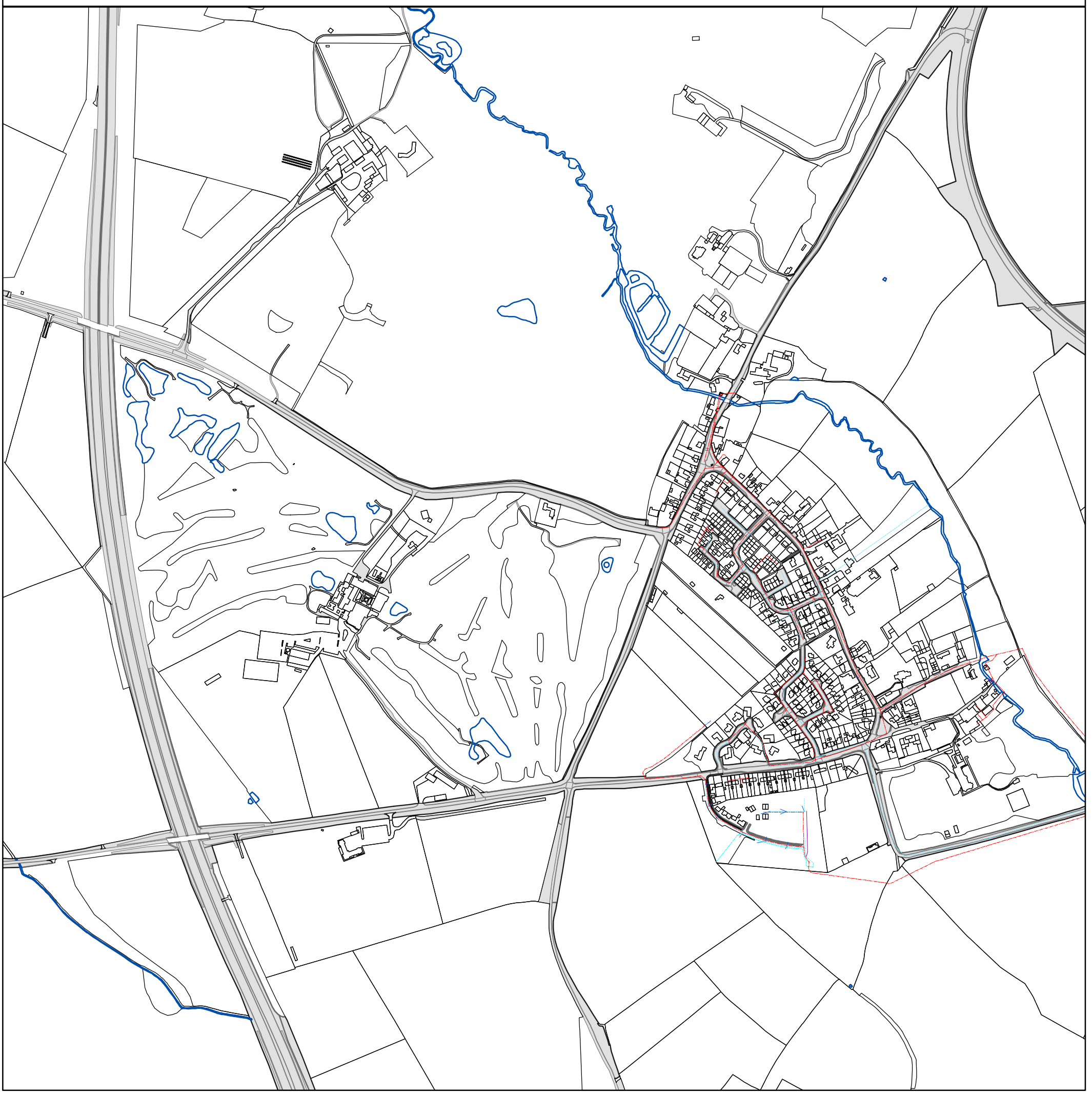
Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2019_3986151



0 45 90 180 270 360
Meters

Scale:	1:7158
Width:	2000m
Printed By:	SAsirvat
Print Date:	15/04/2019
Map Centre:	455522,221600
Grid Reference:	SP5521NE

Comments:

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

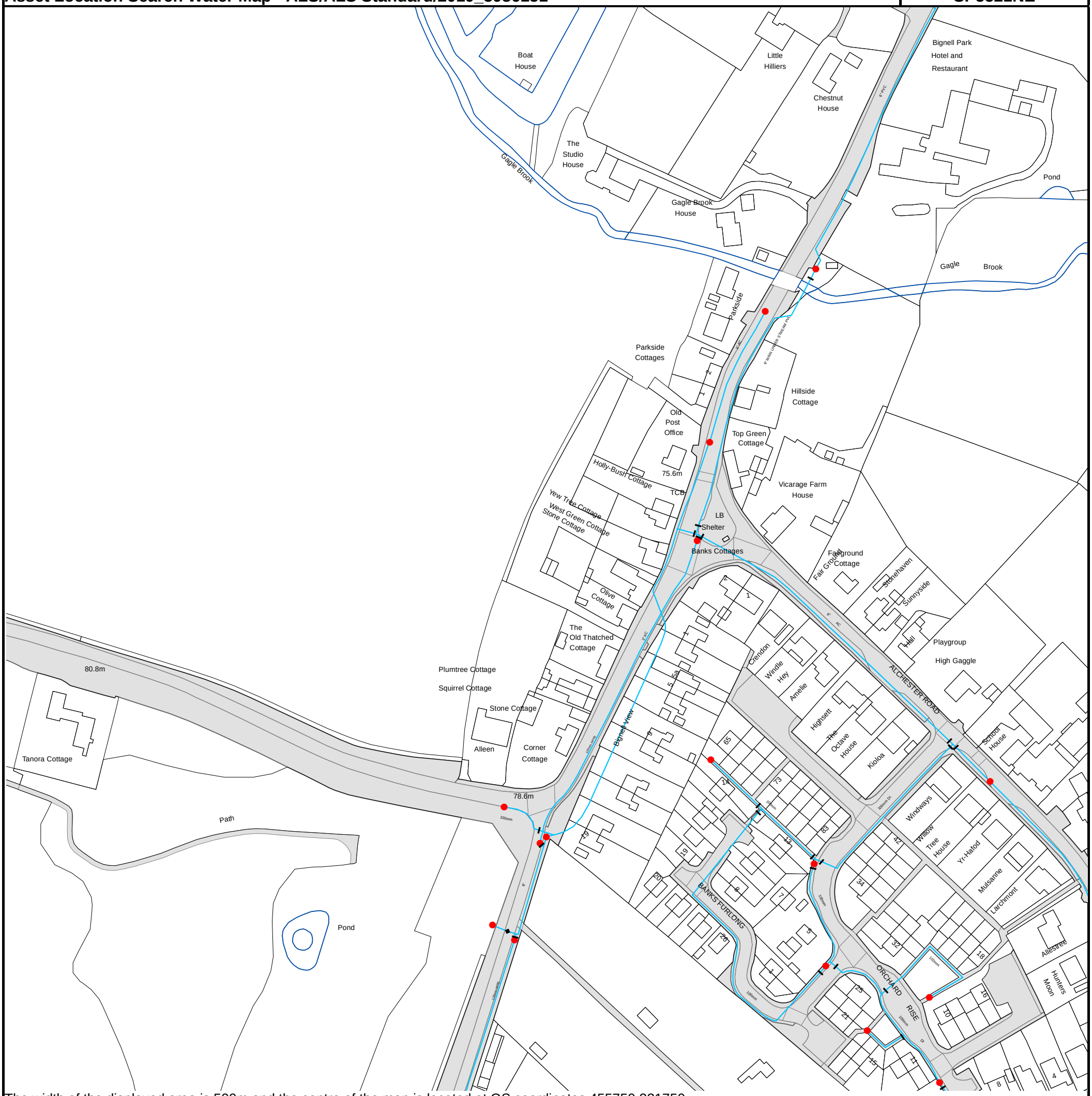
Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2019_3986151

SP5521NE

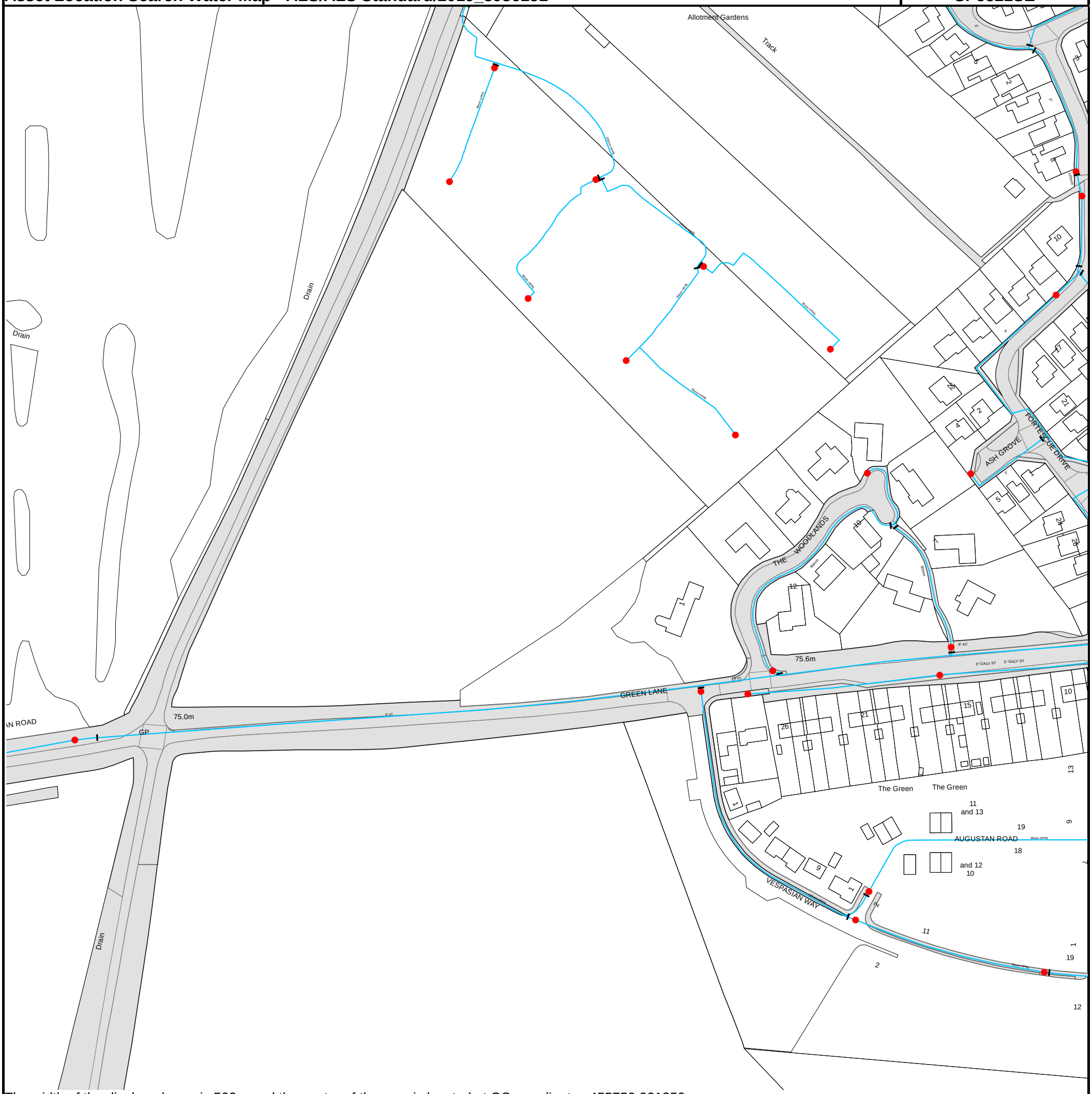


The width of the displayed area is 500m and the centre of the map is located at OS coordinates 455750,221750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Asset Location Search Water Map - ALS/ALS Standard/2019_3986151

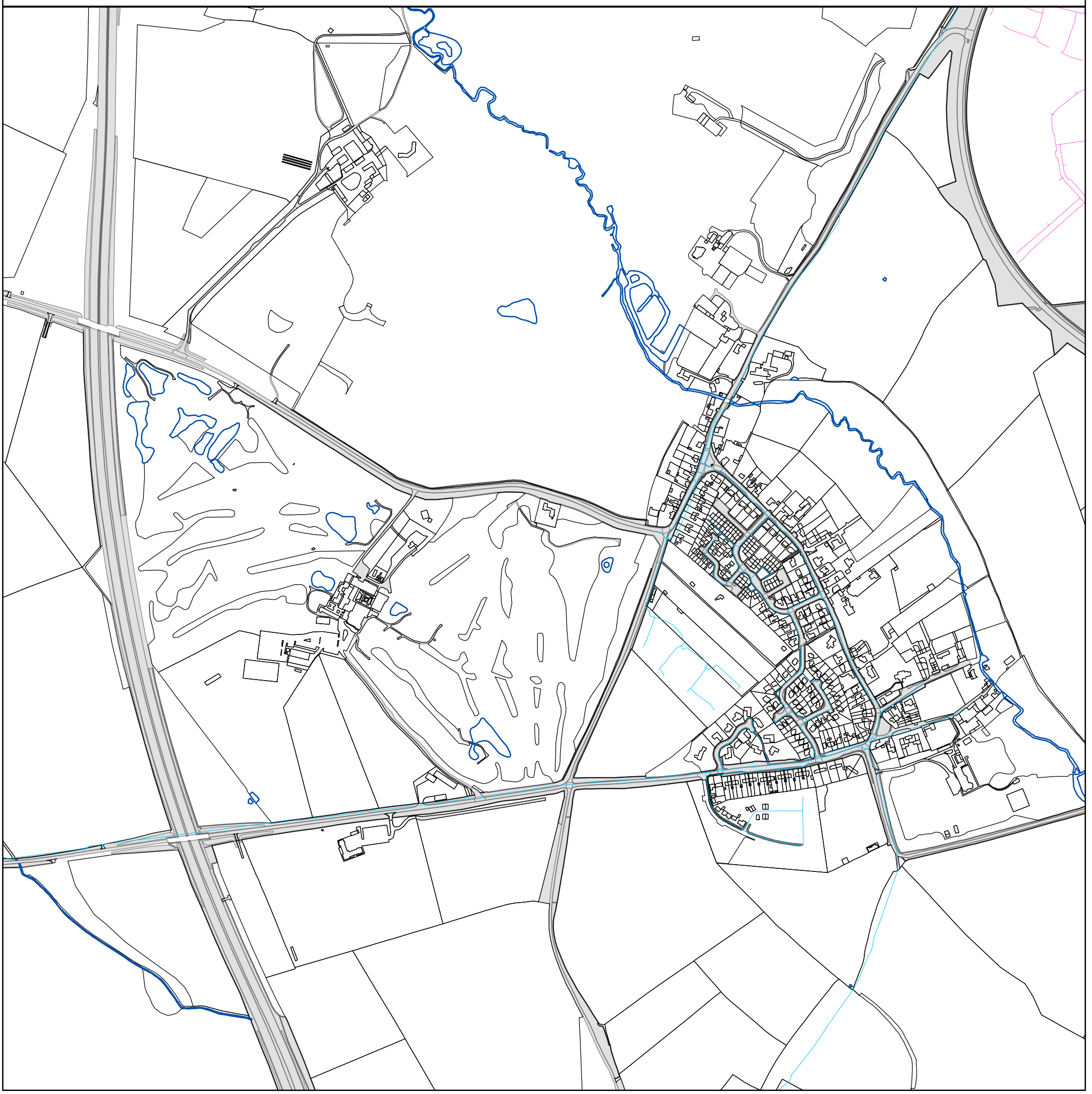
SP5521SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 455750,221250

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2019_3986151



0 45 90 180 270 360
Meters

Scale:	1:7158
Width:	2000m
Printed By:	SAsirvat
Print Date:	15/04/2019
Map Centre:	455522,221600
Grid Reference:	SP5521NE

Comments:

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if the Ombudsman finds that you have suffered actual loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Web site: www.tpos.co.uk
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Appendix D – Surface Water MicroDrainage Results

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.70
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	51.850	0.346	149.9	0.182	4.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	18.713	0.125	150.0	0.262	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.002	37.389	0.249	150.0	0.139	0.00	0.0	0.600	o	450	Pipe/Conduit	
S2.000	27.734	0.185	150.0	0.183	4.00	0.0	0.600	o	450	Pipe/Conduit	
S2.001	16.489	0.110	150.0	0.021	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.003	29.486	0.197	150.0	0.029	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.004	85.930	0.158	543.9	0.172	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	10.784	0.025	431.4	0.102	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.006	40.931	0.084	487.3	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.007	40.728	0.327	124.4	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S3.000	18.510	0.093	199.0	0.091	4.00	0.0	0.600	o	300	Pipe/Conduit	
S3.001	25.698	0.128	200.8	0.371	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.008	90.845	0.214	424.5	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.67	81.800	0.182	0.0	0.0	0.0	1.28	90.6	24.7
S1.001	50.00	4.86	81.304	0.445	0.0	0.0	0.0	1.66	263.6	60.2
S1.002	50.00	5.24	81.179	0.584	0.0	0.0	0.0	1.66	263.6	79.0
S2.000	50.00	4.28	81.500	0.183	0.0	0.0	0.0	1.66	263.6	24.8
S2.001	50.00	4.44	81.315	0.204	0.0	0.0	0.0	1.66	263.6	27.7
S1.003	50.00	5.53	80.930	0.817	0.0	0.0	0.0	1.66	263.6	110.6
S1.004	50.00	7.19	80.733	0.989	0.0	0.0	0.0	0.86	137.5	133.9
S1.005	50.00	7.38	80.575	1.092	0.0	0.0	0.0	0.97	154.7	147.8
S1.006	50.00	8.05	80.475	1.092	0.0	0.0	0.0	1.01	218.2	147.8
S1.007	50.00	8.39	80.391	1.092	0.0	0.0	0.0	2.01	434.5	147.8
S3.000	50.00	4.28	81.400	0.091	0.0	0.0	0.0	1.11	78.5	12.4
S3.001	50.00	4.55	81.082	0.463	0.0	0.0	0.0	1.58	341.4	62.7
S1.008	50.00	9.79	80.064	1.554	0.0	0.0	0.0	1.08	234.0	210.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.009	18.244	0.212	86.1	0.074	0.00	0.0	0.600	o	525	Pipe/Conduit	
S4.000	17.546	0.088	199.4	0.094	4.00	0.0	0.600	o	300	Pipe/Conduit	
S4.001	29.597	0.148	200.0	0.334	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.010	40.263	0.071	567.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.011	43.225	0.086	502.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.012	11.877	0.021	565.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.013	88.680	0.222	399.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S5.000	43.138	0.069	625.2	0.108	4.00	0.0	0.600	o	500	Pipe/Conduit	
S6.000	11.170	0.094	118.8	0.000	4.00	0.0	0.600	o	450	Pipe/Conduit	
S5.001	17.050	0.067	254.5	0.286	0.00	0.0	0.600	o	500	Pipe/Conduit	
S5.002	56.548	0.268	211.0	0.347	0.00	0.0	0.600	o	500	Pipe/Conduit	
S5.003	119.208	0.478	249.4	0.190	0.00	0.0	0.600	o	500	Pipe/Conduit	
S7.000	41.099	0.113	363.7	0.131	4.00	0.0	0.600	o	750	Pipe/Conduit	
S8.000	13.815	0.152	90.9	0.171	4.00	0.0	0.600	o	350	Pipe/Conduit	
S8.001	53.708	0.134	400.8	0.230	0.00	0.0	0.600	o	350	Pipe/Conduit	
S1.014	28.594	0.191	150.0	0.524	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.015	76.982	0.192	400.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S9.000	15.276	0.034	449.3	0.000	4.00	0.0	0.600	o	375	Pipe/Conduit	
S9.001	57.051	0.905	63.0	0.650	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.009	50.00	9.92	79.850	1.629	0.0	0.0	0.0	2.42	522.9	220.6
S4.000	50.00	4.26	81.400	0.094	0.0	0.0	0.0	1.11	78.4	12.8
S4.001	50.00	4.61	81.162	0.428	0.0	0.0	0.0	1.43	228.1	58.0
S1.010	50.00	10.58	79.563	2.057	0.0	0.0	0.0	1.02	287.1	278.5
S1.011	50.00	11.25	79.492	2.057	0.0	0.0	0.0	1.08	305.2	278.5
S1.012	50.00	11.44	79.406	2.057	0.0	0.0	0.0	1.02	287.5	278.5
S1.013	50.00	12.66	79.385	2.057	0.0	0.0	0.0	1.21	342.7	278.5
S5.000	50.00	4.83	80.771	0.108	0.0	0.0	0.0	0.86	169.1	14.7
S6.000	50.00	4.10	81.500	0.000	0.0	0.0	0.0	1.86	296.5	0.0
S5.001	50.00	5.04	80.702	0.395	0.0	0.0	0.0	1.36	266.5	53.4
S5.002	50.00	5.68	80.635	0.742	0.0	0.0	0.0	1.49	292.9	100.4
S5.003	50.00	7.12	80.317	0.932	0.0	0.0	0.0	1.37	269.2	126.2
S7.000	50.00	4.47	80.300	0.131	0.0	0.0	0.0	1.46	645.7	17.7
S8.000	50.00	4.13	80.600	0.171	0.0	0.0	0.0	1.82	175.1	23.2
S8.001	50.00	5.17	80.448	0.402	0.0	0.0	0.0	0.86	82.8	54.4
S1.014	50.00	12.87	79.013	4.045	0.0	0.0	0.0	2.28	1008.5	547.8
S1.015	50.00	13.79	78.822	4.045	0.0	0.0	0.0	1.39	615.4	547.8
S9.000	50.00	4.30	81.149	0.000	0.0	0.0	0.0	0.85	93.7	0.0
S9.001	50.00	4.72	81.115	0.650	0.0	0.0	0.0	2.29	252.4	88.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S10.000	12.952	0.022	588.7	0.000	4.00	0.0	0.600	o	100	Pipe/Conduit	
S10.001	9.455	0.232	40.8	0.322	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.002	16.772	0.496	33.8	0.123	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	11.319	0.039	290.2	0.000	4.00	0.0	0.600	o	100	Pipe/Conduit	
S11.001	15.510	0.039	397.7	0.435	0.00	0.0	0.600	o	450	Pipe/Conduit	
S9.003	50.328	0.149	337.8	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S12.000	27.093	0.119	227.7	0.000	4.00	0.0	0.600	o	100	Pipe/Conduit	
S12.001	25.584	0.078	328.0	0.155	0.00	0.0	0.600	o	350	Pipe/Conduit	
S9.004	55.057	0.110	500.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S13.000	18.331	0.167	109.8	0.000	4.00	0.0	0.600	o	100	Pipe/Conduit	
S13.001	15.785	0.029	544.3	0.556	0.00	0.0	0.600	o	375	Pipe/Conduit	
S9.005	44.176	0.457	96.7	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S14.000	19.864	0.265	75.0	0.000	4.00	0.0	0.600	o	100	Pipe/Conduit	
S14.001	18.644	0.162	115.1	0.507	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.006	18.723	0.056	334.3	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S15.000	59.093	0.405	145.9	0.000	4.00	0.0	0.600	o	675	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S10.000	50.00	4.70	80.739	0.000	0.0	0.0	0.0	0.31	2.4	0.0
S10.001	50.00	4.77	80.592	0.322	0.0	0.0	0.0	2.06	81.7	43.7
S9.002	50.00	4.86	80.210	1.095	0.0	0.0	0.0	3.13	345.2	148.3
S11.000	50.00	4.42	80.067	0.000	0.0	0.0	0.0	0.45	3.5	0.0
S11.001	50.00	4.68	79.678	0.435	0.0	0.0	0.0	1.01	161.2	58.8
S9.003	50.00	5.55	79.564	1.530	0.0	0.0	0.0	1.21	262.6	207.1
S12.000	50.00	4.89	80.112	0.000	0.0	0.0	0.0	0.51	4.0	0.0
S12.001	50.00	5.34	79.743	0.155	0.0	0.0	0.0	0.95	91.6	20.9
S9.004	50.00	6.40	79.340	1.684	0.0	0.0	0.0	1.08	305.8	228.1
S13.000	50.00	4.42	80.239	0.000	0.0	0.0	0.0	0.73	5.8	0.0
S13.001	50.00	4.76	79.797	0.556	0.0	0.0	0.0	0.77	85.0	75.2
S9.005	50.00	6.70	79.230	2.240	0.0	0.0	0.0	2.48	700.4	303.3
S14.000	50.00	4.37	79.700	0.000	0.0	0.0	0.0	0.89	7.0	0.0
S14.001	50.00	4.58	79.235	0.507	0.0	0.0	0.0	1.46	103.5	68.7
S9.006	50.00	6.93	78.773	2.747	0.0	0.0	0.0	1.33	375.0	372.0
S15.000	50.00	4.45	79.000	0.000	0.0	0.0	0.0	2.17	775.7	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.016	91.803	0.141	651.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.017	24.873	0.050	497.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.018	93.931	0.188	499.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.016	50.00	16.30	78.595	6.792	0.0	0.0	0.0	0.61	43.0«	919.8
S1.017	50.00	16.90	78.454	6.792	0.0	0.0	0.0	0.70	49.4«	919.8
S1.018	50.00	19.14	78.450	6.792	0.0	0.0	0.0	0.70	49.2«	919.8

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	82.700	0.900	Open Manhole	1200	S1.000	81.800	300				
S2	82.700	1.396	Open Manhole	1350	S1.001	81.304	450	S1.000	81.454	300	
S3	82.700	1.521	Open Manhole	1350	S1.002	81.179	450	S1.001	81.179	450	
S4	82.700	1.200	Open Manhole	1350	S2.000	81.500	450				
S5	82.700	1.385	Open Manhole	1350	S2.001	81.315	450	S2.000	81.315	450	
S6	82.700	1.770	Open Manhole	1350	S1.003	80.930	450	S1.002	80.930	450	
								S2.001	81.205	450	275
S7	83.000	2.267	Open Manhole	1350	S1.004	80.733	450	S1.003	80.733	450	
S8	83.000	2.425	Open Manhole	1350	S1.005	80.575	450	S1.004	80.575	450	
S9	82.700	2.225	Open Manhole	1500	S1.006	80.475	525	S1.005	80.550	450	
S10	82.700	2.309	Open Manhole	1500	S1.007	80.391	525	S1.006	80.391	525	
S11	82.600	1.200	Open Manhole	1200	S3.000	81.400	300				
S12	82.600	1.518	Open Manhole	1500	S3.001	81.082	525	S3.000	81.307	300	
S13	82.700	2.636	Open Manhole	1500	S1.008	80.064	525	S1.007	80.064	525	
								S3.001	80.954	525	890
S14	82.600	2.750	Open Manhole	1500	S1.009	79.850	525	S1.008	79.850	525	
S15	82.600	1.200	Open Manhole	1200	S4.000	81.400	300				
S16	82.600	1.438	Open Manhole	1350	S4.001	81.162	450	S4.000	81.312	300	
S17	82.250	2.687	Open Manhole	1500	S1.010	79.563	600	S1.009	79.638	525	
								S4.001	81.014	450	1301
S18	81.550	2.058	Open Manhole	1500	S1.011	79.492	600	S1.010	79.492	600	
S19	81.700	2.294	Open Manhole	1500	S1.012	79.406	600	S1.011	79.406	600	
S20	81.600	2.215	Open Manhole	1500	S1.013	79.385	600	S1.012	79.385	600	
S21	82.700	1.929	Open Manhole	1500	S5.000	80.771	500				
S22	82.700	1.200	Open Manhole	1350	S6.000	81.500	450				
S23	82.700	1.998	Open Manhole	1500	S5.001	80.702	500	S5.000	80.702	500	
								S6.000	81.406	450	654
S24	82.700	2.065	Open Manhole	1500	S5.002	80.635	500	S5.001	80.635	500	
S25	82.300	1.983	Open Manhole	1500	S5.003	80.317	500	S5.002	80.367	500	50
S26	82.700	2.400	Open Manhole	1800	S7.000	80.300	750				
S27	82.700	2.100	Open Manhole	1200	S8.000	80.600	350				
S28	82.700	2.252	Open Manhole	1200	S8.001	80.448	350	S8.000	80.448	350	
S29	82.100	3.087	Open Manhole	1800	S1.014	79.013	750	S1.013	79.163	600	
								S5.003	79.839	500	576
								S7.000	80.187	750	1174
								S8.001	80.314	350	901
S30	82.000	3.178	Open Manhole	1800	S1.015	78.822	750	S1.014	78.822	750	
S31	83.000	1.851	Open Manhole	1350	S9.000	81.149	375				
S31a	83.000	1.885	Open Manhole	1350	S9.001	81.115	375	S9.000	81.115	375	
S32	82.500	1.761	Open Manhole	1200	S10.000	80.739	100				
S32a	82.500	1.908	Open Manhole	1200	S10.001	80.592	225	S10.000	80.717	100	
S33	82.500	2.290	Open Manhole	1350	S9.002	80.210	375	S9.001	80.210	375	
								S10.001	80.360	225	
S34	81.500	1.433	Open Manhole	1200	S11.000	80.067	100				
S34a	81.500	1.822	Open Manhole	1350	S11.001	79.678	450	S11.000	80.028	100	
S35	81.500	1.936	Open Manhole	1500	S9.003	79.564	525	S9.002	79.714	375	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								S11.001	79.639	450	
S36	81.500	1.388	Open Manhole	1200	S12.000	80.112	100				
S36a	81.500	1.757	Open Manhole	1200	S12.001	79.743	350	S12.000	79.993	100	
S37	81.500	2.160	Open Manhole	1500	S9.004	79.340	600	S9.003	79.415	525	
								S12.001	79.665	350	75
S38	81.500	1.261	Open Manhole	1200	S13.000	80.239	100				
S39	81.500	1.703	Open Manhole	1350	S13.001	79.797	375	S13.000	80.072	100	
S40	81.500	2.270	Open Manhole	1500	S9.005	79.230	600	S9.004	79.230	600	
								S13.001	79.768	375	313
S41	81.500	1.800	Open Manhole	1200	S14.000	79.700	100				
S41a	81.500	2.265	Open Manhole	1200	S14.001	79.235	300	S14.000	79.435	100	
S42	81.500	2.727	Open Manhole	1500	S9.006	78.773	600	S9.005	78.773	600	
								S14.001	79.073	300	
S43	81.500	2.500	Open Manhole	1500	S15.000	79.000	675				
S44	81.500	2.905	Open Manhole	1800	S1.016	78.595	300	S1.015	78.630	750	485
								S9.006	78.717	600	422
								S15.000	78.595	675	
S45	80.789	2.335	Open Manhole	1200	S1.017	78.454	300	S1.016	78.454	300	
S46	80.984	2.580	Open Manhole	1200	S1.018	78.450	300	S1.017	78.404	300	
S	80.000	1.738	Open Manhole	300		OUTFALL		S1.018	78.262	300	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.018	S	80.000	78.262	78.550	300	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 10 Number of Storage Structures 11 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	0.413		

Online Controls for Storm

Orifice Manhole: S12, DS/PN: S3.001, Volume (m³): 3.9

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 81.082

Orifice Manhole: S16, DS/PN: S4.001, Volume (m³): 3.2

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 81.162

Orifice Manhole: S23, DS/PN: S5.001, Volume (m³): 13.3

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 80.702

Orifice Manhole: S31a, DS/PN: S9.001, Volume (m³): 4.2

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 81.115

Orifice Manhole: S32a, DS/PN: S10.001, Volume (m³): 2.3

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 80.717

Orifice Manhole: S34a, DS/PN: S11.001, Volume (m³): 2.7

Diameter (m) 0.060 Discharge Coefficient 0.600 Invert Level (m) 79.928

Orifice Manhole: S36a, DS/PN: S12.001, Volume (m³): 2.2

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 79.992

Orifice Manhole: S39, DS/PN: S13.001, Volume (m³): 2.6

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 79.997

Orifice Manhole: S41a, DS/PN: S14.001, Volume (m³): 2.7

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 79.435

Hydro-Brake® Optimum Manhole: S44, DS/PN: S1.016, Volume (m³): 66.0

Unit Reference	MD-SHE-0215-3130-2800-3130
Design Head (m)	2.800
Design Flow (l/s)	31.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	215
Invert Level (m)	78.595
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.800	31.3	Kick-Flo®	1.678	24.5
Flush-Flo™	0.801	31.3	Mean Flow over Head Range	-	27.3

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

Hydro-Brake® Optimum Manhole: S44, DS/PN: S1.016, Volume (m³): 66.0

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.3	0.800	31.3	2.000	26.6	4.000	37.1	7.000	48.6
0.200	21.0	1.000	31.0	2.200	27.9	4.500	39.3	7.500	50.3
0.300	26.8	1.200	30.2	2.400	29.0	5.000	41.3	8.000	51.9
0.400	28.8	1.400	28.7	2.600	30.2	5.500	43.3	8.500	53.4
0.500	30.1	1.600	26.1	3.000	32.3	6.000	45.1	9.000	54.9
0.600	30.8	1.800	25.3	3.500	34.8	6.500	46.9	9.500	56.4

Storage Structures for Storm

Tank or Pond Manhole: S2, DS/PN: S1.001

Invert Level (m) 81.304

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	100.0	1.000	100.0	1.001	0.0

Tank or Pond Manhole: S12, DS/PN: S3.001

Invert Level (m) 82.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	183.0	0.500	1184.0

Tank or Pond Manhole: S16, DS/PN: S4.001

Invert Level (m) 82.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	183.0	0.500	1184.0

Porous Car Park Manhole: S23, DS/PN: S5.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	30.0
Membrane Percolation (mm/hr)	1000	Length (m)	30.0
Max Percolation (l/s)	250.0	Slope (1:X)	400.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	82.400	Membrane Depth (mm)	0

Porous Car Park Manhole: S31a, DS/PN: S9.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	70.0
Membrane Percolation (mm/hr)	1000	Length (m)	70.0
Max Percolation (l/s)	1361.1	Slope (1:X)	400.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	82.600	Membrane Depth (mm)	0

Porous Car Park Manhole: S32a, DS/PN: S10.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	54.0
Membrane Percolation (mm/hr)	1000	Length (m)	54.0
Max Percolation (l/s)	810.0	Slope (1:X)	400.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	82.100	Membrane Depth (mm)	0

Porous Car Park Manhole: S34a, DS/PN: S11.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	50.0
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	555.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	81.100	Membrane Depth (mm)	0

Porous Car Park Manhole: S36a, DS/PN: S12.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	30.0
Membrane Percolation (mm/hr)	1000	Length (m)	21.0
Max Percolation (l/s)	175.0	Slope (1:X)	400.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	81.100	Membrane Depth (mm)	0

Porous Car Park Manhole: S39, DS/PN: S13.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	65.0
Membrane Percolation (mm/hr)	1000	Length (m)	64.0
Max Percolation (l/s)	1155.6	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	81.100	Membrane Depth (mm)	0

Porous Car Park Manhole: S41a, DS/PN: S14.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	55.0
Membrane Percolation (mm/hr)	1000	Length (m)	55.0
Max Percolation (l/s)	840.3	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	81.100	Membrane Depth (mm)	0

Tank or Pond Manhole: S44, DS/PN: S1.016

Invert Level (m) 79.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2000.0	1.000	2000.0	1.001	0.0

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 10 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 455172 221569 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	20, 20, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	2	+20%	100/15 Summer				81.939	-0.161	0.000
S1.001	S2	15 Winter	2	+20%	30/15 Summer				81.470	-0.284	0.000
S1.002	S3	15 Winter	2	+20%	30/15 Summer				81.357	-0.272	0.000
S2.000	S4	15 Winter	2	+20%	100/15 Summer				81.624	-0.326	0.000
S2.001	S5	15 Winter	2	+20%	30/15 Winter				81.458	-0.307	0.000
S1.003	S6	15 Winter	2	+20%	30/15 Summer				81.197	-0.183	0.000
S1.004	S7	15 Winter	2	+20%	30/15 Summer				81.142	-0.042	0.000
S1.005	S8	30 Winter	2	+20%	2/30 Winter				81.026	0.000	0.000
S1.006	S9	15 Winter	2	+20%	30/15 Winter				80.794	-0.207	0.000
S1.007	S10	15 Winter	2	+20%	100/15 Winter				80.591	-0.326	0.000
S3.000	S11	240 Winter	2	+20%	2/15 Summer				82.293	0.593	0.000
S3.001	S12	240 Winter	2	+20%	2/15 Summer				82.292	0.685	0.000
S1.008	S13	15 Winter	2	+20%	100/15 Summer				80.341	-0.248	0.000
S1.009	S14	15 Winter	2	+20%	100/15 Winter				80.054	-0.321	0.000
S4.000	S15	240 Winter	2	+20%	2/15 Summer				82.281	0.581	0.000
S4.001	S16	240 Winter	2	+20%	2/15 Summer				82.281	0.669	0.000
S1.010	S17	30 Winter	2	+20%	100/15 Summer				79.915	-0.248	0.000
S1.011	S18	30 Winter	2	+20%	100/15 Summer				79.856	-0.236	0.000
S1.012	S19	30 Winter	2	+20%	100/15 Summer				79.809	-0.197	0.000
S1.013	S20	30 Winter	2	+20%	100/15 Summer				79.627	-0.358	0.000
S5.000	S21	240 Winter	2	+20%	2/15 Summer				82.474	1.203	0.000
S6.000	S22	240 Winter	2	+20%	2/15 Summer				82.474	0.524	0.000
S5.001	S23	240 Winter	2	+20%	2/15 Summer				82.474	1.272	0.000
S5.002	S24	15 Winter	2	+20%	100/15 Summer				80.794	-0.341	0.000
S5.003	S25	15 Winter	2	+20%	100/15 Summer				80.519	-0.298	0.000
S7.000	S26	15 Winter	2	+20%	100/360 Winter				80.408	-0.642	0.000
S8.000	S27	15 Winter	2	+20%	30/15 Summer				80.743	-0.207	0.000
S8.001	S28	15 Winter	2	+20%	30/15 Summer				80.717	-0.081	0.000
S1.014	S29	480 Winter	2	+20%	30/240 Winter				79.442	-0.321	0.000
S1.015	S30	480 Winter	2	+20%	30/15 Winter				79.429	-0.144	0.000
S9.000	S31	360 Winter	2	+20%	2/15 Summer				82.739	1.215	0.000
S9.001	S31a	360 Winter	2	+20%	2/15 Summer				82.739	1.249	0.000
S10.000	S32	240 Winter	2	+20%	2/15 Summer				82.189	1.350	0.000

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.44		37.6	OK	
S1.001	S2	0.29		58.3	OK	
S1.002	S3	0.33		75.7	OK	
S2.000	S4	0.17		37.9	OK	
S2.001	S5	0.22		41.0	OK	
S1.003	S6	0.47		105.4	OK	
S1.004	S7	0.87		112.6	OK	
S1.005	S8	1.24		114.0	SURCHARGED	
S1.006	S9	0.62		117.8	OK	
S1.007	S10	0.31		116.2	OK	
S3.000	S11	0.06		3.8	SURCHARGED	
S3.001	S12	0.01		3.6	SURCHARGED	
S1.008	S13	0.51		112.3	OK	
S1.009	S14	0.32		113.7	OK	
S4.000	S15	0.06		4.0	SURCHARGED	
S4.001	S16	0.02		3.5	SURCHARGED	
S1.010	S17	0.47		114.7	OK	
S1.011	S18	0.42		110.0	OK	
S1.012	S19	0.79		109.1	OK	
S1.013	S20	0.34		107.6	OK	
S5.000	S21	0.03		4.6	FLOOD RISK	
S6.000	S22	0.00		0.6	FLOOD RISK	
S5.001	S23	0.02		4.4	FLOOD RISK	
S5.002	S24	0.22		57.7	OK	
S5.003	S25	0.34		87.5	OK	
S7.000	S26	0.05		27.1	OK	
S8.000	S27	0.26		35.2	OK	
S8.001	S28	0.93		72.2	OK	
S1.014	S29	0.12		81.2	OK	
S1.015	S30	0.15		80.3	OK	
S9.000	S31	0.01		0.5	FLOOD RISK	
S9.001	S31a	0.02		4.2	FLOOD RISK	
S10.000	S32	0.29		0.7	SURCHARGED	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)
S10.001	S32a	240 Winter	2	+20%	2/15 Summer				82.189	1.372	0.000
S9.002	S33	30 Winter	2	+20%	100/240 Winter				80.283	-0.302	0.000
S11.000	S34	120 Winter	2	+20%	2/15 Summer				81.150	0.983	0.000
S11.001	S34a	120 Winter	2	+20%	2/15 Summer				81.150	1.022	0.000
S9.003	S35	30 Winter	2	+20%	100/240 Winter				79.689	-0.400	0.000
S12.000	S36	120 Winter	2	+20%	2/15 Summer				81.167	0.955	0.000
S12.001	S36a	120 Winter	2	+20%	2/15 Summer				81.167	1.074	0.000
S9.004	S37	30 Winter	2	+20%	100/240 Summer				79.480	-0.460	0.000
S13.000	S38	360 Winter	2	+20%	2/15 Summer				81.255	0.916	0.000
S13.001	S39	360 Winter	2	+20%	2/15 Summer				81.255	1.083	0.000
S9.005	S40	480 Winter	2	+20%	30/960 Winter				79.388	-0.442	0.000
S14.000	S41	240 Winter	2	+20%	2/15 Summer				81.185	1.385	0.000
S14.001	S41a	240 Winter	2	+20%	2/15 Summer				81.185	1.650	0.000
S9.006	S42	480 Winter	2	+20%	2/240 Winter				79.385	0.012	0.000
S15.000	S43	480 Winter	2	+20%	30/240 Winter				79.382	-0.293	0.000
S1.016	S44	480 Winter	2	+20%	2/15 Summer				79.382	0.487	0.000
S1.017	S45	480 Winter	2	+20%					78.668	-0.086	0.000
S1.018	S46	480 Winter	2	+20%					78.626	-0.124	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.001	S32a	0.06		4.0	SURCHARGED	
S9.002	S33	0.08		22.6	OK	
S11.000	S34	0.35		1.2	SURCHARGED	
S11.001	S34a	0.07		8.2	SURCHARGED	
S9.003	S35	0.13		30.1	OK	
S12.000	S36	0.22		0.9	SURCHARGED	
S12.001	S36a	0.04		3.6	SURCHARGED	
S9.004	S37	0.12		33.1	OK	
S13.000	S38	0.07		0.4	FLOOD RISK	
S13.001	S39	0.07		3.7	FLOOD RISK	
S9.005	S40	0.04		26.4	OK	
S14.000	S41	0.09		0.6	SURCHARGED	
S14.001	S41a	0.05		4.4	SURCHARGED	
S9.006	S42	0.11		29.9	SURCHARGED	
S15.000	S43	0.00		0.0	OK	
S1.016	S44	0.74		30.9	SURCHARGED	
S1.017	S45	0.70		30.9	OK	
S1.018	S46	0.65		30.9	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 10 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 455172 221569 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	20, 20, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	30	+20%	100/15 Summer				82.074	-0.026	0.000
S1.001	S2	15 Winter	30	+20%	30/15 Summer				81.883	0.129	0.000
S1.002	S3	15 Winter	30	+20%	30/15 Summer				81.807	0.177	0.000
S2.000	S4	15 Winter	30	+20%	100/15 Summer				81.848	-0.102	0.000
S2.001	S5	15 Winter	30	+20%	30/15 Winter				81.776	0.011	0.000
S1.003	S6	15 Summer	30	+20%	30/15 Summer				81.673	0.293	0.000
S1.004	S7	15 Summer	30	+20%	30/15 Summer				81.533	0.350	0.000
S1.005	S8	15 Winter	30	+20%	2/30 Winter				81.163	0.137	0.000
S1.006	S9	15 Winter	30	+20%	30/15 Winter				81.004	0.004	0.000
S1.007	S10	15 Winter	30	+20%	100/15 Winter				80.673	-0.243	0.000
S3.000	S11	240 Winter	30	+20%	2/15 Summer				82.457	0.757	0.000
S3.001	S12	240 Winter	30	+20%	2/15 Summer				82.457	0.850	0.000
S1.008	S13	15 Winter	30	+20%	100/15 Summer				80.479	-0.110	0.000
S1.009	S14	30 Winter	30	+20%	100/15 Winter				80.236	-0.139	0.000
S4.000	S15	240 Winter	30	+20%	2/15 Summer				82.440	0.740	0.000
S4.001	S16	240 Winter	30	+20%	2/15 Summer				82.440	0.828	0.000
S1.010	S17	60 Summer	30	+20%	100/15 Summer				80.163	0.000	0.000
S1.011	S18	30 Summer	30	+20%	100/15 Summer				80.092	0.000	0.000
S1.012	S19	30 Winter	30	+20%	100/15 Summer				80.006	0.000	0.000
S1.013	S20	960 Winter	30	+20%	100/15 Summer				79.851	-0.134	0.000
S5.000	S21	240 Winter	30	+20%	2/15 Summer				82.573	1.302	0.000
S6.000	S22	240 Winter	30	+20%	2/15 Summer				82.573	0.623	0.000
S5.001	S23	240 Winter	30	+20%	2/15 Summer				82.573	1.371	0.000
S5.002	S24	15 Winter	30	+20%	100/15 Summer				80.927	-0.208	0.000
S5.003	S25	15 Winter	30	+20%	100/15 Summer				80.713	-0.104	0.000
S7.000	S26	15 Winter	30	+20%	100/360 Winter				80.471	-0.579	0.000
S8.000	S27	15 Winter	30	+20%	30/15 Summer				81.565	0.615	0.000
S8.001	S28	15 Winter	30	+20%	30/15 Summer				81.435	0.637	0.000
S1.014	S29	960 Winter	30	+20%	30/240 Winter				79.836	0.073	0.000
S1.015	S30	960 Winter	30	+20%	30/15 Winter				79.834	0.261	0.000
S9.000	S31	360 Winter	30	+20%	2/15 Summer				82.845	1.321	0.000
S9.001	S31a	360 Winter	30	+20%	2/15 Summer				82.845	1.355	0.000
S10.000	S32	240 Winter	30	+20%	2/15 Summer				82.272	1.433	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.97		83.3	OK	
S1.001	S2	0.48		96.0	SURCHARGED	
S1.002	S3	0.46		106.0	SURCHARGED	
S2.000	S4	0.37		82.4	OK	
S2.001	S5	0.42		78.9	SURCHARGED	
S1.003	S6	0.68		153.8	SURCHARGED	
S1.004	S7	1.38		179.5	SURCHARGED	
S1.005	S8	2.39		219.2	SURCHARGED	
S1.006	S9	1.13		214.3	SURCHARGED	
S1.007	S10	0.56		212.5	OK	
S3.000	S11	0.11		7.6	FLOOD RISK	
S3.001	S12	0.01		3.9	FLOOD RISK	
S1.008	S13	0.94		206.4	OK	
S1.009	S14	0.64		226.9	OK	
S4.000	S15	0.12		7.9	FLOOD RISK	
S4.001	S16	0.02		3.7	FLOOD RISK	
S1.010	S17	0.83		202.5	OK	
S1.011	S18	0.75		196.3	OK	
S1.012	S19	1.57		218.2	OK	
S1.013	S20	0.12		38.7	OK	
S5.000	S21	0.06		9.2	FLOOD RISK	
S6.000	S22	0.00		0.0	FLOOD RISK	
S5.001	S23	0.02		4.5	FLOOD RISK	
S5.002	S24	0.62		164.2	OK	
S5.003	S25	0.97		250.0	OK	
S7.000	S26	0.12		62.8	OK	
S8.000	S27	0.58		77.5	SURCHARGED	
S8.001	S28	2.37		183.1	SURCHARGED	
S1.014	S29	0.12		82.4	SURCHARGED	
S1.015	S30	0.15		81.3	SURCHARGED	
S9.000	S31	0.00		0.0	FLOOD RISK	
S9.001	S31a	0.02		4.4	FLOOD RISK	
S10.000	S32	0.00		0.0	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)
S10.001	S32a	240 Winter	30	+20%	2/15 Summer				82.272	1.455	0.000
S9.002	S33	15 Winter	30	+20%	100/240 Winter				80.335	-0.250	0.000
S11.000	S34	120 Winter	30	+20%	2/15 Summer				81.284	1.117	0.000
S11.001	S34a	120 Winter	30	+20%	2/15 Summer				81.284	1.156	0.000
S9.003	S35	480 Winter	30	+20%	100/240 Winter				79.926	-0.163	0.000
S12.000	S36	120 Winter	30	+20%	2/15 Summer				81.308	1.096	0.000
S12.001	S36a	120 Winter	30	+20%	2/15 Summer				81.308	1.215	0.000
S9.004	S37	480 Winter	30	+20%	100/240 Summer				79.903	-0.037	0.000
S13.000	S38	360 Winter	30	+20%	2/15 Summer				81.365	1.026	0.000
S13.001	S39	360 Winter	30	+20%	2/15 Summer				81.365	1.193	0.000
S9.005	S40	960 Winter	30	+20%	30/960 Winter				79.837	0.007	0.000
S14.000	S41	240 Winter	30	+20%	2/15 Summer				81.247	1.447	0.000
S14.001	S41a	240 Winter	30	+20%	2/15 Summer				81.247	1.712	0.000
S9.006	S42	960 Winter	30	+20%	2/240 Winter				79.834	0.461	0.000
S15.000	S43	960 Winter	30	+20%	30/240 Winter				79.831	0.156	0.000
S1.016	S44	960 Winter	30	+20%	2/15 Summer				79.831	0.936	0.000
S1.017	S45	480 Summer	30	+20%					78.670	-0.084	0.000
S1.018	S46	480 Summer	30	+20%					78.627	-0.123	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.001	S32a	0.06		4.1	FLOOD RISK	
S9.002	S33	0.24		67.0	OK	
S11.000	S34	0.00		0.0	FLOOD RISK	
S11.001	S34a	0.08		8.7	FLOOD RISK	
S9.003	S35	0.10		22.6	OK	
S12.000	S36	0.01		0.0	FLOOD RISK	
S12.001	S36a	0.05		3.8	FLOOD RISK	
S9.004	S37	0.10		26.2	OK	
S13.000	S38	0.00		0.0	FLOOD RISK	
S13.001	S39	0.07		3.9	FLOOD RISK	
S9.005	S40	0.04		27.0	SURCHARGED	
S14.000	S41	0.00		0.0	FLOOD RISK	
S14.001	S41a	0.05		4.5	FLOOD RISK	
S9.006	S42	0.11		31.4	SURCHARGED	
S15.000	S43	0.00		0.0	SURCHARGED	
S1.016	S44	0.75		31.2	SURCHARGED	
S1.017	S45	0.71		31.2	OK	
S1.018	S46	0.66		31.2	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 10 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 455172 221569 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	20, 20, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	100	+40%	100/15 Summer				82.683	0.583	0.000
S1.001	S2	30 Winter	100	+40%	30/15 Summer				82.480	0.726	0.000
S1.002	S3	15 Winter	100	+40%	30/15 Summer				82.376	0.747	0.000
S2.000	S4	30 Winter	100	+40%	100/15 Summer				82.425	0.475	0.000
S2.001	S5	30 Winter	100	+40%	30/15 Winter				82.299	0.534	0.000
S1.003	S6	15 Winter	100	+40%	30/15 Summer				82.237	0.857	0.000
S1.004	S7	30 Winter	100	+40%	30/15 Summer				82.053	0.869	0.000
S1.005	S8	960 Winter	100	+40%	2/30 Winter				81.525	0.499	0.000
S1.006	S9	960 Winter	100	+40%	30/15 Winter				81.523	0.522	0.000
S1.007	S10	960 Winter	100	+40%	100/15 Winter				81.520	0.604	0.000
S3.000	S11	360 Winter	100	+40%	2/15 Summer				82.571	0.871	0.000
S3.001	S12	360 Winter	100	+40%	2/15 Summer				82.570	0.963	0.000
S1.008	S13	960 Winter	100	+40%	100/15 Summer				81.518	0.929	0.000
S1.009	S14	960 Winter	100	+40%	100/15 Winter				81.513	1.138	0.000
S4.000	S15	360 Winter	100	+40%	2/15 Summer				82.550	0.850	0.000
S4.001	S16	360 Winter	100	+40%	2/15 Summer				82.549	0.937	0.000
S1.010	S17	960 Winter	100	+40%	100/15 Summer				81.510	1.347	0.000
S1.011	S18	960 Winter	100	+40%	100/15 Summer				81.507	1.415	0.000
S1.012	S19	960 Winter	100	+40%	100/15 Summer				81.503	1.497	0.000
S1.013	S20	960 Winter	100	+40%	100/15 Summer				81.501	1.516	0.000
S5.000	S21	240 Winter	100	+40%	2/15 Summer				82.677	1.406	0.000
S6.000	S22	240 Winter	100	+40%	2/15 Summer				82.677	0.727	0.000
S5.001	S23	240 Winter	100	+40%	2/15 Summer				82.677	1.475	0.000
S5.002	S24	960 Winter	100	+40%	100/15 Summer				81.503	0.368	0.000
S5.003	S25	960 Winter	100	+40%	100/15 Summer				81.501	0.684	0.000
S7.000	S26	960 Winter	100	+40%	100/360 Winter				81.497	0.447	0.000
S8.000	S27	15 Winter	100	+40%	30/15 Summer				82.428	1.478	0.000
S8.001	S28	15 Winter	100	+40%	30/15 Summer				82.302	1.504	0.000
S1.014	S29	960 Winter	100	+40%	30/240 Winter				81.497	1.734	0.000
S1.015	S30	960 Winter	100	+40%	30/15 Winter				81.493	1.921	0.000
S9.000	S31	480 Winter	100	+40%	2/15 Summer				82.952	1.428	0.000
S9.001	S31a	480 Winter	100	+40%	2/15 Summer				82.952	1.462	0.000
S10.000	S32	240 Winter	100	+40%	2/15 Summer				82.352	1.513	0.000

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

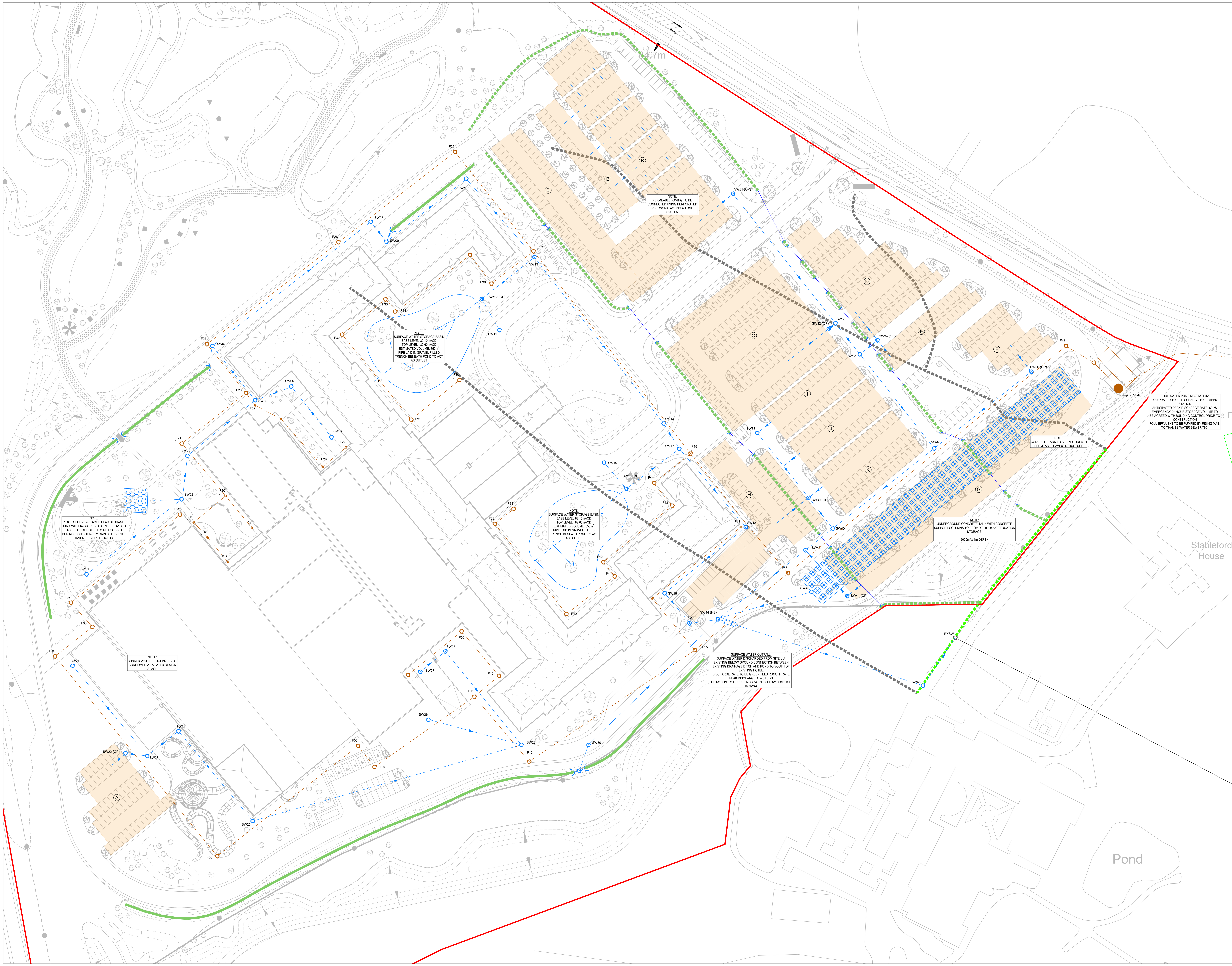
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	1.27		109.1	FLOOD RISK	
S1.001	S2	0.68		134.8	FLOOD RISK	
S1.002	S3	0.74		171.1	SURCHARGED	
S2.000	S4	0.38		85.1	FLOOD RISK	
S2.001	S5	0.50		93.7	SURCHARGED	
S1.003	S6	1.03		231.8	SURCHARGED	
S1.004	S7	1.98		256.5	SURCHARGED	
S1.005	S8	0.48		43.7	SURCHARGED	
S1.006	S9	0.23		43.7	SURCHARGED	
S1.007	S10	0.12		43.7	SURCHARGED	
S3.000	S11	0.12		8.2	FLOOD RISK	
S3.001	S12	0.01		4.0	FLOOD RISK	
S1.008	S13	0.22		47.5	SURCHARGED	
S1.009	S14	0.14		50.4	SURCHARGED	
S4.000	S15	0.13		8.5	FLOOD RISK	
S4.001	S16	0.02		3.9	FLOOD RISK	
S1.010	S17	0.22		53.7	SURCHARGED	
S1.011	S18	0.20		53.8	FLOOD RISK	
S1.012	S19	0.39		53.9	FLOOD RISK	
S1.013	S20	0.17		53.6	FLOOD RISK	
S5.000	S21	0.09		13.6	FLOOD RISK	
S6.000	S22	0.00		0.0	FLOOD RISK	
S5.001	S23	0.02		4.7	FLOOD RISK	
S5.002	S24	0.07		17.9	SURCHARGED	
S5.003	S25	0.10		25.5	SURCHARGED	
S7.000	S26	0.01		5.2	SURCHARGED	
S8.000	S27	0.85		113.2	FLOOD RISK	
S8.001	S28	3.43		265.4	SURCHARGED	
S1.014	S29	0.18		121.0	SURCHARGED	
S1.015	S30	0.22		120.9	SURCHARGED	
S9.000	S31	0.00		0.0	FLOOD RISK	
S9.001	S31a	0.02		4.5	FLOOD RISK	
S10.000	S32	0.00		0.0	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S10.001	S32a	240 Winter	100	+40%	2/15 Summer				82.352	1.535	0.000
S9.002	S33	960 Winter	100	+40%	100/240 Winter				81.497	0.912	0.000
S11.000	S34	120 Winter	100	+40%	2/15 Summer				81.422	1.255	0.000
S11.001	S34a	120 Winter	100	+40%	2/15 Summer				81.422	1.294	0.000
S9.003	S35	960 Winter	100	+40%	100/240 Winter				81.493	1.404	0.000
S12.000	S36	120 Winter	100	+40%	2/15 Summer				81.457	1.245	0.000
S12.001	S36a	120 Winter	100	+40%	2/15 Summer				81.457	1.364	0.000
S9.004	S37	960 Winter	100	+40%	100/240 Summer				81.491	1.551	0.000
S13.000	S38	960 Winter	100	+40%	2/15 Summer				81.487	1.148	0.000
S13.001	S39	960 Winter	100	+40%	2/15 Summer				81.487	1.315	0.000
S9.005	S40	960 Winter	100	+40%	30/960 Winter				81.490	1.660	0.000
S14.000	S41	960 Winter	100	+40%	2/15 Summer				81.303	1.503	0.000
S14.001	S41a	960 Winter	100	+40%	2/15 Summer				81.303	1.768	0.000
S9.006	S42	960 Winter	100	+40%	2/240 Winter				81.489	2.116	0.000
S15.000	S43	960 Winter	100	+40%	30/240 Winter				81.488	1.813	0.000
S1.016	S44	960 Winter	100	+40%	2/15 Summer				81.488	2.593	0.000
S1.017	S45	960 Winter	100	+40%					78.670	-0.084	0.000
S1.018	S46	960 Winter	100	+40%					78.627	-0.123	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S10.001	S32a	0.06		4.2	FLOOD RISK	
S9.002	S33	0.05		13.3	SURCHARGED	
S11.000	S34	0.00		0.0	FLOOD RISK	
S11.001	S34a	0.08		8.8	FLOOD RISK	
S9.003	S35	0.09		21.6	FLOOD RISK	
S12.000	S36	0.01		0.0	FLOOD RISK	
S12.001	S36a	0.05		4.0	FLOOD RISK	
S9.004	S37	0.09		24.6	FLOOD RISK	
S13.000	S38	0.00		0.0	FLOOD RISK	
S13.001	S39	0.07		3.9	FLOOD RISK	
S9.005	S40	0.05		28.0	FLOOD RISK	
S14.000	S41	0.00		0.0	FLOOD RISK	
S14.001	S41a	0.05		4.4	FLOOD RISK	
S9.006	S42	0.12		32.2	FLOOD RISK	
S15.000	S43	0.00		0.2	FLOOD RISK	
S1.016	S44	0.75		31.3	FLOOD RISK	
S1.017	S45	0.71		31.3	OK	
S1.018	S46	0.66		31.3	OK	

Appendix E – Drainage General Arrangement


NOTE:
PERMEABLE PAVING TO BE CONNECTED USING PERFORATED PIPE WORK, ACTING AS ONE SYSTEM
NOTE:
SURFACE WATER STORAGE BASIN
BASE LEVEL 82.10mAOD
TOP LEVEL : 82.60mAOD
ESTIMATED VOLUME: 350m3
PIPE LAID IN GRAVEL FILLED TRENCH BENEATH POND TO ACT AS OUTLET
NOTE:
SURFACE WATER STORAGE BASIN
BASE LEVEL 82.10mAOD
TOP LEVEL : 82.60mAOD
ESTIMATED VOLUME: 350m3
PIPE LAID IN GRAVEL FILLED TRENCH BENEATH POND TO ACT AS OUTLET
NOTE:
100m² OFFLINE GEO-CELLULAR STORAGE TANK WITH 1m WORKING DEPTH PROVIDED TO PROTECT HOTEL FROM FLOODING DURING HIGH INTENSITY RAINFALL EVENTS.
INVERT LEVEL:81.30mAOD
NOTE:
BUNKER WATERPROOFING TO BE CONFIRMED AT A LATER DESIGN STAGE
SURFACE WATER OUTFALL:
SURFACE WATER DISCHARGED FROM SITE VIA EXISTING BELOW GROUND CONNECTION BETWEEN EXISTING DRAINAGE DITCH AND POND TO SOUTH OF EXISTING HOTEL.
DISCHARGE RATE TO BE GREENFIELD RUNOFF RATE
PEAK DISCHARGE: Q = 31.3L/S
FLOW CONTROLLED USING A VORTEX FLOW CONTROL IN SW44
NOTE:
UNDERGROUND CONCRETE TANK WITH CONCRETE SUPPORT COLUMNS TO PROVIDE 2000m³ ATTENUATION STORAGE.
2000m² x 1m DEPTH
NOTE:
CONCRETE TANK TO BE UNDERNEATH PERMEABLE PAVING STRUCTURE
Pumping Station
FOUL WATER PUMPING STATION:
FOUL WATER TO BE DISCHARGE TO PUMPING STATION
ANTICIPATED PEAK DISCHARGE RATE: 50L/S.
EMERGENCY 24-HOUR STORAGE VOLUME TO BE AGREED WITH BUILDING CONTROL PRIOR TO CONSTRUCTION
FOUL EFFLUENT TO BE PUMPED BY RISING MAIN TO THAMES WATER SEWER 7601
Stableford House
Pond

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE FROM THIS DRAWING. ALL DETAILS AND DIMENSIONS AND LEVELS ARE TO BE CHECKED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF CONSTRUCTION. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER.
3. ALL LEVELS ARE IN METERS & DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
4. DESIGN BASED ON TOPOGRAPHICAL & CCTV SURVEY AVAILABLE AT THE TIME OF DESIGN. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
5. ALL PIPEWORK TO BE VITRIFIED CLAY.
6. WHERE EXISTING DRAINAGE IS BEING USED, ALLOWANCES SHOULD BE MADE TO REMEDIATE THIS DRAINAGE IN LINE WITH AVAILABLE CCTV SURVEY INFORMATION.
7. WHERE THERE IS NO REQUIREMENT TO KEEP EXISTING DRAINAGE, ALLOWANCES SHOULD BE MADE TO ABANDON THIS IN LINE WITH CURTINS DRAINAGE SPECIFICATION.
8. ALL INTERNAL DRAINAGE POINTS ARE SHOWN INDICATIVELY AND ARE TO BE DESIGNED AND SET OUT BY THE M&E ENGINEER.
9. ANY DRAINAGE RUNS AND THEIR CONNECTIONS DAMAGED THROUGH CONSTRUCTION WORKS SHOULD BE REPLACED TO SUFFICIENT STANDARD.
10. CURTINS ACCEPT NO RESPONSIBILITY FOR DEFECTS OR INADEQUACIES OF EXISTING DRAINAGE SYSTEMS. FAILURE OF SITE DRAINAGE DUE TO AN ISSUE WITH THESE NETWORKS ARE OUTSIDE OF OUR REMIT UNLESS SPECIFICALLY INSTRUCTED OTHERWISE.
11. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
12. EXISTING DITCH DIVERSIONS TO BE 1M WIDE AND 300-500mm IN DEPTH, AS AGREED WITH THE LLFA
13. SITE SURFACE WATER DISCHARGE LIMITED TO QBAR (31.3l/s) AS AGREED WITH OCC
14. FOUL PUMPING STATION TO BE DESIGNED BY OTHERS AT LATER DESIGN STAGE. PROVISION OF 24-HOUR EMERGENCY STORAGE TO BE AGREED WITH BUILDING CONTROL AT LATER DESIGN STAGE. SECONDARY POWER SUPPLY AND SECONDARY PUMP TO BE PROVIDED.

KEY:

-SURFACE WATER DRAIN.
SW00 -SURFACE WATER CHAMBER.
-FOUL WATER DRAIN.
FW00 -FOUL WATER CHAMBER.
-EXISTING SURFACE WATER SEWER
-SURFACE WATER CULVERT
-BYPASS SEPARATOR

ORIFICE PLATES:

SW12 (OP) -ORIFICE PLATE: Ø(mm): 50 INVERT LEVEL: 81.08m AOD
SW16 (OP) -ORIFICE PLATE: Ø(mm): 50 INVERT LEVEL: 81.16m AOD
SW22 (OP) -ORIFICE PLATE: Ø(mm): 40 INVERT LEVEL: 80.70m AOD
SW31 (OP) -ORIFICE PLATE: Ø(mm): 40 INVERT LEVEL: 81.12m AOD
SW32 (OP) -ORIFICE PLATE: Ø(mm): 40 INVERT LEVEL: 80.72m AOD
SW34 (OP) -ORIFICE PLATE: Ø(mm): 60 INVERT LEVEL: 79.93m AOD
SW36 (OP) -ORIFICE PLATE: Ø(mm): 40 INVERT LEVEL: 79.99m AOD
SW39 (OP) -ORIFICE PLATE: Ø(mm): 50 INVERT LEVEL: 80.00m AOD
SW41 (OP) -ORIFICE PLATE: Ø(mm): 50 INVERT LEVEL: 79.44m AOD

HYDROBRAKES:

SW42 (HB) -HYDROBRAKE: Q (l/s): 31.3 H (m): 2 Ø(mm): 227 INVERT LEVEL: 78.60m AOD

-BELOW GROUND SURFACE WATER GEO-CELLULAR STORAGE.
-BELOW GROUND SURFACE WATER ATTENUATION CONCRETE TANK WITH SUPPORT COLUMNS
-ABOVE GROUND SURFACE WATER STORAGE BASIN DEPTH: 500mm SLOPE: 1h:20v
-PERMEABLE SUB-BASE. SUB-BASE TO COLLECT AND ATTENUATE FLOWS. SURFACING TO BE CONFIRMED AT DETAILED DESIGN PHASE.
(A) -PERMEABLE SUB-BASE. AREA: 936m² DEPTH: 300mm @ 95% VOID RATIO
(B) -PERMEABLE SUB-BASE. AREA: 4775m² DEPTH: 300mm @ 30% VOID RATIO
(C) -PERMEABLE SUB-BASE. AREA: 2900m² DEPTH: 300mm @ 30% VOID RATIO
(D) -PERMEABLE SUB-BASE. AREA: 1480m² DEPTH: 300mm @ 30% VOID RATIO
(E) -PERMEABLE SUB-BASE. AREA: 520m² DEPTH: 300mm @ 30% VOID RATIO
(F) -PERMEABLE SUB-BASE. AREA: 630m² DEPTH: 300mm @ 30% VOID RATIO
(G) -PERMEABLE SUB-BASE. AREA: 3025m² DEPTH: 300mm @ 95% VOID RATIO
(H) -PERMEABLE SUB-BASE. AREA: 1700m² DEPTH: 300mm @ 30% VOID RATIO
(I) -PERMEABLE SUB-BASE. AREA: 685m² DEPTH: 300mm @ 30% VOID RATIO
(J) -PERMEABLE SUB-BASE. AREA: 690m² DEPTH: 300mm @ 30% VOID RATIO
(K) -PERMEABLE SUB-BASE. AREA: 945m² DEPTH: 300mm @ 30% VOID RATIO
-PROPOSED SWALE. LOCATIONS AND DEPTHS TO BE CONFIRMED. ANTICIPATED DEPTH 300-500mm.
-PLANNING BOUNDARY.
-EXISTING SURFACE WATER SEWER
-EXISTING LAND DRAINS TO BE RETAINED
-EXISTING LAND DRAINS TO BE DIVERTED.
-PROPOSED DIVERTED LAND DRAIN.

Rev:	Description:	Date:	By:	Chkd:
P05	UPDATED FOLLOWING COMMENT	11.11.19	LB	MS
P04	FOUL NETWORK ADDED	18.09.19	LB	MS
P03	UPDATED FOLLOWING COMMENTS	04.09.19	LB	MS
P02	FOR INFORMATION	28.08.19	LB	MS
P01	PRELIMINARY ISSUE	02.08.19	NMH	MS

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Status: PRELIMINARY

Project: GREAT WOLF LODGE

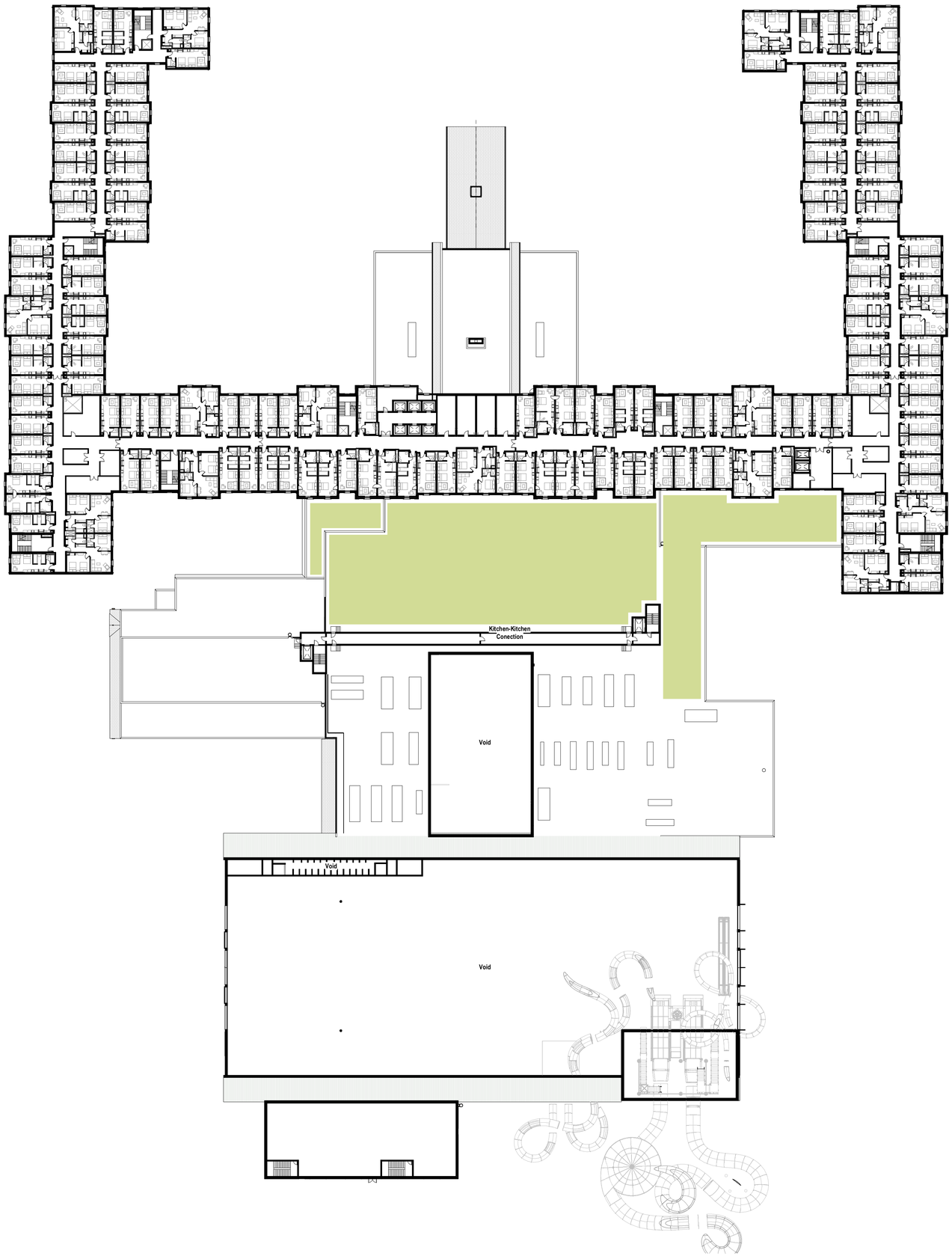
Drg Title: PROPOSED DRAINAGE STRATEGY

Size:	Date:	Drawn By:	Designed By:	Checked By:
A0	02.08.19	NMH	MS	MS
Scale: 1:500				

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
06535	CUR	00	XX	DR	C	92000	P05

Projects\068000.000 - 068999.000\068535 - Great Wolfe Lodge\QMS 4 Production\4B Drawings\CS\AutoCAD\92\

Appendix F – Green Roof Proposed Locations



Keyplan

North

Notes:
1. Do not scale
2. Contractor to Check all dimensions and report omissions and errors to the Architect.
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5. This drawing does not contain shared coordinates and is not issued for coordination purposes.

No.	Revision	Date	Initial	Chk'd
1	P01 - Preliminary Planning Issue	25.10.19	LGO	CT

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Proposed Second Floor Plan

Scale @A1	Status	Suitability	Revision
As indicated	Planning	S4	1

Project Code	Originator	Zone	Level	Type	Role	Class.	Number
10875	EPR	00	02	DR	A	TP	0202

Appendix G – Foul Water Flow Calculations

FOUL SEWERAGE DESIGN

Design Criteria for Foul

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Calculation Method	EN 752	Maximum Backdrop Height (m)	3.000
Frequency Factor	0.70	Min Design Depth for Optimisation (m)	0.900
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.70
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	59.816	0.399	149.9	0.000	500.0	0.0	1.500	o	225	Pipe/Conduit	
1.001	13.775	0.092	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.002	20.283	0.135	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.003	109.867	0.732	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.004	76.373	0.509	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.005	11.385	0.076	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.006	52.188	0.348	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
2.000	29.500	0.197	150.0	0.000	32.4	0.0	1.500	o	150	Pipe/Conduit	
2.001	24.763	0.165	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
2.002	13.729	0.092	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
1.007	36.245	0.242	150.0	0.000	47.4	0.0	1.500	o	225	Pipe/Conduit	
1.008	85.233	0.568	150.0	0.000	310.7	0.0	1.500	o	225	Pipe/Conduit	
3.000	48.558	0.324	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
3.001	28.551	0.190	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
1.009	51.591	0.344	150.0	0.000	310.7	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	81.950	0.000	0.0	500.0	0.0	102	0.90	0.94	37.2	15.7
1.001	81.551	0.000	0.0	500.0	0.0	102	0.90	0.94	37.2	15.7
1.002	81.459	0.000	0.0	500.0	0.0	102	0.90	0.94	37.2	15.7
1.003	81.324	0.000	0.0	500.0	0.0	102	0.90	0.94	37.2	15.7
1.004	80.592	0.000	0.0	500.0	0.0	102	0.90	0.94	37.2	15.7
1.005	80.082	0.000	0.0	500.0	0.0	102	0.90	0.94	37.2	15.7
1.006	80.006	0.000	0.0	500.0	0.0	102	0.90	0.94	37.2	15.7
2.000	81.650	0.000	0.0	32.4	0.0	58	0.63	0.71	12.6	4.0
2.001	81.453	0.000	0.0	32.4	0.0	58	0.63	0.71	12.6	4.0
2.002	81.288	0.000	0.0	32.4	0.0	58	0.63	0.71	12.6	4.0
1.007	79.659	0.000	0.0	579.8	0.0	106	0.91	0.94	37.2	16.9
1.008	79.417	0.000	0.0	890.5	0.0	120	0.96	0.94	37.2	20.9
3.000	81.950	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
3.001	81.626	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
1.009	78.849	0.000	0.0	1201.2	0.0	132	1.00	0.94	37.2	24.3

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	17.590	0.117	150.0	0.000	110.0	0.0	1.500	o	150	Pipe/Conduit	
5.000	13.604	0.091	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
5.001	8.771	0.058	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
5.002	17.663	0.118	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
4.001	29.164	0.194	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
4.002	35.000	0.233	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
6.000	12.912	0.086	150.1	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
6.001	27.128	0.181	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
6.002	12.422	0.083	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
6.003	6.605	0.044	150.0	0.000	24.7	0.0	1.500	o	150	Pipe/Conduit	
4.003	26.658	0.178	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
4.004	71.000	0.473	150.0	0.000	310.7	0.0	1.500	o	225	Pipe/Conduit	
4.005	62.938	0.420	150.0	0.000	310.7	0.0	1.500	o	225	Pipe/Conduit	
4.006	54.049	0.360	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
7.000	26.663	0.178	150.0	0.000	311.0	0.0	1.500	o	150	Pipe/Conduit	
7.001	46.809	0.312	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
7.002	23.820	0.159	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
7.003	6.986	0.047	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
7.004	39.449	0.263	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
7.005	15.212	0.101	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
7.006	22.608	0.151	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	81.950	0.000	0.0	110.0	0.0	82	0.74	0.71	12.6	7.3
5.000	81.950	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
5.001	81.859	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
5.002	81.801	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
4.001	81.683	0.000	0.0	110.0	0.0	82	0.74	0.71	12.6	7.3
4.002	81.489	0.000	0.0	110.0	0.0	82	0.74	0.71	12.6	7.3
6.000	81.950	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
6.001	81.864	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
6.002	81.683	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
6.003	81.600	0.000	0.0	24.7	0.0	54	0.61	0.71	12.6	3.5
4.003	81.255	0.000	0.0	134.7	0.0	87	0.76	0.71	12.6	8.1
4.004	81.003	0.000	0.0	445.4	0.0	98	0.88	0.94	37.2	14.8
4.005	80.529	0.000	0.0	756.1	0.0	115	0.94	0.94	37.2	19.2
4.006	80.110	0.000	0.0	756.1	0.0	115	0.94	0.94	37.2	19.2
7.000	81.850	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
7.001	81.672	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
7.002	81.360	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
7.003	81.201	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
7.004	81.155	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
7.005	80.892	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
7.006	80.790	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.007	109.313	0.729	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
8.000	10.271	0.068	150.0	0.000	311.0	0.0	1.500	o	150	Pipe/Conduit	
8.001	49.399	0.329	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
8.002	26.133	0.174	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
8.003	7.804	0.052	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
8.004	38.296	0.255	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
8.005	12.339	0.082	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
8.006	19.969	0.133	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
4.008	65.883	0.439	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.010	156.471	1.043	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.011	17.268	0.115	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.012	11.978	0.080	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.007	79.749	0.000	0.0	1067.1	0.0	128	0.98	0.94	37.2	22.9
8.000	81.850	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
8.001	81.782	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
8.002	81.452	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
8.003	81.278	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
8.004	81.226	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
8.005	80.971	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
8.006	80.888	0.000	0.0	311.0	0.0	120	0.81	0.71	12.6	12.3
4.008	79.021	0.000	0.0	1378.1	0.0	138	1.01	0.94	37.2	26.0
1.010	78.505	0.000	0.0	2579.3	0.0	176	1.06	0.94	37.2	35.6
1.011	77.462	0.000	0.0	2579.3	0.0	176	1.06	0.94	37.2	35.6
1.012	77.346	0.000	0.0	2579.3	0.0	176	1.06	0.94	37.2	35.6

Manhole Schedules for Foul

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F1	82.700	0.750	Open Manhole	1200	1.000	81.950	225				
F2	82.700	1.149	Open Manhole	1200	1.001	81.551	225	1.000	81.551	225	
F3	82.700	1.241	Open Manhole	1200	1.002	81.459	225	1.001	81.459	225	
F4	82.700	1.376	Open Manhole	1200	1.003	81.324	225	1.002	81.324	225	
F5	82.700	2.108	Open Manhole	1200	1.004	80.592	225	1.003	80.592	225	
F6	82.700	2.618	Open Manhole	1200	1.005	80.082	225	1.004	80.082	225	
F7	82.700	2.694	Open Manhole	1200	1.006	80.006	225	1.005	80.006	225	
F8	82.700	1.050	Open Manhole	1200	2.000	81.650	150				
F9	82.700	1.247	Open Manhole	1200	2.001	81.453	150	2.000	81.453	150	
F10	82.700	1.412	Open Manhole	1200	2.002	81.288	150	2.001	81.288	150	
F11	82.700	3.041	Open Manhole	1200	1.007	79.659	225	1.006	79.659	225	
								2.002	81.197	150	1463
F12	82.200	2.783	Open Manhole	1200	1.008	79.417	225	1.007	79.417	225	
F13	82.700	0.750	Open Manhole	1200	3.000	81.950	150				
F14	82.700	1.074	Open Manhole	1200	3.001	81.626	150	3.000	81.626	150	
F15	82.100	3.251	Open Manhole	1200	1.009	78.849	225	1.008	78.849	225	
								3.001	81.436	150	2512
F16	82.700	0.750	Open Manhole	1200	4.000	81.950	150				
F17	82.700	0.750	Open Manhole	1200	5.000	81.950	150				
F18	82.700	0.841	Open Manhole	1200	5.001	81.859	150	5.000	81.859	150	
F19	82.700	0.899	Open Manhole	1200	5.002	81.801	150	5.001	81.801	150	
F20	82.700	1.017	Open Manhole	1200	4.001	81.683	150	4.000	81.833	150	150
								5.002	81.683	150	
F21	82.700	1.211	Open Manhole	1200	4.002	81.489	150	4.001	81.489	150	
F22	82.700	0.750	Open Manhole	1200	6.000	81.950	150				
F23	82.700	0.836	Open Manhole	1200	6.001	81.864	150	6.000	81.864	150	
F24	82.700	1.017	Open Manhole	1200	6.002	81.683	150	6.001	81.683	150	
F25	82.700	1.100	Open Manhole	1200	6.003	81.600	150	6.002	81.600	150	
F26	82.700	1.445	Open Manhole	1200	4.003	81.255	150	4.002	81.255	150	
								6.003	81.556	150	301
F27	83.000	1.997	Open Manhole	1200	4.004	81.003	225	4.003	81.078	150	
F28	83.000	2.471	Open Manhole	1200	4.005	80.529	225	4.004	80.529	225	
F29	83.000	2.890	Open Manhole	1200	4.006	80.110	225	4.005	80.110	225	
F30	82.600	0.750	Open Manhole	1200	7.000	81.850	150				
F31	82.600	0.928	Open Manhole	1200	7.001	81.672	150	7.000	81.672	150	
F32	82.600	1.240	Open Manhole	1200	7.002	81.360	150	7.001	81.360	150	
F33	82.600	1.399	Open Manhole	1200	7.003	81.201	150	7.002	81.201	150	
F34	82.600	1.445	Open Manhole	1200	7.004	81.155	150	7.003	81.155	150	
F35	82.600	1.708	Open Manhole	1200	7.005	80.892	150	7.004	80.892	150	
F36	82.600	1.810	Open Manhole	1200	7.006	80.790	150	7.005	80.790	150	
F37	82.600	2.851	Open Manhole	1200	4.007	79.749	225	4.006	79.749	225	
								7.006	80.640	150	815
F38	82.600	0.750	Open Manhole	1200	8.000	81.850	150				
F39	82.600	0.818	Open Manhole	1200	8.001	81.782	150	8.000	81.782	150	
F40	82.600	1.148	Open Manhole	1200	8.002	81.452	150	8.001	81.452	150	
F41	82.600	1.322	Open Manhole	1200	8.003	81.278	150	8.002	81.278	150	

Manhole Schedules for Foul

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F42	82.600	1.374	Open Manhole	1200	8.004	81.226	150	8.003	81.226	150	
F43	82.600	1.629	Open Manhole	1200	8.005	80.971	150	8.004	80.971	150	
F44	82.600	1.712	Open Manhole	1200	8.006	80.888	150	8.005	80.888	150	
F45	82.700	3.679	Open Manhole	1200	4.008	79.021	225	4.007	79.021	225	
								8.006	80.755	150	1660
F46	81.100	2.595	Open Manhole	1200	1.010	78.505	225	1.009	78.505	225	
								4.008	78.581	225	77
F47	82.000	4.538	Open Manhole	1200	1.011	77.462	225	1.010	77.462	225	
F48	82.000	4.654	Open Manhole	1200	1.012	77.346	225	1.011	77.346	225	
FPumping Station	83.875	6.608	Open Manhole	225		OUTFALL		1.012	77.267	225	

Free Flowing Outfall Details for Foul

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.012	FPumping Station	83.875	77.267	77.900	225	0

Hotel

Room Name	Room Count	Toilet Count	Sink Count	Shower Count	Bath Count	DU Toilets	DU Sinks	DU Shower	DU Bath	Total
Family Suite	239	1	1	1	1	478	71.7	119.5	143.4	812.6
Grizzly Suite	55	2	3	2	1	220	49.5	55	33	357.5
Kids Cabin	95	1	1	1	1	190	28.5	47.5	57	323
Wolf Den	109	1	1	1	1	218	32.7	54.5	65.4	370.6
									Total Hotel DU:	1863.7
									Frequency Fact:	0.7
									Flow (l/s)	30.22

Water park

Room Name	Room Count	Toilet Count	Sink Count	Shower Count	Urinal Count	DU Toilets	DU Sinks	DU Urinal	DU Bath	Total
Mens Guest Toilet	1	9	10	12	8	18	3	6	4.8	31.8
Womens Guest Toilet	1	13	9	12	0	26	2.7	6	0	34.7
Disabled Guest Toilet	4	1	1	1	0	8	1.2	2	0	11.2
Staff Toilet	1	11	14	6	3	22	4.2	3	1.8	31
									Total Hotel DU:	108.7
									Frequency Fact:	0.7
									Flow (l/s)	7.30

Back of House Estimate

Appliance	DU	Count	Total DU
Wash Basin	0.3	8	2.4
Shower with plug	0.5	2	1
Single urinal with cistern	0.5	2	1
kitchen sink	0.6	5	3
dishwasher	0.6	4	2.4
washing machine up to 12kg	1.2	20	24
WC 9l	2	5	10
Floor gully DN70	0.9	4	3.6
		Total DU	47.4
		Freqency Fact:	0.7
		Flow (l/s):	4.82

Conference Area Estimate

Appliance	DU	Count	Total DU
Wash Basin	0.3	8	2.4
Single urinal with cistern	0.5	6	3
kitchen sink	0.6	2	1.2
dishwasher	0.6	2	1.2
WC 9l	2	8	16
Floor gully DN70	0.9	1	0.9
		Total DU	24.7
		Freqency Fact:	0.7
		Flow (l/s):	3.48

Food Hall Estimate

Appliance	DU	Count	Total DU
Wash Basin	0.3	16	4.8
Single urinal with cistern	0.5	4	2
kitchen sink	0.6	8	4.8
dishwasher	0.6	8	4.8
WC 9l	2	8	16
		Total DU	32.4
		Freqency Fact:	0.7
		Flow (l/s):	3.98

Total Discharge

Area	Total DU	Total Flow (l/s)
Hotel	1863.7	30.22
Water Park Toilets	108.7	7.30
Back of House	47.4	4.82
Conference	24.7	3.48
Food Hall	32.4	3.98
Condensation		1.05
Back Wash Pool		TBC
All		50.85

Appendix H – Existing Land Drainage Note

Proposed Great Wolf Lodge Chesterton, Bicester

Technical Note – Existing Site Ditches

Curtins Ref: 068535-CUR-00-XX-DS-C-0003

Revision: P01

Issue Date: November 2019

Client Name: Great Lakes UK Limited

Site Address: Land to the east of M40 and south of A4095, Chesterton, Bicester

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1.0 Introduction

The proposed drainage strategy for the Great Wolf Lodge development, proposes to divert two existing drainage ditches that cross the Site. The strategy has been outlined in detail in the Below Ground Drainage Strategy (068535-CUR-00-XX-RP-C-00002-P01).

This document has been written to provide further information on the ditches running across the Site.

The approximate location of the ditches is shown in Figure 1-1 below. The ditches are also shown in detail on the topographical survey produced by 1st Horizon (Drawing CS-GW5389-01).

Figure 1-1: Approximate Ditch Location

2.0 Description

As shown above, there are two existing ditches running across the Site from north to south. It is understood that these ditches were constructed by site maintenance staff to manage ground water. This was confirmed by the site staff during a walkover. The two ditches join in an inspection chamber to the north of the existing hotel. From here, any flows are directed to an irrigation pond to the south east of the hotel. The full discharge route is outlined in the Below Ground Drainage Strategy (068535-CUR-00-XX-RP-C-00002-P01).

This section will give an overview of the two ditches. For clarity the ditch closest to the A4095 has been referred to as the northern ditch, with the ditch running closest to the M40 referred to as the southern ditch.

2.1 Southern Ditch

The topographical survey shows the southern ditch to begin in the dense vegetation to the north of the Site. There is no indication from the topographical survey, aerial mapping or site walkovers, that the ditch has any inlets at its origin.

The level at the base of the ditch is 83.332mAOD at its origin, the ditch depth is approximately 500mm. The topographical survey indicates only one piped inlet into the ditch along its length, this is a 300mm diameter pipe adjacent to the inlet to the culvert described below. It is believed this 300mm inlet is a high-level overflow from the lined pond to the south, this is shown in Figure 2-2. The site walkover only encountered small diameter shallow perforated land drains and no other inlets not shown on the topographical survey.

Prior to discharge into the inspection chamber with the northern ditch, the southern ditch is culverted for approximately 50m. The invert level before the ditch enters the culvert is 80.863m with a depth of approximately 1m. The inlet to the culvert was not been highlighted on the topographical survey but observed during a site walkover. This can be seen in Figure 2-1 below.

Figure 2-1: Southern Ditch Culvert Inlet

The area to the south of the southern culvert has been highlighted in Figure 2-2 for clarity. The culvert has been viewed on the Site and the connection between the two ditches confirmed by site maintenance staff.

The ditch was completely dry for its entire length during the walkover and there was no evidence of water retention or regular flow through the ditches for the majority of their length.

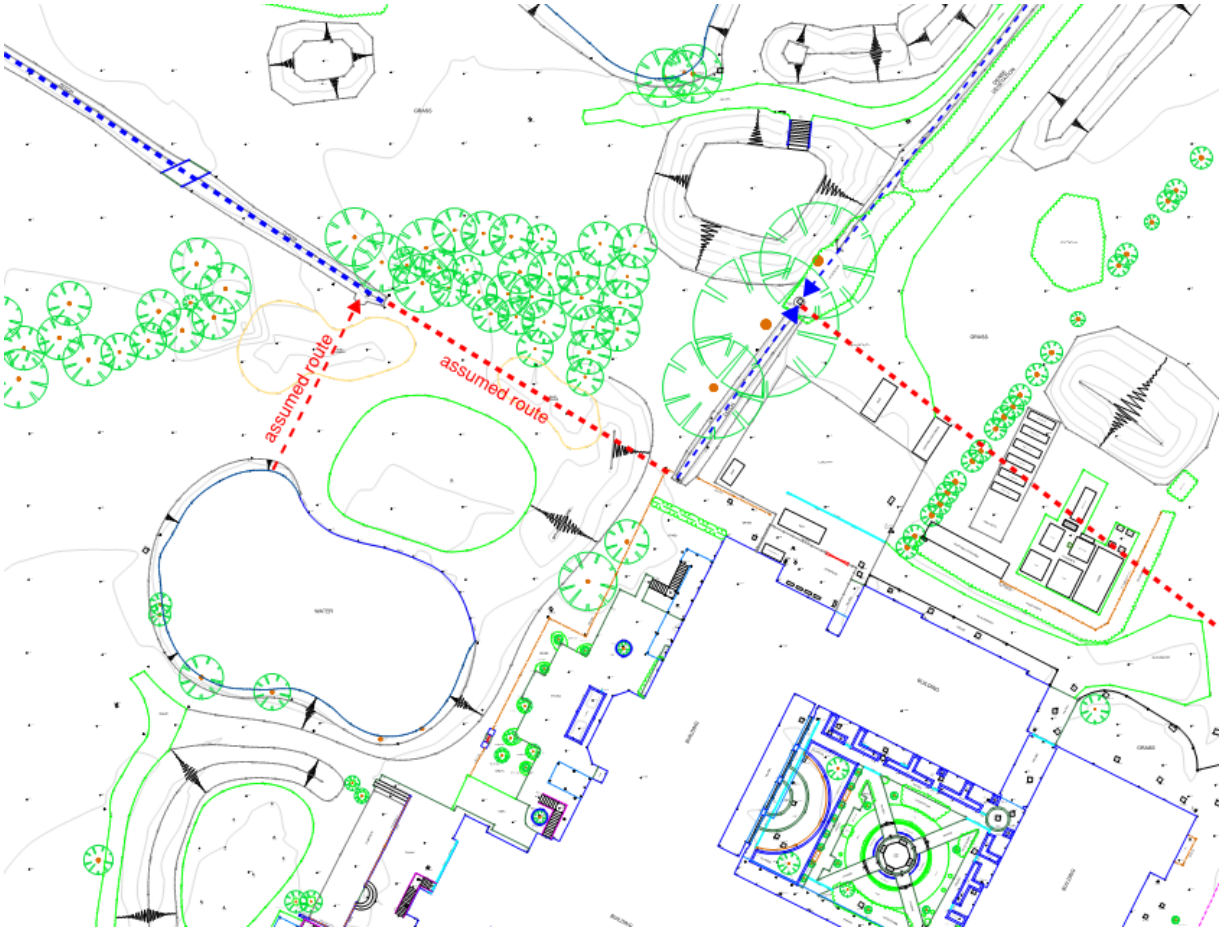

Figure 2-2: Southern Ditch Outfall (Ditch – Blue, Culvert – Red)

2.2 Northern Ditch

The topographical survey indicates that the northern ditch begins at the foot of an earth mound. There is no indication from the topographical survey, aerial mapping or site walkover, that the ditch has any inlets at its origin. This can be seen on the topographical survey produced by 1st Horizon (Drawing CS-GW5389-01).

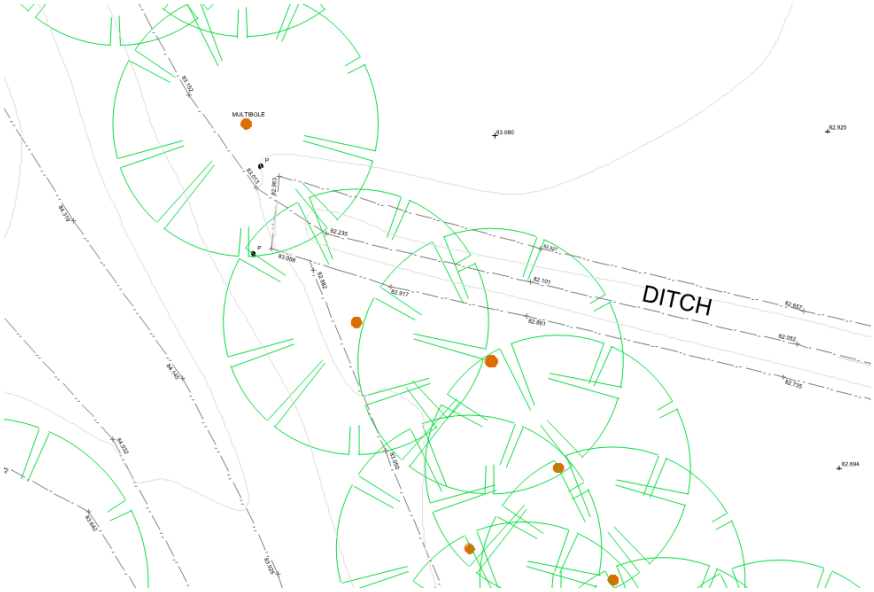

Figure 2-3: Northern Ditch Origin

The level at the base of the ditch at its origin is 82.235mAOD, the depth is approximately 700mm. The topographical survey indicates no piped inlet into the ditch along its entire length, however a secondary ditch connects from the north, mid-way along its length. There are no inlets into secondary ditch. The site walkover only encountered small diameter shallow perforated land drains, that were installed by the land owner and no other inlets.

Prior to discharge into the inspection chamber, where it meets the southern ditch, a small pond is encountered along its length. From visual inspection, this pond appears to not be lined and at the time of the visit was not actively discharging via the downstream ditch. Site staff confirmed this pond to be groundwater fed.

Except for the section where the pond was encountered, the ditch was completely dry for its entire length.

The ditch outlet from the pond has an invert level of 80.574mAOD and a depth of approximately 500mm. The route is shown in Figure 2-4.

Figure 2-4: Northern Ditch Outlet

3.0 Existing Site Wide Drainage Interpretation

3.1 Historic Mapping

It is understood that the formation of the two ditches was by the golf course maintenance staff as a land drainage network to prevent the putting greens and fairways from flooding. It is unclear when these were constructed, however these do not appear on maps from the 80's that were received as part of the Envirocheck report – see Figure 3-1. The golf course can be seen to occupy the Site at this time and other drains have been recorded on the map.

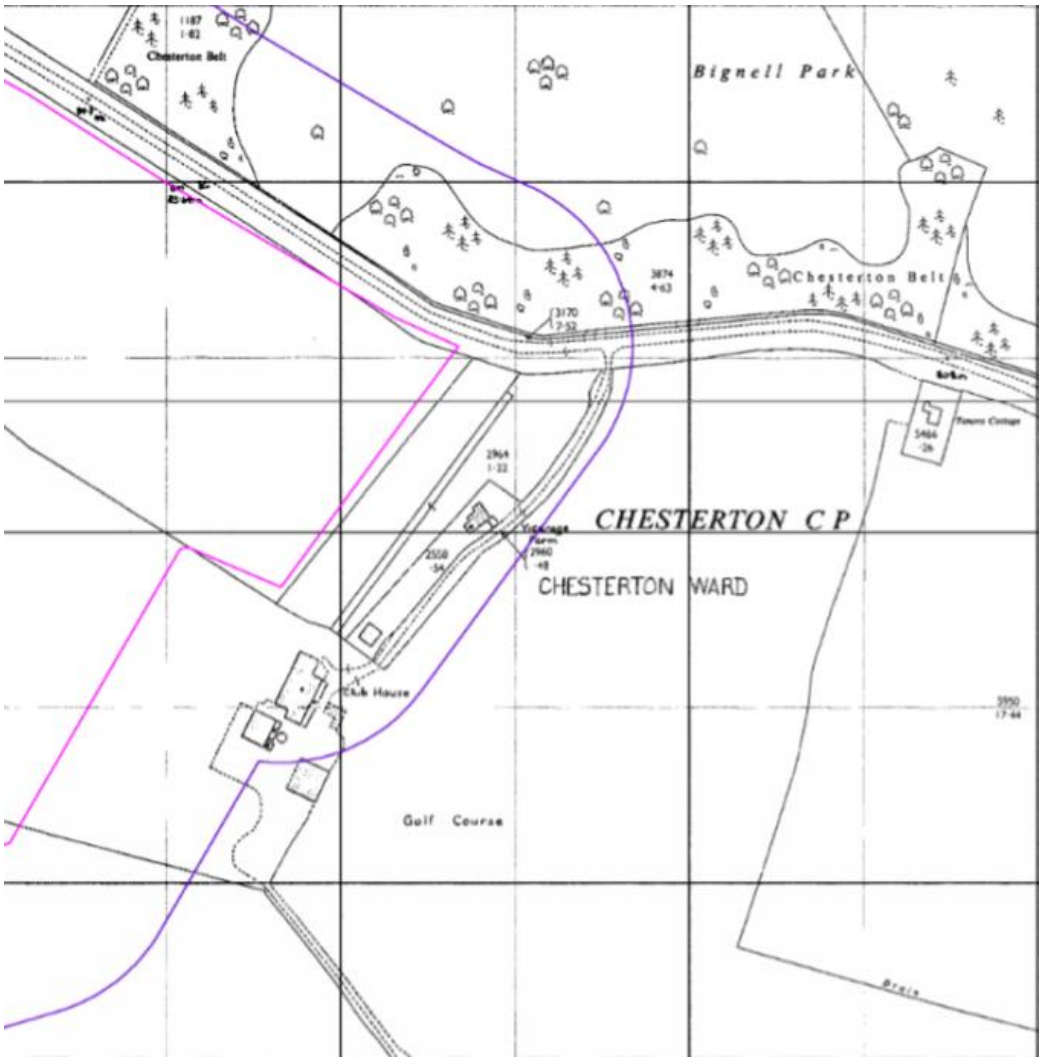

Figure 3-1: Historic Mapping - OS Maps 1980's

3.2 Groundwater

As stated above and confirmed by the site maintenance manager during our visit, it is understood that the usage and original creation of these ditches were to drain the land to the south east of the Site.

The geology of the Site consists of Cornbrash limestone overlying Forest Marble which acts as a partial aquiclude.

A number of ponds have been constructed on the Site which are directly filled by groundwater from the Cornbrash. A UAV survey combined with examination of borehole records around the Site confirms that the groundwater is very high as shown by the UAV plot of pond levels and that soakaways will not work. This has been discussed in the Below Ground Drainage Strategy (068535-CUR-00-XX-RP-C-00002-V02). The results of the UAV survey can be seen in Figure 3-2.

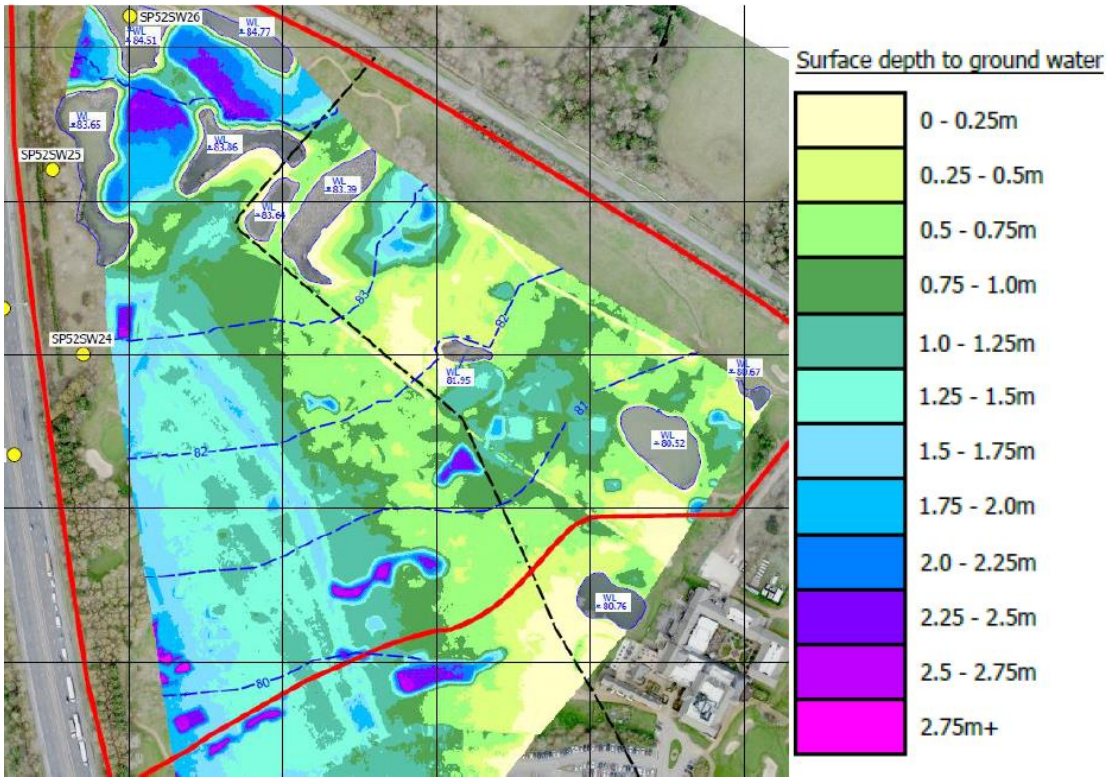

Figure 3-2: UAV Groundwater Survey

It can therefore be seen that the ditches are located in the area where groundwater levels are shallowest. This is further confirmed by the presence of perforated pipework laid across this area of the Site, that outfall into these ditches. These shallow small diameter land drains have been observed during site walk overs and can be seen on aerial imagery. Extracts from the aerial imagery showing the surface marks from the land drains can be seen in Figure 3-3 .

It should also be noted, that due to the expanse of shallow perforated pipework across the Site that outfall to these ditches, large areas of the Site could be considered as positively drained and therefore not behave truly like a greenfield. The proposed strategy is therefore considered to be reducing flood risk across the Site and down stream by removing these ditches and incorporating formal controlled network.

Figure 3-3: Aerial Imagery Evidence of Land Drainage

3.3 Existing Pond Catchment

As previously discussed, these ditches have no formal inlets at their origins and only internal connection within the Site, which have been formed by the site's maintenance team. They are not positively connected to the ponds in the northern region of the Site and do not act as a high-level outfall from the ponds. This is proven by the fact that the northern ditch is separated from the ponds by an earth mound, which would prevent any overland run-off reaching the ditch.

It is also understood that the ponds are not connected above ground in any way to each other or any off-site water feature. This can be seen on the topographical survey. None of the ponds in the northern region of the Site were lined and it is understood they are groundwater fed. It is accepted that the ponds were dug by the existing site owner to form features for the golf course, and subsequently filled with groundwater.

3.4 Oxfordshire Flood Toolkit

The Oxfordshire Flood Toolkit shows all surface water drains, ditches and watercourses in the county and has been used in the production of the site wide drainage strategy. An extract covering the Site and the area around it can be seen in Figure 3-4.

The mapping shows that the Site has a river (Gagle brook) to the east and a number of drains around the Site. However, it shows that there are no drains or watercourses on the Site. The nearest drain is on the Site of the existing gold course, to the south.

Figure 3-4: Oxfordshire Flood Toolkit Extract

4.0 Mitigation

The diverted ditches have been shown on the proposed Drainage Strategy Drawing (06535-CUR-00-XX-DR-C-92000). It is understood that any significant change to land drainage across the Site, may have an effect on the ponds water levels. However, until a detailed site investigation is undertaken, this cannot be known for certain.

In the interim period before a site investigation is completed, it is proposed to divert the land drainage. Following site surveys, if this is proven to not be effective, the strategy will be adjusted accordingly. The proposed diversion can be seen on Drainage Strategy Drawing (06535-CUR-00-XX-DR-C-92000).

The area currently served by the existing perforated pipework, feeding into the ditches to the east is proposed to be drained using a new below ground network of perforated pipework, discharging to the downstream end of the northern drainage ditch. To maintain groundwater levels to the north of the hotel and car park, a swale has been included in the proposed surface water drainage strategy.

This strategy has been developed to maintain groundwater levels in the north, whilst mitigating flood risk in the south. Monitoring of groundwater levels, post planning, will ensure that accurate groundwater levels are known to inform the design of the proposed drainage features.

5.0 Conclusion

From the evidence presented in this technical note, it is concluded that the two ditches running across the Site are not watercourses and were constructed for use as land drains by the golf course and continue to act in this way. Their use is highlighted by the lack of inlets into them and UAV survey indicating high groundwater in their vicinity.

The proposed development requires their removal, as they are located in the building and car park footprint. It has been proposed to maintain the existing drainage regime with the use of land drains and swales as discussed with OCC as the LLFA and outlined in the drainage strategy.

Following receipt of site investigations, the results are to be analysed to ensure that the sites below ground hydrology will not be affected by their removal or the inclusion of the proposed mitigating measures. If this is proven to not be the case, the drainage strategy will be amended to ensure the pond water levels are maintained.

The proposed outfalls of all areas of the Site remains to be the ditch where the existing northern and southern ditch outfall, prior to entering the inspection chamber.

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Appendix I – Proposed Land Drainage General Arrangement