Reid Jones partnership

Consulting Civil & Structural Engineers

SURFACE WATER AND FOUL WATER DRAINAGE STRATEGY

Relating to

PROPOSED RESIDENTIAL DEVELOPMENT AT LOWER REAPS FARM, WHINNEY LANE, MELLOR

On behalf of

STANTON ANDREWS LTD

MARCH 2025

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1. INTRODUCTION

1.1 This surface water drainage scheme has been produced on behalf of Stanton Andrews Ltd to discharge Condition 17 of the planning approval from Ribble Valley Borough Council (Reference 3/2022/1165) for a residential development at Lower Reaps Farm, Mellor. A location plan is included within Appendix A.

1.2 Condition 17 states the following:

Prior to the commencement of development, a drainage scheme, which shall detail measures for the attenuation and the disposal of foul and surface waters, shall be submitted to and approved in writing by the Local Planning Authority. The surface water drainage scheme shall be in accordance with the hierarchy of drainage options outlined in the National Planning Practice Guidance and the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015), or any subsequent replacement national guidance / standards, with evidence of an assessment of the site conditions to include site investigation and test results to confirm infiltrations rates to be submitted. For the avoidance of doubt, surface water must drain separate from the foul and unless otherwise agreed in writing by the Local Planning Authority, no surface water shall discharge to the public sewerage system either directly or indirectly.

No dwelling shall be occupied or brought into first use until the drainage works associated with that dwelling have been completed in accordance with the approved scheme. Thereafter the agreed scheme shall be retained, managed and maintained in accordance with the approved details.

Reason: To promote sustainable development using appropriate drainage systems, ensure a safe form of development that poses no unacceptable risk of pollution to water resources or human health and to prevent an undue increase in surface water run-off to reduce the risk of flooding.

1.3 This surface water drainage scheme is to discharge Condition 17 of the planning approval. It describes the existing site conditions and proposed development. It assesses the potential impact of proposals on existing drainage and includes a proposed scheme for the provision of new drainage to serve the proposed development.

2. BASE INFORMATION

Existing site

2.1 The existing site is located to the East of Mellor Village and is accessed from Whinney Lane.

2.2 The existing site comprises of farm buildings and associated hardstanding areas.

2.3 The site falls towards the southern boundary.

Site geology

2.4 Site investigations have not been carried out for the site.

2.5 The online Soilscapes Viewer has identified that the geology encountered is likely to comprise slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage.

2.6 Soakaways are therefore not appropriate for the discharge of surface water into the ground and infiltration tests have not been carried out.

Understanding of existing drainage local to and within the site

2.7 A drainage ditch flows through the site and continues towards the southern boundary.

2.8 The drainage ditch flows South East from the site into Arley Brook.

2.9 The existing drainage is assumed to discharge into the on-site drainage ditch.

Proposed development

2.10 The proposal is to refurbish and convert a number of agricultural buildings into three residential properties; conversion of outbuildings for associated residential use and external works.

2.11 The proposed site plan is on the approved drawing 6590-P01-B.

3. PROPOSED SURFACE WATER DRAINAGE SCHEME

3.1 In accordance with the National Standards for Sustainable Drainage, the surface water drainage scheme should incorporate the use of Sustainable Drainage (SUDS) where possible. The approach promotes the use infiltration features in the first instance. If drainage cannot be achieved solely through infiltration due to site conditions or contamination risks, the preferred options are (in order of preference):

(i) a controlled discharge to a local waterbody or watercourse, or

(ii) a controlled discharge into the public sewer network (depending on availability and capacity).

3.2 The rate and volume of discharge should be restricted to the pre-development values as far as practicable.

3.3 The nature of the geology of the site means that infiltration back into the ground is not feasible.

3.4 A drainage ditch flows southwest across the site, starting from the northern boundary, continuing towards the southern boundary, and ultimately discharging into Arley Brook.

3.5 Surface water from the existing site is believed to discharge unrestricted into Arley Brook via the drainage ditch that flows through the site.

3.6 It is intended that surface water runoff from the developed site will be attenuated and discharge into the watercourse, mimicking the existing scenario.

3.7 The site is a Brownfield site and the area of existing roofs and hardstanding have been measured as 0.1 ha.

3.8 Surface water runoff from the developed site will be restricted to either 2.0 l/s or the pre-development Greenfield runoff rate (Qbar), whichever is greater. Runoff from all rainfall events up to the 1-in-100-year critical storm, plus a 45% allowance for climate change, will be attenuated before discharging into the drainage ditch along the southern site boundary, ultimately flowing to Arley Brook.

3.9 To determine the restricted surface water discharge rate from the developed site, the pre-development Greenfield runoff rates have been calculated using the 'Causeway Flow' programme. The calculations are based upon the area of the application site that has been measured as 0.1ha. The existing pre-development Greenfield runoff rate Qbar has been calculated as 1.1 l/s. The calculation is below.

Pre-development discharge

Site Makeup	Brownfield
Brownfield Method	Greenfield
Greenfield Method	IH124
Positively Drained Area (ha)	0.100
SAAR (mm)	1136
Soil Index	5
SPR	0.53
Region	10
Betterment (%)	0
	Calc
QBar (l/s)	1.1

Return Period (years)	Growth Factor	Q (l/s)
1	0.85	0.9
30	1.95	2.2
100	2.48	2.7

3.10 The surface water drainage design accounts for the 100-year critical rainstorm with a 45% climate change allowance. Runoff from the proposed residential roofs, access roads, garages, and parking areas will be attenuated and discharged at a controlled rate of 2.0 l/s into the drainage ditch, which flows southwest from the site's southern boundary into Arley Brook.

3.11 Attenuation storage of approx. 78 m^3 is provided within the proposed drainage network using storage crates located under the soft landscaping to the south of the converted buildings. The surface water drainage design is included within Appendix B.

3.12 Surface water falling onto the undrained soft landscaped areas will also be retained on site with attenuation storage being provided by the topsoil layer, which will allow water to percolate into it where it will either be taken up by the vegetation or evaporate. The surface water within these areas of the site will therefore be dealt with close to where it falls, at source.

4. PROPOSED FOUL WATER DRAINAGE

4.1 Each of the three units will have a separate foul drainage system, with wastewater treated by individual treatment plants. The treated effluent will then be discharged into the drainage ditch, subject to approval from the Environment Agency.

5. SUMMARY AND CONCLUSIONS

5.1 This surface water drainage scheme has been produced on behalf of Stanton Andrews LTD to discharge Condition 17 of the planning approval from Ribble Valley Borough Council (Reference 3/2022/1165) for a residential development at Lower Reaps Farm, Mellor.

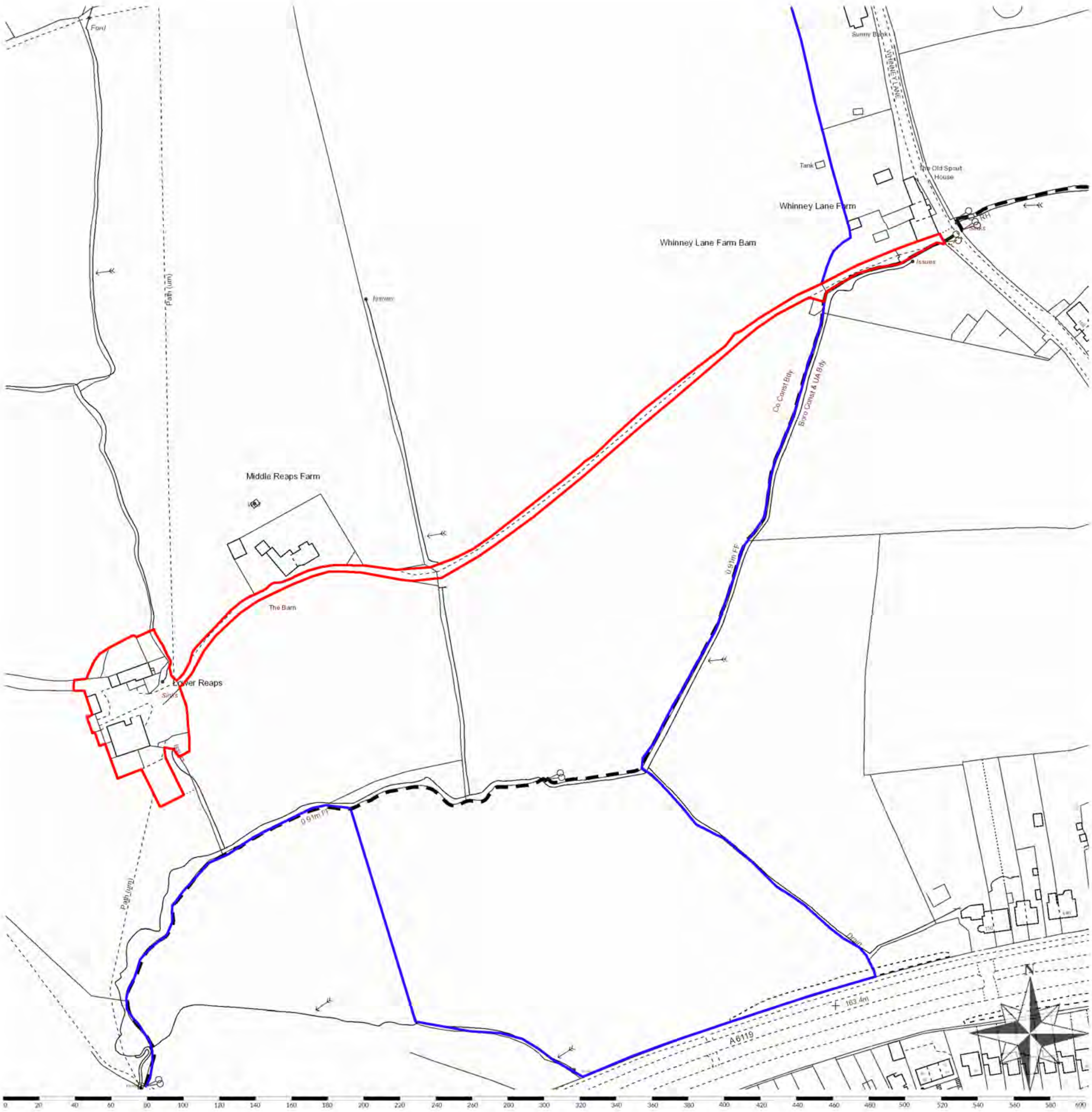
5.2 The nature of the local geology means that infiltration of surface water runoff back into the ground is not feasible.

5.3 Surface water runoff from the developed site will be attenuated and discharged into the existing drainage ditch, which flows from the northern to the southern boundary before continuing to Arley Brook, maintaining the natural drainage pattern. The discharge rate will be restricted to greenfiled run off rate of 2.0 l/s.

5.4 The surface water drainage design accommodates runoff from all rainfall events up to the 1-in-100-year critical storm, with a 45% allowance for climate change. Attenuation is achieved through underground storage crates within the soft landscaped areas to the south of the converted buildings.

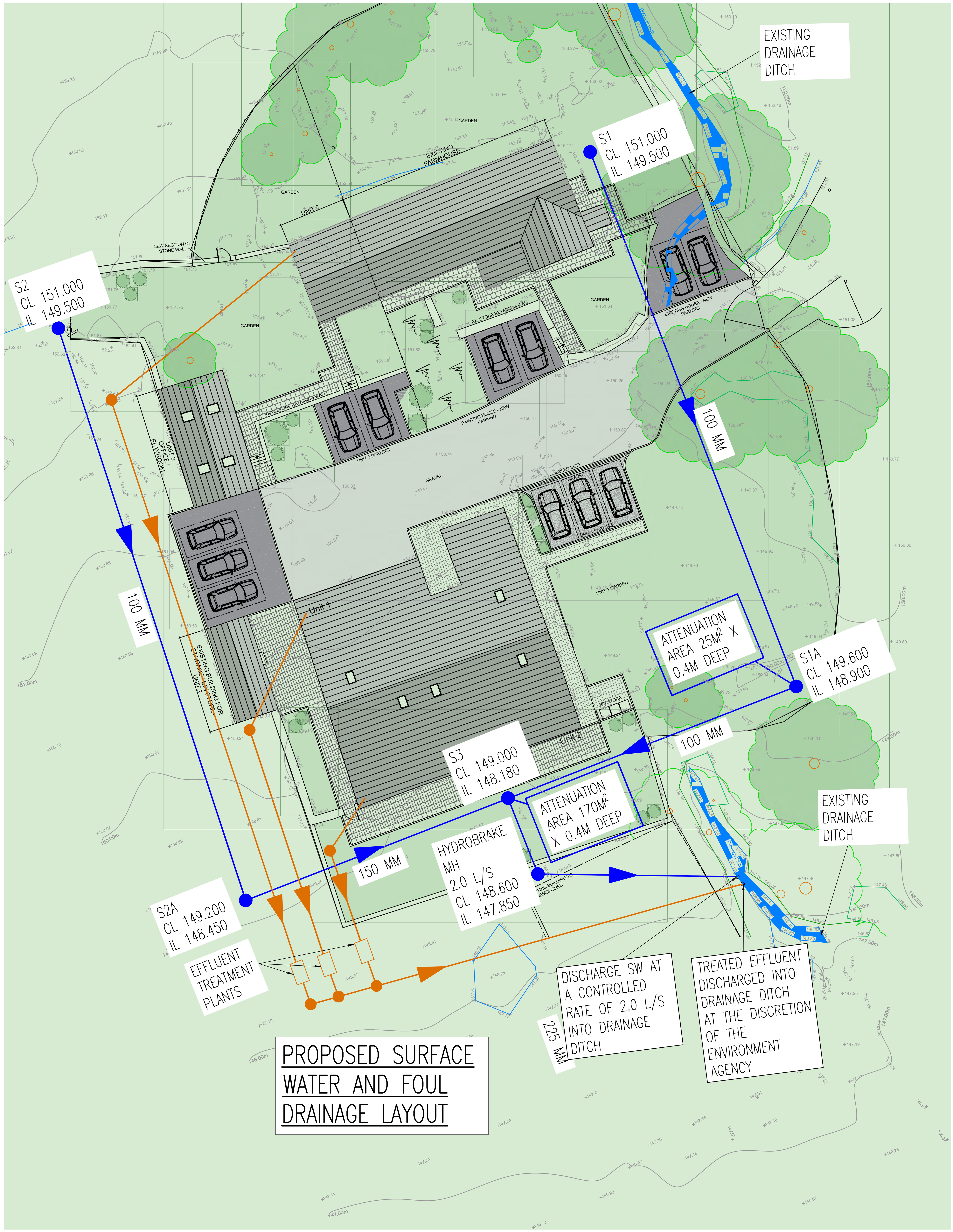
5.5 Foul water from the three proposed buildings will be treated by separate treatment plants before being discharged into the drainage ditch.

APPENDIX A

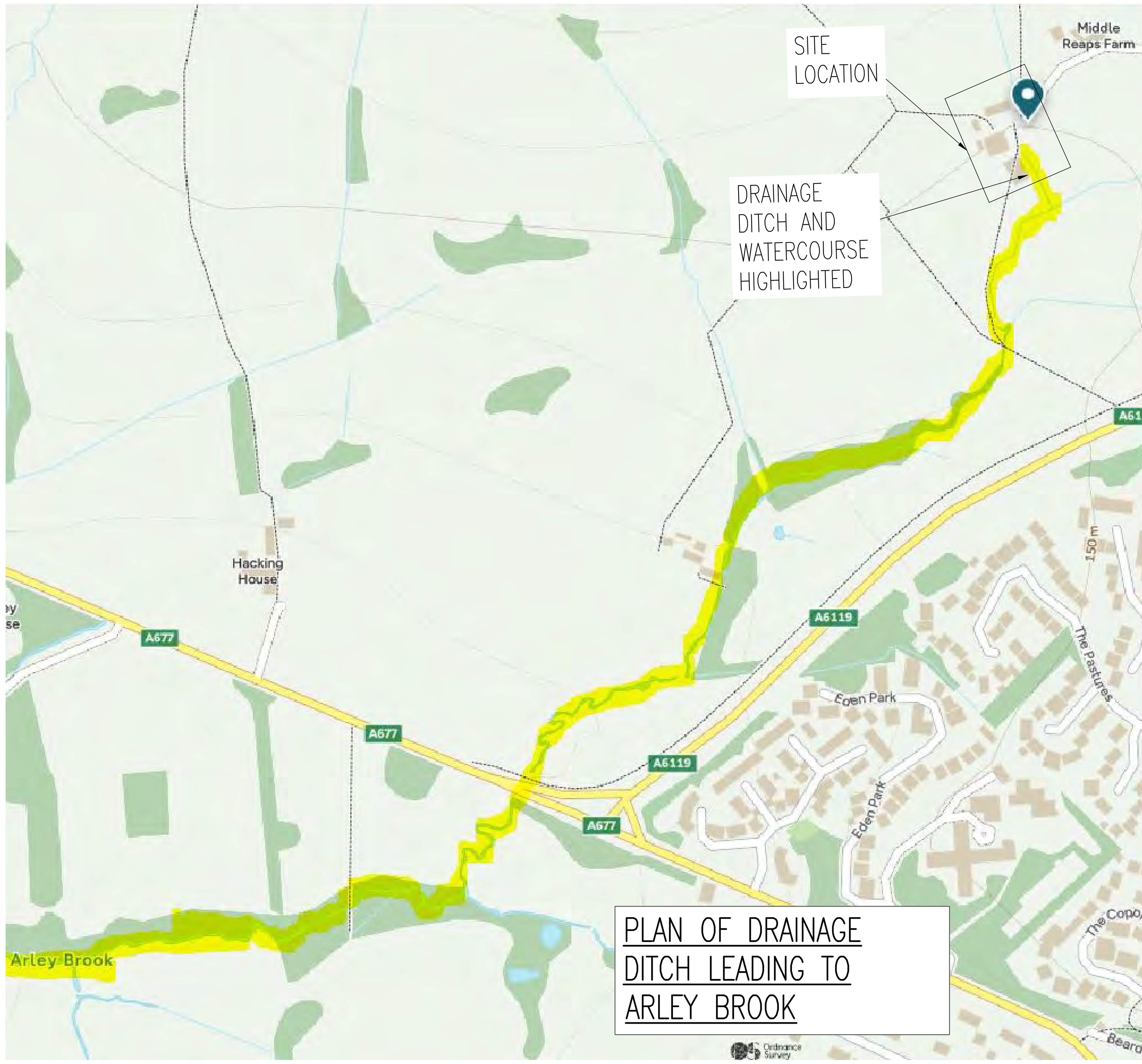


Scale: 1:2500 | Area 36Ha | Grid Reference: 366348,430280 | Paper Size: A3

APPENDIX B



PROPOSED SURFACE WATER AND FOUL DRAINAGE LAYOUT



PLAN OF DRAINAGE DITCH LEADING TO ARLEY BROOK

Rev	Details	Drawn By	Chk/App By	Date
P1	ISSUED FOR APPROVAL	SHR	SJR	18.03.25

Client: STANTON ANDREWS LTD

Project: LOWER REAPS FARM

Title: SW AND FOUL DRAINAGE LAYOUT AND WATERCOURSE PLAN

Issued For: PRELIMINARY

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Scale: NOT TO SCALE

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PRELIMINARY DRAWING. NOT FOR CONSTRUCTION.

Design Settings

Rainfall Methodology	FSR
Return Period (years)	2
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.300
CV	0.750
Time of Entry (mins)	5.00

Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	75.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	0.600
Include Intermediate Ground	✓
Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
s1		5.00	151.000	600	366298.009	430214.744	1.500
s1a	0.050	5.00	149.600	600	366314.753	430171.302	0.700
s2		5.00	151.000	600	366257.624	430201.577	1.500
s2a	0.050	5.00	149.200	600	366272.857	430155.074	0.750
s3			149.000	600	366291.325	430162.228	0.820
hydrobrake mh			148.600	1200	366294.077	430155.292	0.750

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	s1	s1a	46.557	0.600	149.500	148.900	0.600	77.6	100	5.89	56.8
2.000	s2	s2a	48.934	0.600	149.500	148.500	1.000	48.9	100	5.74	57.4
1.001	s1a	s3	25.124	0.600	148.900	148.230	0.670	37.5	100	6.22	55.5
2.001	s2a	s3	19.805	0.600	148.450	148.180	0.270	73.4	150	6.02	56.3
1.002	s3	hydrobrake mh	7.462	0.600	148.180	147.850	0.330	22.6	150	6.28	55.3

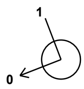
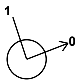
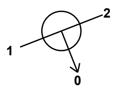
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.874	6.9	0.0	1.400	0.600	0.000	0.0	0	0.000
2.000	1.104	8.7	0.0	1.400	0.600	0.000	0.0	0	0.000
1.001	1.263	9.9	7.5	0.600	0.670	0.050	0.0	65	1.389
2.001	1.175	20.8	7.6	0.600	0.670	0.050	0.0	63	1.087
1.002	2.127	37.6	15.0	0.670	0.600	0.100	0.0	66	2.010

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	46.557	77.6	100	Circular	151.000	149.500	1.400	149.600	148.900	0.600
2.000	48.934	48.9	100	Circular	151.000	149.500	1.400	149.200	148.500	0.600
1.001	25.124	37.5	100	Circular	149.600	148.900	0.600	149.000	148.230	0.670
2.001	19.805	73.4	150	Circular	149.200	148.450	0.600	149.000	148.180	0.670
1.002	7.462	22.6	150	Circular	149.000	148.180	0.670	148.600	147.850	0.600

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	s1	600	Manhole	Adoptable	s1a	600	Manhole	Adoptable
2.000	s2	600	Manhole	Adoptable	s2a	600	Manhole	Adoptable
1.001	s1a	600	Manhole	Adoptable	s3	600	Manhole	Adoptable
2.001	s2a	600	Manhole	Adoptable	s3	600	Manhole	Adoptable
1.002	s3	600	Manhole	Adoptable	hydrobrake mh	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
s1	366298.009	430214.744	151.000	1.500	600		0	1.000	149.500	100
s1a	366314.753	430171.302	149.600	0.700	600		1	1.000	148.900	100
							0	1.001	148.900	100
s2	366257.624	430201.577	151.000	1.500	600		0	2.000	149.500	100
s2a	366272.857	430155.074	149.200	0.750	600		1	2.000	148.500	100
							0	2.001	148.450	150
s3	366291.325	430162.228	149.000	0.820	600		1	2.001	148.180	150
							2	1.001	148.230	100
							0	1.002	148.180	150
hydrobrake mh	366294.077	430155.292	148.600	0.750	1200		1	1.002	147.850	150

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
Rainfall Events	Singular	Additional Storage (m^3/ha)	0.0
FSR Region	England and Wales	Starting Level (m)	
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.300	1 year (l/s)	0.9
Summer CV	0.750	30 year (l/s)	2.2
Winter CV	0.840	100 year (l/s)	2.7
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year 360 minute (m^3)	

Storm Durations

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

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

Pre-development Discharge Rate

Site Makeup	Brownfield	Growth Factor 1 year	0.85
Brownfield Method	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.100	Betterment (%)	0
SAAR (mm)	1136	QBar	1.1
Soil Index	5	Q 1 year (l/s)	0.9
SPR	0.53	Q 30 year (l/s)	2.2
Region	10	Q 100 year (l/s)	2.7

Pre-development Discharge Volume

Site Makeup	Brownfield	Return Period (years)	100
Brownfield Method	Greenfield	Climate Change (%)	0
Greenfield Method	FSR/FEH	Storm Duration (mins)	360
Positively Drained Area (ha)	0.100	Betterment (%)	0
Soil Index	5	PR	
SPR	0.53	Runoff Volume (m^3)	
CWI			

Node hydrobrake mh Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	147.850	Product Number	CTL-SHE-0072-2000-0700-2000
Design Depth (m)	0.700	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node s3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	148.180
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	192

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	170.0	0.0	0.400	170.0	0.0	0.401	0.0	0.0

Node s1a Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	148.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	9

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	25.0	0.0	0.400	25.0	0.0	0.401	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	s1	1	149.500	0.000	0.0	0.0000	0.0000	OK
15 minute winter	s1a	12	148.948	0.048	6.4	1.1591	0.0000	OK
15 minute summer	s2	1	149.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	s2a	9	148.532	0.082	6.1	0.0233	0.0000	OK
120 minute winter	s3	90	148.221	0.041	4.8	6.6645	0.0000	OK
120 minute winter	hydrobrake mh	82	148.237	0.387	3.7	0.4372	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	s1	1.000	s1a	0.0	0.000	0.000	0.0822	
15 minute winter	s1a	1.001	s3	4.5	1.216	0.451	0.0925	
15 minute summer	s2	2.000	s2a	0.0	0.000	0.000	0.0532	
15 minute winter	s2a	2.001	s3	6.7	1.565	0.321	0.0992	
180 minute summer	s3	1.002	hydrobrake mh	4.4	0.348	0.117	0.0789	
15 minute winter	hydrobrake mh	Hydro-Brake®		2.0				5.3

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	s1	1	149.500	0.000	0.0	0.0000	0.0000	OK
15 minute winter	s1a	14	149.089	0.189	22.8	4.5418	0.0000	SURCHARGED
15 minute summer	s2	1	149.500	0.000	0.0	0.0000	0.0000	OK
15 minute winter	s2a	11	148.743	0.293	22.8	0.0829	0.0000	SURCHARGED
180 minute winter	s3	176	148.408	0.228	12.5	36.8956	0.0000	SURCHARGED
180 minute winter	hydrobrake mh	176	148.407	0.557	3.7	0.6299	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	s1	1.000	s1a	0.0	0.000	0.000	0.1821	
60 minute winter	s1a	1.001	s3	10.3	1.399	1.035	0.1966	
15 minute summer	s2	2.000	s2a	0.0	0.000	0.000	0.1914	
15 minute winter	s2a	2.001	s3	21.6	1.640	1.042	0.2454	
15 minute winter	s3	1.002	hydrobrake mh	7.4	0.719	0.196	0.1165	
180 minute winter	hydrobrake mh	Hydro-Brake®		2.0				40.1

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	s1	1	149.500	0.000	0.0	0.0000	0.0000	OK
30 minute winter	s1a	23	149.195	0.295	24.0	7.0933	0.0000	SURCHARGED
15 minute summer	s2	1	149.500	0.000	0.0	0.0000	0.0000	OK
15 minute winter	s2a	11	148.975	0.525	29.4	0.1487	0.0000	FLOOD RISK
240 minute winter	s3	232	148.501	0.321	13.2	51.9277	0.0000	SURCHARGED
240 minute winter	hydrobrake mh	232	148.500	0.650	2.8	0.7348	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	s1	1.000	s1a	0.0	0.000	0.000	0.1821	
30 minute winter	s1a	1.001	s3	10.8	1.384	1.090	0.1966	
15 minute summer	s2	2.000	s2a	0.0	0.000	0.000	0.1914	
15 minute winter	s2a	2.001	s3	27.0	1.943	1.302	0.2856	
15 minute summer	s3	1.002	hydrobrake mh	8.3	0.699	0.221	0.1247	
15 minute summer	hydrobrake mh	Hydro-Brake®		2.0				22.7