

Levee

CONSULTING

Technical Note: Drainage Strategy at Bedford Road, Hitchin

Planning Reference: 25/03234/FP

Author: Alan Griffin MEng CEng MICE ACGI

Revision: -

Date: 14/05/26

Introduction

We have prepared this Technical Note to review the on site drainage provisions for the proposed development of 50 residential units at Bedford Road, Hitchin. The development covers an area of 1.75Ha. The site is presently pasture with existing housing development to the north and west and The Priory School to the south and east. This Technical Note should be read in conjunction with drawing reference “AC_01_017D Drainage Strategy” and “Bedford Road MicroDrainage Simulation Results” which can be found in Appendices A and B respectively.

Surface Water Drainage Strategy

A Flood Risk Assessment (FRA) has been prepared by Arcadis dated December 2025. The Arcadis FRA does not make recommendations concerning the on site drainage.

Levee Consulting have produced a surface water drainage strategy. This is shown on drawing reference: “AC_01_017D Drainage Strategy” and detailed MicroDrainage simulation results have also been provided, please see “Bedford Road MicroDrainage Simulation Results”. The surface water drainage system is gravity fed to a detention basin and then discharged by gravity to an existing public sewer. Following the SUDS Hierarchy both infiltration and discharge to watercourse were considered.

The site is underlain by superficial deposits of Lowestoft Formation generally comprising Diamicton with the north of the Site underlain by glaciofluvial deposits. Below the superficial deposits are the bedrock deposits of Gault Formation comprising of mudstone. The site is recorded on Soilsmap Mapping (see Appendix F) as having “slightly acid loamy and clayey soil with impeded drainage”. It is thus believed that soakaways will not be viable on this development owing to poor ground drainage.

The River Oughton is located approximately 30m north of the site. A direct discharge to this watercourse however is not possible without crossing third party land. But it is possible to make an indirect connection to this same watercourse. The existing Anglian Water sewer

discharges into the same watercourse at a point 40m away from the proposed sewer connection point. The Anglian Water sewer arrangement as can be seen on the Anglian Water Asset Plan in Appendix D.

We have thus proposed to connect to the Anglian Water sewer that outfalls into the River Oughton. Anglian Water have confirmed that a connection can be made to the sewer at Manhole 8952 at a discharge rate no greater than 3.82l/s. A copy of the Anglian Water pre-app is in Appendix E.

The greenfield run-off calculation can be seen in Appendix C. The QBar is 4.7l/s, Q1 is 4.0l/s, Q30 is 10.5l/s and Q100 is 14.8l/s. The required outfall rate of 3.82l/s by Anglian Water is thus below the greenfield run-off rate, using this discharge rate the proposed development will reduce the risk of surface water flooding in all return periods.

Attenuation storage is provided by a 1.45m deep detention basin giving an attenuation capacity of 475m³ allowing for a 300mm freeboard (and upto 615m³ if freeboard is ignored). The outflow is restricted by a hydrobrake limiting the outflow to 3.8l/s for all storm events. The MicroDrainage Simulation data demonstrates there is no flooding within the site for the 1:100 year return period storm, nor do water levels within the detention basin exceed the 300mm freeboard (the basin effectively has a spare further 30% capacity). The outfall discharge within the drainage strategy and MicroDrainage Simulation does not exceed the required 3.8l/s, and a 40% climate change allowance has been allowed with a further 10% urban creep factor.

The proposed surface water drainage strategy also provides treatment of surface water at the detention basin. Following table 26.2 of "The SUDS Manual C753" issued by CIRIA the proposed scheme has pollution indices of 0.5 / 0.4 / 0.5 (Total Suspended Solids / Metals / Hydrocarbons). Table 26.3 indicates that a detention basin provides treatment indices of 0.5 / 0.5 / 0.6 thus the treatment indices exceed the stated pollution indices providing water treatment in compliance with the "The SUDS Manual C753".

Foul Water Drainage Strategy

The foul water sewer arrangement is shown on drawing reference: "AC_01_017D Drainage Strategy". The foul water sewer network is gravity fed to the existing public sewer. The Anglian Water pre-app in Appendix E shows a connection to Manhole 8900 is viable.

Appendix A – Surface Water Strategy Drawing



MANHOLE SCHEDULE							
MH No.	MANHOLE DIAMETER (mm)	MANHOLE TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
S2	1200	Type B	57.854	55.95	1.804	517945.146	230804.324
S3	1200	Type B	57.712	55.85	1.562	517952.160	230820.517
S6	---	HEADWALL	---	54.82	---	517925.940	230913.887
S7	---	HEADWALL	---	54.81	---	517906.246	230921.399
S8	1350	Type C	56.360	54.80	1.480	517869.996	230921.556
S9	1350	Type C	58.139	56.60	1.314	517883.397	230930.112
S10	1350	Type C	57.075	55.50	1.275	517915.48	230837.127
S11	1350	Type B	57.116	55.05	1.616	517944.954	230845.533
S12	1350	Type C	57.816	57.30	0.366	517880.589	230843.871
S13	1350	Type C	56.139	54.70	1.139	517855.731	230911.116
S14	1350	Type C	56.169	54.75	0.899	517899.148	230916.697
S16	1350	Type C	56.240	54.90	0.880	517932.859	230889.096
S17	1350	Type B	56.652	56.20	2.152	517884.917	230791.034
S18	1200	Type B	58.040	56.10	1.640	517911.293	230794.424
S20	1350	Type C	55.773	54.47	1.003	517942.063	230948.628
S21	1350	Type C	56.367	54.65	1.267	517870.652	230917.012
F2	1350	Type C	58.137	56.80	1.237	517908.029	230796.777
F3	1350	Type C	57.869	56.50	1.249	517949.275	230808.128
F4	1350	Type C	57.719	56.40	1.169	517949.571	230819.932
F5	1350	Type C	57.062	55.65	1.262	517941.137	230847.592
F6	1350	Type C	56.028	54.65	1.228	517927.193	230900.037
F7	1350	Type B	56.367	54.20	2.017	517874.791	230914.888
F9	1350	Type B	56.179	54.00	2.029	517857.530	230911.777
F10	1350	Type C	57.905	56.55	1.255	517888.656	230834.221
F11	1350	Type C	56.937	55.85	0.937	517919.459	230840.751
F12	1200	Type B	56.160	54.45	1.560	517907.046	230913.496
F13	1200	Type B	55.763	53.40	2.213	517842.329	230843.854
F14	1200	Type B	55.697	53.60	1.947	517945.066	230955.667

LEGEND		
	Proposed Adoptable Surface Water Sewer	
	Proposed Adoptable Foul Water Sewer	
	Proposed Private Surface Water Drain	

Table A: Operation and Maintenance Requirements for Pipes, Ducts and Manholes		
Maintenance Schedule	Required Action	Record Frequency
Regular Maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action	Monthly for first 3 months and then as required
	Debris removal from catchment surface before any sewer risk to performance	Monthly
	Remove sediment from pre-treatment structure (if sited)	Annually or as required
Table B: Operation and Maintenance Requirements for Detention Basins		
Maintenance Schedule	Required Action	Record Frequency
Regular Maintenance	Remove litter, debris and trash	Monthly
	Cut grass - for landscaped areas and access routes	Monthly during growing season or as required
	Cut grass - roadside grass or around ponds	Half yearly: Spring before seeding season and Autumn
Occasional Maintenance	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment structures and/or pre-treatment	As required
Remedial Actions	Repair or rehabilitate inlets, outlets and overflows	As required
	Remove excess surface and restore design levels	As required
	Inspect, test and overhaul for leakage, or as required	Monthly
Monitoring	Inspect basins, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems for risk accumulation, establish appropriate risk removal measures	Half yearly
	Survey water of tank for sediment build-up and remove if necessary	Half yearly

Table C: Operation and Maintenance Requirements for Culverts		
Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then Annually
	Remove debris from the catchment surface before it may cause risks to performance	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of floor for blockage by sediment, silt or other matter - remove and replace surface infiltration medium as necessary	Annually
Remedial actions	Remove sediment from pre-treatment structures and/or pre-treatment	Annually or as required
	Repair/rehabilitate inlets, outlets, overflows and vents	As required
	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
Monitoring	Survey water of tank for sediment build-up and remove if necessary	Every 3 years or as required

Rev	Date	Comment
A	04.08.25	Layout Updated.
B	17.08.25	Maintenance and Management Schedule Updated.
C	05.09.25	Detention Basin Information Added.
D	03.03.26	Cutfill information added.

HITCHIN
BEDFORD ROAD

DRAINAGE STRATEGY

SCALE : 1:250

DATE : AUGUST 2025

DRAWN : ACG

CHECKED :

DRG.No. : AC_01_017

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Appendix B – MicroDrainage Calculations

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Manhole Schedules for Surface Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S17	58.652	2.452	Open Manhole	1350	1.000	56.200	300				
S18	58.040	1.940	Open Manhole	1200	1.001	56.100	300	1.000	56.100	300	
S2	57.854	1.904	Open Manhole	1200	1.002	55.950	300	1.001	55.950	300	
S3	57.712	1.862	Open Manhole	1200	1.003	55.850	300	1.002	55.850	300	
S12	57.816	0.516	Open Manhole	1350	2.000	57.300	150				
S9	58.139	1.539	Open Manhole	1350	2.001	56.600	225	2.000	56.675	150	
S10	57.075	1.575	Open Manhole	1350	2.002	55.500	300	2.001	55.575	225	
S11	57.116	2.066	Open Manhole	1350	1.004	55.050	450	1.003	55.200	300	
								2.002	55.200	300	
S16	56.250	1.350	Open Manhole	1350	1.005	54.900	450	1.004	54.900	450	
S6	56.250	1.430	Open Manhole	1350	1.006	54.820	450	1.005	54.820	450	
S7	56.250	1.440	Open Manhole	1350	1.007	54.810	450	1.006	54.810	450	
S14	56.250	1.500	Open Manhole	1350	1.008	54.750	450	1.007	54.750	450	
S21	56.387	1.737	Open Manhole	1350	1.009	54.650	450	1.008	54.650	450	
S13	56.139	1.439	Open Manhole	1350	3.000	54.700	300				
S8	56.360	1.760	Open Manhole	1500	1.010	54.600	300	1.009	54.600	450	
								3.000	54.650	300	
S20	55.773	1.303	Open Manhole	1350		OUTFALL		1.010	54.470	300	50

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S17	517894.917	230791.034	517894.917	230791.034	Required	
S18	517911.293	230794.425	517911.293	230794.425	Required	
S2	517945.146	230804.324	517945.146	230804.324	Required	
S3	517952.160	230820.518	517952.160	230820.518	Required	
S12	517880.569	230843.871	517880.569	230843.871	Required	
S9	517883.397	230830.112	517883.397	230830.112	Required	

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PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	S17	58.652	56.200	2.152	Open Manhole	1350
1.001	o	300	S18	58.040	56.100	1.640	Open Manhole	1200
1.002	o	300	S2	57.854	55.950	1.604	Open Manhole	1200
1.003	o	300	S3	57.712	55.850	1.562	Open Manhole	1200
2.000	o	150	S12	57.816	57.300	0.366	Open Manhole	1350
2.001	o	225	S9	58.139	56.600	1.314	Open Manhole	1350
2.002	o	300	S10	57.075	55.500	1.275	Open Manhole	1350
1.004	o	450	S11	57.116	55.050	1.616	Open Manhole	1350
1.005	o	450	S16	56.250	54.900	0.900	Open Manhole	1350
1.006	o	450	S6	56.250	54.820	0.980	Open Manhole	1350
1.007	o	450	S7	56.250	54.810	0.990	Open Manhole	1350
1.008	o	450	S14	56.250	54.750	1.050	Open Manhole	1350
1.009	o	450	S21	56.387	54.650	1.287	Open Manhole	1350
3.000	o	300	S13	56.139	54.700	1.139	Open Manhole	1350
1.010	o	300	S8	56.360	54.600	1.460	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	16.723	167.2	S18	58.040	56.100	1.640	Open Manhole	1200
1.001	35.271	235.1	S2	57.854	55.950	1.604	Open Manhole	1200
1.002	17.647	176.5	S3	57.712	55.850	1.562	Open Manhole	1200
1.003	26.030	40.0	S11	57.116	55.200	1.616	Open Manhole	1350
2.000	14.047	22.5	S9	58.139	56.675	1.314	Open Manhole	1350
2.001	32.841	32.0	S10	57.075	55.575	1.275	Open Manhole	1350
2.002	30.659	102.2	S11	57.116	55.200	1.616	Open Manhole	1350
1.004	45.214	301.4	S16	56.250	54.900	0.900	Open Manhole	1350
1.005	25.834#	322.9	S6	56.250	54.820	0.980	Open Manhole	1350
1.006	21.042#	2104.2	S7	56.250	54.810	0.990	Open Manhole	1350
1.007	8.514#	141.9	S14	56.250	54.750	1.050	Open Manhole	1350
1.008	28.298	283.0	S21	56.387	54.650	1.287	Open Manhole	1350
1.009	11.768	235.4	S8	56.360	54.600	1.310	Open Manhole	1500
3.000	11.278	225.6	S8	56.360	54.650	1.410	Open Manhole	1500
1.010	32.473	249.8	S20	55.773	54.470	1.003	Open Manhole	1350

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Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.010	S20	55.773	54.470	0.000	1350	0

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.442		

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Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S8, DS/PN: 1.010, Volume (m³): 5.5

Unit Reference	MD-SHE-0087-3800-1350-3800
Design Head (m)	1.350
Design Flow (l/s)	3.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	87
Invert Level (m)	54.600
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.350	3.8
Flush-Flo™	0.384	3.7
Kick-Flo®	0.781	2.9
Mean Flow over Head Range	-	3.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.7	1.200	3.6	3.000	5.5	7.000	8.2
0.200	3.4	1.400	3.9	3.500	5.9	7.500	8.5
0.300	3.6	1.600	4.1	4.000	6.3	8.000	8.7
0.400	3.7	1.800	4.3	4.500	6.7	8.500	9.0
0.500	3.6	2.000	4.6	5.000	7.0	9.000	9.2
0.600	3.5	2.200	4.8	5.500	7.3	9.500	9.5
0.800	3.0	2.400	5.0	6.000	7.6		
1.000	3.3	2.600	5.1	6.500	7.9		

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<u>Offline Controls for Surface Network 1</u> <u>Weir Manhole: S6, DS/PN: 1.006, Loop to PN: 1.007</u> Discharge Coef 0.544 Width (m) 10.000 Invert Level (m) 54.820		
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Storage Structures for Surface Network 1

Tank or Pond Manhole: S7, DS/PN: 1.007

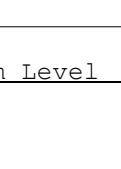
Invert Level (m) 54.820

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	387.4	0.401	410.5	0.801	434.5	1.201	459.3
0.101	393.1	0.501	416.4	0.901	440.6	1.301	465.7
0.201	398.9	0.601	422.4	1.001	446.8	1.401	472.1
0.301	404.7	0.701	428.4	1.101	453.0	1.430	473.9

Cellular Storage Manhole: S8, DS/PN: 1.010

Invert Level (m) 54.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.97
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	25.6	0.0	1.051	0.0	0.0
1.050	25.6	0.0			

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

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

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

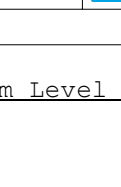
PN	US/MH		Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
	Name	Storm							
1.000	S17	15 Winter	1	+0%	100/15 Summer				56.261
1.001	S18	15 Winter	1	+0%	100/15 Summer				56.199
1.002	S2	15 Winter	1	+0%	100/15 Summer				56.070
1.003	S3	15 Winter	1	+0%	100/15 Summer				55.945
2.000	S12	15 Winter	1	+0%					57.333
2.001	S9	15 Winter	1	+0%	100/15 Winter				56.654
2.002	S10	15 Winter	1	+0%	100/15 Summer				55.593
1.004	S11	15 Winter	1	+0%	30/15 Summer				55.244
1.005	S16	15 Winter	1	+0%	30/15 Summer				55.136
1.006	S6	240 Winter	1	+0%	30/120 Winter		1/15 Summer	54	55.007
1.007	S7	240 Winter	1	+0%	30/120 Winter				55.006
1.008	S14	240 Winter	1	+0%	30/60 Summer				55.007
1.009	S21	240 Winter	1	+0%	30/30 Summer				55.005
3.000	S13	240 Winter	1	+0%	1/240 Winter				55.004
1.010	S8	240 Winter	1	+0%	1/15 Summer				55.004

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

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow (l/s)		
1.000	S17	-0.239	0.000	0.09			6.5		OK	
1.001	S18	-0.201	0.000	0.23			15.5		OK	
1.002	S2	-0.180	0.000	0.33			24.0		OK	
1.003	S3	-0.205	0.000	0.22			34.5		OK	
2.000	S12	-0.117	0.000	0.11			3.7		OK	
2.001	S9	-0.171	0.000	0.13			11.4		OK	
2.002	S10	-0.207	0.000	0.21			20.9		OK	
1.004	S11	-0.256	0.000	0.38			63.4		OK	
1.005	S16	-0.214	0.000	0.53			80.6		OK	
1.006	S6	-0.263	0.000	0.07	16.5		3.8		OK	
1.007	S7	-0.254	0.000	0.04			6.1		OK	
1.008	S14	-0.193	0.000	0.04			7.1		OK	
1.009	S21	-0.095	0.000	0.04			6.1		OK	
3.000	S13	0.004	0.000	0.04			2.4		SURCHARGED	
1.010	S8	0.104	0.000	0.06			3.7		SURCHARGED	

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Date 02/08/2025 18:38 File Option 3A.mdx		
Designed by Alan Checked by		
Innovyze Network 2020.1.3		

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

for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

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

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

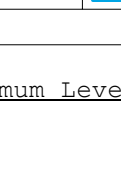
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S17	15 Winter	30	+0%	100/15 Summer				56.311
1.001	S18	15 Winter	30	+0%	100/15 Summer				56.280
1.002	S2	15 Winter	30	+0%	100/15 Summer				56.186
1.003	S3	15 Winter	30	+0%	100/15 Summer				56.026
2.000	S12	15 Winter	30	+0%					57.352
2.001	S9	15 Winter	30	+0%	100/15 Winter				56.696
2.002	S10	15 Winter	30	+0%	100/15 Summer				55.705
1.004	S11	15 Winter	30	+0%	30/15 Summer				55.607
1.005	S16	15 Winter	30	+0%	30/15 Summer				55.437
1.006	S6	360 Winter	30	+0%	30/120 Winter		1/15 Summer	54	55.368
1.007	S7	360 Winter	30	+0%	30/120 Winter				55.367
1.008	S14	360 Winter	30	+0%	30/60 Summer				55.369
1.009	S21	360 Winter	30	+0%	30/30 Summer				55.366
3.000	S13	360 Winter	30	+0%	1/240 Winter				55.366
1.010	S8	360 Winter	30	+0%	1/15 Summer				55.366

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Innovyze	Network 2020.1.3	

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

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow (l/s)		
1.000	S17	-0.189	0.000	0.22			15.9		OK	
1.001	S18	-0.120	0.000	0.64			42.8		OK	
1.002	S2	-0.064	0.000	0.96			68.8		OK	
1.003	S3	-0.124	0.000	0.63			99.1		OK	
2.000	S12	-0.098	0.000	0.26			9.0		OK	
2.001	S9	-0.129	0.000	0.38			32.9		OK	
2.002	S10	-0.095	0.000	0.61			61.4		OK	
1.004	S11	0.107	0.000	1.05			175.7		SURCHARGED	
1.005	S16	0.087	0.000	1.49			224.4		SURCHARGED	
1.006	S6	0.098	0.000	0.21	20.0		11.4		SURCHARGED	
1.007	S7	0.107	0.000	0.04			6.3		SURCHARGED	
1.008	S14	0.169	0.000	0.03			5.7		SURCHARGED	
1.009	S21	0.266	0.000	0.03			5.1		SURCHARGED	
3.000	S13	0.366	0.000	0.07			4.0		SURCHARGED	
1.010	S8	0.466	0.000	0.06			3.7		SURCHARGED	

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Designed by Alan Checked by		
Innovyze		Network 2020.1.3

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

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

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

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
	Name	Storm							
1.000	S17	15 Winter	100	+40%	100/15 Summer				57.226
1.001	S18	15 Winter	100	+40%	100/15 Summer				57.202
1.002	S2	15 Winter	100	+40%	100/15 Summer				57.055
1.003	S3	15 Winter	100	+40%	100/15 Summer				56.842
2.000	S12	15 Winter	100	+40%					57.373
2.001	S9	15 Winter	100	+40%	100/15 Winter				56.885
2.002	S10	15 Winter	100	+40%	100/15 Summer				56.512
1.004	S11	15 Winter	100	+40%	30/15 Summer				56.233
1.005	S16	480 Winter	100	+40%	30/15 Summer				55.948
1.006	S6	480 Winter	100	+40%	30/120 Winter		1/15 Summer	54	55.947
1.007	S7	480 Winter	100	+40%	30/120 Winter				55.946
1.008	S14	480 Winter	100	+40%	30/60 Summer				55.953
1.009	S21	480 Winter	100	+40%	30/30 Summer				55.958
3.000	S13	480 Winter	100	+40%	1/240 Winter				55.958
1.010	S8	480 Winter	100	+40%	1/15 Summer				55.957

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Innovyze	Network 2020.1.3	

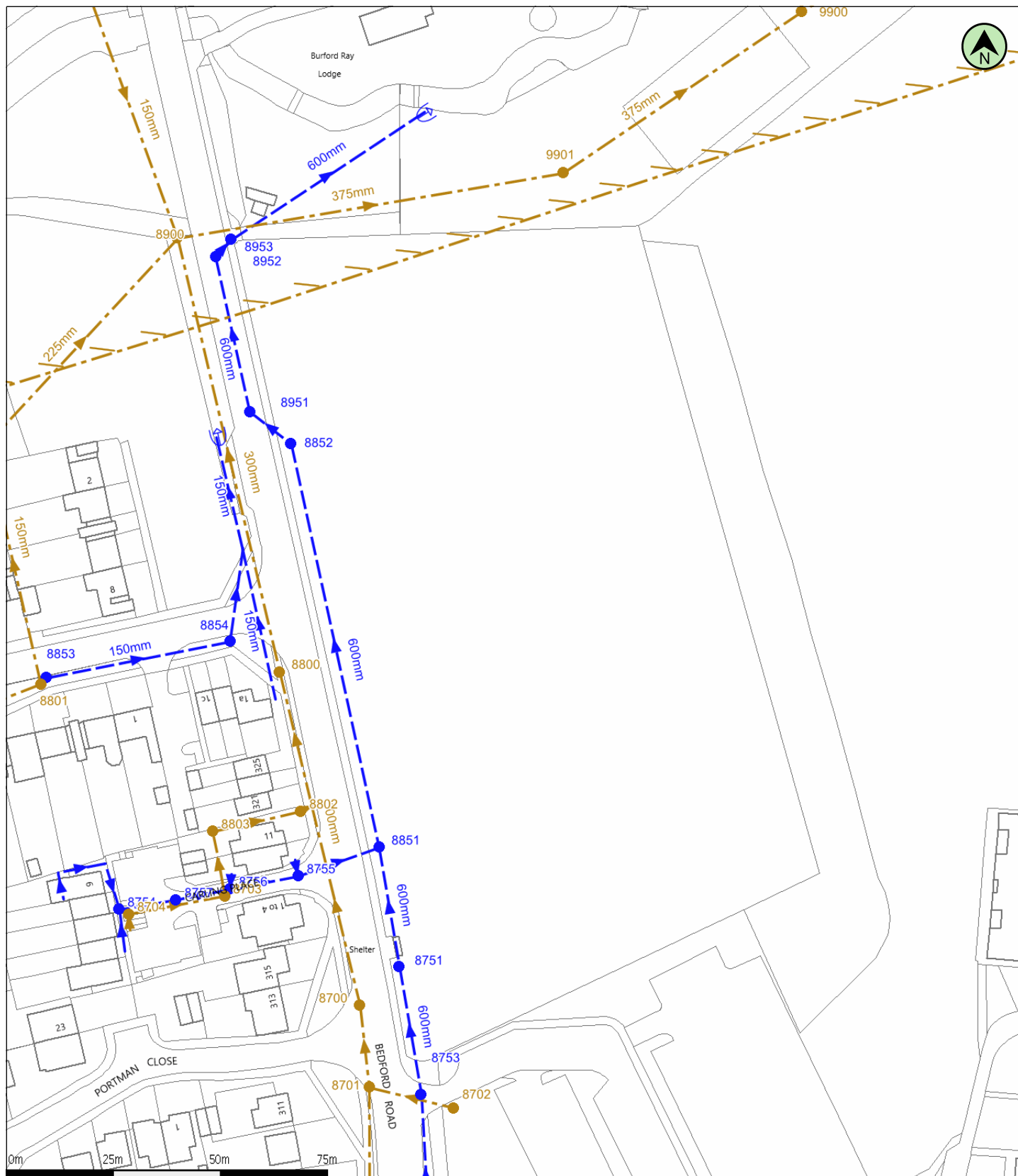
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow (l/s)		
1.000	S17	0.726	0.000	0.39			28.8		SURCHARGED	
1.001	S18	0.802	0.000	0.99			65.8		SURCHARGED	
1.002	S2	0.805	0.000	1.46			104.2		SURCHARGED	
1.003	S3	0.692	0.000	0.95			150.4		SURCHARGED	
2.000	S12	-0.077	0.000	0.48			16.4		OK	
2.001	S9	0.060	0.000	0.65			56.7		SURCHARGED	
2.002	S10	0.712	0.000	0.97			97.5		SURCHARGED	
1.004	S11	0.733	0.000	1.72			287.8		SURCHARGED	
1.005	S16	0.598	0.000	0.29			43.2		SURCHARGED	
1.006	S6	0.677	0.000	0.24	31.3		12.8		SURCHARGED	
1.007	S7	0.686	0.000	0.05			8.3		SURCHARGED	
1.008	S14	0.753	0.000	0.04			5.9		FLOOD RISK	
1.009	S21	0.858	0.000	0.03			5.3		SURCHARGED	
3.000	S13	0.958	0.000	0.10			5.7		FLOOD RISK	
1.010	S8	1.057	0.000	0.06			3.8		SURCHARGED	

Appendix C – Greenfield Run-off Calculations

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19 Liverpool Road St Albans AL1 3UN		
Date 14/05/2026 11:28 File	Designed by Alan Checked by	
Innovyze		Source Control 2020.1.3
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.400 Area (ha) 1.750 Urban 0.000 SAAR (mm) 567 Region Number Region 6 Results l/s QBAR Rural 4.7 QBAR Urban 4.7 Q100 years 14.8 Q1 year 4.0 Q30 years 10.5 Q100 years 14.8		
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Appendix D – Anglian Water Asset Plan



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Data updated: 30/06/21

Scale: 1:1250

Map Centre: 517912,230862

Date: 09/08/21

Our Ref: 618559 - 1

Wastewater Plan A4

Powered by digdat

Foul Sewer	--- Outfall*	⊕ Sewage Treatment Works
Surface Sewer	--- Inlet*	⊕ Public Pumping Station
Combined Sewer	--- Manhole*	● Decommissioned Pumping Station
Final Effluent		
Rising Main*		
Private Sewer*		
Decommissioned Sewer*		

*(Colour denotes effluent type)

utilitisitesearch@outlook.com

hitchin



This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2021 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Appendix E – Anglian Water Pre-app



Pre-Planning Assessment Report

Bedford Road, Hitchin, SG5 2UR

InFlow Reference: PPE-0129906

Assessment Type: Used Water

Report published: 10/09/2021



Thank you for submitting a pre-planning enquiry.

This has been produced for Delta-Simons.

Your reference number is **PPE-0129906**.

This report can be submitted as a drainage strategy for the development should it seek planning permission.

If you have any questions upon receipt of this report, you can submit a further question via InFlow. Alternatively, please contact the Planning & Capacity team on **07929 786 955** or email planningliaison@anglianwater.co.uk

Section 1 - Proposed development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	No. Of units
Dwellings	40

The anticipated residential build rate is:

Year	Y1
Build rate	40

Development type: Greenfield
Planning application status: Unknown
Site grid reference number: TL1791430849

The comments contained within this report relate to the public water mains and sewers indicated on our records.

Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 - Assets affected

Our records indicate that we have the following types of assets within or overlapping the boundary of your development site as listed in the table below.

Additionally, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence. We are unable to permit development either over or within the easement strip without our prior consent. The extent of the easement is provided in the table below. Please be aware that the existing water mains/public sewers should be located in highway or open space and not in private gardens. This is to ensure available access for any future maintenance and repair and this should be taken into consideration when planning your site layout.

Water and Used water easement information		
Asset type	Pipe size (mm)	Total easement required (m)
Sewer mains	600	3.50 m either side of the centre line
Sewer mains	600	3.50 m either side of the centre line
Sewer mains	600	3.50 m either side of the centre line
Sewer mains	600	3.50 m either side of the centre line
Sewer mains	375	3.00 m either side of the centre line
Sewer mains	600	3.50 m either side of the centre line
Sewer mains	600	3.50 m either side of the centre line
Sewer mains	Unknown	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line

If it is not possible to avoid our assets then these may need to be diverted in accordance with Section 185 of the Water Industry Act (1991). You will need to make a formal application if you would like a diversion to be considered.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 - Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and effluent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Hitchin Water Recycling Centre, which currently has capacity to treat the flows from your development site. Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental and regulation driven changes.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. The nearest practicable connection is to the 375mm diameter sewer at manhole 8900 in A600 at National Grid Reference NGR TL1783330944. The cover level is 55.76 and the invert level is 53.16. Anglian Water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

In principle, your proposed method of surface water disposal is acceptable to Anglian Water. It is our understanding that the evidence to confirm compliance with the surface water hierarchy is not available. Once the evidence has been confirmed, then a connection point may be made to manhole 8952 in A600 at NGR TL1784230940 at a maximum rate of 3.82l/s. The cover level is 55.7 and the invert level is 54.5. Our assessment has been based on development flows connecting to the nearest surface water sewer of the same size or greater pipe diameter. The 3.82l/s is the maximum rate permitted as we had discussed on the telephone, we note your email providing your FRA and our surface water engineer has made the following comments; • Firstly, Anglian Water's surface water drainage policy states all flows for all return periods up to the 1:100 plus cc should be limited to the 1:1 which is the 3.82l/s rate provided above. This therefore should be the basis of your design criteria • Half drain times are required to be shown for infiltration features proposed and should be able to half drain in 24hrs for up to the 30yr return period. Failure to drain sufficiently means you will be required to provide more storage on site. It is your responsibility to provide the evidence to confirm that all alternative methods of surface water disposal have been explored and these will be required before your connection can be agreed. This is subject to satisfactory evidence which shows the surface water management hierarchy as outlined in Building Regulations Part H has been explored. This would encompass the results from the site specific infiltration testing and/or confirmation that the flows cannot be discharged to a watercourse. Anglian Water's surface water policy follows the Surface Water hierarchy, outlined in Part H of the Building Regulations. Should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required. You are therefore advised to update Anglian Water with the key supporting evidence at your earliest convenience.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our [website](#). We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating that the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our [website](#)

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

Your development site will be required to pay an infrastructure charge for each new property connecting to the public sewer that benefits from Full planning permission.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

Payment of the infrastructure charge must be made before premises are connected to the public sewer.

Infrastructure charge for water recycling:	£ 573.00
--	-----------------

The Water Recycling Infrastructure charge for your dwellings is:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our [website](#) or via our Development Services team on **0345 60 66 087**.

Sustainable drainage systems

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. .

Our preferred method of surface water disposal is through the use of Sustainable Drainage Systems or SuDS.

SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our [website](#)

We recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for your site to discuss your application.

Private sewer transfers

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

Surface water sewers and lateral drains that do not discharge to the public sewer, e.g. those that discharged to a watercourse.

Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.

Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

It is anticipated that all new sewer applications will need to have an approved Section104 application ahead of a Section 106 connection

Encroachment

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our [website](#)

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from [digdat](#)

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our [website](#)

Charging arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our [website](#)

Section 6 - Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

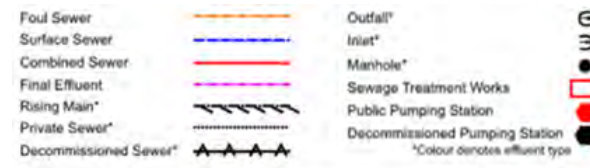
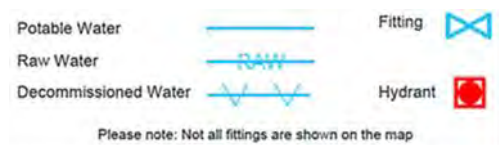
Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content. Furthermore, in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid for the date printed and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s).

Inflow ref: PPE-0129906

Used Water Connection Point: at manhole 8900 located in A600



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Inflow ref: PPE-0129906

Surface Water Connection Point: to manhole 8952 located in A600



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Appendix F – Soilscape Map



Legend



Only layers selected and visible at this map scale will be shown

Magic

Landscape

Geology and Soils

Soilscape (England)

- 1 - Saltmarsh soils
- 2 - Shallow very acid peaty soils over rock
- 3 - Shallow lime-rich soils over chalk or limestone
- 4 - Sand dune soils
- 5 - Freely draining lime-rich loamy soils
- 6 - Freely draining slightly acid loamy soils
- 7 - Freely draining slightly acid but base-rich soils
- 8 - Slightly acid loamy and clayey soils with impeded drainage
- 9 - Lime-rich loamy and clayey soils with impeded drainage
- 10 - Freely draining slightly acid sandy soils
- 11 - Freely draining sandy breckland soils
- 12 - Freely draining floodplain soils
- 13 - Freely draining acid loamy soils over rock
- 14 - Freely draining very acid sandy and loamy soils
- 15 - Naturally wet very acid sandy and loamy soils
- 16 - Very acid loamy upland soils with a wet peaty surface
- 17 - Slowly permeable seasonally wet acid loamy and clayey soils
- 18 - Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
- 19 - Slowly permeable wet very acid upland soils with a peaty surface
- 20 - Loamy and clayey floodplain soils with naturally high groundwater
- 21 - Loamy and clayey soils of coastal flats with naturally high groundwater
- 22 - Loamy soils with naturally high groundwater
- 23 - Loamy and sandy soils with naturally high groundwater and a peaty surface
- 24 - Restored soils mostly from quarry and opencast spoil
- 25 - Blanket bog peat soils
- 26 - Raised bog peat soils
- 27 - Fen peat soils
- 28 - Sea
- 30 - UC
- 31 - Water

