



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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FINAL



Revision Status

Issue	Date	Description	Prepared	Checked	Approved
A	27/09/21	Revised drainage strategy	JE	MG	MG

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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 north east of Warblington and north west 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 5.36ha 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 south western corner also falling away to the west. The levels across the site are in the approximate range of 11.85m AOD in the north west, 10.46m AOD towards the south central area and 10.59m AOD in the south west corner, the topographical survey can be found in Appendix C. The survey also indicates that there is an existing watercourse running along the south eastern boundary of the site, draining from the north east 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 north west of the site. There is an existing watercourse which borders the south east 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 5.36ha. The 1 in 1 year greenfield run off is calculated to be 8.85 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 8.85 l/s and provide storage on site to accommodate this.
- 7.6. The total roof area at the site is approximately 0.859ha, which increases to 0.945ha with 10% for urban creep added. The adoptable highway at the site has an area of approximately 0.758ha and car parking and shared surface at the site is approximately 0.690ha resulting in an approximate total impermeable area of 2.393ha, including urban creep.
- 7.7. It is proposed to surface the private drives and shared paved area 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 8.85 l/s and into 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. Storage crates will be provided to contain the 1 in 100 year + 40% event and will be located such that as the surface water tank sewers surcharge and the excess flow will back up into the crates for events in excess of the 1 in 30 year. The size of the tank sewers, storage crates and permeable paved across the site proposed to store all flows up to the 1 in 100 year plus 40% climate change is:

- 662m of 900mm tank sewer
- Storage Crates: 2582m² to a depth of 0.40m
- Permeable Paving: 8586m² with a sub-base depth of 0.40m

- 7.9. These can be accommodated within the green spaces 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 direct into the surface water system which will then pass into the storage crates below 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 storage crates below 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:	$0.7 + 0.40 = 1.10$
Metals:	$0.6 + 0.40 = 1.00$
Hydrocarbons:	$0.7 + 0.35 = 1.05$

- 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 south west and then pump north into the designated existing Southern Water foul sewer at MH0400 located to the north west 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 ground 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.

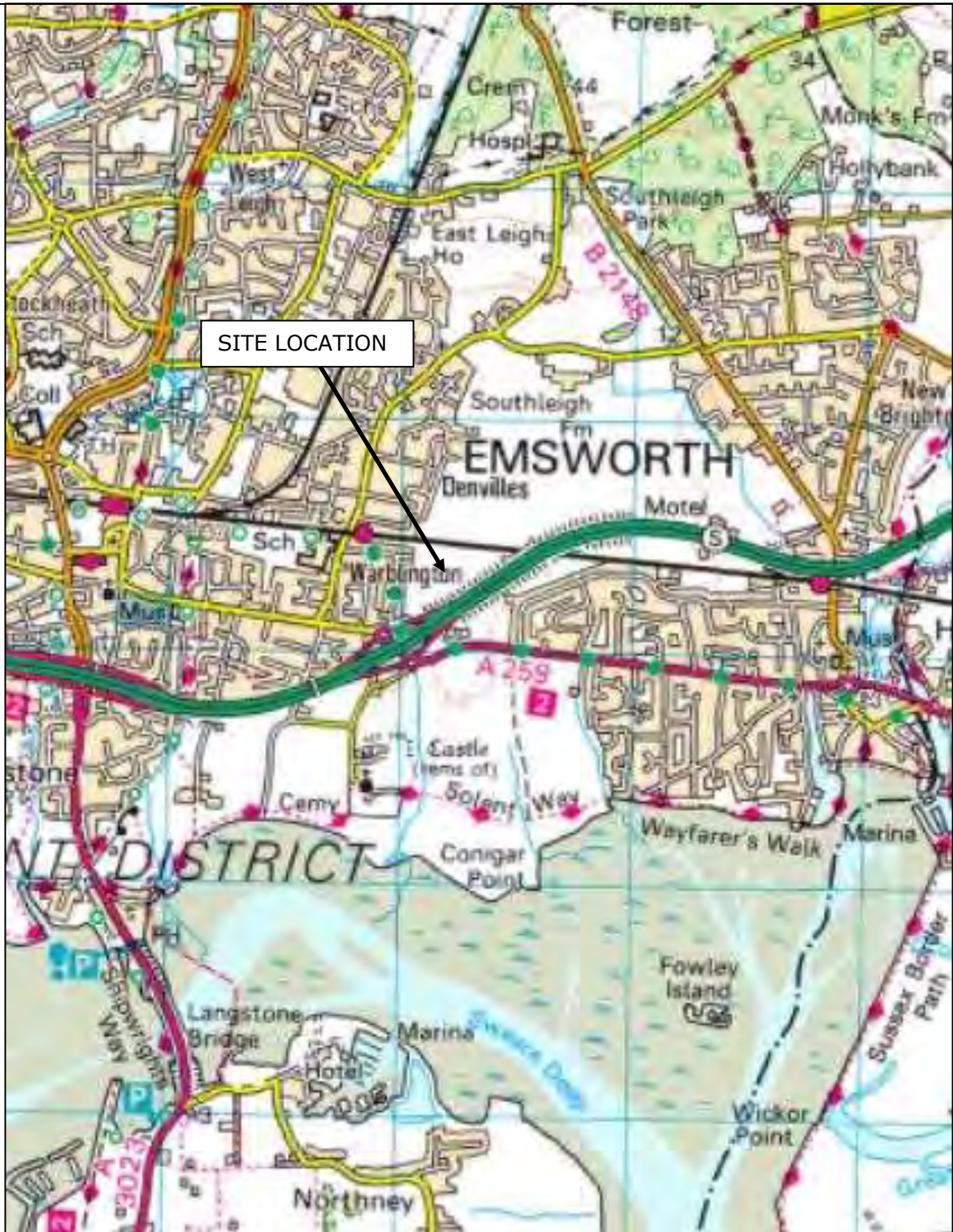
10.2. The residual risks at this site include:-

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

Appendices

Appendix A

Site Location Plan



REPRODUCED FROM ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONARY OFFICE, ©
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SITE LOCATION PLAN

FIGURE 1

SCALE: N.T.S.

JOB NO: 61195

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

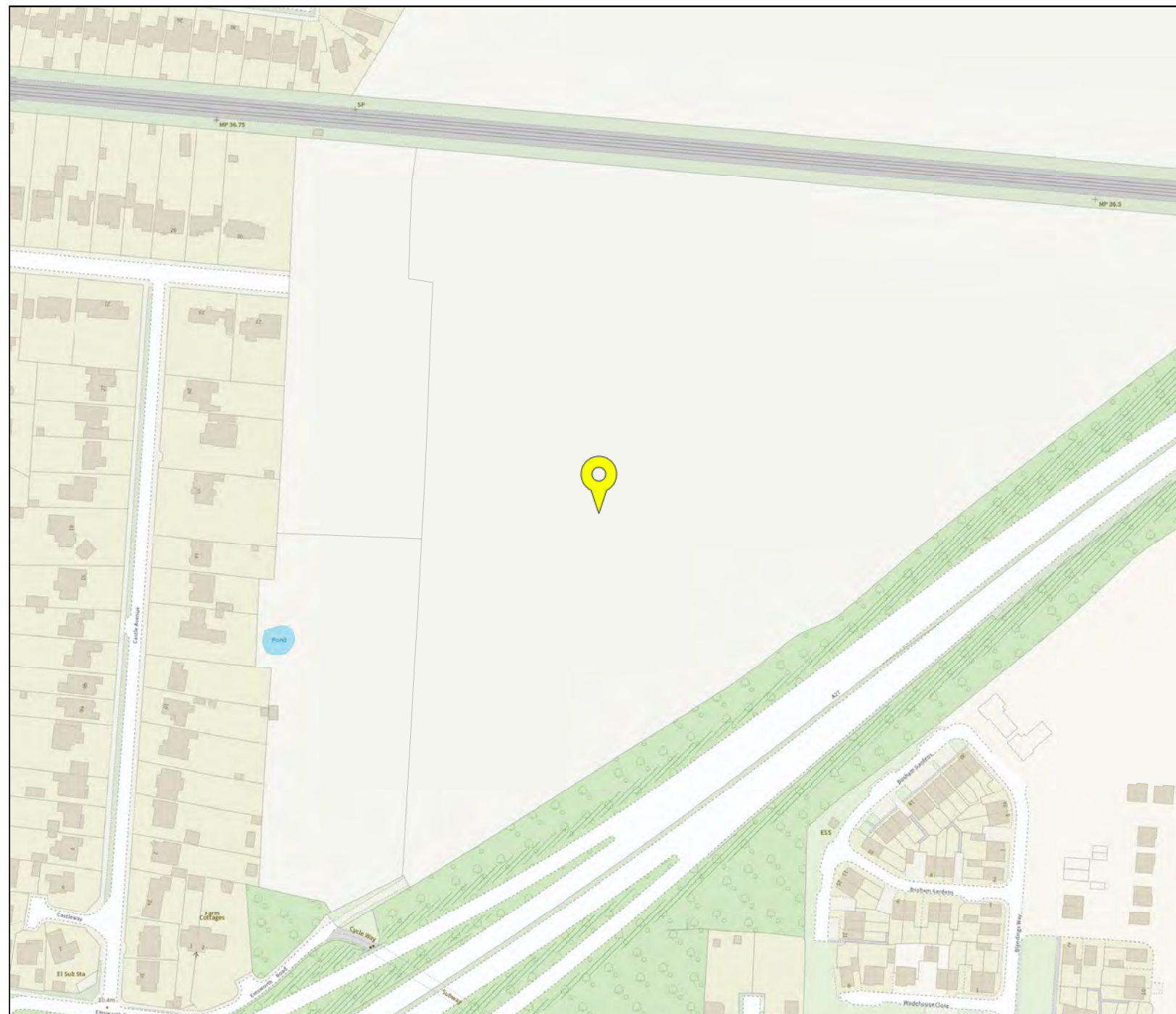
Created

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

0 20 40 60m

Page 2 of 2



Appendix C

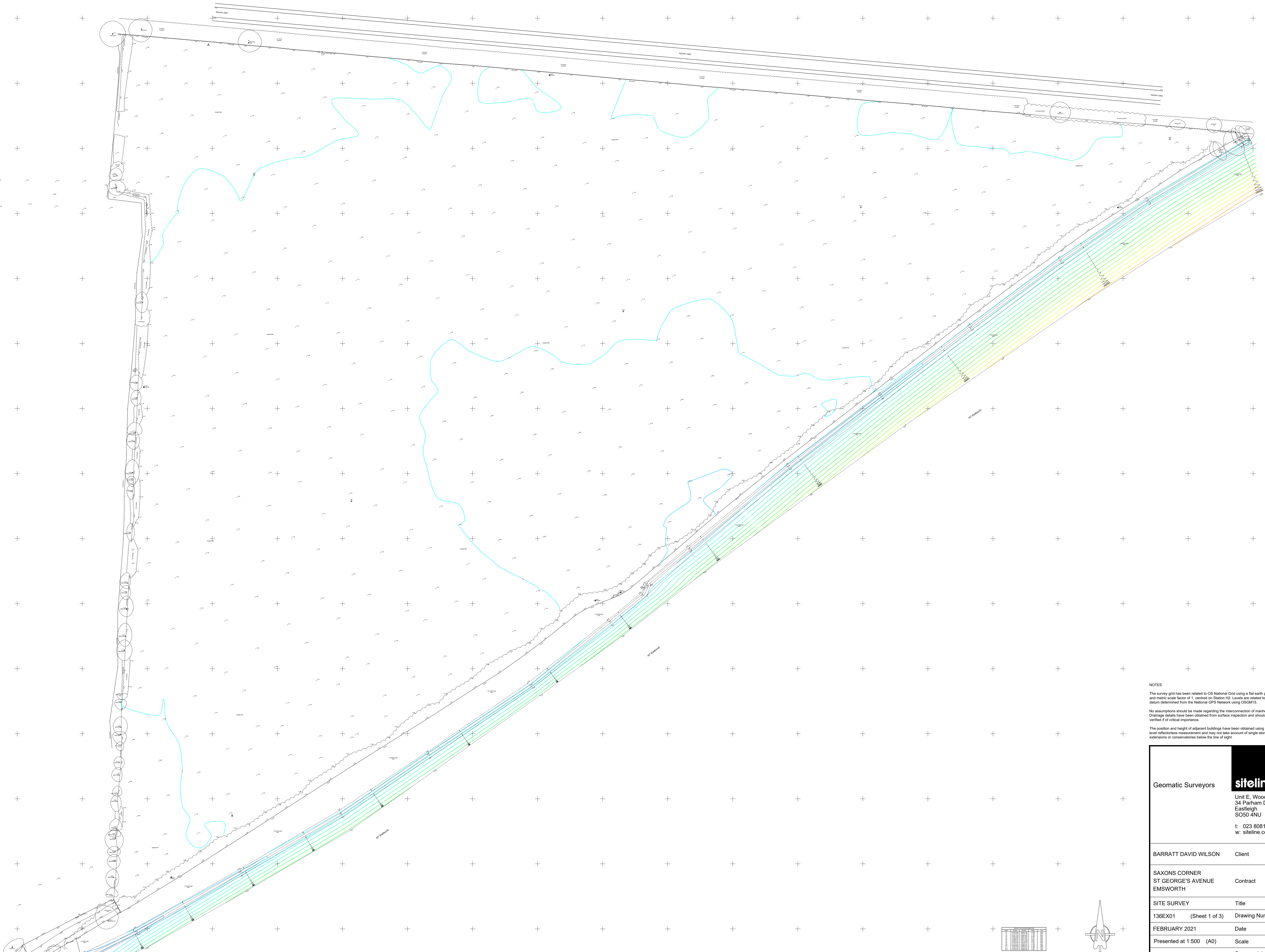
Topographical Survey

TREES	
A	Ash
AL	Alder
AP	Apple
B	Beech
CB	Copper Beech
CH	Cherry
CY	Cypress
E	Elm
EU	Eucalyptus
F	Field Maple
FM	Fruit
H	Hazel
HC	Horse Chestnut
HO	Horn Oak
HW	Hawthorn
HY	Holly
JM	Japanese Maple
LB	Laburnum
L	Lime
LO	Locust Tree
LR	Laurel
M	Maple
MA	Magnolia
MG	Oak
PL	Pine
PL	Plane
P	Plum
PO	Poplar
PP	Pissardi Plum
R	Rose
RD	Redwood
RO	Red Oak
SD	Rhododendron
SB	Silver Birch
SC	Sweet Chestnut
SP	Scots Pine
SY	Spruce
UN	Unidentified
W	Willow
WN	Walnut
Y	Yew

ABBREVIATIONS	
BT	British Telecom
BOL	Bollard
CB	Control Box
CL	Cover Level
CTV	Cable Television
E	Electric
EP	Electricity Pole
FH	Fire Hydrant
GSV	Gas Stop Valve
H	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
OB	Overhead
PG	Post Box
PC	Pram Crossing
RNP	Road Name Plate
RS	Road Sign
SA	Skewway
SV	Stop Valve (Unidentified)
TS	Telephone Box
TC	Telecom
TH	Trial Hole
TL	Traffic Light
TP	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
CP	Concrete Post
CPF	Chestnut Felling Fence
CWF	Chicken Wire Fence
IF	Iron Railing Fence
PKF	Picket Fence
PRF	Post & Rail Fence
PWF	Post & Wire Fence
SCF	Security Fence
SP	Steel Post
WMF	Wire Mesh Fence
WFF	Wood Panel Fence

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		siteline Unit E, Woodside 34 Parham Drive Eastleigh SO50 4NU t: 023 8081 1081 w: siteline.co.uk
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

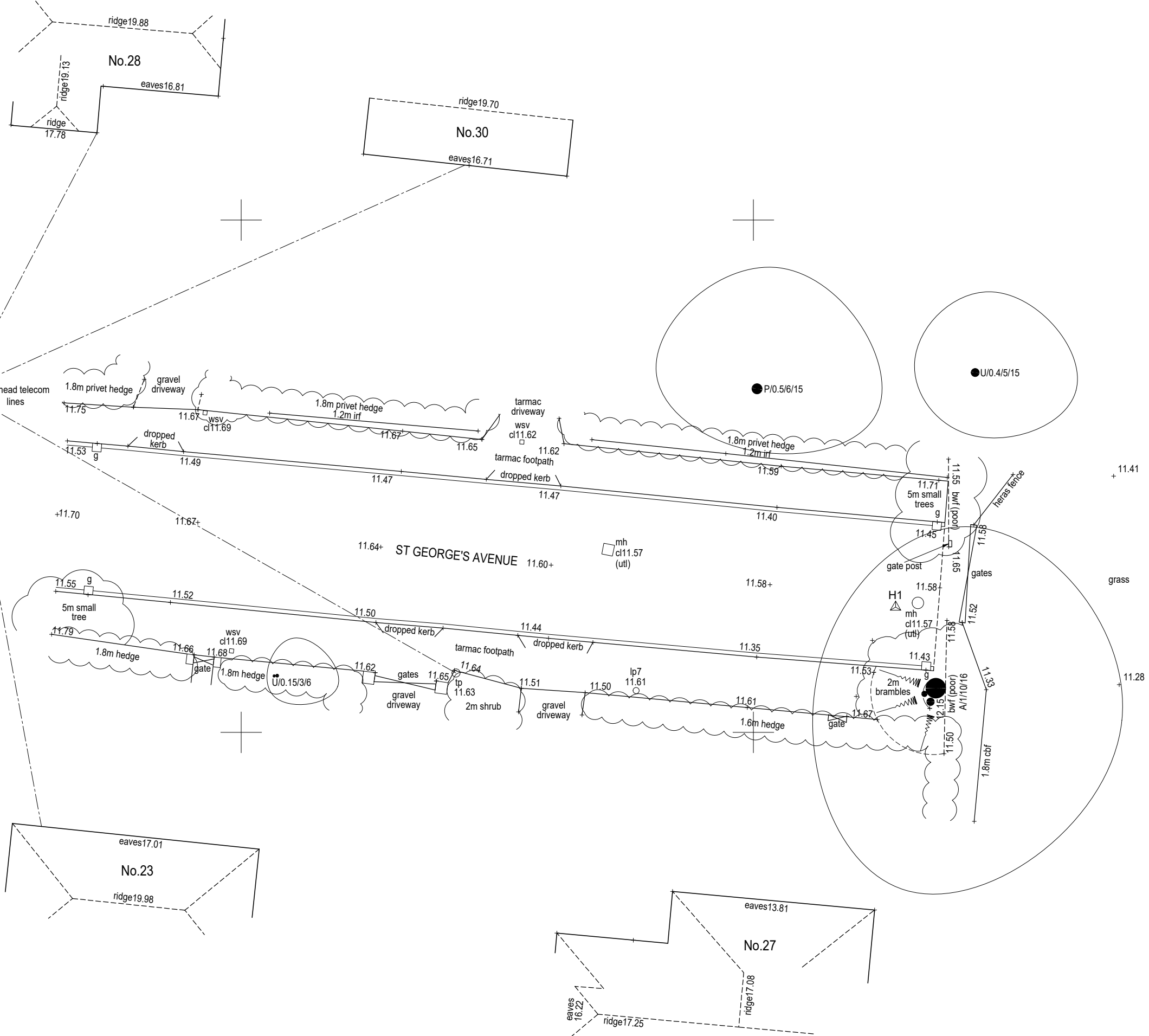
ABBREVIATIONS

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
CPF Chestnut Paling 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	472971.630	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	11.647	PEG



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 H5. Levels are related to OS datum determined from the National GPS Network using OSGM15.

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BARRATT DAVID WILSON

Client

SAXONS CORNER
34 Parham Drive
Eastleigh

Contract

SITE SURVEY

Title

136EX01 (Sheet 2 of 3)

Drawing Number

FEBRUARY 2021

Date

1:200 (at A1)

Scale

RS HB

Surveyor(s)

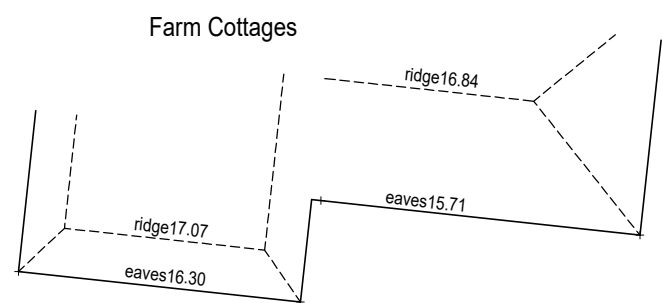
TREES
A Ash
AL Alder
AP Apple
B Beech
CB Cedar
CH Cherry
COP Copper Beech
CY Cypress
E Elm
EU Eucalyptus
F Field Maple
FM Fruit
H Hazel
HC Horse Chestnut
HO Holm Oak
HW Hawthorn
HY Holly
JM Japanese Maple
LB Laburnum
L Lime
LO Locust Tree
La Laurel
M Maple
MG Magnolia
O Oak
P Pine
PA Palm
PL Plane
PM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

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H5	472953.550	106074.074	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
H11	473374.245	106402.302	11.369	PEG
H12	473493.023	106408.843	11.634	PEG
H13	473123.474	106464.935	11.847	PEG



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 192. Levels are related to OS datum determined from the National GPS Network using OSGM15.

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SAXONS CORNER
ST GEORGE'S AVENUE
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.

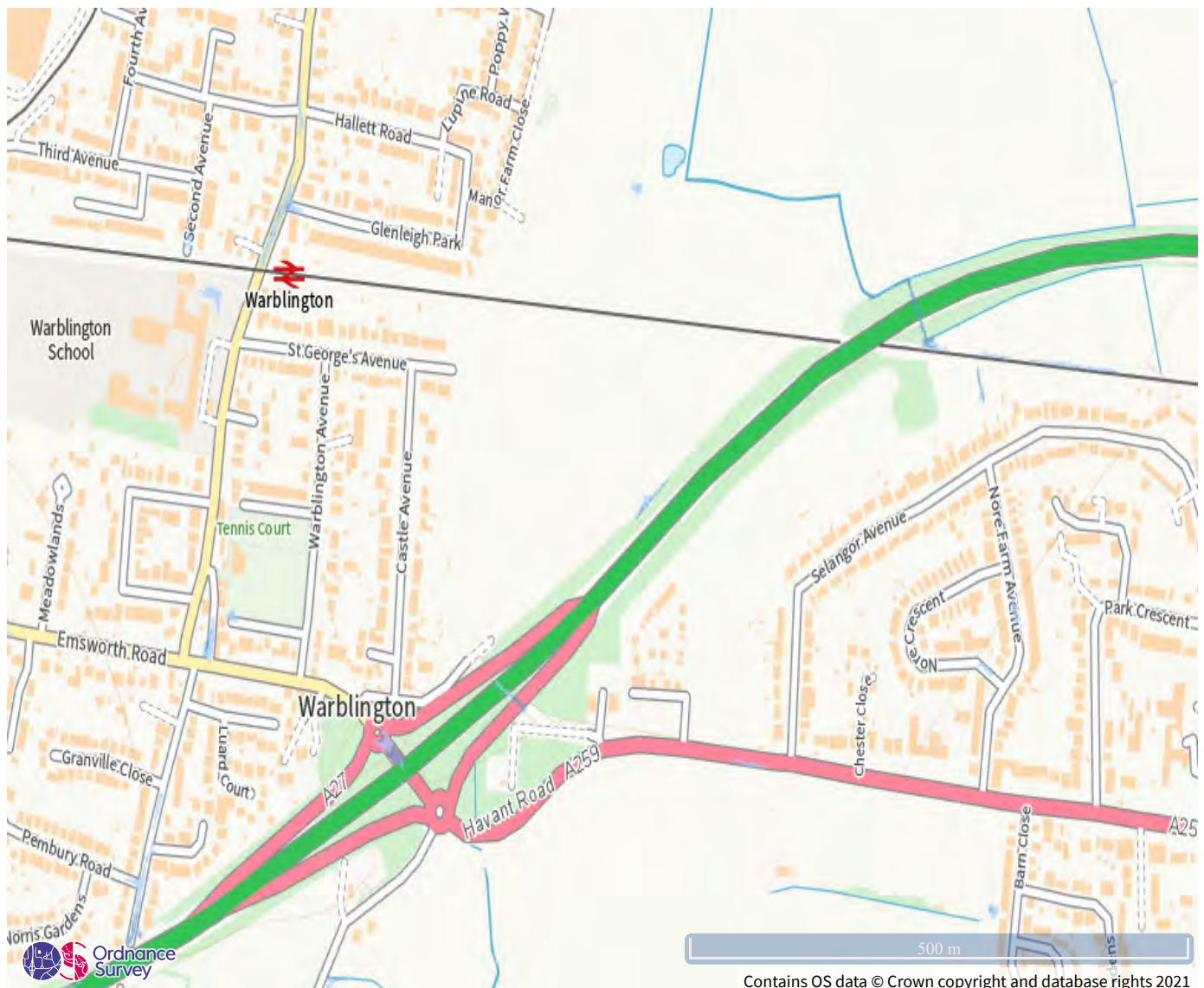
Flood risk

High risk: depth



Location

PO9 2SA



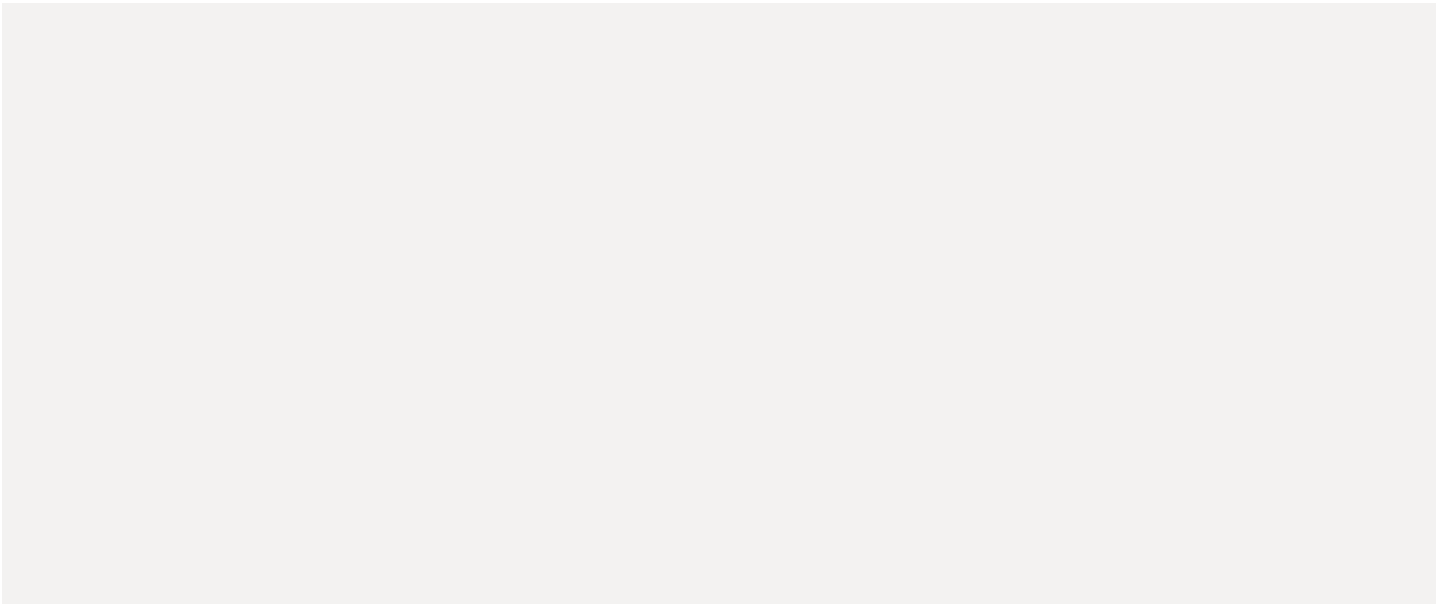
Surface water flood risk: water depth in a high risk scenario

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.

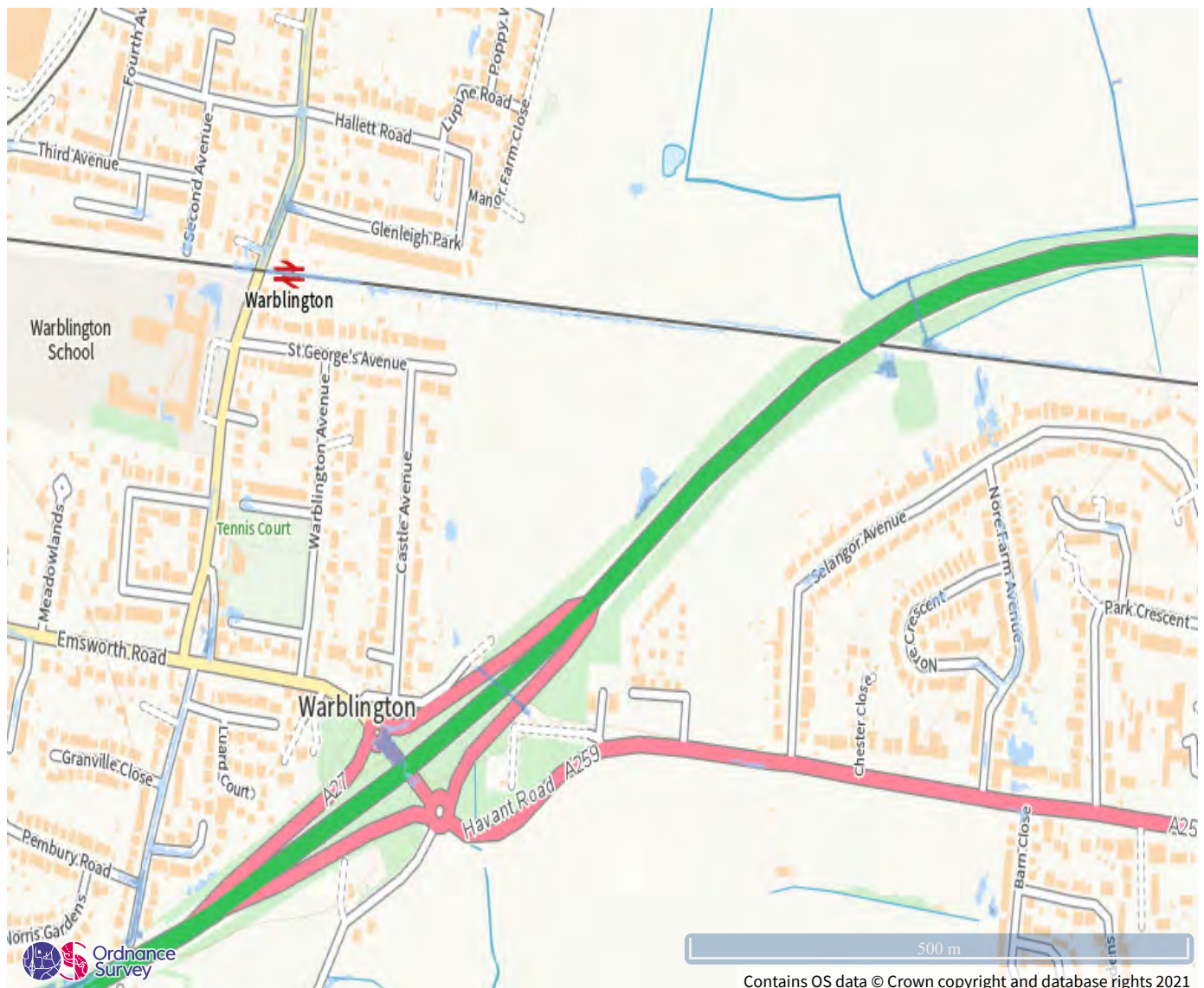
Flood risk

Medium risk: depth



Location

PO9 2SA



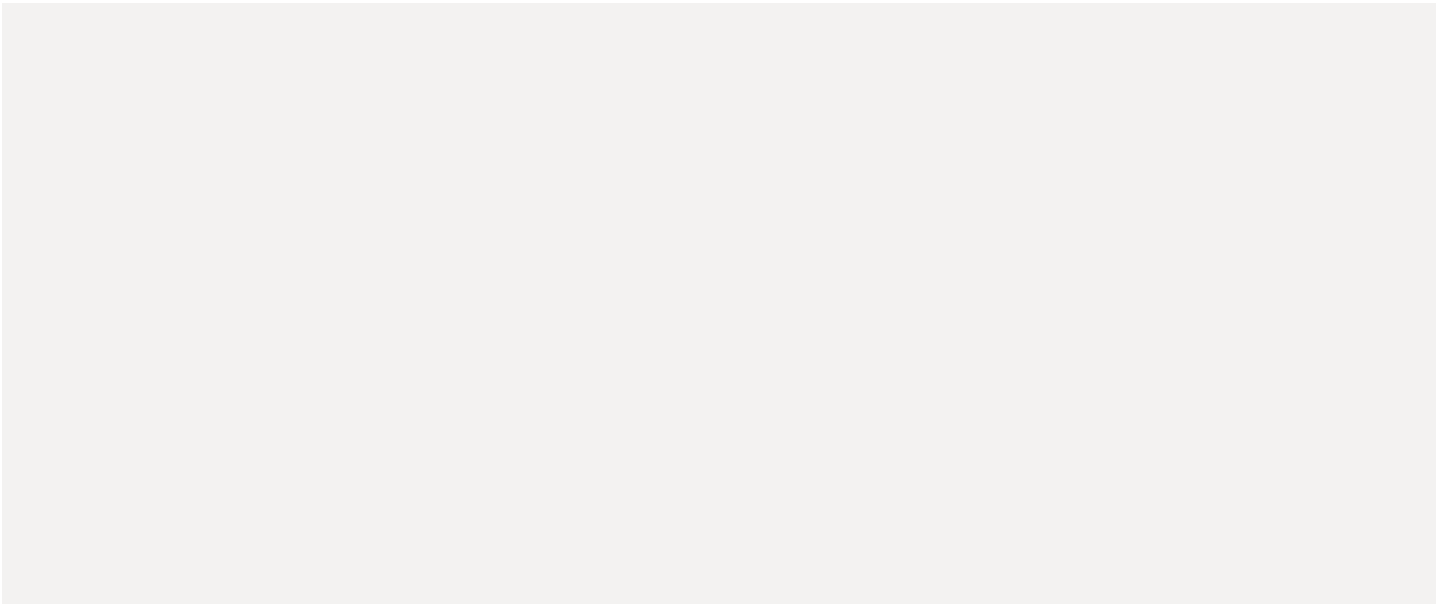
Surface water flood risk: water depth in a medium risk scenario

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.

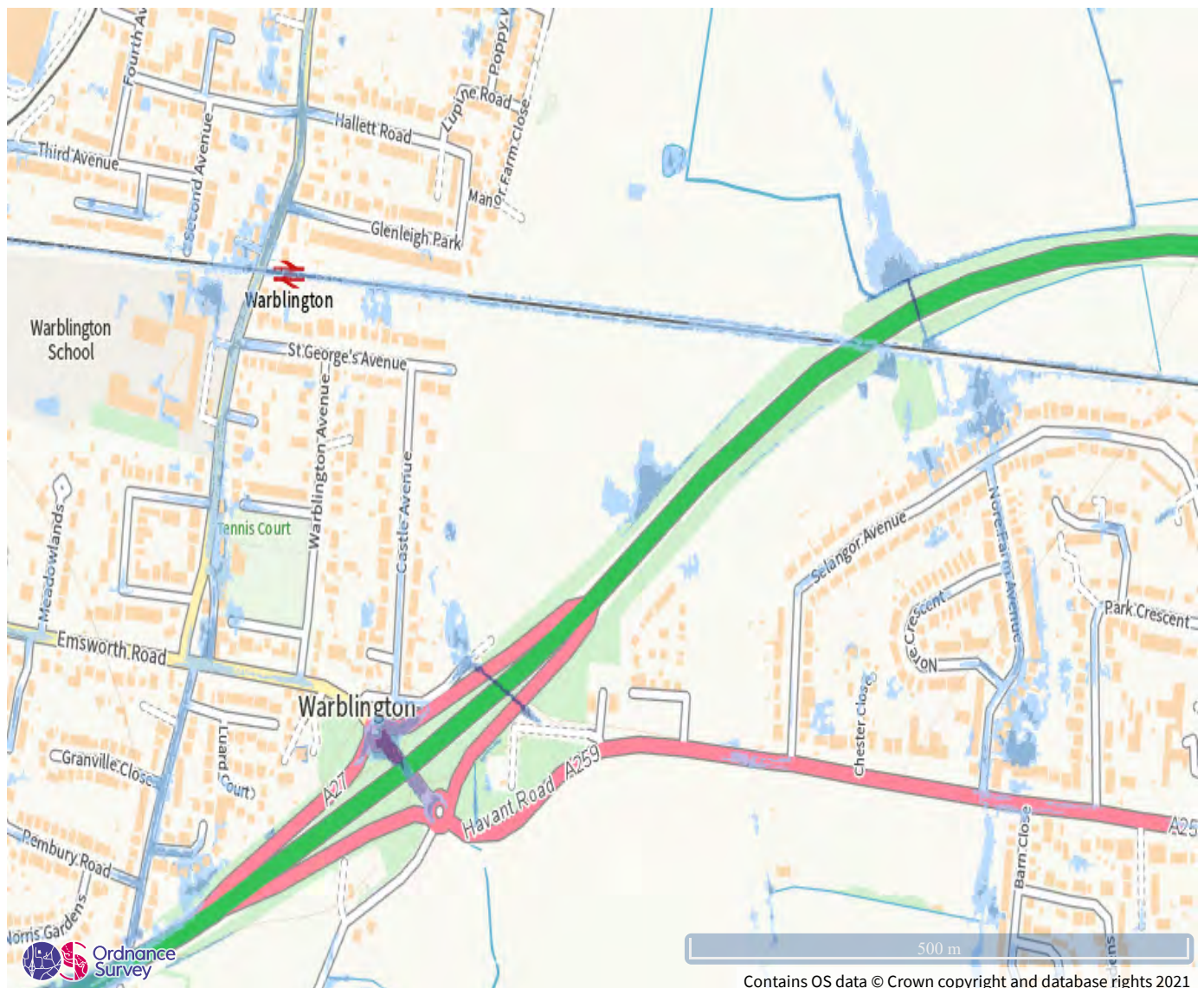
Flood risk

Low risk: depth



Location

PO9 2SA



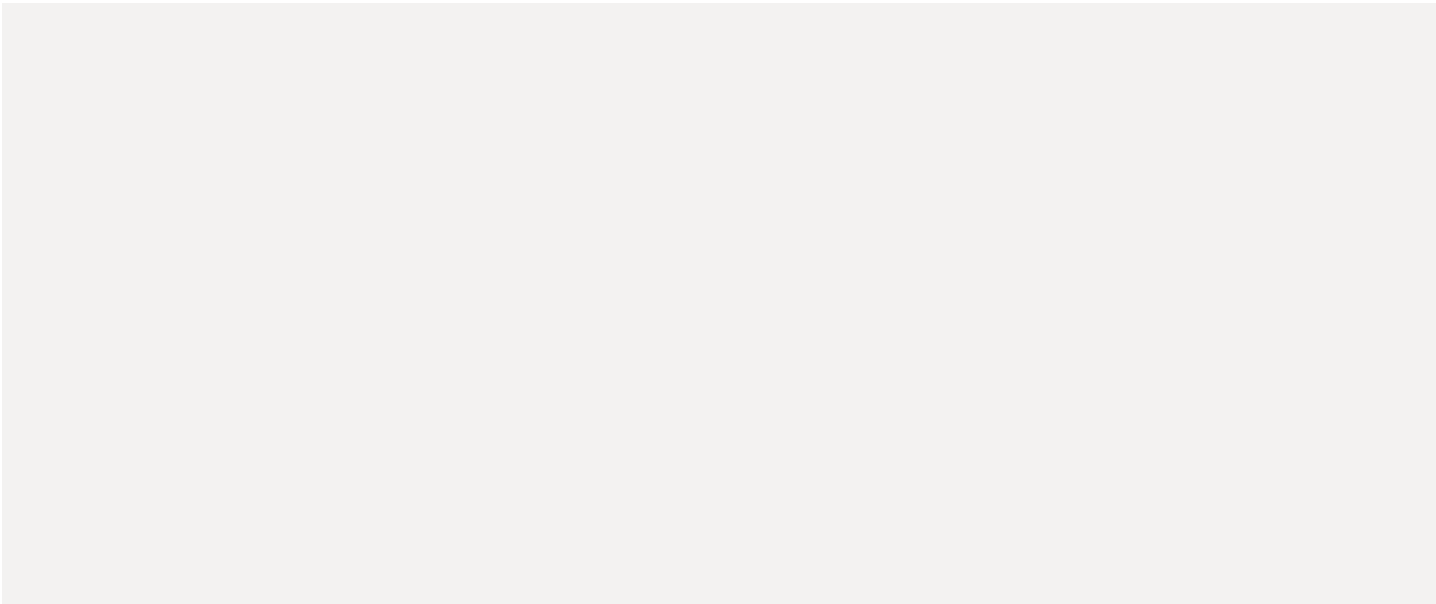
Surface water flood risk: water depth in a low risk scenario

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.

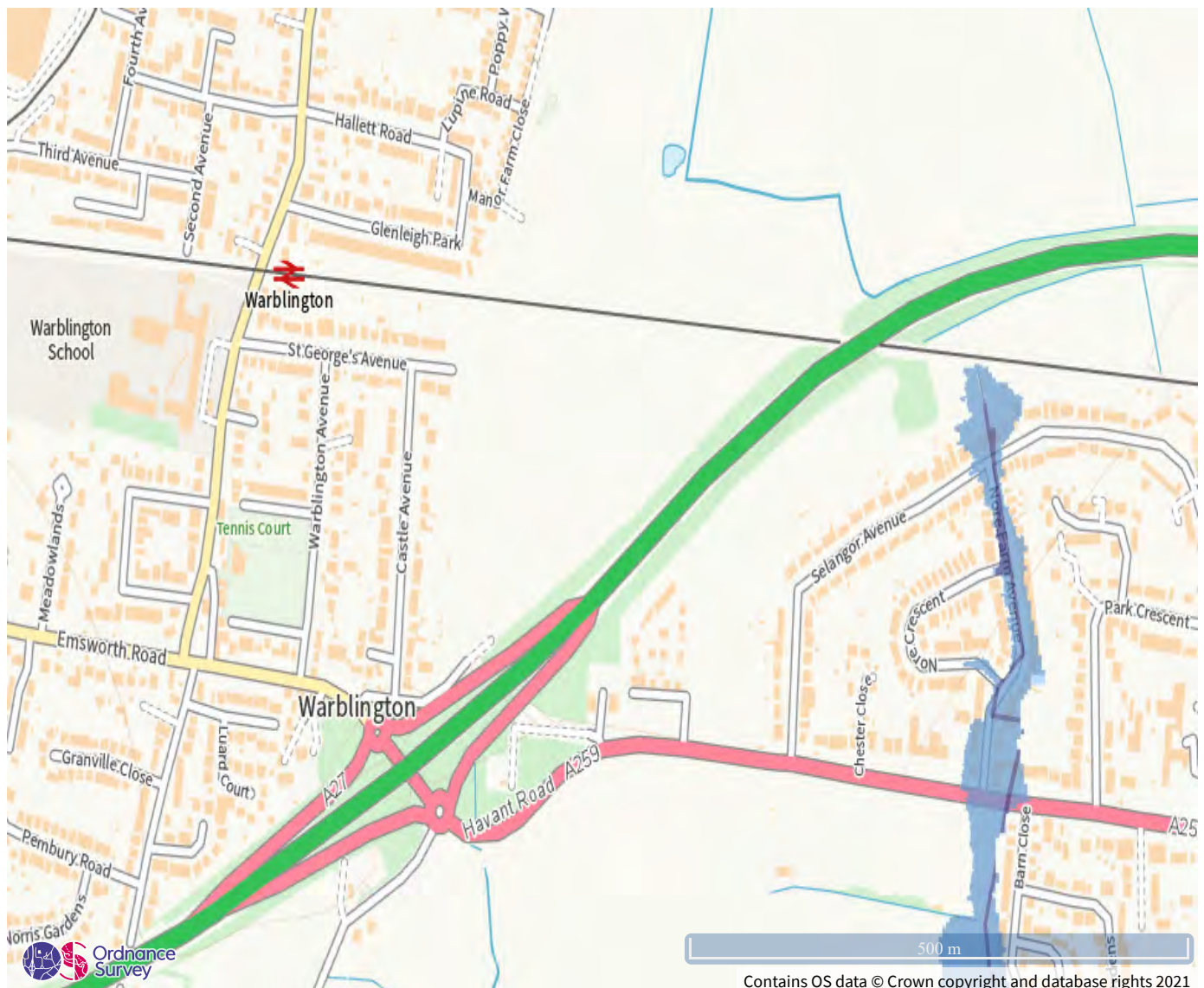
Flood risk

Extent of flooding



Location

PO9 2SA

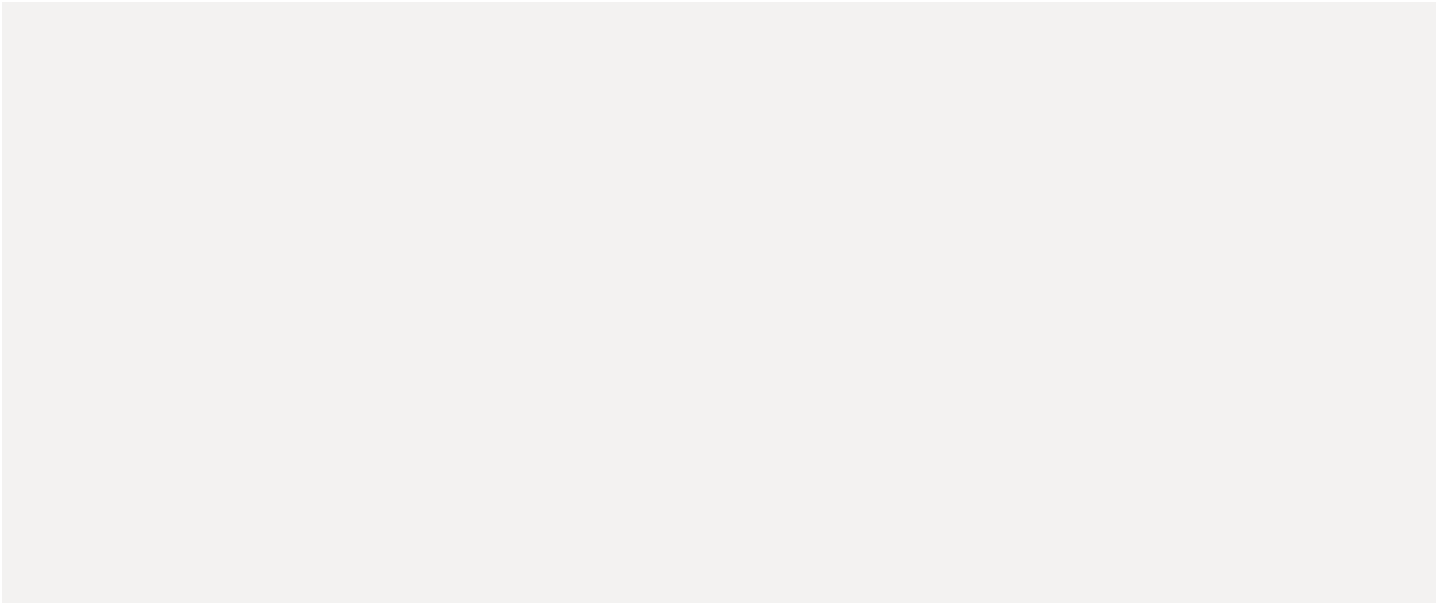


Extent of flooding from rivers or the sea

- [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.

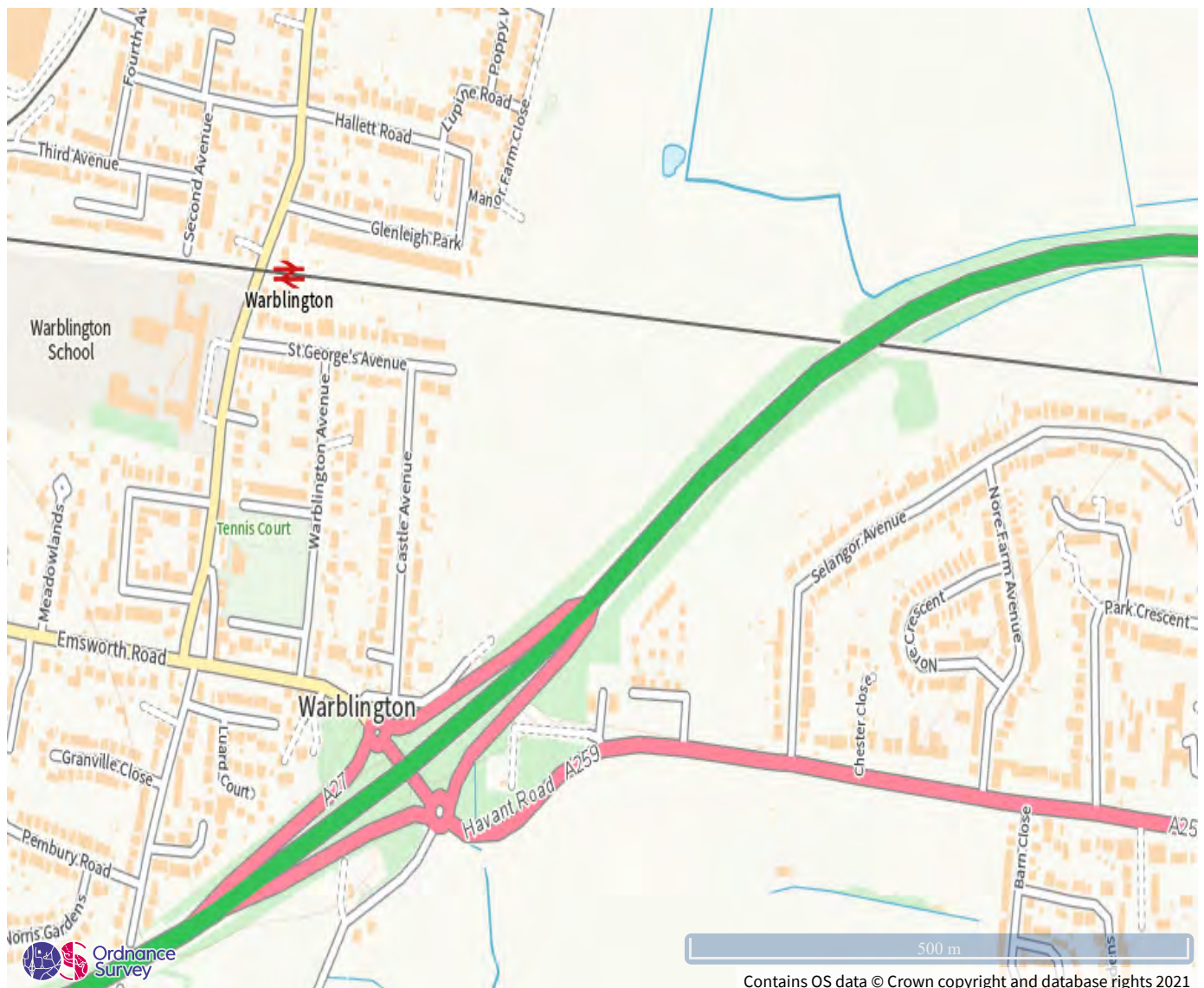
Flood risk

Extent of flooding



Location

PO9 2SA

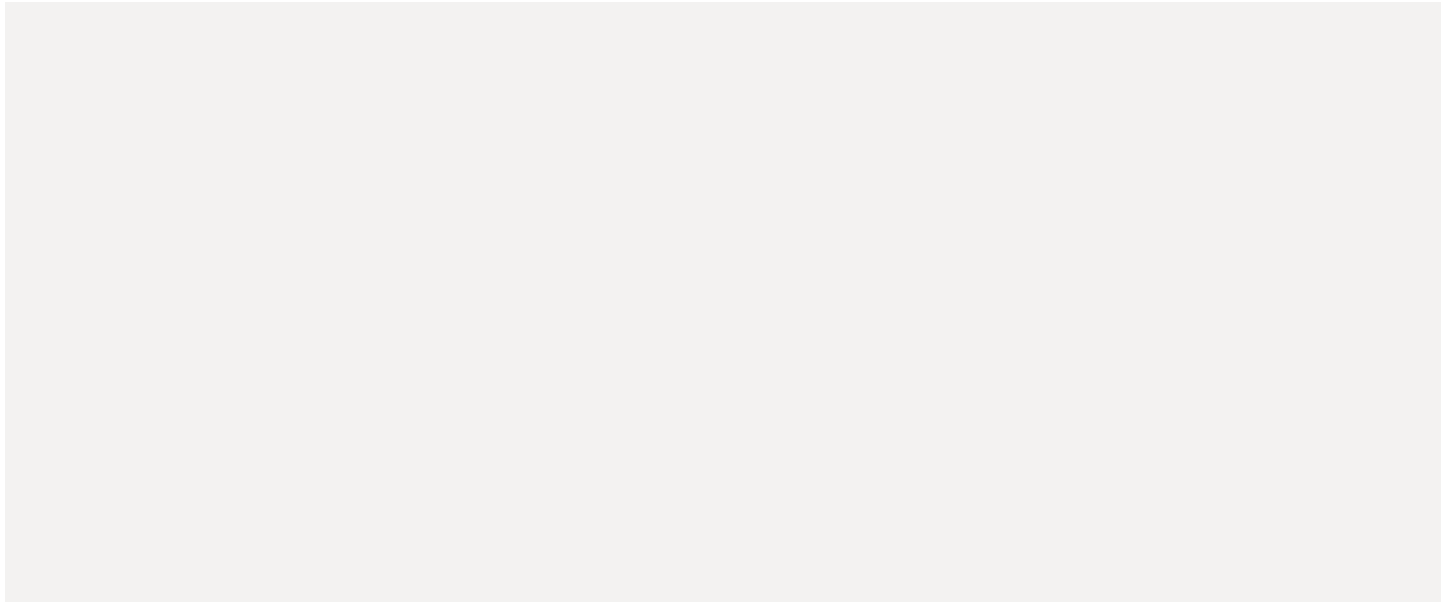


Extent of flooding from reservoirs

● Maximum extent of flooding

[View the flood risk information for another location \(/long-term-flood-risk/postcode\)](/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:	James Everitt
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:	2001561293
Date:	Jun 02 2021 17:04

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	5.36
-----------------------	------

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 ≤ 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

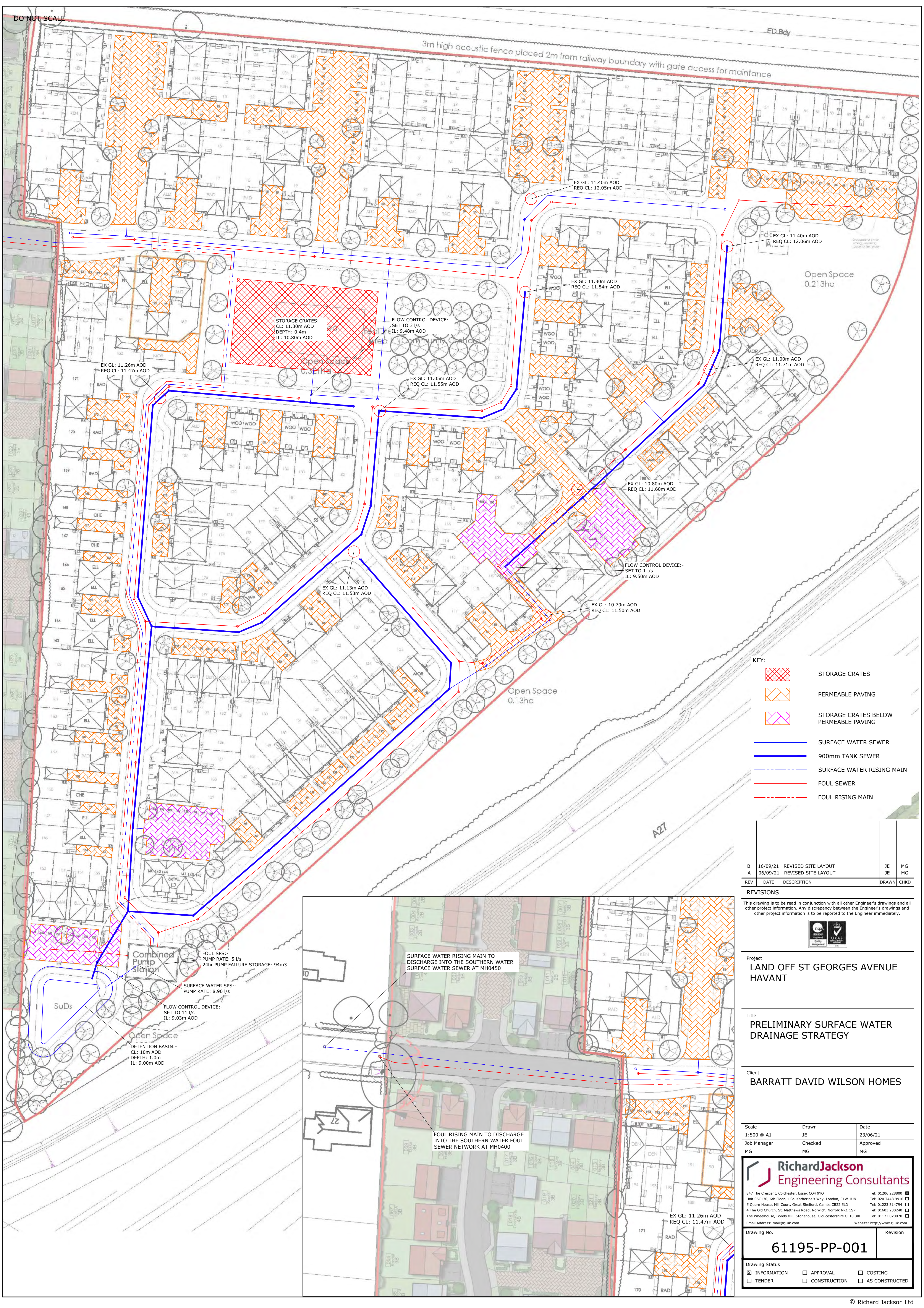
	Default	Edited
Q _{BAR} (l/s):	10.41	10.41
1 in 1 year (l/s):	8.85	8.85
1 in 30 years (l/s):	23.94	23.94
1 in 100 years (l/s):	33.2	33.2
1 in 200 years (l/s):	38.93	38.93

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

3m high acoustic fence placed 2m from railway boundary with gate access for maintenance



KEY:



STORAGE CRATES



PERMEABLE PAVING



STORAGE CRATES BELOW PERMEABLE PAVING

SURFACE WATER SEWER

900mm TANK SEWER

SURFACE WATER RISING MAIN

FOUL SEWER

	16/09/21	REVISED SITE LAYOUT	JE	MG
	06/09/21	REVISED SITE LAYOUT	JE	MG
W	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

PRELIMINARY SURFACE WATER DRAINAGE STRATEGY

BARRATT DAVID WILSON HOMES

500 @ A1	Drawn JE	Date 23/06/21
Manager	Checked MG	Approved MG



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The Wheelhouse, Bonds Mill, Stonehouse, Gloucestershire GL10 3RF Tel: 01172 020070 ☐

Email Address: mail@rj.uk.com Website: <http://www.rj.uk.com>

Drawing No.	Revision
-------------	----------

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

Circular Default Sewer Type Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
H1.1	0.224	5.00	11.500	1350	1.876
H1.2	0.318	5.00	11.300	1350	1.798
CR			11.300	1350	1.818
H1.3	0.098	5.00	11.300	1500	1.838
H1.31		5.00	11.300	1500	1.800
H1.4	0.090	5.00	11.470	1800	2.104
H1.5	0.154	5.00	11.330	1800	2.102
H1.61	0.071	5.00	11.000	1200	1.930
H1.6	0.127	5.00	11.000	1800	1.950
H1.7	0.030	5.00	11.000	1800	1.970
BASIN			10.000	1500	1.000
H2.1	0.167	5.00	11.400	1350	1.610
H2.2	0.056	5.00	11.400	1350	1.730
H2.3	0.021	5.00	11.300	1350	1.678
H3.1	0.028	5.00	11.700	1800	2.104
H3.2	0.061	5.00	11.620	1800	2.096
H3.21	0.077	5.00	11.550	1800	2.100
H3.3	0.104	5.00	11.480	1800	2.100
H3.4	0.142	5.00	11.400	1800	2.110
H4.1	0.060	5.00	11.800	1800	2.104
H4.2	0.102	5.00	11.710	1800	2.102
H4.3	0.224	5.00	11.600	1800	2.102
H4.4			11.540	1200	2.102
H4.5			11.500	1200	2.098
H4.6	0.112	5.00	11.440	1800	2.104
H4.61		5.00	11.530	1800	2.096
H4.7	0.133	5.00	11.430	1800	2.236
H4.8	0.053	5.00	11.200	1800	2.104

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
H1.1	H1.1	H1.2	61.000	0.600	9.624	9.502	0.122	500.0	450	6.13	49.9
H1.2	H1.2	CR	10.000	0.600	9.502	9.482	0.020	500.0	450	7.84	44.1
CR	CR	H1.3	10.000	0.600	9.482	9.462	0.020	500.0	150	8.22	43.0
H1.31	H1.31	H1.3	19.000	0.600	9.500	9.462	0.038	500.0	600	5.29	50.0
H1.3	H1.3	H1.4	48.000	0.600	9.462	9.366	0.096	500.0	600	8.96	41.1
H1.4	H1.4	H1.5	69.000	0.600	9.366	9.228	0.138	500.0	900	9.79	39.3
H1.5	H1.5	H1.6	89.000	0.600	9.228	9.050	0.178	500.0	900	10.85	37.2
H1.61	H1.61	H1.6	10.000	0.600	9.070	9.050	0.020	500.0	300	5.24	50.0
H1.6	H1.6	H1.7	10.000	0.600	9.050	9.030	0.020	500.0	900	10.97	37.0
H1.7	H1.7	BASIN	15.000	0.600	9.030	9.000	0.030	500.0	150	11.53	36.0
H2.1	H2.1	H2.2	60.000	0.600	9.790	9.670	0.120	500.0	450	6.11	49.9

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
H2.2	H2.2	H2.3	24.000	0.600	9.670	9.622	0.048	500.0	450	6.55	48.3
H2.3	H2.3	H1.2	60.000	0.600	9.622	9.502	0.120	500.0	450	7.66	44.6
H3.1	H3.1	H3.2	36.000	0.600	9.596	9.524	0.072	500.0	900	5.43	50.0
H3.2	H3.2	H3.21	37.000	0.600	9.524	9.450	0.074	500.0	900	5.87	50.0
H3.21	H3.21	H3.3	35.000	0.600	9.450	9.380	0.070	500.0	900	6.29	49.2
H3.3	H3.3	H3.4	45.000	0.600	9.380	9.290	0.090	500.0	900	6.83	47.3
H3.4	H3.4	H1.5	31.000	0.600	9.290	9.228	0.062	500.0	900	7.20	46.1
H4.1	H4.1	H4.2	44.000	0.600	9.696	9.608	0.088	500.0	900	5.53	50.0
H4.2	H4.2	H4.3	55.000	0.600	9.608	9.498	0.110	500.0	900	6.18	49.7
H4.3	H4.3	H4.4	30.000	0.600	9.498	9.438	0.060	500.0	150	7.31	45.7
H4.4	H4.4	H4.5	18.000	0.600	9.438	9.402	0.036	500.0	300	7.74	44.4
H4.5	H4.5	H4.6	33.000	0.600	9.402	9.336	0.066	500.0	300	8.53	42.2
H4.61	H4.61	H4.6	49.000	0.600	9.434	9.336	0.098	500.0	900	5.59	50.0
H4.6	H4.6	H4.7	71.000	0.600	9.336	9.194	0.142	500.0	900	9.38	40.2
H4.7	H4.7	H4.8	49.000	0.600	9.194	9.096	0.098	500.0	900	9.97	38.9
H4.8	H4.8	H1.6	23.000	0.600	9.096	9.050	0.046	500.0	900	10.24	38.3

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)
H1.1	61.000	500.0	450	Circular_Default Sewer Type	11.500	9.624	1.426	11.300	9.502	1.348
H1.2	10.000	500.0	450	Circular_Default Sewer Type	11.300	9.502	1.348	11.300	9.482	1.368
CR	10.000	500.0	150	Circular_Default Sewer Type	11.300	9.482	1.668	11.300	9.462	1.688
H1.31	19.000	500.0	600	Circular_Default Sewer Type	11.300	9.500	1.200	11.300	9.462	1.238
H1.3	48.000	500.0	600	Circular_Default Sewer Type	11.300	9.462	1.238	11.470	9.366	1.504
H1.4	69.000	500.0	900	Circular_Default Sewer Type	11.470	9.366	1.204	11.330	9.228	1.202
H1.5	89.000	500.0	900	Circular_Default Sewer Type	11.330	9.228	1.202	11.000	9.050	1.050
H1.61	10.000	500.0	300	Circular_Default Sewer Type	11.000	9.070	1.630	11.000	9.050	1.650
H1.6	10.000	500.0	900	Circular_Default Sewer Type	11.000	9.050	1.050	11.000	9.030	1.070
H1.7	15.000	500.0	150	Circular_Default Sewer Type	11.000	9.030	1.820	10.000	9.000	0.850
H2.1	60.000	500.0	450	Circular_Default Sewer Type	11.400	9.790	1.160	11.400	9.670	1.280
H2.2	24.000	500.0	450	Circular_Default Sewer Type	11.400	9.670	1.280	11.300	9.622	1.228
H2.3	60.000	500.0	450	Circular_Default Sewer Type	11.300	9.622	1.228	11.300	9.502	1.348
H3.1	36.000	500.0	900	Circular_Default Sewer Type	11.700	9.596	1.204	11.620	9.524	1.196

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
H1.1	H1.1	1350	Manhole	Private	H1.2	1350	Manhole	Private
H1.2	H1.2	1350	Manhole	Private	CR	1350	Manhole	Private
CR	CR	1350	Manhole	Private	H1.3	1500	Manhole	Private
H1.31	H1.31	1500	Manhole	Private	H1.3	1500	Manhole	Private
H1.3	H1.3	1500	Manhole	Private	H1.4	1800	Manhole	Private
H1.4	H1.4	1800	Manhole	Private	H1.5	1800	Manhole	Private
H1.5	H1.5	1800	Manhole	Private	H1.6	1800	Manhole	Private
H1.61	H1.61	1200	Manhole	Private	H1.6	1800	Manhole	Private
H1.6	H1.6	1800	Manhole	Private	H1.7	1800	Manhole	Private
H1.7	H1.7	1800	Manhole	Private	BASIN	1500	Manhole	Private
H2.1	H2.1	1350	Manhole	Private	H2.2	1350	Manhole	Private
H2.2	H2.2	1350	Manhole	Private	H2.3	1350	Manhole	Private
H2.3	H2.3	1350	Manhole	Private	H1.2	1350	Manhole	Private
H3.1	H3.1	1800	Manhole	Private	H3.2	1800	Manhole	Private

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)
H3.2	37.000	500.0	900	Circular_Default Sewer Type	11.620	9.524	1.196	11.550	9.450	1.200
H3.21	35.000	500.0	900	Circular_Default Sewer Type	11.550	9.450	1.200	11.480	9.380	1.200
H3.3	45.000	500.0	900	Circular_Default Sewer Type	11.480	9.380	1.200	11.400	9.290	1.210
H3.4	31.000	500.0	900	Circular_Default Sewer Type	11.400	9.290	1.210	11.330	9.228	1.202
H4.1	44.000	500.0	900	Circular_Default Sewer Type	11.800	9.696	1.204	11.710	9.608	1.202
H4.2	55.000	500.0	900	Circular_Default Sewer Type	11.710	9.608	1.202	11.600	9.498	1.202
H4.3	30.000	500.0	150	Circular_Default Sewer Type	11.600	9.498	1.952	11.540	9.438	1.952
H4.4	18.000	500.0	300	Circular_Default Sewer Type	11.540	9.438	1.802	11.500	9.402	1.798
H4.5	33.000	500.0	300	Circular_Default Sewer Type	11.500	9.402	1.798	11.440	9.336	1.804
H4.61	49.000	500.0	900	Circular_Default Sewer Type	11.530	9.434	1.196	11.440	9.336	1.204
H4.6	71.000	500.0	900	Circular_Default Sewer Type	11.440	9.336	1.204	11.430	9.194	1.336
H4.7	49.000	500.0	900	Circular_Default Sewer Type	11.430	9.194	1.336	11.200	9.096	1.204
H4.8	23.000	500.0	900	Circular_Default Sewer Type	11.200	9.096	1.204	11.000	9.050	1.050

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
H3.2	H3.2	1800	Manhole	Private	H3.21	1800	Manhole	Private
H3.21	H3.21	1800	Manhole	Private	H3.3	1800	Manhole	Private
H3.3	H3.3	1800	Manhole	Private	H3.4	1800	Manhole	Private
H3.4	H3.4	1800	Manhole	Private	H1.5	1800	Manhole	Private
H4.1	H4.1	1800	Manhole	Private	H4.2	1800	Manhole	Private
H4.2	H4.2	1800	Manhole	Private	H4.3	1800	Manhole	Private
H4.3	H4.3	1800	Manhole	Private	H4.4	1200	Manhole	Private
H4.4	H4.4	1200	Manhole	Private	H4.5	1200	Manhole	Private
H4.5	H4.5	1200	Manhole	Private	H4.6	1800	Manhole	Private
H4.61	H4.61	1800	Manhole	Private	H4.6	1800	Manhole	Private
H4.6	H4.6	1800	Manhole	Private	H4.7	1800	Manhole	Private
H4.7	H4.7	1800	Manhole	Private	H4.8	1800	Manhole	Private
H4.8	H4.8	1800	Manhole	Private	H1.6	1800	Manhole	Private

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
H1.1	11.500	1.876	1350				
				0	H1.1	9.624	450
H1.2	11.300	1.798	1350				
				1	H1.1	9.502	450
				2	H2.3	9.502	450
				0	H1.2	9.502	450
CR	11.300	1.818	1350				
				1	H1.2	9.482	450
				0	CR	9.482	150
H1.3	11.300	1.838	1500				
				1	H1.31	9.462	600
				2	CR	9.462	150
				0	H1.3	9.462	600

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
H1.31	11.300	1.800	1500				
				0	H1.31	9.500	600
H1.4	11.470	2.104	1800		1	H1.3	9.366
				0	H1.4	9.366	900
H1.5	11.330	2.102	1800		1	H3.4	9.228
				2	H1.4	9.228	900
				0	H1.5	9.228	900
H1.61	11.000	1.930	1200				
				0	H1.61	9.070	300
H1.6	11.000	1.950	1800		1	H1.61	9.050
				2	H4.8	9.050	900
				3	H1.5	9.050	900
				0	H1.6	9.050	900
H1.7	11.000	1.970	1800		1	H1.6	9.030
				0	H1.7	9.030	150
BASIN	10.000	1.000	1500		1	H1.7	9.000
H2.1	11.400	1.610	1350				
				0	H2.1	9.790	450
H2.2	11.400	1.730	1350		1	H2.1	9.670
				0	H2.2	9.670	450
H2.3	11.300	1.678	1350		1	H2.2	9.622
				0	H2.3	9.622	450
H3.1	11.700	2.104	1800				
				0	H3.1	9.596	900
H3.2	11.620	2.096	1800		1	H3.1	9.524
				0	H3.2	9.524	900
H3.21	11.550	2.100	1800		1	H3.2	9.450
				0	H3.21	9.450	900

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
H3.3	11.480	2.100	1800	1	H3.21	9.380	900
				0	H3.3	9.380	900
H3.4	11.400	2.110	1800	1	H3.3	9.290	900
				0	H3.4	9.290	900
H4.1	11.800	2.104	1800				
				0	H4.1	9.696	900
H4.2	11.710	2.102	1800	1	H4.1	9.608	900
				0	H4.2	9.608	900
H4.3	11.600	2.102	1800	1	H4.2	9.498	900
				0	H4.3	9.498	150
H4.4	11.540	2.102	1200	1	H4.3	9.438	150
				0	H4.4	9.438	300
H4.5	11.500	2.098	1200	1	H4.4	9.402	300
				0	H4.5	9.402	300
H4.6	11.440	2.104	1800	1	H4.61	9.336	900
				2	H4.5	9.336	300
				0	H4.6	9.336	900
H4.61	11.530	2.096	1800				
				0	H4.61	9.434	900
H4.7	11.430	2.236	1800	1	H4.6	9.194	900
				0	H4.7	9.194	900
H4.8	11.200	2.104	1800	1	H4.7	9.096	900
				0	H4.8	9.096	900

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m ³ /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	10080
30	120	240	480	720	1440	2880	5760	8640	

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 BASIN Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.000	Product Number	CTL-SHE-0138-8900-1000-8900
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.9	Min Node Diameter (mm)	1200

Node H1.7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.030	Product Number	CTL-SHE-0137-1100-2000-1100
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	11.0	Min Node Diameter (mm)	1500

Node CR Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.482	Product Number	CTL-SHE-0074-3000-1600-3000
Design Depth (m)	1.600	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200

Node H4.3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.498	Product Number	CTL-SHE-0040-1000-2000-1000
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node H1.1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.000	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	32.120	Inf Depth (m)	
Porosity	0.30	Length (m)	32.120		

Node H1.2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.800	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	32.120	Inf Depth (m)	
Porosity	0.30	Length (m)	32.120		

Node CR Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.800	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	33.000	Inf Depth (m)	
Porosity	0.95	Length (m)	33.000		

Node H1.3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.800	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	60	Depth (m)	0.400
Safety Factor	2.0	Width (m)	16.400	Inf Depth (m)	
Porosity	0.30	Length (m)	16.400		

Node H1.4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.000	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	12.240	Inf Depth (m)	
Porosity	0.30	Length (m)	12.240		

Node H1.5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.810	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	45	Depth (m)	0.400
Safety Factor	2.0	Width (m)	24.480	Inf Depth (m)	
Porosity	0.30	Length (m)	24.480		

Node H1.6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.500	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	12.250	Inf Depth (m)	
Porosity	0.30	Length (m)	12.250		

Node H1.7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.500	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	17.400	Inf Depth (m)	
Porosity	0.30	Length (m)	17.400		

Node H1.7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.000	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	17.400	Inf Depth (m)	
Porosity	0.95	Length (m)	17.400		

Node H1.61 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.500	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	17.750	Inf Depth (m)	
Porosity	0.30	Length (m)	17.750		

Node H1.61 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.000	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	17.750	Inf Depth (m)	
Porosity	0.95	Length (m)	17.750		

Node BASIN Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	190.0	0.0	1.000	484.0	0.0

Node H2.1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.900	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	30.500	Inf Depth (m)	
Porosity	0.30	Length (m)	30.500		

Node H2.2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.900	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	29.900	Inf Depth (m)	
Porosity	0.30	Length (m)	29.900		

Node H3.1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.200	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Node H3.2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.100	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Node H3.21 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.050	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	13.000	Inf Depth (m)	
Porosity	0.30	Length (m)	13.000		

Node H3.3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.980	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	14.400	Inf Depth (m)	
Porosity	0.30	Length (m)	14.400		

Node H3.4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.900	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	14.400	Inf Depth (m)	
Porosity	0.30	Length (m)	14.400		

Node H4.1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.300	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	17.600	Inf Depth (m)	
Porosity	0.30	Length (m)	17.600		

Node H4.2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.200	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	17.600	Inf Depth (m)	
Porosity	0.30	Length (m)	17.600		

Node H4.3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.100	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	33.000	Inf Depth (m)	
Porosity	0.30	Length (m)	33.000		

Node H4.3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.600	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	22.960	Inf Depth (m)	
Porosity	0.95	Length (m)	22.960		

Node H4.6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.940	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	14.500	Inf Depth (m)	
Porosity	0.30	Length (m)	14.500		

Node H4.7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	10.930	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.400
Safety Factor	2.0	Width (m)	14.500	Inf Depth (m)	
Porosity	0.30	Length (m)	14.500		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991
1 year 15 minute winter	76.857	30.991
1 year 30 minute summer	71.439	20.215
1 year 30 minute winter	50.133	20.215
1 year 60 minute summer	48.435	12.800
1 year 60 minute winter	32.179	12.800
1 year 120 minute summer	30.053	7.942
1 year 120 minute winter	19.966	7.942
1 year 180 minute summer	23.233	5.979
1 year 180 minute winter	15.102	5.979
1 year 240 minute summer	18.475	4.882
1 year 240 minute winter	12.274	4.882
1 year 360 minute summer	14.169	3.646
1 year 360 minute winter	9.210	3.646
1 year 480 minute summer	11.185	2.956
1 year 480 minute winter	7.431	2.956
1 year 600 minute summer	9.182	2.511
1 year 600 minute winter	6.274	2.511
1 year 720 minute summer	8.203	2.199
1 year 720 minute winter	5.513	2.199
1 year 960 minute summer	6.768	1.782
1 year 960 minute winter	4.483	1.782
1 year 1440 minute summer	4.949	1.326
1 year 1440 minute winter	3.326	1.326
1 year 2160 minute summer	3.574	0.988
1 year 2160 minute winter	2.462	0.988
1 year 2880 minute summer	2.986	0.800
1 year 2880 minute winter	2.007	0.800
1 year 4320 minute summer	2.276	0.595
1 year 4320 minute winter	1.499	0.595
1 year 5760 minute summer	1.885	0.483
1 year 5760 minute winter	1.220	0.483
1 year 7200 minute summer	1.609	0.410
1 year 7200 minute winter	1.038	0.410
1 year 8640 minute summer	1.409	0.359
1 year 8640 minute winter	0.910	0.359
1 year 10080 minute summer	1.260	0.322
1 year 10080 minute winter	0.813	0.322
30 year 15 minute summer	268.706	76.035
30 year 15 minute winter	188.566	76.035
30 year 30 minute summer	174.929	49.499
30 year 30 minute winter	122.757	49.499
30 year 60 minute summer	116.589	30.811
30 year 60 minute winter	77.459	30.811
30 year 120 minute summer	70.438	18.615
30 year 120 minute winter	46.797	18.615
30 year 180 minute summer	53.298	13.715
30 year 180 minute winter	34.645	13.715
30 year 240 minute summer	41.604	10.995
30 year 240 minute winter	27.641	10.995
30 year 360 minute summer	31.221	8.034
30 year 360 minute winter	20.295	8.034

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 480 minute summer	24.324	6.428
30 year 480 minute winter	16.160	6.428
30 year 600 minute summer	19.756	5.404
30 year 600 minute winter	13.498	5.404
30 year 720 minute summer	17.490	4.687
30 year 720 minute winter	11.754	4.687
30 year 960 minute summer	14.215	3.743
30 year 960 minute winter	9.416	3.743
30 year 1440 minute summer	10.161	2.723
30 year 1440 minute winter	6.829	2.723
30 year 2160 minute summer	7.160	1.979
30 year 2160 minute winter	4.933	1.979
30 year 2880 minute summer	5.883	1.577
30 year 2880 minute winter	3.953	1.577
30 year 4320 minute summer	4.374	1.143
30 year 4320 minute winter	2.880	1.143
30 year 5760 minute summer	3.554	0.910
30 year 5760 minute winter	2.301	0.910
30 year 7200 minute summer	2.987	0.762
30 year 7200 minute winter	1.928	0.762
30 year 8640 minute summer	2.583	0.659
30 year 8640 minute winter	1.667	0.659
30 year 10080 minute summer	2.284	0.583
30 year 10080 minute winter	1.474	0.583
100 year +40% CC 15 minute summer	488.233	138.153
100 year +40% CC 15 minute winter	342.620	138.153
100 year +40% CC 30 minute summer	320.551	90.705
100 year +40% CC 30 minute winter	224.948	90.705
100 year +40% CC 60 minute summer	214.603	56.713
100 year +40% CC 60 minute winter	142.577	56.713
100 year +40% CC 120 minute summer	129.587	34.246
100 year +40% CC 120 minute winter	86.094	34.246
100 year +40% CC 180 minute summer	97.729	25.149
100 year +40% CC 180 minute winter	63.526	25.149
100 year +40% CC 240 minute summer	75.977	20.078
100 year +40% CC 240 minute winter	50.477	20.078
100 year +40% CC 360 minute summer	56.677	14.585
100 year +40% CC 360 minute winter	36.841	14.585
100 year +40% CC 480 minute summer	43.979	11.622
100 year +40% CC 480 minute winter	29.219	11.622
100 year +40% CC 600 minute summer	35.604	9.738
100 year +40% CC 600 minute winter	24.327	9.738
100 year +40% CC 720 minute summer	31.433	8.424
100 year +40% CC 720 minute winter	21.125	8.424
100 year +40% CC 960 minute summer	25.432	6.697
100 year +40% CC 960 minute winter	16.847	6.697
100 year +40% CC 1440 minute summer	18.055	4.839
100 year +40% CC 1440 minute winter	12.134	4.839
100 year +40% CC 2160 minute summer	12.630	3.490
100 year +40% CC 2160 minute winter	8.702	3.490
100 year +40% CC 2880 minute summer	10.319	2.766
100 year +40% CC 2880 minute winter	6.935	2.766

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 4320 minute summer	7.609	1.989
100 year +40% CC 4320 minute winter	5.011	1.989
100 year +40% CC 5760 minute summer	6.145	1.573
100 year +40% CC 5760 minute winter	3.978	1.573
100 year +40% CC 7200 minute summer	5.137	1.311
100 year +40% CC 7200 minute winter	3.316	1.311
100 year +40% CC 8640 minute summer	4.424	1.129
100 year +40% CC 8640 minute winter	2.855	1.129
100 year +40% CC 10080 minute summer	3.897	0.994
100 year +40% CC 10080 minute winter	2.515	0.994

Results for 1 year Critical Storm Duration. Lowest mass balance: 95.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	H1.1	232	10.846	1.222	6.4	4.6683	0.0000	SURCHARGED
240 minute winter	H1.2	236	10.846	1.344	21.9	16.0125	0.0000	SURCHARGED
240 minute winter	CR	232	10.846	1.364	23.2	32.7390	0.0000	SURCHARGED
180 minute winter	H1.3	168	9.596	0.134	6.0	0.3805	0.0000	OK
180 minute winter	H1.31	168	9.596	0.096	0.5	0.1700	0.0000	OK
180 minute winter	H1.4	168	9.596	0.230	9.0	0.7816	0.0000	OK
180 minute winter	H1.5	168	9.595	0.367	23.2	1.4733	0.0000	OK
180 minute winter	H1.61	168	9.595	0.525	2.5	0.9807	0.0000	SURCHARGED
180 minute winter	H1.6	168	9.595	0.545	23.0	2.0977	0.0000	OK
180 minute winter	H1.7	168	9.595	0.565	11.3	1.6104	0.0000	SURCHARGED
600 minute winter	BASIN	660	9.269	0.269	10.5	62.1448	0.0000	OK
60 minute winter	H2.1	38	10.882	1.092	29.2	3.8287	0.0000	SURCHARGED
60 minute winter	H2.2	38	10.852	1.182	27.4	2.4580	0.0000	SURCHARGED
240 minute winter	H2.3	228	10.847	1.225	8.1	2.0596	0.0000	SURCHARGED
15 minute winter	H3.1	11	9.638	0.042	3.9	0.1174	0.0000	OK
180 minute winter	H3.2	168	9.596	0.072	3.1	0.2238	0.0000	OK
180 minute winter	H3.21	168	9.596	0.146	5.8	0.4772	0.0000	OK
180 minute winter	H3.3	168	9.595	0.215	9.4	0.7614	0.0000	OK
180 minute winter	H3.4	168	9.595	0.305	13.3	1.1887	0.0000	OK
600 minute winter	H4.1	585	10.325	0.629	1.3	1.9595	0.0000	OK
600 minute winter	H4.2	585	10.325	0.717	2.9	2.5205	0.0000	OK
600 minute winter	H4.3	585	10.325	0.827	3.3	3.8673	0.0000	SURCHARGED
180 minute winter	H4.4	164	9.596	0.158	0.6	0.1786	0.0000	OK
180 minute winter	H4.5	164	9.596	0.194	1.1	0.2192	0.0000	OK
180 minute winter	H4.6	172	9.596	0.260	6.7	0.9380	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)
240 minute winter	H1.1	H1.1	H1.2	6.3	0.181	0.044	9.6651	
240 minute winter	H1.2	H1.2	CR	23.2	0.216	0.162	1.5844	
240 minute winter	CR	Hydro-Brake®	H1.3	2.8				
180 minute winter	H1.3	H1.3	H1.4	6.0	0.401	0.020	3.5100	
180 minute winter	H1.31	H1.31	H1.3	-0.5	-0.040	-0.002	0.7224	
180 minute winter	H1.4	H1.4	H1.5	8.3	0.287	0.009	12.7908	
180 minute winter	H1.5	H1.5	H1.6	17.0	0.274	0.019	28.7035	
180 minute winter	H1.61	H1.61	H1.6	2.4	0.173	0.048	0.7042	
180 minute winter	H1.6	H1.6	H1.7	10.7	0.184	0.012	4.1051	
180 minute winter	H1.7	Hydro-Brake®	BASIN	10.8				
600 minute winter	BASIN	Hydro-Brake®		8.9				354.1
60 minute winter	H2.1	H2.1	H2.2	19.1	0.383	0.133	9.5066	
60 minute winter	H2.2	H2.2	H2.3	25.6	0.377	0.178	3.8026	
240 minute winter	H2.3	H2.3	H1.2	7.9	0.116	0.055	9.5066	
15 minute winter	H3.1	H3.1	H3.2	3.7	0.232	0.004	0.5953	
180 minute winter	H3.2	H3.2	H3.21	3.1	0.268	0.003	1.6588	
180 minute winter	H3.21	H3.21	H3.3	5.8	0.336	0.007	3.1949	
180 minute winter	H3.3	H3.3	H3.4	8.6	0.347	0.010	6.8794	
180 minute winter	H3.4	H3.4	H1.5	10.3	0.330	0.012	6.7072	
600 minute winter	H4.1	H4.1	H4.2	-0.5	0.104	-0.001	22.3307	
600 minute winter	H4.2	H4.2	H4.3	-1.4	0.063	-0.002	31.6667	
600 minute winter	H4.3	Hydro-Brake®	H4.4	0.7				
180 minute winter	H4.4	H4.4	H4.5	0.7	0.263	0.015	0.7715	
180 minute winter	H4.5	H4.5	H4.6	1.0	0.215	0.020	1.8630	
180 minute winter	H4.6	H4.6	H4.7	3.2	0.226	0.004	15.0883	

Results for 1 year Critical Storm Duration. Lowest mass balance: 95.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	H4.61	172	9.596	0.162	1.7	0.4116	0.0000	OK
180 minute winter	H4.7	172	9.596	0.402	9.6	1.4995	0.0000	OK
180 minute winter	H4.8	164	9.595	0.499	9.4	1.5218	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)
180 minute winter	H4.61	H4.61	H4.6	-1.7	-0.074	-0.002	5.6016	
180 minute winter	H4.7	H4.7	H4.8	-5.5	0.274	-0.006	15.5481	
180 minute winter	H4.8	H4.8	H1.6	-7.7	0.146	-0.009	8.7727	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	H1.1	17	11.006	1.382	65.7	5.4331	0.0000	SURCHARGED
600 minute winter	H1.2	585	10.959	1.457	24.7	51.3917	0.0000	SURCHARGED
600 minute winter	CR	585	10.959	1.477	19.6	149.6295	0.0000	SURCHARGED
240 minute winter	H1.3	236	10.039	0.577	8.9	1.6366	0.0000	OK
240 minute winter	H1.31	236	10.039	0.539	1.1	0.9533	0.0000	OK
240 minute winter	H1.4	236	10.040	0.674	11.3	2.2900	0.0000	OK
240 minute winter	H1.5	236	10.040	0.812	22.9	3.2545	0.0000	OK
240 minute winter	H1.61	236	10.040	0.970	6.4	11.0556	0.0000	SURCHARGED
240 minute winter	H1.6	240	10.040	0.990	24.8	3.8078	0.0000	SURCHARGED
240 minute winter	H1.7	236	10.039	1.009	15.1	11.5752	0.0000	SURCHARGED
1440 minute winter	BASIN	1530	9.504	0.504	11.0	134.0756	0.0000	OK
600 minute winter	H2.1	585	10.959	1.169	5.3	16.2126	0.0000	SURCHARGED
600 minute winter	H2.2	585	10.959	1.289	7.0	14.5106	0.0000	SURCHARGED
600 minute winter	H2.3	585	10.959	1.337	7.7	2.2490	0.0000	SURCHARGED
240 minute winter	H3.1	236	10.040	0.444	3.3	1.2494	0.0000	OK
240 minute winter	H3.2	236	10.040	0.516	7.0	1.6147	0.0000	OK
240 minute winter	H3.21	236	10.040	0.590	8.3	1.9346	0.0000	OK
240 minute winter	H3.3	236	10.040	0.660	10.7	2.3330	0.0000	OK
240 minute winter	H3.4	236	10.040	0.750	14.3	2.9170	0.0000	OK
960 minute winter	H4.1	945	10.779	1.083	3.2	3.3728	0.0000	SURCHARGED
960 minute winter	H4.2	945	10.779	1.171	5.4	4.1152	0.0000	SURCHARGED
960 minute winter	H4.3	945	10.779	1.281	11.8	89.7522	0.0000	SURCHARGED
240 minute winter	H4.4	236	10.041	0.603	0.7	0.6819	0.0000	SURCHARGED
240 minute winter	H4.5	236	10.041	0.639	1.1	0.7223	0.0000	SURCHARGED
240 minute winter	H4.6	236	10.040	0.704	12.4	2.5398	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)
30 minute summer	H1.1	H1.1	H1.2	101.6	0.641	0.708	9.6651	748.0
600 minute winter	H1.2	H1.2	CR	19.6	0.124	0.136	1.5844	
600 minute winter	CR	Hydro-Brake®	H1.3	2.7				
240 minute winter	H1.3	H1.3	H1.4	6.8	0.394	0.022	13.4401	
240 minute winter	H1.31	H1.31	H1.3	-1.1	-0.044	-0.004	5.1803	
240 minute winter	H1.4	H1.4	H1.5	7.1	0.279	0.008	38.3311	
240 minute winter	H1.5	H1.5	H1.6	14.0	0.301	0.016	54.9924	
240 minute winter	H1.61	H1.61	H1.6	-5.1	0.203	-0.104	0.7042	
240 minute winter	H1.6	H1.6	H1.7	14.8	0.197	0.017	6.3377	
240 minute winter	H1.7	Hydro-Brake®	BASIN	11.0				
1440 minute winter	BASIN	Hydro-Brake®		8.9				
600 minute winter	H2.1	H2.1	H2.2	5.2	0.232	0.037	9.5066	
600 minute winter	H2.2	H2.2	H2.3	7.0	0.273	0.049	3.8026	
600 minute winter	H2.3	H2.3	H1.2	7.7	0.111	0.054	9.5066	
240 minute winter	H3.1	H3.1	H3.2	-1.7	0.169	-0.002	12.3875	
240 minute winter	H3.2	H3.2	H3.21	4.4	0.279	0.005	15.1131	
240 minute winter	H3.21	H3.21	H3.3	6.1	0.322	0.007	16.4324	
240 minute winter	H3.3	H3.3	H3.4	8.3	0.310	0.009	23.9119	
240 minute winter	H3.4	H3.4	H1.5	10.7	0.286	0.012	18.0798	
960 minute winter	H4.1	H4.1	H4.2	3.2	0.104	0.004	27.8860	
960 minute winter	H4.2	H4.2	H4.3	6.9	0.063	0.008	34.8576	
960 minute winter	H4.3	Hydro-Brake®	H4.4	0.8				
240 minute winter	H4.4	H4.4	H4.5	0.8	0.268	0.017	1.2675	
240 minute winter	H4.5	H4.5	H4.6	1.0	0.201	0.020	2.3238	
240 minute winter	H4.6	H4.6	H4.7	-5.2	0.235	-0.006	40.8446	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	H4.61	232	10.040	0.606	3.8	1.5431	0.0000	OK
240 minute winter	H4.7	236	10.040	0.846	13.1	3.1597	0.0000	OK
240 minute winter	H4.8	236	10.040	0.944	9.2	2.8764	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)
240 minute winter	H4.61	H4.61	H4.6	-3.8	-0.061	-0.004	24.1634	
240 minute winter	H4.7	H4.7	H4.8	-4.7	0.299	-0.005	30.6832	
240 minute winter	H4.8	H4.8	H1.6	-5.9	0.163	-0.007	14.5768	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	H1.1	945	11.102	1.478	8.8	32.1959	0.0000	SURCHARGED
960 minute winter	H1.2	945	11.102	1.600	23.9	96.2810	0.0000	FLOOD RISK
960 minute winter	CR	945	11.102	1.620	18.9	297.7600	0.0000	FLOOD RISK
600 minute winter	H1.3	585	10.956	1.494	7.9	15.4686	0.0000	SURCHARGED
600 minute winter	H1.31	585	10.956	1.456	1.0	2.5722	0.0000	SURCHARGED
600 minute winter	H1.4	585	10.957	1.591	12.6	5.4086	0.0000	SURCHARGED
600 minute winter	H1.5	585	10.957	1.729	33.4	29.0390	0.0000	SURCHARGED
600 minute winter	H1.61	585	10.958	1.888	23.4	156.8596	0.0000	FLOOD RISK
600 minute winter	H1.6	585	10.956	1.906	50.8	24.6401	0.0000	FLOOD RISK
600 minute winter	H1.7	585	10.957	1.927	32.9	152.1065	0.0000	FLOOD RISK
2880 minute winter	BASIN	2940	9.874	0.874	11.0	279.7919	0.0000	OK
960 minute winter	H2.1	945	11.102	1.312	6.6	56.1397	0.0000	FLOOD RISK
960 minute winter	H2.2	945	11.102	1.432	6.7	53.1559	0.0000	FLOOD RISK
960 minute winter	H2.3	945	11.102	1.480	7.3	2.4895	0.0000	FLOOD RISK
600 minute winter	H3.1	585	10.960	1.364	2.9	3.8328	0.0000	SURCHARGED
600 minute winter	H3.2	585	10.959	1.435	6.3	4.4862	0.0000	SURCHARGED
600 minute winter	H3.21	585	10.959	1.509	7.1	4.9459	0.0000	SURCHARGED
600 minute winter	H3.3	585	10.958	1.578	9.0	5.5780	0.0000	SURCHARGED
600 minute winter	H3.4	585	10.958	1.668	16.0	9.1905	0.0000	SURCHARGED
1440 minute winter	H4.1	1440	11.260	1.564	2.8	4.8706	0.0000	SURCHARGED
1440 minute winter	H4.2	1440	11.260	1.652	6.5	9.6974	0.0000	SURCHARGED
1440 minute winter	H4.3	1440	11.260	1.762	14.1	249.7833	0.0000	SURCHARGED
600 minute winter	H4.4	585	10.957	1.519	0.7	1.7176	0.0000	SURCHARGED
600 minute winter	H4.5	585	10.957	1.555	1.3	1.7582	0.0000	SURCHARGED
600 minute winter	H4.6	585	10.956	1.620	9.9	6.1299	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)
960 minute winter	H1.1	H1.1	H1.2	8.7	0.147	0.061	9.6651	
960 minute winter	H1.2	H1.2	CR	18.9	0.123	0.132	1.5844	
960 minute winter	CR	Hydro-Brake®	H1.3	2.8				
600 minute winter	H1.3	H1.3	H1.4	7.5	0.369	0.024	13.5205	
600 minute winter	H1.31	H1.31	H1.3	-1.0	-0.027	-0.003	5.3519	
600 minute winter	H1.4	H1.4	H1.5	11.6	0.276	0.013	43.7304	
600 minute winter	H1.5	H1.5	H1.6	32.0	0.280	0.036	56.4059	
600 minute winter	H1.61	H1.61	H1.6	-19.5	-0.278	-0.397	0.7042	
600 minute winter	H1.6	H1.6	H1.7	31.3	0.167	0.035	6.3377	
600 minute winter	H1.7	Hydro-Brake®	BASIN	11.0				
2880 minute winter	BASIN	Hydro-Brake®		8.9				1384.3
960 minute winter	H2.1	H2.1	H2.2	5.0	0.237	0.035	9.5066	
960 minute winter	H2.2	H2.2	H2.3	6.7	0.273	0.047	3.8026	
960 minute winter	H2.3	H2.3	H1.2	7.3	0.115	0.051	9.5066	
600 minute winter	H3.1	H3.1	H3.2	-1.4	0.128	-0.002	22.8159	
600 minute winter	H3.2	H3.2	H3.21	3.4	0.223	0.004	23.4496	
600 minute winter	H3.21	H3.21	H3.3	5.8	0.245	0.007	22.1821	
600 minute winter	H3.3	H3.3	H3.4	8.0	0.283	0.009	28.5198	
600 minute winter	H3.4	H3.4	H1.5	14.5	0.262	0.016	19.6470	
1440 minute winter	H4.1	H4.1	H4.2	3.7	0.104	0.004	27.8860	
1440 minute winter	H4.2	H4.2	H4.3	8.0	0.048	0.009	34.8576	
1440 minute winter	H4.3	Hydro-Brake®	H4.4	0.7				
600 minute winter	H4.4	H4.4	H4.5	1.3	0.235	0.026	1.2675	
600 minute winter	H4.5	H4.5	H4.6	1.8	0.209	0.037	2.3238	
600 minute winter	H4.6	H4.6	H4.7	9.9	0.224	0.011	44.9979	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	H4.61	585	10.956	1.522	3.2	3.8737	0.0000	SURCHARGED
600 minute winter	H4.7	585	10.956	1.762	14.3	7.3331	0.0000	SURCHARGED
600 minute winter	H4.8	600	10.956	1.860	17.0	5.6707	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)
600 minute winter	H4.61	H4.61	H4.6	-3.2	-0.018	-0.004	31.0549	
600 minute winter	H4.7	H4.7	H4.8	15.2	0.257	0.017	31.0549	
600 minute winter	H4.8	H4.8	H1.6	16.6	0.139	0.019	14.5768	

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



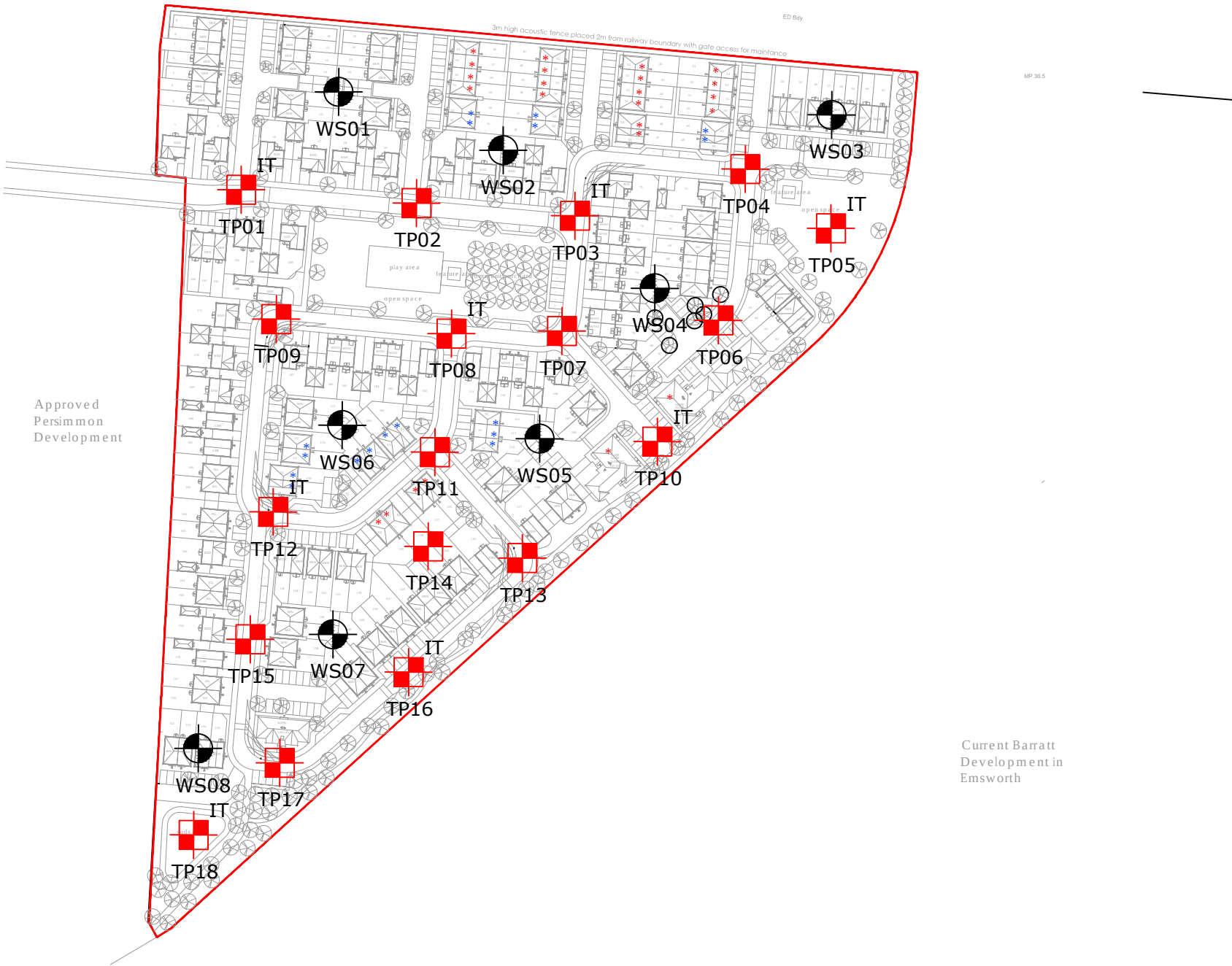
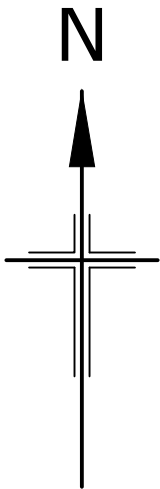
Winter Water Level Monitoring Results - measured in metres below ground level (m bgl)

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

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Tel: 01172 020070

Website: http://www.rj-uk.com

Drawing No.

61195-G-FIG02

Revision

Drawing Status

☒ INFORMATION

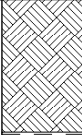
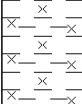
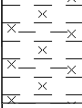
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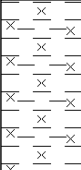
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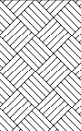
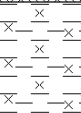
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☐ CONSTRUCTION

☐ AS CONSTRUCTED

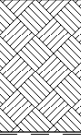
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				Orientation:		08/06/2021			
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		Dimensions (m)			
Client: BDW Southampton				Depth (m): 0.90		Scale 1:20			
						Logged TS			
Ground water	Samples & In Situ Testing			Level (m)	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

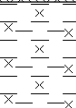
 Richard Jackson Engineering Consultants					5 Quern House, Mill Court, Gt. Shelford, CB22 5LD		Trial Pit No. TP02 Sheet 1 of 1		
Project Name: Saxons Corner Ph 2			Project No. 61195		Co-ords: Orientation:		Date 08/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant					Level (m, aOD):		Dimensions (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



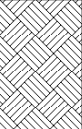
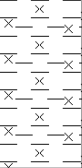
Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords: Orientation:		Dimensions (m) 1.80		Date 07/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		0.50		Scale 1:20		
Client: BDW Southampton				Depth (m): 2.55				Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
▼	0.20	ES1			0.35		Light brown silty clay TOPSOIL. TOPSOIL			
	0.60	ES2					Soft brown/orange SILT/CLAY.			
	0.70	B1					Brown slightly sandy clayey GRAVEL of subangular to subrounded fine to coarse with occasional cobble flint.			
	1.00	D1			0.90					
	2.55	D2			2.55		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			
							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. 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		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								
					0.35		Light brown slightly sandy silty TOPSOIL.				
	0.50	ES1					Soft/firm orange/brown SILT/CLAY.				
	0.70	B1									
	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

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)		Scale	
						0.50		1.20		1:20	
Client: BDW Southampton						Depth (m): 0.80		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				
							Soft/firm orange/brown slightly mottled light grey silty CLAY.				
	0.70	B1			0.80		End of Pit at 0.800m				
	0.80	ES2									
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	

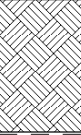
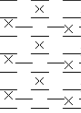
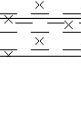


Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords: Orientation:		Dimensions (m) 2.10		Date 08/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		0.50		Scale 1:20		
Client: BDW Southampton				Depth (m): 2.80				Logged TS		
Ground water	Samples & In Situ Testing			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			0.80		Orange/brown clayey GRAVEL of subangular to subrounded fine to coarse flint.					
	0.90	D1			1.00		End of Pit at 1.000m					
Groundwater: Groundwater not encountered							Key					2
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		3	
											4	



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							
					0.35		Light brown silty TOPSOIL.			
	0.50	ES1					Soft/firm orange/brown/light grey mottled silty CLAY with black specks.			
	0.70	B1								
	0.80	ES2								
	1.00	D1			1.00		Brown/orange clayey GRAVEL of subangular to subrounded fine to coarse flint.			
					1.05		End of Pit at 1.050m			
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. TP12 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		Scale 1:20		
Client: BDW Southampton						Depth (m): 0.90		0.50		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					1 2 3 4
					0.35		Soft brown/orange SILT/CLAY.					
	0.50	ES2										
	0.70	B1			0.70		Soft firm orange/brown/light grey mottled silty CLAY.					
					0.80							
							End of Pit at 0.900m					
Groundwater: Groundwater not encountered							Key					
Stability: Dry and Stable							D Disturbed		IVN		Hand Vane	
							B Bulk		PID		PID Reading	
Remarks:							ES Environmental		PP		Pocket Penetrometer	
											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								

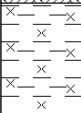


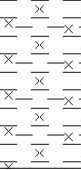
Project Name: Saxons Corner Ph 2		Project No. 61195		Co-ords: Orientation:		Dimensions (m) 1.80		Date 07/06/2021		
Location: St Georges Avenue, Emsworth Road, Havant				Level (m, aOD):		0.50		Scale 1:20		
Client: BDW Southampton				Depth (m): 1.05				Logged TS		
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.40	ES1			0.35		Light brown silty clay TOPSOIL. TOPSOIL			
	0.70	B1			0.70		Soft/firm orange/brown SILT/CLAY.			
	0.70	ES2			0.95		Firm orange/brown mottled light grey silty CLAY.			
	1.00	D1			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



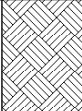
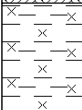
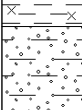
Project Name: Saxons Corner Ph 2				Project No. 61195		Co-ords: Orientation:		Dimensions (m) 1.40		Date 08/06/2021	
Location: St Georges Avenue, Emsworth Road, Havant						Level (m, aOD):		0.50		Scale 1:20	
Client: BDW Southampton						Depth (m): 1.00				Logged TS	
Ground water	Samples & In Situ Testing			Level (m)	Depth (m)	Legend	Stratum Description				
	Depth	Type	Results								
							Light brown silty TOPSOIL.				
					0.30		Soft brown SILT/CLAY.				
	0.45	ES1									
	0.60	ES2									
	0.70	B1			0.70		Soft/firm orange/brown silty CLAY with black specks.				
	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	
							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									
							Light brown silty TOPSOIL. TOPSOIL					1 2 3 4
					0.30		Soft orange/brown SILT/CLAY.					
					0.60		End of Pit at 0.600m					
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			
	0.70	B1			0.80		Soft/firm brown/orange SILT/CLAY.			
	0.70	ES2					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

[illegible]

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

$$\text{Soil Infiltration Rate (f)} = V_{p75-25} / (a_{p50} * t_{p75-25})$$

<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



Colchester
01206 228800



London
020 7448 9910



Norwich
01603 230240



Cambridge
01223 314794



Bristol
01172 020070

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