



Richard Jackson
Engineering Consultants

FLOOD RISK & SUDS ASSESSMENT

Land off St Georges Avenue, Havant

Barratt David Wilson Homes

June 2021

Project no: 61195

Document Review Sheet: -

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Date: - 25 / 06 / 2021

Document Status

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FINAL

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Revision Status

Issue	Date	Description	Prepared	Checked	Approved
A	27/09/21	Revised drainage strategy	JE	MG	MG
B	15/03/22	Strategy revised to suit new site plan	DCH	KRT	KRT

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Title: SUSTAINABLE DRAINAGE SYSTEM ASSESSMENT
 Project: Land off St Georges Avenue, Havant
 Client: Barratt David Wilson Homes
 Project No.: 61195

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1. Introduction
 - 1.1. Richard Jackson Ltd has been appointed by Barratt David Wilson Homes to undertake a Flood Risk and Strategic SuDS Assessment for a residential development proposal for land off St Georges Avenue, Havant.
 - 1.2. This assessment will follow the SuDS guidance provided by the Lead Local Flood Authority (LLFA), Hampshire County Council (HCC), and will also follow the guidance published as part of the National Planning Practice Guidance (NPPG).
2. Development Site and Location
 - 2.1. The site is located to the northeast of Warblington and northwest of Emsworth and is currently greenfield land. The north of the site is greenfield land, to the west a residential area (Castle Ave and St George's Ave) and to the south and east the site is bound by the A27. The site is approximately 5.12ha in area and a site location plan can be found in Appendix A. The grid reference for the site is SU 73200 06353 and the post code is PO9 2SA.
 - 2.2. The flood map for planning, which can be seen in Appendix B, shows the entirety of the site is located in flood zone 1.
 - 2.3. The site surface has an undulating profile with a general fall in a south easterly direction, with the southwestern corner also falling away to the west. The levels across the site are in the approximate range of 11.85m AOD in the northwest, 10.46m AOD towards the south-central area and 10.59m AOD in the southwest corner, the topographical survey can be found in Appendix C. The survey also indicates that there is an existing watercourse running along the southeastern boundary of the site, draining from the northeast to the south west.
3. Development Proposals
 - 3.1. It is proposed to develop the site into a residential development with associated access highways and amenities. The proposed development layout can be seen in Appendix D.
 - 3.2. The proposed residential use at the site is defined by the NPPG to be more vulnerable to flood risk. The development has been considered to have a 100 year life for the purposes of this assessment.
4. Sequential Test
 - 4.1. As the development site is completely located in flood zone 1, the sequential test does not apply.
5. Climate Change
 - 5.1. The NPPG defines climate change allowances that should be considered for various development proposals across the nation. For this proposed use at this site (more vulnerable) the NPPG advises states the central / upper bound of climate change, over a 100 year design life period this should be considered as set out below.

Rainfall uplift 40%

6. Site Specific Flood Risk
Ground Water Flooding

- 6.1. The British Geological Survey (BGS) data suggests the predominant underlying geology comprises of London Clay, (clay, silt and sand) creating an impermeable barrier preventing groundwater rising to the surface, reducing the risk of groundwater flooding and therefore a low risk.
- 6.2. Groundwater monitoring has been undertaken at the site which shows the ground water level recorded at various locations across the site periodically over 14 months. The data shows that the groundwater level varies across the site with depths shown to be in the range of 0.33m (BH5) to 3m (BH3) below ground level, see Appendix I. This data shows that groundwater flooding is a low risk however groundwater emergence is unlikely.

Surface Water Flooding (Appendix E1)

- 6.3. The Gov.UK mapping provides depth and velocity mapping for three scenarios, this mapping can be seen in Appendix E1.
- 6.4. The site is not shown to be at risk of surface water flooding during the high risk scenario (1 in 30 year), however a small strip of surface water is shown along the southern boundary at the low point of the site.
- 6.5. The medium risk scenario (1 in 100 year) shows a worsening of that mentioned above, however a small patch now spilling into the site with depths shown to be below 300mm.
- 6.6. The low risk scenario (1 in 1000 year) again shows a worsening of that mentioned above, with depths shown to be between 0-900mm.
- 6.7. This mapping shows that currently the site is not at significant risk from surface water flooding. It is possible that the mapping shows surface water pooling at a topographical low point, the mapping shows no evidence that the existing ditch, which would convey the shown surface water flooding away from the low point of the site, has been included in the model used to generate the Gov.UK mapping. The topographical survey (Appendix C) shows that the existing watercourse is a reasonable size and continues with a steady fall, a consistent profile and free of obstructions, therefore it is unlikely the flooding shown in the mapping would in reality occur.

Tidal/Fluvial Flood Risk (Appendix E2)

- 6.8. The flood map for planning shows that the site is located in flood zone 1. The Gov.UK mapping also shows the site is in flood zone 1 and not at risk of fluvial / tidal sources of flooding.

Reservoir and Artificial Flooding (Appendix E3)

- 6.9. The Gov.UK flood mapping shows that flooding from a reservoir failure will not reach the boundary of this site.

- 6.10. It is possible that there will be foul water sewers and water mains serving the nearby residential development to the west, which may be a further source of flooding.
7. Surface Water Management
- 7.1. When developing a strategy to manage surface water flows the SuDS hierarchy dictates that draining the site via infiltration methods (where suitable ground conditions allow and ability to provide the necessary pollution treatment), before exploring other options.
- 7.2. The BGS records indicate the site is underlain by London Clay which indicates the geology at the site is not suited to infiltration, recent ground investigations including soakage testing show that there is some infiltration potential at the site, see Appendix J, circa 1×10^{-6} m/s. However, when taking into account the recorded groundwater levels as discussed in section 6 infiltration cannot be relied upon as a sole means of surface water discharge.
- 7.3. It is proposed to pump surface water flows from the development to the nearest surface water sewer into Southern Water MH0450, located to the northwest of the site. There is an existing watercourse which borders the southeast boundary of the site, however this is a highways authority asset which this development is not at liberty to utilise. It is proposed to discharge surface water to the surface water sewer as compliance with the surface water hierarchy using infiltration as evidenced below:
- Infiltration is not possible at this site as the British Geological Society Mapping indicate the soil is predominantly clay and the ground water monitoring indicates a high ground water level.
 - The only feasible watercourse within reach of the proposed development is a highways asset which is not available for discharge.
- 7.4. The level of discharge from the site needs to be reduced to meet the requirements of the LLFA and local flood planning guidance. As the proposed site is greenfield and has an area of approximately 5.12ha. The 1 in 1 year greenfield run off is calculated to be 8.45 l/s as per the UKSuDS online tool. The greenfield run-off calculation can be seen in Appendix F.
- 7.5. Therefore, it is proposed to pump the surface water discharge from the site at 8.45 l/s and provide storage on site to accommodate this.
- 7.6. The total roof area at the site is approximately 0.969ha, which increases to 1.066ha with 10% for urban creep added. The adoptable highway at the site has an area of approximately 0.805ha and car parking and shared surface at the site is approximately 0.892ha resulting in an approximate total impermeable area of 2.763ha, including urban creep.
- 7.7. It is proposed to surface the private drives and shared paved areas of the site with permeable paving which will provide storage and treatment, this will then discharge into surface water sewers and detention basin. The surface water will then pass through a vortex flow control device restricted to 8.45 l/s and into the pumping station which will discharge to the existing surface water sewer. It is proposed to leave the permeable paving un-lined

to utilise any infiltration potential, however due to the nature of the site infiltration will not be included in the hydraulic calculations to provide a conservative approach.

- 7.8. The size of the tank sewers, storage crates and permeable paved areas across the site are proposed to store all flows up to the 1 in 100 year plus 40% climate change is:

- 904m of 900mm tank sewer
- Storage Crates: 675m² to a depth of 0.40m
- Storage Crates: 1125m² to a depth of 0.80m
- Permeable Paving: 8785m² with a minimum sub-base depth of 380mm.

- 7.9. These can be accommodated within the green spaces and beneath shared paved areas, as indicated in Appendix G.

- 7.10. The drainage design has been assessed for the 1 in 1, 1 in 30 and 1 in 100 year storm event including climate change at 40% and these calculations are in Appendix G. The calculations show that the water for the 1 in 100 year storm with 40% climate change can be contained within the designed system. The surface of the site will be graded in such a way as to divert extreme event flows away from the dwellings, into the highway channels and landscaped areas with no constraints or obstructions preventing extreme flows from reaching the existing watercourse.

- 7.11. For the development proposed, the land-owners will be responsible for the permeable paving within private driveways and a maintenance company will be responsible for the shared areas. The surface water system will be offered for adoption by Southern Water. A schedule for the maintenance can be seen in Appendix H.

Surface Water Quality

- 7.12. This development includes residential roofs and medium traffic roads which are defined by table 26.2 of the CIRIA SuDS manual as being low and medium pollution hazards respectively, the medium pollution hazard requiring treatment indices of:

TSS:	0.7
Metals:	0.6
Hydrocarbons:	0.7

- 7.13. The surface water run-off from the adoptable highway surfaces (worst case pollution hazard) will discharge directly into the surface water system which will then be conveyed to the detention basin, passing through a proprietary treatment device prior to discharge off site which will act as a SuDS treatment. The mitigation indices for the proprietary treatment device, such as an Aqua Filter™ are:

TSS:	0.8
Metals:	0.8
Hydrocarbons:	0.7

- 7.14. The surface water run-off from the roof area, private drives and shared surfaces will discharge direct into the permeable paving before entering the surface water system and into the detention basin, passing through a proprietary treatment device prior to discharge off site, this will act as a SuDS treatment train, where the second treatment is divided by 2 (as per the CIRIA SuDS Manual). The mitigation indices for this treatment train are:

TSS:	$0.7 + 0.25 = 0.95$
Metals:	$0.6 + 0.25 = 0.85$
Hydrocarbons:	$0.7 + 0.30 = 1.00$

- 7.15. When compared against Table 26.3 of the SuDS Manual, the proposed treatment of SuDS features would exceed the required pollution control before leaving the site, thus satisfying the criteria as set out in the CIRIA SUDS Manual.

Foul Water

- 7.16. It is proposed to collect foul flows on site and gravitate to the southwest and then pump north into a new manhole on site that will connect via gravity to the existing manhole within the adjacent Persimmon homes development. There is a small proportion of site that will discharge directly to the gravity sewer noted, avoiding the requirement for pumping for approximately 25 units. This network then discharges to the existing Southern Water foul sewer at MH0400 located to the northwest of the site. This will have to be undertaken in agreement with Southern Water.

- 7.17. The proposed connection and pump rate will have to be confirmed with Southern Water during a Pre-Planning Assessment, it is proposed to pump flows at 5 l/s. The pumping station will require storage to contain 24hrs of foul flow in the event of a pump failure to comply with building regulations. This has been calculated (see Appendix K) to be a volume of 94m³. It is proposed to provide the storage within a below ground storage tank.

- 7.18. Ground levels in areas of the site will need to be raised to accommodate the required fall / pipe cover for both the foul and surface water sewer networks, in order to provide a gravity connection. Indicative cover level estimates can be seen on drawing 61195-PP-001 in Appendix G.

8. Occupant and End Users of the Development

- 8.1. In line with good practice all the proposed buildings will have their floor levels and thresholds designed to ensure that any water flowing overland past the building cannot enter. The occupants and users of the development should therefore not be hindered from accessing or egressing the buildings in a design rainfall event. The site layout and surface water drainage system will be designed to cope with events up to the 1.0% Annual Probability event plus 40% climate change and will be safely stored without adverse impacts on or off site.

9. Exception Test

- 9.1. The exception test is not relevant to these proposals, as this application is for development in flood zone 1.

10. Residual Risks

10.1. The residual risk is usually taken to refer to the portion of overall risk that remains once risk mitigation measures have been implemented.

10.2. The residual risks at this site include:-

- Water main or sewer failure;
- Extreme rainfall events that could exceed the capacity of the drainage system;

Appendices

Appendix A

Site Location Plan

Appendix B

Flood Map for Planning

Flood map for planning

Your reference
Warblington

Location (easting/northing)
473176/106302

Created
21 May 2021 8:50

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

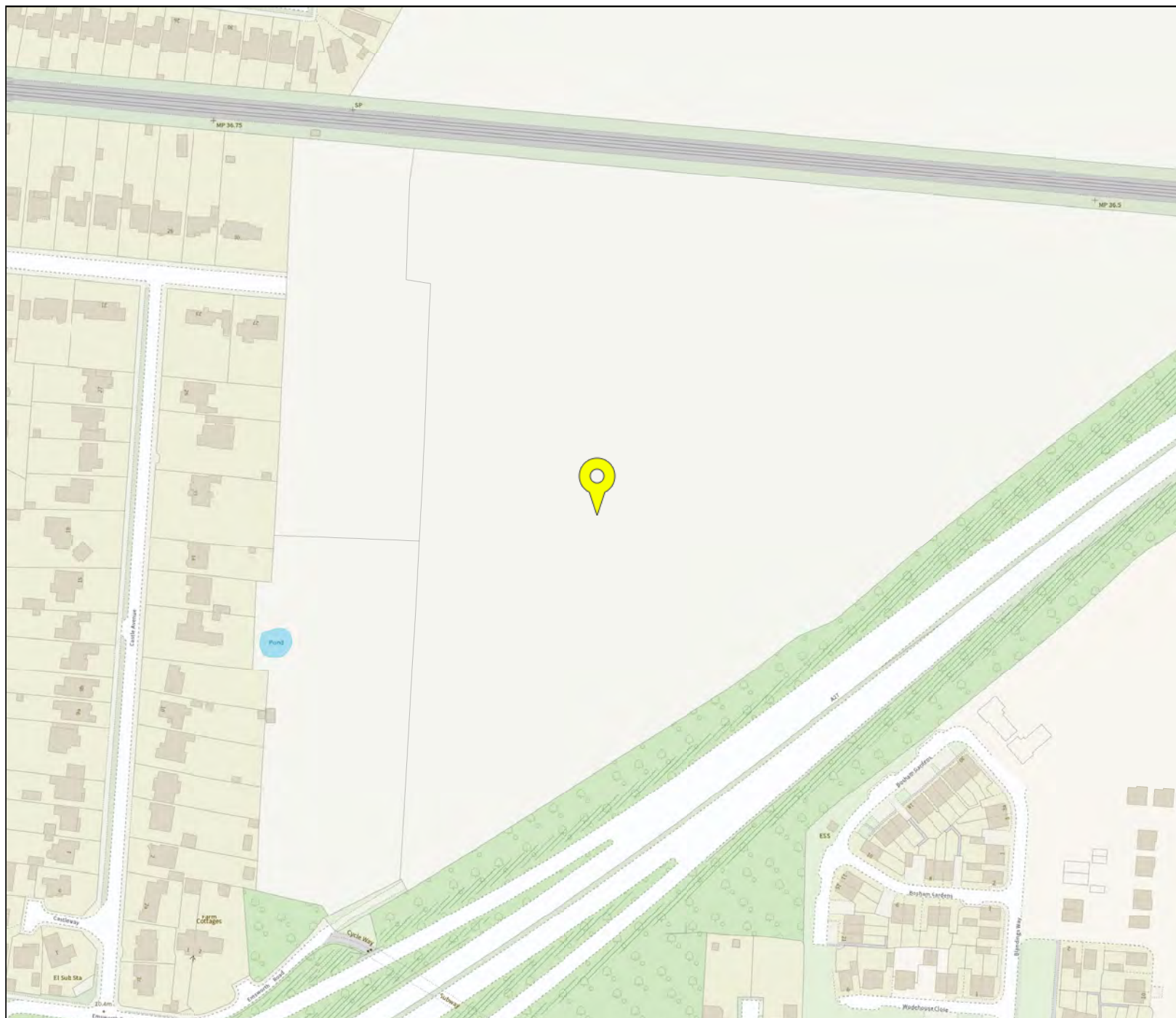
Flood map for planning

Your reference
Warblington

Location (easting/northing)
473176/106302

Scale
1:2500

Created
21 May 2021 8:50



-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

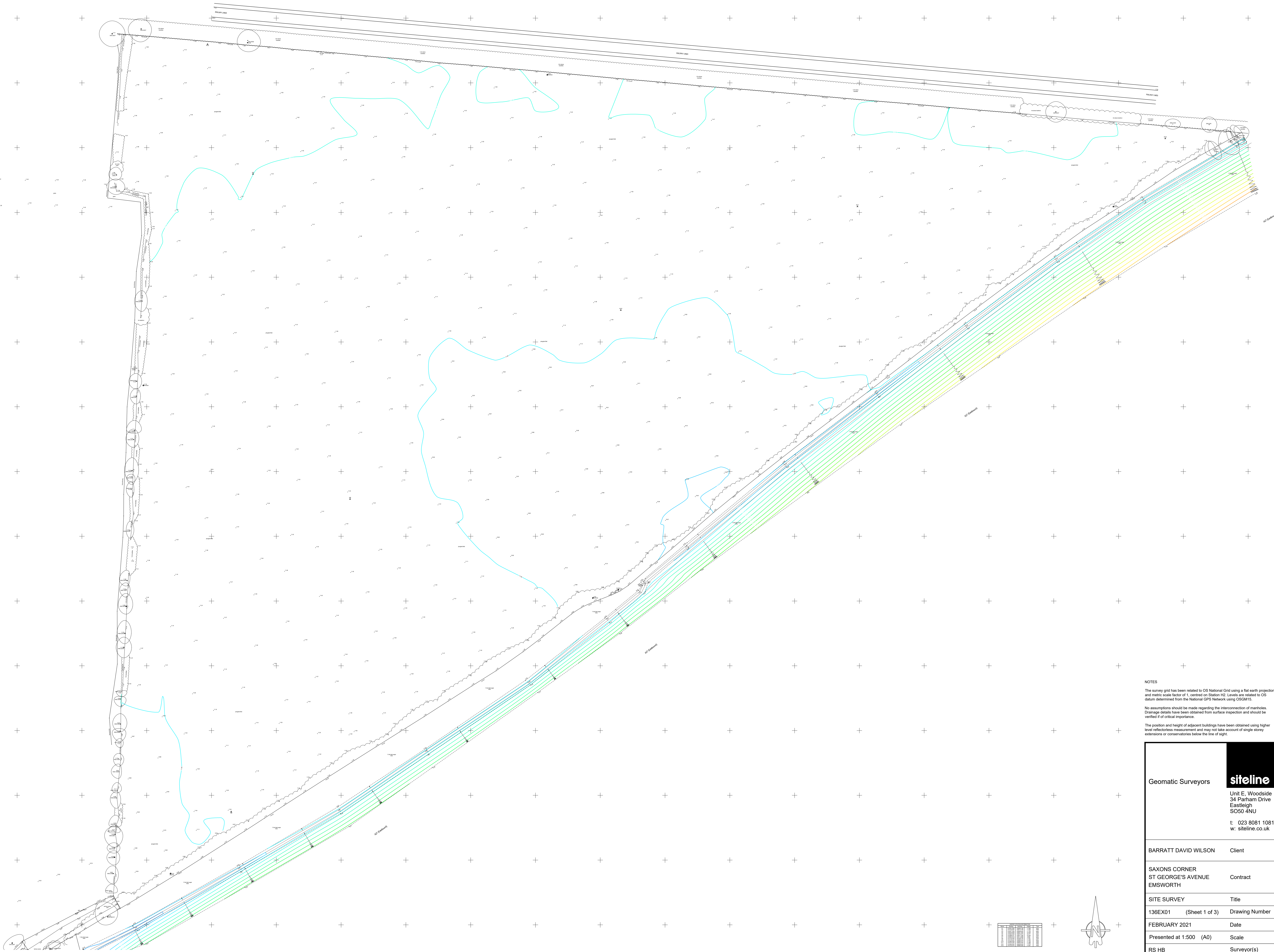
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Appendix C

Topographical Survey

TREES		ABBREVIATIONS		FENCES	
A	Ash	BT	British Telecom	BWF	Barbed Wire Fence
AL	Alder	BOL	Bollard	CBF	Closed Board Fence
AP	Apple	CB	Control Box	CP	Concrete Post
B	Beech	CL	Cover Level	CPF	Chestnut Felling Fence
CB	Copper Beech	CTV	Cable Television	CWF	Chicken Wire Fence
CH	Cherry	E	Electric	IRF	Iron Railing Fence
CY	Cypress	EP	Electricity Pole	PKF	Picket Fence
D	Deer	FH	Fire Hydrant	PRF	Post & Rail Fence
E	Elder	GSV	Gas Stop Valve	PMF	Post & Wire Fence
EU	Eucalyptus	H	Height	SCF	Security Fence
F	Fruit	HVC	High Voltage Cable	SP	Steel Post
FM	Field Maple	IC	Inspection Cover	WMF	Wire Mesh Fence
FR	Hazel	IL	Invert Level	WFF	Wood Panel Fence
HC	Horse Chestnut	LP	Lamp Post		
HO	Horn Oak	MH	Man-Hole		
HW	Hawthorn	MKR	Marker		
HY	Holly	MW	Monitoring Well		
JM	Japanese Maple	O/H	Overhead		
LB	Laburnum	OB	Overhead		
LM	Lime	PC	Pram Crossing		
LO	Locust Tree	RNP	Road Name Plate		
LR	Laurel	RS	Road Sign		
MA	Maple	SA	Skewaway		
MG	Magnolia	SV	Stop Valve (Unidentified)		
MO	Oak	TS	Telephone Box		
PL	Pine	TC	Telecom		
PM	Plane	TH	Trial Hole		
PP	Poplar	TL	Traffic Light		
PR	Pissardin Plum	UTL	Telegraph Pole		
R	Rose	VR	Vent pipe		
RD	Redwood	WM	Water Meter		
RO	Red Oak	WSV	Water Stop Valve		
RS	Rhododendron				
SC	Silver Birch				
SE	Sweet Chestnut				
SP	Scots Pine				
SY	Spruce				
UN	Unidentified				
W	Willow				
WN	Walnut				
Y	Yew				

Species / Dia / Spread (max) / Ht
e.g. OK / 0.6 / 8 / 15



NOTES

The survey grid has been related to OS National Grid using a flat earth projection and metric scale factor of 1, centred on Station 12. Levels are related to OS datum determined from the National GPS Network using OSDM15.

No assumptions should be made regarding the interconnection of manholes. Drainage details have been obtained from surface inspection and should be verified if of critical importance.

The position and height of adjacent buildings have been obtained using higher level reflectorless measurement and may not take account of single storey extensions or conservatories below the line of sight.

Geomatic Surveyors

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BARRATT DAVID WILSON	Client
SAXONS CORNER ST GEORGE'S AVENUE EMSWORTH	Contract
SITE SURVEY	Title
136EX01 (Sheet 1 of 3)	Drawing Number
FEBRUARY 2021	Date
Presented at 1:500 (A0)	Scale
RS HB	Surveyor(s)

TREES

A Ash
AL Alder
AP Apple
B Beech
CB Cedar
CH Cherry
CY Cypress
EL Electric
EP Electricity Pole
FH Fire Hydrant
G Gas Stop Valve
H Height
HVC High Voltage Cable
IC Inspection Cover
IL Invert Level
JM Japanese Maple
LB Laburnum
LM Lime
LO Locust Tree
M Maple
MG Magnolia
OK Oak
P Palm
PL Plane
PM Plum
PO Poplar
PP Pissardii Plum
PR Pear
R Redwood
RD Red Oak
RH Rhododendron
RO Rowan
SB Silver Birch
SC Sweet Chestnut
S Scots Pine
SU Spruce
SY Sycamore
U Unidentified
W Willow
WN Walnut
Y Yew

Species / Dia / Spread (max) / Ht
e.g. OK / 0.6 / 8 / 15

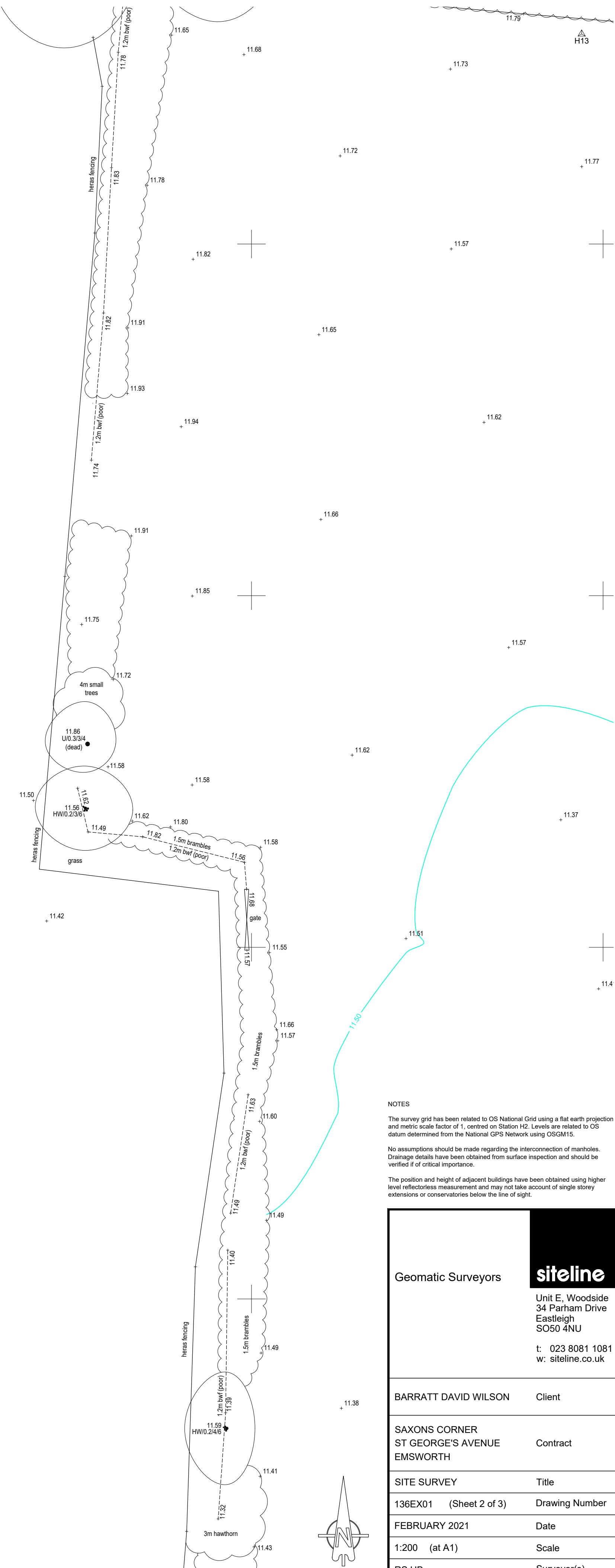
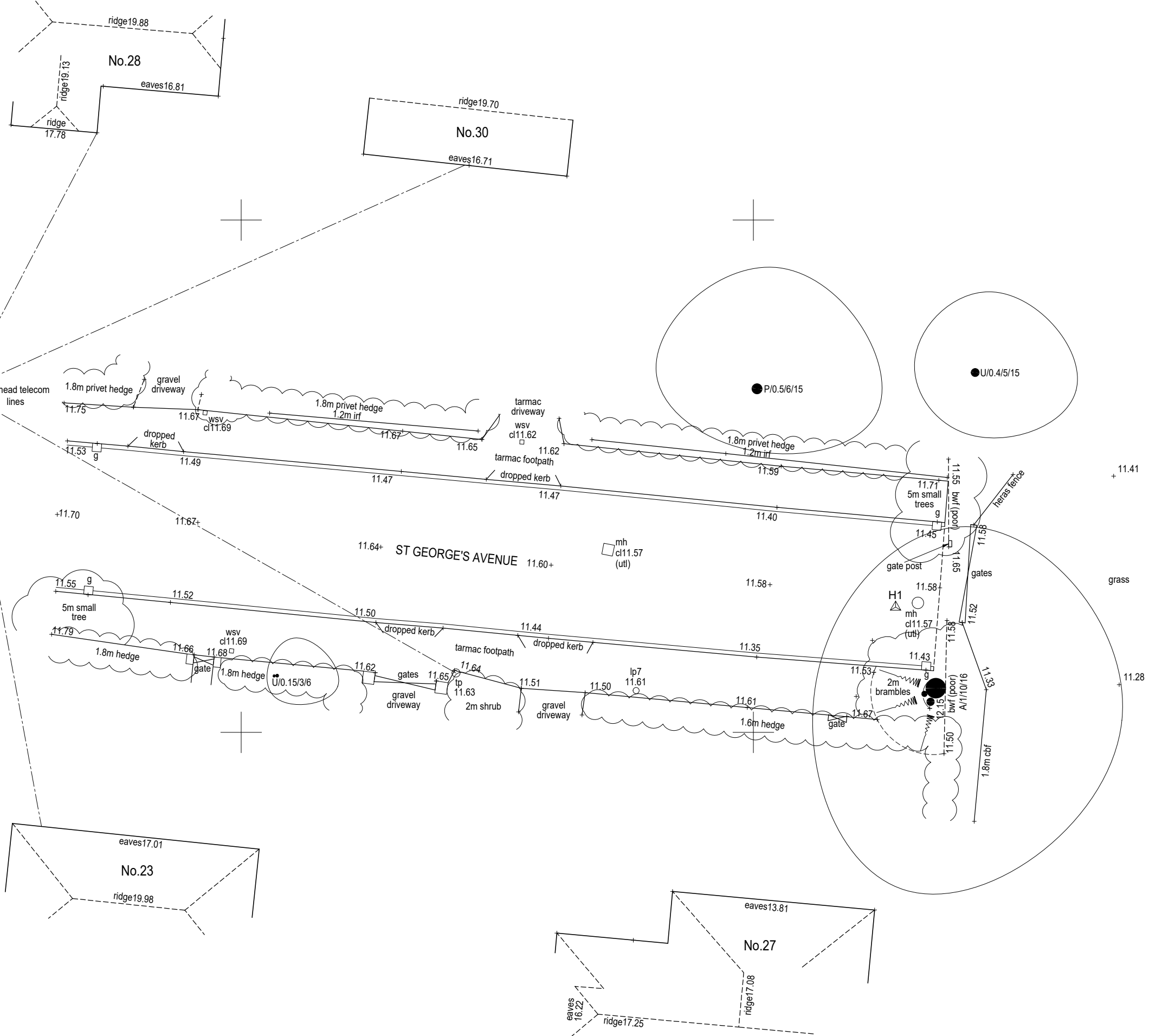
ABBREVIATIONS

BT British Telecom
BOL Bolland
CB Control Box
CL Cover Level
CTV Cable Television
EL Electric
EP Electricity Pole
FH Fire Hydrant
G Gas Stop Valve
H Height
HVC High Voltage Cable
IC Inspection Cover
IL Invert Level
JM Japanese Maple
LB Laburnum
LM Lime
LO Locust Tree
M Maple
MG Magnolia
OK Oak
P Palm
PL Plane
PM Plum
PO Poplar
PP Pissardii Plum
PR Pear
R Redwood
RD Red Oak
RH Rhododendron
RO Rowan
SB Silver Birch
SC Sweet Chestnut
S Scots Pine
SU Spruce
SY Sycamore
U Unidentified
W Willow
WN Walnut
Y Yew

FENCES

BWF Barbed Wire Fence
CBF Closed Board Fence
CBF Concrete Post
CPF Chestnut Piling Fence
CWF Chicken Wire Fence
IRF Iron Railing Fence
PKF Picket Fence
PRF Post & Rail Fence
PWF Post & Wire Fence
SCF Security Fence
SP Steel Post
WMF Wire Mesh Fence
WPF Wood Panel Fence

SURVEY STATION INFORMATION				
Name	Easting	Northing	Height	Type
H1	473031.940	106406.109	11.546	PEG
H2	473140.997	106414.799	11.506	PEG
H3	472971.530	106406.644	11.732	NAIL
H4	472919.639	106421.582	12.025	PEG
H5	472953.550	106074.674	10.371	NAIL
H6	472999.241	106071.396	10.093	PEG
H7	473053.518	106112.998	9.562	NAIL
H8	473132.503	106168.700	11.091	PEG
H9	473178.457	106289.323	11.280	NAIL
H10	473282.929	106362.272	11.104	PEG
H11	473374.245	106402.302	11.369	PEG
H12	473493.023	106428.543	11.634	PEG
H13	473123.474	106464.935	11.947	PEG



NOTES

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34 Parham Drive
Eastleigh
EMSWORTH

Contract

SITE SURVEY

Title

136EX01 (Sheet 2 of 3)

Drawing Number

FEBRUARY 2021

Date

1:200 (at A1)

Scale

RS HB

Surveyor(s)

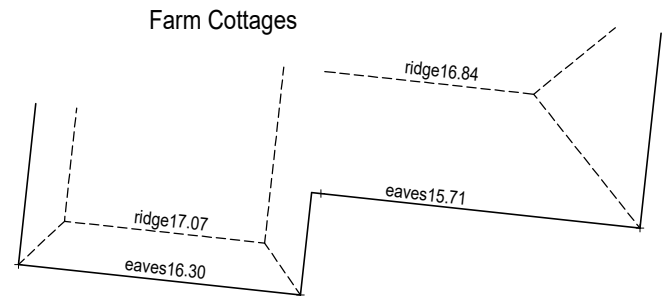
TREES
A Ash
AL Alder
AP Apple
B Beech
CB Cedar
CH Cherry
COP Copper Beech
CY Cypress
E Elm
EU Eucalyptus
F Field Maple
FM Fruit
HZ Hazel
HC Horse Chestnut
HO Holm Oak
HW Hawthorn
HY Holly
JM Japanese Maple
LB Laburnum
L Lime
LO Locust Tree
La Laurel
M Maple
MG Magnolia
O Oak
P Pine
PA Palm
PL Plane
PM Plum
PO Poplar
PP Pissardii Plum
PR Pear
R Redwood
RH Rhododendron
RO Rowan
SB Silver Birch
SC Sweet Chestnut
S Scots Pine
SP Spruce
SY Sycamore
U Unidentified
W Willow
WN Walnut
Y Yew

Species / Dia / Spread (max) / Ht
e.g. OK / 0.6 / 8 / 15

ABBREVIATIONS
BT British Telecom
BOL Bolland
CB Control Box
CLV Cover Level
CTV Cable Television
EL Electric
EP Electricity Pole
FH Fire Hydrant
GSV Gas Stop Valve
HT Height
HVC High Voltage Cable
IC Inspection Cover
IL Invert Level
LP Lamp Post
MH Man-Hole
MKR Marker
MW Monitoring Well
O/H Overhead
G Road Gully
PB Post Box
PC Pram Crossing
RNP Road Name Plate
RS Road Sign
S/A Soakaway
ST Slay / Strut
SV Stop Valve (Unidentified)
TB Telephone Box
TC telecom
TH Trial Hole
TL telegraph Pole
UTL Unable to Lift
VP Vent pipe
WM Water Meter
WSV Water Stop Valve

FENCES
BWF Barbed Wire Fence
CBF Closed Board Fence
CB Concrete Post
CPF Chestnut Piling Fence
CWF Chicken Wire Fence
IRF Iron Railing Fence
PKF Picket Fence
PRF Post & Rail Fence
PWF Post & Wire Fence
SCF Security Fence
SP Steel Post
WMF Wire Mesh Fence
WPF Wood Panel Fence

SURVEY STATION INFORMATION				
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H1	473031.940	106406.109	11.546	PEG
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H3	472971.630	106406.644	11.732	NAIL
H4	472919.639	106401.582	12.025	PEG
H5	472953.550	106074.674	10.371	NAIL
H6	472999.241	106071.396	10.063	PEG
H7	473053.516	106112.398	9.562	NAIL
H8	473132.593	106168.700	11.091	PEG
H9	473178.457	106209.323	11.280	NAIL
H10	473282.929	106362.272	11.104	PEG
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H12	473493.023	106438.843	11.634	PEG
H13	473123.474	106464.935	11.847	PEG



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EMSWORTH

Contract

SITE SURVEY

Title

136EX01 (Sheet 3 of 3)

Drawing Number

FEBRUARY 2021

Date

1:200 (at A1)

Scale

RS HB

Surveyor(s)

Appendix D

Proposed Site Plan

Appendix E1

GOV.UK Surface Water Flood Risk Mapping

Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

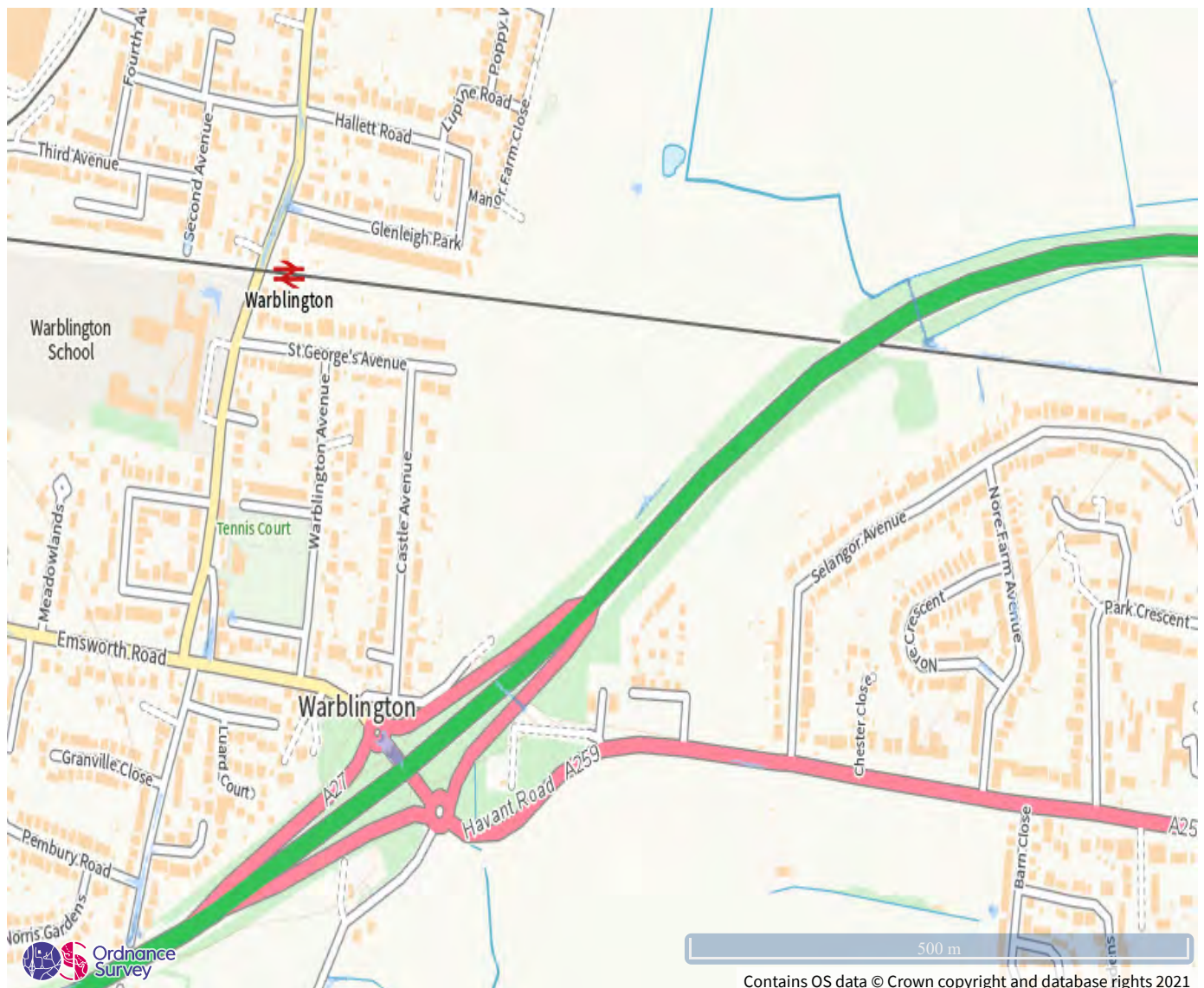
Flood risk

High risk: depth



Location

PO9 2SA



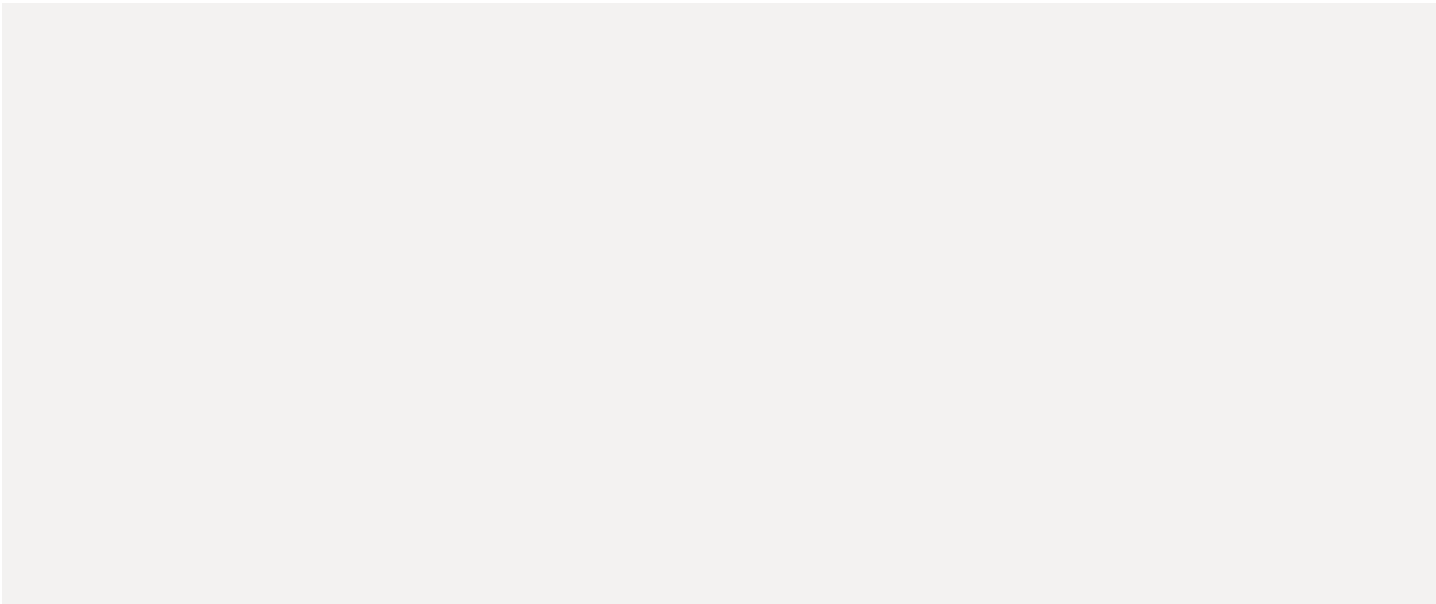
Surface water flood risk: water depth in a high risk scenario

Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm

[View the flood risk information for another location \(/long-term-flood-risk/postcode\).](#)

This information meets the requirements of the EU Floods Directive 2007/60/EC



Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

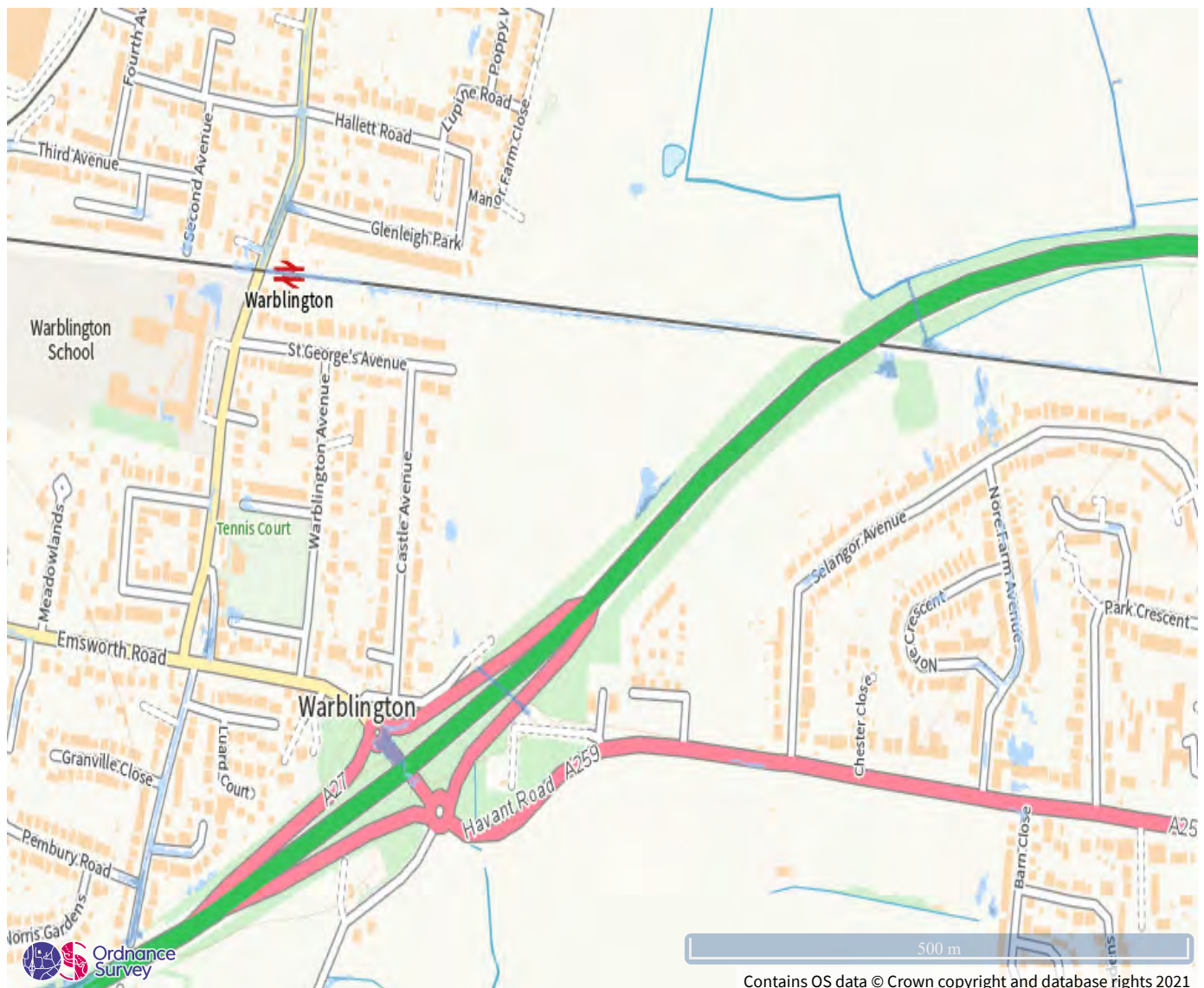
Flood risk

Medium risk: depth



Location

PO9 2SA



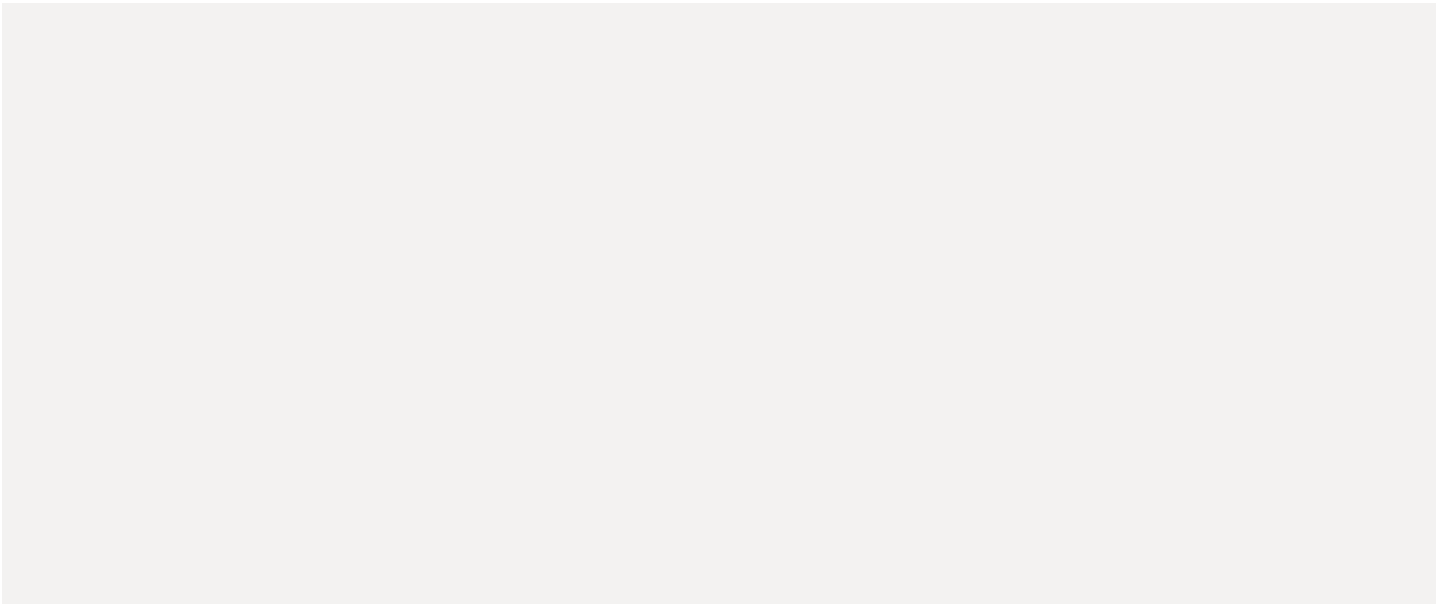
Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm

[View the flood risk information for another location \(/long-term-flood-risk/postcode\).](#)

This information meets the requirements of the EU Floods Directive 2007/60/EC



Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

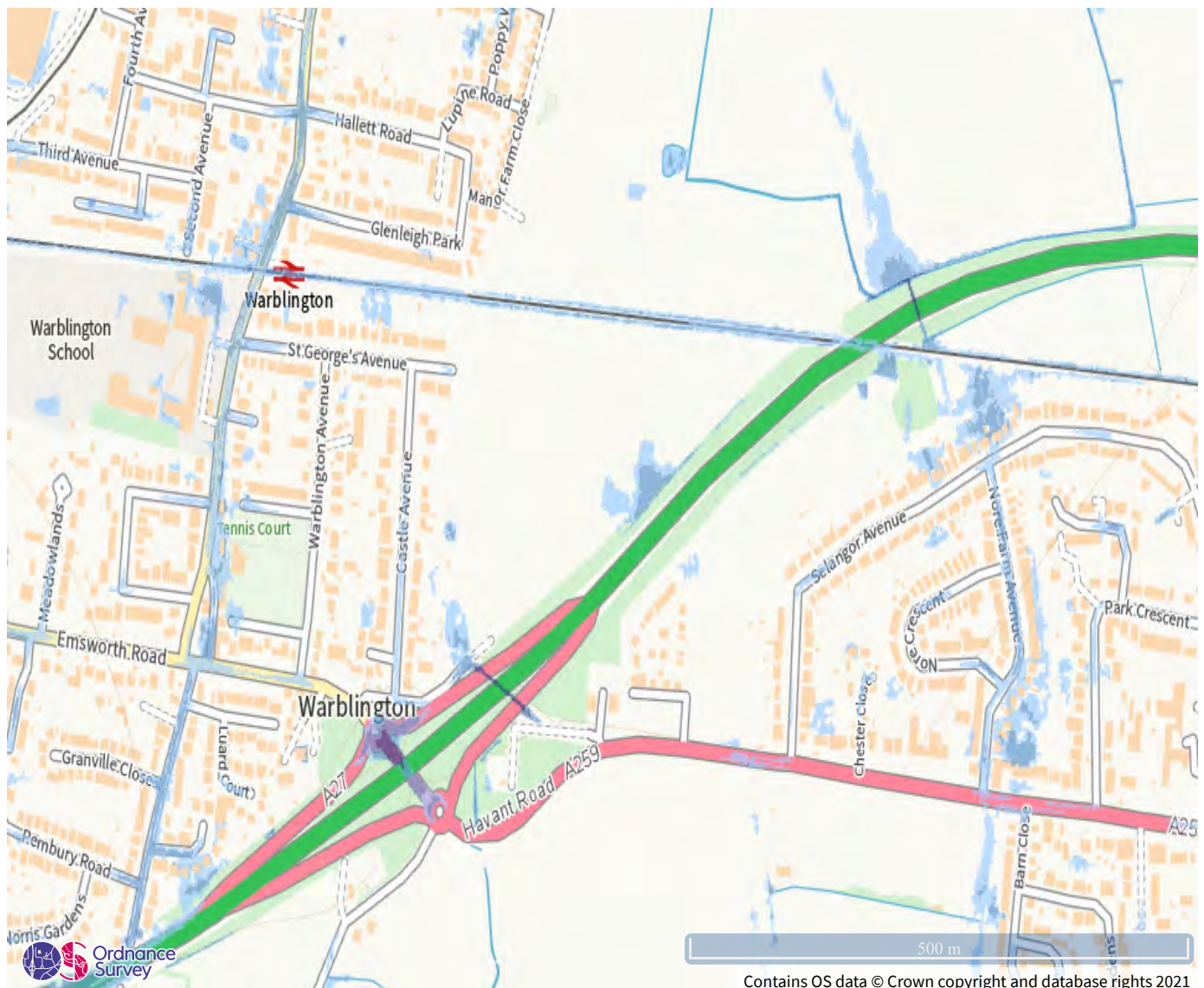
Flood risk

Low risk: depth



Location

PO9 2SA



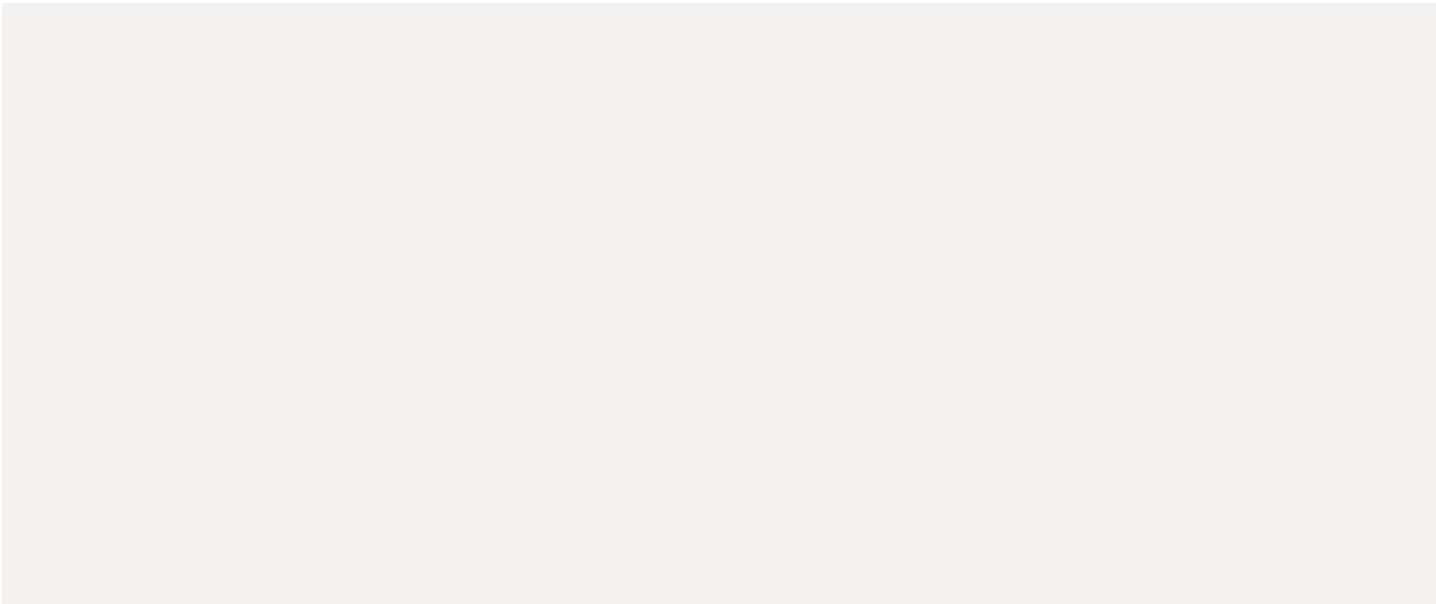
Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm

[View the flood risk information for another location \(/long-term-flood-risk/postcode\).](#)

This information meets the requirements of the EU Floods Directive 2007/60/EC



Appendix E2

GOV.UK Fluvial Flood Risk Mapping

Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

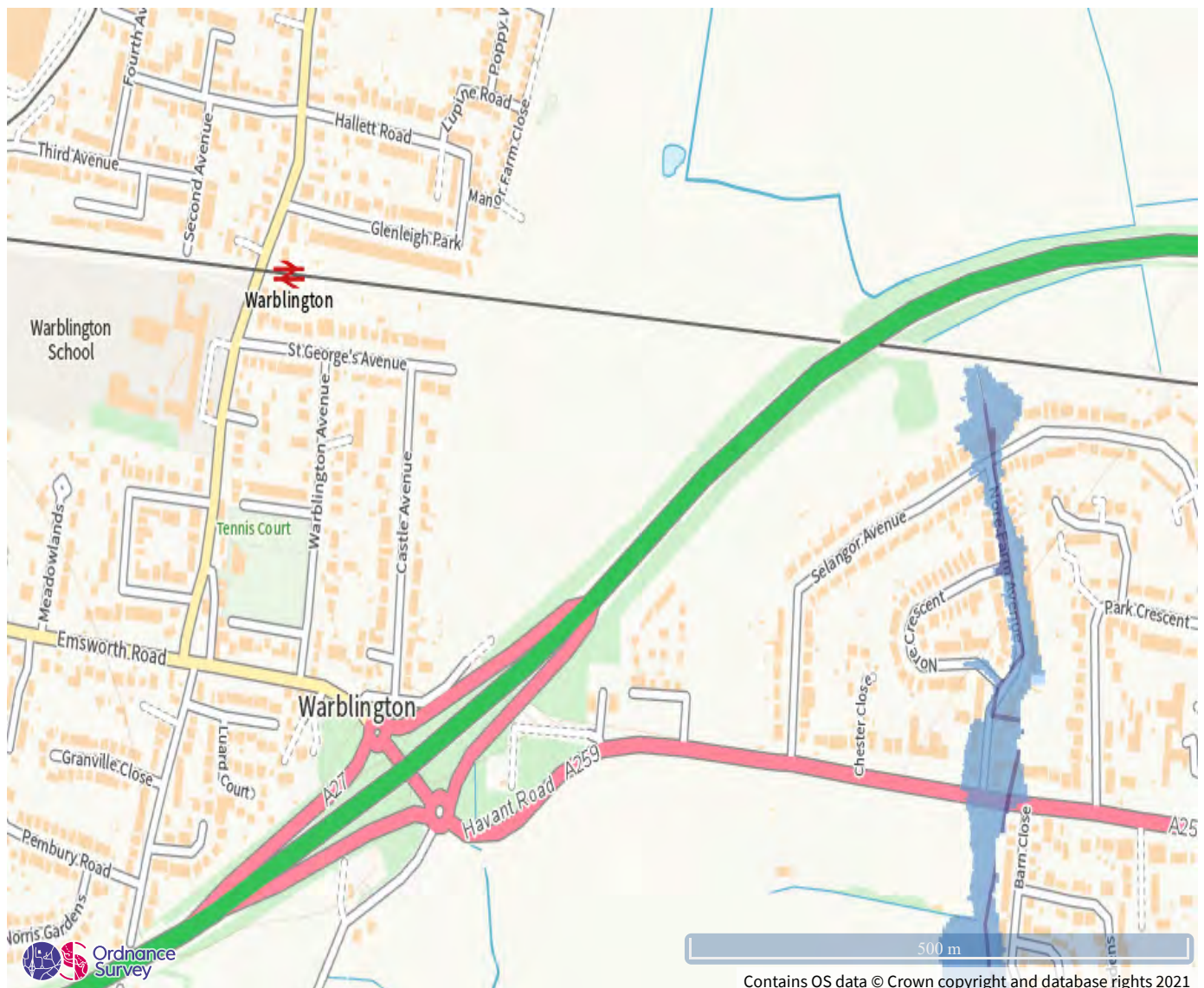
Flood risk

Extent of flooding



Location

PO9 2SA

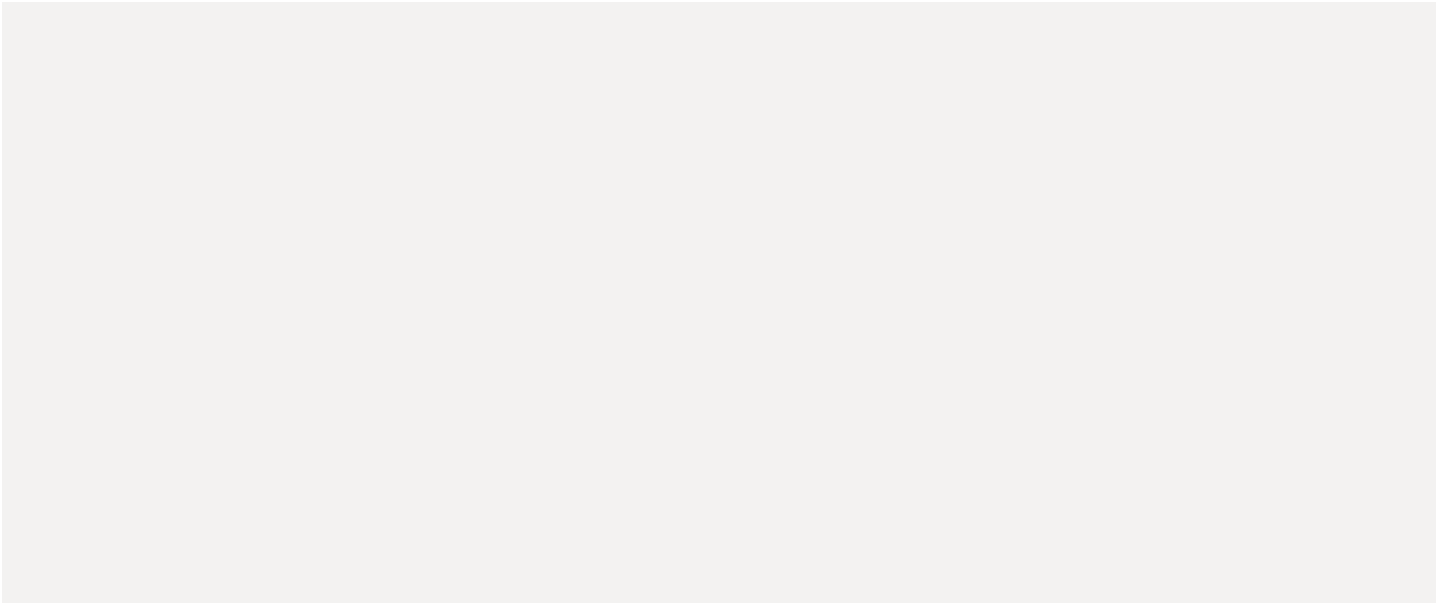


Extent of flooding from rivers or the sea

- [High](#)
- [Medium](#)
- [Low](#)
- [Very low](#)

[View the flood risk information for another location \(/long-term-flood-risk/postcode\).](#)

This information meets the requirements of the EU Floods Directive 2007/60/EC



Appendix E3

GOV.UK Reservoir Flood Risk Mapping

Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

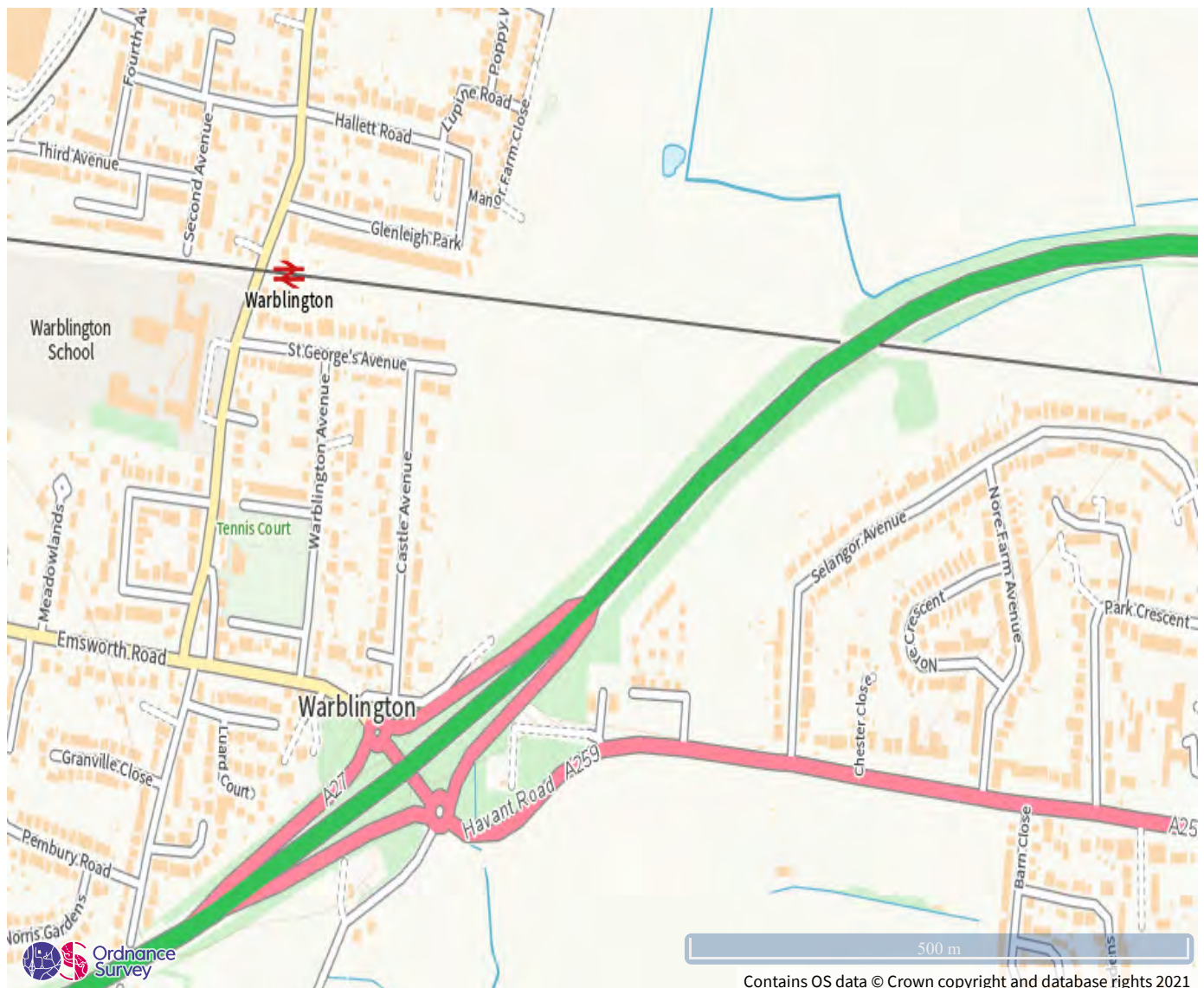
Flood risk

Extent of flooding



Location

PO9 2SA

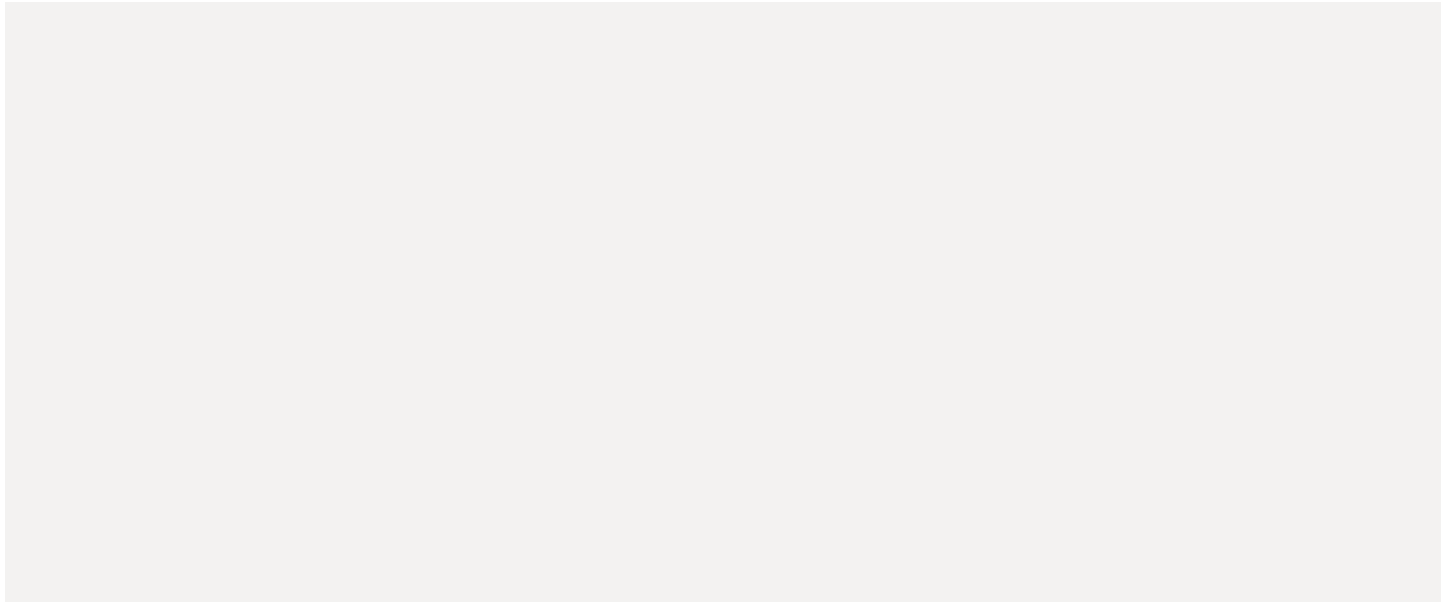


Extent of flooding from reservoirs

● Maximum extent of flooding

[View the flood risk information for another location \(/long-term-flood-risk/postcode\)](#)

This information meets the requirements of the EU Floods Directive 2007/60/EC



Appendix F

UKSuDS Greenfield Run-off Calculation

Calculated by: Kevin Tosh

Site name: Saxons Corner

Site location: Warblington

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude: 50.85184° N

Longitude: 0.96214° W

Reference: 3173864326

Date: Mar 11 2022 09:44

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 5.12

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	739	739
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	9.94	9.94
1 in 1 year (l/s):	8.45	8.45
1 in 30 years (l/s):	22.87	22.87
1 in 100 year (l/s):	31.72	31.72
1 in 200 years (l/s):	37.18	37.18

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix G

Preliminary Calculations & Strategy Drawing

DO NOT SCALE

N

ED Bdy

FOR CONTINUATION SEE
INSET A, BELOW

CHAMBER TO BE FITTED WITH 300mm Ø
HIGH LEVEL OVERFLOW PIPE AT AN IL
10.430, TO ALLOW STORAGE OF 1in100
YEAR WATER WITHIN TANK SPECIFIED.
LOW LEVEL PIPE INVERT IS TO BE FITTED
WITH A FLAP VALVE TO PREVENT
INGRESS OF WATER INTO TANKED
STORAGE IN 1in30 YEAR EVENT.

PROPOSED FLOW CONTROL
CHAMBER TO RESTRICT FLOW
TO MAX 21.0 l/s

PROPOSED FLOW CONTROL
CHAMBER TO RESTRICT
FLOW TO MAX 10.0 l/s

PROPOSED PUMP STATION
COMPOUND SUBJECT TO
DETAILED DESIGN BY OTHERS

PROPRIETARY TREATMENT
DEVICE SUBJECT TO DETAILED
DESIGN BY OTHERS

PROPOSED FLOW CONTROL
CHAMBER TO RESTRICT FLOW
TO MAX 8.5 l/s

INSET A

EXISTING MANHOLE TO BE MODIFIED TO
SUIT PROPOSED CONNECTION.
CONTRACTOR TO CONFIRM INVERT LEVEL
& PIPE SIZE PRIOR TO CONSTRUCTION
AND REPORT RESULTS TO THE ENGINEER.

NOTE
PROPOSALS TO PERSIMMON SITE
TO DRAINAGE OUTFALLS TO BE
INCLUDED FOLLOWING RECEIPT
OF DESIGN INFORMATION

KEY

- S22 CL.46.200 IL.44.733 ADOPTABLE SURFACE WATER MANHOLE WITH REFERENCE NUMBER, COVER LEVEL AND INVERT LEVEL
- SURFACE WATER DRAIN/SEWER
- SURFACE WATER RISING MAIN
- ADOPTABLE SURFACE WATER MANHOLE WITH FLOW CONTROL
- PROPRIETARY VEGETATED SURFACE WATER HEADWALL (E.G. ROOTLOK) TO SUIT PROPOSED SLOPES OF SURFACE WATER BASIN
- DENOTES EXTENT OF DRIVEWAYS FORMED WITH PERMEABLE PAVING
- DENOTES EXTENT OF STORAGE CRATES
- FFL - DENOTES FINISHED FLOOR LEVEL
- SITE BOUNDARY

C	14/03/22	PROPOSALS UPDATED TO SUIT REVISED PLANNING LAYOUT	DCH	KRT
B	16/09/21	REVISED SITE LAYOUT	JE	MG
A	06/09/21	REVISED SITE LAYOUT	JE	MG
REV	DATE	DESCRIPTION	DRAWN	CHKD

REVISIONS

This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.



Project
**LAND OFF ST GEORGES AVENUE
HAVANT**

Title
**PRELIMINARY SURFACE WATER
DRAINAGE STRATEGY**

Client
BARRATT DAVID WILSON HOMES

Scale 1:500 @ A1	Drawn JE	Date 23/06/21
Job Manager MG	Checked MG	Approved MG

Richard Jackson
Engineering Consultants

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Drawing No.	Revision
61195-PP-001	C

Drawing Status

☒ INFORMATION	☐ APPROVAL	☐ COSTING
☐ TENDER	☐ CONSTRUCTION	☐ AS CONSTRUCTED



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.081	5.00	12.006	1800	473107.713	106401.212	2.013
PP01	0.182	5.00	12.180	1200	473121.491	106408.653	1.019
2	0.095	5.00	12.130	1800	473121.283	106401.812	2.164
PP02	0.213	5.00	12.530	1200	473183.798	106404.137	1.878
3	0.091	5.00	12.570	1800	473183.004	106396.509	2.728
4	0.057	5.00	12.312	1800	473288.870	106409.339	2.464
5	0.011	5.00	11.837	1800	473250.872	106412.743	2.065
PP03	0.125	5.00	11.870	1200	473245.130	106418.976	1.270
6	0.014	5.00	11.858	1800	473244.105	106407.088	2.104
7	0.110	5.00	12.018	1800	473242.678	106391.163	2.296
8	0.012	5.00	11.889	1800	473239.430	106354.907	2.240
PP04	0.096	5.00	11.900	1200	473326.811	106412.940	1.140
9	0.000	5.00	12.050	1800	473317.828	106415.111	2.100
PP05	0.070	5.00	11.865	1200	473306.819	106427.776	1.108
10	0.037	5.00	12.455	1800	473305.855	106416.184	2.529
11	0.098	5.00	12.270	1800	473302.447	106378.400	2.420
12	0.062	5.00	12.035	1800	473294.065	106365.236	2.216
PP06	0.057	5.00	11.750	1200	473235.641	106315.365	0.848
14	0.000	5.00	11.905	1800	473242.627	106321.978	2.167
13	0.049	5.00	11.932	1800	473265.347	106317.880	2.187
15	0.031	5.00	12.153	1800	473253.443	106331.508	2.444
16	0.018	5.00	11.844	1800	473239.593	106347.164	2.177
17	0.083	5.00	11.766	1800	473229.841	106346.895	2.142
18	0.026	5.00	11.875	1800	473197.525	106349.338	2.316
19	0.039	5.00	11.774	1800	473194.068	106310.758	2.292
20	0.111	5.00	11.885	1800	473197.282	106297.737	2.430
21	0.014	5.00	11.771	1800	473212.842	106280.185	2.363
22	0.140	5.00	11.790	1800	473214.325	106270.867	2.401
23	0.054	5.00	11.707	1800	473167.325	106221.370	2.455
24	0.000	5.00	11.359	1800	473151.715	106205.222	2.152
25	0.021	5.00	11.244	1800	473142.608	106202.021	2.056
43	0.000	5.00	12.150	1200	473178.022	106362.115	1.958
44	0.000		12.150	1800	473177.501	106357.427	2.467
26	0.100	5.00	11.949	1800	473176.904	106353.167	2.425
27	0.065	5.00	11.551	1800	473136.996	106356.639	2.107
28	0.083	5.00	11.593	1800	473126.951	106348.245	2.175
29	0.106	5.00	11.711	1800	473121.992	106292.899	2.404
33	0.199	5.00	11.555	1800	473126.464	106285.375	2.266
PP07	0.076	5.00	11.950	1200	473127.686	106229.153	1.000
34	0.080	5.00	11.629	1800	473121.482	106229.758	2.452



Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
36	0.057	5.00	11.320	1800	473119.093	106200.630	2.201
37	0.000	5.00	11.300	1800	473117.307	106179.893	2.223
38	0.000	5.00	11.144	1500	473098.575	106181.560	2.105
39	0.000		10.000	1500	473097.912	106174.151	0.976
40	0.000		10.000	1500	473112.724	106171.422	1.006
41	0.000		11.087	1500	473129.386	106169.929	2.126
42	0.000		11.100	1500	473130.040	106177.236	2.183
45	0.000		11.250	1500	473124.618	106182.086	2.348

Links (Results)

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.394	886.9	11.0	1.113	1.264	0.081	0.0	69	0.495
2.000	1.005	17.8	24.7	0.869	0.887	0.182	0.0	150	1.023
1.001	1.394	886.9	48.5	1.264	1.828	0.358	0.0	140	0.763
3.000	1.005	17.8	28.9	1.728	1.845	0.213	0.0	150	1.023
1.002	1.394	886.9	86.2	1.828	1.396	0.662	0.0	187	0.900
4.000	1.394	886.9	7.7	1.564	1.165	0.057	0.0	58	0.445
4.001	1.394	886.9	9.2	1.165	1.204	0.068	0.0	63	0.466
5.000	1.572	111.1	16.9	0.970	1.077	0.125	0.0	79	1.146
4.002	1.394	886.9	28.1	1.204	1.396	0.207	0.0	108	0.652
1.003	1.394	886.9	123.5	1.396	1.340	0.979	0.0	225	0.997
1.004	1.394	886.9	123.7	1.340	1.242	0.991	0.0	225	0.997
6.000	1.005	17.8	13.0	0.990	1.232	0.096	0.0	96	1.097
6.001	1.394	886.9	13.0	1.200	1.629	0.096	0.0	74	0.518
7.000	1.005	17.8	9.5	0.958	1.664	0.070	0.0	78	1.022
6.002	1.394	886.9	27.5	1.629	1.520	0.203	0.0	107	0.649
6.003	1.394	886.9	40.8	1.520	1.316	0.301	0.0	129	0.726
6.004	1.426	907.2	47.5	1.316	1.544	0.363	0.0	138	0.772
8.000	1.005	17.8	7.7	0.698	0.949	0.057	0.0	69	0.972
8.001	1.394	886.9	7.7	1.267	1.544	0.057	0.0	58	0.445
9.000	1.394	886.9	6.6	1.287	1.544	0.049	0.0	54	0.423
6.005	1.394	886.9	64.2	1.544	1.277	0.500	0.0	161	0.828
6.006	1.394	886.9	66.0	1.277	1.219	0.518	0.0	164	0.836
1.005	1.394	886.9	193.6	1.242	1.416	1.592	0.0	283	1.127
1.006	1.394	886.9	190.8	1.416	1.392	1.618	0.0	282	1.124
1.007	1.394	886.9	193.4	1.392	1.530	1.657	0.0	283	1.127
1.008	1.394	886.9	202.7	1.530	1.463	1.768	0.0	290	1.141
1.009	1.394	886.9	202.8	1.463	1.501	1.782	0.0	290	1.141
1.010	1.394	886.9	208.7	1.501	1.555	1.922	0.0	295	1.150
1.011	1.394	886.9	211.5	1.555	1.252	1.976	0.0	298	1.155
1.012	1.394	886.9	210.2	1.252	1.156	1.976	0.0	296	1.152
1.013	1.690	1075.0	209.8	1.156	1.301	1.997	0.0	268	1.327
10.000	1.000	70.7	0.0	1.658	0.939	0.000	0.0	0	0.000
10.001	1.244	549.7	0.0	1.717	1.525	0.000	0.0	0	0.000
10.002	1.394	886.9	13.6	1.525	1.207	0.100	0.0	76	0.526
10.003	1.394	886.9	22.4	1.207	1.275	0.165	0.0	96	0.609
10.004	1.394	886.9	32.7	1.275	1.504	0.248	0.0	116	0.683
10.005	1.394	886.9	46.4	1.504	1.366	0.354	0.0	138	0.755
10.006	1.394	886.9	69.0	1.366	1.552	0.553	0.0	167	0.846



Links (Results)

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
12.000	4.109	72.6	10.3	0.850	1.552	0.076	0.0	38	2.910
10.007	1.394	886.9	86.4	1.552	1.301	0.709	0.0	188	0.903
1.014	1.394	886.9	286.5	1.301	1.323	2.763	0.0	350	1.250
1.015	0.995	215.3	281.9	1.698	1.580	2.763	0.0	525	1.004
1.016	0.995	215.3	280.2	1.580	0.451	2.763	0.0	525	1.004
1.017	0.995	215.3	276.7	0.451	0.481	2.763	0.0	525	1.004
1.018	0.995	215.3	272.9	0.481	1.601	2.763	0.0	525	1.004
1.019	1.730	374.5	272.0	1.601	1.658	2.763	0.0	333	1.879
1.020	0.995	215.3	270.4	1.658	1.823	2.763	0.0	525	1.004

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	13.583	500.0	900	Circular_Default Sewer Type	12.006	9.993	1.113	12.130	9.966	1.264
2.000	6.844	100.0	150	Circular_Default Sewer Type	12.180	11.161	0.869	12.130	11.093	0.887
1.001	61.948	500.0	900	Circular_Default Sewer Type	12.130	9.966	1.264	12.570	9.842	1.828
3.000	7.669	100.0	150	Circular_Default Sewer Type	12.530	10.652	1.728	12.570	10.575	1.845
1.002	59.913	500.0	900	Circular_Default Sewer Type	12.570	9.842	1.828	12.018	9.722	1.396
4.000	38.150	500.0	900	Circular_Default Sewer Type	12.312	9.848	1.564	11.837	9.772	1.165
4.001	8.819	500.0	900	Circular_Default Sewer Type	11.837	9.772	1.165	11.858	9.754	1.204
5.000	11.932	100.0	300	Circular_Default Sewer Type	11.870	10.600	0.970	11.858	10.481	1.077
4.002	15.989	500.0	900	Circular_Default Sewer Type	11.858	9.754	1.204	12.018	9.722	1.396
1.003	36.401	500.0	900	Circular_Default Sewer Type	12.018	9.722	1.396	11.889	9.649	1.340
1.004	12.496	500.0	900	Circular_Default Sewer Type	11.889	9.649	1.340	11.766	9.624	1.242
6.000	9.242	100.0	150	Circular_Default Sewer Type	11.900	10.760	0.990	12.050	10.668	1.232
6.001	12.021	500.0	900	Circular_Default Sewer Type	12.050	9.950	1.200	12.455	9.926	1.629
7.000	11.632	100.0	150	Circular_Default Sewer Type	11.865	10.757	0.958	12.455	10.641	1.664
6.002	37.937	500.0	900	Circular_Default Sewer Type	12.455	9.926	1.629	12.270	9.850	1.520
6.003	15.606	500.0	900	Circular_Default Sewer Type	12.270	9.850	1.520	12.035	9.819	1.316
6.004	52.799	478.0	900	Circular_Default Sewer Type	12.035	9.819	1.316	12.153	9.709	1.544

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1800	Manhole	Adoptable	2	1800	Manhole	Adoptable
2.000	PP01	1200	Manhole	Adoptable	2	1800	Manhole	Adoptable
1.001	2	1800	Manhole	Adoptable	3	1800	Manhole	Adoptable
3.000	PP02	1200	Manhole	Adoptable	3	1800	Manhole	Adoptable
1.002	3	1800	Manhole	Adoptable	7	1800	Manhole	Adoptable
4.000	4	1800	Manhole	Adoptable	5	1800	Manhole	Adoptable
4.001	5	1800	Manhole	Adoptable	6	1800	Manhole	Adoptable
5.000	PP03	1200	Manhole	Adoptable	6	1800	Manhole	Adoptable
4.002	6	1800	Manhole	Adoptable	7	1800	Manhole	Adoptable
1.003	7	1800	Manhole	Adoptable	8	1800	Manhole	Adoptable
1.004	8	1800	Manhole	Adoptable	17	1800	Manhole	Adoptable
6.000	PP04	1200	Manhole	Adoptable	9	1800	Manhole	Adoptable
6.001	9	1800	Manhole	Adoptable	10	1800	Manhole	Adoptable
7.000	PP05	1200	Manhole	Adoptable	10	1800	Manhole	Adoptable
6.002	10	1800	Manhole	Adoptable	11	1800	Manhole	Adoptable
6.003	11	1800	Manhole	Adoptable	12	1800	Manhole	Adoptable
6.004	12	1800	Manhole	Adoptable	15	1800	Manhole	Adoptable



Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
8.000	9.620	100.0	150	Circular_Default Sewer Type	11.750	10.902	0.698	11.905	10.806	0.949
8.001	14.416	500.0	900	Circular_Default Sewer Type	11.905	9.738	1.267	12.153	9.709	1.544
9.000	18.095	500.0	900	Circular_Default Sewer Type	11.932	9.745	1.287	12.153	9.709	1.544
6.005	20.903	500.0	900	Circular_Default Sewer Type	12.153	9.709	1.544	11.844	9.667	1.277
6.006	9.756	500.0	900	Circular_Default Sewer Type	11.844	9.667	1.277	11.766	9.647	1.219
1.005	32.408	500.0	900	Circular_Default Sewer Type	11.766	9.624	1.242	11.875	9.559	1.416
1.006	38.735	500.0	900	Circular_Default Sewer Type	11.875	9.559	1.416	11.774	9.482	1.392
1.007	13.412	500.0	900	Circular_Default Sewer Type	11.774	9.482	1.392	11.885	9.455	1.530
1.008	23.456	500.0	900	Circular_Default Sewer Type	11.885	9.455	1.530	11.771	9.408	1.463
1.009	9.435	500.0	900	Circular_Default Sewer Type	11.771	9.408	1.463	11.790	9.389	1.501
1.010	68.257	500.0	900	Circular_Default Sewer Type	11.790	9.389	1.501	11.707	9.252	1.555
1.011	22.460	500.0	900	Circular_Default Sewer Type	11.707	9.252	1.555	11.359	9.207	1.252
1.012	9.653	500.0	900	Circular_Default Sewer Type	11.359	9.207	1.252	11.244	9.188	1.156
1.013	23.556	341.4	900	Circular_Default Sewer Type	11.244	9.188	1.156	11.320	9.119	1.301
10.000	4.717	-6.6	300	Circular_Default Sewer Type	12.150	10.192	1.658	12.150	10.911	0.939
10.001	4.302	500.0	750	Circular_Default Sewer Type	12.150	9.683	1.717	11.949	9.674	1.525
10.002	40.059	500.0	900	Circular_Default Sewer Type	11.949	9.524	1.525	11.551	9.444	1.207
10.003	13.091	500.0	900	Circular_Default Sewer Type	11.551	9.444	1.207	11.593	9.418	1.275
10.004	55.568	500.0	900	Circular_Default Sewer Type	11.593	9.418	1.275	11.711	9.307	1.504
10.005	8.753	500.0	900	Circular_Default Sewer Type	11.711	9.307	1.504	11.555	9.289	1.366
10.006	55.840	500.0	900	Circular_Default Sewer Type	11.555	9.289	1.366	11.629	9.177	1.552
12.000	6.233	6.1	150	Circular_Default Sewer Type	11.950	10.950	0.850	11.629	9.927	1.552
10.007	29.226	500.0	900	Circular_Default Sewer Type	11.629	9.177	1.552	11.320	9.119	1.301
1.014	20.814	500.0	900	Circular_Default Sewer Type	11.320	9.119	1.301	11.300	9.077	1.323
1.015	18.806	500.0	525	Circular_Default Sewer Type	11.300	9.077	1.698	11.144	9.039	1.580

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
8.000	PP06	1200	Manhole	Adoptable	14	1800	Manhole	Adoptable
8.001	14	1800	Manhole	Adoptable	15	1800	Manhole	Adoptable
9.000	13	1800	Manhole	Adoptable	15	1800	Manhole	Adoptable
6.005	15	1800	Manhole	Adoptable	16	1800	Manhole	Adoptable
6.006	16	1800	Manhole	Adoptable	17	1800	Manhole	Adoptable
1.005	17	1800	Manhole	Adoptable	18	1800	Manhole	Adoptable
1.006	18	1800	Manhole	Adoptable	19	1800	Manhole	Adoptable
1.007	19	1800	Manhole	Adoptable	20	1800	Manhole	Adoptable
1.008	20	1800	Manhole	Adoptable	21	1800	Manhole	Adoptable
1.009	21	1800	Manhole	Adoptable	22	1800	Manhole	Adoptable
1.010	22	1800	Manhole	Adoptable	23	1800	Manhole	Adoptable
1.011	23	1800	Manhole	Adoptable	24	1800	Manhole	Adoptable
1.012	24	1800	Manhole	Adoptable	25	1800	Manhole	Adoptable
1.013	25	1800	Manhole	Adoptable	36	1800	Manhole	Adoptable
10.000	43	1200	Manhole	Adoptable	44	1800	Manhole	Adoptable
10.001	44	1800	Manhole	Adoptable	26	1800	Manhole	Adoptable
10.002	26	1800	Manhole	Adoptable	27	1800	Manhole	Adoptable
10.003	27	1800	Manhole	Adoptable	28	1800	Manhole	Adoptable
10.004	28	1800	Manhole	Adoptable	29	1800	Manhole	Adoptable
10.005	29	1800	Manhole	Adoptable	33	1800	Manhole	Adoptable
10.006	33	1800	Manhole	Adoptable	34	1800	Manhole	Adoptable
12.000	PP07	1200	Manhole	Adoptable	34	1800	Manhole	Adoptable
10.007	34	1800	Manhole	Adoptable	36	1800	Manhole	Adoptable
1.014	36	1800	Manhole	Adoptable	37	1800	Manhole	Adoptable
1.015	37	1800	Manhole	Adoptable	38	1500	Manhole	Adoptable

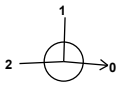
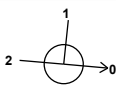
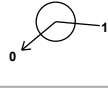


Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.016	7.439	500.0	525	Circular_Default Sewer Type	11.144	9.039	1.580	10.000	9.024	0.451
1.017	15.061	500.0	525	Circular_Default Sewer Type	10.000	9.024	0.451	10.000	8.994	0.481
1.018	16.729	500.0	525	Circular_Default Sewer Type	10.000	8.994	0.481	11.087	8.961	1.601
1.019	7.336	167.0	525	Circular_Default Sewer Type	11.087	8.961	1.601	11.100	8.917	1.658
1.020	7.275	500.0	525	Circular_Default Sewer Type	11.100	8.917	1.658	11.250	8.902	1.823

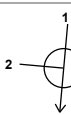
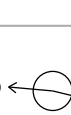
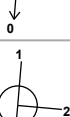
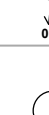
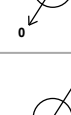
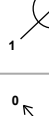
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.016	38	1500	Manhole	Adoptable	39	1500	Manhole	Adoptable
1.017	39	1500	Manhole	Adoptable	40	1500	Manhole	Adoptable
1.018	40	1500	Manhole	Adoptable	41	1500	Manhole	Adoptable
1.019	41	1500	Manhole	Adoptable	42	1500	Manhole	Adoptable
1.020	42	1500	Manhole	Adoptable	45	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	473107.713	106401.212	12.006	2.013	1800		0	1.000	9.993	900
PP01	473121.491	106408.653	12.180	1.019	1200		0	2.000	11.161	150
2	473121.283	106401.812	12.130	2.164	1800		1 2	2.000 1.000	11.093 9.966	150 900
PP02	473183.798	106404.137	12.530	1.878	1200		0	1.001	9.966	900
3	473183.004	106396.509	12.570	2.728	1800		1 2	3.000 1.001	10.652 9.842	150 900
4	473288.870	106409.339	12.312	2.464	1800		0	1.002	9.842	900
5	473250.872	106412.743	11.837	2.065	1800		1 0	4.000 4.001	9.848 9.772	900 900
PP03	473245.130	106418.976	11.870	1.270	1200		0	4.001	9.772	900
							0	5.000	10.600	300

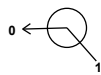
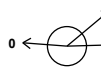
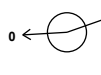


Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
6	473244.105	106407.088	11.858	2.104	1800		1	5.000	10.481	300
							2	4.001	9.754	900
							0	4.002	9.754	900
7	473242.678	106391.163	12.018	2.296	1800		1	4.002	9.722	900
							2	1.002	9.722	900
							0	1.003	9.722	900
8	473239.430	106354.907	11.889	2.240	1800		1	1.003	9.649	900
							0	1.004	9.649	900
PP04	473326.811	106412.940	11.900	1.140	1200					
9	473317.828	106415.111	12.050	2.100	1800		1	6.000	10.668	150
							0	6.001	9.950	900
PP05	473306.819	106427.776	11.865	1.108	1200					
10	473305.855	106416.184	12.455	2.529	1800		1	7.000	10.641	150
							2	6.001	9.926	900
							0	6.002	9.926	900
11	473302.447	106378.400	12.270	2.420	1800		1	6.002	9.850	900
							0	6.003	9.850	900
12	473294.065	106365.236	12.035	2.216	1800		1	6.003	9.819	900
							0	6.004	9.819	900
PP06	473235.641	106315.365	11.750	0.848	1200					
14	473242.627	106321.978	11.905	2.167	1800		1	8.000	10.806	150
							0	8.001	9.738	900
13	473265.347	106317.880	11.932	2.187	1800					
							0	9.000	9.745	900
15	473253.443	106331.508	12.153	2.444	1800		1	9.000	9.709	900
							2	8.001	9.709	900
							3	6.004	9.709	900
							0	6.005	9.709	900

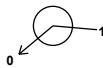
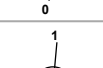
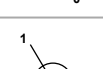
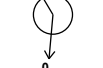
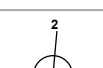
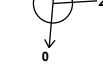
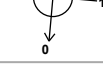
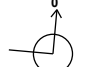


Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
16	473239.593	106347.164	11.844	2.177	1800	 1	6.005	9.667	900
17	473229.841	106346.895	11.766	2.142	1800	0	6.006	9.667	900
						 1	6.006	9.647	900
						2	1.004	9.624	900
18	473197.525	106349.338	11.875	2.316	1800	0	1.005	9.624	900
						1	1.005	9.559	900
						 0	1.006	9.559	900
19	473194.068	106310.758	11.774	2.292	1800	1	1.006	9.482	900
						 0	1.007	9.482	900
20	473197.282	106297.737	11.885	2.430	1800	1	1.007	9.455	900
						 0	1.008	9.455	900
21	473212.842	106280.185	11.771	2.363	1800	1	1.008	9.408	900
						 0	1.009	9.408	900
22	473214.325	106270.867	11.790	2.401	1800	1	1.009	9.389	900
						 0	1.010	9.389	900
23	473167.325	106221.370	11.707	2.455	1800	1	1.010	9.252	900
						 0	1.011	9.252	900
24	473151.715	106205.222	11.359	2.152	1800	1	1.011	9.207	900
						 0	1.012	9.207	900
25	473142.608	106202.021	11.244	2.056	1800	1	1.012	9.188	900
						 0	1.013	9.188	900
43	473178.022	106362.115	12.150	1.958	1200	 0	10.000	10.192	300
44	473177.501	106357.427	12.150	2.467	1800	1	10.000	10.911	300
						 0	10.001	9.683	750
26	473176.904	106353.167	11.949	2.425	1800	1	10.001	9.674	750
						 0	10.002	9.524	900



Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
27	473136.996	106356.639	11.551	2.107	1800		1	10.002	9.444	900
							0	10.003	9.444	900
28	473126.951	106348.245	11.593	2.175	1800		1	10.003	9.418	900
							0	10.004	9.418	900
29	473121.992	106292.899	11.711	2.404	1800		1	10.004	9.307	900
							0	10.005	9.307	900
33	473126.464	106285.375	11.555	2.266	1800		1	10.005	9.289	900
							0	10.006	9.289	900
PP07	473127.686	106229.153	11.950	1.000	1200					
							0	12.000	10.950	150
34	473121.482	106229.758	11.629	2.452	1800		1 2	12.000 10.006	9.927 9.177	150 900
							0	10.007	9.177	900
36	473119.093	106200.630	11.320	2.201	1800		1 2	10.007 1.013	9.119 9.119	900 900
							0	1.014	9.119	900
37	473117.307	106179.893	11.300	2.223	1800		1	1.014	9.077	900
							0	1.015	9.077	525
38	473098.575	106181.560	11.144	2.105	1500		1	1.015	9.039	525
							0	1.016	9.039	525
39	473097.912	106174.151	10.000	0.976	1500		1	1.016	9.024	525
							0	1.017	9.024	525
40	473112.724	106171.422	10.000	1.006	1500		1	1.017	8.994	525
							0	1.018	8.994	525
41	473129.386	106169.929	11.087	2.126	1500		1	1.018	8.961	525
							0	1.019	8.961	525
42	473130.040	106177.236	11.100	2.183	1500		1	1.019	8.917	525
							0	1.020	8.917	525



Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
45	473124.618	106182.086	11.250	2.348	1500	1	1.020	8.902	525



Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	1440
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200
30	120	240	480	720	1440	2880	5760	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Node 37 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	9.077	Product Number	CTL-SHE-0132-1000-1900-1000
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	10.0	Min Node Diameter (mm)	1500

Node PP01 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.500	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	2.0		
Invert Level (m)	11.161	Diameter (m)	0.037		

Node PP05 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.500	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	1.0		
Invert Level (m)	10.757	Diameter (m)	0.026		

Node PP07 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.500	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	2.0		
Invert Level (m)	10.950	Diameter (m)	0.037		



Node 43 Offline Orifice Control

Flap Valve	✓	Invert Level (m)	9.683	Discharge Coefficient	0.600
Loop to Node	44	Diameter (m)	0.300		

Node 20 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	9.455	Product Number	CTL-SHE-0187-2100-2100-2100
Design Depth (m)	2.100	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	21.0	Min Node Diameter (mm)	1800

Node 41 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	8.961	Product Number	CTL-SHE-0137-8500-0900-8500
Design Depth (m)	0.900	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.5	Min Node Diameter (mm)	1200

Node 40 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	3.0	Invert Level (m)	8.994
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1620

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	225.5	0.0	1.000	538.0	0.0

Node PP01 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.200	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	496	Depth (m)	0.500
Safety Factor	2.0	Width (m)	13.610	Inf Depth (m)	
Porosity	0.30	Length (m)	60.000		

Node PP02 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.970	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	225	Depth (m)	0.480
Safety Factor	2.0	Width (m)	13.150	Inf Depth (m)	
Porosity	0.30	Length (m)	54.000		

Node PP03 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.840	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	390	Depth (m)	0.500
Safety Factor	2.0	Width (m)	15.700	Inf Depth (m)	
Porosity	0.30	Length (m)	21.300		

Node PP04 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.865	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	360	Depth (m)	0.480
Safety Factor	2.0	Width (m)	11.370	Inf Depth (m)	
Porosity	0.30	Length (m)	43.000		



Node PP05 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.375	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	540	Depth (m)	0.380
Safety Factor	2.0	Width (m)	10.700	Inf Depth (m)	
Porosity	0.30	Length (m)	37.000		

Node PP06 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.060	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	255	Depth (m)	0.480
Safety Factor	2.0	Width (m)	20.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Node PP07 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.360	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	176	Depth (m)	0.380
Safety Factor	2.0	Width (m)	18.000	Inf Depth (m)	
Porosity	0.30	Length (m)	20.000		

Node 43 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.692
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1125.0	0.0	0.300	1125.0	0.0	0.600	1125.0	0.0	0.801	0.0	0.0
0.100	1125.0	0.0	0.400	1125.0	0.0	0.700	1125.0	0.0			
0.200	1125.0	0.0	0.500	1125.0	0.0	0.800	1125.0	0.0			

Node 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	10.720
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	885

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	150.0	0.0	0.400	150.0	0.0	0.401	0.0	0.0

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	10.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	810

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	160.0	0.0	0.400	160.0	0.0	0.401	0.0	0.0

Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	10.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	1050



Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	120.0	0.0	0.400	120.0	0.0	0.401	0.0	0.0

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	10.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	810

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	60.0	0.0	0.400	60.0	0.0	0.401	0.0	0.0

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	10.870
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	465

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	90.0	0.0	0.400	90.0	0.0	0.401	0.0	0.0

Node 14 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.660	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	1035	Depth (m)	0.400
Safety Factor	2.0	Width (m)	14.250	Inf Depth (m)	
Porosity	0.95	Length (m)	7.000		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	1 year 1440 minute winter	3.326	1.326
1 year 15 minute winter	76.857	30.991	1 year 2160 minute summer	3.574	0.988
1 year 30 minute summer	71.439	20.215	1 year 2160 minute winter	2.462	0.988
1 year 30 minute winter	50.133	20.215	1 year 2880 minute summer	2.986	0.800
1 year 60 minute summer	48.435	12.800	1 year 2880 minute winter	2.007	0.800
1 year 60 minute winter	32.179	12.800	1 year 4320 minute summer	2.276	0.595
1 year 120 minute summer	30.053	7.942	1 year 4320 minute winter	1.499	0.595
1 year 120 minute winter	19.966	7.942	1 year 5760 minute summer	1.885	0.483
1 year 180 minute summer	23.233	5.979	1 year 5760 minute winter	1.220	0.483
1 year 180 minute winter	15.102	5.979	1 year 7200 minute summer	1.609	0.410
1 year 240 minute summer	18.475	4.882	1 year 7200 minute winter	1.038	0.410
1 year 240 minute winter	12.274	4.882	30 year 15 minute summer	268.706	76.035
1 year 360 minute summer	14.169	3.646	30 year 15 minute winter	188.566	76.035
1 year 360 minute winter	9.210	3.646	30 year 30 minute summer	174.929	49.499
1 year 480 minute summer	11.185	2.956	30 year 30 minute winter	122.757	49.499
1 year 480 minute winter	7.431	2.956	30 year 60 minute summer	116.589	30.811
1 year 600 minute summer	9.182	2.511	30 year 60 minute winter	77.459	30.811
1 year 600 minute winter	6.274	2.511	30 year 120 minute summer	70.438	18.615
1 year 720 minute summer	8.203	2.199	30 year 120 minute winter	46.797	18.615
1 year 720 minute winter	5.513	2.199	30 year 180 minute summer	53.298	13.715
1 year 960 minute summer	6.768	1.782	30 year 180 minute winter	34.645	13.715
1 year 960 minute winter	4.483	1.782	30 year 240 minute summer	41.604	10.995
1 year 1440 minute summer	4.949	1.326	30 year 240 minute winter	27.641	10.995



Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 360 minute summer	31.221	8.034	100 year +40% CC 120 minute summer	129.587	34.246
30 year 360 minute winter	20.295	8.034	100 year +40% CC 120 minute winter	86.094	34.246
30 year 480 minute summer	24.324	6.428	100 year +40% CC 180 minute summer	97.729	25.149
30 year 480 minute winter	16.160	6.428	100 year +40% CC 180 minute winter	63.526	25.149
30 year 600 minute summer	19.756	5.404	100 year +40% CC 240 minute summer	75.977	20.078
30 year 600 minute winter	13.498	5.404	100 year +40% CC 240 minute winter	50.477	20.078
30 year 720 minute summer	17.490	4.687	100 year +40% CC 360 minute summer	56.677	14.585
30 year 720 minute winter	11.754	4.687	100 year +40% CC 360 minute winter	36.841	14.585
30 year 960 minute summer	14.215	3.743	100 year +40% CC 480 minute summer	43.979	11.622
30 year 960 minute winter	9.416	3.743	100 year +40% CC 480 minute winter	29.219	11.622
30 year 1440 minute summer	10.161	2.723	100 year +40% CC 600 minute summer	35.604	9.738
30 year 1440 minute winter	6.829	2.723	100 year +40% CC 600 minute winter	24.327	9.738
30 year 2160 minute summer	7.160	1.979	100 year +40% CC 720 minute summer	31.433	8.424
30 year 2160 minute winter	4.933	1.979	100 year +40% CC 720 minute winter	21.125	8.424
30 year 2880 minute summer	5.883	1.577	100 year +40% CC 960 minute summer	25.432	6.697
30 year 2880 minute winter	3.953	1.577	100 year +40% CC 960 minute winter	16.847	6.697
30 year 4320 minute summer	4.374	1.143	100 year +40% CC 1440 minute summer	18.055	4.839
30 year 4320 minute winter	2.880	1.143	100 year +40% CC 1440 minute winter	12.134	4.839
30 year 5760 minute summer	3.554	0.910	100 year +40% CC 2160 minute summer	12.630	3.490
30 year 5760 minute winter	2.301	0.910	100 year +40% CC 2160 minute winter	8.702	3.490
30 year 7200 minute summer	2.987	0.762	100 year +40% CC 2880 minute summer	10.319	2.766
30 year 7200 minute winter	1.928	0.762	100 year +40% CC 2880 minute winter	6.935	2.766
100 year +40% CC 15 minute summer	488.233	138.153	100 year +40% CC 4320 minute summer	7.609	1.989
100 year +40% CC 15 minute winter	342.620	138.153	100 year +40% CC 4320 minute winter	5.011	1.989
100 year +40% CC 30 minute summer	320.551	90.705	100 year +40% CC 5760 minute summer	6.145	1.573
100 year +40% CC 30 minute winter	224.948	90.705	100 year +40% CC 5760 minute winter	3.978	1.573
100 year +40% CC 60 minute summer	214.603	56.713	100 year +40% CC 7200 minute summer	5.137	1.311
100 year +40% CC 60 minute winter	142.577	56.713	100 year +40% CC 7200 minute winter	3.316	1.311



Results for 1 year Critical Storm Duration. Lowest mass balance: 82.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	10.073	0.080	11.4	0.2666	0.0000	OK
240 minute winter	PP01	200	11.306	0.145	5.2	19.3212	0.0000	OK
15 minute winter	2	11	10.065	0.099	25.0	0.3395	0.0000	OK
15 minute winter	PP02	11	10.975	0.323	30.0	1.1578	0.0000	SURCHARGED
60 minute winter	3	56	10.057	0.215	35.7	0.6911	0.0000	OK
60 minute winter	4	57	10.058	0.210	7.1	0.6314	0.0000	OK
60 minute winter	5	57	10.056	0.284	9.8	0.7534	0.0000	OK
15 minute winter	PP03	10	10.685	0.085	17.6	0.2646	0.0000	OK
60 minute winter	6	57	10.056	0.302	12.9	0.8079	0.0000	OK
60 minute winter	7	58	10.056	0.334	45.4	1.1691	0.0000	OK
60 minute winter	8	58	10.055	0.406	35.8	1.0779	0.0000	OK
15 minute winter	PP04	10	10.866	0.106	13.5	0.2975	0.0000	OK
60 minute winter	9	52	10.057	0.107	7.0	0.2718	0.0000	OK
60 minute winter	PP05	50	11.419	0.662	5.1	4.6268	0.0000	FLOOD RISK
60 minute winter	10	52	10.057	0.131	10.8	0.3708	0.0000	OK
60 minute winter	11	60	10.056	0.206	17.9	0.6924	0.0000	OK
60 minute winter	12	60	10.057	0.238	22.0	0.7375	0.0000	OK
15 minute winter	PP06	10	10.977	0.075	8.0	0.1848	0.0000	OK
60 minute winter	14	59	10.056	0.318	4.2	0.8096	0.0000	OK
60 minute winter	13	59	10.056	0.311	3.6	0.9310	0.0000	OK
60 minute winter	15	59	10.056	0.347	25.1	0.9713	0.0000	OK
60 minute winter	16	59	10.055	0.388	15.5	1.0526	0.0000	OK
60 minute winter	17	60	10.055	0.431	41.3	1.4321	0.0000	OK
60 minute winter	18	59	10.056	0.497	34.6	1.3759	0.0000	OK
60 minute winter	19	59	10.056	0.574	26.0	1.6571	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	10.8	0.355	0.012	0.4412	
240 minute winter	PP01	2.000	2	1.0	0.532	0.056	0.0127	
15 minute winter	2	1.001	3	24.0	0.440	0.027	3.4303	
15 minute winter	PP02	3.000	3	27.8	1.578	1.565	0.1336	
60 minute winter	3	1.002	7	35.2	0.547	0.040	9.8735	
60 minute winter	4	4.000	5	4.0	0.231	0.005	5.4113	
60 minute winter	5	4.001	6	-9.0	0.136	-0.010	1.5775	
15 minute winter	PP03	5.000	6	17.3	1.104	0.156	0.1872	
60 minute winter	6	4.002	7	9.0	0.224	0.010	3.1969	
60 minute winter	7	1.003	8	35.1	0.548	0.040	8.9487	
60 minute winter	8	1.004	17	30.0	0.429	0.034	3.6118	
15 minute winter	PP04	6.000	9	13.1	1.048	0.740	0.1161	
60 minute winter	9	6.001	10	7.0	0.360	0.008	0.5944	
60 minute winter	PP05	7.000	10	1.1	0.557	0.063	0.0235	
60 minute winter	10	6.002	11	10.8	0.391	0.012	3.1450	
60 minute winter	11	6.003	12	17.5	0.511	0.020	1.8960	
60 minute winter	12	6.004	15	20.0	0.458	0.022	9.4496	
15 minute winter	PP06	8.000	14	7.8	0.936	0.441	0.0805	
60 minute winter	14	8.001	15	2.6	0.155	0.003	3.0685	
60 minute winter	13	9.000	15	1.7	0.185	0.002	3.7972	
60 minute winter	15	6.005	16	14.2	0.434	0.016	5.0928	
60 minute winter	16	6.006	17	12.8	0.354	0.014	2.6406	
60 minute winter	17	1.005	18	32.7	0.569	0.037	10.6763	
60 minute winter	18	1.006	19	24.0	0.393	0.027	15.2239	
60 minute winter	19	1.007	20	19.6	0.125	0.022	5.8833	



Results for 1 year Critical Storm Duration. Lowest mass balance: 82.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	20	59	10.056	0.601	23.6	2.0796	0.0000	OK
360 minute winter	21	344	9.933	0.525	17.6	1.3989	0.0000	OK
360 minute winter	22	344	9.933	0.544	19.1	2.0199	0.0000	OK
360 minute winter	23	344	9.933	0.681	17.9	2.0337	0.0000	OK
360 minute winter	24	344	9.933	0.726	15.5	1.8483	0.0000	OK
360 minute winter	25	344	9.933	0.745	14.9	2.0487	0.0000	OK
15 minute summer	43	1	9.683	-0.509	0.0	0.0000	0.0000	OK
240 minute winter	44	240	9.933	0.250	0.6	0.6370	0.0000	OK
240 minute winter	26	240	9.933	0.409	3.0	1.3788	0.0000	OK
360 minute winter	27	344	9.933	0.489	2.8	1.5471	0.0000	OK
360 minute winter	28	344	9.933	0.515	3.1	1.7047	0.0000	OK
360 minute winter	29	344	9.933	0.626	3.7	2.1462	0.0000	OK
360 minute winter	33	344	9.933	0.644	4.6	2.7709	0.0000	OK
30 minute winter	PP07	27	11.396	0.446	8.3	3.9634	0.0000	SURCHARGED
360 minute winter	34	344	9.933	0.756	5.1	2.4176	0.0000	OK
360 minute winter	36	344	9.933	0.814	14.7	2.4940	0.0000	OK
360 minute winter	37	344	9.933	0.856	10.9	2.1791	0.0000	SURCHARGED
1440 minute winter	38	1440	9.358	0.319	10.0	0.5644	0.0000	OK
1440 minute winter	39	1440	9.358	0.334	9.9	0.5907	0.0000	OK
1440 minute winter	40	1440	9.358	0.364	9.9	103.4794	0.0000	OK
1440 minute winter	41	1440	9.358	0.397	8.5	0.7016	0.0000	OK
1440 minute summer	42	1170	8.987	0.070	8.5	0.1245	0.0000	OK
360 minute winter	45	888	8.961	0.059	8.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	20	1.008	21	20.3	0.519	0.023	5.6399	
360 minute winter	21	1.009	22	16.8	0.503	0.019	3.7037	
360 minute winter	22	1.010	23	17.0	0.430	0.019	31.2590	
360 minute winter	23	1.011	24	15.5	0.396	0.017	11.9403	
360 minute winter	24	1.012	25	14.5	0.403	0.016	5.3557	
360 minute winter	25	1.013	36	13.7	0.199	0.013	13.7185	
15 minute summer	43	10.000	44	0.0	0.000	0.000	0.0000	
15 minute summer	43	Orifice	44	0.0				0.0
240 minute winter	44	10.001	26	-0.6	-0.160	-0.001	0.5667	
240 minute winter	26	10.002	27	2.2	0.236	0.003	12.6611	
360 minute winter	27	10.003	28	2.0	0.247	0.002	4.7616	
360 minute winter	28	10.004	29	2.5	0.226	0.003	23.5152	
360 minute winter	29	10.005	33	2.2	0.237	0.002	4.1872	
360 minute winter	33	10.006	34	2.7	0.271	0.003	29.4407	
30 minute winter	PP07	12.000	34	1.9	1.729	0.026	0.0067	
360 minute winter	34	10.007	36	3.7	0.255	0.004	17.1278	
360 minute winter	36	1.014	37	10.9	0.162	0.012	12.7588	
360 minute winter	37	1.015	38	10.0	0.460	0.046	1.9541	
1440 minute winter	38	1.016	39	9.9	0.375	0.046	1.0509	
1440 minute winter	39	1.017	40	9.9	0.555	0.046	2.2960	
1440 minute winter	40	1.018	41	8.5	0.123	0.040	2.8026	
1440 minute winter	41	1.019	42	8.5	0.565	0.023	0.1106	
1440 minute summer	42	1.020	45	8.5	0.561	0.039	0.1103	654.4



Results for 30 year Critical Storm Duration. Lowest mass balance: 82.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	1	705	10.968	0.975	2.2	3.2655	0.0000	SURCHARGED
240 minute winter	PP01	232	11.439	0.278	11.7	52.5608	0.0000	SURCHARGED
720 minute winter	2	705	10.968	1.002	9.3	38.8513	0.0000	SURCHARGED
15 minute winter	PP02	14	11.051	0.399	73.7	12.9623	0.0000	SURCHARGED
720 minute winter	3	705	10.968	1.126	12.4	36.8165	0.0000	SURCHARGED
720 minute winter	4	705	10.968	1.120	2.5	3.3671	0.0000	SURCHARGED
720 minute winter	5	705	10.968	1.196	3.7	3.1704	0.0000	SURCHARGED
720 minute winter	PP03	705	10.968	0.368	3.7	12.7847	0.0000	SURCHARGED
720 minute winter	6	705	10.968	1.214	13.9	39.5543	0.0000	SURCHARGED
720 minute winter	7	705	10.968	1.246	17.7	4.3646	0.0000	SURCHARGED
720 minute winter	8	705	10.968	1.319	16.0	3.4980	0.0000	SURCHARGED
720 minute winter	PP04	705	10.968	0.208	2.6	12.5529	0.0000	SURCHARGED
720 minute winter	9	705	10.968	1.018	2.9	11.0120	0.0000	SURCHARGED
120 minute winter	PP05	114	11.502	0.745	7.6	14.7254	0.0000	FLOOD RISK
720 minute winter	10	705	10.968	1.042	4.2	15.4105	0.0000	SURCHARGED
720 minute winter	11	705	10.968	1.118	5.8	3.7509	0.0000	SURCHARGED
720 minute winter	12	705	10.968	1.149	6.4	3.5665	0.0000	SURCHARGED
15 minute winter	PP06	11	11.064	0.162	19.7	0.4550	0.0000	SURCHARGED
720 minute winter	14	705	10.968	1.230	8.0	31.9916	0.0000	SURCHARGED
720 minute winter	13	705	10.968	1.223	1.3	3.6605	0.0000	SURCHARGED
720 minute winter	15	705	10.968	1.259	7.3	3.5228	0.0000	SURCHARGED
720 minute winter	16	705	10.968	1.301	7.5	3.5257	0.0000	SURCHARGED
720 minute winter	17	705	10.968	1.344	15.8	4.4621	0.0000	SURCHARGED
720 minute winter	18	705	10.968	1.409	14.5	3.9015	0.0000	SURCHARGED
720 minute winter	19	705	10.968	1.486	13.3	4.2870	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	1	1.000	2	1.8	0.197	0.002	8.6086	
240 minute winter	PP01	2.000	2	1.4	0.590	0.080	0.0165	
720 minute winter	2	1.001	3	-6.3	0.264	-0.007	39.2610	
15 minute winter	PP02	3.000	3	31.6	1.795	1.780	0.1336	
720 minute winter	3	1.002	7	9.5	0.363	0.011	37.9713	
720 minute winter	4	4.000	5	2.9	0.198	0.003	24.1785	
720 minute winter	5	4.001	6	-3.4	0.134	-0.004	5.5893	
720 minute winter	PP03	5.000	6	3.4	0.703	0.031	0.8402	
720 minute winter	6	4.002	7	-9.7	0.169	-0.011	10.1334	
720 minute winter	7	1.003	8	-15.9	0.423	-0.018	23.0700	
720 minute winter	8	1.004	17	-15.8	0.354	-0.018	7.9196	
720 minute winter	PP04	6.000	9	2.6	0.703	0.146	0.1627	
720 minute winter	9	6.001	10	-2.9	0.234	-0.003	7.6186	
120 minute winter	PP05	7.000	10	1.2	0.567	0.067	0.1066	
720 minute winter	10	6.002	11	3.8	0.295	0.004	24.0435	
720 minute winter	11	6.003	12	5.1	0.354	0.006	9.8907	
720 minute winter	12	6.004	15	5.5	0.315	0.006	33.4626	
15 minute winter	PP06	8.000	14	18.4	1.075	1.037	0.1600	
720 minute winter	14	8.001	15	-7.2	0.082	-0.008	9.1365	
720 minute winter	13	9.000	15	0.8	0.074	0.001	11.4681	
720 minute winter	15	6.005	16	-6.2	0.352	-0.007	13.2478	
720 minute winter	16	6.006	17	-7.1	0.335	-0.008	6.1831	
720 minute winter	17	1.005	18	14.1	0.416	0.016	20.5393	
720 minute winter	18	1.006	19	12.8	0.226	0.014	24.5492	
720 minute winter	19	1.007	20	12.2	0.103	0.014	8.5002	



Results for 30 year Critical Storm Duration. Lowest mass balance: 82.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	20	705	10.968	1.513	13.8	5.2318	0.0000	SURCHARGED
480 minute winter	21	344	10.924	1.516	14.9	4.0371	0.0000	SURCHARGED
480 minute winter	22	344	10.924	1.535	16.7	5.6964	0.0000	SURCHARGED
480 minute winter	23	344	10.924	1.672	15.1	4.9909	0.0000	SURCHARGED
480 minute winter	24	344	10.924	1.717	12.3	4.3697	0.0000	FLOOD RISK
480 minute winter	25	344	10.924	1.736	11.7	4.7722	0.0000	FLOOD RISK
480 minute winter	43	384	9.694	-0.498	1.4	2.5823	0.0000	OK
480 minute winter	44	344	10.924	1.241	1.5	3.1583	0.0000	SURCHARGED
480 minute winter	26	344	10.924	1.400	6.9	4.7166	0.0000	SURCHARGED
480 minute winter	27	344	10.924	1.480	6.2	4.6797	0.0000	SURCHARGED
480 minute winter	28	344	10.924	1.506	8.2	4.9818	0.0000	SURCHARGED
480 minute winter	29	344	10.924	1.617	8.9	5.5414	0.0000	SURCHARGED
480 minute winter	33	344	10.924	1.635	14.5	7.0321	0.0000	SURCHARGED
60 minute winter	PP07	59	11.482	0.532	13.4	13.5395	0.0000	SURCHARGED
480 minute winter	34	344	10.924	1.747	18.3	5.5851	0.0000	SURCHARGED
480 minute winter	36	344	10.924	1.805	19.6	5.5286	0.0000	FLOOD RISK
480 minute winter	37	344	10.924	1.847	10.9	4.7005	0.0000	FLOOD RISK
4320 minute winter	38	3720	9.673	0.634	10.0	1.1196	0.0000	SURCHARGED
4320 minute winter	39	3720	9.673	0.649	9.9	1.1461	0.0000	FLOOD RISK
4320 minute winter	40	3720	9.673	0.679	14.9	226.1479	0.0000	FLOOD RISK
4320 minute winter	41	3720	9.672	0.711	32.7	1.2572	0.0000	SURCHARGED
60 minute summer	42	771	8.987	0.070	8.5	0.1245	0.0000	OK
60 minute summer	45	771	8.961	0.059	8.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	20	1.008	21	12.9	0.443	0.014	14.8658	
480 minute winter	21	1.009	22	-14.5	0.468	-0.016	5.9797	
480 minute winter	22	1.010	23	13.8	0.472	0.016	43.2595	
480 minute winter	23	1.011	24	12.3	0.426	0.014	14.2346	
480 minute winter	24	1.012	25	11.4	0.422	0.013	6.1178	
480 minute winter	25	1.013	36	10.8	0.178	0.010	14.9292	
480 minute winter	43	10.000	44	-1.4	-1.413	-0.020	0.0047	
480 minute winter	43	Orifice	44	0.0				0.0
480 minute winter	44	10.001	26	-1.5	-0.030	-0.003	1.8934	
480 minute winter	26	10.002	27	-3.4	0.184	-0.004	25.3883	
480 minute winter	27	10.003	28	-3.9	0.220	-0.004	8.2967	
480 minute winter	28	10.004	29	5.6	0.248	0.006	35.2175	
480 minute winter	29	10.005	33	8.3	0.267	0.009	5.5474	
480 minute winter	33	10.006	34	13.9	0.305	0.016	35.3899	
60 minute winter	PP07	12.000	34	2.0	1.768	0.028	0.0584	
480 minute winter	34	10.007	36	17.8	0.293	0.020	18.5227	
480 minute winter	36	1.014	37	10.9	0.163	0.012	13.1914	
480 minute winter	37	1.015	38	10.0	0.469	0.046	2.7935	
4320 minute winter	38	1.016	39	9.9	0.352	0.046	1.6071	
4320 minute winter	39	1.017	40	9.9	0.481	0.046	3.2537	
4320 minute winter	40	1.018	41	32.7	0.151	0.152	3.6140	
4320 minute winter	41	1.019	42	8.5	0.564	0.023	0.1106	
60 minute summer	42	1.020	45	8.5	0.561	0.039	0.1103	632.6



Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 82.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	1	540	11.407	1.414	4.2	4.7361	0.0000	SURCHARGED
480 minute winter	PP01	464	11.660	0.499	12.4	107.7844	0.0000	SURCHARGED
720 minute winter	2	540	11.407	1.441	13.5	62.0757	0.0000	SURCHARGED
720 minute winter	PP02	555	11.409	0.757	13.5	90.4498	0.0000	SURCHARGED
720 minute winter	3	540	11.407	1.565	36.2	65.9793	0.0000	SURCHARGED
720 minute winter	4	540	11.407	1.559	4.6	4.6884	0.0000	SURCHARGED
720 minute winter	5	540	11.407	1.635	7.0	4.3348	0.0000	FLOOD RISK
720 minute winter	PP03	540	11.407	0.807	8.9	51.3081	0.0000	SURCHARGED
720 minute winter	6	540	11.407	1.653	11.4	50.1411	0.0000	SURCHARGED
720 minute winter	7	540	11.407	1.685	22.3	5.9031	0.0000	SURCHARGED
720 minute winter	8	540	11.407	1.758	13.4	4.6625	0.0000	SURCHARGED
720 minute winter	PP04	540	11.408	0.648	10.9	69.1487	0.0000	SURCHARGED
720 minute winter	9	540	11.407	1.457	14.2	37.9938	0.0000	SURCHARGED
180 minute winter	PP05	180	11.661	0.904	10.2	33.8874	0.0000	FLOOD RISK
720 minute winter	10	540	11.407	1.481	18.9	27.0589	0.0000	SURCHARGED
720 minute winter	11	540	11.407	1.557	16.6	5.2242	0.0000	SURCHARGED
720 minute winter	12	540	11.407	1.588	12.3	4.9296	0.0000	SURCHARGED
720 minute winter	PP06	540	11.407	0.505	4.1	21.7886	0.0000	FLOOD RISK
720 minute winter	14	540	11.407	1.669	20.9	41.8689	0.0000	SURCHARGED
720 minute winter	13	540	11.407	1.662	2.4	4.9748	0.0000	SURCHARGED
720 minute winter	15	540	11.407	1.698	21.5	4.7514	0.0000	SURCHARGED
720 minute winter	16	540	11.407	1.740	19.1	4.7157	0.0000	FLOOD RISK
720 minute winter	17	540	11.407	1.783	27.4	5.9199	0.0000	FLOOD RISK
720 minute winter	18	540	11.407	1.848	24.5	5.1173	0.0000	SURCHARGED
720 minute winter	19	540	11.407	1.925	24.1	5.5537	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	1	1.000	2	7.0	0.199	0.008	8.6086	
480 minute winter	PP01	2.000	2	1.9	0.630	0.106	0.1205	
720 minute winter	2	1.001	3	11.1	0.258	0.012	39.2610	
720 minute winter	PP02	3.000	3	10.1	0.975	0.568	0.1350	
720 minute winter	3	1.002	7	-22.2	0.347	-0.025	37.9713	
720 minute winter	4	4.000	5	2.8	0.197	0.003	24.1785	
720 minute winter	5	4.001	6	-6.5	0.135	-0.007	5.5893	
720 minute winter	PP03	5.000	6	6.2	0.790	0.056	0.8402	
720 minute winter	6	4.002	7	10.2	0.162	0.012	10.1334	
720 minute winter	7	1.003	8	13.0	0.422	0.015	23.0700	
720 minute winter	8	1.004	17	13.4	0.347	0.015	7.9196	
720 minute winter	PP04	6.000	9	-6.2	0.803	-0.348	0.1627	
720 minute winter	9	6.001	10	-14.2	0.226	-0.016	7.6186	
180 minute winter	PP05	7.000	10	2.1	0.566	0.116	0.2048	
720 minute winter	10	6.002	11	-16.1	0.288	-0.018	24.0435	
720 minute winter	11	6.003	12	-11.8	0.338	-0.013	9.8907	
720 minute winter	12	6.004	15	-9.2	0.312	-0.010	33.4626	
720 minute winter	PP06	8.000	14	2.8	0.711	0.158	0.1694	
720 minute winter	14	8.001	15	-18.2	0.081	-0.020	9.1365	
720 minute winter	13	9.000	15	2.7	0.072	0.003	11.4681	
720 minute winter	15	6.005	16	-18.2	0.353	-0.021	13.2478	
720 minute winter	16	6.006	17	-18.2	0.331	-0.021	6.1831	
720 minute winter	17	1.005	18	-23.7	0.439	-0.027	20.5393	
720 minute winter	18	1.006	19	-23.3	0.331	-0.026	24.5492	
720 minute winter	19	1.007	20	-22.4	0.115	-0.025	8.5002	



Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 82.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	20	540	11.407	1.952	23.4	6.7501	0.0000	SURCHARGED
60 minute winter	21	38	11.155	1.747	27.7	4.6532	0.0000	SURCHARGED
60 minute winter	22	38	11.156	1.767	69.0	6.5559	0.0000	SURCHARGED
60 minute winter	23	38	11.147	1.895	47.4	5.6556	0.0000	SURCHARGED
60 minute winter	24	39	11.135	1.928	34.5	4.9067	0.0000	FLOOD RISK
60 minute winter	25	39	11.134	1.946	45.8	5.3482	0.0000	FLOOD RISK
1440 minute winter	43	1590	10.471	0.279	30.7	833.7846	0.0000	OK
60 minute winter	44	39	11.125	1.442	213.0	3.6690	0.0000	SURCHARGED
60 minute winter	26	39	11.132	1.608	214.6	5.4189	0.0000	SURCHARGED
60 minute winter	27	39	11.140	1.696	188.9	5.3640	0.0000	FLOOD RISK
60 minute winter	28	39	11.141	1.723	173.1	5.6996	0.0000	SURCHARGED
60 minute winter	29	39	11.136	1.829	144.5	6.2664	0.0000	SURCHARGED
60 minute winter	33	39	11.135	1.846	106.9	7.9376	0.0000	FLOOD RISK
120 minute winter	PP07	116	11.633	0.683	15.1	30.2448	0.0000	FLOOD RISK
60 minute winter	34	39	11.131	1.954	73.3	6.2469	0.0000	SURCHARGED
60 minute winter	36	39	11.135	2.016	67.0	6.1756	0.0000	FLOOD RISK
60 minute winter	37	39	11.126	2.049	29.7	5.2158	0.0000	FLOOD RISK
7200 minute winter	38	7020	9.868	0.829	10.0	1.4649	0.0000	SURCHARGED
7200 minute winter	39	7020	9.868	0.844	10.0	1.4913	0.0000	FLOOD RISK
7200 minute winter	40	7020	9.868	0.874	22.1	317.9395	0.0000	FLOOD RISK
7200 minute winter	41	7020	9.868	0.907	30.5	1.6023	0.0000	SURCHARGED
480 minute summer	42	928	8.987	0.070	8.5	0.1245	0.0000	OK
480 minute summer	45	928	8.961	0.059	8.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	20	1.008	21	20.6	0.496	0.023	14.8658	
60 minute winter	21	1.009	22	-24.2	0.487	-0.027	5.9797	
60 minute winter	22	1.010	23	32.2	0.593	0.036	43.2595	
60 minute winter	23	1.011	24	34.5	0.485	0.039	14.2346	
60 minute winter	24	1.012	25	40.9	0.440	0.046	6.1178	
60 minute winter	25	1.013	36	52.4	0.207	0.049	14.9292	
1440 minute winter	43	10.000	44	-30.7	-3.292	-0.434	0.1628	
1440 minute winter	43	Orifice	44	6.5				206.2
60 minute winter	44	10.001	26	-213.0	-0.484	-0.388	1.8934	
60 minute winter	26	10.002	27	-191.5	0.375	-0.216	25.3883	
60 minute winter	27	10.003	28	-173.9	0.432	-0.196	8.2967	
60 minute winter	28	10.004	29	-153.9	0.426	-0.174	35.2175	
60 minute winter	29	10.005	33	-120.0	0.462	-0.135	5.5474	
60 minute winter	33	10.006	34	-62.1	0.609	-0.070	35.3899	
120 minute winter	PP07	12.000	34	3.9	1.755	0.054	0.1097	
60 minute winter	34	10.007	36	50.4	0.541	0.057	18.5227	
60 minute winter	36	1.014	37	29.7	0.398	0.034	13.1914	
60 minute winter	37	1.015	38	11.0	0.490	0.051	1.9761	
7200 minute winter	38	1.016	39	10.0	0.349	0.046	1.6071	
7200 minute winter	39	1.017	40	10.0	0.440	0.046	3.2537	
7200 minute winter	40	1.018	41	30.5	0.141	0.141	3.6140	
7200 minute winter	41	1.019	42	8.5	0.564	0.023	0.1106	
480 minute summer	42	1.020	45	8.5	0.561	0.039	0.1103	924.3

Appendix H

Drainage Maintenance Schedule

SUDS Feature	Regular Maintenance Activity	Frequency	Occasional Maintenance Activity	Frequency	Responsibility
Pipes and Manholes	Visual inspection	Monthly or as required	Cleaning/jetting when silt accumulation occurs	Annually or as required	Highway Authority/Maintenance company/Southern Water.
Gullies	Visual inspection	Monthly or as required	Gully pots to be emptied	Annually or as required	Highway Authority
Control Structures	Inspect control structures for blockages and remove blockage if found	Monthly or as required	Maintenance in accordance with manufacturers recommendations	Annually or as required	Maintenance Company/Southern Water
Permeable Paving	Visual Inspection	Monthly or as required	Remove debris and sweep	Annually or as required	Maintenance Company/Householder
Basin	- Remove litter - Inspect outlets - Mow grass to swales & margins at 75-100mm	Monthly or as required	- Outlet cleaning - Remove silt from channels - Remove silt from catchpits - Remove leaf accumulation	Annually or as required	Maintenance Company
Storage Crates	Visual Inspection	Monthly or as required	Maintenance in accordance with manufacturers recommendations	Annually or as required	Maintenance Company

Title: SITE SPECIFIC FLOOD RISK ASSESSMENT
 Project: Land Off St Georges Avenue, Havant
 Client: Barratt David Wilson Homes
 Project No.: 61195

Appendix I

Ground Water Monitoring

Site Emsworth Triangle Site - Saxon Corner Phase 2

Client BDW Southampton



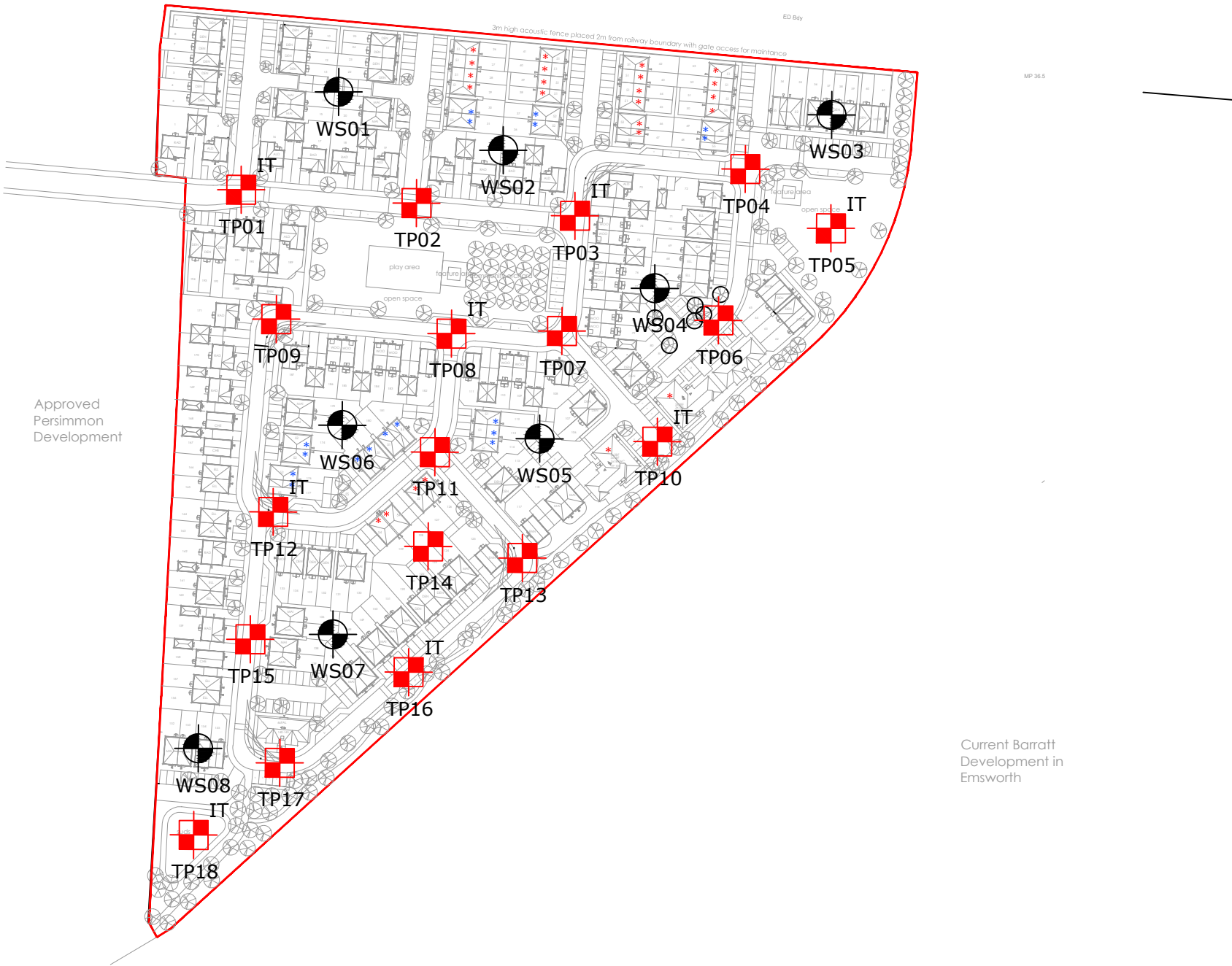
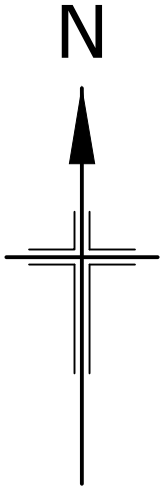
Winter Water Level Monitoring Results - measured in metres below ground level (m bgl)

Date	BH1	BH2	BH3	BH4	BH5
12 Dec 2019	2.30	1.45	2.52	2.10	0.97
14 Jan 2020	1.47	0.87	2.37	1.80	0.40
15 Feb 2020	1.80	0.75	2.20	1.85	0.33
12 Mar 2020	1.97	1.03	2.10	1.68	0.42
31 Oct 2020	2.03	1.45	3.00	1.97	1.44
17 Nov 2020	1.63	0.99	1.79	1.47	0.38
18 Dec 2020	1.59	0.97	1.78	1.45	0.38
19 Jan 2021	1.62	1.05	1.84	1.51	0.43
15 Feb 2021	1.65	1.11	1.89	1.59	0.50

Appendix J

Ground Investigations

DO NOT SCALE



KEY:



TRIAL PIT LOCATIONS
(TP01 - TP18)



WINDOWLESS SAMPLER
BOREHOLE LOCATIONS
(WS01 - WS08)



INFILTRATION TEST
LOCATION

REV	DATE	DESCRIPTION	DRAWN	CHKD

REVISIONS

This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.



Project

SAXONS CORNER, EMSWORTH

Title

PROPOSED EXPLORATORY HOLE
LOCATION PLAN

Client

BDW SOUTHAMPTON

Scale 1:2000 @ A3	Drawn FM	Date JUNE 21
Job Manager KB	Checked	Approved

847, The Crescent, Colchester, Essex CO4 9YQ
Unit 06C130, 6th Floor, 1 St. Katherine's Way, London, E1W 1UN
5 Queen House, Mill Court, Great Shelford, Cambs CB22 5LD
4 The Old Church, St. Matthews Road, Norwich, Norfolk NR1 1SP
The Wheelhouse, Bonds Mill, Stonehouse, Gloucestershire GL10 3RF
Email Address: mail@rj-uk.com

Tel: 01206 228800
Tel: 020 7448 9910
Tel: 01223 314794
Tel: 01603 230240
Tel: 01172 020070
Website: http://www.rj-uk.com

Drawing No.
61195-G-FIG02

Revision

Drawing Status

☒ INFORMATION

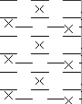
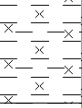
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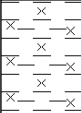
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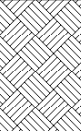
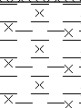
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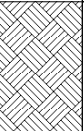
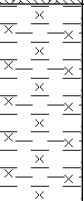
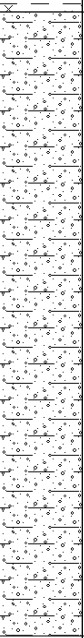
☐ CONSTRUCTION

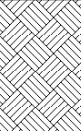
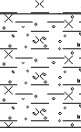
☐ AS CONSTRUCTED

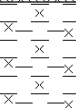
Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords:		Date			
				Orientation:		08/06/2021			
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		Dimensions (m)			
Client: BDW Southampton				Depth (m): 0.90		Scale 1:20			
						Logged TS			
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES1		0.75	0.90	  	Light brown silty TOPSOIL. TOPSOIL		
	0.50	ES2					Soft/firm orange/brown SILT/CLAY.		
	0.70	B1					End of Pit at 0.900m		
Groundwater: Groundwater not encountered						Key			
Stability: Dry and Stable						D	Disturbed	IVN	Hand Vane
Remarks:						B	Bulk	PID	PID Reading
						ES	Environmental	PP	Pocket Penetrometer
						▽	Groundwater strike	▼	Standing water level

 Richard Jackson Engineering Consultants					5 Quern House, Mill Court, Gt. Shelford, CB22 5LD		Trial Pit No. TP02 Sheet 1 of 1			
Project Name: Saxons Corner Ph 2			Project No. 61195		Co-ords: Orientation:		Date 08/06/2021			
Location: St Georges Avenue, Emsworth Road, Havant					Level (m, aOD):		Dimensions (m) 1.30			
Client: BDW Southampton					Depth (m): 1.00		Scale 1:20 Logged TS			
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.40	ES1			0.35		Light brown silty TOPSOIL. TOPSOIL			
	0.70	B1					Soft/firm orange/brown SILT/CLAY.			
	0.80	ES2			0.85		Brown/orange clayey GRAVEL of subangular to subrounded fine to coarse with occasional cobble flint.			
	1.00	D1			1.00		End of Pit at 1.000m			
Groundwater: Groundwater not encountered							Key			
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane
Remarks:							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
								Groundwater strike		Standing water level

Richard Jackson Engineering Consultants					5 Quern House, Mill Court, Gt. Shelford, CB22 5LD		Trial Pit No. TP03 Sheet 1 of 1			
Project Name: Saxons Corner Ph 2			Project No. 61195		Co-ords: Orientation:		Date 07/06/2021			
Location: St Georges Avenue, Emsworth Road, Havant					Level (m, aOD):		Dimensions (m) 1.20			
Client: BDW Southampton					Depth (m): 0.85		Scale 1:20 Logged TS			
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.30	ES1			0.35		Light brown silty TOPSOIL. TOPSOIL			
	0.60	ES2					Soft/firm orange/brown SILT/CLAY.			
	0.70	B1								
					0.85		End of Pit at 0.850m			
Groundwater: Groundwater not encountered							Key			
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane
Remarks:							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
								Groundwater strike		Standing water level

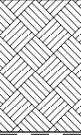
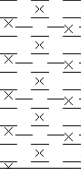
Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords:		Date				
				Orientation:		07/06/2021				
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		Dimensions (m)				
Client: BDW Southampton				Depth (m): 2.55		Scale 1:20				
						Logged TS				
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
▼	0.20	ES1			0.35		Light brown silty clay TOPSOIL. TOPSOIL			
	0.60	ES2			0.90		Soft brown/orange SILT/CLAY.			
	0.70	B1								
	1.00	D1								
	2.55	D2			2.55		Brown slightly sandy clayey GRAVEL of subangular to subrounded fine to coarse with occasional cobble flint.			
							End of Pit at 2.550m			
Groundwater: Water seepage noted at 2.45m							Key			
Stability: Sidewall collapse from 1.30m							D	Disturbed	IVN	Hand Vane
Remarks:							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
							▼	Groundwater strike	▼	Standing water level

Richard Jackson Engineering Consultants					5 Quern House, Mill Court, Gt. Shelford, CB22 5LD		Trial Pit No. TP05 Sheet 1 of 1			
Project Name: Saxons Corner Ph 2				Project No. 61195		Co-ords: Orientation:		Date 07/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant						Level (m, aOD):		Dimensions (m) 1.10		
Client: BDW Southampton						Depth (m): 0.80		Scale 1:20 Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.70	B1			0.35 0.50 0.80		Light brown slightly sandy clay TOPSOIL. TOPSOIL			
							Brown/orange silty CLAY.			
							Soft/firm orange/brown slightly gravelly silty CLAY. Gravel of subangular to subrounded fine to coarse flint.			
							End of Pit at 0.800m			
Groundwater: Groundwater not encountered							Key			
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane
Remarks:							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
								Groundwater strike		Standing water level

Richard Jackson Engineering Consultants					5 Quern House, Mill Court, Gt. Shelford, CB22 5LD		Trial Pit No. TP06 Sheet 1 of 1			
Project Name: Saxons Corner Ph 2				Project No. 61195		Co-ords: Orientation:		Date 07/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant						Level (m, aOD):		Dimensions (m) 1.60		
Client: BDW Southampton						Depth (m): 1.00		Scale 1:20 Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.50	ES1			0.35		Light brown slightly sandy silty TOPSOIL.			
	0.70	B1					Soft/firm orange/brown SILT/CLAY.			
	0.85	ES2			0.85		Dark brown clayey GRAVEL of subangular to subrounded fine to coarse flint.			
	1.00	D1			1.00		End of Pit at 1.000m			
Groundwater: Groundwater not encountered							Key			
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane
Remarks:							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
								Groundwater strike		Standing water level



Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords: Orientation:		Dimensions (m) 1.60		Date 07/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		0.50		Scale 1:20		
Client: BDW Southampton				Depth (m): 2.40				Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
▼					0.35		Light brown silty TOPSOIL. TOPSOIL			
	0.70	B1					Soft/firm orange/brown SILT/CLAY with black specks.			
	0.80	ES1			0.90		Dark brown clayey GRAVEL of subangular to subrounded fine to coarse with occasional cobble of flint.			
	1.10	ES2					...pink hue at 1.50m.			
	1.20	D1			2.30 2.40		Green/brown (olive green that rapidly became brown on exposure to air) silty SAND. End of Pit at 2.400m			
Groundwater: Water seepage noted at 2.25m							Key			
Stability: Slight sidewall collapse above 2.30							D	Disturbed	IVN	Hand Vane
Remarks:							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
								Groundwater strike		Standing water level

Richard Jackson Engineering Consultants					5 Quern House, Mill Court, Gt. Shelford, CB22 5LD		Trial Pit No. TP08 Sheet 1 of 1							
Project Name: Saxons Corner Ph 2			Project No. 61195		Co-ords: Orientation:		Date 08/06/2021							
Location: St Georges Avenue, Emsworth Road, Havant					Level (m, aOD):		Dimensions (m) 1.20		Scale 1:20					
Client: BDW Southampton					Depth (m): 0.80		0.50		Logged TS					
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description							
	Depth	Type	Results											
	0.30	ES1			0.35		Light brown silty TOPSOIL. TOPSOIL					1 2 3 4		
							Soft/firm orange/brown slightly mottled light grey silty CLAY.							
	0.70	B1												
	0.80	ES2			0.80		End of Pit at 0.800m							
Groundwater: Groundwater not encountered							Key							
Stability: Dry and Stable							D B ES		Disturbed Bulk Environmental		IVN PID PP		Hand Vane PID Reading Pocket Penetrometer	
Remarks:									Groundwater strike				Standing water level	



Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords: Orientation:		Dimensions (m) 2.10		Date 08/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		0.50		Scale 1:20		
Client: BDW Southampton				Depth (m): 2.80				Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
▼					0.35		Light brown silty TOPSOIL. TOPSOIL			
	0.70	B1					Soft/firm orange/brown mottled light grey silty CLAY with black specks.			
	0.70	ES1								
	1.00	ES2			1.00		Orange/brown mottled light grey clayey GRAVEL of subangular to subrounded fine to coarse with occasional cobble flint with black specks in clay.			
	1.20	D1								
	2.30	D2			2.10		Brown/green (olive green rapidly becoming brown in air) silty fine SAND. Moist.			
	2.80	D3			2.80		End of Pit at 2.800m			
Groundwater: Moist at 2.20m							Key			
Stability: Sidewall collapse from 2.10m							D	Disturbed	IVN	Hand Vane
							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
Remarks:								Groundwater strike		Standing water level

Richard Jackson Engineering Consultants					5 Quern House, Mill Court, Gt. Shelford, CB22 5LD		Trial Pit No. TP10 Sheet 1 of 1					
Project Name: Saxons Corner Ph 2				Project No. 61195		Co-ords: Orientation:		Date 07/06/2021				
Location: St Georges Avenue, Emsworth Road, Havant						Level (m, aOD):		Dimensions (m) 1.50		Scale 1:20		
Client: BDW Southampton						Depth (m): 1.00		0.50		Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description					
	Depth	Type	Results									
							Light brown silty TOPSOIL. TOPSOIL					1
	0.40	ES1			0.35		Soft/firm orange/brown SILT/CLAY.					
	0.60	ES2										
	0.70	B1										
	0.90	D1			0.80		Orange/brown clayey GRAVEL of subangular to subrounded fine to coarse flint.					
					1.00		End of Pit at 1.000m					4
Groundwater: Groundwater not encountered							Key					
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane		
Remarks:							B	Bulk	PID	PID Reading		
							ES	Environmental	PP	Pocket Penetrometer		
								Groundwater strike		Standing water level		



Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords: Orientation:		Dimensions (m) 1.50		Date 08/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		0.50		Scale 1:20		
Client: BDW Southampton				Depth (m): 1.05				Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
							Light brown silty TOPSOIL. TOPSOIL Soft/firm orange/brown/light grey mottled silty CLAY with black specks. Brown/orange clayey GRAVEL of subangular to subrounded fine to coarse flint. End of Pit at 1.050m			
	0.50	ES1			0.35					
	0.70	B1								
	0.80	ES2								
	1.00	D1			1.00 1.05					
Groundwater: Groundwater not encountered							Key			
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane
							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
Remarks:								Groundwater strike		Standing water level



Project Name: Saxons Corner Ph 2				Project No. 61195		Co-ords: Orientation:		Dimensions (m) 1.50		Date 08/06/2021	
Location: St Georges Avenue, Emsworth Road, Havant						Level (m, aOD):		0.50		Scale 1:20	
Client: BDW Southampton						Depth (m): 0.90				Logged TS	
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description				
	Depth	Type	Results								
	0.20	ES1					Light brown silty TOPSOIL. TOPSOIL				
	0.50	ES2					Soft brown/orange SILT/CLAY.				
	0.70	B1					Soft firm orange/brown/light grey mottled silty CLAY.				
							End of Pit at 0.900m				
Groundwater: Groundwater not encountered							Key				
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane	
Remarks:							B	Bulk	PID	PID Reading	
							ES	Environmental	PP	Pocket Penetrometer	
								Groundwater strike		Standing water level	



Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords: Orientation:		Dimensions (m) 2.10		Date 07/06/2021										
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		0.50		Scale 1:20										
Client: BDW Southampton				Depth (m): 2.80				Logged TS										
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description											
	Depth	Type	Results															
▼	0.70	B1			0.35		Light brown silty clay TOPSOIL. TOPSOIL			1								
							Soft/firm orange/brown SILT/CLAY.											
							...land drain at 0.70m.											
							1.00 1.10 1.20	ES1 D1 ES2	1.20			Firm orange/brown mottled grey silty CLAY with black specks.						
												Firm/brown/orange/grey very gravelly CLAY.						
												1.50	D2	1.70		Dark brown clayey GRAVEL of subangular to subrounded fine to coarse flint.		
																...clay has reddish/pink hue at 2.30m.		
							2.00	D3	2.50			Brown silty fine SAND. Moist.						
												End of Pit at 2.800m						
							2.60	D4	2.80						3			
							4											
Groundwater: Water seepage noted at 2.50m.							Key											
Stability: Sidewall collapse from 2.50m							D	Disturbed	IVN	Hand Vane								
							B	Bulk	PID	PID Reading								
							ES	Environmental	PP	Pocket Penetrometer								
Remarks:								Groundwater strike		Standing water level								

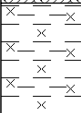


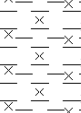
Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords: Orientation:		Dimensions (m) 1.80		Date 07/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		0.50		Scale 1:20		
Client: BDW Southampton				Depth (m): 1.05				Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.40	ES1			0.35		Light brown silty clay TOPSOIL. TOPSOIL			
							Soft/firm orange/brown SILT/CLAY.			
	0.70 0.70	B1 ES2			0.70		Firm orange/brown mottled light grey silty CLAY.			
	1.00	D1			0.95 1.05		Dark brown clayey GRAVEL of subangular to subrounded fine to coarse flint. End of Pit at 1.050m			
							1			
							2			
							3			
							4			
Groundwater: Groundwater not encountered							Key			
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane
Remarks:							B	Bulk	PID	PID Reading
							ES	Environmental	PP	Pocket Penetrometer
								Groundwater strike		Standing water level



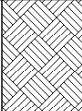
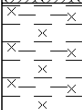
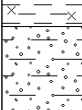
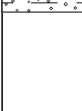
Project Name: Saxons Corner Ph 2				Project No. 61195		Co-ords: Orientation:		Dimensions (m) 1.40		Date 08/06/2021				
Location: St Georges Avenue, Emsworth Road, Havant						Level (m, aOD):		0.50		Scale 1:20				
Client: BDW Southampton						Depth (m): 1.00				Logged TS				
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description							
	Depth	Type	Results											
							Light brown silty TOPSOIL. TOPSOIL					1		
	0.45	ES1			0.30		Soft brown SILT/CLAY.						2	
	0.60	ES2			0.70		Soft/firm orange/brown silty CLAY with black specks.							3
	0.70	B1												
	1.00	D1			1.00		End of Pit at 1.000m					4		
Groundwater: Groundwater not encountered							Key							
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane				
							B	Bulk	PID	PID Reading				
							ES	Environmental	PP	Pocket Penetrometer				
Remarks:								Groundwater strike		Standing water level				



Project Name: Saxons Corner Ph 2				Project No. 61195		Co-ords: Orientation:		Dimensions (m)		Date 08/06/2021	
Location: St Georges Avenue, Emsworth Road, Havant						Level (m, aOD):				Scale 1:20	
Client: BDW Southampton						Depth (m): 0.60				Logged TS	
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description				
	Depth	Type	Results								
					0.30		Light brown silty TOPSOIL.				
					0.60		Soft orange/brown SILT/CLAY.				
							End of Pit at 0.600m				
							1				
							2				
							3				
							4				
Groundwater: Groundwater not encountered							Key				
Stability: Dry and Stable							D	Disturbed	IVN	Hand Vane	
Remarks:							B	Bulk	PID	PID Reading	
							ES	Environmental	PP	Pocket Penetrometer	
								Groundwater strike		Standing water level	

Richard Jackson Engineering Consultants					5 Quern House, Mill Court, Gt. Shelford, CB22 5LD		Trial Pit No. TP16A Sheet 1 of 1		
Project Name: Saxons Corner Ph 2			Project No. 61195		Co-ords: Orientation:		Date 08/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant					Level (m, aOD):		Dimensions (m) 1.50		
Client: BDW Southampton					Depth (m): 0.80		Scale 1:20 Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.40	ES1			0.30		Light brown silty TOPSOIL. TOPSOIL		
							Soft/firm brown/orange SILT/CLAY.		
	0.70 0.70	B1 ES2			0.80		End of Pit at 0.800m		
Groundwater: Groundwater not encountered						Key			
Stability: Dry and Stable						D	Disturbed	IVN	Hand Vane
Remarks:						B	Bulk	PID	PID Reading
						ES	Environmental	PP	Pocket Penetrometer
							Groundwater strike		Standing water level

Project Name:		Saxons Corner Ph 2	Project No.		61195		Co-ords:				Date
							Orientation:		Dimensions (m)		09/06/2021
Location: St Georges Avenue, Emsworth Road, Havant							Level (m, aOD):		2.60		Scale 1:20
Client: BDW Southampton							Depth (m): 2.60		0.50		Logged TS
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description				
	Depth	Type	Results								
▼	0.70 0.80	B1 ES1			0.30 0.60 1.10		Light brown silty TOPSOIL. TOPSOIL				1
							Soft/firm brown SILT/CLAY.				
						Soft/firm orange/brown slightly grey mottled silty CLAY.					
						Orange/brown clayey GRAVEL of subangular to subrounded fine to coarse with occasional cobble flint.					
						...becomes more brown with depth and more gravelly from 1.80m.					
						...becoming moise with depth from 2.20m.					
						End of Pit at 2.600m					
Groundwater: Water seepage noted at 2.20m							Key				
Stability: Sidewall collapse from 1.80m							D B ES ▽	Disturbed Bulk Environmental Groundwater strike	IVN PID PP ▼	Hand Vane PID Reading Pocket Penetrometer Standing water level	
Remarks:											

Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords:		Date			
				Orientation:		09/06/2021			
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		Dimensions (m)			
Client: BDW Southampton				Depth (m): 0.90		1.40			
				0.50		0.50			
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.70	B1			0.30		Light brown silty TOPSOIL. TOPSOIL		
							Soft/firm orange/brown silty CLAY.		
							Orange/brown clayey GRAVEL of subangular to subrounded fine to coasre with occasional cobble of flint.		
							End of Pit at 0.900m		
Groundwater: Groundwater not encountered						Key			
Stability: Dry and Stable						D	Disturbed	IVN	Hand Vane
Remarks:						B	Bulk	PID	PID Reading
						ES	Environmental	PP	Pocket Penetrometer
							Groundwater strike		Standing water level

$$\text{Soil Infiltration Rate (f)} = V_{p_{75-25}} / (a_{p_{50}} * t_{p_{75-25}})$$

<u>Infiltration TP01 - Test 1 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.90
Effective Depth (m)	0.40
tp ₇₅ (mins)	186
tp ₂₅ (mins)	44
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.04
a _{p₅₀}	1.28
tp ₇₅₋₂₅	142
f = 3.3E-06 m/s	

<u>Infiltration TP01 - Test 2 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.90
Effective Depth (m)	0.34
tp ₇₅ (mins)	397
tp ₂₅ (mins)	127
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.18
tp ₇₅₋₂₅	270
f = 1.6E-06 m/s	

<u>Infiltration TP01 - Test 3 of 3</u>	
Date: 10/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.90
Effective Depth (m)	0.37
tp ₇₅ (mins)	380
tp ₂₅ (mins)	129
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.23
tp ₇₅₋₂₅	251.0
f = 1.8E-06 m/s	

NB Volume adjusted by a factor of 0.3 to allow for presence of gravel in trial pit

$$\text{Soil Infiltration Rate (f)} = V_{p_{75-25}} / (a_{p_{50}} * t_{p_{75-25}})$$

<u>Infiltration TP03 - Test 1 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.82
Effective Depth (m)	0.34
tp ₇₅ (mins)	245
tp ₂₅ (mins)	47
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.18
tp ₇₅₋₂₅	198
f = 2.2E-06 m/s	

<u>Infiltration TP03 - Test 2 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.82
Effective Depth (m)	0.36
tp ₇₅ (mins)	462
tp ₂₅ (mins)	115
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.21
tp ₇₅₋₂₅	347
f = 1.3E-06 m/s	

<u>Infiltration TP03 - Test 3 of 3</u>	
Date: 10/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.82
Effective Depth (m)	0.32
tp ₇₅ (mins)	780
tp ₂₅ (mins)	220
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.14
tp ₇₅₋₂₅	560.0
f = 7.5E-07 m/s	

NB Volume adjusted by a factor of 0.3 to allow for presence of gravel in trial pit

$$\text{Soil Infiltration Rate (f)} = V_{p_{75-25}} / (a_{p_{50}} * t_{p_{75-25}})$$

<u>Infiltration TP05 - Test 1 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.10
Width (m)	0.50
Depth (m)	0.84
Effective Depth (m)	0.33
tp ₇₅ (mins)	17.5
tp ₂₅ (mins)	11.5
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.08
t _{p₇₅₋₂₅}	6
f = 7.0E-05 m/s	

<u>Infiltration TP05 - Test 2 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.10
Width (m)	0.50
Depth (m)	0.84
Effective Depth (m)	0.33
tp ₇₅ (mins)	154
tp ₂₅ (mins)	45
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.08
t _{p₇₅₋₂₅}	109
f = 3.9E-06 m/s	

<u>Infiltration TP801A - Test 3 of 3</u>	
Date: 10/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.10
Width (m)	0.50
Depth (m)	0.84
Effective Depth (m)	0.41
tp ₇₅ (mins)	154
tp ₂₅ (mins)	41
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.21
t _{p₇₅₋₂₅}	113
f = 4.1E-06 m/s	

NB Volume adjusted by a factor of 0.3 to allow for presence of gravel in trial pit

$$\text{Soil Infiltration Rate (f)} = V_{p_{75-25}} / (a_{p_{50}} * t_{p_{75-25}})$$

<u>Infiltration TP08 - Test 1 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.77
Effective Depth (m)	0.32
tp ₇₅ (mins)	182
tp ₂₅ (mins)	43
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.14
tp ₇₅₋₂₅	139
f = 3.0E-06 m/s	

<u>Infiltration TP08 - Test 2 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.77
Effective Depth (m)	0.39
tp ₇₅ (mins)	440
tp ₂₅ (mins)	90
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.04
a _{p₅₀}	1.26
tp ₇₅₋₂₅	350
f = 1.3E-06 m/s	

<u>Infiltration TP08 - Test 3 of 3</u>	
Date: 10/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.20
Width (m)	0.50
Depth (m)	0.77
Effective Depth (m)	0.31
tp ₇₅ (mins)	350
tp ₂₅ (mins)	100
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.13
tp ₇₅₋₂₅	250
f = 1.7E-06 m/s	

NB Volume adjusted by a factor of 0.3 to allow for presence of gravel in trial pit

$$\text{Soil Infiltration Rate (f)} = V_{p_{75-25}} / (a_{p_{50}} * t_{p_{75-25}})$$

<u>Infiltration TP10 - Test 1 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.50
Width (m)	0.50
Depth (m)	0.99
Effective Depth (m)	0.24
tp ₇₅ (mins)	36
tp ₂₅ (mins)	7.5
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.23
tp ₇₅₋₂₅	28.5
f = 1.3E-05 m/s	

<u>Infiltration TP10 - Test 2 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.50
Width (m)	0.50
Depth (m)	0.99
Effective Depth (m)	0.23
tp ₇₅ (mins)	58.5
tp ₂₅ (mins)	11.5
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.21
tp ₇₅₋₂₅	47
f = 7.6E-06 m/s	

<u>Infiltration TP10 - Test 3 of 3</u>	
Date: 10/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.50
Width (m)	0.50
Depth (m)	0.99
Effective Depth (m)	0.25
tp ₇₅ (mins)	36
tp ₂₅ (mins)	12.5
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.25
tp ₇₅₋₂₅	23.5
f = 1.6E-05 m/s	

NB Volume adjusted by a factor of 0.3 to allow for presence of gravel in trial pit

$$\text{Soil Infiltration Rate (f)} = V_{p_{75-25}} / (a_{p_{50}} * t_{p_{75-25}})$$

<u>Infiltration TP12 - Test 1 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.50
Width (m)	0.50
Depth (m)	0.90
Effective Depth (m)	0.28
tp ₇₅ (mins)	210
tp ₂₅ (mins)	52
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.03
a _{p₅₀}	1.31
tp ₇₅₋₂₅	158
f = 2.5E-06 m/s	

<u>Infiltration TP12 - Test 2 of 3</u>	
Date: 09/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.50
Width (m)	0.50
Depth (m)	0.90
Effective Depth (m)	0.34
tp ₇₅ (mins)	Not Achieved
tp ₂₅ (mins)	102.5
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.04
a _{p₅₀}	1.43
tp ₇₅₋₂₅	#VALUE!
f = #VALUE! m/s	

<u>Infiltration TP12 - Test 3 of 3</u>	
Date: 10/06/2021	
<u>Trial Pit Dimensions</u>	
Length (m)	1.50
Width (m)	0.50
Depth (m)	0.90
Effective Depth (m)	0.32
tp ₇₅ (mins)	420
tp ₂₅ (mins)	122.5
<u>Calculations</u>	
V _{p₇₅₋₂₅}	0.04
a _{p₅₀}	1.39
tp ₇₅₋₂₅	297.5
f = 1.5E-06 m/s	

NB Volume adjusted by a factor of 0.3 to allow for presence of gravel in trial pit

Appendix K

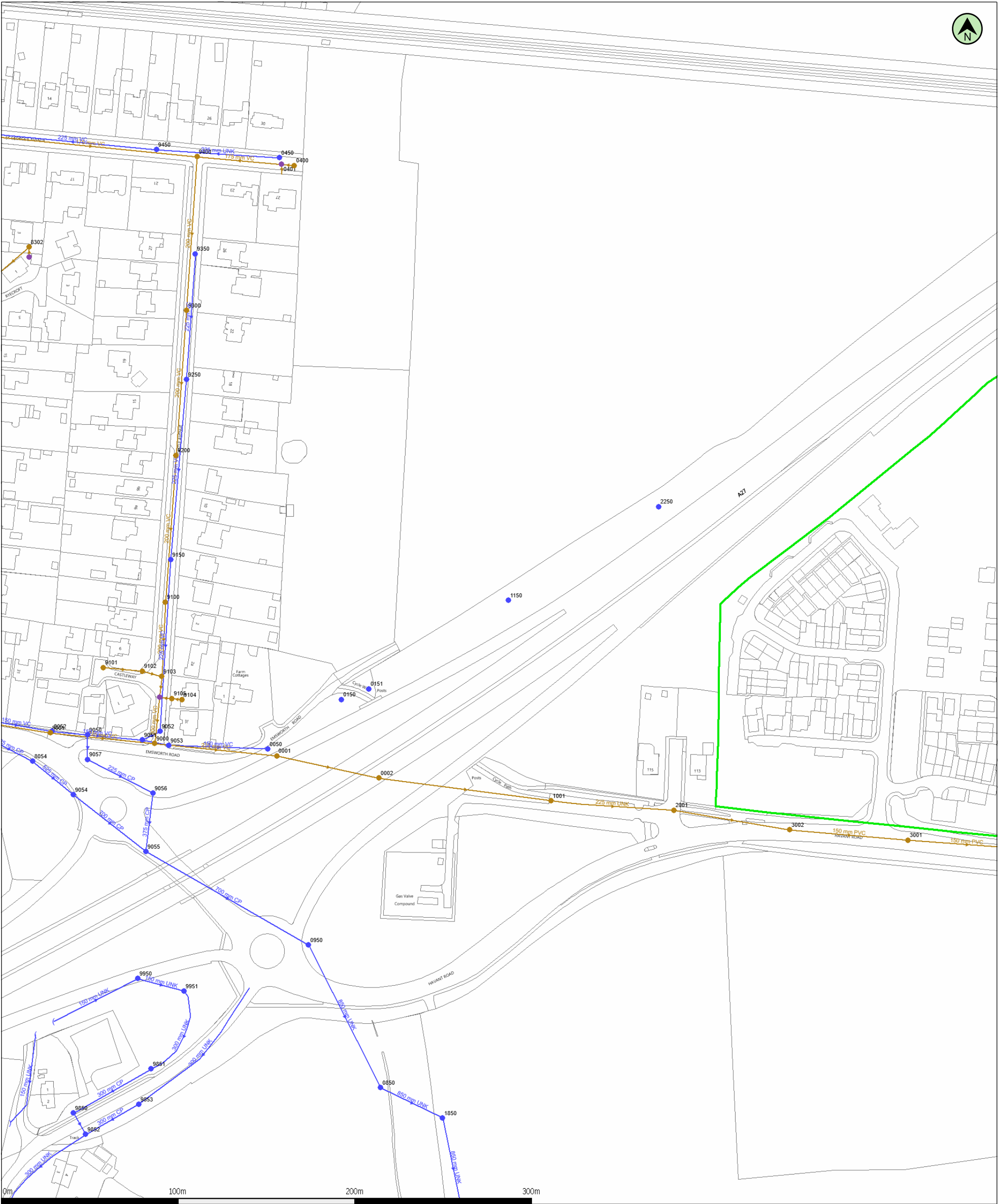
24hr Foul Storage Calculation

Use type	no	P	P Total	l/day	Volume	flow (l/s)
2 Bed House	58	4	232	150	34800	0.402778
3 Bed House	69	5	345	150	51750	0.598958
4 Bed House	37	6	222	150	33300	0.385417
Apartments	30	3	90	150	13500	0.15625
				889	133350 litres	
					133.35 m3	
P Factor@70%					93.345 m3	

Calculation based on the values within British Water Flow and Loads - 4

Appendix L

Southern Water Sewer Records



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Data updated: 19/07/21

Scale: 1:2035
Map Centre: 473146,106158

Date: 16/08/21
Wastewater Plan A3
Powered by digdat

mimi.corke@southernwater.co.uk



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2021 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



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