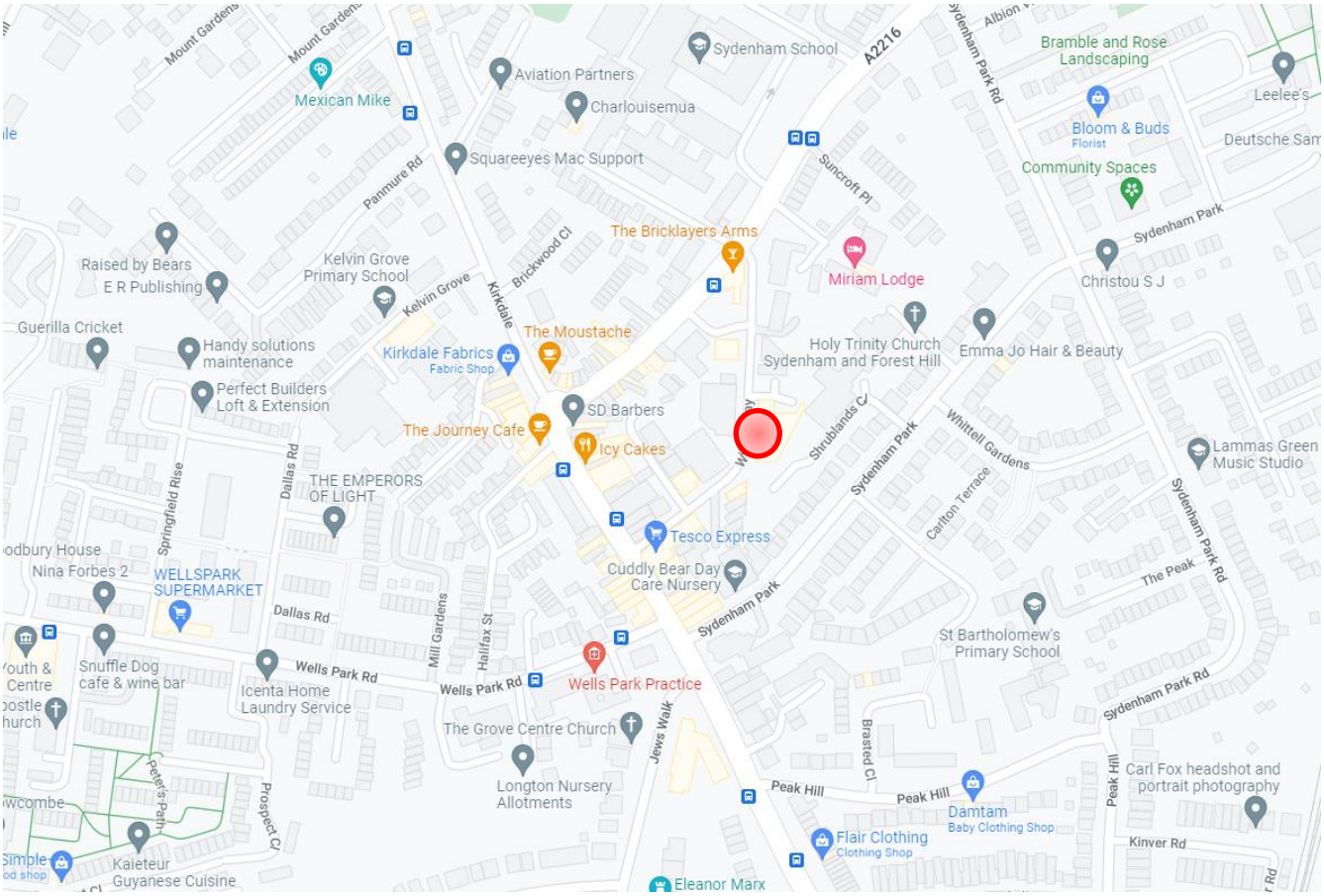
The proposed development is to demolish the existing buildings and build a new building comprising of commercial space with flats over, and a small parking court to the rear.

Foul and surface water flows will be conveyed to the Thames Water combine sewer in Willow Way to the west

The surface water offsite flow rate will be reduced to a practical minimum of $2ls^{-1}$ which is less then 10% of the pre development flow rate.

An attenuation tank will be used to balance volumes generated by the site prior to discharge for all storms up to and including the 100 year event with a 40% allowance for climate change.

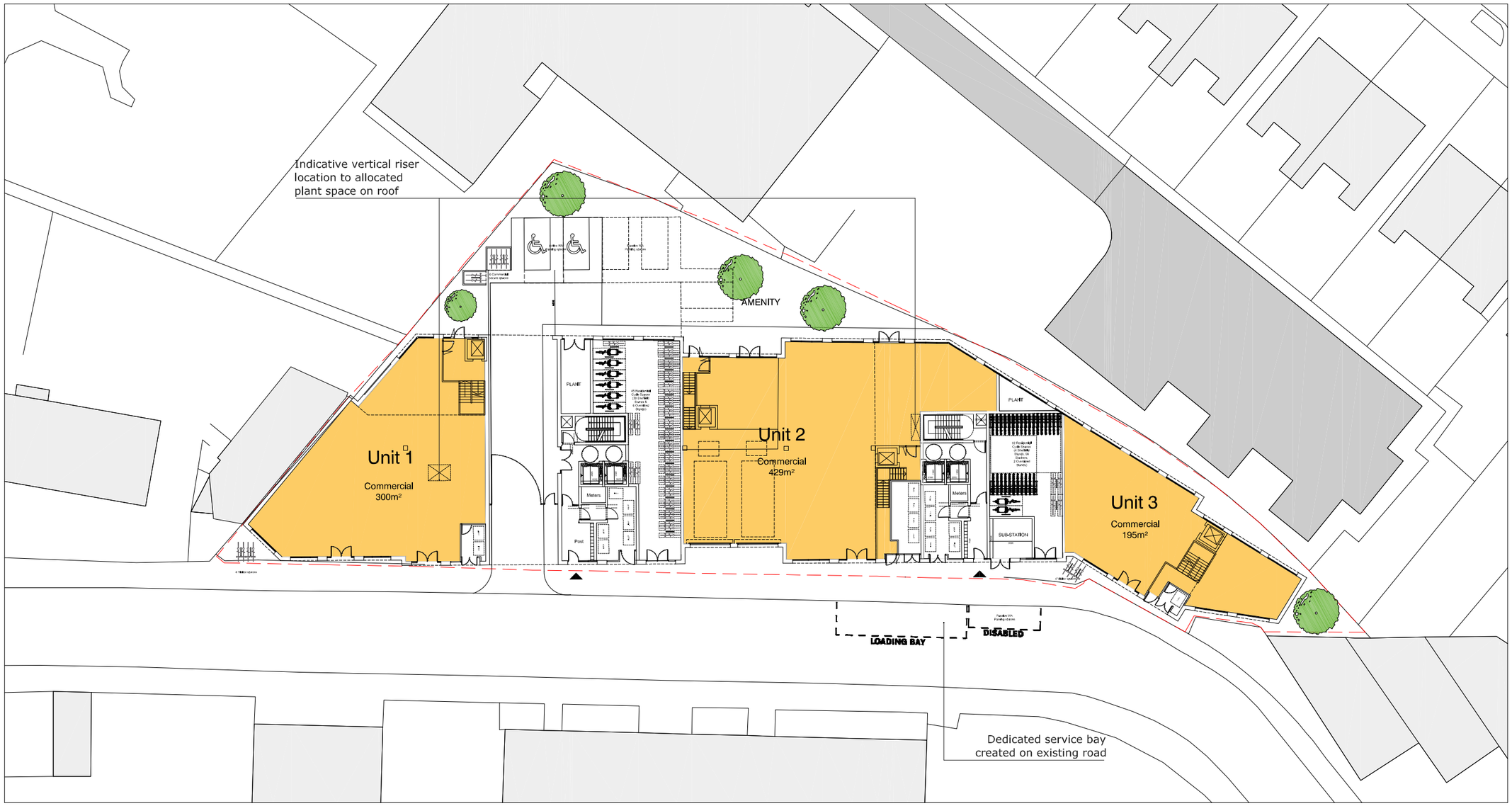
Appendix A – Site Location Plan



Site Location

Appendix B – Proposed Site Plan

NOTES:



A GROUND FLOOR PLAN
1:200@A1, 1:400@A3

REVISIONS

DRAFT
14/12/2022

0 2 m 10 m

Project :
21 - 57 Willow Way
Sydenham

Client :
Kitewood Estates Ltd

Scale:
1:200 @A1

Title :
GROUND FLOOR PLAN

Drawing Number :
KTW034-DCR-GF-PL-A-0100

Date :	Drawn by :	Approved by:
16.11.2022	CF	--

DC ARCHITECTURE+DESIGN
Unit 512, Highgate Studios, 53-79 Highgate Road, LONDON NW5 1TL
Tel: +44 (0)207 284 9200, Fax: +44 (0)207 284 9222
email: info@DCarchitecture.com

Appendix C – Topographic Survey

Drawing Naming Convention:

Job No\Code\Dwg type\Location\Ref

Code: 02 = Existing

Dwg Type: B = Building; S = Section; E = Elevation; T = Topographical

Location: B = Basement; E = External; G = Ground; 1 = First; R = Roof; M = Mezzanine; C = Ceiling Plan; F = Front; S = Side; R = Rear; GA = General Layout; AA = Section AA

Ref: Ref to individual dwg ID, (e.g., Revision)

Standard Abbreviations (where applicable):

Building Survey

AB	AIR BRICK
ACU	AIR CONDITIONING UNIT
AH	ACCESS HATCH
AP	ACCESS PANEL
AV	AIR VALVE
BH	BEAM HT
BR	BOILER
BSL	BEAM SOFFIT LEVEL
CB	CUPBOARD
CC	CEILING CHANGE
CIH	CLEAR INTERNAL HT
C>A	CILL TO APEX HT
C>H	CILL TO HEAD HT
C>S	CILL TO SPRING HT
DB	DOOR BASE HT
DH	DOOR HEAD HT
FA	FIRE ALARM
FAB	FIRE ALARM BELL
FX	FIRE EXTINGUISHER
F>A	FLOOR TO APEX HT
F>C	FLOOR TO CILL HT
F>H	FLOOR TO HEAD HT
F>S	FLOOR TO SPRING HT
GEA	GROSS EXTERNAL AREA
GIA	GROSS INTERNAL AREA
GU	GULLY
HT	HEATER
HW	HOT WATER TANK
NIA	NET INTERNAL AREA
NTS	NOT TO SCALE
RAD	RADIATOR
RE	RECESS HEAD HEIGHT
RFV	RAISED FLOOR VOID
RL	ROOF LEVEL
RSH	ROLLER SHUTTER
RWP	RAIN WATER PIPE
SPO	SPOT LIGHT
SVP	SOIL VENT PIPE
V	VENT

Land Survey

B	BOLLARD
BS	BRICK SETTS
BT	B.T. COVER
CAM	CAMERA
CATV	CABLE TV COVER
CL	COVER LEVEL
EL	ELECTRIC COVER
EP	ELECTRIC POLE
ER	EARTH ROD
FB	FLOWERBED
FH	FIRE HYDRANT
FW	FOUL WATER
GU	GULLY
GV	GAS VALVE
IC	INSPECTION COVER
IL	INVERT LEVEL
LP	LAMP POST
MH	MANHOLE
OHT	OVERHEAD TELECOM
P	POST
PM	PARKING METER
PI	PIPE
RO	RODDING EYE
RS	ROAD SIGN
RTW	RETAINING WALL
RWP	RAIN WATER PIPE
SA	SITE AREA
SI	SIGN
STU	TREE STUMP
SV	STOP VALVE
SVP	SOIL VENT PIPE
SW	STORM WATER
TOF	TOP OF FENCE
TOW	TOP OF WALL
TP	TELEGRAPH POLE
UTL	UNABLE TO LIFT
VP	VENT PIPE
WM	WATER METER
WT	WATER TAP

Symbols (where applicable):

Direction of sloping ceiling

2 = PLUG SOCKET; 2 = NO. OF SOCKETS

1 = LIGHT SWITCH; 1 = NO. OF SWITCHES

2.65 = FLOOR TO STRUCTURAL CEILING HT

2.65 = FLOOR TO SUSPENDED CEILING HT

10.00 = FLOOR LEVEL RELATIVE TO DATUM

Notes:

The Survey relates to OS GPS 'Active Network'.

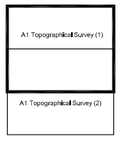
All direction arrows indicate UP unless otherwise stated.

Visible features in the vicinity of any boundaries, as shown on this survey, may not represent the extent of legally conveyed ownerships.

Whilst every effort has been made to determine all materials, no guarantee is given. Materials should be regarded as assumed unless verified by a qualified third party.

Tree spread and height are approximate, Species should be regarded as assumed unless verified by a qualified third party.

SHEET LAYOUT



Rev	Date	By	Description

HB Surveys Ltd
Land & Measured Building Surveyors
Spring House, 60 Poplar Way, Midhurst, West Sussex GU29 9TA
t. 01730 814884 info@hbsurveys.com

Client: KITEWOOD

Project: WILLOW WAY, SYDENHAM, LONDON SE26 4QP

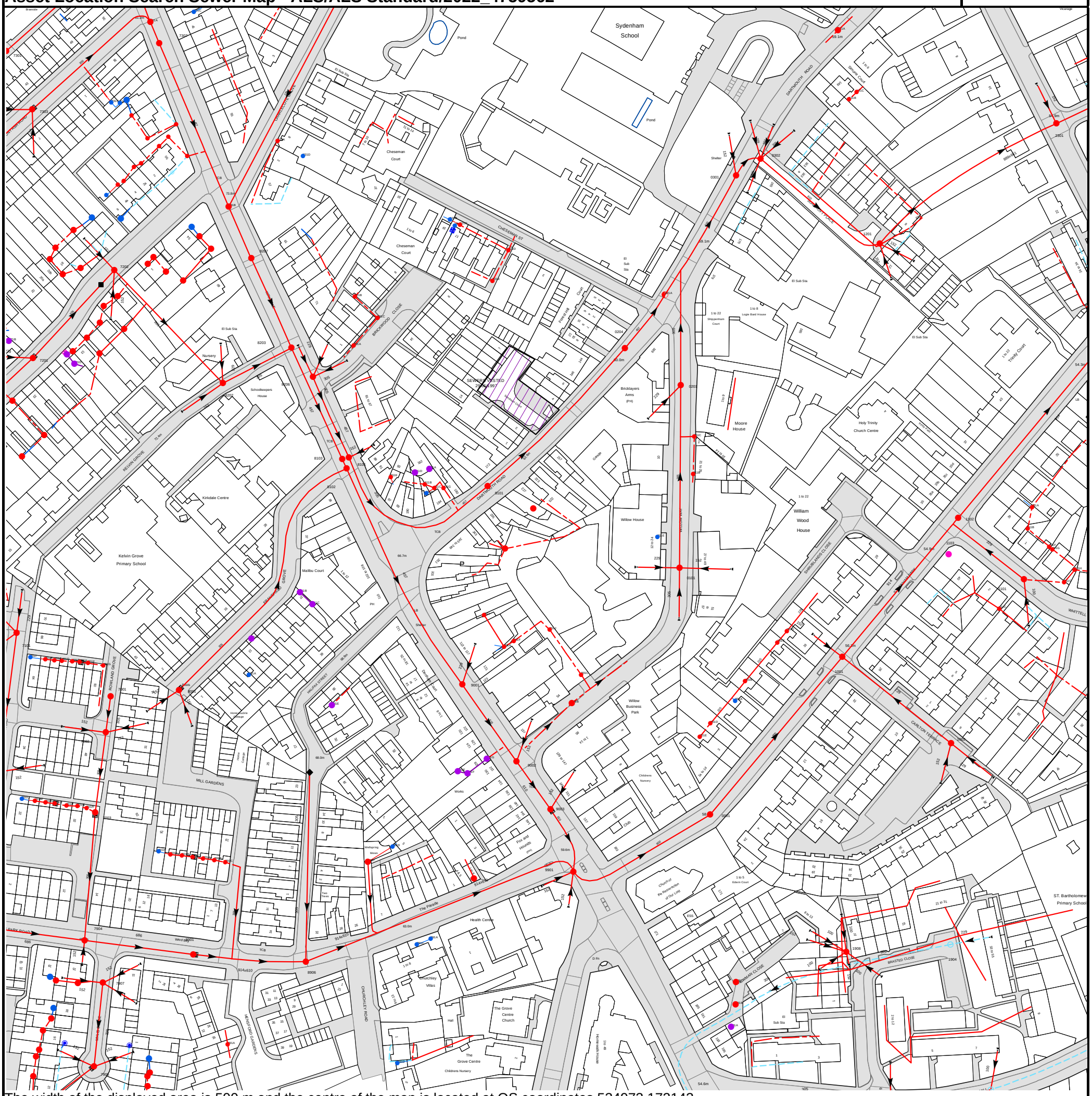
Drawing Title: EXISTING TOPOGRAPHICAL SURVEY

Date:	Scale:	Surveyor:	Drawn:	Checked:
OCT 2022	1:200@A1	PPS	PPS	HB

Job No:	Drawing No:	Sheet No:	Rev:
22115	22115-02-T-E	1 of 3	

Appendix D – Thames Water Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4759562



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 534973,172143

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 and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
001A	n/a	n/a
001B	n/a	n/a
001C	n/a	n/a
011D	n/a	n/a
1001	56.21	52.61
1103	n/a	n/a
1002	56.7	55.02
1102	54.65	51.84
1101	54.92	52.25
111B	n/a	n/a
111A	n/a	n/a
211F	n/a	n/a
211G	n/a	n/a
211C	n/a	n/a
211H	n/a	n/a
091A	n/a	n/a
091B	n/a	n/a
091C	n/a	n/a
1908	58.5	56.75
1904	59.49	56.47
1807	59.11	56.5
73WR	n/a	n/a
731D	n/a	n/a
731C	n/a	n/a
73WS	n/a	n/a
7307	n/a	n/a
731A	n/a	n/a
831C	n/a	n/a
831B	n/a	n/a
72WW	n/a	n/a
72WX	n/a	n/a
72WY	n/a	n/a
72XQ	n/a	n/a
73XQ	n/a	n/a
7303	84.45	80.97
7301	89.07	84.84
1201	55.65	53.37
2301	54.53	50.43
131B	n/a	n/a
131C	n/a	n/a
131A	n/a	n/a
0204	n/a	n/a
821C	n/a	n/a
821B	n/a	n/a
021A	n/a	n/a
921E	n/a	n/a
921D	n/a	n/a
921A	n/a	n/a
921C	n/a	n/a
921B	n/a	n/a
0301	58.94	54.89
0302	58.9	54.64
8202	70.06	68.16
8206	68	64.9
8203	68.49	65.58
821A	n/a	n/a
72VQ	n/a	n/a
72US	n/a	n/a
82WX	n/a	n/a
72UX	n/a	n/a
7202	75.28	73.06
72UZ	n/a	n/a
8207	n/a	n/a
72UY	n/a	n/a
82WY	n/a	n/a
82WZ	n/a	n/a
82XQ	n/a	n/a
72XY	n/a	n/a
731B	n/a	n/a
73WZ	n/a	n/a
73WY	n/a	n/a
73WV	n/a	n/a
73WX	n/a	n/a
73WW	n/a	n/a
83WT	n/a	n/a
831D	n/a	n/a
73WU	n/a	n/a
831A	n/a	n/a
73WQ	n/a	n/a
73WT	n/a	n/a
83WR	n/a	n/a
7102	n/a	n/a
7103	n/a	n/a
7204	n/a	n/a
721D	n/a	n/a
7201	76.5	73.98
721E	n/a	n/a
72YR	n/a	n/a
72UW	n/a	n/a
721B	n/a	n/a
72UV	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
72UU	n/a	n/a
72UT	n/a	n/a
72WV	n/a	n/a
72WU	n/a	n/a
801A	n/a	n/a
811A	n/a	n/a
811B	n/a	n/a
811C	n/a	n/a
8103	n/a	n/a
8102	67.31	64.45
8101	67.36	64.55
911K	n/a	n/a
911D	n/a	n/a
911B	n/a	n/a
911H	n/a	n/a
911A	n/a	n/a
911C	n/a	n/a
911G	n/a	n/a
9001	64.84	60.4
911I	n/a	n/a
9101	63.35	60.83
901A	n/a	n/a
91WT	n/a	n/a
911F	n/a	n/a
91WQ	n/a	n/a
911J	n/a	n/a
901C	n/a	n/a
011E	n/a	n/a
0101	58.78	56.79
0201	59.16	56.21
011B	n/a	n/a
011C	n/a	n/a
111C	n/a	n/a
701Q	n/a	n/a
701P	n/a	n/a
701O	n/a	n/a
701N	n/a	n/a
701M	n/a	n/a
701L	n/a	n/a
7002	71.66	68.8
7001	72.98	69.7
701G	n/a	n/a
701F	n/a	n/a
701H	n/a	n/a
701E	n/a	n/a
701D	n/a	n/a
701C	n/a	n/a
701B	n/a	n/a
701I	n/a	n/a
7101	75.17	72.42
79XQ	n/a	n/a
701K	n/a	n/a
701J	n/a	n/a
8001	72.9	70.29
801B	n/a	n/a
801C	n/a	n/a
8901	64.73	61.63
801D	n/a	n/a
891B	n/a	n/a
891C	n/a	n/a
891A	n/a	n/a
8906	64.06	60
801E	n/a	n/a
8907	65.25	63.35
901D	n/a	n/a
991D	n/a	n/a
991C	n/a	n/a
991A	n/a	n/a
901E	n/a	n/a
901F	n/a	n/a
99YU	n/a	n/a
901G	n/a	n/a
9002	61.99	58.23
9003	60.63	56.53
901B	n/a	n/a
9901	59.72	56.47
001E	n/a	n/a
0001	58.16	53.49
001D	n/a	n/a
79WS	n/a	n/a
79WT	n/a	n/a
79WU	n/a	n/a
79WV	n/a	n/a
79VW	n/a	n/a
79WW	n/a	n/a
79WX	n/a	n/a
79VV	n/a	n/a
79VU	n/a	n/a
7904	65.49	62.4
701R	n/a	n/a
7906	61.65	60.12
7003	69.46	66.59
7907	63.96	61.4

Manhole Reference	Manhole Cover Level	Manhole Invert Level
79WZ	n/a	n/a
78YU	n/a	n/a
79XR	n/a	n/a

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 and established on site before any works are undertaken.

Appendix E – Proposed Drainage Layout

KEY:

PRIVATE DRAINAGE

ALL BELOW GROUND PIPEWORK TO BE 100Ø UNLESS NOTED OTHERWISE

- 150Ø, 1:80 -SURFACE WATER DRAIN.
- -SURFACE WATER CHAMBER.
- S1 CP1 -SURFACE WATER CATCHPIT CHAMBER.
- RE -RODDING EYE.
- HB -HYDRO-BRAKE FLOW CONTROL MANHOLE.
- -PERMEABLE PAVING (TANKED).
- -BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION STORAGE SYSTEM BY SDS (TEL: 01934 751 303).
- RAT -REVERSE ACTION INTERCEPTOR REF. RI ?/? BY HEPWORTH OR EQUIVALENT.
- 150Ø, 1:80 -FOUL WATER DRAIN.
- F1 -FOUL WATER CHAMBER.
- 150Ø, 1:80 -COMBINED DRAIN.
- C1 -COMBINED CHAMBER.

EXISTING DRAINAGE

- 305Ø -COMBINED DRAIN TO REMAIN.
- Ex. -COMBINED DRAIN CHAMBER.

GENERAL

- -EXISTING LEVEL.
- × (50.00) -EXISTING LEVEL INTERPOLATED.
- × 50.00 -PROPOSED LEVEL.
- 1:50 -PROPOSED FALL.
- -PROPOSED VALLEY / RIDGE LINE.
- -EXCEEDANCE FLOOD ROUTING.

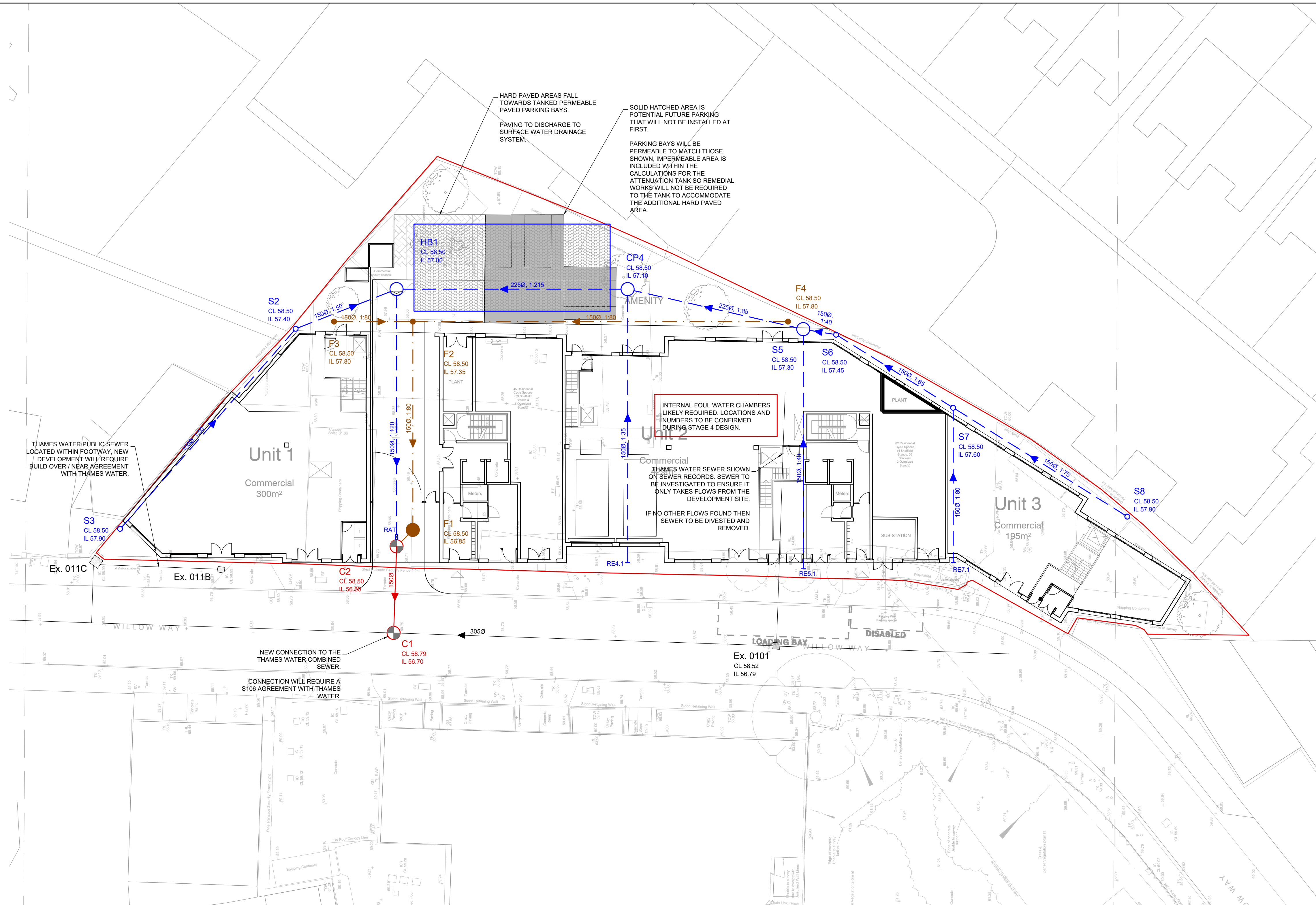
0m 2 4 6 8 10m 12 14 16 18 20m
1:200 SCALE

CHAMBER HB1 FITTED WITH HYDRO-BRAKE FLOW CONTROL.
DESIGN HEAD = 0.80m
DESIGN FLOW = 2l/s
MODEL: MD-SHE-0066-2000-1050-2000

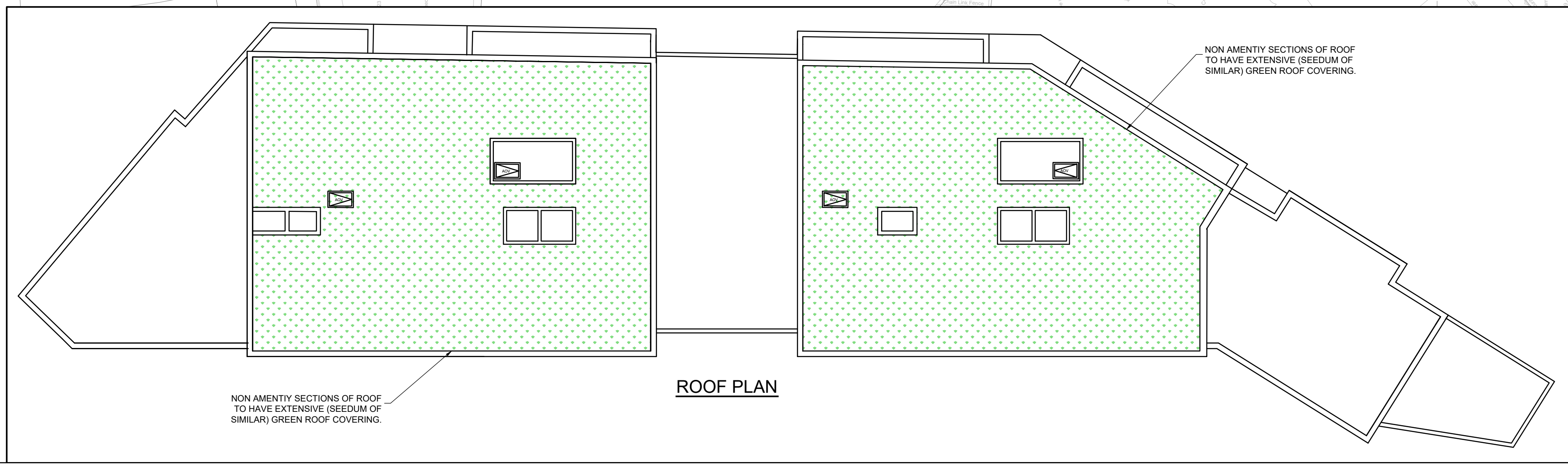
THE USE OF ANY OTHER FLOW CONTROL WILL INVALIDATE ANY DESIGN BASED ON THIS DATA AND COULD CONSTITUTE A FLOOD RISK. IF ALTERNATIVE PRODUCT IS PROPOSED THEN ABSTRUCT CONSULTING TO BE ADVISED PRIOR TO START OF CONSTRUCTION SO THAT PROPOSED DESIGN CHANGE CAN BE REVIEWED AND VALIDATED.

BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION SYSTEM
18m LONG x 8m WIDE x 0.75m EFFECTIVE DEPTH
(94.33m³ OF STORAGE VOLUME)

ATTENUATION TANK FORMED USING SDS GEOLIGHT UNITS, FULLY TANKED AND CROSS VENTED AND INSTALLED FULLY IN ACCORDANCE WITH SDS RECOMMENDATIONS AND SPECIFICATIONS.
SDS TEL: 01934 751 303



HARD PAVED AREAS FALL TOWARDS TANKED PERMEABLE PAVED PARKING BAYS.
PAVING TO DISCHARGE TO SURFACE WATER DRAINAGE SYSTEM.
SOLID HATCHED AREA IS POTENTIAL FUTURE PARKING THAT WILL NOT BE INSTALLED AT FIRST.
PARKING BAYS WILL BE PERMEABLE TO MATCH THOSE SHOWN, IMPERMEABLE AREA IS INCLUDED WITHIN THE CALCULATIONS FOR THE ATTENUATION TANK SO REMEDIAL WORKS WILL NOT BE REQUIRED TO THE TANK TO ACCOMMODATE THE ADDITIONAL HARD PAVED AREA.
HB1 CL 58.50 IL 57.00
CP4 CL 58.50 IL 57.10
S2 CL 58.50 IL 57.40
F4 CL 58.50 IL 57.80
F3 CL 58.50 IL 57.80
F2 CL 58.50 IL 57.35
S5 CL 58.50 IL 57.30
S6 CL 58.50 IL 57.45
S7 CL 58.50 IL 57.60
S8 CL 58.50 IL 57.90
S3 CL 58.50 IL 57.90
F1 CL 58.50 IL 56.85
C2 CL 58.50 IL 56.80
C1 CL 58.79 IL 56.70
225Ø, 1:215
225Ø, 1:85
150Ø, 1:50
150Ø, 1:80
150Ø, 1:40
150Ø, 1:65
150Ø, 1:75
150Ø, 1:120
150Ø, 1:35
150Ø
AMENITY
INTERNAL FOUL WATER CHAMBERS LIKELY REQUIRED. LOCATIONS AND NUMBERS TO BE CONFIRMED DURING STAGE 4 DESIGN.
THAMES WATER SEWER SHOWN ON SEWER RECORDS. SEWER TO BE INVESTIGATED TO ENSURE IT ONLY TAKES FLOWS FROM THE DEVELOPMENT SITE.
IF NO OTHER FLOWS FOUND THEN SEWER TO BE DIVESTED AND REMOVED.
THAMES WATER PUBLIC SEWER LOCATED WITHIN FOOTWAY, NEW DEVELOPMENT WILL REQUIRE BUILD OVER / NEAR AGREEMENT WITH THAMES WATER.
Unit 1
Commercial
300m²
Unit 2
Commercial
Unit 3
Commercial
195m²
PLANT
RAT
RE4.1
RE5.1
RE7.1
Ex. 011C
Ex. 011B
Ex. 0101
CL 58.52
IL 56.79
305Ø
WILLOW WAY
LOADING BAY
DISABLED
NEW CONNECTION TO THE THAMES WATER COMBINED SEWER.
CONNECTION WILL REQUIRE A S106 AGREEMENT WITH THAMES WATER.



ROOF PLAN

NOTES

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND SPECIFICATIONS.
3. PUBLIC SEWER INFORMATION, AND STATUTORY SERVICE INFORMATION IF SHOWN IS BASED ON INFORMATION PROVIDED BY OR INTERPOLATED FROM PUBLIC SEWER AUTHORITY AND SERVICE PROVIDERS RECORDS. ALL INFORMATION RELATING TO SEWERS AND SERVICES TO BE VERIFIED ON SITE BY CONTRACTOR AND ENGINEER INFORMED IF INFORMATION DIFFERS FROM THAT SHOWN.
4. INVERT LEVELS OF EXISTING DRAINAGE AT PROPOSED OUTFALL TO BE VERIFIED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION OF ANY DRAINAGE AND FINDINGS REPORTED TO ENGINEER FOR REVIEW AND ACTION IF REQUIRED.
5. ALL WORK TO PUBLIC SEWER NETWORK, INCLUDING MATERIALS, CONNECTIONS TO EXISTING MANHOLES, NEW MANHOLES AND ARRANGEMENT OF PIPE JUNCTIONS WITHIN MANHOLES TO BE FULLY IN ACCORDANCE WITH CURRENT EDITION OF SEWERS FOR ADOPTION AND SEWER UNDERTAKERS REQUIREMENTS UNLESS NOTED OTHERWISE.

CDM REGULATIONS 2015 RESIDUAL HAZARDS

RESIDUAL HAZARDS IDENTIFIED

CONSTRUCTION

1. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.

FUTURE DEMOLITION

A. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.

THIS REGISTER IS A NON-EXHAUSTIVE LIST OF RESIDUAL HAZARDS RELATING TO THE WORKS SHOWN ON THIS DRAWING THAT HAVE BEEN IDENTIFIED DURING THE DESIGN STAGE.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A CONTRACTOR WITH THE APPROPRIATE SKILLS, KNOWLEDGE & EXPERIENCE, AND IF THEY ARE AN ORGANISATION, THE ORGANISATIONAL CAPABILITY NECESSARY TO FULFILL THE ROLE.

PRELIMINARY ISSUE

Mark	Date	By	Chkd	Revision notes
P01	16/12/22	MH	MH	PRELIMINARY ISSUE.

abstruct consulting
Structural & Civil Engineers
T: 01732 838050 E: info@abstruct-consult.com www.abstruct-consult.com

Job Title: WILLOW WAY, SYDENHAM.

Drawing Title: DRAINAGE LAYOUT.

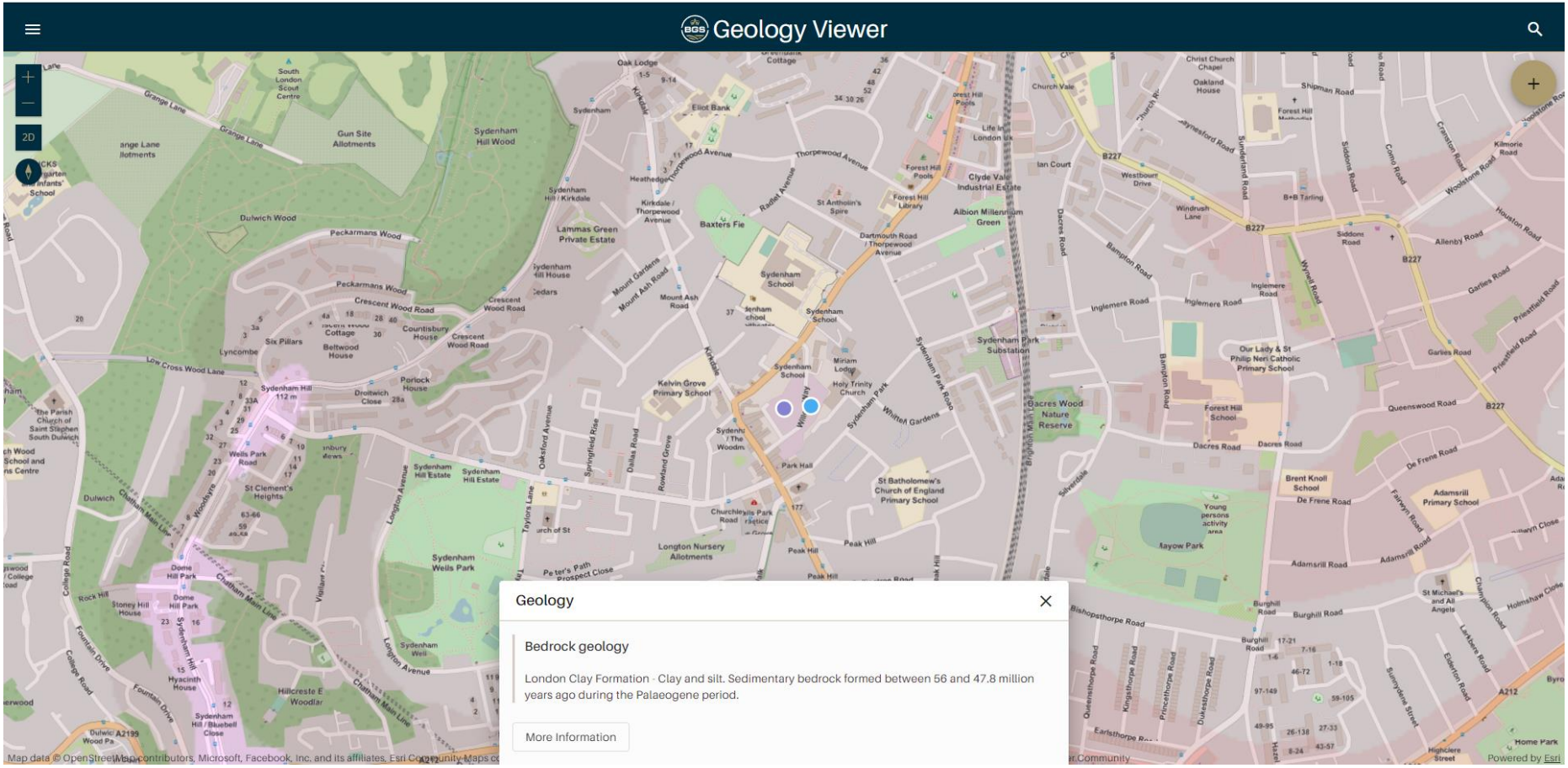
Client: KITEWOOD.

Abstruct Job No	Drawn	Checked
AC22260	MH	MH

Scale @ A1	Date	Date
1:200	DEC'22	DEC'22

File Name	Revision
AC22260-ABS-XX-XX-DR-C-5100	P01

Appendix F – British Geological Society Map Extract



Appendix G – Pre / Post Development Runoff Calculations

abstruct consulting Structural & Civil Engineers	File Name: AC22260-ABS-XX-XX-CA-C-5500	Project: Willow Way, Sydenham	Job No: AC22260
Title: Pre / Post Development Offsite Flows		By: MH	Date: 16/12/2022	Sheet No: 1 of 1

Pre Development Offsite Flows

Impermeable area = 2,239 m²

Micro Drainage Rainfall Profiles

1:1 year, 15 minute storm	32.012	$mmhr^{-1}$
1:30 year, 15 minute storm	78.580	$mmhr^{-1}$
1:100 year, 15 minute storm	102.102	$mmhr^{-1}$
1:100 year, 6 hour storm	10.026	$mmhr^{-1}$

Offsite Flow Rates

1:1 year, 15 minute storm	19.9	ls^{-1}
1:30 year, 15 minute storm	48.9	ls^{-1}
1:100 year, 15 minute storm	63.5	ls^{-1}

Offsite Flow Volume

1:100 year, 6 hour storm	134.7	m³

Greenfield Runoff Rates

IH 124 gives greenfield runoff rates for a 50ha site, guidance for sites smaller than this is to linearly interpolate down to the site size (1,818m² drained area), greenfield rates calculated using Micro Drainage.

	1 year		30 year		100 year	
IH 124 (50ha)	68.6	ls-1	182.9	ls-1	257.4	ls-1
Site Specific (1,818m²)	0.3	ls-1	0.7	ls-1	1.0	ls-1

Post Development Offsite Flows

Micro Drainage Model Results

Impermeable area = 1,895 m²

1:1 year event	1.9	ls^{-1}
1:30 year event	1.8	ls^{-1}
1:100 +40% allowance for c.c.	2.0	ls^{-1}

Offsite Flow Volume

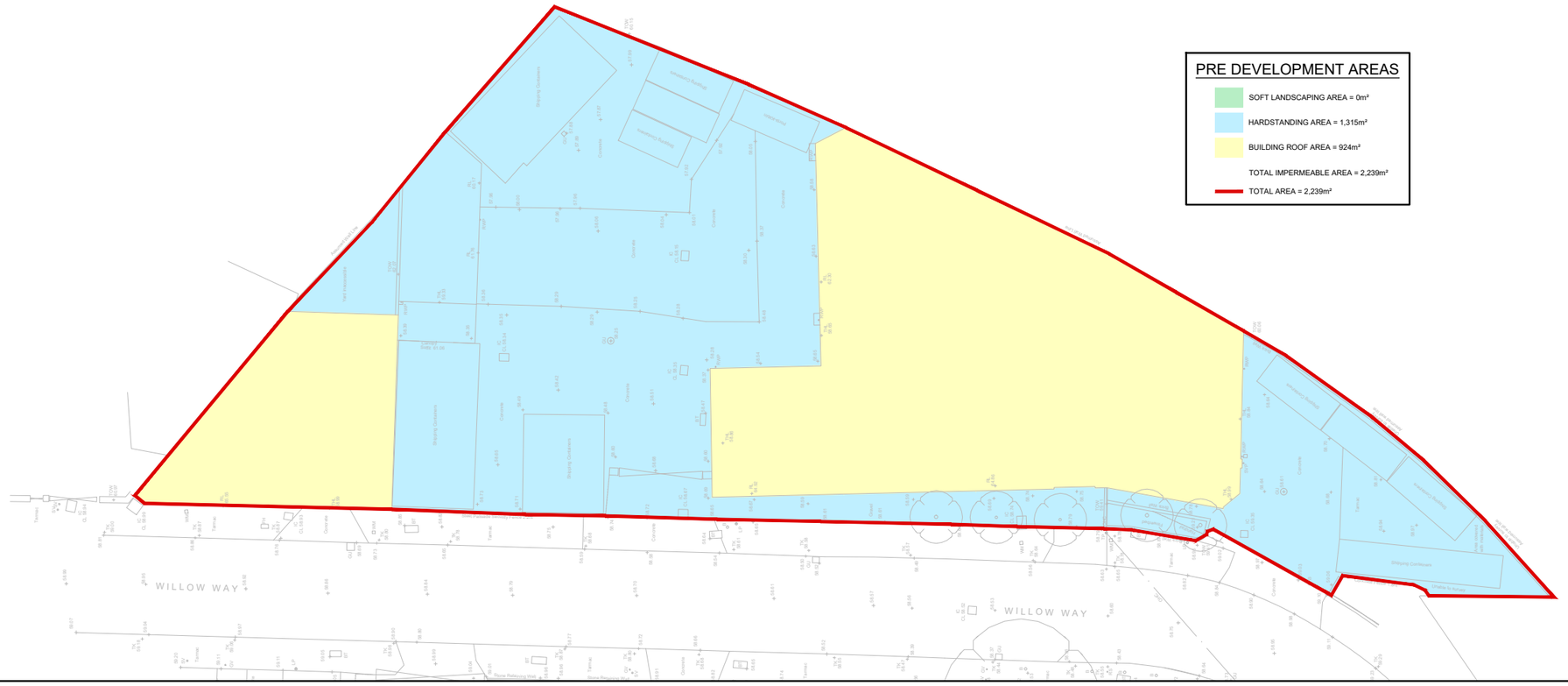
1:100 year, 6 hour storm +40%	159.6	m³

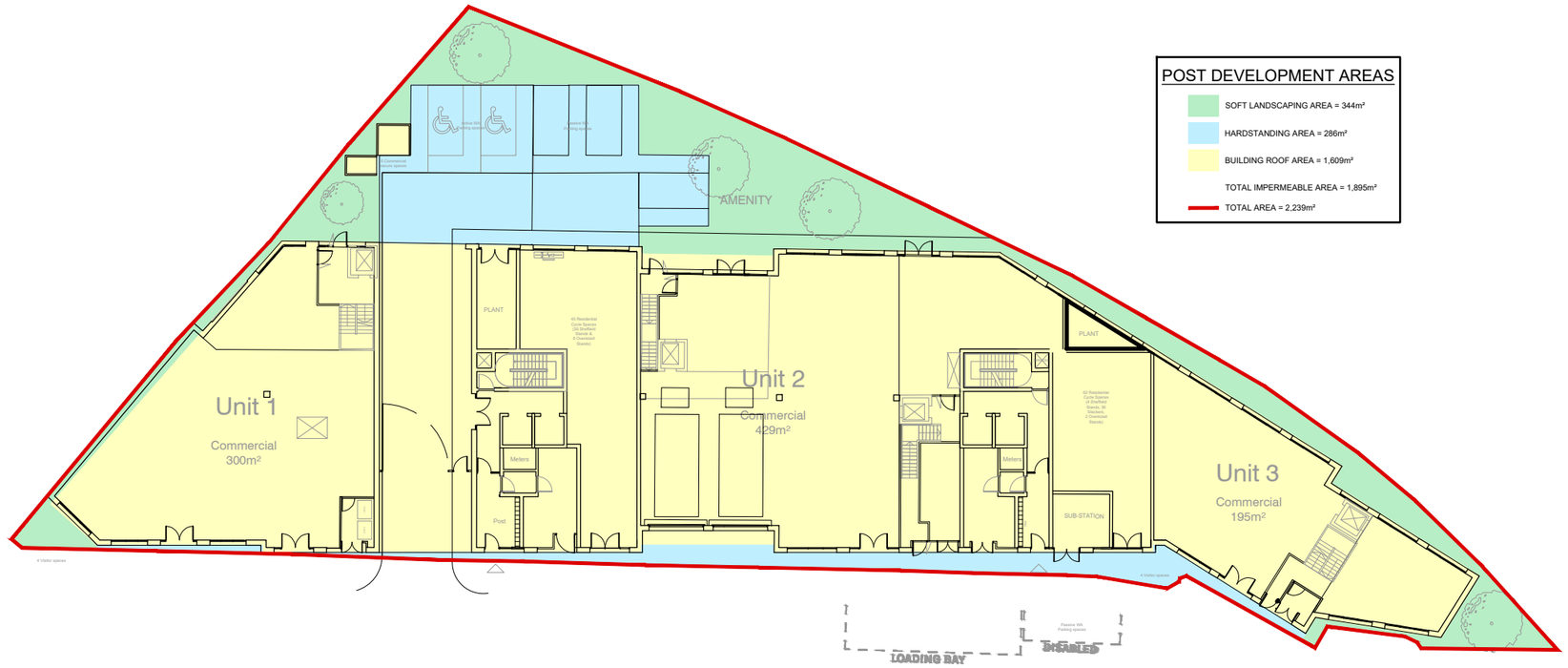
IH 124 Mean Annual Flood

Input

Return Period (years)	1	Soil	0.300
Area (ha)	50.000	Urban	0.000
SAAR (mm)	631	Region Number	Region 6

Results	**l/s**
QBAR Rural	80.7
QBAR Urban	80.7
Q1 year	68.6
Q1 year	68.6
Q2 years	71.1
Q5 years	103.3
Q10 years	130.7
Q20 years	161.7
Q25 years	173.4
Q30 years	182.9
Q50 years	211.4
Q100 years	257.4
Q200 years	302.6
Q250 years	317.2
Q1000 years	416.4





NOTES

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND SPECIFICATIONS.

PRELIMINARY ISSUE

Mark	Date	By	Chkd	Revision notes
P01	16/12/22	MH	MH	PRELIMINARY ISSUE.

abstruct consulting
Structural & Civil Engineers
T: 01732 838050 E: info@abstruct-consult.com www.abstruct-consult.com

Job Title
WILLOW WAY,
SYDENHAM.

Drawing Title
PRE / POST DEVELOPMENT MEASURED AREAS.

Client
KITEWOOD.

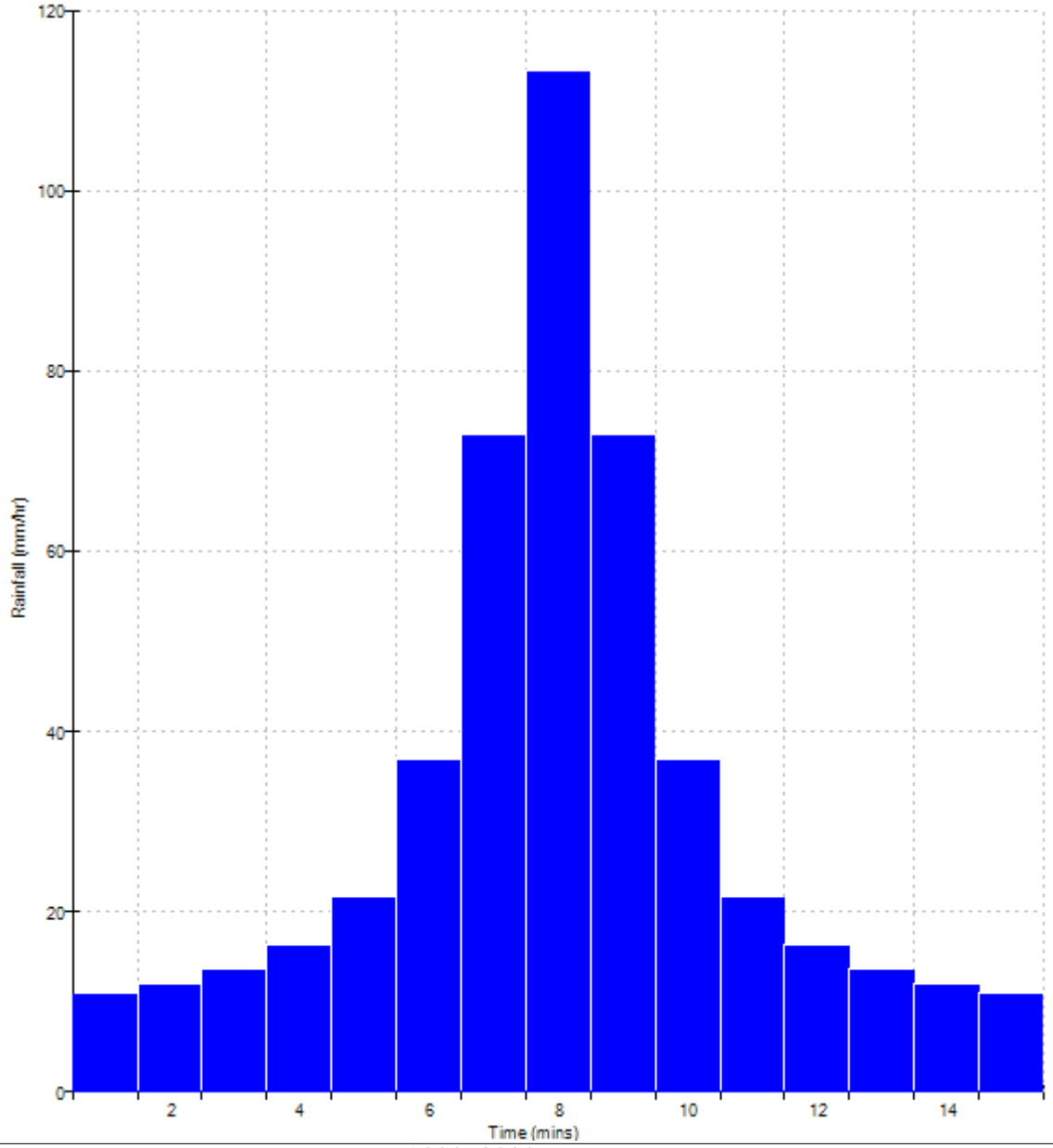
Abstruct Job No	Drawn	Checked
AC22260	MH	MH
Scale @ A1	Date	Date
1:200	DEC'22	DEC'22

File Name: AC22260-ABS-XX-XX-DR-C-5101
Revision: P01

Rainfall profile

Storm duration (mins) 15

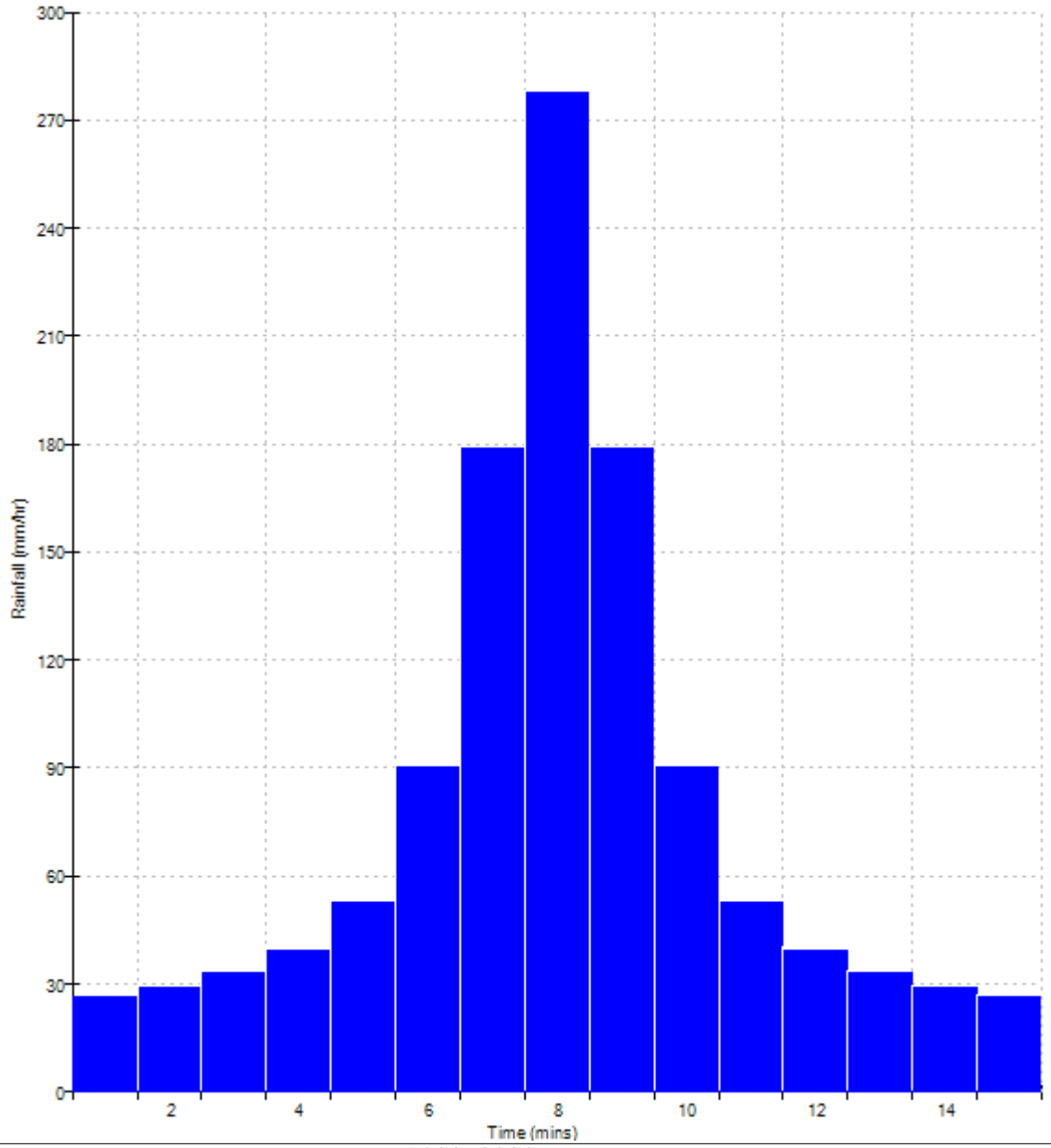
FSR Data	
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.441
Peak Intensity (mm/hr)	113.129
Ave. Intensity (mm/hr)	32.012
Return Period (years)	1.0



Rainfall profile

Storm duration (mins) 15

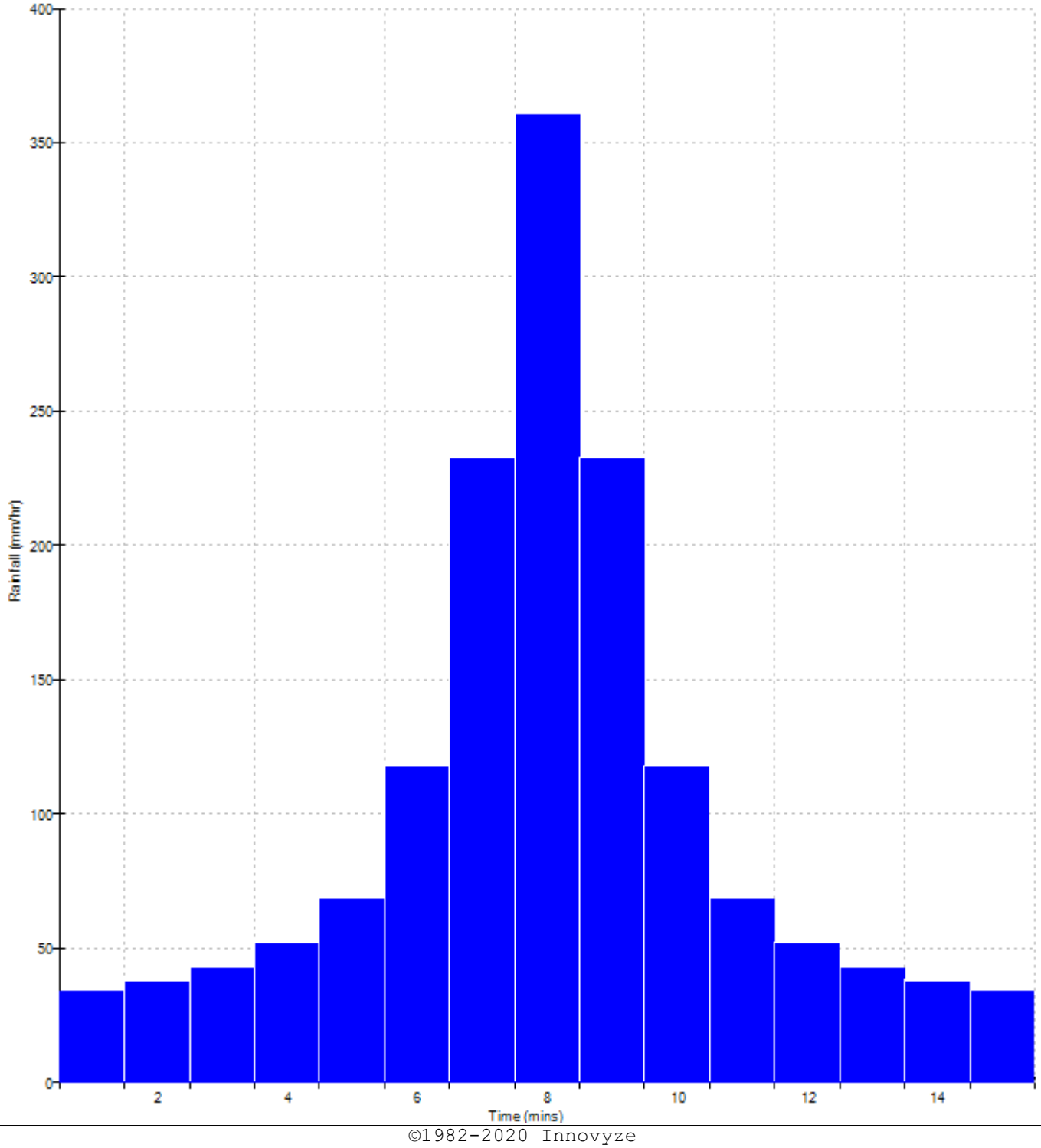
FSR Data	
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.441
Peak Intensity (mm/hr)	277.703
Ave. Intensity (mm/hr)	78.580
Return Period (years)	30.0



Rainfall profile

Storm duration (mins) 15

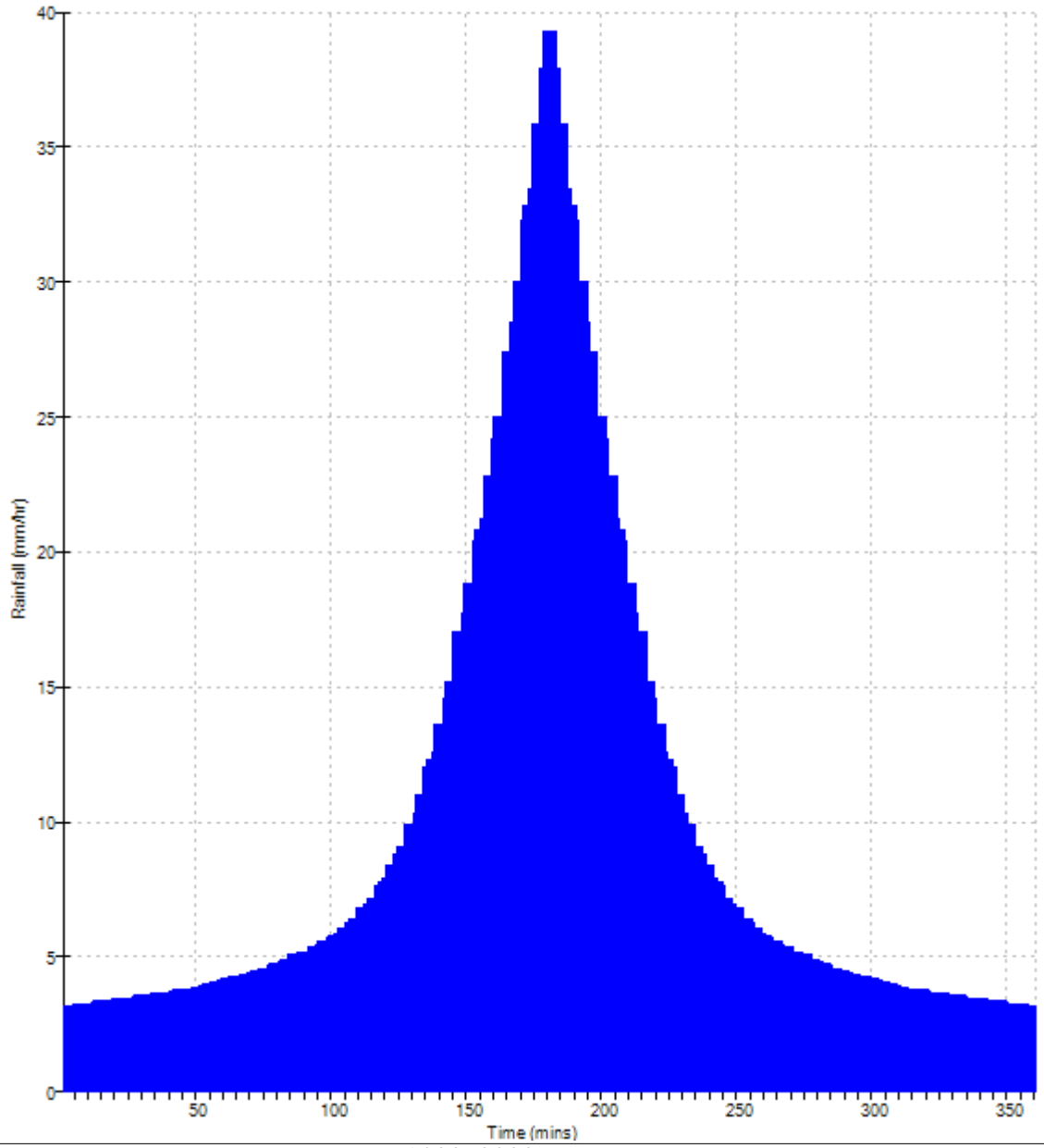
FSR Data	
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.441
Peak Intensity (mm/hr)	360.828
Ave. Intensity (mm/hr)	102.102
Return Period (years)	100.0



Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.441
Peak Intensity (mm/hr)	39.300
Ave. Intensity (mm/hr)	10.026
Return Period (years)	100.0



Appendix H – Surface Water Drainage Calculations

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.125	4-8	0.064

Total Area Contributing (ha) = 0.190

Total Pipe Volume (m^3) = 5.465

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
S1.000	18.840	0.250	75.4	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit
S2.000	14.214	0.175	81.2	0.011	5.00	0.0	0.600	o	150	Pipe/Conduit
S1.001	12.660	0.200	63.3	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit
S1.002	3.015	0.075	40.2	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit
S3.000	21.424	0.525	40.8	0.022	5.00	0.0	0.600	o	150	Pipe/Conduit
S1.003	16.656	0.200	83.3	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit
S4.000	25.107	0.725	34.6	0.024	5.00	0.0	0.600	o	150	Pipe/Conduit
S1.004	21.200	0.100	212.0	0.022	0.00	0.0	0.600	o	225	Pipe/Conduit
S5.000	24.408	0.500	48.8	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit
S5.001	9.953	0.200	49.8	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit
S1.005	23.606	0.200	118.0	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit
S6.000	34.413	0.450	76.5	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.000	57.900	0.013	0.0	1.16	20.5
S2.000	57.900	0.011	0.0	1.12	19.7
S1.001	57.650	0.035	0.0	1.27	22.4
S1.002	57.450	0.042	0.0	1.59	28.1
S3.000	57.900	0.022	0.0	1.58	27.9
S1.003	57.300	0.078	0.0	1.43	57.0
S4.000	57.900	0.024	0.0	1.72	30.3
S1.004	57.100	0.123	0.0	0.89	35.5
S5.000	57.900	0.027	0.0	1.44	25.5
S5.001	57.400	0.046	0.0	1.43	25.3
S1.005	57.000	0.190	0.0	0.92	16.3
S6.000	57.800	0.000	0.0	1.15	20.3

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
S7.000	7.230	0.150	48.2	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
S6.001	19.119	0.500	38.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
S6.002	2.121	0.050	42.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
S1.006	7.950	0.100	79.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S7.000	57.500	0.000	0.0	1.45	25.7
S6.001	57.350	0.000	0.0	1.63	28.9
S6.002	56.850	0.000	0.0	1.55	27.4
S1.006	56.800	0.190	0.0	1.13	19.9

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.013	0.013	0.013
2.000	User	-	100	0.011	0.011	0.011
1.001	User	-	100	0.012	0.012	0.012
1.002	User	-	100	0.006	0.006	0.006
3.000	User	-	100	0.022	0.022	0.022
1.003	User	-	100	0.014	0.014	0.014
4.000	User	-	100	0.024	0.024	0.024
1.004	User	-	100	0.022	0.022	0.022
5.000	User	-	100	0.027	0.027	0.027
5.001	User	-	100	0.019	0.019	0.019
1.005	User	-	100	0.021	0.021	0.021
6.000	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.000	0.000	0.000
6.001	-	-	100	0.000	0.000	0.000
6.002	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.190	0.190	0.190

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.006	Sewer	58.000	56.700	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.441		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: HB1, DS/PN: S1.005, Volume (m³): 2.7

Unit Reference	MD-SHE-0070-2000-0800-2000
Design Head (m)	0.800
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	70
Invert Level (m)	57.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	2.0
Flush-Flo™	0.240	2.0
Kick-Flo®	0.504	1.6
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	1.200	2.4	3.000	3.7	7.000	5.5
0.200	2.0	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.0	1.600	2.7	4.000	4.2	8.000	5.8
0.400	1.9	1.800	2.9	4.500	4.4	8.500	6.0
0.500	1.6	2.000	3.0	5.000	4.7	9.000	6.2
0.600	1.8	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.3		

Storage Structures for Storm

Cellular Storage Manhole: HB1, DS/PN: S1.005

Invert Level (m) 57.050 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	132.4	0.0	0.751	0.0	0.0
0.750	132.4	0.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S8	15 Winter	1	+0%	100/15 Summer				57.931
S2.000	RE7.1	15 Winter	1	+0%	100/15 Summer				57.929
S1.001	S7	15 Winter	1	+0%	100/15 Summer				57.699
S1.002	S6	15 Winter	1	+0%	100/15 Summer				57.509
S3.000	RE5.1	15 Winter	1	+0%					57.935
S1.003	S5	15 Winter	1	+0%	100/15 Summer				57.369
S4.000	RE4.1	15 Winter	1	+0%					57.934
S1.004	CP4	15 Winter	1	+0%	30/15 Summer				57.214
S5.000	S3	15 Winter	1	+0%					57.940
S5.001	S2	15 Winter	1	+0%	100/15 Summer				57.454
S1.005	HB1	60 Winter	1	+0%	1/30 Winter				57.163
S6.000	F4	15 Summer	1	+0%					57.800
S7.000	F3	15 Summer	1	+0%					57.500
S6.001	F2	15 Summer	1	+0%					57.350
S6.002	F1	15 Summer	1	+0%					56.850

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S8	-0.119	0.000	0.09			1.8	OK	
S2.000	RE7.1	-0.121	0.000	0.08			1.5	OK	
S1.001	S7	-0.101	0.000	0.23			4.7	OK	
S1.002	S6	-0.091	0.000	0.32			5.6	OK	
S3.000	RE5.1	-0.115	0.000	0.12			3.2	OK	
S1.003	S5	-0.156	0.000	0.20			10.4	OK	
S4.000	RE4.1	-0.116	0.000	0.12			3.4	OK	
S1.004	CP4	-0.111	0.000	0.50			16.3	OK	
S5.000	S3	-0.110	0.000	0.16			3.9	OK	
S5.001	S2	-0.096	0.000	0.27			6.1	OK	
S1.005	HB1	0.013	0.000	0.13			1.9	SURCHARGED	
S6.000	F4	-0.150	0.000	0.00			0.0	OK	
S7.000	F3	-0.150	0.000	0.00			0.0	OK	
S6.001	F2	-0.150	0.000	0.00			0.0	OK	
S6.002	F1	-0.150	0.000	0.00			0.0	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.006	C1	60 Winter	1	+0%					56.833

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.006	C1	-0.117	0.000	0.11			1.9	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S8	15 Winter	30	+0%	100/15 Summer				57.949
S2.000	RE7.1	15 Winter	30	+0%	100/15 Summer				57.946
S1.001	S7	15 Winter	30	+0%	100/15 Summer				57.736
S1.002	S6	15 Winter	30	+0%	100/15 Summer				57.560
S3.000	RE5.1	15 Winter	30	+0%					57.956
S1.003	S5	15 Winter	30	+0%	100/15 Summer				57.451
S4.000	RE4.1	15 Winter	30	+0%					57.955
S1.004	CP4	180 Winter	30	+0%	30/15 Summer				57.404
S5.000	S3	15 Winter	30	+0%					57.966
S5.001	S2	15 Winter	30	+0%	100/15 Summer				57.497
S1.005	HB1	180 Winter	30	+0%	1/30 Winter				57.401
S6.000	F4	15 Summer	30	+0%					57.800
S7.000	F3	15 Summer	30	+0%					57.500
S6.001	F2	15 Summer	30	+0%					57.350
S6.002	F1	15 Summer	30	+0%					56.850

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S8	-0.101	0.000	0.23			4.4	OK	
S2.000	RE7.1	-0.104	0.000	0.21			3.8	OK	
S1.001	S7	-0.064	0.000	0.62			12.6	OK	
S1.002	S6	-0.040	0.000	0.87			14.9	OK	
S3.000	RE5.1	-0.094	0.000	0.30			7.9	OK	
S1.003	S5	-0.074	0.000	0.54			27.3	OK	
S4.000	RE4.1	-0.095	0.000	0.29			8.3	OK	
S1.004	CP4	0.079	0.000	0.29			9.3	SURCHARGED	
S5.000	S3	-0.084	0.000	0.39			9.5	OK	
S5.001	S2	-0.053	0.000	0.74			16.5	OK	
S1.005	HB1	0.251	0.000	0.13			2.0	SURCHARGED	
S6.000	F4	-0.150	0.000	0.00			0.0	OK	
S7.000	F3	-0.150	0.000	0.00			0.0	OK	
S6.001	F2	-0.150	0.000	0.00			0.0	OK	
S6.002	F1	-0.150	0.000	0.00			0.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.006	C1	960 Summer	30	+0%					56.834

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.006	C1	-0.116	0.000	0.11			2.0	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S8	15 Winter	100	+40%	100/15 Summer				58.222
S2.000	RE7.1	15 Winter	100	+40%	100/15 Summer				58.213
S1.001	S7	15 Winter	100	+40%	100/15 Summer				58.189
S1.002	S6	15 Winter	100	+40%	100/15 Summer				58.001
S3.000	RE5.1	15 Winter	100	+40%					57.992
S1.003	S5	15 Winter	100	+40%	100/15 Summer				57.866
S4.000	RE4.1	15 Winter	100	+40%					57.978
S1.004	CP4	240 Winter	100	+40%	30/15 Summer				57.796
S5.000	S3	15 Winter	100	+40%					57.995
S5.001	S2	240 Winter	100	+40%	100/15 Summer				57.794
S1.005	HB1	240 Winter	100	+40%	1/30 Winter				57.793
S6.000	F4	15 Summer	100	+40%					57.800
S7.000	F3	15 Summer	100	+40%					57.500
S6.001	F2	15 Summer	100	+40%					57.350
S6.002	F1	15 Summer	100	+40%					56.850

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S8	0.172	0.000	0.38			7.3	FLOOD RISK	
S2.000	RE7.1	0.163	0.000	0.35			6.3	FLOOD RISK	
S1.001	S7	0.389	0.000	0.94			19.2	SURCHARGED	
S1.002	S6	0.401	0.000	1.30			22.4	SURCHARGED	
S3.000	RE5.1	-0.058	0.000	0.55			14.4	OK	
S1.003	S5	0.341	0.000	0.83			42.1	SURCHARGED	
S4.000	RE4.1	-0.072	0.000	0.52			15.1	OK	
S1.004	CP4	0.471	0.000	0.41			13.3	SURCHARGED	
S5.000	S3	-0.055	0.000	0.71			17.3	OK	
S5.001	S2	0.244	0.000	0.23			5.3	SURCHARGED	
S1.005	HB1	0.643	0.000	0.13			2.0	SURCHARGED	
S6.000	F4	-0.150	0.000	0.00			0.0	OK	
S7.000	F3	-0.150	0.000	0.00			0.0	OK	
S6.001	F2	-0.150	0.000	0.00			0.0	OK	
S6.002	F1	-0.150	0.000	0.00			0.0	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.006	C1	240 Winter	100	+40%					56.834

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.006	C1	-0.116	0.000	0.12			2.0	OK	