

DRAINAGE STATEMENT

**Barnham, Goodacres -
117**

Croudace
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DRAINAGE STATEMENT

This note sets out the proposed Surface and Foul Water Drainage Strategies for the development as outlined below;

Surface Water System

The Stormwater Drainage Strategy will be developed based on the principles of Sustainable Urban Drainage (SUDS) and taking into account best practice for minimising the environmental impacts of surface water, as outlined in guidance documents such as the National Planning Policy Framework (NPPF), the Building Regulations (approved Document H) and the CIRIA Guide 'C697: The SUDS Manual'. These documents advocate dealing with stormwater as close to the source as possible, ideally by infiltration to the ground underlying the site or where this is not possible, discharging to the nearest water course, with appropriate controls such that the post-development run-off mimics the natural hydrological state of the catchment.

The soils across the site are variable and comprise a mixture of silty, sandy, gravelly CLAY, silty SAND and GRAVEL. However due to the high water table infiltration was not an option for this development. The exiting field ditch system is connected to a private surface water sewer which discharges into the Barnham Rife.

The proposed system comprises of attenuated storage within the sub-base of a tanked permeable access road. Private roof drainage, drives and the road itself are drained at source via the tanked permeable access road, the locations of which are shown on the drainage strategy layout 117/45 in Appendix 1. This has the benefit of capturing surface water close to the source and providing effective treatment especially for the associated vehicular uses i.e. hydrocarbons and heavy metals. The permeable access road is tanked and levelled to convey the surface water to low points with outlets to 3 points in the existing ditch system.

The 3 connection points are also shown on 117/45 and are set out as follows;

- North west corner which will connect to the existing manhole and ditch culvert. This manhole is to be rebuilt to an acceptable standard, with a new manhole cover.
- Mid way along the northern boundary and into Barn Rise. The development flows will discharge into the existing culverted ditch and ditch system along the northern boundary. The ditch is to be re-profiled to ensure it conveys the water to the outlet. The re-profiled ditch levels are shown on 117/45.
- A small catchment will utilise the ditch system to north east of the site. A new oversized pipe will provide adequate storage for the restricted outflow to the ditch.

Please note that all systems have a restricted outflow to mimic the existing greenfield runoff (see Appendix 2). The Micro Drainage simulation results are provided in Appendix 3. A summary table below shows the comparison of the proposed to existing runoff rates.

Storm Event	Existing Greenfield Runoff	Discharge restriction from existing FRA	Proposed development Runoff
1/1 Year	9.1 l/s	23.9l/s	10.4l/s
1/30 Year	24.4l/s		14.7l/s
1/100 + 30%	44.6l/s		20.0l/s

A series of orifice manholes are used to control and restrict the development flows, with the storage being provided in the road sub-base.

Foul Water System

Following a meeting with Southern Water to progress the proposal of a connection to the public system, Croudace Homes have submitted a Section 98 Sewer Requisition application to enable a gravity connection from the proposed development.

At this stage Southern Water have confirmed that there is not sufficient capacity in the sewer to accommodate the development and thus as part of the Section 98 Requisition process will analyse what upgrade works will be required to permit a connection. Following initial discussion from the preliminary modelling it is likely that the scale of the upgrade works would render the development unviable. A formal response from Southern Water is awaited, however on this basis we have progressed the private treatment plant option.

A gravity sewer will collect foul water and convey it to the proposed treatment plant south of the emergency access off Barn Rise. All FW manholes are to have sealed lockable covers. See Appendix 4 for drainage details.

A detailed design of a Batched Reactor treatment plant has been provided by Advanced Aeration. The detailed design is attached in Appendix 5. Please note the plant has been designed to achieve the following water quality levels for the predicted loading;

Final Effluent Quality

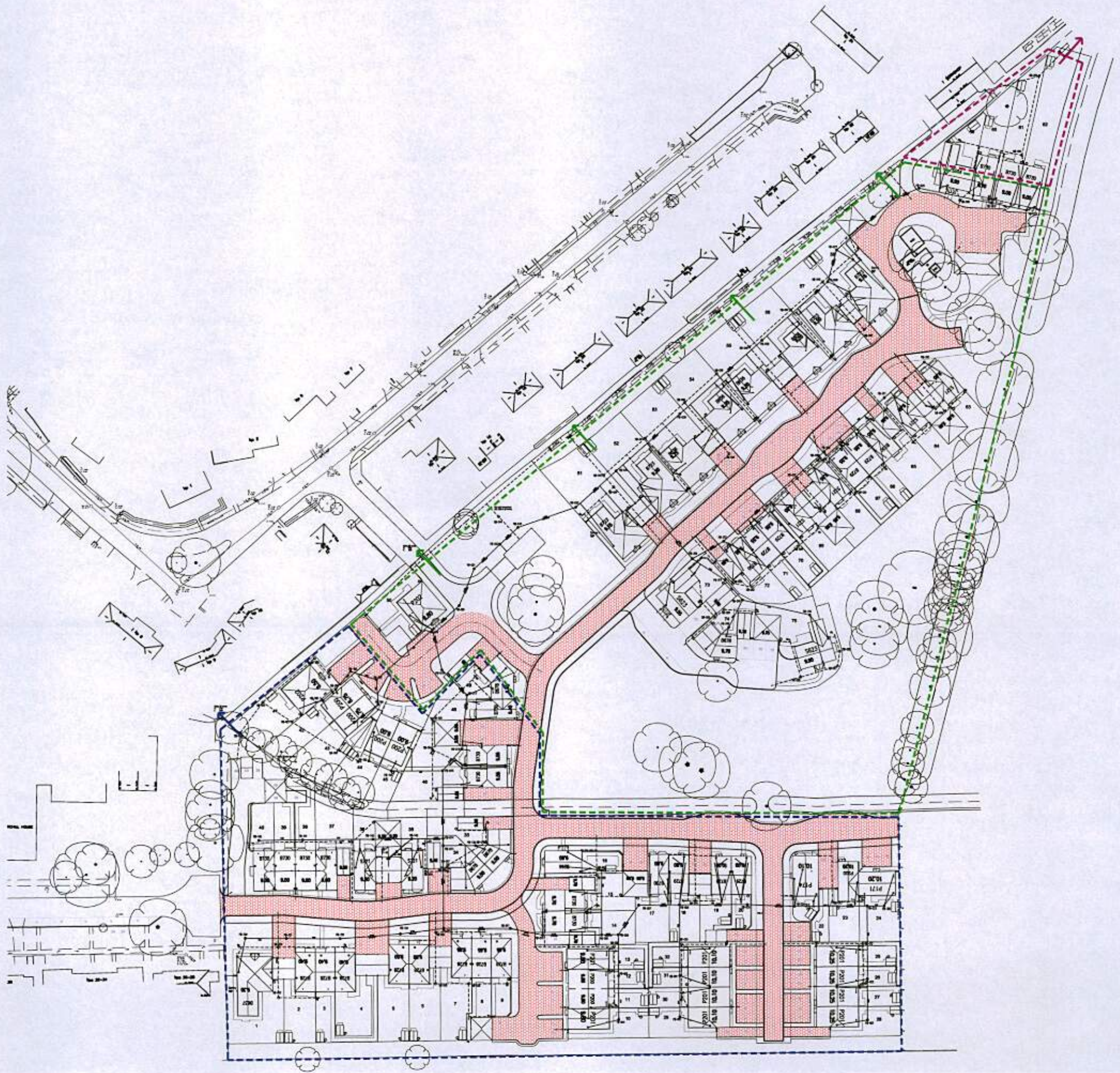
Biological Oxygen Demand (BOD5 ATU)	- 10 mg/l
Suspended Solids 105°C (SS)	- 15 mg/l
Ammonia (NH3-N)	- 2 mg/l

Following treatment of the effluent the clean water will be discharged via a sampling chamber to the surface water system.

APPENDIX 1 – Drainage Strategy Layout 117/45

Legend

Permeable Areas



Rev	Description	Initial	Date
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BARNHAM
GOODACRES

DRAINAGE STRATEGY LAYOUT

SCALE: 1/500 @ A1

DATE: MAY 2014

DRAWN: KH

CHECKED:

DRG.No.: 117/45

APPENDIX 2 – Greenfield Runoff Calculation

APPENDIX 3 – Micro Drainage Simulation

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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	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.350	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	10.000	0.100	100.0	0.050	5.00	0.0	0.600	o	150
1.001	21.460	0.220	97.5	0.045	0.00	0.0	0.600	o	150
2.000	16.640	0.170	97.9	0.029	5.00	0.0	0.600	o	150
2.001	10.360	0.110	94.2	0.000	0.00	0.0	0.600	o	150
2.002	13.570	0.260	52.2	0.000	0.00	0.0	0.600	o	150
1.002	11.240	0.210	53.5	0.000	0.00	0.0	0.600	o	150
3.000	10.000	0.100	100.0	0.028	5.00	0.0	0.600	o	100
3.001	10.000	0.190	52.6	0.035	0.00	0.0	0.600	o	150

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E Area (ha)	E DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.17	8.280	0.050	0.0	0.0	0.0	1.00	17.8	6.8
1.001	50.00	5.52	8.180	0.095	0.0	0.0	0.0	1.02	18.0	12.9
2.000	50.00	5.27	8.500	0.029	0.0	0.0	0.0	1.02	18.0	3.9
2.001	50.00	5.44	8.330	0.029	0.0	0.0	0.0	1.04	18.3	3.9
2.002	50.00	5.60	8.220	0.029	0.0	0.0	0.0	1.40	24.7	3.9
1.002	50.00	5.74	7.960	0.124	0.0	0.0	0.0	1.38	24.4	16.8
3.000	50.00	5.22	8.520	0.028	0.0	0.0	0.0	0.77	6.0	3.8
3.001	50.00	5.34	8.370	0.063	0.0	0.0	0.0	1.39	24.6	8.5

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Network Design Table for Storm										
PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)	
4.000	10.000	0.240	41.7	0.015	5.00	0.0	0.600	o	100	
3.002	18.210	0.130	140.1	0.044	0.00	0.0	0.600	o	225	
5.000	10.570	0.110	96.1	0.032	5.00	0.0	0.600	o	150	
5.001	13.010	0.160	81.3	0.000	0.00	0.0	0.600	o	150	
5.002	13.690	0.170	80.5	0.000	0.00	0.0	0.600	o	150	
3.003	12.360	0.100	123.5	0.000	0.00	0.0	0.600	o	225	
6.000	10.000	0.100	100.0	0.030	5.00	0.0	0.600	o	100	
6.001	9.080	0.091	99.8	0.060	0.00	0.0	0.600	o	150	
1.003	41.530	0.307	135.3	0.000	0.00	0.0	0.600	o	300	
7.000	10.000	0.100	100.0	0.055	5.00	0.0	0.600	o	150	
7.001	20.710	0.082	252.6	0.090	0.00	0.0	0.600	o	225	
1.004	10.000	0.100	100.0	0.000	0.00	0.0	0.600	o	300	
Network Results Table										
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E Area (ha)	E DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	50.00	5.14	8.470	0.015	0.0	0.0	0.0	1.20	9.4	2.0
3.002	50.00	5.61	8.105	0.122	0.0	0.0	0.0	1.10	43.8	16.5
5.000	50.00	5.17	8.290	0.032	0.0	0.0	0.0	1.03	18.1	4.3
5.001	50.00	5.37	8.180	0.032	0.0	0.0	0.0	1.12	19.7	4.3
5.002	50.00	5.57	8.020	0.032	0.0	0.0	0.0	1.12	19.8	4.3
3.003	50.00	5.79	7.775	0.154	0.0	0.0	0.0	1.18	46.7	20.9
6.000	50.00	5.22	8.400	0.030	0.0	0.0	0.0	0.77	6.0	4.1
6.001	50.00	5.37	8.250	0.090	0.0	0.0	0.0	1.01	17.8	12.2
1.003	50.00	6.30	7.600	0.368	0.0	0.0	0.0	1.35	95.4	49.8
7.000	50.00	5.17	7.625	0.055	0.0	0.0	0.0	1.00	17.8	7.4
7.001	50.00	5.59	7.450	0.145	0.0	0.0	0.0	0.82	32.5	19.6
1.004	50.00	6.41	7.293	0.513	0.0	0.0	0.0	1.57	111.1	69.5
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Manhole Schedules for Storm										
MH Name	MH CL (m)	MH Depth (m)	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	9.210	0.930	1050	1.000	8.280	150				
2	9.110	0.930	1050	1.001	8.180	150	1.000	8.180	150	
3	9.100	0.600	1050	2.000	8.500	150				
3	9.000	0.670	1050	2.001	8.330	150	2.000	8.330	150	
3	9.000	0.780	1050	2.002	8.220	150	2.001	8.220	150	
4	9.000	1.040	1050	1.002	7.960	150	1.001	7.960	150	
							2.002	7.960	150	
5	9.450	0.930	1050	3.000	8.520	100				
6	9.250	0.880	1050	3.001	8.370	150	3.000	8.420	100	
7	9.350	0.880	1050	4.000	8.470	100				
8	9.110	1.005	1050	3.002	8.105	225	3.001	8.180	150	
							4.000	8.230	100	
11	9.050	0.760	1050	5.000	8.290	150				
11	8.900	0.720	1050	5.001	8.180	150	5.000	8.180	150	
9	9.000	0.980	1050	5.002	8.020	150	5.001	8.020	150	
10	8.850	1.075	1050	3.003	7.775	225	3.002	7.975	225	200
							5.002	7.850	150	
11	9.000	0.600	1050	6.000	8.400	100				
11	9.000	0.750	1050	6.001	8.250	150	6.000	8.300	100	
12	8.500	0.900	1050	1.003	7.600	300	1.002	7.750	150	
							3.003	7.675	225	
							6.001	8.159	150	409
14	8.500	0.875	1050	7.000	7.625	150				
15	8.880	1.430	1050	7.001	7.450	225	7.000	7.525	150	
16	8.085	0.792	1050	1.004	7.293	300	1.003	7.293	300	
							7.001	7.368	225	
	8.000	0.807	0		OUTFALL		1.004	7.193	300	

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PIPELINE SCHEDULES for Storm							
Upstream Manhole							
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.000	o	150	1	9.210	8.280	0.780	1050
1.001	o	150	2	9.110	8.180	0.780	1050
2.000	o	150	3	9.100	8.500	0.450	1050
2.001	o	150	3	9.000	8.330	0.520	1050
2.002	o	150	3	9.000	8.220	0.630	1050
1.002	o	150	4	9.000	7.960	0.890	1050
3.000	o	100	5	9.450	8.520	0.830	1050
3.001	o	150	6	9.250	8.370	0.730	1050
4.000	o	100	7	9.350	8.470	0.780	1050
3.002	o	225	8	9.110	8.105	0.780	1050
5.000	o	150	11	9.050	8.290	0.610	1050
5.001	o	150	11	8.900	8.180	0.570	1050
5.002	o	150	9	9.000	8.020	0.830	1050
Downstream Manhole							
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.000	10.000	100.0	2	9.110	8.180	0.780	1050
1.001	21.460	97.5	4	9.000	7.960	0.890	1050
2.000	16.640	97.9	3	9.000	8.330	0.520	1050
2.001	10.360	94.2	3	9.000	8.220	0.630	1050
2.002	13.570	52.2	4	9.000	7.960	0.890	1050
1.002	11.240	53.5	12	8.500	7.750	0.600	1050
3.000	10.000	100.0	6	9.250	8.420	0.730	1050
3.001	10.000	52.6	8	9.110	8.180	0.780	1050
4.000	10.000	41.7	8	9.110	8.230	0.780	1050
3.002	18.210	140.1	10	8.850	7.975	0.650	1050
5.000	10.570	96.1	11	8.900	8.180	0.570	1050
5.001	13.010	81.3	9	9.000	8.020	0.830	1050
5.002	13.690	80.5	10	8.850	7.850	0.850	1050
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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
3.003	o	225	10	8.850	7.775	0.850	1050
6.000	o	100	11	9.000	8.400	0.500	1050
6.001	o	150	11	9.000	8.250	0.600	1050
1.003	o	300	12	8.500	7.600	0.600	1050
7.000	o	150	14	8.500	7.625	0.725	1050
7.001	o	225	15	8.880	7.450	1.205	1050
1.004	o	300	16	8.085	7.293	0.492	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
3.003	12.360	123.5	12	8.500	7.675	0.600	1050
6.000	10.000	100.0	11	9.000	8.300	0.600	1050
6.001	9.080	99.8	12	8.500	8.159	0.191	1050
1.003	41.530	135.3	16	8.085	7.293	0.492	1050
7.000	10.000	100.0	15	8.880	7.525	1.205	1050
7.001	20.710	252.6	16	8.085	7.368	0.492	1050
1.004	10.000	100.0		8.000	7.193	0.507	0

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)
1.004		8.000	7.193	0.000	0	0

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Online Controls for Storm

Orifice Manhole: 2, DS/PN: 1.001, Volume (m³): 1.0

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 8.180

Orifice Manhole: 4, DS/PN: 1.002, Volume (m³): 1.5

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 7.960

Orifice Manhole: 6, DS/PN: 3.001, Volume (m³): 0.8

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 8.370

Orifice Manhole: 8, DS/PN: 3.002, Volume (m³): 1.1

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 8.105

Orifice Manhole: 10, DS/PN: 3.003, Volume (m³): 1.8

Diameter (m) 0.055 Discharge Coefficient 0.600 Invert Level (m) 7.775

Orifice Manhole: 11, DS/PN: 6.001, Volume (m³): 0.7

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 8.250

Orifice Manhole: 12, DS/PN: 1.003, Volume (m³): 1.6

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 7.600

Orifice Manhole: 15, DS/PN: 7.001, Volume (m³): 1.4

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 7.450

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Storage Structures for Storm

Porous Car Park Manhole: 2, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	16.5
Membrane Percolation (mm/hr)	1	Length (m)	16.5
Max Percolation (l/s)	0.1	Slope (1:X)	150.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.180	Cap Volume Depth (m)	0.490

Porous Car Park Manhole: 6, DS/PN: 3.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.6
Membrane Percolation (mm/hr)	1	Length (m)	18.6
Max Percolation (l/s)	0.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.370	Cap Volume Depth (m)	0.490

Porous Car Park Manhole: 8, DS/PN: 3.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.5
Membrane Percolation (mm/hr)	1	Length (m)	15.5
Max Percolation (l/s)	0.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.105	Cap Volume Depth (m)	0.490

Porous Car Park Manhole: 11, DS/PN: 6.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	24.4
Membrane Percolation (mm/hr)	1	Length (m)	24.4
Max Percolation (l/s)	0.2	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.300	Cap Volume Depth (m)	0.490

Swale Manhole: 12, DS/PN: 1.003

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	120.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	2.0
Safety Factor	2.0	Slope (1:X)	200.0
Porosity	1.00	Cap Volume Depth (m)	0.400
Invert Level (m)	7.600	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.2	Include Swale Volume	Yes

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

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%	30/30 Winter				
1.001	60 Winter	1	0%	30/15 Summer				
2.000	15 Winter	1	0%	100/15 Summer				
2.001	15 Winter	1	0%	100/15 Summer				
2.002	60 Winter	1	0%	30/15 Summer				
1.002	60 Winter	1	0%					
3.000	15 Winter	1	0%	30/15 Summer				
3.001	600 Winter	1	0%	30/60 Summer				
4.000	15 Winter	1	0%	100/180 Winter				
3.002	1440 Winter	1	0%	30/120 Summer				
5.000	15 Winter	1	0%	100/15 Summer				
5.001	15 Winter	1	0%	30/15 Winter				
5.002	15 Winter	1	0%	30/15 Summer				
3.003	15 Winter	1	0%					
6.000	15 Winter	1	0%	30/15 Summer				
6.001	120 Winter	1	0%	30/15 Winter				
1.003	240 Winter	1	0%	1/30 Winter				
7.000	15 Winter	1	0%	30/15 Winter				
7.001	240 Winter	1	0%	100/30 Summer				
1.004	240 Winter	1	0%					

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

Storm

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	8.346	-0.084	0.000	0.40	0.0	6.3	OK
1.001	2	8.292	-0.038	0.000	0.16	0.0	2.7	OK
2.000	3	8.548	-0.102	0.000	0.22	0.0	3.6	OK
2.001	3	8.378	-0.102	0.000	0.22	0.0	3.6	OK
2.002	3	8.265	-0.105	0.000	0.09	0.0	2.0	OK
1.002	4	8.260	0.151	0.000	0.12	0.0	2.7	SURCHARGED
3.000	5	8.578	-0.042	0.000	0.62	0.0	3.5	OK
3.001	6	8.479	-0.041	0.000	0.01	0.0	0.3	OK
4.000	7	8.502	-0.068	0.000	0.22	0.0	1.9	OK
3.002	8	8.289	-0.041	0.000	0.01	0.0	0.3	OK
5.000	11	8.341	-0.099	0.000	0.25	0.0	4.0	OK
5.001	11	8.228	-0.102	0.000	0.22	0.0	4.0	OK
5.002	9	8.068	-0.102	0.000	0.22	0.0	4.1	OK
3.003	10	8.041	0.041	0.000	0.08	0.0	3.0	SURCHARGED
6.000	11	8.461	-0.039	0.000	0.66	0.0	3.7	OK
6.001	11	8.363	-0.037	0.000	0.10	0.0	1.6	OK
1.003	12	7.981	0.081	0.000	0.04	0.0	3.1	SURCHARGED
7.000	14	7.695	-0.080	0.000	0.44	0.0	6.9	OK
7.001	15	7.568	-0.107	0.000	0.05	0.0	1.6	OK
1.004	16	7.340	-0.253	0.000	0.06	0.0	4.7	OK

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

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	120 Winter	30	0%	30/30 Winter				
1.001	120 Winter	30	0%	30/15 Summer				
2.000	15 Winter	30	0%	100/15 Summer				
2.001	15 Winter	30	0%	100/15 Summer				
2.002	15 Winter	30	0%	30/15 Summer				
1.002	30 Winter	30	0%					
3.000	15 Winter	30	0%	30/15 Summer				
3.001	720 Winter	30	0%	30/60 Summer				
4.000	15 Winter	30	0%	100/180 Winter				
3.002	720 Winter	30	0%	30/120 Summer				
5.000	15 Winter	30	0%	100/15 Summer				
5.001	15 Winter	30	0%	30/15 Winter				
5.002	15 Winter	30	0%	30/15 Summer				
3.003	15 Winter	30	0%					
6.000	15 Winter	30	0%	30/15 Summer				
6.001	120 Winter	30	0%	30/15 Winter				
1.003	360 Winter	30	0%	1/30 Winter				
7.000	15 Winter	30	0%	30/15 Winter				
7.001	240 Winter	30	0%	100/30 Summer				
1.004	360 Winter	30	0%					

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

for Storm

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	8.463	0.033	0.000	0.32	0.0	5.0	SURCHARGED
1.001	2	8.458	0.128	0.000	0.16	0.0	2.6	SURCHARGED
2.000	3	8.579	-0.071	0.000	0.53	0.0	8.8	OK
2.001	3	8.464	-0.016	0.000	0.52	0.0	8.4	OK
2.002	3	8.440	0.070	0.000	0.32	0.0	7.2	SURCHARGED
1.002	4	8.419	0.309	0.000	0.16	0.0	3.4	SURCHARGED
3.000	5	8.731	0.111	0.000	1.46	0.0	8.2	SURCHARGED
3.001	6	8.602	0.082	0.000	0.02	0.0	0.3	SURCHARGED
4.000	7	8.522	-0.048	0.000	0.53	0.0	4.6	OK
3.002	8	8.469	0.139	0.000	0.01	0.0	0.5	SURCHARGED
5.000	11	8.375	-0.065	0.000	0.61	0.0	9.8	OK
5.001	11	8.355	0.025	0.000	0.54	0.0	9.7	SURCHARGED
5.002	9	8.339	0.169	0.000	0.43	0.0	7.8	SURCHARGED
3.003	10	8.323	0.323	0.000	0.10	0.0	4.2	SURCHARGED
6.000	11	8.631	0.131	0.000	1.50	0.0	8.4	SURCHARGED
6.001	11	8.441	0.041	0.000	0.14	0.0	2.1	SURCHARGED
1.003	12	8.189	0.289	0.000	0.04	0.0	3.9	SURCHARGED
7.000	14	7.783	0.008	0.000	1.05	0.0	16.6	SURCHARGED
7.001	15	7.666	-0.009	0.000	0.08	0.0	2.3	OK
1.004	16	7.348	-0.245	0.000	0.08	0.0	6.1	OK

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

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	120 Winter	100	+30%	30/30 Winter				
1.001	120 Winter	100	+30%	30/15 Summer				
2.000	15 Winter	100	+30%	100/15 Summer				
2.001	15 Winter	100	+30%	100/15 Summer				
2.002	120 Winter	100	+30%	30/15 Summer				
1.002	120 Winter	100	+30%					
3.000	15 Winter	100	+30%	30/15 Summer				
3.001	960 Winter	100	+30%	30/60 Summer				
4.000	960 Winter	100	+30%	100/180 Winter				
3.002	960 Winter	100	+30%	30/120 Summer				
5.000	30 Winter	100	+30%	100/15 Summer				
5.001	30 Winter	100	+30%	30/15 Winter				
5.002	30 Winter	100	+30%	30/15 Summer				
3.003	30 Winter	100	+30%					
6.000	15 Winter	100	+30%	30/15 Summer				
6.001	180 Winter	100	+30%	30/15 Winter				
1.003	360 Winter	100	+30%	1/30 Winter				
7.000	15 Winter	100	+30%	30/15 Winter				
7.001	180 Winter	100	+30%	100/30 Summer				
1.004	360 Winter	100	+30%					

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

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	8.709	0.279	0.000	0.54	0.0	8.5	SURCHARGED
1.001	2	8.704	0.374	0.000	0.18	0.0	3.0	SURCHARGED
2.000	3	8.757	0.107	0.000	0.79	0.0	13.2	SURCHARGED
2.001	3	8.681	0.201	0.000	0.69	0.0	11.4	SURCHARGED
2.002	3	8.659	0.289	0.000	0.20	0.0	4.4	SURCHARGED
1.002	4	8.655	0.546	0.000	0.18	0.0	3.9	SURCHARGED
3.000	5	9.069	0.449	0.000	2.32	0.0	13.0	SURCHARGED
3.001	6	8.836	0.316	0.000	0.02	0.0	0.4	SURCHARGED
4.000	7	8.912	0.342	0.000	0.06	0.0	0.6	SURCHARGED
3.002	8	8.910	0.580	0.000	0.02	0.0	0.6	FLOOD RISK
5.000	11	8.867	0.427	0.000	0.72	0.0	11.6	FLOOD RISK
5.001	11	8.844	0.514	0.000	0.54	0.0	9.8	FLOOD RISK
5.002	9	8.819	0.649	0.000	0.43	0.0	7.7	FLOOD RISK
3.003	10	8.794	0.794	0.000	0.15	0.0	5.9	FLOOD RISK
6.000	11	8.975	0.475	0.000	2.33	0.0	13.1	FLOOD RISK
6.001	11	8.529	0.129	0.000	0.17	0.0	2.6	SURCHARGED
1.003	12	8.379	0.479	0.000	0.05	0.0	4.5	FLOOD RISK
7.000	14	7.989	0.214	0.000	1.77	0.0	28.0	SURCHARGED
7.001	15	7.783	0.108	0.000	0.10	0.0	2.9	SURCHARGED
1.004	16	7.354	-0.239	0.000	0.09	0.0	7.3	OK

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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	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.350	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	14.810	0.080	185.1	0.026	5.00	0.0	0.600	o	150
1.001	19.690	0.100	196.9	0.000	0.00	0.0	0.600	o	150
1.002	7.430	0.050	148.6	0.000	0.00	0.0	0.600	o	150
1.003	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	150

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E Area (ha)	E DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.34	8.350	0.026	0.0	0.0	0.0	0.74	13.0	3.5
1.001	50.00	5.80	8.270	0.026	0.0	0.0	0.0	0.71	12.6	3.5
1.002	50.00	5.95	8.170	0.026	0.0	0.0	0.0	0.82	14.5	3.5
1.003	50.00	6.03	8.120	0.026	0.0	0.0	0.0	1.00	17.8	3.5

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	8.750	0.400	1050	1.000	8.350	150				
2	8.800	0.530	1050	1.001	8.270	150	1.000	8.270	150	
3	8.650	0.480	1050	1.002	8.170	150	1.001	8.170	150	
4	8.650	0.530	1050	1.003	8.120	150	1.002	8.120	150	
	8.650	0.580	0		OUTFALL		1.003	8.070	150	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.000	o	150	1	8.750	8.350	0.250	1050
1.001	o	150	2	8.800	8.270	0.380	1050
1.002	o	150	3	8.650	8.170	0.330	1050
1.003	o	150	4	8.650	8.120	0.380	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.000	14.810	185.1	2	8.800	8.270	0.380	1050
1.001	19.690	196.9	3	8.650	8.170	0.330	1050
1.002	7.430	148.6	4	8.650	8.120	0.380	1050
1.003	5.000	100.0		8.650	8.070	0.430	0

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)
1.003		8.650	8.070	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline 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)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

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Storage Structures for Storm

Swale Manhole: 4, DS/PN: 1.003

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	10.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	200.0
Porosity	1.00	Cap Volume Depth (m)	0.300
Invert Level (m)	8.120	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5	Include Swale Volume	Yes

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

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, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%	100/15 Summer				
1.001	15 Winter	1	0%	100/15 Summer				
1.002	30 Winter	1	0%	30/15 Summer				
1.003	30 Winter	1	0%	30/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	8.403	-0.097	0.000	0.27	0.0	3.2	OK
1.001	2	8.323	-0.097	0.000	0.27	0.0	3.2	OK
1.002	3	8.241	-0.079	0.000	0.20	0.0	2.4	OK
1.003	4	8.238	-0.032	0.000	0.07	0.0	1.0	OK

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

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, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%	100/15 Summer				
1.001	30 Winter	30	0%	100/15 Summer				
1.002	60 Winter	30	0%	30/15 Summer				
1.003	60 Winter	30	0%	30/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	8.441	-0.059	0.000	0.66	0.0	7.9	OK
1.001	2	8.367	-0.053	0.000	0.54	0.0	6.3	OK
1.002	3	8.357	0.037	0.000	0.30	0.0	3.8	FLOOD RISK
1.003	4	8.353	0.083	0.000	0.11	0.0	1.5	FLOOD RISK

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

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, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	60 Winter	100	+30%	100/15 Summer				
1.001	60 Winter	100	+30%	100/15 Summer				
1.002	60 Winter	100	+30%	30/15 Summer				
1.003	60 Winter	100	+30%	30/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	8.606	0.106	0.000	0.60	0.0	7.2	FLOOD RISK
1.001	2	8.597	0.177	0.000	0.55	0.0	6.6	FLOOD RISK
1.002	3	8.586	0.266	0.000	0.49	0.0	6.1	FLOOD RISK
1.003	4	8.579	0.309	0.000	0.16	0.0	2.2	FLOOD RISK

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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	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.350	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	25.000	0.250	100.0	0.110	5.00	0.0	0.600	o	150
1.001	25.000	0.250	100.0	0.118	0.00	0.0	0.600	o	225
2.000	25.000	0.250	100.0	0.063	5.00	0.0	0.600	o	150
1.002	50.000	0.500	100.0	0.250	0.00	0.0	0.600	o	300
1.003	5.000	0.050	100.0	0.027	0.00	0.0	0.600	o	300
1.004	12.104	0.110	110.0	0.000	0.00	0.0	0.600	o	300
1.005	5.670	0.050	113.4	0.022	0.00	0.0	0.600	o	300
1.006	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.41	9.070	0.110	0.0	0.0	0.0	1.00	17.8	14.9
1.001	50.00	5.73	8.745	0.228	0.0	0.0	0.0	1.31	52.0	30.9
2.000	50.00	5.41	8.570	0.063	0.0	0.0	0.0	1.00	17.8	8.5
1.002	50.00	6.26	8.170	0.541	0.0	0.0	0.0	1.57	111.1	73.3
1.003	50.00	6.32	7.670	0.568	0.0	0.0	0.0	1.57	111.1	76.9
1.004	50.00	6.45	7.620	0.568	0.0	0.0	0.0	1.50	105.9	76.9
1.005	50.00	6.52	7.510	0.590	0.0	0.0	0.0	1.48	104.3	79.9
1.006	50.00	6.57	7.460	0.590	0.0	0.0	0.0	1.57	111.1	79.9

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Date 21/05/2014 09:20 File SOUTH SITE AREA.MDX				Designed By whitesides Checked By						
Elstree Computing Ltd				Network W.12.4						
Manhole Schedules for Storm										
MH Name	MH CL (m)	MH Depth (m)	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	10.000	0.930	1050	1.000	9.070	150				
2	9.750	1.005	1050	1.001	8.745	225	1.000	8.820	150	
3	9.500	0.930	1050	2.000	8.570	150				
4	9.250	1.080	1050	1.002	8.170	300	1.001	8.495	225	250
							2.000	8.320	150	
5	8.750	1.080	1050	1.003	7.670	300	1.002	7.670	300	
6	8.550	0.930	1050	1.004	7.620	300	1.003	7.620	300	
7	8.150	0.640	1050	1.005	7.510	300	1.004	7.510	300	
8	7.795	0.335	1050	1.006	7.460	300	1.005	7.460	300	
	7.800	0.390	0		OUTFALL		1.006	7.410	300	
©1982-2010 Micro Drainage Ltd										

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.000	o	150	1	10.000	9.070	0.780	1050
1.001	o	225	2	9.750	8.745	0.780	1050
2.000	o	150	3	9.500	8.570	0.780	1050
1.002	o	300	4	9.250	8.170	0.780	1050
1.003	o	300	5	8.750	7.670	0.780	1050
1.004	o	300	6	8.550	7.620	0.630	1050
1.005	o	300	7	8.150	7.510	0.340	1050
1.006	o	300	8	7.795	7.460	0.035	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.000	25.000	100.0	2	9.750	8.820	0.780	1050
1.001	25.000	100.0	4	9.250	8.495	0.530	1050
2.000	25.000	100.0	4	9.250	8.320	0.780	1050
1.002	50.000	100.0	5	8.750	7.670	0.780	1050
1.003	5.000	100.0	6	8.550	7.620	0.630	1050
1.004	12.104	110.0	7	8.150	7.510	0.340	1050
1.005	5.670	113.4	8	7.795	7.460	0.035	1050
1.006	5.000	100.0		7.800	7.410	0.090	0

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)
1.006		7.800	7.410	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	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	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	5
Number of Online Controls	5	Number of Time/Area Diagrams	0
Number of Offline 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)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Orifice Manhole: 2, DS/PN: 1.001, Volume (m³): 1.3

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 8.745

Orifice Manhole: 4, DS/PN: 1.002, Volume (m³): 2.3

Diameter (m) 0.070 Discharge Coefficient 0.600 Invert Level (m) 8.170

Orifice Manhole: 5, DS/PN: 1.003, Volume (m³): 4.4

Diameter (m) 0.080 Discharge Coefficient 0.600 Invert Level (m) 7.670

Orifice Manhole: 6, DS/PN: 1.004, Volume (m³): 1.1

Diameter (m) 0.080 Discharge Coefficient 0.600 Invert Level (m) 7.620

Orifice Manhole: 8, DS/PN: 1.006, Volume (m³): 0.6

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 7.460

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Storage Structures for Storm

Porous Car Park Manhole: 1, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	26.1
Membrane Percolation (mm/hr)	1	Length (m)	26.1
Max Percolation (l/s)	0.2	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.070	Cap Volume Depth (m)	0.490

Porous Car Park Manhole: 2, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	22.1
Membrane Percolation (mm/hr)	1	Length (m)	22.1
Max Percolation (l/s)	0.1	Slope (1:X)	150.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.745	Cap Volume Depth (m)	0.490

Porous Car Park Manhole: 3, DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	19.3
Membrane Percolation (mm/hr)	1	Length (m)	19.3
Max Percolation (l/s)	0.1	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.570	Cap Volume Depth (m)	0.490

Porous Car Park Manhole: 4, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	22.0
Membrane Percolation (mm/hr)	1	Length (m)	22.0
Max Percolation (l/s)	0.1	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.170	Cap Volume Depth (m)	0.490

Porous Car Park Manhole: 5, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.8
Membrane Percolation (mm/hr)	1	Length (m)	9.8
Max Percolation (l/s)	0.0	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	7.670	Cap Volume Depth (m)	0.490

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

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	600 Winter	30	0%	100/30 Winter				
1.001	600 Winter	30	0%	1/240 Winter				
2.000	180 Winter	30	0%	100/15 Winter				
1.002	180 Winter	30	0%	30/15 Summer				
1.003	240 Winter	30	0%	30/30 Summer				
1.004	240 Winter	30	0%	30/180 Winter				
1.005	600 Winter	30	0%					
1.006	600 Winter	30	0%	100/180 Winter				

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	9.202	-0.018	0.000	0.21	0.0	3.5	OK
1.001	2	9.199	0.229	0.000	0.03	0.0	1.2	SURCHARGED
2.000	3	8.680	-0.040	0.000	0.29	0.0	4.9	OK
1.002	4	8.674	0.204	0.000	0.07	0.0	7.1	SURCHARGED
1.003	5	8.263	0.293	0.000	0.11	0.0	6.8	SURCHARGED
1.004	6	8.016	0.096	0.000	0.08	0.0	6.8	SURCHARGED
1.005	7	7.631	-0.179	0.000	0.11	0.0	7.0	OK
1.006	8	7.635	-0.125	0.000	0.12	0.0	7.1	FLOOD RISK

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

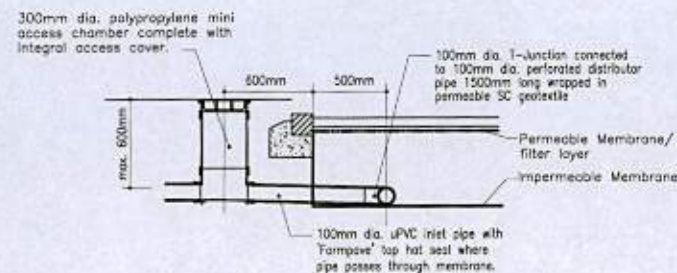
Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

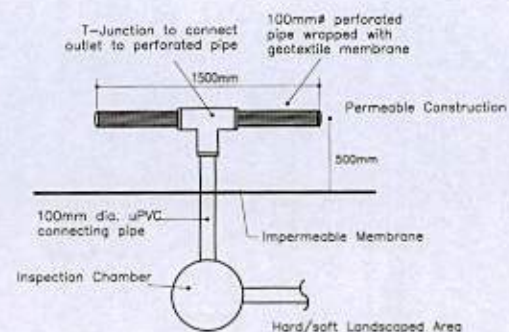
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	600 Winter	100	+30%	100/30 Winter				
1.001	600 Winter	100	+30%	1/240 Winter				
2.000	180 Winter	100	+30%	100/15 Winter				
1.002	120 Winter	100	+30%	30/15 Summer				
1.003	180 Winter	100	+30%	30/30 Summer				
1.004	180 Winter	100	+30%	30/180 Winter				
1.005	180 Winter	100	+30%					
1.006	180 Winter	100	+30%	100/180 Winter				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	9.438	0.218	0.000	0.26	0.0	4.3	SURCHARGED
1.001	2	9.435	0.465	0.000	0.03	0.0	1.5	SURCHARGED
2.000	3	9.096	0.376	0.000	0.39	0.0	6.6	SURCHARGED
1.002	4	9.248	0.778	0.000	0.10	0.0	10.2	FLOOD RISK
1.003	5	8.711	0.741	0.000	0.15	0.0	9.1	FLOOD RISK
1.004	6	8.252	0.332	0.000	0.11	0.0	9.0	FLOOD RISK
1.005	7	7.773	-0.037	0.000	0.17	0.0	10.5	OK
1.006	8	7.765	0.005	0.000	0.17	0.0	10.5	FLOOD RISK

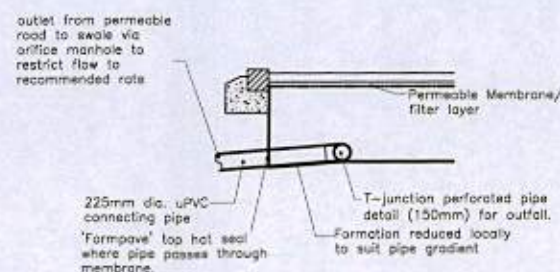
APPENDIX 4 – Drainage Details 117/40



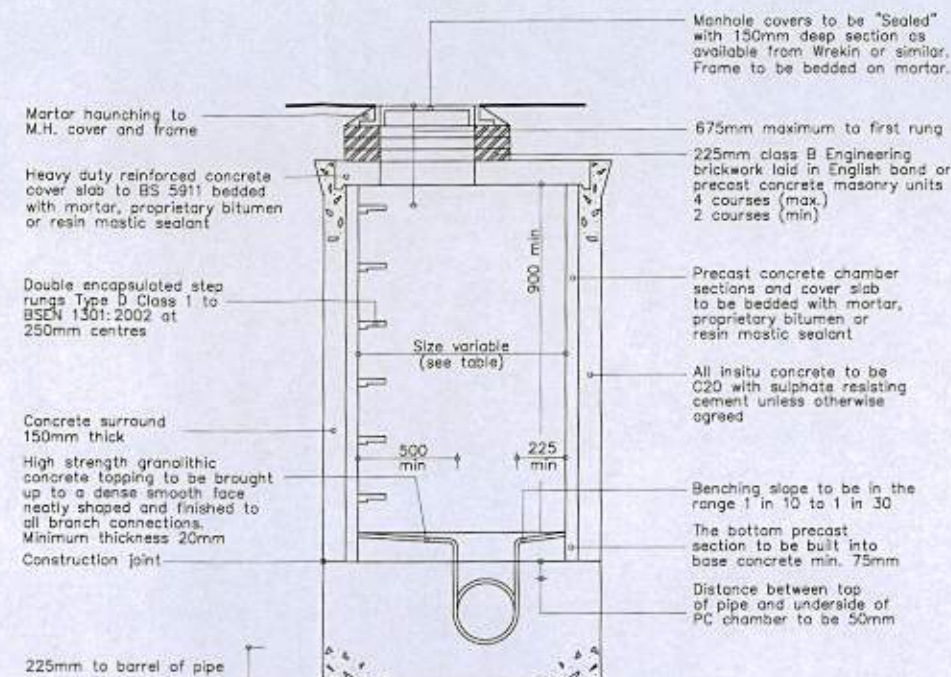
TYPICAL INLET DETAIL TO PERMEABLE PAVING



TYPICAL T-JUNCTION PERFORATED PIPE DETAIL (PLAN)



OUTLET FROM PERMEABLE PAVING



225mm to barrel of pipe

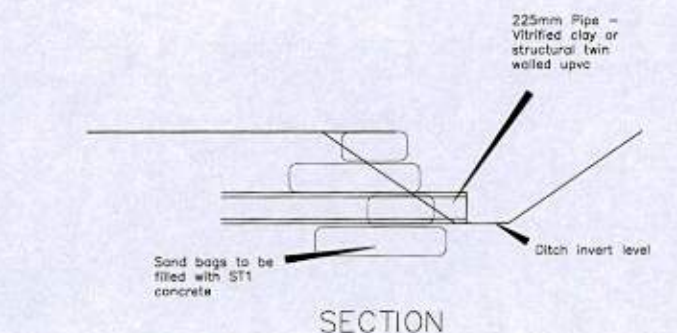
Joint to be as close as practicable to face of manhole to permit satisfactory joint and subsequent movement

Pipe joint with channel to be located min. 100mm inside face of chamber

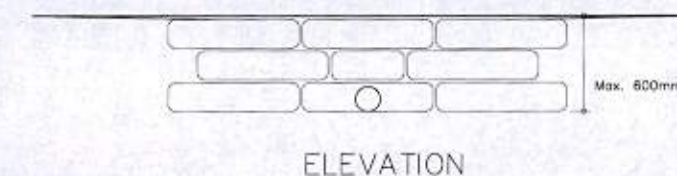
Chambers with outgoing pipes greater than 600mm dia. shall be fitted with guard bars, safety chains or other safety devices

Rocker pipe

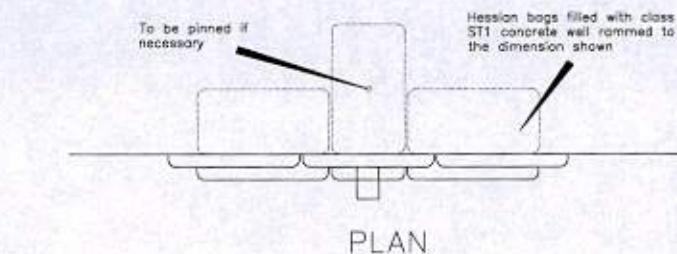
Pipe Dia.	Rocker Pipe length
150-600	0.6
675-750	1.0
> 825	1.25



SECTION

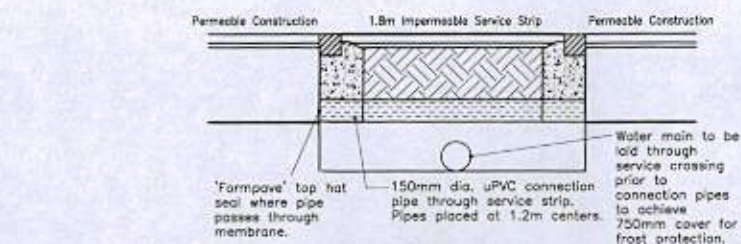


ELEVATION

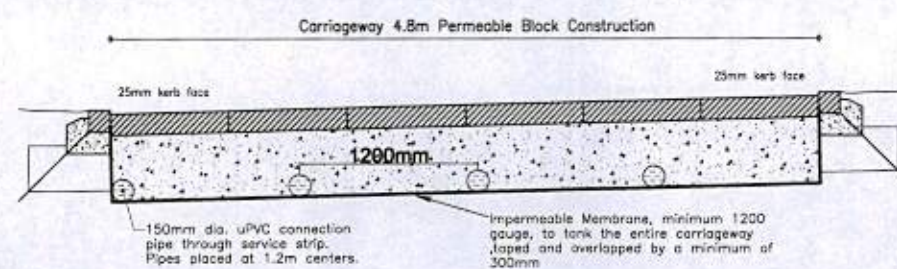


PLAN

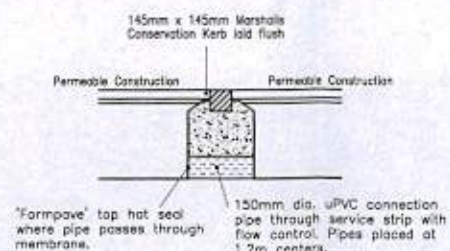
OUTFALL TO SWALE



SERVICE CROSSING DETAIL LONG SECTION



SERVICE CROSSING DETAIL CROSS SECTION



CHECK DAM DETAIL

FW MANHOLE - TYPE B

Depth to soffit 1.45m to 3.0m

Rev Description Initial Date

Croudace
HOMES.CO.UK

BARNHAM
GOODACRES

DRAINAGE DETAILS

SCALE: 1/25 @ A1

DATE: MAY 2014

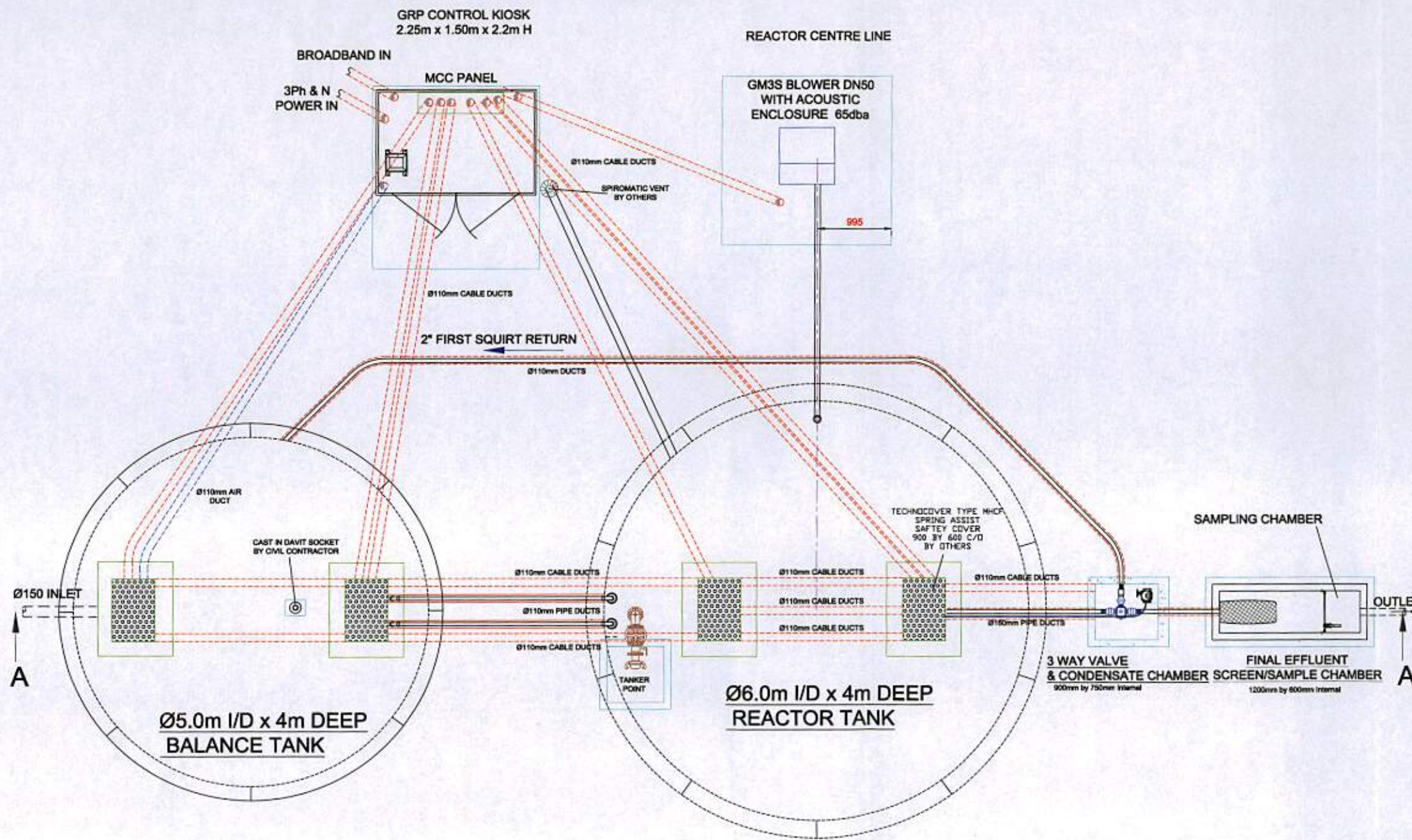
DRAWN: SW

CHECKED:

DRG.No.: 117/40

APPENDIX 5 – Sewage Treatment Plant Details

REV	DESCRIPTION	BY	DATE
0	FIRST ISSUE	NGA	18-05-14



PLAN VIEW

NOTES:-

- 1) ALL MANHOLE COVERS & FRAMES BY CIVIL CONTRACTOR
- 2) TANKS TO BE WATER TESTED BY OTHERS

CLIENT

Croudace
HOMES.CO.UK

PRINCIPLE CONTRACTOR

CIVIL CONTRACTOR

BI BUBBLE
TECHNOLOGIES

ADVANCED
AERATION

COMBINED WASTEWATER & SLUDGE TREATMENT
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BARNHAM DEVELOPMENT WwTP
GENERAL ARRANGEMENT
PLAN

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
NGA	27/03/12				
DRAWING No :- BB0624/10/101/002					
UNITS IN mm	NTS	A1	SHT 1 OF 1	REV 0	

