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Land at The Old Vicarage Field and The Old Estate Yard, Church Road, Turners Hill

Surface / Foul Water Drainage Strategy Report

Project No. AC20188

Doc No. AC20188-ABS-XX-XX-RP-C-5800

Revision P05

May 2025

Issue, Revision & Check

			Signed
First Issue	P01	10/11/2022	
	P02	29/11/2022	
	P03	01/05/2025	
	P04	20/05/2025	
	P05	23/05/2025	
By	Martin Howell	MEng (Hons)	
Checked	Matthew Woods	BEng (Hons)	
Approved	Matthew Woods	BEng (Hons)	

Contents

AC20188: Land at Old Vicarage Field and The Old Estate Yard, Church Road, Turners Hill – Surface / Foul Water Drainage Strategy Report

1. Introduction

ABSTRUCT Consulting have been appointed by Elivia Homes to undertake a drainage strategy for the proposed development to support a planning application. This report incorporates a SUDS assessment and maintenance strategy to assist with the planning application.

The site is located at land to the north of, The Old Vicarage, Church Road, Turners Hill, RH10 4PA, ordnance survey grid TQ 340 355. A site location plan has been provided in Appendix A.

The site is predominantly greenfield, comprising a number of grass covered fields, with a small section of developed land to the south eastern corner, comprising storage sheds and informal hardstanding. The site is bounded by Church Road to the south, Lion Lane to the east, and further fields to the north and west.

It is proposed to demolition existing buildings and develop with 40 dwellings (including affordable housing) with open space, access, parking, drainage, landscaping and other associated works as well as the creation of a new community car park and replacement parking for Lion Lane residents. A proposed site layout can be found in Appendix B.

2. Existing Drainage

The existing site has no formal foul drainage connection to the public sewer network.

The sewer records for the area around the site (Appendix D) show that there are foul water sewers to the south and east within Church Road and Lion Lane. No surface water sewers are shown.

The topographical survey (Appendix C) has not identified any formal on-site drainage, therefore all surface water generated by the small, developed area is assumed to flow overland following the general lay of the land with ground levels generally falling south to north.

3. Proposed Foul Drainage

The proposed development will connect to the Southern Water Foul Sewer (sewer records in Appendix D) to the east of the site at the junction of the car park and Lion Lane, via a new private foul sewer connection.

Southern Water have been consulted via a pre-development enquiry and have confirmed that they have sufficient capacity within the network at our proposed discharge point (Appendix F).

All foul drainage is proposed to discharge under gravity.

A proposed drainage layout can be found in Appendix E.

4. SUDS Assessment

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

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

The British Geological Society (BGS) mapping for the site shows the site to underlain by the Ardingly Sandstone Member - Sandstone. The records of these can be found in Appendix G. Due to the cohesive nature of sandstone, it would not be expected to support infiltration. This is further supported by an earlier ground investigation report undertaken in February 2019 by WSP for a previous development proposal which identified through insitu infiltration testing that the infiltration rates recorded were not adequate to justify the use of soakaways. An extract of the WSP report can also be found in Appendix G.

SUDS Feature	Site Specific Notes	Proposed Use
1) Store Rainwater for Later Use		
Rainwater Harvesting	Rainwater butts are suitable for collecting water for garden irrigation.	Rainwater butts proposed.
2) Use Infiltration Techniques		
Green Roofs	Pitched roofs are unsuitable for green roofs.	Not proposed for use.
Soakaways	Site is underlain by sandstone which is unlikely to support infiltration. This is supported by insitu soakage testing which has identified that ground has poor infiltration potential.	Not proposed for use.
Permeable Paving	Site is underlain by sandstone which is unlikely to support infiltration. This is supported by insitu soakage testing which has identified that ground has poor infiltration potential. The site has large areas of paving which would be suitable for permeable paving (tanked) to capture and treat rainwater falling upon the surface.	Proposed for use as a tanked system discharging to the wider site drainage system.
3) Attenuate Rainwater in Ponds / Open Features for Gradual Release		
Swales / Detention Basins / Ponds	There are large open spaces available on site suitable for a pond and swales, The swale will convey water to the pond which will attenuate the flows prior to discharge to a watercourse to the north of the development where the existing greenfield runoff flows.	Proposed for use.
4) Attenuate Rainwater in Tanks for Gradual Release		
Reduced Discharge and Storage	Due to the topography and layout of the site / development an element of below ground attenuation (crates) is proposed to temporarily store captured surface water run-off prior to discharge to the wider drainage network at a reduced rate.	Proposed for use.

Table 1 – SUDS Features Summary

Due to the underlying ground strata being sandstone with poor infiltration potential it is proposed to discharge surface water to the watercourse to the north. A combination of below ground attenuation (crates) and an attenuation basin will temporarily store the excess surface water volumes in larger storms.

5. Proposed Surface Water Drainage

Post development the drained area of the site will be 9,742m² (29.31%). Therefore, surface water flows generated by the site will increase post development.

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

Return Period	Greenfield Runoff Rate (ls^{-1})
1:1 year	4.6
QBar	5.4
1:30 year	10.6
1:100 year	13.5

Table 2 – Greenfield Runoff Rates

Due to the underlying ground strata being sandstone with poor infiltration potential it is proposed to discharge surface water to the watercourse to the north. Following consultation with West Sussex County Council (acting as the Lead Local Flood Authority), Appendix I, offsite flow rates will be limited to the QBar rate as advised.

Following this consultation, the areas of permeable paving, and the swales were introduced to provide a higher level of control of surface water nearer the source. As per the policy the areas of permeable paving have not been included within the calculations for the storage area.

Surface water flows will be collected via rainwater pipes, gullies, permeable paving, and swales then conveyed via a gravity surface water drainage system, incorporating an element of below ground attenuation (crates), an open basin storage structure and swales, towards the north. Beyond the outfall control of the detention basin the surface water flows will be conveyed via a series of new ditches and interconnecting pipes across the fields and under hedgerows to the north and discharge to an existing watercourse. Drainage layouts showing the above can be found in Appendix E showing the proposals.

Temporary storage will be provided within the basin to balance the volumes prior to discharge to the watercourse up to and including the 1:100 year event with a 45% allowance for climate change which is in accordance with the Environment Agencies recent changes (May 2022), to how Climate Change Allowance is assessed and incorporated within developments. Using the Environment Agencies Climate Change Allowances web page Climate Change Allowance Link the 1% annual exceedance rainfall event for the 2070's Epoch * (upper end allowance) is 45%.

** Environment Agency guidelines state:-*

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

The total offsite flow rates are shown in table 3 below.

Return Period	Runoff Rate (ls^{-1})
1:1 year	5.2
1:30 year	5.4
1:100 year	5.4

Table 3 – Post Development Offsite Flow Rates

Flow Calculations supporting the above strategy can be found in Appendix J.

In the event of surface water drainage system exceedance / failure, surface water will spread out over the grassed area to the north flowing downhill to the watercourse that eventually feeds into the River Medway, replicating the existing situation, pre-development.

It is therefore shown that post development offsite surface water flows will be suitably managed and controlled to greenfield runoff rates

6. Water Quality, Environmental and Social Benefits

As demonstrated in figure 1 below the site does not lay within a Source Protection Zone. Therefore no particular measures are required for water quality prior to discharge to the watercourse beyond standard precautions.

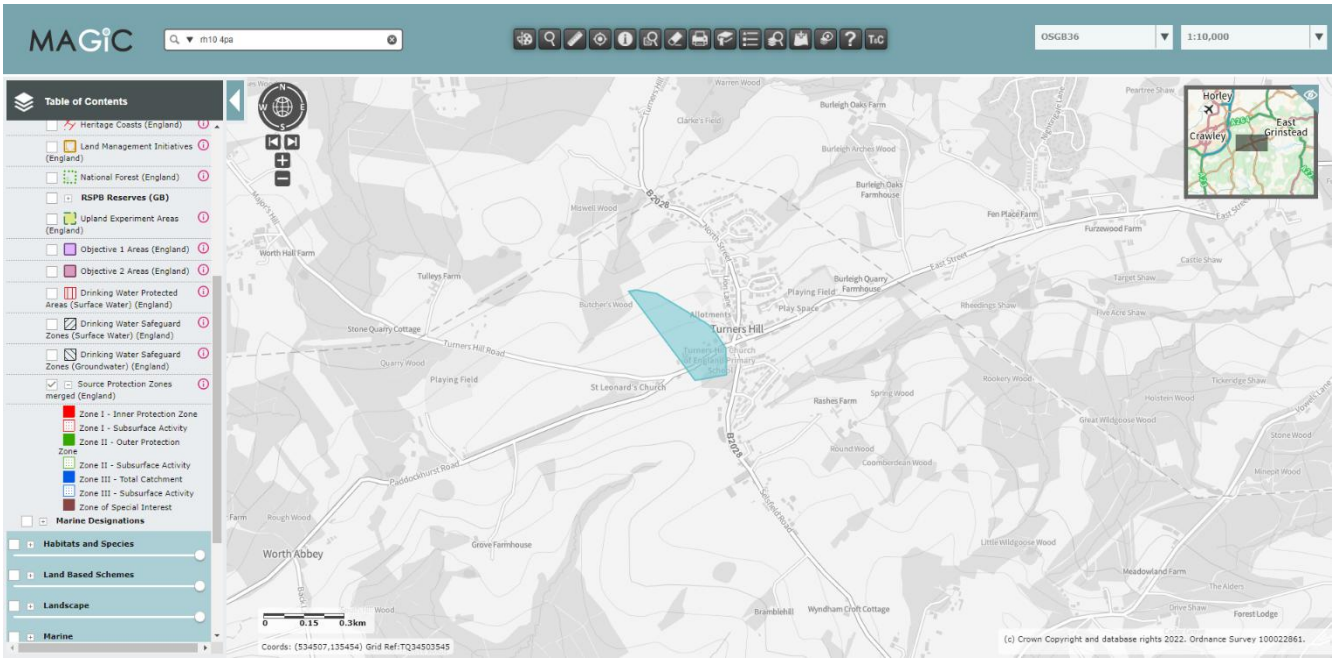


Figure 1 – Magic Map Showing Source Protection Zone

Table 4.3 from CIRIA C753 (The SuDS Manual 2015) sets out water quality management requirements for discharges to receiving ground and surface water.

For residential roofs and streets a Simple Index Approach is considered appropriate.

The residential roofs have Pollution Hazard Indices of 0.2 (Total Suspended Solids), 0.2 (Metals) and 0.05 (Hydrocarbons) as set out in Table 26.2 of CIRIA C753, as such we need to ensure that the SuDS Mitigation Index is greater than or equal to these.

The parking areas and roads for the site have Pollution Hazard Indices of 0.5 (Total Suspended Solids), 0.4 (Metals) and 0.4 (Hydrocarbons) as set out in Table 26.2 of CIRIA C753, as such we need to ensure that the SuDS Mitigation Index is greater than or equal to these.

The surface water from the roof will pass through a piped network via trapped access gullies at the bases of the rainwater pipes as well as catchpits before eventually discharging to an attenuation basin prior to discharge to the watercourse.

The parking areas are collected via tanked permeable paving prior to discharge to piped network where it is conveyed to the basin prior to discharge to the watercourse.

The roads will be collected via either trapped gullies, or discharged to a swale, before being conveyed to the basin, prior to discharge to the watercourse.

Table 4 below sets out the mitigation indices of each of the proposed forms of SUDS proposed for the development. This is taken from Table 26.3 of CIRIA C753.

SUDS Component	Total Suspended Solids	Metals	Hydrocarbons
Swale	0.5	0.6	0.6
Permeable Pavement	0.7	0.6	0.7
Attenuation Basin	0.5	0.5	065

Table 4 – Indicative SUDS Mitigation Indices for Discharges

It can be seen from the Mitigation Indices that every SUDS Component provides sufficient treatment by itself for the Hazard Indices of the surface water passing through them. Therefore as all surface water is proposed to pass through at least one of the SUDS features (the basin), it is shown that the Hazard Indices are appropriately mitigated.

As well as providing water quality benefits the swales, and basin will provide environmental benefits by encouraging flora and fauna.

7. Adoption

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

8. Drainage Maintenance

The surface water drainage system serving the development will be managed and maintained by the residents own appointed management and maintenance team once the development has been officially handed over.

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

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

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

Table 5 sets out the various elements of the drainage system and suggested maintenance requirements.

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

Table 5 – Drainage Maintenance Summary

9. Construction Phase Drainage System

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

10. Conclusion

The site is predominantly greenfield, comprising a number of grass covered fields, with a small section of developed land to the south eastern corner, comprising storage sheds and informal hardstanding. There is no formal existing foul drainage connection to the public sewer and surface water discharges to the surface where it spreads out across the green area before making its way to the stream / watercourse to the north as greenfield runoff.

The proposed development consisting of 40 new dwellings, comprising 34 houses and 6 flats, in a small block, along with a new junction with Church Road to access the development as well as associated access roads, parking and hardstandings. Two small car parks are also proposed to replace the parking areas being lost from the pre-development condition.

Foul flows are proposed to communicate to the existing Southern Water public foul sewer to the east of the site in Lion Lane via a new connection. This will be via a new manhole built over the public sewer.

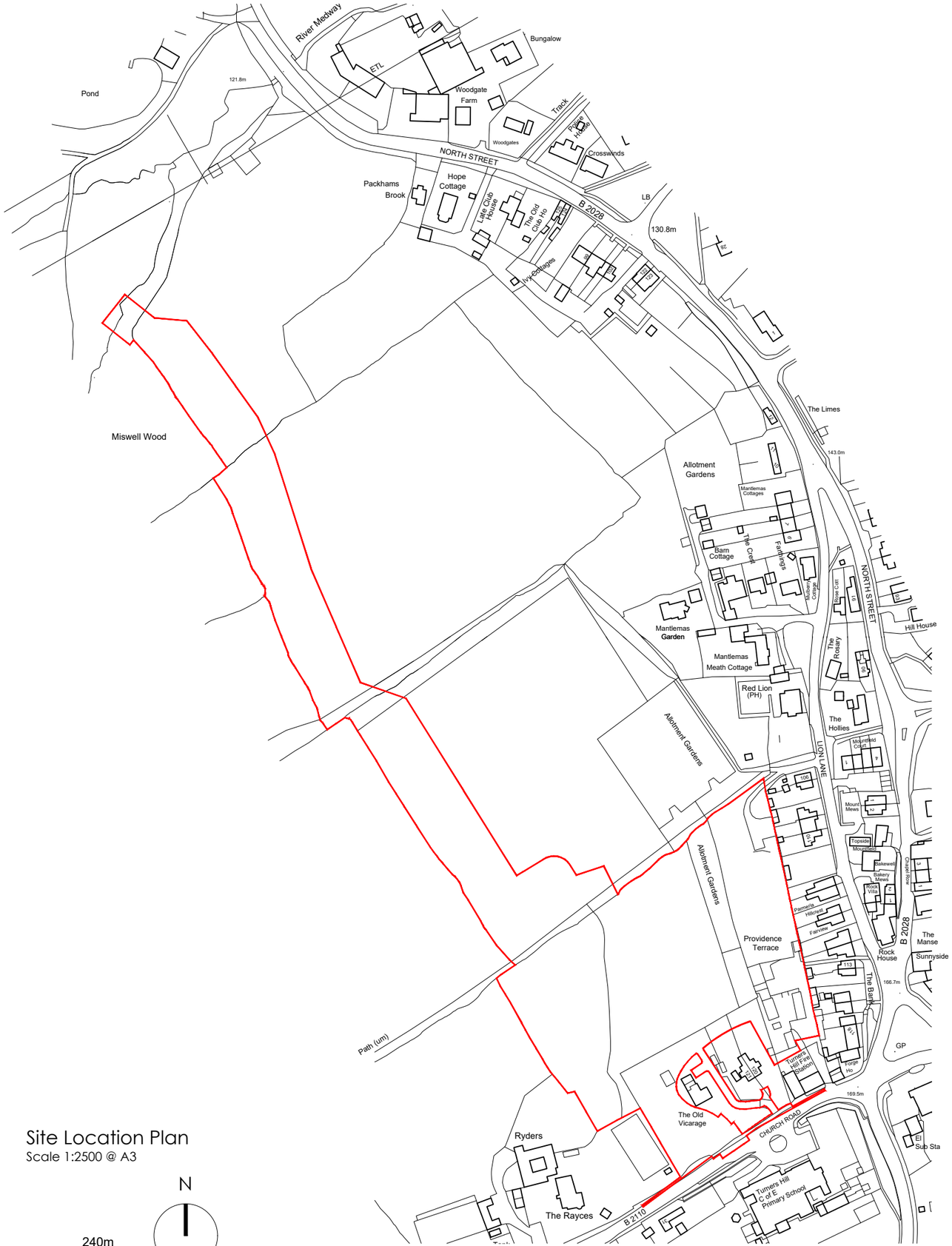
Surface water will be discharged to the watercourse downhill to the north of the development at the QBar Greenfield Runoff Rate as discussed with the Lead Local Flood Authority.

The use of SUDS with suitable mitigation indices (permeable paving, swales, and an attenuation basin) will ensure that all surface water pollution hazard indices are matched or bettered prior to discharge.

A storage basin will be used to balance volumes generated by the site prior to discharge for all storms up to and including the 100 year event with a 45% allowance for climate change.

Appendix A – Site Location Plan

ELIVIA
— HOMES —



Site Location Plan
Scale 1:2500 @ A3

Scale: 1:2500
0 20 60 100 240m

N

Revision Note & Date

Rev	Date	Note	Amended	Checked

ON ARCHITECTURE
Canterbury Studio
Logan House, St Andrews Close
Canterbury,
CT1 2RP
info@onarchitecture.co.uk
onarchitecture.co.uk
01227 634334

Project Title
Proposed Residential Development,
Land at Old Vicarage Field, Turners Hill

Clients Details
Elivia Homes Eastern

Drawing Title
Site Location Plan
(Red Line Only)

BIM Number

Scale	Date	Drawn	Checked
1:2500 @A3	May 2025	DK	DK

Drawing Status
Planning Issue

Project No.	Drawing No.	Status	Revision
20.173	501		

Appendix B – Proposed Site Plan

Scale: 1:500

0 10 30 50m

ELIVIA HOMES

Mount Mews
Mountfield
Lion Lane
Hillcrest
Rock House
13 Private Spaces for residents of Lion Lane
20 Private Spaces for residents of Lion Lane
6 visitor spaces for the village
No-dig access point to drainage basin
Local Play Area (TBC)
Turners Hill Fire Station
GP
Church Road
Ryders
The Rayces
Turners Hill C of E Primary School

Proposed Site Layout Plan
Scale 1:500 @ A1

Revision Note & Date

Rev	Date	Note	Amended	Checked
	22/05/25	Plots 28 + 30 roof plan updated following levels.	GA	DK

ON ARCHITECTURE

Canterbury Studio
Logan House, St Andrews Close
Canterbury,
CT1 2RP

info@onarchitecture.co.uk
onarchitecture.co.uk
01227 634334

Project Title
Proposed Residential Development, Church Road, Turners Hill

Client Details
Elivia Homes Eastern

Drawing Title
Proposed Site Layout Plan

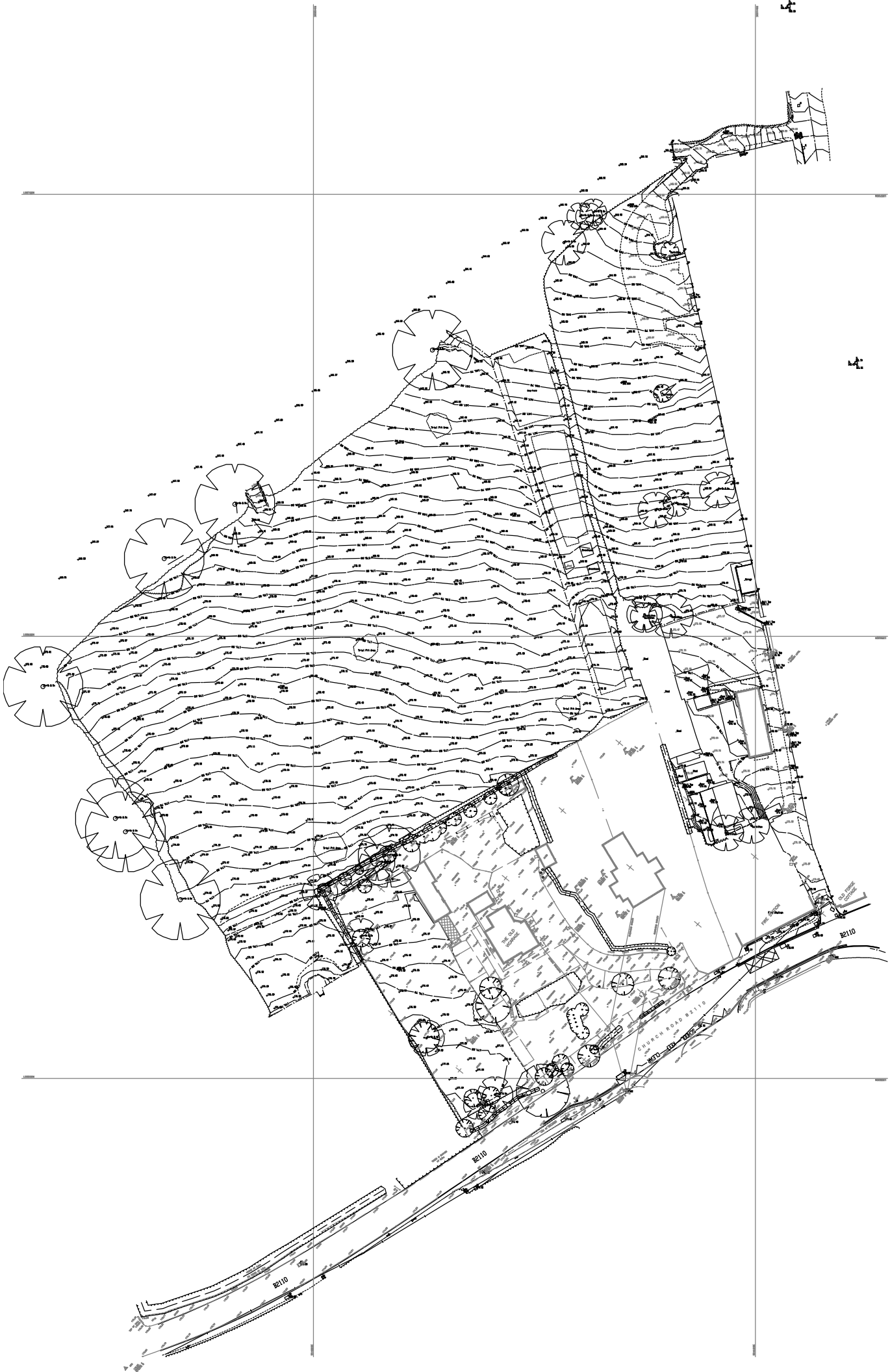
BIM Number
-

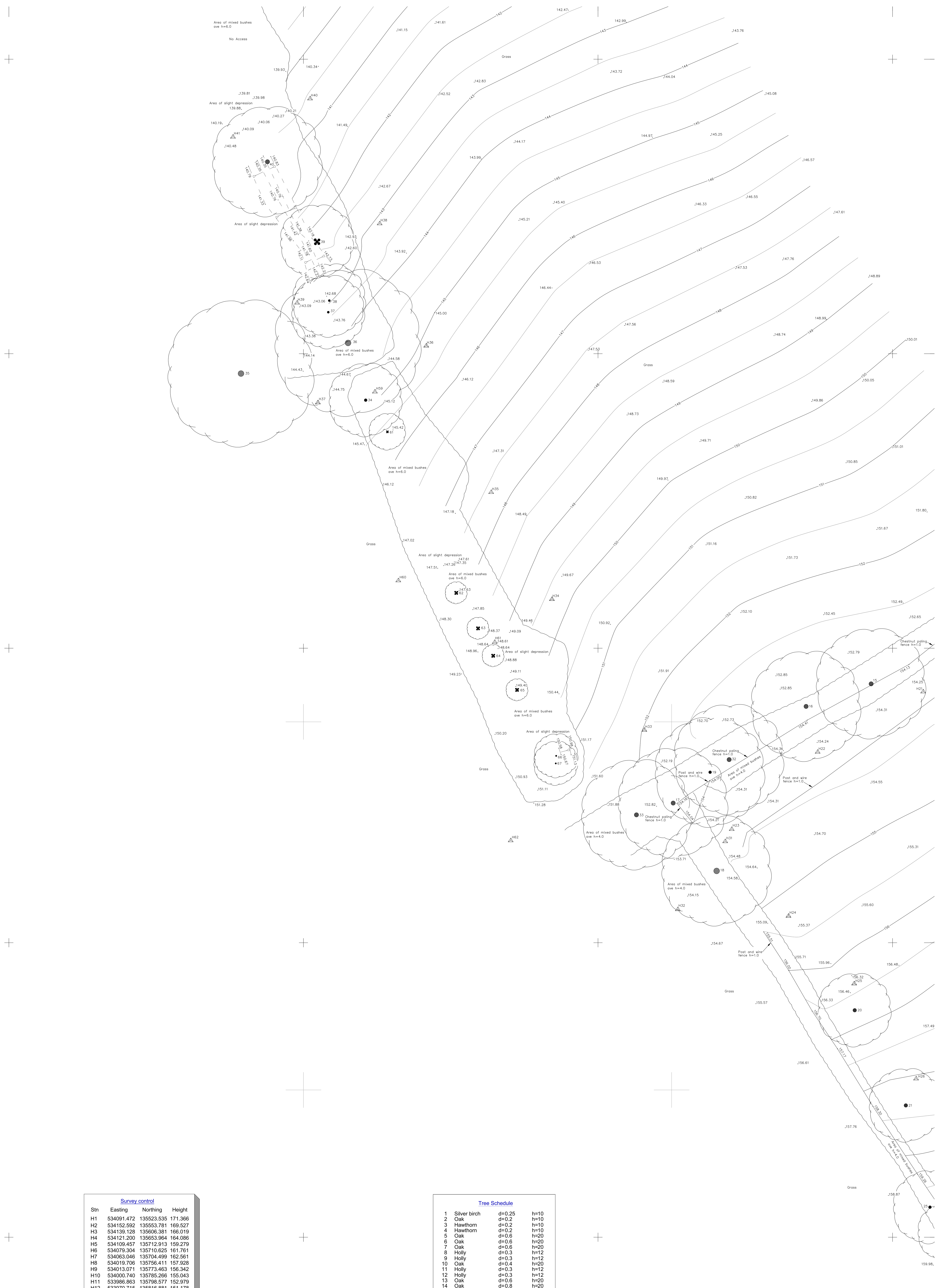
Scale	Date	Drawn	Checked
1:500@A1	May 2025	GA	RDT

Drawing Status
Planning Issue

Project No.	Drawing No.	Status	Revision
20.173	1000	-	A

Appendix C – Topographic Survey


B2110
CHURCH ROAD B2110
THE OLD HOUSE
OLD FORGE COTTAGE



Topographical Survey Legend

Hedge
Undergrowth
Tree
Bush
Building
Glass Building
Open Building
Telephone line
Power line
Banking
Contour line 64
Survey Station H5
Gate
Level .115.28
Ordnance Survey Benchmark OSBM
Foul Drainage 100mm FW MH CL 117.10 IL 116.75
Storm Drainage 100mm SW MH CL 117.10 IL 116.75

Abbreviations

Animal Sett	Sett
Air Valve	AV
Borehole	BH
Bus Stop	BS
Cover Level	CL
Earth Rod	ER
Electricity Pole	EP
Fire Hydrant	FH
Inspection Cover	IC
Invert Level	IL
Lamp Post	LP
Manhole	MH
Marker	MK
Name Plate	RNP
Power Pole	PP
Rain water Pipe	RWP
Road Sign	RS
Rodding Eye	RE
Reinforced Steel Joint	RSJ
Soil Vent Pipe	SVP
Stop Valve	SV
Survey Station	STN
Telegraph Pole	TP
Tree Stump	Stump
Trial Hole	TH
Unable To Lift	UTL
Vent Pipe	VP
Water Valve	WV

Metres
0 5 10
Scale

Notes

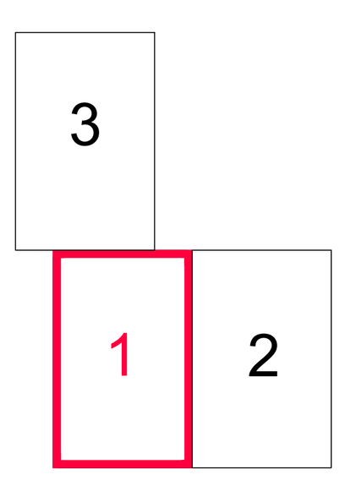
All trees are identified where possible. Species, spread, height and girth are indicative only.

Drainage has been surveyed where found, and traced where possible.

Eaves and ridge heights of surrounding buildings have been surveyed where possible.

Existing Survey shown in half-tone, pen colour 134. Layers prefixed Ex survey_

Sheet Layout



Survey control

Stn	Easting	Northing	Height
H1	534091.472	135523.535	171.366
H2	534152.592	135553.781	169.527
H3	534139.128	135606.381	166.019
H4	534121.200	135653.964	164.086
H5	534109.457	135712.913	159.279
H6	534079.304	135710.625	161.761
H7	534063.046	135704.499	162.561
H8	534019.706	135756.411	157.928
H9	534013.071	135773.463	156.342
H10	534000.740	135785.266	155.043
H11	533986.863	135798.577	152.979
H12	533970.715	135816.881	151.178
H13	533958.192	135808.056	151.651
H14	533958.132	135808.041	151.646
H15	533945.992	135799.285	152.289
H16	533936.685	135792.532	152.701
H17	533925.217	135784.345	153.203
H18	533914.532	135776.550	153.622
H19	533903.499	135768.248	154.098
H20	533895.542	135762.096	154.264
H21	533884.178	135754.115	154.311
H22	533869.846	135745.925	154.318
H23	533858.177	135735.437	154.395
H24	533865.885	135723.648	155.192
H25	533874.807	135714.459	156.445
H26	533883.212	135701.551	157.980
H27	533893.933	135683.085	160.149
H28	533930.188	135723.756	159.619
H30	533982.199	135725.515	160.168
H31	533857.292	135733.779	154.422
H32	533850.850	135724.544	154.100
H33	533846.314	135748.904	152.027
H34	533833.761	135766.677	149.631
H35	533825.511	135781.206	147.617
H36	533816.694	135801.091	145.135
H37	533801.978	135793.378	144.789
H38	533810.367	135817.696	143.107
H39	533799.156	135806.924	143.044
H40	533800.915	135834.665	140.587
H41	533790.448	135829.469	140.360
H42	533793.954	135856.152	138.122
H43	533785.082	135862.129	137.265
H44	533798.009	135875.818	137.214
H50	533787.473	135876.137	136.546
H51	533785.474	135881.569	135.126
H52	533783.322	135895.385	134.459
H53	533767.334	135912.806	132.112
H54	533754.581	135926.448	129.925
H55	533745.527	135937.781	128.332
H56	533732.184	135952.123	125.150
H57	533724.269	135952.741	124.612
H58	533733.289	135939.942	126.962
H59	533809.721	135794.851	145.043
H60	533812.901	135769.206	147.679
H61	533825.986	135760.832	148.587
H62	533828.161	135733.898	151.643
S1	533890.051	135408.388	174.269
S2	533996.850	135451.527	175.195

Tree Schedule

1	Silver birch	d=0.25	h=10
2	Oak	d=0.2	h=10
3	Hawthorn	d=0.2	h=10
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5	Oak	d=0.6	h=20
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7	Oak	d=0.6	h=20
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14	Oak	d=0.8	h=20
15	Oak	d=0.6	h=20
16	Oak	d=0.6	h=20
17	Oak	d=0.6	h=20
18	Oak	d=0.8	h=20
19	Oak	d=0.4	h=20
20	Oak	d=0.5	h=20
21	Oak	d=0.5	h=20
22	Oak	d=0.5	h=20
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51	Lime	multubole	h=20
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53	Ash	d=0.3	h=20
54	Ash	d=0.6	h=20
55	Oak	d=0.6	h=20
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57	Holly	d=0.3	h=10
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62	Hazel	multibole	h= 6
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64	Hazel	multibole	h= 6
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66	Unknown	d=0.2	h= 6
67	Unknown	d=0.2	h= 6

HOOK SURVEY

Land & Building Surveyors
www.hooksurvey.com

Project :
Old Vicarage Field, Church Road
Turners Hill, Crawley, RH10 4PA

Client :
Millwood Designer Homes Limited

Drawing title :
Topographical Survey

Job No. :	Dwg No. :	Revision :
S22/8833	S22/8833/01	-
Scale : 1:200	Date : May 2022	Drawn by : W.M.

Grid & Levels related to :
Existing Survey by others - Dwg No. 29083
Survey Station S1 & S2

Head Office
Unit 1, Bybow Farm
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Dartford, Kent
DA2 7ER
Email - mail@hooksurvey.com
Tel - 01322 277221

Midlands Office
42 Hanson Avenue
Shipston-on-Stour
Warwickshire
CV36 4HS
Email - midlands@hooksurvey.com
Tel - 01608 523118

www.hooksurvey.com

Sheet Layout

	3	
1		2

HOOK SURVEY
Land & Building Surveyors
www.hooksurvey.com

Project :
Old Vicarage Field, Church Road
Turners Hill, Crawley, RH10 4PA

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Midlands Office
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Shipston-on-Stour
Warwickshire
CV36 4HS
Email - midlands@hooksurvey.com
Tel - 01608 523118

Tree Schedule

1	Silver birch	d=0.25	h=10
2	Oak	d=0.2	h=10
3	Hawthorn	d=0.2	h=10
4	Hawthorn	d=0.2	h=10
5	Oak	d=0.6	h=20
6	Oak	d=0.6	h=20
7	Oak	d=0.6	h=20
8	Holly	d=0.3	h=12
9	Holly	d=0.3	h=12
10	Oak	d=0.4	h=20
11	Holly	d=0.3	h=12
12	Holly	d=0.3	h=12
13	Oak	d=0.6	h=20
14	Oak	d=0.8	h=20
15	Oak	d=0.6	h=20
16	Oak	d=0.6	h=20
17	Oak	d=0.6	h=20
18	Oak	d=0.8	h=20
19	Oak	d=0.4	h=20
20	Oak	d=0.5	h=20
21	Oak	d=0.5	h=20
22	Oak	d=0.5	h=20
23	Oak	d=0.4	h=20
24	Oak	d=0.4	h=20
25	Oak	d=0.4	h=20
26	Lime	d=0.25	h=15
27	Oak	d=0.3	h=15
28	Ash	d=0.5	h=20
29	Oak	d=0.3	h=15
30	Oak	d=0.4	h=15
31	Oak	d=0.3	h=15
32	Oak	d=0.6	h=20
33	Oak	d=0.6	h=20
34	Hawthorn	d=0.4	h=12
35	Oak	d=0.8	h=20
36	Oak	d=0.8	h=20
37	Hawthorn	d=0.3	h=12
38	Hawthorn	d=0.3	h=12
39	Hawthorn	multibole	h=12
40	Beech	d=0.6	h=15
41	Ash	d=0.4	h=20
42	Ash	d=0.4	h=20
43	Hawthorn	d=0.2	h=12
44	Ash	multibole	h=20
45	Ash	d=0.6	h=20
46	Ash	d=0.9	h=20
47	Ash	d=0.6	h=20
48	Ash	multibole	h=20
49	Oak	d=0.4	h=20
50	Oak	d=0.6	h=20
51	Lime	multubole	h=20
52	Lime	d=0.5	h=15
53	Ash	d=0.3	h=20
54	Ash	d=0.6	h=20
55	Oak	d=0.6	h=20
56	Ash	multibole	h=22
57	Holly	d=0.3	h=10
58	Ash	multibole	h=18
59	Oak	d=0.7	h=20
60	Oak	d=1	h=20
61	Hawthorn	multibole	h=10
62	Hazel	multibole	h= 6
63	Hazel	multibole	h= 6
64	Hazel	multibole	h= 6
65	Hazel	multibole	h= 6
66	Unknown	d=0.2	h= 6
67	Unknown	d=0.2	h= 6

Survey control

Stn	Easting	Northing	Height
H1	534091.472	135523.535	171.366
H2	534152.592	135553.781	169.527
H3	534139.128	135606.381	166.019
H4	534121.200	135653.964	164.086
H5	534109.457	135712.913	159.279
H6	534079.304	135710.625	161.761
H7	534063.046	135704.499	162.561
H8	534019.706	135756.411	157.928
H9	534013.071	135773.463	156.342
H10	534000.740	135785.266	155.043
H11	533986.863	135798.577	152.979
H12	533970.715	135816.881	151.178
H13	533958.192	135808.056	151.651
H14	533958.132	135808.041	151.646
H15	533945.992	135799.285	152.289
H16	533936.685	135792.532	152.701
H17	533925.217	135784.345	153.203
H18	533914.532	135776.550	153.622
H19	533903.499	135768.248	154.098
H20	533895.542	135762.096	154.264
H21	533884.178	135754.115	154.311
H22	533869.846	135745.925	154.318
H23	533858.177	135735.437	154.395
H24	533865.885	135723.648	155.192
H25	533874.807	135714.459	156.445
H26	533883.212	135701.551	157.980
H27	533893.933	135683.085	160.149
H28	533930.188	135723.756	159.619
H30	533982.199	135725.515	160.168
H31	533857.292	135733.779	154.422
H32	533850.850	135724.544	154.100
H33	533846.314	135748.904	152.027
H34	533833.761	135766.677	149.631
H35	533825.511	135781.206	147.617
H36	533816.694	135801.091	145.135
H37	533801.978	135793.378	144.789
H38	533810.367	135817.696	143.107
H39	533799.156	135806.924	143.044
H40	533800.915	135834.665	140.587
H41	533790.448	135829.469	140.360
H42	533793.954	135856.152	138.122
H43	533785.082	135862.129	137.265
H44	533798.009	135875.818	137.214
H50	533787.473	135876.137	136.546
H51	533785.474	135881.569	135.126
H52	533783.322	135895.385	134.459
H53	533767.334	135912.806	132.112
H54	533754.581	135926.448	129.925
H55	533745.527	135937.781	128.332
H56	533732.184	135952.123	125.150
H57	533724.269	135952.741	124.612
H58	533733.289	135939.942	126.962
H59	533809.721	135794.851	145.043
H60	533812.901	135769.206	147.679
H61	533825.986	135760.832	148.587
H62	533828.161	135733.898	151.643
S1	533890.051	135408.388	174.269
S2	533996.850	135451.527	175.195

Topographical Survey Legend

Hedge
Undergrowth
Tree
Bush
Building
Glass Building
Open Building
Telephone line
Power line
Banking
Contour line 64
Survey Station H5
Gate
Level 115.28
Ordnance Survey Benchmark OSBM
Foul Drainage 100mm FW MH CL 117.10 IL 116.75
Storm Drainage 100mm SW MH CL 117.10 IL 116.75

Abbreviations

Animal Sett	Sett
Air Valve	AV
Borehole	BH
Bus Stop	BS
Cover Level	CL
Earth Rod	ER
Electricity Pole	EP
Fire Hydrant	FH
Inspection Cover	IC
Invert Level	IL
Lamp Post	LP
Manhole	MH
Marker	MK
Name Plate	RNP
Power Pole	PP
Rain water Pipe	RWP
Road Sign	RS
Rodding Eye	RE
Reinforced Steel Joint	RSJ
Soil Vent Pipe	SVP
Stop Valve	SV
Survey Station	STN
Telegraph Pole	TP
Tree Stump	Stump
Trial Hole	TH
Unable To Lift	UTL
Vent Pipe	VP
Water Valve	WV

Metres
0 5 10
Scale

Notes

All trees are identified where possible.
Species, spread, height and girth are indicative only.

Drainage has been surveyed where found, and traced where possible.

Eaves and ridge heights of surrounding buildings have been surveyed where possible.

Existing Survey shown in half-tone, pen colour 134.
Layers prefixed Ex survey_

Sheet Layout

3
1 2

HOOK SURVEY

Land & Building Surveyors
www.hooksurvey.com

Project :
Old Vicarage Field, Church Road
Turners Hill, Crawley, RH10 4PA

Client :
Millwood Designer Homes Limited

Drawing title :
Topographical Survey

Job No. :	Dwg No. :	Revision :
S22/8833	S22/8833/03	-
Scale : 1:200	Date : May 2022	Drawn by : W.M.

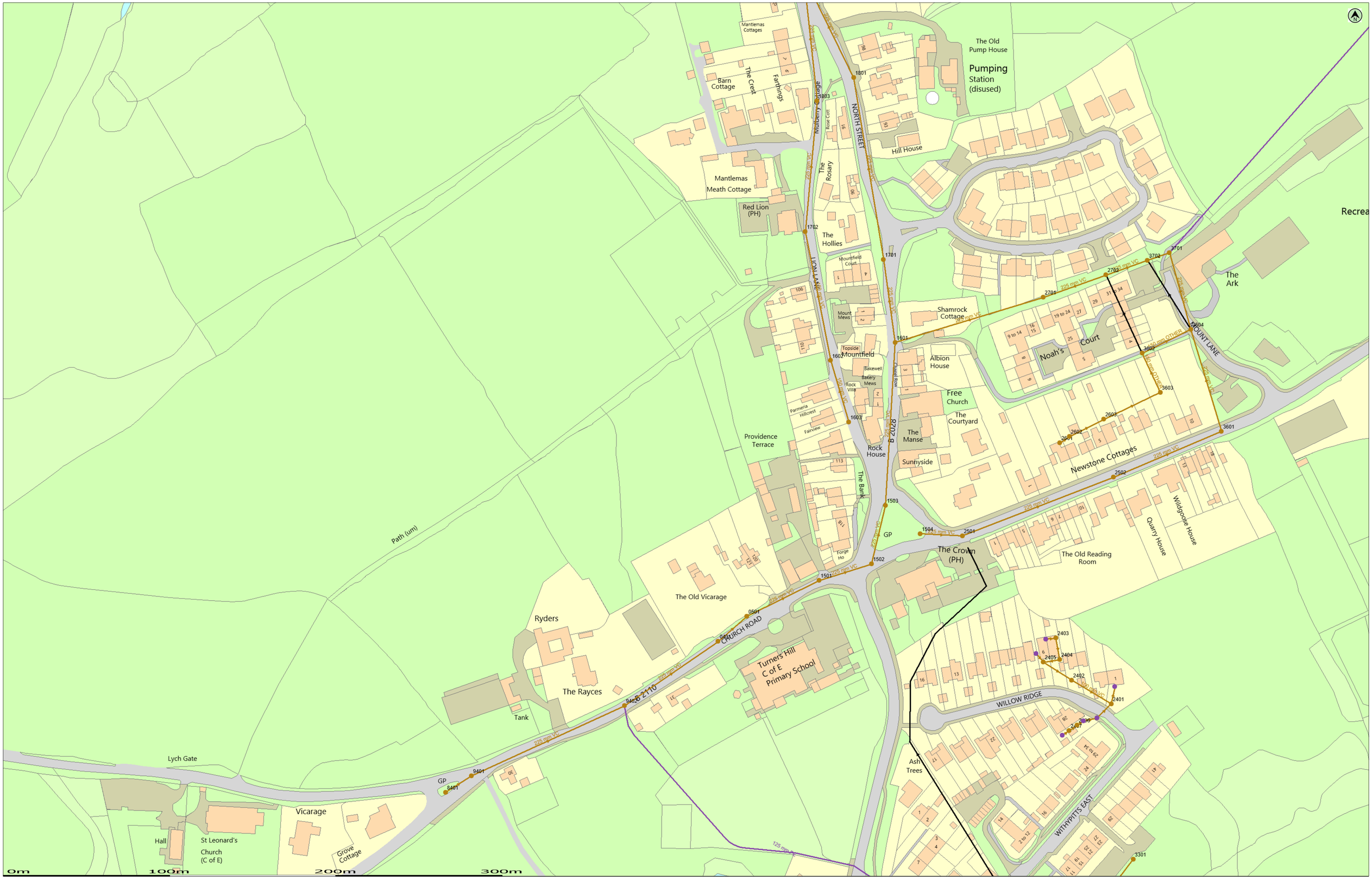
Grid & Levels related to :
Existing Survey by others - Dwg No. 29083
Survey Station S1 & S2

Head Office
Unit 1, Bybow Farm
Orchard Way
Dartford, Kent
DA2 7ER
Email - mail@hooksurvey.com
Tel - 01322 277221

Midlands Office
42 Hanson Avenue
Shipston-on-Stour
Warwickshire
CV36 4HS
Email - midlands@hooksurvey.com
Tel - 01608 523118

www.hooksurvey.com

Appendix D – Southern Water Sewer Records



(c) Crown copyright and database rights 2022 Ordnance Survey 100031673 | Date: 24/06/22 | Scale: 1:1000 | Map Centre: 534034,135617 | Data updated: 16/06/22 | Our Ref: 886607 - 1 | Wastewater Plan A1

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

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

Foul Gravity Sewer | Combined Gravity Sewer | Culverted Water Course or Treated Effluent | Surface Water Gravity Sewer | Rising Main, Vacuum or Syphon | Combined Outfall | Foul Outfall | Surface Water Outfall | Surface Water Inlet | Combined Pumping Station | Surface Water Pumping Station | Foul Pumping Station | Water Treatment Works | Section 104 Area | Building Over Agreement Area | Foul Manhole | Combined Manhole | Surface Water Manhole | Side Entry Manhole, Depression Chamber, Gulley Manhole or Surface Water Soakaway

civils@abstruct-consult.com

AC20188

WATER for LIFE from Southern Water.

Appendix E – Proposed Drainage Layout

NOTES

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND SPECIFICATIONS.
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4. INVERT LEVELS OF EXISTING DRAINAGE AT PROPOSED OUTFALL TO BE VERIFIED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION OF ANY DRAINAGE AND FINDINGS REPORTED TO ENGINEER FOR REVIEW AND ACTION IF REQUIRED.
5. ALL WORK TO PUBLIC SEWER NETWORK, INCLUDING MATERIALS, CONNECTIONS TO EXISTING MANHOLES, NEW MANHOLES AND ARRANGEMENT OF PIPE JUNCTIONS WITHIN MANHOLES TO BE FULLY IN ACCORDANCE WITH CURRENT EDITION OF SEWERS FOR ADOPTION AND SEWER UNDERTAKERS REQUIREMENTS UNLESS NOTED OTHERWISE.

CDM REGULATIONS 2015 RESIDUAL HAZARDS

RESIDUAL HAZARDS IDENTIFIED ⚠

CONSTRUCTION

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

FUTURE DEMOLITION

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

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CHAMBER FITTED WITH HYDRO-BRAKE FLOW CONTROL
DESIGN HEAD = 1.05m
DESIGN FLOW = 1l/s

BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION SYSTEM
6m x 13m x 1.0m EFFECTIVE DEPTH
(72.1m³ OF STORAGE VOLUME)

CHAMBER FITTED WITH HYDRO-BRAKE FLOW CONTROL.
DESIGN HEAD = 1.05m
DESIGN FLOW = 1l/s

BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION SYSTEM
5m x 11m x 1m EFFECTIVE DEPTH
(50.6m³ OF STORAGE VOLUME)

PERMEABLE PAVED DRIVES TO BE CONNECTED TO SURFACE WATER DRAINAGE FOR THE DISPOSAL OF SURFACE WATER DUE TO GROUND CONDITIONS.

PAVING TO PROVIDE WATER QUALITY BENEFITS.

KEY:

PRIVATE DRAINAGE

ALL BELOW GROUND PIPEWORK TO BE 100Ø UNLESS NOTED OTHERWISE

- 150Ø, 1:80 — -SURFACE WATER DRAIN.
- S1 — -SURFACE WATER CHAMBER.
- CP1 — -SURFACE WATER CATCHPIT CHAMBER.
- RG — -ROAD GULLY, 150Ø OUTLET.
- HB — -HYDRO-BRAKE FLOW CONTROL MANHOLE.
- -PERMEABLE PAVING.
- -HEADWALL.
- -BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION STORAGE SYSTEM BY SDS (TEL: 01934 751 303).
- PI VENT — -CLASS 1 BY-PASS SEPARATOR BY SPEL PRODUCTS (TEL: 01743 445 200).
- 150Ø, 1:80 — -FOUL WATER DRAIN.
- F1 — -FOUL WATER CHAMBER.

EXISTING DRAINAGE

- 150Ø Ex — -FOUL WATER DRAIN TO REMAIN.
- -FOUL WATER CHAMBER.

GENERAL

- -EXISTING LEVEL.
- × (165.00) -EXISTING LEVEL INTERPOLATED.
- × 165.00 -PROPOSED LEVEL.
- 1:50 -PROPOSED FALL.
- -PROPOSED NEW LANDSCAPED BANK.
- -RETAINING STRUCTURE.
- -EXCEEDANCE FLOOD ROUTING.

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

LEGEND

5100

PRELIMINARY ISSUE

P08	23/05/25	MH	MH	SITE LAYOUT UPDATED.
P07	20/05/25	MH	MH	FINAL SITE LAYOUT AND REDLINE ADDED.
P06	01/05/25	AS	MH	AMENDED TO SUIT NEW SITE LAYOUT, ADDITIONAL SW STORAGE.
P05	29/11/22	MH	MH	RETAINED HEIGHTS ADDED TO RETAINING STRUCTURES, RED LINE BOUNDARY UPDATED.
P04	25/10/22	MH	MRW	SITE BOUNDARY AMENDED TO MATCH PLANNING DRAWINGS, POND POSITION ADJUSTED TO MOVE AWAY FROM EXISTING TREES.
P03	26/09/22	MH	MRW	AREAS OF PERMEABLE PAVING AND SWALES ADDED TO DESIGN, OFFSITE FLOW RATE REDUCED TO QBAR RATE AND POND SIZE INCREASED ACCORDINGLY, FFLs ADDED.
P02	16/08/22	MH	MRW	UPDATED WITH NEW SITE PLAN.
P01	13/07/22	MH	MRW	PRELIMINARY ISSUE.
Mark	Date	By	Chkd	Revision notes

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

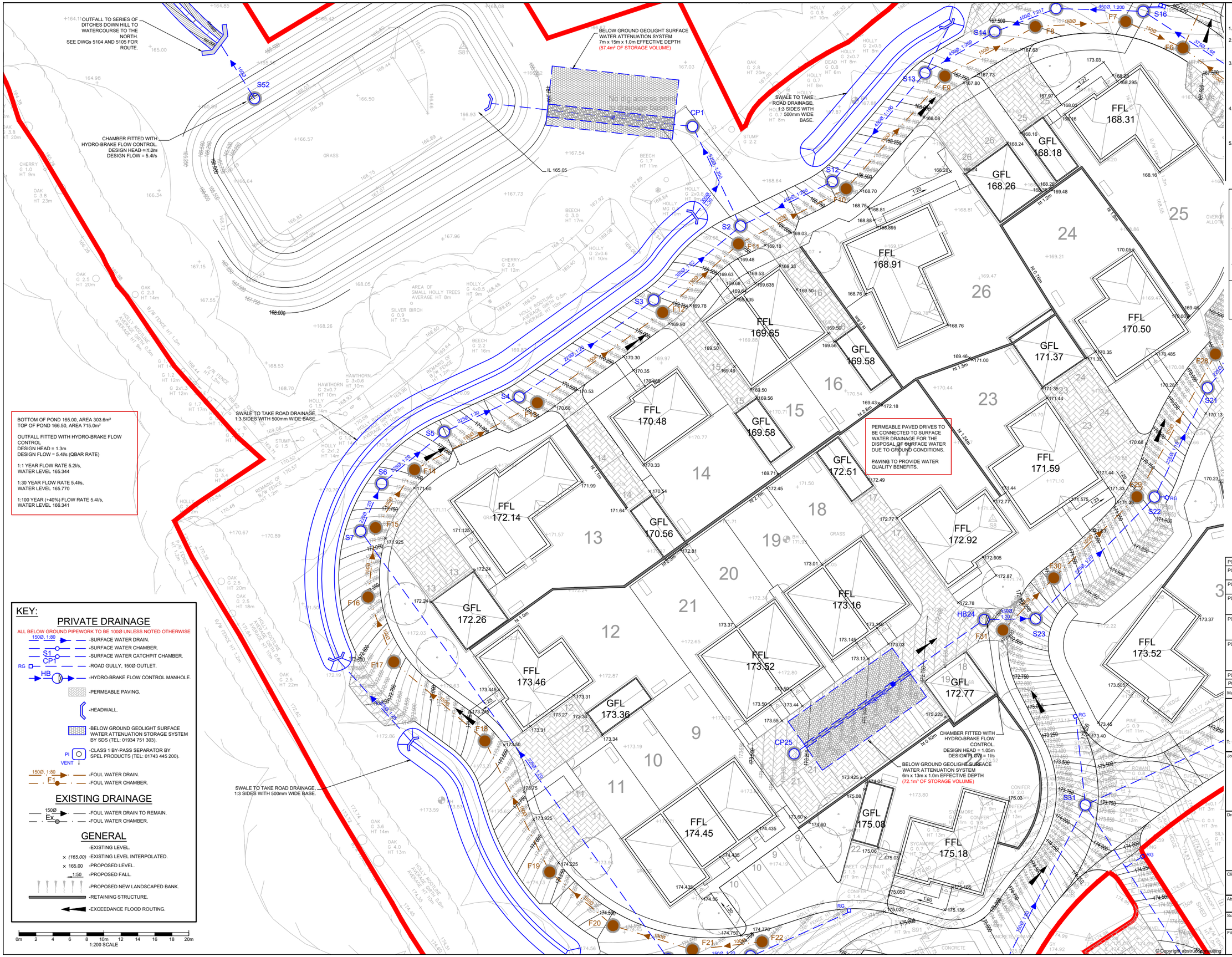
Job Title
OLD VICARAGE FIELD, TURNERS HILL.

Drawing Title
ENGINEERING LAYOUT, SHEET 1 OF 4.

Client
ELIVIA HOMES.

Abstruct Job No	Drawn	Checked
AC20188	MH	MRW
Scale @ A1	Date	Date
1:200	JUL'22	JUL'22

File Name: AC20188-ABS-XX-XX-DR-C-5100 | Revision: P08



NOTES

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LEGEND

5101

PRELIMINARY ISSUE

Mark	Date	By	Chkd	Revision notes
P08	23/05/25	MH	MH	SITE LAYOUT UPDATED.
P07	20/05/25	MH	MH	FINAL SITE LAYOUT AND REDLINE ADDED.
P06	01/05/25	AS	MH	AMENDED TO SUIT NEW SITE LAYOUT, ADDITIONAL SW STORAGE.
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P01	13/07/22	MH	MRW	PRELIMINARY ISSUE.

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Job Title
OLD VICARAGE FIELD, TURNERS HILL.

Drawing Title
ENGINEERING LAYOUT, SHEET 2 OF 4.

Client
ELIVIA HOMES.

Abstruct Job No	Drawn	Checked
AC20188	MH	MRW
Scale @ A1	Date	Date
1:200	JUL'22	JUL'22
File Name		Revision
AC20188-ABS-XX-XX-DR-C-5101		P08

BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION SYSTEM
7m x 15m x 1.0m EFFECTIVE DEPTH
(87.4m³ OF STORAGE VOLUME)

SWALE TO TAKE ROAD DRAINAGE. 1:3 SIDES WITH 500mm WIDE BASE.

PERMEABLE PAVED DRIVES TO BE CONNECTED TO SURFACE WATER DRAINAGE FOR THE DISPOSAL OF SURFACE WATER DUE TO GROUND CONDITIONS.

PAVING TO PROVIDE WATER QUALITY BENEFITS.

CHAMBER FITTED WITH HYDRO-BRAKE FLOW CONTROL.
DESIGN HEAD = 1.05m
DESIGN FLOW = 1l/s

BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION SYSTEM
6m x 13m x 1.0m EFFECTIVE DEPTH
(72.1m³ OF STORAGE VOLUME)

CHAMBER FITTED WITH HYDRO-BRAKE FLOW CONTROL.
DESIGN HEAD = 1.60m
DESIGN FLOW = 1l/s

BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION SYSTEM
13m x 22m x 1.5m EFFECTIVE DEPTH
(397.9m³ OF STORAGE VOLUME)

KEY:

PRIVATE DRAINAGE

ALL BELOW GROUND PIPEWORK TO BE 100Ø UNLESS NOTED OTHERWISE

- 150Ø, 1:80 — -SURFACE WATER DRAIN.
- S1 — -SURFACE WATER CHAMBER.
- CP1 — -SURFACE WATER CATCHPIT CHAMBER.
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GENERAL

- -EXISTING LEVEL.
- × (165.00) -EXISTING LEVEL INTERPOLATED.
- × 165.00 -PROPOSED LEVEL.
- 1:50 -PROPOSED FALL.
- -PROPOSED NEW LANDSCAPED BANK.
- -RETAINING STRUCTURE.
- -EXCEEDANCE FLOOD ROUTING.

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

NOTES

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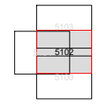
LEGEND



PRELIMINARY ISSUE

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OLD VICARAGE FIELD, TURNERS HILL.

Drawing Title
ENGINEERING LAYOUT, SHEET 3 OF 4.

Client
ELIVIA HOMES.

Abstruct Job No	Drawn	Checked
AC20188	MH	MRW
Scale @ A1	Date	Date
1:200	JUL'22	JUL'22

File Name: AC20188-ABS-XX-XX-DR-C-5102 Revision: P08

KEY:

PRIVATE DRAINAGE

ALL BELOW GROUND PIPEWORK TO BE 100Ø UNLESS NOTED OTHERWISE

- 150Ø, 1:80 — -SURFACE WATER DRAIN.
- S1 — -SURFACE WATER CHAMBER.
- CP1 — -SURFACE WATER CATCHPIT CHAMBER.
- RG — -ROAD GULLY, 150Ø OUTLET.
- HB — -HYDRO-BRAKE FLOW CONTROL MANHOLE.
- -PERMEABLE PAVING.
- -HEADWALL.
- -BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION STORAGE SYSTEM BY SDS (TEL: 01934 751 303).
- PI / VENT — -CLASS 1 BY-PASS SEPARATOR BY SPEL PRODUCTS (TEL: 01743 445 200).
- 150Ø, 1:80 — -FOUL WATER DRAIN.
- F1 — -FOUL WATER CHAMBER.

EXISTING DRAINAGE

- 150Ø Ex. — -FOUL WATER DRAIN TO REMAIN.
- -FOUL WATER CHAMBER.

GENERAL

- -EXISTING LEVEL.
- × (165.00) -EXISTING LEVEL INTERPOLATED.
- × 165.00 -PROPOSED LEVEL.
- 1:50 -PROPOSED FALL.
- -PROPOSED NEW LANDSCAPED BANK.
- -RETAINING STRUCTURE.
- -EXCEEDANCE FLOOD ROUTING.

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

PERMEABLE PAVED DRIVES TO BE CONNECTED TO SURFACE WATER DRAINAGE FOR THE DISPOSAL OF SURFACE WATER DUE TO GROUND CONDITIONS.

PAVING TO PROVIDE WATER QUALITY BENEFITS.

BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION SYSTEM
7m x 15m x 1.0m EFFECTIVE DEPTH
(87.4m³ OF STORAGE VOLUME)

No dig access path through basin

SWALE TO TAKE ROAD DRAINAGE. 1:3 SIDES WITH 500mm WIDE BASE.

NEW CHAMBER BUILT ON EXISTING SOUTHERN WATER SEWER, DEPTH AND LOCATION TO BE CONFIRMED ON SITE PRIOR TO CONSTRUCTION.

PERMEABLE SURFACED CAR PARK TO MATCH EXISTING INFORMAL CAR PARK DRAINAGE, FINISH TO BE CONFIRMED.

SURFACE WATER TO DISCHARGE TO GROUND AS EXISTING CONDITION.

NOTES

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CDM REGULATIONS 2015 RESIDUAL HAZARDS

RESIDUAL HAZARDS IDENTIFIED

CONSTRUCTION

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LEGEND

PRELIMINARY ISSUE

Mark	Date	By	Chkd	Revision notes
P08	23/05/25	MH	MH	SITE LAYOUT UPDATED.
P07	20/05/25	MH	MH	FINAL SITE LAYOUT AND REDLINE ADDED.
P06	01/05/25	AS	MH	AMENDED TO SUIT NEW SITE LAYOUT, ADDITIONAL SW STORAGE.
P05	29/11/22	MH	MH	RETAINED HEIGHTS ADDED TO RETAINING STRUCTURES, RED LINE BOUNDARY UPDATED.
P04	25/10/22	MH	MRW	SITE BOUNDARY AMENDED TO MATCH PLANNING DRAWINGS, POND POSITION ADJUSTED TO MOVE AWAY FROM EXISTING TREES.
P03	26/09/22	MH	MRW	AREAS OF PERMEABLE PAVING AND SWALES ADDED TO DESIGN, OFFSITE FLOW RATE REDUCED TO QBAR RATE AND POND SIZE INCREASED ACCORDINGLY. FFLs ADDED.
P02	16/08/22	MH	MRW	UPDATED WITH NEW SITE PLAN.
P01	13/07/22	MH	MRW	PRELIMINARY ISSUE.

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Job Title
OLD VICARAGE FIELD, TURNERS HILL.

Drawing Title
ENGINEERING LAYOUT, SHEET 4 OF 4.

Client
ELIVIA HOMES.

Abstruct Job No	Drawn	Checked
AC20188	MH	MRW
Scale @ A1	Date	Date
1:200	JUL'22	JUL'22
File Name		Revision
AC20188-ABS-XX-XX-DR-C-5103		P08

NEW 0.5m DEEP DITCH WITH 1:2 SIDES, 0.5m WIDE BASE, TO CARRY SURFACE WATER RUNOFF TO WATERCOURSE ACROSS FIELD.

HW5
CL 152.30
IL 151.80

150Ø

CONNECTING PIPE HAND DUG.

HW6
CL 154.50
IL 154.00

NEW 0.5m DEEP DITCH WITH 1:2 SIDES, 0.5m WIDE BASE, TO CARRY SURFACE WATER RUNOFF TO WATERCOURSE ACROSS FIELD.

HW7
CL 165.30
IL 164.80

POND AND OUTFALL SEE DWG. 5101 FOR FURTHER INFORMATION.

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VENT
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Ex -FOUL WATER CHAMBER.

GENERAL

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1:50 -PROPOSED FALL.
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-EXCEEDANCE FLOOD ROUTING.

0m 5 10 15 20 25m 30 35 40 45 50m
1:500 SCALE

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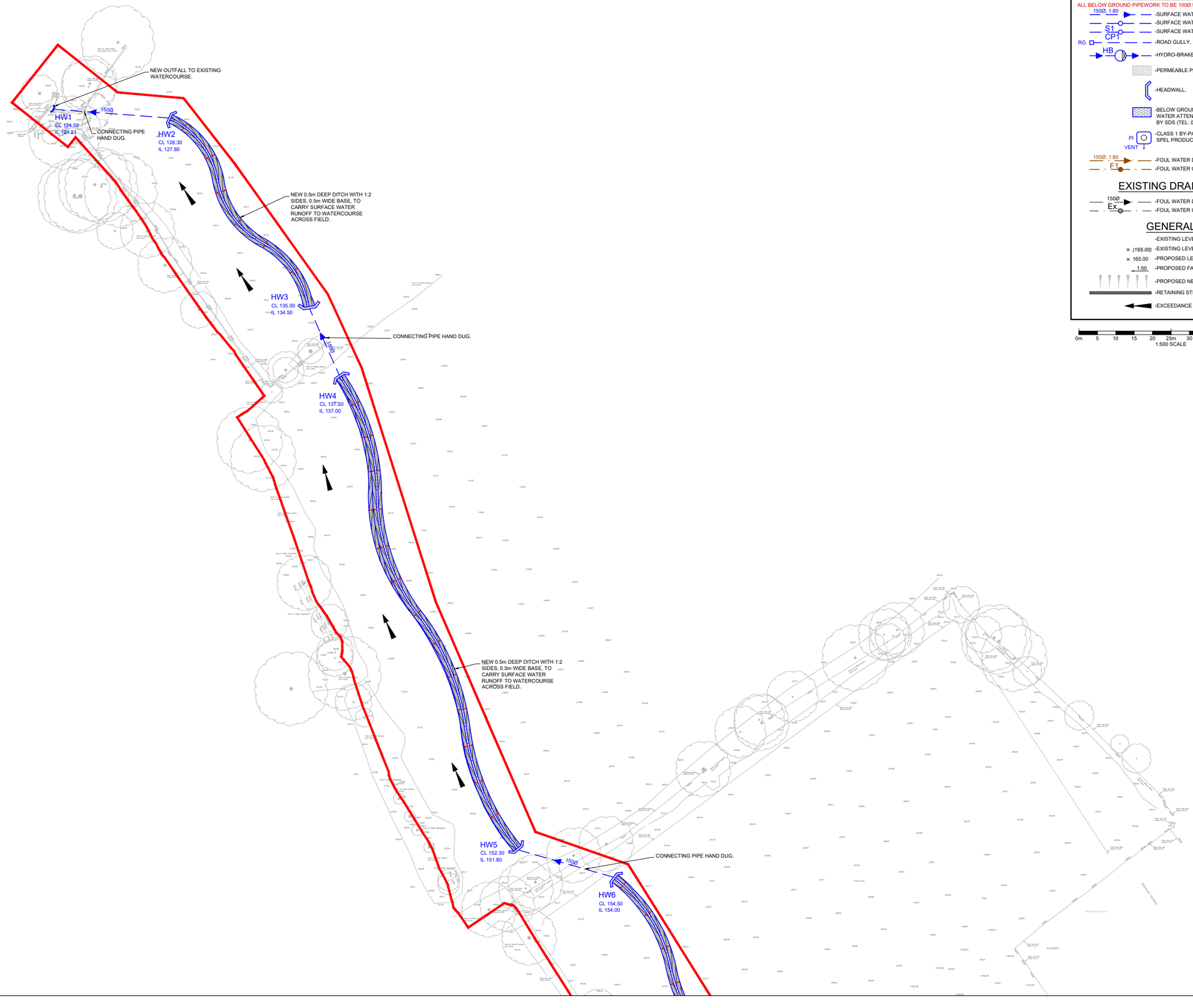
Job Title
OLD VICARAGE FIELD, TURNERS HILL.

Drawing Title
SURFACE WATER OUTFALL, SHEET 1 OF 2

Client
ELIVIA HOMES.

Abstruct Job No	Drawn	Checked
AC20188	MH	MRW
Scale @ A1	Date	Date
1:500	JUL'22	JUL'22
File Name		Revision
AC20188-ABS-XX-XX-DR-C-5104		P08



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Job Title
OLD VICARAGE FIELD, TURNERS HILL.

Drawing Title
SURFACE WATER OUTFALL, SHEET 2 OF 2

Client
ELIVIA HOMES.

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Scale @ A1	Date	Date
1:500	JUL'22	JUL'22

File Name: AC20188-ABS-XX-XX-DR-C-5105 — Revision: P08

Appendix F – Southern Water Pre Development Enquiry

from Southern Water

Matthew Woods
The Dovecote
Salters Heath Business Centre
Cold Arbor Road
Sevenoaks
Kent
TN13 2BL

Your ref
18060

Our ref
DSA000038898

Date
25 February 2025

Contact
Tel 0330 303 0119

Dear Mr Woods,

Level 1 Capacity Check Enquiry: Old Vicarage Field, Church Road, Turners Hill, West Sussex, RH10 4PA.

We have completed the capacity check for the above development site and the results are as follows:

Foul Water

The enquiry has been reassessed to determine the capacity available for 0.72 l/s at manhole reference TQ34351702 Grid Reference: 534106, 135741.

There is currently adequate capacity in the local sewerage network to accommodate a foul flow of 0.72 l/s for the above development at manhole reference TQ34351702. Please note that no surface water flows (existing or proposed) can be accommodated within the existing foul sewerage system unless agreed by the Lead Local Flood Authority in consultation with Southern Water, after the hierarchy Part H3 of Building Regulations has been complied with.

Connecting to our network

It should be noted that this information is only a hydraulic assessment of the existing sewerage network and does not grant approval for a connection to the public sewerage system. A formal Sewer Connection (S106) application is required to be completed and approved by Southern Water Services. To make an application visit: developerservices.southernwater.co.uk

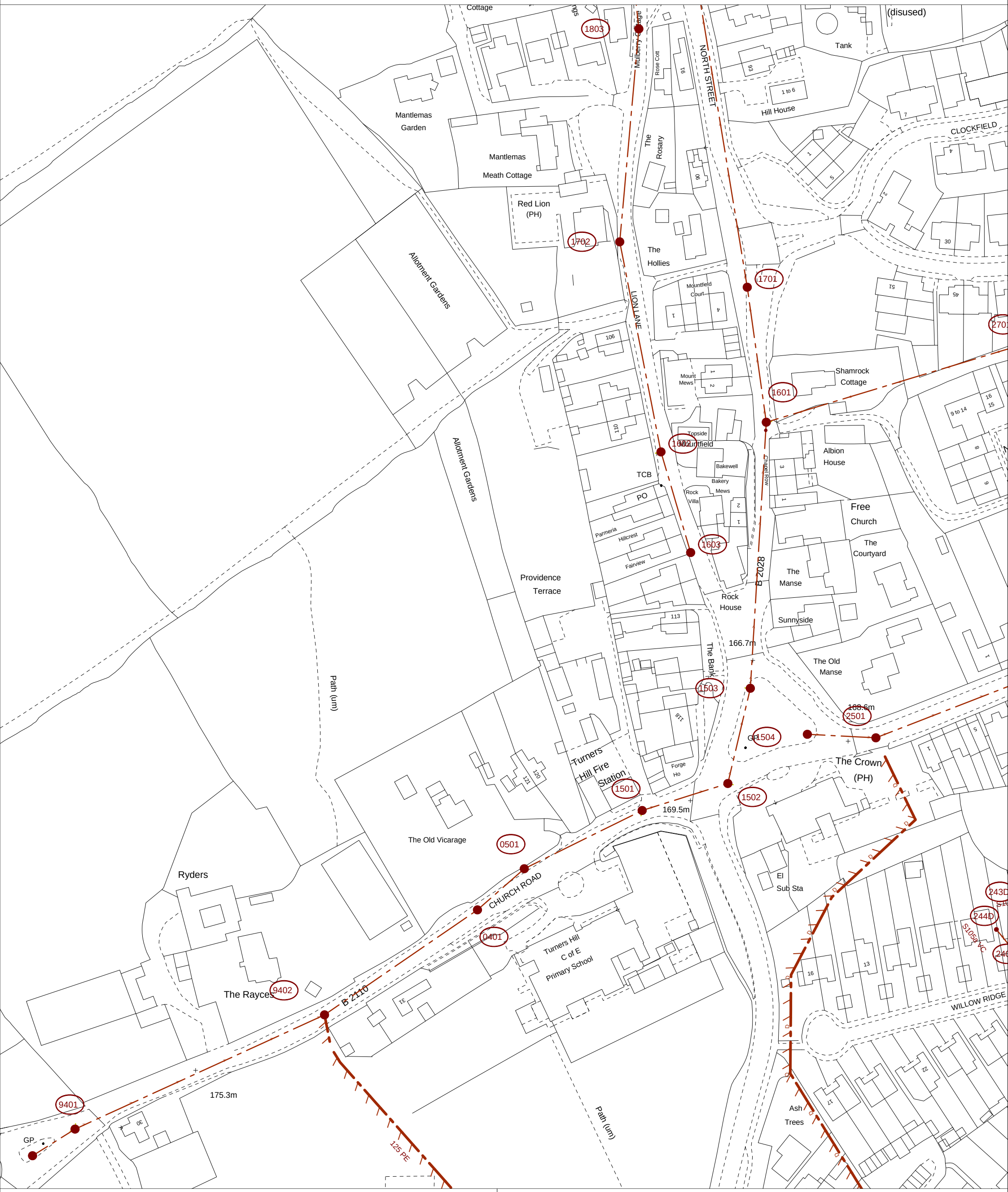
Please note the information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

Please get in touch via the Get Connected customer dashboard if you have any queries.

Yours sincerely,

Future Growth Planning Team
Developer Services
southernwater.co.uk/developing-building/planning-your-development

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Southern Water

O.S. REF: TQ3435NW

Scale: 1:1250

Printed By: Mercy

Date: 4-8-2022

Sewer Plot

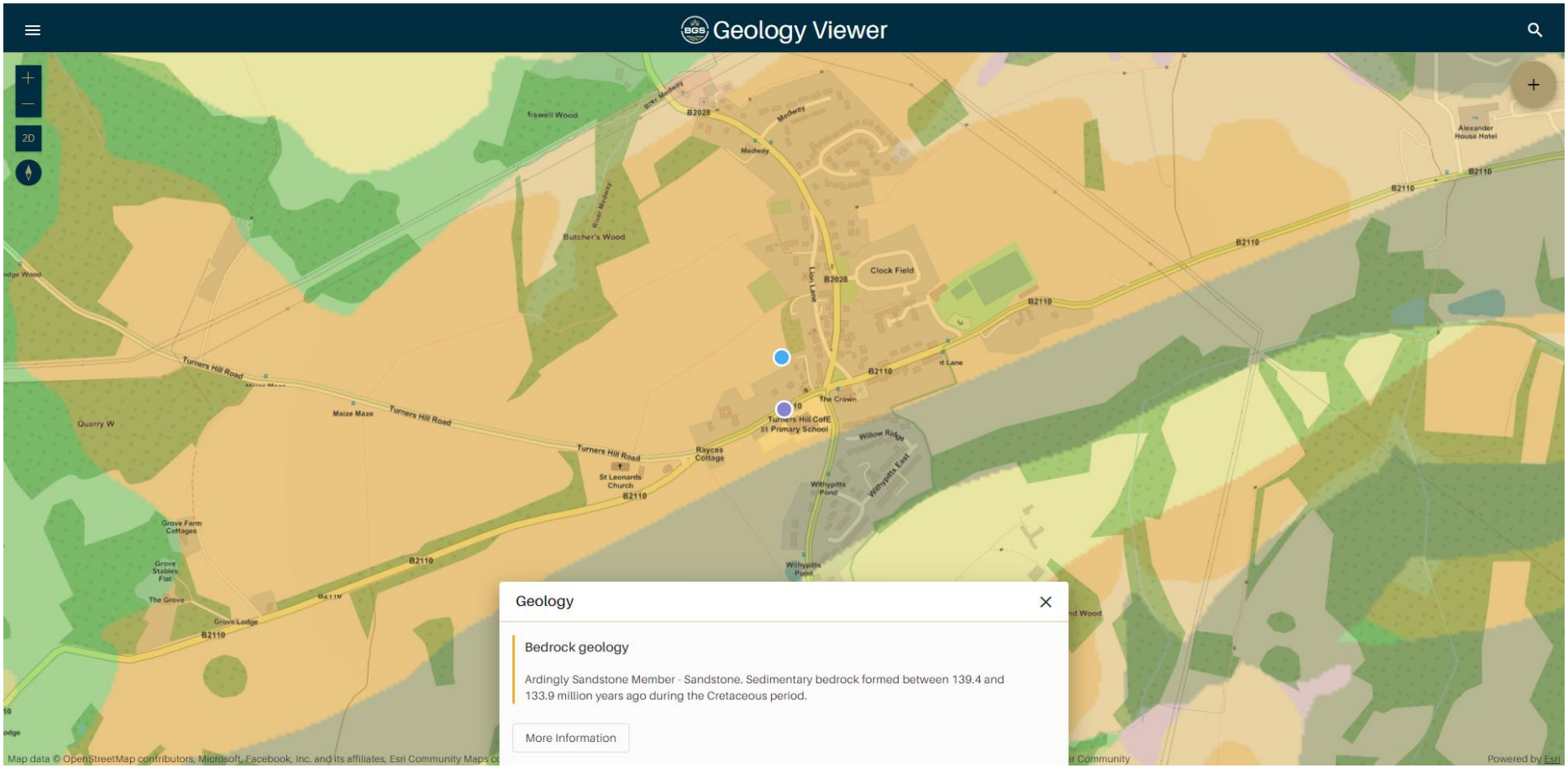
Site Plan

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

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

Requested By:

Appendix G – British Geological Society Map Extract



PADDOCKHURST ESTATE

OLD VICARAGE FIELD, TURNERS HILL

Ground Investigation Report

VERSION 1
FEBRUARY 2019

CONFIDENTIAL

PADDOCKHURST ESTATE

OLD VICARAGE FIELD, TURNERS HILL

Ground Investigation Report

TYPE OF DOCUMENT CONFIDENTIAL

PROJECT NO. 70041007

OUR REF. NO. VERSION 1

DATE: FEBRUARY 2019

WSP

Unit 9, The Chase
John Tate Road, Foxholes Business Park
Hertford
SG13 7NN

Phone: +44 1992 526 000

Fax: +44 1992 526 001

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks				
Date	March 2018	February 2019		
Prepared by	David Loeb / Alice Waylett	Rob Melillo / Keeley Seymour		
Signature		 Melillo, Rob I am the author of this document 2019.02.19 09:37:03 Z		
Checked by	Abi Barton / Alex Mann	Abi Barton / Alex Mann		
Signature		 I have checked this document 2019.02.19 09:43:26 Z		
Authorised by	Mark Wheeler	Liam Barber		
Signature		Barber, Liam Digitally signed by Barber, Liam DN: cn=Barber, Liam, ou=Cambridge (Hills Road), email=Liam.Barber@wsp.com Date: 2019.02.19 13:46:47		
Project number	70041007	70041007		
Report number	70041007-GIR-	70041007-GIR-Rev 1		
File reference				

CONTENTS

TABLES

LIST OF FIGURES (APPENDIX A)

APPENDICES

EXECUTIVE SUMMARY

The Old Vicarage Field, located in Turners Hill, West Sussex is a proposed development that will comprise of 44 residential plots, an office building and associated access roads. The proposed access road off Church Lane for the development will lie in a cutting up to 4m deep, into bedrock with a cut slope of 1(v) in 2(h). This development will provide residential space and office space for the village of Turners Hill.

This Ground Investigation Report brings together the previous and recent ground investigations undertaken by Endeavour Drilling in January and October 2018. This report should be read in conjunction with the WSP Preliminary Risk Assessment (March 2018) and supersedes the Preliminary Ground Investigation Report (March 2018).

ENVIRONMENTAL SETTING

The published geological map for the area identifies the following geological units in the area: Ardingly Sandstone, Lower Tunbridge Wells Sands Formation and Wadhurst Clay Formation. The published maps do not identify Superficial Deposits on site, however, the Ground Investigation has confirmed Superficial Deposits comprising of a thin layer of Topsoil and Made Ground. The site slopes from Church Lane in the south towards Lion Lane in the north east of the site.

GEOTECHNICAL SUMMARY

The exploratory holes of both the preliminary (Jan 2018) and supplementary (Oct 2018) ground investigations encountered reworked sandy gravelly Topsoil across the site, with the exception of the car park to the north and workshop areas to the south. Made Ground was also encountered beneath the car park, the workshop areas and as small concrete obstructions in the east and south east of the site.

Beneath the Topsoil and Made Ground, weathered Ardingly Sandstone, a soft to stiff gravelly clay and a light yellowish brown mottled light grey slightly gravelly clayey fine sand with sandstone lithorelics, was encountered varying in thickness. The contact with rock head below was variable, ranging from 0.55m bgl to 3.00m bgl, and typically 1.0m bgl. Underlying the weathered material, the investigation encountered the Ardingly Sandstone, an extremely weak to weak sandstone with interbedded stiff clay and dense sand. The base of this unit was not proven. Groundwater monitoring undertaken during a wet season (Jan 2018) indicated a level from 2.0m bgl to 4.2m bgl. The later investigation during a considerably dry period (Oct 2018) indicated a large fluctuation in the groundwater levels with the levels below the scope of the investigation.

Strip or square pad foundations constructed to a depth of 1.5m bgl are considered suitable for this site. It is anticipated that the soils at formation depth (1.5m bgl) will vary between either cohesive or granular soils and sandstone. Therefore, the recommended allowable bearing capacity has been limited to 100kPa in order to reduce the risk of differential settlement.

It is recommended that foundations penetrate a minimum of 300mm into undisturbed natural strata, and a minimum undrained shear strength of 65kPa is confirmed at foundation level for cohesive deposits.

The capacities of the founding stratum, Rock Mass Rating (RMR) and material properties should be confirmed in situ on site during any earthworks or construction stages after the foundation schedule and zoning plan are finalised.

The feasibility of the slope angle for the access road cutting will depend on depth of the weathered material, the quality of the rock slope uncovered and the favourability of bedding planes and discontinuities and groundwater level. The regional Geology dips 3^{o} – 5^{o} to the Northwest, hence unfavourable discontinuities could daylight in the slope surface. A detailed Slope Stability Assessment should be included within the Geotechnical Design Report (GDR) to develop a safe design.

Groundwater strikes and subsequent groundwater monitoring during the preliminary investigation (Jan 2018) recorded groundwater within the range of 166.2m AOD to 172.25m AOD (2.0m bgl to 4.2mbgl). No groundwater was encountered during the supplementary ground investigation undertaken in October 2018.

Two infiltration tests were carried out in January 2018, with neither providing adequate infiltration rates for the use soakaways.

The weathered Ardingly Sandstone has been assigned a Design Sulphate Class of DS-1 and an Aggressive Concrete Environment Class of AC-1. The Ardingly Sandstone deposits have been assigned a Design Sulphate Class of DS-1 and an Aggressive Concrete Environment Class of AC-1.

CONTAMINATION SUMMARY

Ground contamination constraints have been identified with regard to human health comprising elevated soil concentrations in the south-east of the site within the reworked Topsoil. In addition, constraints relating to controlled waters comprise the leachate potential of the reworked Topsoil in the south east of the site; and the marginally elevated contaminants within the underlying groundwater within the Ardingly Sandstone Member.

The nearest significant water feature is located 300m north of the site; there are no abstractions identified within 500m; and the site is not currently within a groundwater source protection zone, therefore it is considered that any lateral or vertical migration that may occur is unlikely to represent a significant risk to controlled waters.

It should be noted that an attenuation basin is proposed in the north east of the site to allow discharge of surface waters to the River Medway, however this will only capture surface run-off from hardstanding areas and therefore water being discharge from this area will not come into contact with the potential contaminated soils in the south east of the site

Mitigation measures such as source removal of the reworked Topsoil should be considered for the site however it is likely that this topsoil will be removed as part of the creation of the development plateau as part of the construction works for the site. This material could be further assessed to examine suitability for reuse within garden and landscape areas (under a materials management plan).

Recorded concentrations of ground gas were below levels of concern resulting in a classification of the site as CIRIA Characteristic Situation 1 and NHBC characterisation of Green, where no mitigation measures are required.

RECOMMENDATIONS

WSP recommend that the following be undertaken at the appropriate stage of the development, with the majority of the actions falling within detailed design, post planning:

- The Ground Investigation Report should be submitted to the local authority for review;
- A Geotechnical Design Report (GDR) be completed to include an earthworks specification, foundation design and slope stability assessment concerning the proposed cutting.
- A foundation schedule and zoning plan is produced to aid Contractors at the tender stage;
- The slope design should be validated at construction stage by means of an on-site rock mass classification to inform the final safe slope angle;
- Discussion is undertaken with the water supply providers regarding appropriate mitigation measures for water supply pipes;
- Completion of a Material Management Plan designed to make sure that where possible existing soils are retained on-site. Mitigation measures may include further delineation of soils, localised removal, segregation and validation of underlying soils prior to being reused or potentially removed from site.

APPENDIX F

Groundwater Monitoring Results

endeavour drilling

Gas and Water Level Readings

Client: WSP

Site: Paddockhurst Estate, Old Vicarage Field Date: Various

Borehole No.	Round	Date monitored	Install depth (mbgl)	Depth dipped (mbgl)	CH4 % Peak/stable	CO2 % Peak/Stable	O2 %	mB	H2S ppm	LEL	CO ppm	Flow l/h peak/stable	Water Level (mbgl)	Water samples taken	Gas Analyser	Any Colouration / Odour noted / Comments
BH01	1	17/10/2018	7	6.13	0	4.2	17.7	1001	0	0	0	-0.1	0	NO	GA2000	
BH03	1	17/10/2018	6	5.7	0	1.9	20.1	1000	0	0	0	-0.1	0	NO	GA2000	
WS215	1	17/10/2018	2.4	2.58	0	1.3	19.8	1000	0	0	0	-0.1	0	NO	GA2000	
WS216	1	17/10/2018	1.5	1.41	0	1	20.3	1000	0	0	0	-0.1	0	NO	GA2000	
WS217	1	17/10/2018	1.5	1.37	0	2.4	18.8	1000	0	0	0	-0.1	0	NO	GA2000	
WS218	1	17/10/2018	1.8	1.73	0	1.6 / 1.5	19.7	1000	0	0	0	-0.1	0	NO	GA2000	
WS220	1	17/10/2018	1.3	1.39	0	0.9	19.3	1000	0	0	2 / 0	-0.1	0	NO	GA2000	
BH201	1	17/10/2018	14	13.6	0	0.7	20.6	999	0	0	0	-0.1	0	NO	GA2000	
BH202	1	17/10/2018	7	7.45	0	0.4	21.3	1000	0	0	1 / 0	-0.2 / -0.1	0	NO	GA2000	
BH01	2	24/10/2018	7	6.08	0.1	4.5	18	1012	0	1	0	+0.1	0	NO	GA2000	
BH03	2	24/10/2018	6	5.69	0.1	2.1	19.9	1012	0	1	0	0	0	NO	GA2000	
WS215	2	24/10/2018	2.4	2.50	0.1	1.3	20.4	1012	0	1	0	-0.1	0	NO	GA2000	
WS216	2	24/10/2018	1.5	1.32	0.1	1.1	20.8	1012	0	1	0	+0.1	0	NO	GA2000	
WS217	2	24/10/2018	1.5	1.30	0.1	1.9	20.1	1012	0	1	0	+0.1	0	NO	GA2000	
WS218	2	24/10/2018	1.8	1.64	0.1	2.1	19.8	1012	0	1	0	-0.1	0	NO	GA2000	
WS220	2	24/10/2018	1.3	1.32	0.1	1.1	20.2	1012	0	1	0	+0.1	0	NO	GA2000	
BH201	2	24/10/2018	14	13.51	0.1	1.5	20.1	1012	0	1	0	+0.1 / 0	0	NO	GA2000	
BH202	2	24/10/2018	7	7.37	0.1	2.5	19.9	1012	0	1	0	+0.2 / +0.1	0	NO	GA2000	
BH01	3	31/10/2018	7	6.08	0.2	4.2	17.9	990	0	3	1	0	0	NO	GA2000	
BH03	3	31/10/2018	6	5.65	0.1	2.2	20.4	990	0	2	1 / 0	0	0	NO	GA2000	
WS215	3	31/10/2018	2.4	2.50	0.1	1.4	20.7	990	0	2	1 / 0	0	0	NO	GA2000	
WS216	3	31/10/2018	1.5	1.35	0.2 / 0.1	0.9	21.3	990	0	2	0	0	0	NO	GA2000	
WS217	3	31/10/2018	1.5	1.30	0.2	1.6	20.3	990	0	3	0	0	0	NO	GA2000	
WS218	3	31/10/2018	1.8	1.65	0.1	1.7	20.5	990	0	2	0	0	0	NO	GA2000	
WS220	3	31/10/2018	1.3	1.34	0.2	1.2	20.6	990	0	3	0	0	0	NO	GA2000	
BH201	3	31/10/2018	14	13.48	0.1	1.6	20.8	990	0	2	0	0	0	NO	GA2000	
BH202	3	31/10/2018	7	7.36	0.1	0.3	21.8	990	0	2	1 / 0	0	0	NO	GA2000	

Appendix H – Greenfield Flowrate Calculations

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	1 year (l/s)	4.6
Rainfall Events	Singular	Drain Down Time (mins)	1440	30 year (l/s)	10.6
Summer CV	1.000	Additional Storage (m³/ha)	0.0	100 year (l/s)	13.5
Winter CV	1.000	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	10	0
30	40	10	0
100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	FEH	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.975	Betterment (%)	0
SAAR (mm)	860	QMed	4.9
Host	1	QBar	5.4
BFIHost	0.488	Q 1 year (l/s)	4.6
Region	1	Q 30 year (l/s)	10.6
QBar/QMed conversion factor	1.111	Q 100 year (l/s)	13.5
Growth Factor 1 year	0.85		

Appendix I – Pre App Email Advice

Martin Howell

From: Natalie James <Natalie.James@midsussex.gov.uk>
Sent: 01 September 2022 12:27
To: Matthew Woods
Cc: Martin Howell
Subject: RE: AC20188-TURNERS HILL- LLFA pre App
Attachments: MSDC Flood Risk & Drainage Team; General Drainage Requirement Guidance - Apr 2022.pdf

Good afternoon Matthew,

Thanks for sending these plans over. I've had a look and can provide the below informal comments about the drainage strategy. Please be aware that these informal comments do not prejudice the flood risk and drainage team's formal consultation response once a planning application has been submitted.

Advice and comments with regards to surface water drainage design:

- The proposed attenuation and discharge to watercourse approach is considered acceptable in principle for this site.
- There appears to be a general lack of sustainable drainage features within the development itself.
    - A surface water drainage system which utilises a SuDS train, especially incorporating source control elements, would be preferable to the proposed piped system into a single basin approach shown at present.
- There are a lot of manholes and short lengths of pipework to account for the curvature of the road design. Whilst not necessarily unacceptable we would require evidence that this design would not result in undue blockage risks, including any mitigations proposed as part of the design. It maybe that consideration of SuDS features within the system could reduce the need for such short pipe lengths.
- All attenuation features should be located within areas of public realm located within the red line boundary of the development site.
    - Whilst we encourage the use of permeable paving within private curtilage on driveways etc these should not be used within the wider drainage design for attenuation. This is to ensure all attenuation required to meet the design requirements remains within the control of a single entity (such as a maintenance and management company) for the lifetime of the development.
- The use of open conveyance features such as ditches or swales is encouraged. Where these are located outside of the redline boundary and within third party land the maintenance and management schedule should include specific details of how these shall be retained and maintained, including responsible parties.
- The West Sussex Lead Local Flood Authority's Policy for the Management of Surface Water requires the surface water discharge rate to be limited to the Greenfield 1 in 1-year runoff rate for the area being drained for all events up to and including the 1 in 100-year with climate change event. Mid Sussex District Council are aware this policy is due to be updated soon and will therefore allow discharge rates up to the Greenfield QBar rate. (The policy is available online at https://www.westsussex.gov.uk/fire-emergencies-and-crime/dealing-with-extreme-weather/flooding/flood-risk-management/flood-reports-projects-and-policies/)
- I also advise that the Environment Agency have recently updated their climate change allowances and the final detailed drainage design will need to utilise these. Details of this can be found online at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.
    - We would encourage that information submitted at application stage utilises the latest climate change allowances. However, give the scale of the development and the size of the site the use of the previous climate change allowances are unlikely to impact the applications ability to show that drainage could, in principle be provided. Therefore, it is unlikely we would require this to be updated prior to the detailed design stage.

Advice and comments with regards to foul water drainage design:

- As with the surface water drainage system I note that there are a lot of short lengths of pipe and numerous manholes. This is likely to increase the blockage risk and will need to be clearly addressed within the information submitted.
- I am unsure whether it's envisioned for the foul water system to be adopted by Southern Water. However, I would advise that planning consultation response we've received for other schemes in the district advise that no surface water conveying features should be located within 5m of a public sewer. We've found this includes privately maintained shared surface water pipework so placing both within the roadways may not be acceptable to Southern Water.

Advice and comments on flood risk / exceedance flows:

- The Planning Practice Guidance on flood risk and coastal change was updated significantly on 25th August 2022. The specific impacts of this update on planning are still being discussed, however in general it improved the guidance on surface water flood risk and how it's considered. The guidance is now that all sources of flood risk should be reviewed with a consistent approach, i.e. surface water flood extents should be considered the same as flood zones.
    - I am unsure whether the site has areas of increased surface water flood risk, however I would advise this is reviewed at the earliest opportunity as it could impact proposed layouts etc.
    - The full updated flood risk and coastal change section of the Planning Practice Guidance can be found online at Flood risk and coastal change - GOV.UK (www.gov.uk).
- The engineering layout sheet 1 of 4 shows an exceedance direction towards Church Road. I would advise that the development should not increase flood risk offsite, and exceedance flows off of the site should be avoided.

I also attached our general drainage requirement guidance which provides information on the level of information required at detailed design stage, which I believe may have been updated since I last sent it to you.

I hope that the above and attached is helpful. Should you have any queries or concerns please don't hesitate to get in touch. Please be aware I am on annual leave 5th - 13th September.

Kind regards,
Natalie

Natalie James
Drainage Engineer (Flood Risk)
Corporate Estates & Facilities Business Unit
DD: 01444 477201

From: Matthew Woods <matthewwoods@abstruct-consult.com>
Sent: 31 August 2022 17:12
To: Natalie James <Natalie.James@midsussex.gov.uk>
Cc: Martin Howell <MartinHowell@abstruct-consult.com>
Subject: AC20188-TURNERS HILL- LLFA pre App

> You don't often get email from matthewwoods@abstruct-consult.com. Learn why this is important

Hello Natalie

Thank you for your time the other day.

I relayed our conversation to my client and they have confirmed that they are happy for us to discuss our drainage proposals with you directly rather than via the formal planning pre-application process. As such please find attached PDF's of the following for your information and comments:

AC20188-ABS-XX-XX-DR-C-5100-P02 - Engineering Layout, Sheet 1 of 4
AC20188-ABS-XX-XX-DR-C-5101-P02 - Engineering Layout, Sheet 2 of 4
AC20188-ABS-XX-XX-DR-C-5102-P02 - Engineering Layout, Sheet 3 of 4
AC20188-ABS-XX-XX-DR-C-5103-P02 - Engineering Layout, Sheet 4 of 4

Pages 1 – 9 of WSP's, 310-page Ground investigation Report Ref. 70041007, Version 1, February 2019 – If you would like the whole report please let us know and we will provide a link to download it (it's 30mb in size so we can't e-mail it)

WSP's report confirms that infiltration is not viable which is why we have developed a solution that conveys the surface water run-off to a local watercourse (head of River Medway (?)) at greenfield run-off rates. For the "off site" route we are proposing open watercourses (ditches) and a detention pond which will also incorporate a flow control to restrict the flows to greenfield run-off rates for the 1 in 1, 1 in 30 and 1 in 100 events.

If you have any questions regarding the above or would like to discuss any aspect in further detail, please call. We would be happy to set up a Teams call / meeting if you would like as well.

Kind regards

Matthew Woods
BEng (Hons)
Technical Director (Civil Engineering)
abstruct consulting

matthewwoods@abstruct-consult.com
Mobile: 07989 331 676

The Highland Suite, Great Hollanden Business Centre, Mill Lane, Underriver, Sevenoaks, TN15 0SQ. Tel: 01732 838 050
www.abstruct-consult.com

From: Natalie James <Natalie.James@midsussex.gov.uk>
Sent: 08 April 2022 09:56
To: Matthew Woods <matthewwoods@abstruct-consult.com>
Cc: Anna Gillings <anna@gillingsplanning.co.uk>; Robin Underhill <robinu@mdh.uk.com>; Martin Howell <MartinHowell@abstruct-consult.com>
Subject: RE: Turners Hill - LLFA pre App

Good morning Matthew,

I can confirm you understood the two approached to pre-application advice correctly. I would also add that use of the formal planning pre-application process doesn't mean we wouldn't be open to further discussions / addressing queries once that process was complete.

To aid in your initial designs please find attached our general drainage requirement guidance for what is required at detailed design stage. This level of detail isn't needed at outline or full planning application stage as we would usually recommend it was covered by a drainage condition.

At application stage all we require is enough information to show that in principle there's a means of draining the development (foul and surface water). If there is only a single possible way of draining the site then we'll need to see sufficient evidence that it's likely to work. From your description of the site in this case that may mean providing evidence that an easement over third party land is likely to be possible (although no easements need to have been agreed).

I hope the above is helpful at this early stage in your designs. Should you have any queries please don't hesitate to get in touch.

Kind regards,
Natalie

Natalie James
Drainage Engineer (Flood Risk)
Corporate Estates & Facilities Business Unit
DD: 01444 477201

From: Matthew Woods <matthewwoods@abstruct-consult.com>
Sent: 07 April 2022 16:03
To: Natalie James <Natalie.James@midsussex.gov.uk>
Cc: Anna Gillings <anna@gillingsplanning.co.uk>; Robin Underhill <robinu@mdh.uk.com>; Martin Howell <MartinHowell@abstruct-consult.com>
Subject: Turners Hill - LLFA pre App

Hello Natalie

Thank you for your time just now, much appreciated. From our conversation we understand that there are two possible routes for pre-application advice in relation to the drainage strategy for our Clients proposed development at Turners Hill. These being either as part of a wider planning application pre-app, where we would specifically request feedback / comments relating to the below ground drainage strategy, or, On a less formal basis directly with yourself. Hopefully I have understood our conversation correctly, if I have misunderstood or missed something please let me know.

The development layout proposals are currently being finalised. Once complete we will review with our Client and the wider team as necessary and start to work up a drainage strategy, in conjunction with early discussions with yourself.

Our current thinking is an “off site” route to discharge at a controlled rate to the River Medway (or a tributary of) via a series of linked, new open surface features (ideally) such as swales, ditches, ponds, although we are sure that there will be short sections that will inevitably require culverting to provide access to the surrounding fields. The route and final drainage solution is subject to further review and discussion with our client and interested third parties so the above approach may alter, although we would hope not.

Kind regards

Matthew Woods
BEng (Hons)
Technical Director (Civil Engineering)
abstruct consulting

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Appendix J – Surface Water Drainage Calculations

Design Settings

Rainfall Methodology	FEH-22	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	x
Return Period (years)	1	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200		
Additional Flow (%)	0	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200		
CV	1.000	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
34	0.038	5.00	174.900	1200	534033.918	135521.295	3.100
33	0.006	5.00	175.250	1200	534026.181	135534.955	3.710
32	0.028	5.00	174.250	1200	534061.980	135528.219	1.500
31	0.043	5.00	173.750	1200	534040.018	135562.276	2.575
30	0.056	5.00	172.500	1200	534076.069	135579.112	1.790
CP29	0.033	5.00	172.050	1200	534088.957	135581.984	1.450
CP28	0.051	5.00	172.300		534095.702	135574.192	3.250
CP27	0.020	5.00	171.100	1200	534090.234	135600.232	2.560
HB26			171.250	1200	534085.364	135599.092	2.750
23	0.011	5.00	172.200	1200	534034.181	135584.156	1.810
22	0.055	5.00	170.850	1200	534048.188	135598.490	1.470
21	0.012	5.00	169.950	1200	534054.411	135611.337	1.440
20	0.017	5.00	169.450	1200	534059.409	135617.094	1.360
19	0.027	5.00	168.850	1200	534063.236	135624.026	1.280
18	0.048	5.00	168.075	1200	534063.735	135636.151	1.230
17	0.025	5.00	167.550	1500	534058.758	135647.923	1.280
16	0.067	5.00	167.300	1500	534046.847	135655.612	1.285
15	0.011	5.00	167.400	1500	534036.583	135655.945	1.430
SWALE-3-IN	0.021	5.00	168.300	1200	534008.089	135639.059	0.500
SWALE-3-2	0.011	5.00	167.650	1200	534018.497	135650.853	0.500
SWALE-3-OUT	0.011	5.00	167.350	1200	534023.959	135653.821	0.500
14	0.006	5.00	167.550	1500	534029.375	135653.208	1.610
13	0.008	5.00	167.750	1500	534021.153	135648.368	1.850
12	0.016	5.00	168.650	1500	534010.251	135635.588	2.830
9	0.027	5.00	174.250	1200	534000.617	135544.550	2.110
8	0.043	5.00	173.750	1200	533990.921	135544.189	2.240
7	0.011	5.00	171.150	1200	533954.729	135594.478	2.680
6			170.950	1200	533957.202	135600.075	2.720
5	0.014	5.00	170.550	1200	533964.567	135606.162	2.740
4	0.014	5.00	170.200	1200	533973.382	135610.259	2.815
3			169.440	1200	533989.222	135621.659	2.970
2	0.024	5.00	168.900	1500	533999.438	135630.373	3.210
SWALE-2-IN	0.012	5.00	173.250	1200	533978.967	135544.947	0.500
SWALE-2-2	0.010	5.00	172.800	1200	533971.951	135551.750	0.500
SWALE-2-3	0.010	5.00	172.600	1200	533967.713	135560.237	0.500
SWALE-2-4	0.010	5.00	172.150	1200	533964.038	135567.133	0.500
SWALE-2-OUT			172.050	1200	533960.621	135569.790	0.500
SWALE-1-IN	0.010	5.00	171.650	1200	533952.030	135579.376	0.500
SWALE-1-2	0.010	5.00	171.050	1200	533950.316	135593.804	0.500
SWALE-1-3	0.011	5.00	170.700	1200	533957.584	135606.451	0.500
SWALE-1-4	0.011	5.00	170.050	1200	533970.485	135613.324	0.500
SWALE-1-5			169.350	1200	533986.885	135624.906	0.500
SWALE-1-OUT			169.100	1200	533994.100	135631.693	0.500
JUNCTION			168.600		533996.923	135635.587	2.940
CP1			167.000	1500	533993.799	135642.064	1.850

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Pond			166.600	1800	533970.092	135644.782	1.600
Ditch-2			150.500	1200	533845.799	135764.779	0.500
HW1			124.520		533727.086	135954.578	0.310
52			166.500	1200	533942.221	135645.333	1.500
HW7			165.300	1200	533938.275	135651.656	0.500
HW6			154.500	1220	533878.977	135746.189	0.500
HW5			152.300	1200	533853.298	135753.579	0.500
Ditch-2-1			144.500	1200	533824.108	135819.992	0.500
HW4			137.500	1200	533804.541	135882.450	0.500
HW3			135.000	1200	533796.458	135900.345	0.550
HW2			128.300	1200	533758.220	135952.222	0.500
HB10	0.028	5.00	175.500	1200	534002.007	135529.519	2.500
HB24	0.039	5.00	172.550	1200	534028.137	135584.080	1.600
CP25	0.040	5.00	173.300	1200	534005.798	135568.294	2.000
CP11	0.030	5.00	176.100		533989.234	135522.446	2.950

Links

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)
1.000	34	33	14.410	0.600	171.800	171.615	0.185	77.9	150	5.21	36.5
1.001	33	31	29.334	0.600	171.540	171.175	0.365	80.4	225	5.55	48.4
2.000	32	31	40.524	0.600	172.750	171.250	1.500	27.0	150	5.35	49.6
1.002	31	30	38.588	0.600	171.175	170.785	0.390	98.9	225	6.04	46.6
1.003	30	CP29	12.000	0.600	170.710	170.600	0.110	109.1	300	6.17	46.0
1.004	CP29	HB26	25.306	0.600	170.600	169.880	0.720	35.1	300	6.33	32.5
3.000	CP28	CP27	26.608	0.600	169.050	168.540	0.510	52.2	300	5.20	36.5
3.001	CP27	HB26	5.001	0.600	168.540	168.500	0.040	125.0	300	5.26	36.4
1.005	HB26	20	29.702	0.600	168.500	168.200	0.300	99.0	150	6.82	31.9
4.000	CP25	HB24	27.354	0.600	171.300	170.950	0.350	78.2	150	5.40	35.9
4.001	HB24	23	6.044	0.600	170.950	170.660	0.290	20.8	150	5.45	35.8
4.002	23	22	18.709	0.600	170.390	169.380	1.010	18.5	225	5.55	35.4
4.003	22	21	13.074	0.600	169.380	168.510	0.870	15.0	225	5.61	50.0
1.006	21	20	6.424	0.600	168.510	168.090	0.420	15.3	225	5.64	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.140	20.1	5.0	2.950	3.485	0.038	0.0
1.001	1.460	58.0	7.7	3.485	2.350	0.044	0.0
2.000	1.944	34.4	5.0	1.350	2.350	0.028	0.0
1.002	1.314	52.3	19.4	2.350	1.490	0.115	0.0
1.003	1.504	106.3	28.4	1.490	1.150	0.171	0.0
1.004	2.660	188.0	24.0	1.150	1.070	0.204	0.0
3.000	2.181	154.2	6.7	2.950	2.260	0.051	0.0
3.001	1.405	99.3	9.3	2.260	2.450	0.071	0.0
1.005	1.010	17.8	31.7	2.600	1.100	0.275	0.0
4.000	1.138	20.1	5.2	1.850	1.450	0.040	0.0
4.001	2.216	39.2	10.2	1.450	1.390	0.079	0.0
4.002	3.054	121.4	11.5	1.585	1.245	0.090	0.0
4.003	3.392	134.9	26.2	1.245	1.215	0.145	0.0
1.006	3.362	133.7	28.4	1.215	1.135	0.157	0.0

Links

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)
1.007	20	19	7.919	0.600	168.090	167.645	0.445	17.8	225	6.86	44.6
1.009	18	17	11.580	0.600	166.845	166.345	0.500	23.2	300	6.95	44.4
1.008	19	18	12.134	0.600	167.570	166.845	0.725	16.7	300	6.89	44.2
1.010	17	16	12.977	0.600	166.270	166.080	0.190	68.3	375	7.05	43.8
1.011	16	15	9.069	0.600	166.015	165.970	0.045	201.5	450	7.15	43.4
1.012	15	14	6.509	0.600	165.970	165.940	0.030	217.0	450	7.23	43.2
1.013	14	13	8.340	0.600	165.940	165.900	0.040	208.5	450	7.33	42.8
5.000	SWALE-3-IN	SWALE-3-2	15.729	0.600	167.800	167.150	0.650	24.2	500	6.84	44.4
5.001	SWALE-3-2	SWALE-3-OUT	6.216	0.600	167.150	166.850	0.300	20.7	500	7.51	42.4
5.002	SWALE-3-OUT	13	6.133	0.600	166.850	166.200	0.650	9.4	150	7.54	42.4
1.014	13	12	15.598	0.600	165.900	165.820	0.080	195.0	450	7.72	42.3
1.015	12	2	10.804	0.600	165.820	165.765	0.055	196.4	450	7.85	29.6
6.000	CP11	HB10	14.601	0.600	173.150	173.000	0.150	97.3	150	5.24	36.4
6.001	HB10	9	15.095	0.600	173.000	172.850	0.150	100.6	150	5.49	35.6
6.002	9	8	11.086	0.600	172.140	171.590	0.550	20.2	150	5.57	35.4
6.003	8	7	60.758	0.600	171.510	168.470	3.040	20.0	225	5.92	49.0
6.004	7	6	4.919	0.600	168.470	168.230	0.240	20.5	225	5.94	48.9
6.005	6	5	8.355	0.600	168.230	167.810	0.420	19.9	225	5.99	48.6
6.006	5	4	8.519	0.600	167.810	167.385	0.425	20.0	225	6.04	48.4
6.007	4	3	18.315	0.600	167.385	166.470	0.915	20.0	225	6.14	47.9
6.008	3	2	12.227	0.600	166.470	165.915	0.555	22.0	300	6.21	47.8
1.016	2	JUNCTION	5.789	0.600	165.690	165.660	0.030	193.0	525	7.91	41.7
7.000	SWALE-2-IN	SWALE-2-2	9.773	0.045	172.750	172.300	0.450	21.7	500	5.08	50.0
7.001	SWALE-2-2	SWALE-2-3	9.485	0.045	172.300	172.100	0.200	47.4	500	5.20	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.007	3.116	123.9	72.4	1.135	0.980	0.449	0.0
1.009	3.280	231.9	84.1	0.930	0.905	0.524	0.0
1.008	3.861	272.9	76.0	0.980	0.930	0.476	0.0
1.010	2.195	242.4	86.9	0.905	0.845	0.549	0.0
1.011	1.428	227.1	96.6	0.835	0.980	0.616	0.0
1.012	1.376	218.8	97.9	0.980	1.160	0.627	0.0
1.013	1.404	223.3	97.9	1.160	1.400	0.633	0.0
5.000	0.143	142.6	3.4	0.000	0.000	0.021	0.0
5.001	0.154	154.1	4.9	0.000	0.000	0.032	0.0
5.002	3.299	58.3	6.6	0.350	1.400	0.043	0.0
1.014	1.452	231.0	104.6	1.400	2.380	0.684	0.0
1.015	1.447	230.1	75.0	2.380	2.685	0.700	0.0
6.000	1.018	18.0	3.9	2.800	2.350	0.030	0.0
6.001	1.001	17.7	7.5	2.350	1.250	0.058	0.0
6.002	2.253	39.8	10.9	1.960	2.010	0.085	0.0
6.003	2.940	116.9	22.7	2.015	2.455	0.128	0.0
6.004	2.903	115.4	24.6	2.455	2.495	0.139	0.0
6.005	2.947	117.2	24.4	2.495	2.515	0.139	0.0
6.006	2.935	116.7	26.8	2.515	2.590	0.153	0.0
6.007	2.938	116.8	28.9	2.590	2.745	0.167	0.0
6.008	3.364	237.8	28.8	2.670	2.685	0.167	0.0
1.016	1.609	348.2	134.3	2.685	2.415	0.891	0.0
7.000	2.007	2007.0	2.2	0.000	0.000	0.012	0.0
7.001	1.358	1358.2	4.0	0.000	0.000	0.022	0.0

Links

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)
7.002	SWALE-2-3	SWALE-2-4	7.815	0.045	172.100	171.650	0.450	17.4	500	5.26	50.0
7.003	SWALE-2-4	SWALE-2-OUT	4.328	0.240	171.650	171.550	0.100	43.3	500	5.53	49.5
7.004	SWALE-2-OUT	SWALE-1-IN	12.872	0.600	171.550	171.150	0.400	32.2	225	5.62	49.2
7.005	SWALE-1-IN	SWALE-1-2	15.306	0.240	171.150	170.550	0.600	25.5	500	6.35	46.5
7.006	SWALE-1-2	SWALE-1-3	14.586	0.045	170.550	170.200	0.350	41.7	500	6.52	47.8
7.007	SWALE-1-3	SWALE-1-4	14.618	0.045	170.200	169.550	0.650	22.5	500	6.64	47.1
7.008	SWALE-1-4	SWALE-1-5	20.070	0.240	169.550	168.850	0.700	28.7	500	7.67	30.0
7.009	SWALE-1-5	SWALE-1-OUT	9.905	0.045	168.850	168.600	0.250	39.6	500	7.78	29.8
7.010	SWALE-1-OUT	JUNCTION	4.810	0.600	168.600	166.035	2.565	1.9	150	7.79	43.4
1.017	JUNCTION	CP1	12.208	0.600	165.660	165.600	0.060	203.5	525	8.03	29.3
1.018	CP1	Pond	21.240	0.600	165.150	165.050	0.100	212.4	525	8.27	28.8
1.019	Pond	52	27.876	0.600	165.000	165.000	0.000	0.0	225	8.73	28.0
1.020	52	HW7	7.453	0.600	165.000	164.800	0.200	37.3	150	8.81	27.9
1.021	HW7	HW6	111.592	0.240	164.800	154.000	10.800	10.3	500	12.27	33.1
1.022	HW6	HW5	26.721	0.600	154.000	151.800	2.200	12.1	150	12.42	32.9
1.023	HW5	Ditch-2	13.479	0.240	151.800	150.000	1.800	7.5	500	12.78	32.4
1.024	Ditch-2	Ditch-2-1	59.321	0.240	150.000	144.000	6.000	9.9	500	14.58	30.1
1.025	Ditch-2-1	HW4	65.451	0.240	144.000	137.000	7.000	9.4	500	16.51	28.1
1.026	HW4	HW3	19.636	0.600	137.000	134.450	2.550	7.7	150	16.60	28.0
1.027	HW3	HW2	64.447	0.240	134.450	127.800	6.650	9.7	500	18.54	26.3
1.028	HW2	HW1	31.223	0.600	127.800	124.210	3.590	8.7	150	18.69	26.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
7.002	2.244	2244.4	5.8	0.000	0.000	0.032	0.0
7.003	0.267	266.6	7.5	0.000	0.000	0.042	0.0
7.004	2.314	92.0	7.5	0.275	0.275	0.042	0.0
7.005	0.347	347.2	8.7	0.000	0.000	0.052	0.0
7.006	1.449	1448.8	10.7	0.000	0.000	0.062	0.0
7.007	1.972	1972.3	12.4	0.000	0.000	0.073	0.0
7.008	0.328	327.5	9.1	0.000	0.000	0.084	0.0
7.009	1.486	1485.9	9.0	0.000	0.000	0.084	0.0
7.010	7.417	131.1	13.2	0.350	2.415	0.084	0.0
1.017	1.566	339.1	103.1	2.415	0.875	0.975	0.0
1.018	1.533	331.8	101.6	1.325	1.025	0.975	0.0
1.019	1.000	39.8	98.7	1.375	1.275	0.975	0.0
1.020	1.654	29.2	98.3	1.350	0.350	0.975	0.0
1.021	0.537	295.4	116.6	0.000	0.000	0.975	0.0
1.022	2.906	51.4	115.9	0.350	0.350	0.975	0.0
1.023	0.631	347.0	114.2	0.000	0.000	0.975	0.0
1.024	0.549	302.0	106.1	0.000	0.000	0.975	0.0
1.025	0.565	310.5	99.0	0.000	0.000	0.975	0.0
1.026	3.653	64.6	98.7	0.350	0.400	0.975	0.0
1.027	0.555	305.0	92.7	0.050	0.000	0.975	0.0
1.028	3.437	60.7	92.3	0.350	0.160	0.975	0.0

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Rate(s)	✓	100 year (l/s)	13.5
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0	1 year (l/s)	4.6	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)		30 year (l/s)	10.6		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	10	0	30	40	10	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Host	1	Growth Factor 1 year	0.85	QMed	4.9	Q 100 year (l/s)	13.5
Greenfield Method	FEH	BFIHost	0.488	Growth Factor 30 year	1.95	QBar	5.4		
Positively Drained Area (ha)	0.975	Region	1	Growth Factor 100 year	2.48	Q 1 year (l/s)	4.6		
SAAR (mm)	860	QBar/QMed conversion factor	1.111	Betterment (%)	0	Q 30 year (l/s)	10.6		

Node HB26 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	1.600	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	x	Design Flow (l/s)	1.0	Product Number	CTL-SHE-0042-1000-1600-1000		
Invert Level (m)	168.500	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.075		

Node Pond Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	1.200	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	x	Design Flow (l/s)	5.4	Product Number	CTL-SHE-0106-5400-1200-5400		
Invert Level (m)	165.000	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.150		

Node HB10 Online Hydro-Brake® Control

Flap Valve	x	Invert Level (m)	173.000	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.075
Downstream Link	6.001	Design Depth (m)	1.050	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	x	Design Flow (l/s)	1.0	Product Number	CTL-SHE-0046-1000-1050-1000		

Node HB24 Online Hydro-Brake® Control

Flap Valve	x	Invert Level (m)	170.950	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.075
Downstream Link	4.001	Design Depth (m)	1.050	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	x	Design Flow (l/s)	1.0	Product Number	CTL-SHE-0046-1000-1050-1000		

Node CP27 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Side Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Porosity 0.95 | Invert Level (m) 168.600 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	279.2	0.0	1.500	279.2	0.0	1.501	0.0	0.0

Node Pond Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Side Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Porosity 1.00 | Invert Level (m) 165.000 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	303.6	0.0	1.500	715.0	0.0

Node HB10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Side Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Porosity 0.95 | Invert Level (m) 173.050 | Time to half empty (mins) 440

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	53.3	70.1	1.000	53.3	99.8	1.001	0.0	99.8

Node HB24 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Side Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Porosity 0.95 | Invert Level (m) 171.000 | Time to half empty (mins) 675

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.9	102.6	1.000	75.9	138.5	1.001	0.0	138.5

Node CP1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Side Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Porosity 0.95 | Invert Level (m) 165.150 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	92.0	102.6	1.000	92.0	138.5	1.001	0.0	138.5

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year +10% A 15 minute summer	73.507	20.800	30 year +40% CC +10% A 15 minute summer	403.294	114.118	100 year +45% CC +10% A 15 minute summer	528.733	149.613
1 year +10% A 15 minute winter	51.584	20.800	30 year +40% CC +10% A 15 minute winter	283.013	114.118	100 year +45% CC +10% A 15 minute winter	371.041	149.613
1 year +10% A 30 minute summer	48.769	13.800	30 year +40% CC +10% A 30 minute summer	269.331	76.211	100 year +45% CC +10% A 30 minute summer	356.164	100.782
1 year +10% A 30 minute winter	34.224	13.800	30 year +40% CC +10% A 30 minute winter	189.004	76.211	100 year +45% CC +10% A 30 minute winter	249.939	100.782
1 year +10% A 60 minute summer	33.299	8.800	30 year +40% CC +10% A 60 minute summer	184.543	48.769	100 year +45% CC +10% A 60 minute summer	245.461	64.868
1 year +10% A 60 minute winter	22.123	8.800	30 year +40% CC +10% A 60 minute winter	122.606	48.769	100 year +45% CC +10% A 60 minute winter	163.079	64.868
1 year +10% A 120 minute summer	25.136	6.643	30 year +40% CC +10% A 120 minute summer	111.358	29.429	100 year +45% CC +10% A 120 minute summer	144.921	38.298
1 year +10% A 120 minute winter	16.700	6.643	30 year +40% CC +10% A 120 minute winter	73.983	29.429	100 year +45% CC +10% A 120 minute winter	96.282	38.298
1 year +10% A 180 minute summer	21.098	5.429	30 year +40% CC +10% A 180 minute summer	84.843	21.833	100 year +45% CC +10% A 180 minute summer	109.426	28.159
1 year +10% A 180 minute winter	13.714	5.429	30 year +40% CC +10% A 180 minute winter	55.150	21.833	100 year +45% CC +10% A 180 minute winter	71.130	28.159
1 year +10% A 240 minute summer	17.554	4.639	30 year +40% CC +10% A 240 minute summer	66.728	17.634	100 year +45% CC +10% A 240 minute summer	85.729	22.656
1 year +10% A 240 minute winter	11.662	4.639	30 year +40% CC +10% A 240 minute winter	44.333	17.634	100 year +45% CC +10% A 240 minute winter	56.956	22.656
1 year +10% A 360 minute summer	14.155	3.643	30 year +40% CC +10% A 360 minute summer	50.546	13.007	100 year +45% CC +10% A 360 minute summer	64.904	16.702
1 year +10% A 360 minute winter	9.201	3.643	30 year +40% CC +10% A 360 minute winter	32.856	13.007	100 year +45% CC +10% A 360 minute winter	42.189	16.702
1 year +10% A 480 minute summer	11.462	3.029	30 year +40% CC +10% A 480 minute summer	39.568	10.457	100 year +45% CC +10% A 480 minute summer	50.991	13.475
1 year +10% A 480 minute winter	7.615	3.029	30 year +40% CC +10% A 480 minute winter	26.288	10.457	100 year +45% CC +10% A 480 minute winter	33.877	13.475
1 year +10% A 600 minute summer	9.551	2.612	30 year +40% CC +10% A 600 minute summer	32.262	8.824	100 year +45% CC +10% A 600 minute summer	41.778	11.427
1 year +10% A 600 minute winter	6.526	2.612	30 year +40% CC +10% A 600 minute winter	22.043	8.824	100 year +45% CC +10% A 600 minute winter	28.545	11.427
1 year +10% A 720 minute summer	8.616	2.309	30 year +40% CC +10% A 720 minute summer	28.662	7.682	100 year +45% CC +10% A 720 minute summer	37.314	10.000
1 year +10% A 720 minute winter	5.790	2.309	30 year +40% CC +10% A 720 minute winter	19.263	7.682	100 year +45% CC +10% A 720 minute winter	25.077	10.000
1 year +10% A 960 minute summer	7.197	1.895	30 year +40% CC +10% A 960 minute summer	23.461	6.178	100 year +45% CC +10% A 960 minute summer	30.889	8.134
1 year +10% A 960 minute winter	4.768	1.895	30 year +40% CC +10% A 960 minute winter	15.541	6.178	100 year +45% CC +10% A 960 minute winter	20.461	8.134
1 year +10% A 1440 minute summer	5.332	1.429	30 year +40% CC +10% A 1440 minute summer	17.019	4.561	100 year +45% CC +10% A 1440 minute summer	22.732	6.092
1 year +10% A 1440 minute winter	3.583	1.429	30 year +40% CC +10% A 1440 minute winter	11.438	4.561	100 year +45% CC +10% A 1440 minute winter	15.277	6.092
1 year +10% A 2160 minute summer	3.943	1.090	30 year +40% CC +10% A 2160 minute summer	12.242	3.383	100 year +45% CC +10% A 2160 minute summer	16.513	4.564
1 year +10% A 2160 minute winter	2.717	1.090	30 year +40% CC +10% A 2160 minute winter	8.435	3.383	100 year +45% CC +10% A 2160 minute winter	11.378	4.564
1 year +10% A 2880 minute summer	3.387	0.908	30 year +40% CC +10% A 2880 minute summer	10.239	2.744	100 year +45% CC +10% A 2880 minute summer	13.832	3.707
1 year +10% A 2880 minute winter	2.276	0.908	30 year +40% CC +10% A 2880 minute winter	6.881	2.744	100 year +45% CC +10% A 2880 minute winter	9.296	3.707
1 year +10% A 4320 minute summer	2.732	0.714	30 year +40% CC +10% A 4320 minute summer	7.838	2.049	100 year +45% CC +10% A 4320 minute summer	10.485	2.741
1 year +10% A 4320 minute winter	1.799	0.714	30 year +40% CC +10% A 4320 minute winter	5.162	2.049	100 year +45% CC +10% A 4320 minute winter	6.905	2.741

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	34	10	171.852	0.052	5.0	0.0593	0.0000	OK
15 minute summer	33	11	171.587	0.047	5.7	0.0536	0.0000	OK
15 minute summer	32	10	172.783	0.033	3.7	0.0374	0.0000	OK
15 minute summer	31	11	171.258	0.083	14.9	0.0941	0.0000	OK
15 minute summer	30	11	170.809	0.099	21.8	0.1117	0.0000	OK
15 minute summer	CP29	11	170.678	0.078	26.0	0.0879	0.0000	OK
15 minute summer	CP28	10	169.092	0.042	6.7	0.0000	0.0000	OK
720 minute winter	CP27	690	168.815	0.275	4.3	57.5744	0.0000	OK
720 minute winter	HB26	690	168.815	0.315	3.7	0.3567	0.0000	SURCHARGED
15 minute summer	23	10	170.410	0.020	2.1	0.0231	0.0000	OK
15 minute summer	22	10	169.420	0.040	9.4	0.0456	0.0000	OK
15 minute summer	21	10	168.554	0.044	10.9	0.0503	0.0000	OK
15 minute summer	20	10	168.144	0.054	13.6	0.0608	0.0000	OK
15 minute summer	19	10	167.621	0.051	17.1	0.0573	0.0000	OK
15 minute summer	18	10	166.913	0.068	23.4	0.0770	0.0000	OK
15 minute summer	17	10	166.359	0.089	26.5	0.1569	0.0000	OK
15 minute summer	16	11	166.153	0.138	35.0	0.2441	0.0000	OK
15 minute summer	15	11	166.116	0.146	36.3	0.2578	0.0000	OK
15 minute summer	SWALE-3-IN	12	167.871	0.071	2.8	0.0800	0.0000	OK
30 minute summer	SWALE-3-2	22	167.245	0.095	3.3	0.1077	0.0000	OK
30 minute summer	SWALE-3-OUT	20	166.874	0.024	2.9	0.0267	0.0000	OK
15 minute summer	14	11	166.082	0.142	37.3	0.2512	0.0000	OK
15 minute summer	13	11	166.039	0.139	40.8	0.2460	0.0000	OK
15 minute summer	12	11	165.962	0.142	42.8	0.2504	0.0000	OK
15 minute summer	9	10	172.174	0.033	4.1	0.0379	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	34	1.000	33	4.9	0.924	0.245	0.0770	
15 minute summer	33	1.001	31	5.7	0.608	0.098	0.2846	
15 minute summer	32	2.000	31	3.6	1.256	0.104	0.1156	
15 minute summer	31	1.002	30	14.7	1.124	0.282	0.5057	
15 minute summer	30	1.003	CP29	21.9	1.265	0.205	0.2079	
15 minute summer	CP29	1.004	HB26	26.1	1.850	0.139	0.3566	
15 minute summer	CP28	3.000	CP27	6.6	0.680	0.043	0.3325	
720 minute winter	CP27	3.001	HB26	-3.0	-0.071	-0.031	0.3454	
720 minute winter	HB26	1.005	20	0.6	0.476	0.035	0.0394	
15 minute summer	23	4.002	22	2.1	0.851	0.017	0.0616	
15 minute summer	22	4.003	21	9.3	1.794	0.069	0.0676	
15 minute summer	21	1.006	20	10.8	1.695	0.081	0.0411	
15 minute summer	20	1.007	19	13.5	1.961	0.109	0.0547	
15 minute summer	19	1.008	18	17.1	1.736	0.063	0.1202	
15 minute summer	18	1.009	17	23.2	2.031	0.100	0.1323	
15 minute summer	17	1.010	16	26.3	1.395	0.109	0.2450	
15 minute summer	16	1.011	15	34.9	0.819	0.154	0.3886	
15 minute summer	15	1.012	14	36.5	0.837	0.167	0.2844	
15 minute summer	SWALE-3-IN	5.000	SWALE-3-2	2.4	0.047	0.017	0.8657	
30 minute summer	SWALE-3-2	5.001	SWALE-3-OUT	2.1	0.052	0.013	0.2723	
30 minute summer	SWALE-3-OUT	5.002	13	2.9	1.680	0.050	0.0106	
15 minute summer	14	1.013	13	37.4	0.884	0.167	0.3527	
15 minute summer	13	1.014	12	40.8	0.967	0.177	0.6580	
15 minute summer	12	1.015	2	42.4	1.062	0.184	0.4323	
15 minute summer	9	6.002	8	4.1	1.426	0.102	0.0317	

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	10	171.554	0.044	9.8	0.0493	0.0000	OK
15 minute summer	7	11	168.521	0.051	11.1	0.0581	0.0000	OK
15 minute summer	6	11	168.278	0.048	11.0	0.0546	0.0000	OK
15 minute summer	5	11	167.863	0.053	12.9	0.0596	0.0000	OK
15 minute summer	4	11	167.441	0.056	14.7	0.0632	0.0000	OK
15 minute summer	3	11	166.523	0.053	14.7	0.0597	0.0000	OK
15 minute summer	2	11	165.851	0.161	60.1	0.2839	0.0000	OK
15 minute summer	SWALE-2-IN	10	172.762	0.012	1.6	0.0138	0.0000	OK
15 minute summer	SWALE-2-2	11	172.323	0.023	2.9	0.0262	0.0000	OK
15 minute summer	SWALE-2-3	11	172.120	0.020	4.2	0.0228	0.0000	OK
15 minute summer	SWALE-2-4	12	171.746	0.096	5.4	0.1089	0.0000	OK
15 minute summer	SWALE-2-OUT	12	171.586	0.035	5.0	0.0401	0.0000	OK
15 minute summer	SWALE-1-IN	13	171.245	0.095	6.0	0.1070	0.0000	OK
30 minute summer	SWALE-1-2	21	170.584	0.034	5.9	0.0383	0.0000	OK
30 minute summer	SWALE-1-3	21	170.228	0.028	6.6	0.0321	0.0000	OK
30 minute summer	SWALE-1-4	23	169.660	0.110	7.4	0.1248	0.0000	OK
30 minute summer	SWALE-1-5	24	168.888	0.038	6.3	0.0428	0.0000	OK
30 minute summer	SWALE-1-OUT	24	168.623	0.023	6.3	0.0261	0.0000	OK
15 minute summer	JUNCTION	11	165.815	0.155	60.7	0.0000	0.0000	OK
960 minute summer	CP1	645	165.316	0.166	14.1	14.7680	0.0000	OK
960 minute summer	Pond	645	165.316	0.316	12.1	110.2731	0.0000	SURCHARGED
120 minute summer	Ditch-2	98	150.055	0.055	4.3	0.0618	0.0000	OK
960 minute summer	HW1	675	124.240	0.030	5.2	0.0000	0.0000	OK
960 minute summer	52	645	165.043	0.043	5.2	0.0483	0.0000	OK
960 minute summer	HW7	660	164.877	0.077	5.2	0.0872	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	8	6.003	7	9.6	1.591	0.082	0.3687	
15 minute summer	7	6.004	6	11.0	1.695	0.096	0.0321	
15 minute summer	6	6.005	5	11.1	1.668	0.095	0.0555	
15 minute summer	5	6.006	4	12.9	1.755	0.111	0.0627	
15 minute summer	4	6.007	3	14.7	2.001	0.126	0.1350	
15 minute summer	3	6.008	2	14.7	1.832	0.062	0.0983	
15 minute summer	2	1.016	JUNCTION	60.0	1.098	0.172	0.3163	
15 minute summer	SWALE-2-IN	7.000	SWALE-2-2	1.6	0.162	0.001	0.0959	
15 minute summer	SWALE-2-2	7.001	SWALE-2-3	2.9	0.233	0.002	0.1161	
15 minute summer	SWALE-2-3	7.002	SWALE-2-4	4.1	0.117	0.002	0.3384	
15 minute summer	SWALE-2-4	7.003	SWALE-2-OUT	5.0	0.109	0.019	0.2109	
15 minute summer	SWALE-2-OUT	7.004	SWALE-1-IN	5.0	0.632	0.054	0.1264	
15 minute summer	SWALE-1-IN	7.005	SWALE-1-2	5.1	0.116	0.015	0.7185	
30 minute summer	SWALE-1-2	7.006	SWALE-1-3	5.8	0.314	0.004	0.2699	
30 minute summer	SWALE-1-3	7.007	SWALE-1-4	6.6	0.148	0.003	0.7827	
30 minute summer	SWALE-1-4	7.008	SWALE-1-5	6.3	0.118	0.019	1.1514	
30 minute summer	SWALE-1-5	7.009	SWALE-1-OUT	6.3	0.348	0.004	0.1800	
30 minute summer	SWALE-1-OUT	7.010	JUNCTION	6.3	3.842	0.048	0.0078	
15 minute summer	JUNCTION	1.017	CP1	60.8	1.182	0.179	0.6277	
960 minute summer	CP1	1.018	Pond	12.1	0.483	0.036	1.7825	
960 minute summer	Pond	1.019	52	5.2	0.462	0.130	0.3214	
120 minute summer	Ditch-2	1.024	Ditch-2-1	4.4	0.161	0.015	1.9898	
960 minute summer	52	1.020	HW7	5.2	0.787	0.176	0.0493	
960 minute summer	HW7	1.021	HW6	5.2	0.167	0.017	3.5157	

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	HW6	660	154.032	0.032	5.2	0.0376	0.0000	OK
960 minute summer	HW5	660	151.850	0.050	5.2	0.0561	0.0000	OK
960 minute summer	Ditch-2-1	660	144.077	0.077	5.2	0.0874	0.0000	OK
960 minute summer	HW4	660	137.029	0.029	5.2	0.0325	0.0000	OK
960 minute summer	HW3	675	134.527	0.077	5.2	0.0873	0.0000	OK
960 minute summer	HW2	675	127.830	0.030	5.2	0.0338	0.0000	OK
360 minute summer	HB10	232	173.153	0.153	2.5	5.2394	0.0000	SURCHARGED
360 minute summer	HB24	240	171.114	0.164	3.4	8.4651	0.0000	SURCHARGED
15 minute summer	CP25	10	171.352	0.052	5.3	0.0589	0.0000	OK
15 minute summer	CP11	10	173.198	0.048	4.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	HW6	1.022	HW5	5.2	1.329	0.100	0.1047	
960 minute summer	HW5	1.023	Ditch-2	5.2	0.177	0.015	0.3921	
960 minute summer	Ditch-2-1	1.025	HW4	5.2	0.173	0.017	2.0014	
960 minute summer	HW4	1.026	HW3	5.2	0.995	0.080	0.1127	
960 minute summer	HW3	1.027	HW2	5.2	0.171	0.017	1.9910	
960 minute summer	HW2	1.028	HW1	5.2	2.087	0.085	0.0772	277.1
360 minute summer	HB10	6.001	9	0.8	0.503	0.044	0.0233	
360 minute summer	HB24	4.001	23	0.8	0.867	0.020	0.0055	
15 minute summer	CP25	4.000	HB24	5.2	0.757	0.259	0.2122	
15 minute summer	CP11	6.000	HB10	4.0	0.604	0.220	0.1110	

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	34	11	172.241	0.441	27.5	0.4986	0.0000	SURCHARGED
15 minute summer	33	12	171.922	0.382	30.8	0.4324	0.0000	SURCHARGED
15 minute summer	32	10	172.833	0.083	20.3	0.0934	0.0000	OK
15 minute summer	31	11	171.817	0.642	75.1	0.7263	0.0000	SURCHARGED
15 minute summer	30	11	170.993	0.283	110.5	0.3195	0.0000	OK
15 minute summer	CP29	11	170.805	0.205	132.9	0.2316	0.0000	OK
2880 minute winter	CP28	2760	169.632	0.581	1.1	0.0000	0.0000	SURCHARGED
2880 minute winter	CP27	2760	169.632	1.091	5.0	274.9522	0.0000	SURCHARGED
2880 minute winter	HB26	2760	169.632	1.131	4.3	1.2797	0.0000	SURCHARGED
15 minute summer	23	10	170.431	0.041	8.8	0.0462	0.0000	OK
15 minute summer	22	10	169.477	0.097	48.5	0.1097	0.0000	OK
15 minute summer	21	10	168.628	0.118	57.0	0.1330	0.0000	OK
15 minute summer	20	10	168.234	0.144	69.7	0.1629	0.0000	OK
15 minute summer	19	10	167.694	0.124	88.9	0.1401	0.0000	OK
15 minute summer	18	11	167.029	0.184	123.5	0.2079	0.0000	OK
15 minute summer	17	11	166.693	0.423	141.0	0.7480	0.0000	SURCHARGED
15 minute summer	16	11	166.592	0.577	183.0	1.0202	0.0000	SURCHARGED
15 minute summer	15	11	166.529	0.559	190.1	0.9882	0.0000	SURCHARGED
15 minute summer	SWALE-3-IN	11	167.973	0.173	15.2	0.1954	0.0000	OK
30 minute summer	SWALE-3-2	20	167.403	0.253	19.7	0.2866	0.0000	OK
30 minute summer	SWALE-3-OUT	21	166.917	0.067	21.3	0.0763	0.0000	OK
15 minute summer	14	11	166.470	0.530	193.7	0.9365	0.0000	SURCHARGED
15 minute summer	13	11	166.402	0.502	218.5	0.8865	0.0000	SURCHARGED
15 minute summer	12	11	166.283	0.463	229.0	0.8174	0.0000	SURCHARGED
15 minute summer	9	10	172.222	0.082	20.4	0.0931	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	34	1.000	33	26.5	1.504	1.314	0.2537	
15 minute summer	33	1.001	31	28.8	0.839	0.496	1.1666	
15 minute summer	32	2.000	31	20.2	1.571	0.587	0.5581	
15 minute summer	31	1.002	30	72.3	1.818	1.384	1.5130	
15 minute summer	30	1.003	CP29	110.1	1.811	1.036	0.7202	
15 minute summer	CP29	1.004	HB26	132.1	2.742	0.703	1.2188	
2880 minute winter	CP28	3.000	CP27	1.0	0.057	0.007	1.8737	
2880 minute winter	CP27	3.001	HB26	-3.6	-0.052	-0.037	0.3522	
2880 minute winter	HB26	1.005	20	0.8	0.520	0.048	0.0485	
15 minute summer	23	4.002	22	8.8	0.881	0.072	0.1988	
15 minute summer	22	4.003	21	48.4	2.591	0.358	0.2441	
15 minute summer	21	1.006	20	56.8	2.375	0.425	0.1536	
15 minute summer	20	1.007	19	69.3	2.868	0.559	0.1911	
15 minute summer	19	1.008	18	88.7	2.500	0.325	0.4357	
15 minute summer	18	1.009	17	122.9	2.754	0.530	0.6697	
15 minute summer	17	1.010	16	136.8	1.447	0.564	1.4313	
15 minute summer	16	1.011	15	182.5	1.152	0.804	1.4369	
15 minute summer	15	1.012	14	189.6	1.197	0.866	1.0313	
15 minute summer	SWALE-3-IN	5.000	SWALE-3-2	13.7	0.070	0.096	3.7542	
30 minute summer	SWALE-3-2	5.001	SWALE-3-OUT	16.2	0.103	0.105	1.1391	
30 minute summer	SWALE-3-OUT	5.002	13	21.2	2.777	0.363	0.0753	
15 minute summer	14	1.013	13	193.2	1.219	0.865	1.3214	
15 minute summer	13	1.014	12	217.9	1.375	0.943	2.4714	
15 minute summer	12	1.015	2	228.4	1.455	0.993	1.6725	
15 minute summer	9	6.002	8	20.3	2.155	0.509	0.1043	

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	10	171.614	0.104	51.5	0.1171	0.0000	OK
15 minute summer	7	10	168.612	0.142	59.1	0.1610	0.0000	OK
15 minute summer	6	10	168.357	0.127	58.3	0.1438	0.0000	OK
15 minute summer	5	10	167.953	0.143	68.2	0.1620	0.0000	OK
15 minute summer	4	10	167.535	0.150	78.1	0.1700	0.0000	OK
15 minute summer	3	11	166.593	0.123	78.0	0.1390	0.0000	OK
15 minute summer	2	11	166.173	0.483	323.3	0.8541	0.0000	OK
15 minute summer	SWALE-2-IN	10	172.783	0.033	8.7	0.0372	0.0000	OK
15 minute summer	SWALE-2-2	10	172.360	0.060	15.8	0.0680	0.0000	OK
15 minute summer	SWALE-2-3	11	172.153	0.053	22.8	0.0601	0.0000	OK
15 minute summer	SWALE-2-4	11	171.867	0.217	29.7	0.2452	0.0000	OK
15 minute summer	SWALE-2-OUT	11	171.637	0.087	29.5	0.0984	0.0000	OK
15 minute summer	SWALE-1-IN	12	171.389	0.239	36.3	0.2698	0.0000	OK
15 minute summer	SWALE-1-2	12	170.647	0.097	40.6	0.1099	0.0000	OK
15 minute summer	SWALE-1-3	12	170.285	0.085	47.0	0.0962	0.0000	OK
15 minute summer	SWALE-1-4	13	169.841	0.291	53.3	0.3291	0.0000	OK
15 minute summer	SWALE-1-5	14	168.955	0.105	46.6	0.1188	0.0000	OK
15 minute summer	SWALE-1-OUT	14	168.667	0.067	46.0	0.0753	0.0000	OK
15 minute summer	JUNCTION	11	166.112	0.452	348.6	0.0000	0.0000	OK
1440 minute summer	CP1	1440	165.991	0.841	31.3	74.9872	0.0000	SURCHARGED
1440 minute summer	Pond	1440	165.991	0.991	27.1	438.0365	0.0000	SURCHARGED
30 minute summer	Ditch-2	41	150.073	0.073	5.4	0.0823	0.0000	OK
60 minute summer	HW1	581	124.240	0.030	5.4	0.0000	0.0000	OK
15 minute summer	52	14	165.053	0.053	5.4	0.0598	0.0000	OK
60 minute summer	HW7	571	164.879	0.079	5.4	0.0897	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	8	6.003	7	51.1	2.305	0.437	1.3454	
15 minute summer	7	6.004	6	58.3	2.352	0.505	0.1220	
15 minute summer	6	6.005	5	58.1	2.342	0.496	0.2080	
15 minute summer	5	6.006	4	68.0	2.485	0.583	0.2336	
15 minute summer	4	6.007	3	78.0	3.096	0.668	0.4610	
15 minute summer	3	6.008	2	78.3	2.456	0.329	0.5605	
15 minute summer	2	1.016	JUNCTION	321.7	1.583	0.924	1.1750	
15 minute summer	SWALE-2-IN	7.000	SWALE-2-2	8.6	0.290	0.004	0.2963	
15 minute summer	SWALE-2-2	7.001	SWALE-2-3	15.6	0.411	0.011	0.3601	
15 minute summer	SWALE-2-3	7.002	SWALE-2-4	22.5	0.190	0.010	1.1114	
15 minute summer	SWALE-2-4	7.003	SWALE-2-OUT	29.5	0.203	0.111	0.6830	
15 minute summer	SWALE-2-OUT	7.004	SWALE-1-IN	29.4	0.971	0.320	0.3470	
15 minute summer	SWALE-1-IN	7.005	SWALE-1-2	34.8	0.207	0.100	2.8082	
15 minute summer	SWALE-1-2	7.006	SWALE-1-3	40.8	0.579	0.028	1.0292	
15 minute summer	SWALE-1-3	7.007	SWALE-1-4	47.1	0.266	0.024	3.3615	
15 minute summer	SWALE-1-4	7.008	SWALE-1-5	46.6	0.216	0.142	4.8593	
15 minute summer	SWALE-1-5	7.009	SWALE-1-OUT	46.0	0.707	0.031	0.6548	
15 minute summer	SWALE-1-OUT	7.010	JUNCTION	46.1	6.609	0.352	0.0353	
15 minute summer	JUNCTION	1.017	CP1	348.7	1.861	1.028	2.2834	
1440 minute summer	CP1	1.018	Pond	27.1	0.555	0.082	4.5885	
1440 minute summer	Pond	1.019	52	5.4	0.471	0.136	0.3294	
30 minute summer	Ditch-2	1.024	Ditch-2-1	6.7	0.184	0.022	2.3351	
15 minute summer	52	1.020	HW7	5.4	1.710	0.186	0.0508	
60 minute summer	HW7	1.021	HW6	5.4	0.170	0.018	3.6255	

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	HW6	201	154.033	0.033	5.4	0.0385	0.0000	OK
30 minute summer	HW5	33	151.857	0.057	5.4	0.0644	0.0000	OK
60 minute summer	Ditch-2-1	577	144.080	0.080	6.6	0.0899	0.0000	OK
60 minute summer	HW4	578	137.029	0.029	5.4	0.0332	0.0000	OK
60 minute summer	HW3	580	134.529	0.079	5.4	0.0898	0.0000	OK
60 minute summer	HW2	582	127.831	0.031	5.4	0.0346	0.0000	OK
240 minute winter	HB10	236	173.720	0.720	7.8	33.9510	0.0000	SURCHARGED
480 minute winter	HB24	464	171.700	0.750	6.1	51.3323	0.0000	SURCHARGED
15 minute summer	CP25	11	171.926	0.626	29.0	0.7078	0.0000	SURCHARGED
240 minute winter	CP11	236	173.720	0.570	4.1	0.0000	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)
30 minute summer	HW6	1.022	HW5	5.4	1.343	0.105	0.1129	
30 minute summer	HW5	1.023	Ditch-2	5.4	0.185	0.016	0.4762	
60 minute summer	Ditch-2-1	1.025	HW4	5.4	0.175	0.017	2.0641	
60 minute summer	HW4	1.026	HW3	5.4	2.116	0.084	0.1167	
60 minute summer	HW3	1.027	HW2	5.4	0.173	0.018	2.0534	
60 minute summer	HW2	1.028	HW1	5.4	2.114	0.089	0.0797	388.9
240 minute winter	HB10	6.001	9	0.8	0.515	0.047	0.0245	
480 minute winter	HB24	4.001	23	0.9	0.888	0.022	0.0058	
15 minute summer	CP25	4.000	HB24	26.9	1.527	1.337	0.4816	
240 minute winter	CP11	6.000	HB10	4.0	0.225	0.220	0.2570	

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	34	12	173.158	1.358	36.1	1.5361	0.0000	SURCHARGED
15 minute summer	33	12	172.649	1.109	35.8	1.2540	0.0000	SURCHARGED
15 minute summer	32	12	173.184	0.434	26.6	0.4904	0.0000	SURCHARGED
15 minute summer	31	12	172.483	1.308	91.1	1.4796	0.0000	SURCHARGED
15 minute summer	30	11	171.154	0.444	138.7	0.5017	0.0000	SURCHARGED
15 minute summer	CP29	11	170.854	0.254	168.2	0.2868	0.0000	OK
2880 minute winter	CP28	2760	170.125	1.075	1.4	0.0000	0.0000	SURCHARGED
2880 minute winter	CP27	2760	170.125	1.585	7.0	399.9178	0.0000	SURCHARGED
2880 minute winter	HB26	2760	170.125	1.625	5.8	1.8378	0.0000	SURCHARGED
15 minute summer	23	10	170.436	0.046	11.2	0.0520	0.0000	OK
15 minute summer	22	10	169.494	0.114	63.3	0.1288	0.0000	OK
15 minute summer	21	10	168.653	0.143	74.5	0.1621	0.0000	OK
15 minute summer	20	10	168.269	0.179	90.9	0.2025	0.0000	OK
15 minute summer	19	11	167.769	0.199	115.8	0.2254	0.0000	OK
15 minute summer	18	11	167.534	0.689	159.1	0.7795	0.0000	SURCHARGED
15 minute summer	17	11	167.177	0.907	177.5	1.6030	0.0000	SURCHARGED
15 minute summer	16	11	167.011	0.996	236.1	1.7593	0.0000	FLOOD RISK
15 minute summer	15	11	166.907	0.937	244.0	1.6552	0.0000	SURCHARGED
15 minute summer	SWALE-3-IN	11	167.998	0.198	19.9	0.2236	0.0000	OK
30 minute summer	SWALE-3-2	20	167.428	0.278	26.4	0.3147	0.0000	OK
15 minute summer	SWALE-3-OUT	12	166.977	0.127	32.4	0.1434	0.0000	OK
15 minute summer	14	11	166.810	0.870	247.3	1.5374	0.0000	SURCHARGED
15 minute summer	13	12	166.700	0.800	280.0	1.4140	0.0000	SURCHARGED
15 minute summer	12	12	166.505	0.685	292.4	1.2098	0.0000	SURCHARGED
15 minute summer	9	10	172.238	0.098	26.4	0.1112	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	34	1.000	33	30.4	1.729	1.511	0.2537	
15 minute summer	33	1.001	31	37.5	0.942	0.645	1.1666	
15 minute summer	32	2.000	31	24.3	1.530	0.708	0.7134	
15 minute summer	31	1.002	30	90.6	2.278	1.733	1.5347	
15 minute summer	30	1.003	CP29	138.3	1.980	1.301	0.8036	
15 minute summer	CP29	1.004	HB26	167.6	2.832	0.891	1.4962	
2880 minute winter	CP28	3.000	CP27	1.4	0.044	0.009	1.8737	
2880 minute winter	CP27	3.001	HB26	-5.0	-0.071	-0.051	0.3522	
2880 minute winter	HB26	1.005	20	1.0	0.546	0.056	0.0545	
15 minute summer	23	4.002	22	11.2	0.885	0.092	0.2427	
15 minute summer	22	4.003	21	63.1	2.693	0.468	0.3061	
15 minute summer	21	1.006	20	74.2	2.440	0.555	0.1945	
15 minute summer	20	1.007	19	90.2	2.984	0.728	0.2382	
15 minute summer	19	1.008	18	113.5	2.416	0.416	0.7288	
15 minute summer	18	1.009	17	154.8	2.714	0.668	0.8155	
15 minute summer	17	1.010	16	175.4	1.591	0.724	1.4313	
15 minute summer	16	1.011	15	234.0	1.477	1.030	1.4369	
15 minute summer	15	1.012	14	241.9	1.527	1.106	1.0313	
15 minute summer	SWALE-3-IN	5.000	SWALE-3-2	18.2	0.073	0.127	4.4677	
30 minute summer	SWALE-3-2	5.001	SWALE-3-OUT	23.1	0.112	0.150	1.4202	
15 minute summer	SWALE-3-OUT	5.002	13	32.4	2.758	0.556	0.1027	
15 minute summer	14	1.013	13	245.3	1.548	1.098	1.3214	
15 minute summer	13	1.014	12	279.3	1.763	1.209	2.4714	
15 minute summer	12	1.015	2	292.7	1.847	1.272	1.7118	
15 minute summer	9	6.002	8	26.3	2.272	0.659	0.1281	

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	10	171.631	0.121	67.0	0.1369	0.0000	OK
15 minute summer	7	10	168.646	0.176	77.0	0.1995	0.0000	OK
15 minute summer	6	10	168.385	0.155	76.1	0.1757	0.0000	OK
15 minute summer	5	10	167.990	0.180	89.1	0.2037	0.0000	OK
15 minute summer	4	10	167.574	0.189	102.0	0.2133	0.0000	OK
15 minute summer	3	11	166.636	0.166	102.2	0.1876	0.0000	OK
15 minute summer	2	12	166.329	0.639	414.4	1.1291	0.0000	SURCHARGED
15 minute summer	SWALE-2-IN	10	172.788	0.038	11.4	0.0435	0.0000	OK
15 minute summer	SWALE-2-2	10	172.370	0.070	20.8	0.0789	0.0000	OK
15 minute summer	SWALE-2-3	10	172.162	0.062	30.0	0.0700	0.0000	OK
15 minute summer	SWALE-2-4	11	171.893	0.243	39.2	0.2748	0.0000	OK
15 minute summer	SWALE-2-OUT	11	171.652	0.102	39.0	0.1149	0.0000	OK
15 minute summer	SWALE-1-IN	12	171.420	0.270	48.0	0.3054	0.0000	OK
15 minute summer	SWALE-1-2	12	170.662	0.112	54.9	0.1272	0.0000	OK
15 minute summer	SWALE-1-3	12	170.299	0.099	62.9	0.1122	0.0000	OK
15 minute summer	SWALE-1-4	13	169.885	0.335	71.3	0.3791	0.0000	OK
15 minute summer	SWALE-1-5	13	168.971	0.121	64.0	0.1366	0.0000	OK
15 minute summer	SWALE-1-OUT	14	168.680	0.079	63.2	0.0899	0.0000	OK
2160 minute winter	JUNCTION	2040	166.312	0.652	21.5	0.0000	0.0000	SURCHARGED
2160 minute winter	CP1	2040	166.313	1.162	21.5	89.4978	0.0000	SURCHARGED
2160 minute winter	Pond	2100	166.313	1.313	19.0	638.2955	0.0000	FLOOD RISK
15 minute summer	Ditch-2	35	150.073	0.073	5.4	0.0823	0.0000	OK
2160 minute winter	HW1	2100	124.240	0.030	5.4	0.0000	0.0000	OK
15 minute summer	52	14	165.055	0.055	5.4	0.0623	0.0000	OK
2160 minute winter	HW7	2100	164.879	0.079	5.4	0.0898	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	8	6.003	7	66.6	2.411	0.570	1.6751	
15 minute summer	7	6.004	6	76.1	2.425	0.659	0.1541	
15 minute summer	6	6.005	5	75.9	2.395	0.648	0.2645	
15 minute summer	5	6.006	4	88.9	2.570	0.762	0.2966	
15 minute summer	4	6.007	3	102.2	3.133	0.875	0.6092	
15 minute summer	3	6.008	2	102.0	2.376	0.429	0.6748	
15 minute summer	2	1.016	JUNCTION	412.4	1.909	1.184	1.2506	
15 minute summer	SWALE-2-IN	7.000	SWALE-2-2	11.3	0.316	0.006	0.3574	
15 minute summer	SWALE-2-2	7.001	SWALE-2-3	20.5	0.447	0.015	0.4360	
15 minute summer	SWALE-2-3	7.002	SWALE-2-4	29.7	0.208	0.013	1.3320	
15 minute summer	SWALE-2-4	7.003	SWALE-2-OUT	39.0	0.222	0.146	0.8230	
15 minute summer	SWALE-2-OUT	7.004	SWALE-1-IN	38.9	1.177	0.423	0.3679	
15 minute summer	SWALE-1-IN	7.005	SWALE-1-2	46.1	0.224	0.133	3.4283	
15 minute summer	SWALE-1-2	7.006	SWALE-1-3	54.4	0.628	0.038	1.2639	
15 minute summer	SWALE-1-3	7.007	SWALE-1-4	63.1	0.285	0.032	4.2219	
15 minute summer	SWALE-1-4	7.008	SWALE-1-5	64.0	0.237	0.195	6.1089	
15 minute summer	SWALE-1-5	7.009	SWALE-1-OUT	63.2	0.841	0.043	0.8053	
15 minute summer	SWALE-1-OUT	7.010	JUNCTION	62.4	7.064	0.476	0.0618	
2160 minute winter	JUNCTION	1.017	CP1	21.5	0.875	0.064	2.6373	
2160 minute winter	CP1	1.018	Pond	19.0	0.559	0.057	4.5885	
2160 minute winter	Pond	1.019	52	5.4	0.471	0.136	0.3298	
15 minute summer	Ditch-2	1.024	Ditch-2-1	6.7	0.185	0.022	2.3351	
15 minute summer	52	1.020	HW7	5.5	1.741	0.190	0.0511	
2160 minute winter	HW7	1.021	HW6	5.4	0.170	0.018	3.6301	

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	HW6	2100	154.033	0.033	5.4	0.0385	0.0000	OK
15 minute summer	HW5	27	151.857	0.057	5.4	0.0644	0.0000	OK
2160 minute winter	Ditch-2-1	2100	144.080	0.080	5.4	0.0901	0.0000	OK
2160 minute winter	HW4	2100	137.029	0.029	5.4	0.0332	0.0000	OK
2160 minute winter	HW3	2100	134.530	0.080	5.4	0.0899	0.0000	OK
2160 minute winter	HW2	2100	127.831	0.031	5.4	0.0347	0.0000	OK
360 minute winter	HB10	344	173.968	0.968	7.4	46.4976	0.0000	SURCHARGED
600 minute winter	HB24	570	171.950	1.000	6.8	69.6314	0.0000	SURCHARGED
15 minute summer	CP25	11	172.468	1.168	38.0	1.3211	0.0000	SURCHARGED
360 minute winter	CP11	344	173.968	0.818	3.9	0.0000	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)
2160 minute winter	HW6	1.022	HW5	5.4	1.343	0.105	0.1086	
15 minute summer	HW5	1.023	Ditch-2	5.4	0.183	0.016	0.4772	
2160 minute winter	Ditch-2-1	1.025	HW4	5.4	0.175	0.017	2.0669	
2160 minute winter	HW4	1.026	HW3	5.4	0.937	0.084	0.1169	
2160 minute winter	HW3	1.027	HW2	5.4	0.173	0.018	2.0561	
2160 minute winter	HW2	1.028	HW1	5.4	2.115	0.089	0.0798	975.4
360 minute winter	HB10	6.001	9	1.0	0.536	0.054	0.0270	
600 minute winter	HB24	4.001	23	1.0	0.923	0.025	0.0064	
15 minute summer	CP25	4.000	HB24	34.6	1.968	1.722	0.4816	
360 minute winter	CP11	6.000	HB10	3.8	0.214	0.209	0.2570	