

Technical Note 3: Response to WSP Comments

Site: 19 Farncombe Road, Worthing, West Sussex
Prepared by: Phil Allen MCIWEM C.WEM
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Date: 18th February 2026

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1.0 Introduction

- 1.1 This technical note has been produced by Motion to respond to WSP's comments relating to the drainage strategy on consents AWDM/1522/24 and AWDM/1567/24 at 19 Farncombe Road, Worthing, West Sussex.
- 1.2 WSP do not consider the drainage conditions to be discharged, and have stated that they still have concerns regarding the following:
- § *Half drain time has been shown to be well above 24 hours. If a half drain time of 24 hours cannot be achieved, then we would expect to see consecutive storm calculations showing that the system can cope with a subsequent 1 in 10-year event without flooding occurring at the site.*
 - § *We recognise the use of catch pits and pretreatment measures; however, as a standard across all planning applications, we still require calculations to only use side infiltration.*
- 1.3 WSP's correspondence can be seen in full in [Appendix A](#) of this technical note.

2.0 The Development Site

- 2.1 The proposed development is for a rear extension to the existing building and provide a proposed annex to the rear of the garden.
- 2.2 The drainage strategy for the development proposes a geocellular soakaway in the rear garden of the development (in which both development applications are located) for the discharge of surface water. The proposed drainage strategy is only for the new developments, it will not seek to alter or incorporate the existing drainage serving 19 Farncombe Road.

3.0 Discussion

Half-Drain Time

- 3.1 Motion's previous technical note discussed the half drain times and the low risk of the site, which discharges the 1 in 100-year + 45% event without flooding, but WSP support a precautionary approach and, as per their statement above, they have stated that if the system can accommodate the 1 in 100-year + 45% rainfall event, then can subsequently cope with surface water generated in the 1 in 10-year + 40% rainfall event, then this will be satisfactory.
- 3.2 With this in mind, Motion will demonstrate the following:
- „ The overall attenuation volume available in the geocellular soakaway structure.
 - „ The maximum volume of surface water within the geocellular soakaway structure following the 1 in 100-year + 45% rainfall event.
 - „ The reduction in volume and levels of surface water in the geocellular soakaway structure after 24 hours (1,440-minutes)
 - „ The residual attenuation volume available within the geocellular soakaway structure after 24 hours (1,440-minutes)
 - „ How the 1 in 10-year + 40% rainfall event can be accommodated within the residual attenuation without flooding.

- 3.3 In order to successfully demonstrate the above, the dimensions of the geocellular soakaway structure were increased further to 7.0m x 5.5m x 1.2m (L x W x D). This, inclusive of the geocellular soakaway's 95% porosity, provides a total available attenuation volume of 43.890m³.
- 3.4 The MicroDrainage Network hydraulic model was run for all storms and the revised geocellular soakaway dimensions and the results from this model are in [Appendix B](#).
- 3.5 The results in [Appendix B](#) show that the maximum volume of storm water within the geocellular soakaway is 28.508m³ in the critical 1 in 100-year + 45% rainfall event.
- 3.6 This means that the geocellular soakaway with a volume of 43.890m³ has 15.382m³ available (43.890m³ - 28.508m³) following the 1 in 100-year + 45% rainfall event.
- 3.7 The half drain time in the critical 1 in 100-year + 45% rainfall event is 6,048-minutes. This means that it takes 6,048-minutes to drain half the maximum volume of storm water within the geocellular soakaway. Therefore, it takes 6,048-minutes to remove 14.254m³ (28.508m³ / 2) of storm water.
- 3.8 If it takes 6,048-minutes to remove 14.254m³ of storm water, it means that after 24 hours (1,440-minutes) that 3.394m³ of surface water ((14.254m³ / 6,048-minutes) x 1,440-minutes) will have discharged from the geocellular soakaway structure.
- 3.9 Therefore, 24-hours after the 1 in 100-year + 45% rainfall event, the volume available within the geocellular soakaway is 18.776m³ ((43.890m³ - 28.508m³) + 3.394m³). This is the volume into which the 1 in 10-year + 40% rainfall event must be accommodated.
- 3.10 The MicroDrainage Network hydraulic model results in [Appendix B](#) show that the geocellular soakaway has an invert level of 5.248 mAOD and a soffit level of 6.448 mAOD.
- 3.11 To understand the depth available within the geocellular soakaway that 18.776m³ of volume creates, 18.776m³ should be divided by the plan area of the tank (38.5m²). This means that the available depth in the geocellular soakaway after the 1 in 100-year + 45% rainfall event is 0.488m. The top water level within the soakaway 24-hours after the 1 in 100-year + 45% rainfall event is therefore 5.96 mAOD (6.448 mAOD – 0.448m).
- 3.12 The MicroDrainage Network hydraulic model has been rerun for the 1 in 10-year + 40% rainfall event and with a geocellular soakaway structure with the following characteristics, to represent the volume available 24-hours after the 1 in 100-year + 45% rainfall event:
- Cover Level: 7.230 mAOD
- Soffit Level: 6.448 mAOD
- Invert Level: 5.960 mAOD
- Dimensions: 7.0m x 5.5m x 0.488m
- Volume : 17.849m³ (inclusive of 95% porosity)
- 3.13 The MicroDrainage Network hydraulic model results for the 1 in 10-year + 40% rainfall event, using a geocellular soakaway designed and dimensioned to represent the residual available attenuation volume 24-hours after the 1 in 100-year + 45% rainfall event, can be seen in [Appendix C](#). These results show that surface water within the geocellular soakaway reaches a maximum level of 6.410 mAOD, thus remains within the structure. This means that the 1 in 10-year + 40% rainfall event occurring 24 hours after the 1 in 100-year + 45% rainfall event can be accommodated within the geocellular soakaway structure without flooding.
- 3.14 The detailed drainage layout has been updated to represent the changed soakaway dimensions, and this can be seen in [Appendix D](#).
- 3.15 With the provision of the information above and in the appendices, WSP can discharge the condition.

Use of Side Infiltration Only

- 3.16 WSP's response acknowledges the use of filtration structures upstream of the geocellular soakaway, as referenced in our previous technical note. However, this was not the substantive point of our earlier comments. It is regrettable that WSP has not addressed the bulk of the technical evidence we provided, which demonstrated that base infiltration is an integral and valid component of geocellular soakaway design.
- 3.17 To assist in clarifying this matter, we set out in our previous Technical Note (TN03) the relevant design guidance from the CIRIA SuDS Manual (C753), which clearly establishes that base infiltration is fundamental to the correct functioning of geocellular soakaway systems and should not be omitted. We have also highlighted that the exclusion of base infiltration is a design approach specific only to ring soakaways, and that no recognised design standard suggests that this approach should also be applied to geocellular soakaways.
- 3.18 To ensure clarity regarding the distinct and separate design methodologies for ring soakaways and geocellular soakaways, and to address the incorrect assumption that base infiltration should be excluded from geocellular systems, we have set out the following technical explanation. We expect WSP to give full and objective consideration to this information and to revise their current stance accordingly, rather than maintaining a position that is not supported by established design principles.
- 3.19 To help WSP with their under our approach, and to explain why Motion will not depart from standard and exclude base infiltration from the geocellular soakaway, we have set out a step-by-step explanation, below, explaining the key differences between ring soakaways and geocellular soakaways and to clearly demonstrate to the LPA (and any reviews by others in the future) why WSP's position on this is unsustainable.

Ring Soakaways

- 3.20 Ring soakaways are basically manhole rings with perforated walls. They are set within a gravel surround and have solid bases (like a manhole). See the below picture of a ring soakaway.



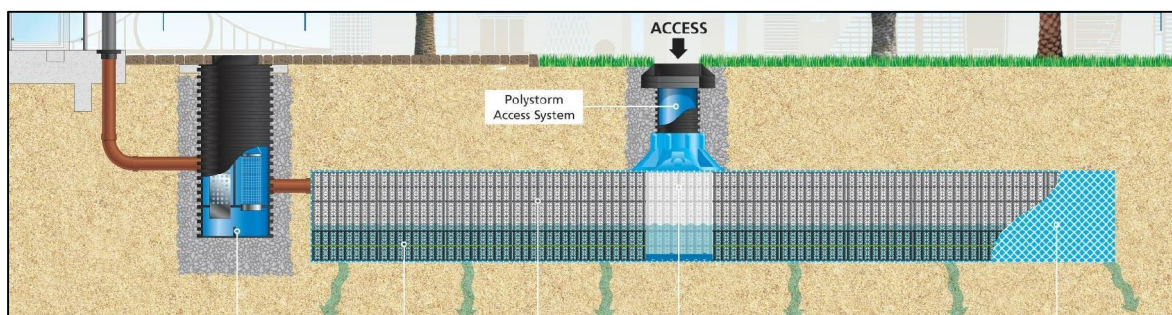
- 3.21 When using (and designing for) ring soakaways, infiltration should only be specified from the sides; as noted above, they usually have solid bases and, because they are usually taller than they are in diameter, the sides are the largest surface area and allow the successful discharge of surface water into the surrounding gravel. This fact is supported in MicroDrainage and the design parameters within the hydraulic modelling software allow for this exact approach.
- 3.22 So, to confirm, because ring soakaways often have solid bases, infiltration is rarely included from this part of the structure, but it is not detrimental to the function of ring soakaways because the sides of the structure form most of the functional surface area.

Geocellular Soakaways

- 3.23 Geocellular tanks/soakaways are a system of modular crates. The image below shows a typical single geocellular crate unit.



- 3.24 When modular crates are combined to form a full geocellular tank/soakaway, they create a shallow, wide structure, wrapped in a pervious geotextile, and it allows infiltration from all surfaces. The drawing below of the Polystorm geocellular soakaway system represents this.

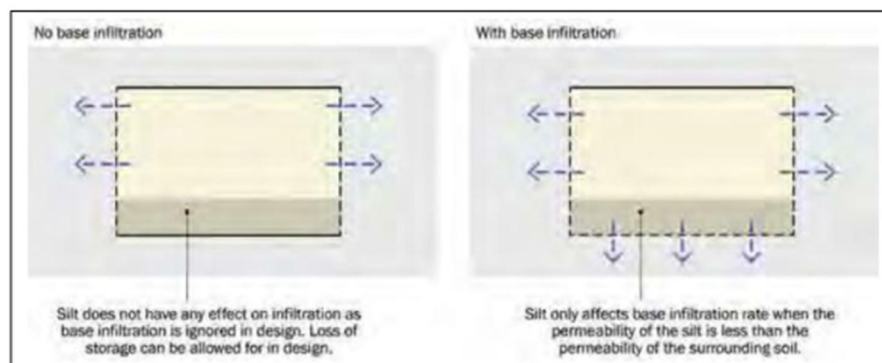


- 3.25 Because geocellular soakaways are shallow and wide, most of the infiltration occurs from the base (where hydrostatic pressure is the greatest). This is a key part of their design and function. It is fundamentally how geocellular soakaways work.
- 3.26 We have specified a geocellular tank at Farncombe Road, and as per the above, infiltration from the base has been included in the design.

Exceptions and Other Considerations

- 3.27 The only time when the base of geocellular soakaways should have infiltration from the base of the structure reduced is when very good natural infiltration rates exist, and it is expected that some siltation will occur over time on the base of the tank, and this will result in slower infiltration rates from the base of the tank than the sides. We detailed this in our previous Technical Note to WSP (TN03) and included guidance taken direct from the design instructions in the CIRIA C753 SuDS Manual. However, as mentioned above, WSP have not acknowledged this in their response. For ease of reference, it is below:

"Section 25.4 of the CIRIA SuDS Manual Guidance outlines the impacts of siltation on the performance of infiltration systems, comparing scenarios with and without base infiltration. Figure 25.6 of the CIRIA SuDS Manual states that 'Silt only affects the base infiltration rate when the permeability of the silt is less than the permeability of the surrounding soil'. It further notes that 'If the surrounding soil has similar permeability to the silt then there will be little effect'. Silt typically has a permeability of around 1×10^{-6} m/s.



- 3.28 The soakaway that has been designed for 19 Farncombe Road has an infiltration rate of 1.17×10^{-6} m/s, which is slower than that of silt. As a result, the impact of siltation on systems performance is expected to be negligible."

WSP's Objection

- 3.29 In light of the above, it WSP are incorrectly applying the design methodology for ring soakaways to geocellular soakaway systems. Their statement in Appendix A that "as a standard across all planning applications, we still require calculations to only use side infiltration" does not constitute a technically robust justification for this approach. Different types of infiltration infrastructure exist precisely so that their respective design benefits can be applied appropriately to individual schemes. A single, uniform regulatory position cannot reasonably be imposed across all applications. Such an approach risks leading to inappropriate assessments, technically unsound conclusions, and suboptimal advice being provided to Worthing Borough Council in WSP's capacity as their drainage advisors. If decisions based on misapplied standards were to be carried forward to appeal, they would place Worthing Borough Council in a significantly weakened and untenable position.
- 3.30 It is worth noting that if the base of the geocellular soakaway did not allow infiltration, the drainage design would be completely unsuccessful (because it would remove the majority the structures ability to discharge surface water).
- 3.31 Also, because of the well-established design requirement to have the base of soakaway structures a minimum of one metre above winter groundwater levels, it is crucial that a geocellular system is used; it allows a significant amount of attenuation and provides a wide surface area from which surface water can discharge while allowing it to remain safely above local groundwater levels, which are 3.850 mBGL. A ring soakaway, in order to provide the same amount of attenuation and usable surface area, would need penetrate much deeper below ground and would, therefore, conflict with groundwater levels and would not be acceptable or appropriate.
- 3.32 Therefore, WSP's misapplied standards are currently stopping the scheme and the drainage strategy coming forward.

4.0 Summary and Conclusions

- 4.1 This technical note has reviewed the comments made by WSP relating to the drainage strategy on consents AWD/1522/24 and AWD/1567/24 at 19 Farncombe Road, Worthing, West Sussex.
- 4.2 The half drain time requirements of WSP have been fully addressed through design.
- 4.3 We have also comprehensively presented why WSP's position on not allowing infiltration from the base of a soakaway structure is erroneous, misapplied, and should be dismissed, and we expect Worthing BC to discharge the condition on this due the inaccurate advice provided to them by WSP.

Appendix A

WSP's Comments



Rebekah Hincke
Adur & Worthing Councils
Portland House,
Richmond Road,
Worthing,
BN11 1LF

10 February 2026

Dear Rebekah,

RE: AWDM/1394/25 - 19 Farncombe Road Worthing West Sussex.

Thank you for your consultation on the above site. We have reviewed the application as the drainage consultant acting on behalf of the Council and wish to make the following comments.

The applicant is applying to vary condition 1 (Approved Drawings) to include railings, amended entrance gates, entrance ramp, amended patio steps, external land level adjustments, external guard rail to terrace and change of eastern casement window to sash. Amended details now include sustainable surface water drainage. Also variation of the following conditions to require compliance with newly submitted details: 4 - Construction Management Plan 5 - Biodiversity Gain Plan 6 - Landscape & Ecology Management Plan 7 - Surface Water Drainage Details 10 - Details of Windows and Doors 11 - Railings, Gates & Posts 12 - Cycle Parking ORIGINAL DESCRIPTION: AWDM/1522/24: Two-storey rear extension with first floor terrace to existing office (Use Class E); basement extension with front and rear lightwells; alterations to front boundary treatment and new rooflight to office building. The application is to Worthing Borough Council.

Following a review of the updated information, we note that updated calculations have been received demonstrating that a CV value of 1 has been utilised. However, we still have concerns regarding the following:

- Half drain time has been shown to be well above 24 hours. If a half drain time of 24 hours cannot be achieved, then we would expect to see consecutive storm calculations showing that the system can cope with a subsequent 1 in 10-year event without flooding occurring at the site.
- We recognise the use of catch pits and pretreatment measures; however, as a standard across all planning applications, we still require calculations to only use side infiltration.

We note that maintenance information has been received; however, this cannot be approved until the proposed method of drainage is approved in case of any changes to the drainage components. Therefore, we still require the following conditions to be attached to the approval of the application.

Condition 1: Construction shall not begin until a detailed surface water drainage scheme for the site has been submitted to and approved in writing by the Local Planning Authority. The surface water drainage scheme must prioritise the use of source control Sustainable Drainage Systems (SuDS) in consideration of the Non-Statutory Technical Standards for SuDS and demonstrate no increase in flood risk as a result of the Proposed Development with sufficient supporting evidence provided to support its viability including supporting calculations for the 100% AEP (1 in 1 year), 3.33% AEP (1 in 30 year), 3.33% AEP (1 in 30 year) plus climate change, the 1% AEP (1 in 100 year) and the 1% AEP (1 in 100) plus climate change critical storms. The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, and the recommendations of the SuDS Manual produced by CIRIA. Winter groundwater monitoring will be required to support the already provided infiltration testing and the design of any infiltration drainage. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.

Reason: To ensure the flood risk is adequately addressed and not increased in accordance with NPPF and Policies of Adur & Worthing Council.

Condition 2: The development hereby approved shall not be occupied until details of the maintenance and management of the sustainable drainage scheme have been submitted to and approved in writing by the Local Planning Authority. The drainage scheme shall be implemented prior to the first occupation of the development hereby approved and thereafter managed and maintained in accordance with the approved details in perpetuity. The Local Planning Authority shall be granted access to inspect the sustainable drainage scheme for the lifetime of the development. The details of the scheme to be submitted for approval shall include:

- I. a timetable for its implementation.
- II. details of SuDS feature and connecting drainage structures and maintenance requirement for each aspect including a drawing showing where they are located.
- III. a management and maintenance plan for the lifetime of the development which shall include details of design life and the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime. This will include the name and contact details of any appointed management company.

Reason: To ensure that the development achieves a high standard of sustainability and ensure the flood risk is adequately addressed for each new dwelling and not increased in accordance with NPPF and Policies of Adur and Worthing Council.

Yours sincerely,

Sustainable Water Management Officer

Appendix B

MicroDrainage Network Hydraulic Modelling Results

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

Return Period (years)		FEH Rainfall Model		Volumetric Runoff Coeff.		1.000
		100		PIMP (%)		100
FEH Rainfall Version		2013		Add Flow / Climate Change (%)		0
Site Location		GB 515700 103000 TQ 15700 03000		Minimum Backdrop Height (m)		0.000
Data Type		Catchment		Maximum Backdrop Height (m)		0.000
Maximum Rainfall (mm/hr)		550		Min Design Depth for Optimisation (m)		0.400
Maximum Time of Concentration (mins)		30		Min Vel for Auto Design only (m/s)		1.00
Foul Sewage (l/s/ha)		0.000		Min Slope for Optimisation (1:X)		500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.013	4-8	0.004	8-12	0.003	12-16	0.003

Total Area Contributing (ha) = 0.022

Total Pipe Volume (m³) = 0.577

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - 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	10.738#	0.134	80.0	0.003	15.00	0.0	0.600	o	100	Pipe/Conduit	⚠
S1.001	6.420#	0.088	73.0	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit	⚠
S2.000	10.738#	0.134	80.0	0.003	15.00	0.0	0.600	o	100	Pipe/Conduit	⚠
S2.001	6.955#	0.087	80.0	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit	⚠
S1.002	0.988#	0.015	65.9	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	⚠
S3.000	8.245#	0.103	80.0	0.003	15.00	0.0	0.600	o	100	Pipe/Conduit	⚠
S3.001	6.326	0.079	80.1	0.002	0.00	0.0	0.600	o	100	Pipe/Conduit	⚠
S4.000	7.881#	0.099	80.0	0.004	15.00	0.0	0.600	o	100	Pipe/Conduit	⚠
S4.001	12.731#	0.159	80.0	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit	⚠

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E 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	93.74	15.21	6.525	0.003	0.0	0.0	0.0	0.86	6.8	0.9
S1.001	93.38	15.33	6.391	0.005	0.0	0.0	0.0	0.90	7.1	1.8
S2.000	93.74	15.21	6.524	0.003	0.0	0.0	0.0	0.86	6.8	0.9
S2.001	93.33	15.34	6.390	0.005	0.0	0.0	0.0	0.86	6.8	1.8
S1.002	93.27	15.36	6.303	0.011	0.0	0.0	0.0	0.95	7.5	3.6
S3.000	93.89	15.16	6.479	0.003	0.0	0.0	0.0	0.86	6.8	1.0
S3.001	93.51	15.28	6.375	0.005	0.0	0.0	0.0	0.86	6.8	1.7
S4.000	93.91	15.15	6.554	0.004	0.0	0.0	0.0	0.86	6.8	1.3
S4.001	93.15	15.40	6.455	0.007	0.0	0.0	0.0	0.86	6.8	2.2

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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
S3.002	0.915#	0.045	20.3	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.003	1.483	0.016	92.7	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.002	93.13	15.41	6.296	0.012	0.0	0.0	0.0	1.72	13.5	3.9
S1.003	93.03	15.44	5.830	0.022	0.0	0.0	0.0	0.80	6.3κ	7.5

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	7.230	0.705	Junction		S1.000	6.525	100				
S2	7.230	0.839	Open Manhole	450	S1.001	6.391	100	S1.000	6.391	100	
S3	7.230	0.706	Open Manhole	1200	S2.000	6.524	100				
S4	7.230	0.840	Open Manhole	1200	S2.001	6.390	100	S2.000	6.390	100	
S5 - Catchpit	7.230	0.927	Open Manhole	1200	S1.002	6.303	100	S1.001	6.303	100	
								S2.001	6.303	100	
S6	7.230	0.751	Junction		S3.000	6.479	100				
S7	7.230	0.855	Open Manhole	450	S3.001	6.375	100	S3.000	6.376	100	1
S8	7.230	0.676	Open Manhole	1200	S4.000	6.554	100				
S9	7.230	0.775	Open Manhole	1200	S4.001	6.455	100	S4.000	6.455	100	
S10 - Catchpit	7.230	0.934	Open Manhole	1200	S3.002	6.296	100	S3.001	6.296	100	
								S4.001	6.296	100	
SGeocellular Tank	7.230	1.400	Open Manhole	1200	S1.003	5.830	100	S1.002	6.288	100	458
								S3.002	6.251	100	421
S	7.230	1.416	Open Manhole	0		OUTFALL		S1.003	5.814	100	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	9.375	36.219			No Entry	
S2	9.330	26.239	9.330	26.239	Required	
S3	20.904	36.427	20.904	36.427	Required	
S4	20.904	25.900	20.904	25.900	Required	
S5 - Catchpit	14.682	21.831	14.682	21.831	Required	
S6	14.506	1.850			No Entry	
S7	12.471	10.129	12.471	10.129	Required	
S8	31.311	6.166	31.311	6.166	Required	
S9	29.223	14.141	29.223	14.141	Required	
S10 - Catchpit	16.288	15.197	16.288	15.197	Required	
SGeocellular Tank	15.442	18.665	15.442	18.665	Required	
S	13.994	18.344			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	100		7.230	6.525	0.605	Junction	
S1.001	o	100		7.230	6.391	0.739	Open Manhole	450
S2.000	o	100		7.230	6.524	0.606	Open Manhole	1200
S2.001	o	100		7.230	6.390	0.740	Open Manhole	1200
S1.002	o	100	S5 - Catchpit	7.230	6.303	0.827	Open Manhole	1200
S3.000	o	100		7.230	6.479	0.651	Junction	
S3.001	o	100		7.230	6.375	0.755	Open Manhole	450
S4.000	o	100		7.230	6.554	0.576	Open Manhole	1200
S4.001	o	100		7.230	6.455	0.675	Open Manhole	1200
S3.002	o	100	S10 - Catchpit	7.230	6.296	0.834	Open Manhole	1200
S1.003	o	100	SGeocellular Tank	7.230	5.830	1.300	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	10.738#	80.0		7.230	6.391	0.739	Open Manhole	450
S1.001	6.420#	73.0	S5 - Catchpit	7.230	6.303	0.827	Open Manhole	1200
S2.000	10.738#	80.0		7.230	6.390	0.740	Open Manhole	1200
S2.001	6.955#	80.0	S5 - Catchpit	7.230	6.303	0.827	Open Manhole	1200
S1.002	0.988#	65.9	SGeocellular Tank	7.230	6.288	0.842	Open Manhole	1200
S3.000	8.245#	80.0		7.230	6.376	0.754	Open Manhole	450
S3.001	6.326	80.1	S10 - Catchpit	7.230	6.296	0.834	Open Manhole	1200
S4.000	7.881#	80.0		7.230	6.455	0.675	Open Manhole	1200
S4.001	12.731#	80.0	S10 - Catchpit	7.230	6.296	0.834	Open Manhole	1200
S3.002	0.915#	20.3	SGeocellular Tank	7.230	6.251	0.879	Open Manhole	1200
S1.003	1.483	92.7	S	7.230	5.814	1.316	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.003	0.003	0.003
1.001	User	-	100	0.003	0.003	0.003
2.000	User	-	100	0.003	0.003	0.003
2.001	User	-	100	0.003	0.003	0.003
1.002	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.003	0.003	0.003
3.001	User	-	100	0.002	0.002	0.002
4.000	User	-	100	0.004	0.004	0.004
4.001	User	-	100	0.003	0.003	0.003
3.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.022	0.022	0.022

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)
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S1.003	S	7.230	5.814	0.000	0	0
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Simulation Criteria for Storm

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

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	100	Winter Storms	No
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 515700 103000 TQ 15700 03000	Cv (Winter)	1.000
Data Type	Catchment	Storm Duration (mins)	30

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Online Controls for Storm Pump Manhole: SGeocellular Tank, DS/PN: S1.003, Volume (m³): 1.6 Invert Level (m) 5.830 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>0.0000</td><td>0.600</td><td>0.0000</td><td>1.100</td><td>0.0000</td><td>1.600</td><td>0.0000</td><td>2.100</td><td>0.0000</td><td>2.600</td><td>0.0000</td></tr><tr><td>0.200</td><td>0.0000</td><td>0.700</td><td>0.0000</td><td>1.200</td><td>0.0000</td><td>1.700</td><td>0.0000</td><td>2.200</td><td>0.0000</td><td>2.700</td><td>0.0000</td></tr><tr><td>0.300</td><td>0.0000</td><td>0.800</td><td>0.0000</td><td>1.300</td><td>0.0000</td><td>1.800</td><td>0.0000</td><td>2.300</td><td>0.0000</td><td>2.800</td><td>0.0000</td></tr><tr><td>0.400</td><td>0.0000</td><td>0.900</td><td>0.0000</td><td>1.400</td><td>0.0000</td><td>1.900</td><td>0.0000</td><td>2.400</td><td>0.0000</td><td>2.900</td><td>0.0000</td></tr><tr><td>0.500</td><td>0.0000</td><td>1.000</td><td>0.0000</td><td>1.500</td><td>0.0000</td><td>2.000</td><td>0.0000</td><td>2.500</td><td>0.0000</td><td>3.000</td><td>0.0000</td></tr></table>			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)	Depth (m)	Flow (l/s)	0.100	0.0000	0.600	0.0000	1.100	0.0000	1.600	0.0000	2.100	0.0000	2.600	0.0000	0.200	0.0000	0.700	0.0000	1.200	0.0000	1.700	0.0000	2.200	0.0000	2.700	0.0000	0.300	0.0000	0.800	0.0000	1.300	0.0000	1.800	0.0000	2.300	0.0000	2.800	0.0000	0.400	0.0000	0.900	0.0000	1.400	0.0000	1.900	0.0000	2.400	0.0000	2.900	0.0000	0.500	0.0000	1.000	0.0000	1.500	0.0000	2.000	0.0000	2.500	0.0000	3.000	0.0000
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)	Depth (m)	Flow (l/s)																																																															
0.100	0.0000	0.600	0.0000	1.100	0.0000	1.600	0.0000	2.100	0.0000	2.600	0.0000																																																															
0.200	0.0000	0.700	0.0000	1.200	0.0000	1.700	0.0000	2.200	0.0000	2.700	0.0000																																																															
0.300	0.0000	0.800	0.0000	1.300	0.0000	1.800	0.0000	2.300	0.0000	2.800	0.0000																																																															
0.400	0.0000	0.900	0.0000	1.400	0.0000	1.900	0.0000	2.400	0.0000	2.900	0.0000																																																															
0.500	0.0000	1.000	0.0000	1.500	0.0000	2.000	0.0000	2.500	0.0000	3.000	0.0000																																																															
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Storage Structures for Storm

Cellular Storage Manhole: SGeocellular Tank, DS/PN: S1.003

Invert Level (m) 5.248 Infiltration Coefficient Side (m/hr) 0.00421 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00421 Safety Factor 1.5

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	38.5	38.5	1.200	38.5	68.5	1.201	0.0	68.5

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S1.000		0.000	0.084	0.000	0.084
S1.001		0.133	0.050	0.000	0.184
S2.000		0.798	0.084	0.000	0.883
S2.001		0.950	0.055	0.000	1.005
S1.002	S5 - Catchpit	1.048	0.008	0.000	1.056
S3.000		0.000	0.065	0.000	0.065
S3.001		0.136	0.050	0.000	0.186
S4.000		0.765	0.062	0.000	0.826
S4.001		0.877	0.100	0.000	0.976
S3.002	S10 - Catchpit	1.056	0.007	0.000	1.064
S1.003	SGeocellular Tank	1.583	0.012	43.902	45.497
Total		7.347	0.577	43.902	51.826

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Catchment
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 515700 103000 TQ 15700 03000	Cv (Winter)	1.000
Margin for Flood Risk Warning (mm)	300.0	DTS Status	OFF
Analysis Timestep	Fine	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
Return Period(s) (years)	2, 10, 30, 100
Climate Change (%)	0, 40, 40, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Overflow Vol (m ³)	Maximum Vol (m ³)	Discharge Vol (m ³)	Half Drain Time (mins)
S1.000	S1	30 minute 2 year Summer I+0%	30	7.230	6.537	-0.088	0.000		0.008	0.287	
S1.001	S2	30 minute 2 year Summer I+0%	30	7.230	6.413	-0.078	0.000		0.008	0.609	
S2.000	S3	30 minute 2 year Summer I+0%	30	7.230	6.537	-0.087	0.000		0.009	0.290	
S2.001	S4	30 minute 2 year Summer I+0%	30	7.230	6.412	-0.078	0.000		0.024	0.613	
S1.002	S5 - Catchpit	30 minute 2 year Summer I+0%	30	7.230	6.343	-0.060	0.000		0.057	1.222	
S3.000	S6	30 minute 2 year Summer I+0%	30	7.230	6.493	-0.086	0.000		0.009	0.350	
S3.001	S7	30 minute 2 year Summer I+0%	30	7.230	6.396	-0.079	0.000		0.007	0.569	
S4.000	S8	30 minute 2 year Summer I+0%	30	7.230	6.570	-0.084	0.000		0.013	0.446	
S4.001	S9	30 minute 2 year Summer I+0%	30	7.230	6.478	-0.077	0.000		0.025	0.738	
S3.002	S10 - Catchpit	30 minute 2 year Summer I+0%	30	7.230	6.328	-0.068	0.000		0.046	1.307	
S1.003	SGeocellular Tank	5760 minute 2 year Summer I+0%	5760	7.230	5.457	-0.473	0.000		7.888	0.000	3120

PN	US/MH Name	Pipe Flow (l/s)	Status
S1.000	S1	0.3	OK*
S1.001	S2	0.7	OK
S2.000	S3	0.3	OK
S2.001	S4	0.7	OK
S1.002	S5 - Catchpit	1.3	OK
S3.000	S6	0.3	OK*
S3.001	S7	0.6	OK
S4.000	S8	0.4	OK
S4.001	S9	0.8	OK
S3.002	S10 - Catchpit	1.3	OK
S1.003	SGeocellular Tank	0.0	OK

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Catchment
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 515700 103000 TQ 15700 03000	Cv (Winter)	1.000
Margin for Flood Risk Warning (mm)	300.0	DTS Status	OFF
Analysis Timestep	Fine	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		
Return Period(s) (years)		2, 10, 30, 100	
Climate Change (%)		0, 40, 40, 45	

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Overflow Vol (m ³)	Maximum Vol (m ³)	Discharge Vol (m ³)	Half Drain Time (mins)
S1.000	S1	30 minute 10 year Summer I+40%	30	7.230	6.545	-0.080	0.000		0.015	0.702	
S1.001	S2	15 minute 10 year Summer I+40%	15	7.230	6.429	-0.062	0.000		0.015	1.091	
S2.000	S3	30 minute 10 year Summer I+40%	30	7.230	6.545	-0.079	0.000		0.018	0.709	
S2.001	S4	15 minute 10 year Summer I+40%	15	7.230	6.429	-0.061	0.000		0.048	1.099	
S1.002	S5 - Catchpit	15 minute 10 year Summer I+40%	15	7.230	6.382	-0.021	0.000		0.121	2.190	
S3.000	S6	30 minute 10 year Summer I+40%	30	7.230	6.501	-0.078	0.000		0.017	0.855	
S3.001	S7	15 minute 10 year Summer I+40%	15	7.230	6.410	-0.065	0.000		0.014	1.019	
S4.000	S8	30 minute 10 year Summer I+40%	30	7.230	6.580	-0.074	0.000		0.024	1.089	
S4.001	S9	15 minute 10 year Summer I+40%	15	7.230	6.494	-0.061	0.000		0.048	1.323	
S3.002	S10 - Catchpit	15 minute 10 year Summer I+40%	15	7.230	6.353	-0.043	0.000		0.087	2.342	
S1.003	SGeoCellular Tank	5760 minute 10 year Summer I+40%	5760	7.230	5.709	-0.221	0.000		17.377	0.000	5016

PN	US/MH Name	Pipe Flow (l/s)	Status
S1.000	S1	0.6	OK*
S1.001	S2	1.9	OK
S2.000	S3	0.6	OK
S2.001	S4	1.9	OK
S1.002	S5 - Catchpit	3.8	OK
S3.000	S6	0.8	OK*
S3.001	S7	1.6	OK
S4.000	S8	1.0	OK
S4.001	S9	2.0	OK
S3.002	S10 - Catchpit	3.6	OK
S1.003	SGeoCellular Tank	0.0	OK

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Catchment
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 515700 103000 TQ 15700 03000	Cv (Winter)	1.000
Margin for Flood Risk Warning (mm)	300.0	DTS Status	OFF
Analysis Timestep	Fine	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
Return Period(s) (years)	2, 10, 30, 100
Climate Change (%)	0, 40, 40, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Overflow Vol (m ³)	Maximum Vol (m ³)	Discharge Vol (m ³)	Half Drain Time (mins)
S1.000	S1	30 minute 30 year Summer I+40%	30	7.230	6.548	-0.077	0.000		0.018	0.924	
S1.001	S2	15 minute 30 year Summer I+40%	15	7.230	6.436	-0.055	0.000		0.019	1.422	
S2.000	S3	30 minute 30 year Summer I+40%	30	7.230	6.548	-0.076	0.000		0.021	0.932	
S2.001	S4	15 minute 30 year Summer I+40%	15	7.230	6.436	-0.054	0.000		0.059	1.433	
S1.002	S5 - Catchpit	15 minute 30 year Summer I+40%	15	7.230	6.418	0.015	0.000		0.178	2.855	
S3.000	S6	30 minute 30 year Summer I+40%	30	7.230	6.504	-0.075	0.000		0.021	1.124	
S3.001	S7	15 minute 30 year Summer I+40%	15	7.230	6.415	-0.060	0.000		0.016	1.329	
S4.000	S8	30 minute 30 year Summer I+40%	30	7.230	6.585	-0.069	0.000		0.029	1.432	
S4.001	S9	15 minute 30 year Summer I+40%	15	7.230	6.501	-0.054	0.000		0.057	1.725	
S3.002	S10 - Catchpit	15 minute 30 year Summer I+40%	15	7.230	6.364	-0.032	0.000		0.107	3.054	
S1.003	SGeoCellular Tank	5760 minute 30 year Winter I+40%	5760	7.230	5.820	-0.110	0.000		21.567	0.000	5112

PN	US/MH Name	Pipe Flow (l/s)	Status
S1.000	S1	0.8	OK*
S1.001	S2	2.5	OK
S2.000	S3	0.8	OK
S2.001	S4	2.5	OK
S1.002	S5 - Catchpit	5.0	SURCHARGED
S3.000	S6	1.0	OK*
S3.001	S7	2.0	OK
S4.000	S8	1.3	OK
S4.001	S9	2.7	OK
S3.002	S10 - Catchpit	4.6	OK
S1.003	SGeoCellular Tank	0.0	OK

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

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000

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

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Catchment
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 515700 103000 TQ 15700 03000	Cv (Winter)	1.000
Margin for Flood Risk Warning (mm)	300.0	DTS Status	OFF
Analysis Timestep	Fine	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
Return Period(s) (years)	2, 10, 30, 100
Climate Change (%)	0, 40, 40, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)
S1.000	S1	30 minute 100 year Summer I+45%	30	7.230	6.551	-0.074	0.000		0.022	1.209	
S1.001	S2	15 minute 100 year Summer I+45%	15	7.230	6.460	-0.031	0.000		0.030	1.844	
S2.000	S3	30 minute 100 year Summer I+45%	30	7.230	6.552	-0.072	0.000		0.026	1.220	
S2.001	S4	15 minute 100 year Summer I+45%	15	7.230	6.461	-0.029	0.000		0.094	1.858	
S1.002	S5 - Catchpit	15 minute 100 year Summer I+45%	15	7.230	6.436	0.033	0.000		0.207	3.702	
S3.000	S6	30 minute 100 year Summer I+45%	30	7.230	6.509	-0.070	0.000		0.025	1.471	
S3.001	S7	15 minute 100 year Summer I+45%	15	7.230	6.422	-0.053	0.000		0.019	1.723	
S4.000	S8	30 minute 100 year Summer I+45%	30	7.230	6.589	-0.065	0.000		0.034	1.875	
S4.001	S9	15 minute 100 year Summer I+45%	15	7.230	6.508	-0.047	0.000		0.067	2.236	
S3.002	S10 - Catchpit	30 minute 100 year Summer I+45%	30	7.230	6.389	-0.007	0.000		0.148	5.500	
S1.003	SGeocellular Tank	5760 minute 100 year Winter I+45%	5760	7.230	6.004	0.074	0.000		28.508	0.000	6048

PN	US/MH Name	Pipe Flow (l/s)	Status
S1.000	S1	1.1	OK*
S1.001	S2	3.2	OK
S2.000	S3	1.1	OK
S2.001	S4	3.1	OK
S1.002	S5 - Catchpit	6.3	SURCHARGED
S3.000	S6	1.3	OK*
S3.001	S7	2.6	OK
S4.000	S8	1.7	OK
S4.001	S9	3.5	OK
S3.002	S10 - Catchpit	5.9	OK
S1.003	SGeocellular Tank	0.0	SURCHARGED

Appendix C

1 in 10-year +40% MicroDrainage Network Modelling Results

Motion

84 North Street
Guildford
Surrey GU1 4AU

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)

FEH Rainfall Version

Site Location

Data Type

Maximum Rainfall (mm/hr)

Maximum Time of Concentration (mins)

Foul Sewage (l/s/ha)

100

2013

GB 515700 103000 TQ 15700 03000

Catchment

550

30

0.000

Volumetric Runoff Coeff.

PIMP (%)

Add Flow / Climate Change (%)

Minimum Backdrop Height (m)

Maximum Backdrop Height (m)

Min Design Depth for Optimisation (m)

Min Vel for Auto Design only (m/s)

Min Slope for Optimisation (1:X)

1.000

100

0

0.000

0.000

0.400

1.00

500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)

Area (ha)

Time (mins)

Area (ha)

Time (mins)

Area (ha)

Time (mins)

Area (ha)

0-4

0.013

4-8

0.004

8-12

0.003

12-16

0.003

Total Area Contributing (ha) = 0.022

Total Pipe Volume (m³) = 0.577

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - 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

10.738#

0.134

80.0

0.003

15.00

0.0

0.600

o

100

Pipe/Conduit



S1.001

6.420#

0.088

73.0

0.003

0.00

0.0

0.600

o

100

Pipe/Conduit



S2.000

10.738#

0.134

80.0

0.003

15.00

0.0

0.600

o

100

Pipe/Conduit



S2.001

6.955#

0.087

80.0

0.003

0.00

0.0

0.600

o

100

Pipe/Conduit



S1.002

0.988#

0.015

65.9

0.000

0.00

0.0

0.600

o

100

Pipe/Conduit



S3.000

8.245#

0.103

80.0

0.003

15.00

0.0

0.600

o

100

Pipe/Conduit



S3.001

6.326

0.079

80.1

0.002

0.00

0.0

0.600

o

100

Pipe/Conduit



S4.000

7.881#

0.099

80.0

0.004

15.00

0.0

0.600

o

100

Pipe/Conduit



S4.001

12.731#

0.159

80.0

0.003

0.00

0.0

0.600

o

100

Pipe/Conduit



Network Results Table

PN

Rain (mm/hr)

T.C. (mins)

US/IL (m)

E 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

93.74

15.21

6.525

0.003

0.0

0.0

0.0

0.86

6.8

0.9

S1.001

93.38

15.33

6.391

0.005

0.0

0.0

0.0

0.90

7.1

1.8

S2.000

93.74

15.21

6.524

0.003

0.0

0.0

0.0

0.86

6.8

0.9

S2.001

93.33

15.34

6.390

0.005

0.0

0.0

0.0

0.86

6.8

1.8

S1.002

93.27

15.36

6.303

0.011

0.0

0.0

0.0

0.95

7.5

3.6

S3.000

93.89

15.16

6.479

0.003

0.0

0.0

0.0

0.86

6.8

1.0

S3.001

93.51

15.28

6.375

0.005

0.0

0.0

0.0

0.86

6.8

1.7

S4.000

93.91

15.15

6.554

0.004

0.0

0.0

0.0

0.86

6.8

1.3

S4.001

93.15

15.40

6.455

0.007

0.0

0.0

0.0

0.86

6.8

2.2

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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
S3.002	0.915#	0.045	20.3	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.003	1.483	0.016	92.7	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.002	93.13	15.41	6.296	0.012	0.0	0.0	0.0	1.72	13.5	3.9
S1.003	93.03	15.44	5.830	0.022	0.0	0.0	0.0	0.80	6.3κ	7.5

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	7.230	0.705	Junction		S1.000	6.525	100				
S2	7.230	0.839	Open Manhole	450	S1.001	6.391	100	S1.000	6.391	100	
S3	7.230	0.706	Open Manhole	1200	S2.000	6.524	100				
S4	7.230	0.840	Open Manhole	1200	S2.001	6.390	100	S2.000	6.390	100	
S5 - Catchpit	7.230	0.927	Open Manhole	1200	S1.002	6.303	100	S1.001	6.303	100	
								S2.001	6.303	100	
S6	7.230	0.751	Junction		S3.000	6.479	100				
S7	7.230	0.855	Open Manhole	450	S3.001	6.375	100	S3.000	6.376	100	1
S8	7.230	0.676	Open Manhole	1200	S4.000	6.554	100				
S9	7.230	0.775	Open Manhole	1200	S4.001	6.455	100	S4.000	6.455	100	
S10 - Catchpit	7.230	0.934	Open Manhole	1200	S3.002	6.296	100	S3.001	6.296	100	
								S4.001	6.296	100	
SGeocellular Tank	7.230	1.400	Open Manhole	1200	S1.003	5.830	100	S1.002	6.288	100	458
								S3.002	6.251	100	421
S	7.230	1.416	Open Manhole	0		OUTFALL		S1.003	5.814	100	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	9.375	36.219			No Entry	
S2	9.330	26.239	9.330	26.239	Required	
S3	20.904	36.427	20.904	36.427	Required	
S4	20.904	25.900	20.904	25.900	Required	
S5 - Catchpit	14.682	21.831	14.682	21.831	Required	
S6	14.506	1.850			No Entry	
S7	12.471	10.129	12.471	10.129	Required	
S8	31.311	6.166	31.311	6.166	Required	
S9	29.223	14.141	29.223	14.141	Required	
S10 - Catchpit	16.288	15.197	16.288	15.197	Required	
SGeocellular Tank	15.442	18.665	15.442	18.665	Required	
S	13.994	18.344			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	100		S1 7.230	6.525	0.605	Junction	
S1.001	o	100		S2 7.230	6.391	0.739	Open Manhole	450
S2.000	o	100		S3 7.230	6.524	0.606	Open Manhole	1200
S2.001	o	100		S4 7.230	6.390	0.740	Open Manhole	1200
S1.002	o	100	S5 - Catchpit	7.230	6.303	0.827	Open Manhole	1200
S3.000	o	100		S6 7.230	6.479	0.651	Junction	
S3.001	o	100		S7 7.230	6.375	0.755	Open Manhole	450
S4.000	o	100		S8 7.230	6.554	0.576	Open Manhole	1200
S4.001	o	100		S9 7.230	6.455	0.675	Open Manhole	1200
S3.002	o	100	S10 - Catchpit	7.230	6.296	0.834	Open Manhole	1200
S1.003	o	100	SGeocellular Tank	7.230	5.830	1.300	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	10.738#	80.0		S2 7.230	6.391	0.739	Open Manhole	450
S1.001	6.420#	73.0	S5 - Catchpit	7.230	6.303	0.827	Open Manhole	1200
S2.000	10.738#	80.0		S4 7.230	6.390	0.740	Open Manhole	1200
S2.001	6.955#	80.0	S5 - Catchpit	7.230	6.303	0.827	Open Manhole	1200
S1.002	0.988#	65.9	SGeocellular Tank	7.230	6.288	0.842	Open Manhole	1200
S3.000	8.245#	80.0		S7 7.230	6.376	0.754	Open Manhole	450
S3.001	6.326	80.1	S10 - Catchpit	7.230	6.296	0.834	Open Manhole	1200
S4.000	7.881#	80.0		S9 7.230	6.455	0.675	Open Manhole	1200
S4.001	12.731#	80.0	S10 - Catchpit	7.230	6.296	0.834	Open Manhole	1200
S3.002	0.915#	20.3	SGeocellular Tank	7.230	6.251	0.879	Open Manhole	1200
S1.003	1.483	92.7	S	7.230	5.814	1.316	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.003	0.003	0.003
1.001	User	-	100	0.003	0.003	0.003
2.000	User	-	100	0.003	0.003	0.003
2.001	User	-	100	0.003	0.003	0.003
1.002	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.003	0.003	0.003
3.001	User	-	100	0.002	0.002	0.002
4.000	User	-	100	0.004	0.004	0.004
4.001	User	-	100	0.003	0.003	0.003
3.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.022	0.022	0.022

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)
---------------------	--------------	--------------	--------------	------------------	----------	--------

S1.003	S	7.230	5.814	0.000	0	0
--------	---	-------	-------	-------	---	---

Simulation Criteria for Storm

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

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	100	Winter Storms	No
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 515700 103000 TQ 15700 03000	Cv (Winter)	1.000
Data Type	Catchment	Storm Duration (mins)	30

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<u>Online Controls for Storm</u>											
<u>Pump Manhole: SGeocellular Tank, DS/PN: S1.003, Volume (m³): 1.6</u>											
Invert Level (m) 5.830											
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)	Depth (m)	Flow (l/s)
0.100	0.0000	0.600	0.0000	1.100	0.0000	1.600	0.0000	2.100	0.0000	2.600	0.0000
0.200	0.0000	0.700	0.0000	1.200	0.0000	1.700	0.0000	2.200	0.0000	2.700	0.0000
0.300	0.0000	0.800	0.0000	1.300	0.0000	1.800	0.0000	2.300	0.0000	2.800	0.0000
0.400	0.0000	0.900	0.0000	1.400	0.0000	1.900	0.0000	2.400	0.0000	2.900	0.0000
0.500	0.0000	1.000	0.0000	1.500	0.0000	2.000	0.0000	2.500	0.0000	3.000	0.0000
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Storage Structures for Storm

Cellular Storage Manhole: SGeocellular Tank, DS/PN: S1.003

Invert Level (m) 5.960 Infiltration Coefficient Side (m/hr) 0.00421 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00421 Safety Factor 1.5

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	38.5	38.5	0.488	38.5	51.0	0.489	0.0	51.0

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S1.000	S5 - Catchpit	S1	0.000	0.084	0.084
S1.001		S2	0.133	0.050	0.184
S2.000		S3	0.798	0.084	0.883
S2.001		S4	0.950	0.055	1.005
S1.002		S5	1.048	0.008	1.056
S3.000		S6	0.000	0.065	0.065
S3.001		S7	0.136	0.050	0.186
S4.000		S8	0.765	0.062	0.826
S4.001		S9	0.877	0.100	0.976
S3.002	S10 - Catchpit	S10	1.056	0.007	1.064
S1.003		SGeocellular Tank	1.583	0.012	17.861
Total			7.347	0.577	25.784

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Catchment
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 515700 103000 TQ 15700 03000	Cv (Winter)	1.000
Margin for Flood Risk Warning (mm)	300.0	DTS Status	OFF
Analysis Timestep	Fine	DVD Status	ON
Inertia Status	ON		

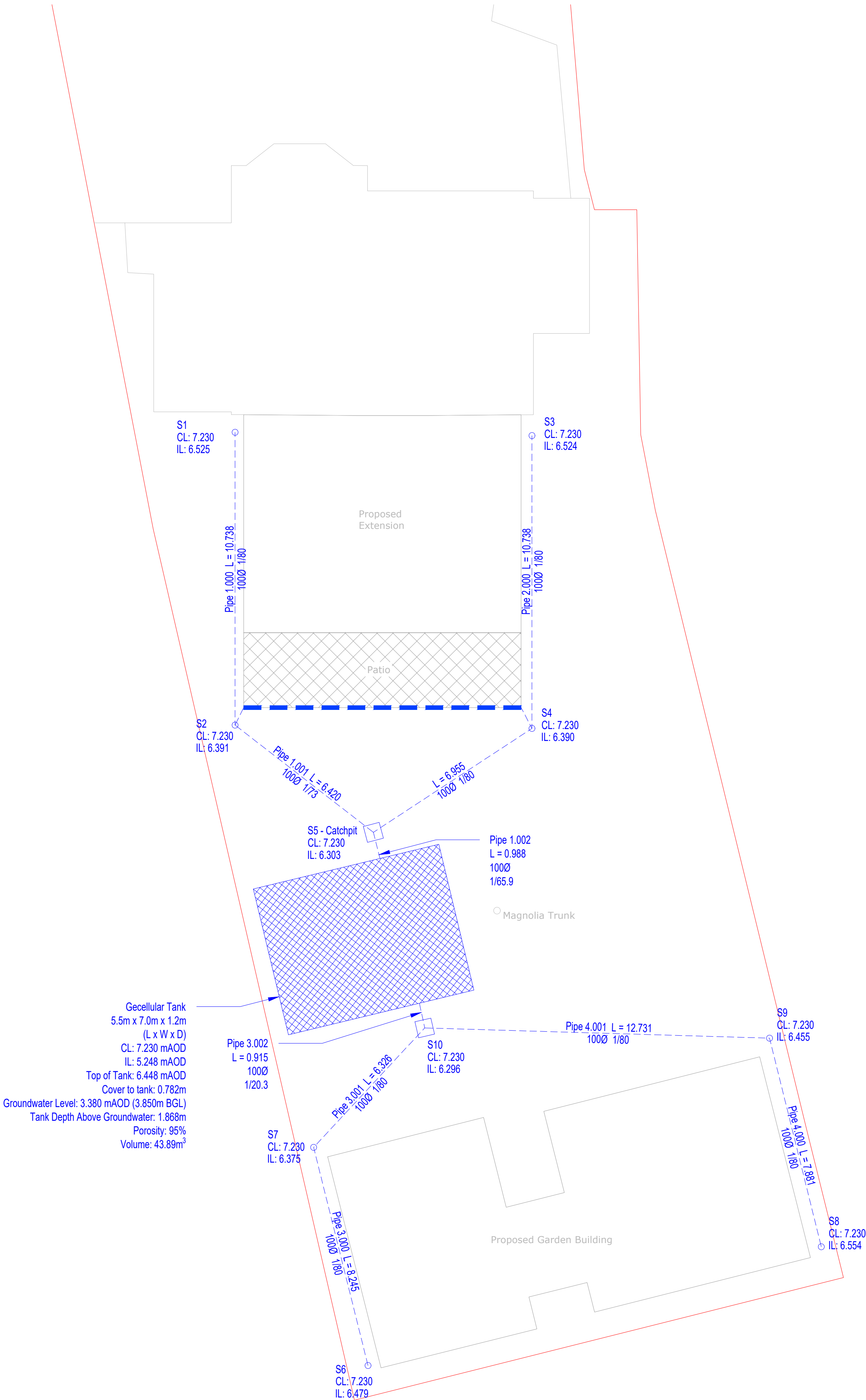
Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760
Return Period(s) (years)	10
Climate Change (%)	40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Overflow Vol (m ³)	Maximum Vol (m ³)	Discharge Vol (m ³)	Half Drain Time (mins)
S1.000	S1	30 minute 10 year Summer I+40%	30	7.230	6.545	-0.080	0.000		0.015	0.702	
S1.001	S2	15 minute 10 year Summer I+40%	15	7.230	6.429	-0.062	0.000		0.015	1.091	
S2.000	S3	30 minute 10 year Summer I+40%	30	7.230	6.545	-0.079	0.000		0.018	0.709	
S2.001	S4	15 minute 10 year Summer I+40%	15	7.230	6.429	-0.061	0.000		0.048	1.099	
S1.002	S5 - Catchpit	5760 minute 10 year Summer I+40%	5760	7.230	6.410	0.007	0.000		0.166	13.178	
S3.000	S6	30 minute 10 year Summer I+40%	30	7.230	6.501	-0.078	0.000		0.017	0.855	
S3.001	S7	5760 minute 10 year Summer I+40%	5760	7.230	6.410	-0.065	0.000		0.014	6.132	
S4.000	S8	30 minute 10 year Summer I+40%	30	7.230	6.580	-0.074	0.000		0.024	1.089	
S4.001	S9	15 minute 10 year Summer I+40%	15	7.230	6.494	-0.061	0.000		0.048	1.323	
S3.002	S10 - Catchpit	5760 minute 10 year Summer I+40%	5760	7.230	6.410	0.014	0.000		0.184	14.096	
S1.003	SGeoCellular Tank	5760 minute 10 year Summer I+40%	5760	7.230	6.410	0.480	0.000		17.101	0.000	5136

PN	US/MH Name	Pipe Flow (l/s)	Status
S1.000	S1	0.6	OK*
S1.001	S2	1.9	OK
S2.000	S3	0.6	OK
S2.001	S4	1.9	OK
S1.002	S5 - Catchpit	0.1	SURCHARGED
S3.000	S6	0.8	OK*
S3.001	S7	0.1	OK
S4.000	S8	1.0	OK
S4.001	S9	2.0	OK
S3.002	S10 - Catchpit	0.2	SURCHARGED
S1.003	SGeoCellular Tank	0.0	SURCHARGED

Appendix D

Drainage Layout



Notes

- All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
- All RWP pipe locations are assumed and any change in layout as a result in change of RWP locations requires a revisit of the drainage layout, including all pipe lengths, diameters and gradients.
- Any discrepancies should be reported to the architect and/or engineer immediately, so that clarification can be sought prior to the commencement of works.
- This drawing should be read in conjunction with all other relevant architect and engineering details, drawings and specification.
- Manholes situated within areas accessible to motor vehicles are to be fitted with suitable strength covers and frames.
- Refer to Statutory Undertakers records for details of apparatus present within the construction areas. Chambers are to be adjusted where required to match new levels. The main contractor is to coordinate all diversionary works.
- All Sewer elements of the works to be constructed in accordance with Design & Construction Guidance for Foul & Surface Water Sewers offered for adoption under the Code for Adoption Agreements for water and sewerage companies operating wholly or mainly in England. All Foul Water Sewer pipework to be constructed from vitrified clay to BS EN 295 or concrete to BS EN 1916 and BS 5911.
- All works to the private drainage system to be in accordance with the Building Regulations Approved Document "H" 2015 edition.
- Pipes and channels constructed within private drainage to be either:
 - Concrete to BS EN 1916 & BS 5911.
 - Extra Strength Vitrified Clay to BS EN 295
 - Unplasticised PVC to BS EN 1401 (Not to be used in adoptable drainage and beneath basement slab)
 - Ductile Iron to BS EN 598. Ductile Iron to BS EN 598. For use within pile caps and ground beams. Ductile iron pipes to have a cement mortar lining.
- Drainage from units to be in plastic pipe-work to BS EN 1452 & BS EN 13598.
- Manhole covers and frames are to be in accordance with BS EN 124 and kite-marked.
- All private manhole covers shall be lockable. In addition all private manhole covers in hard-paved areas shall be recessed so as to accommodate the relevant surfacing materials.
- All pipes are to be 100mm diameter unless otherwise shown except for highway and road gully connections which are to be 150 mm diameter.
- All pipes below slab level are to be minimum gradient of 1 in 40, unless otherwise specified.
- All pipes connected to a chamber shall have a common soffit level unless otherwise stated.
- All pipes to have Class 'S' surround.
- Locations of the RWP and SVP are obtained from from the structural engineer's drawings.

Legend

- New Surface Water Gravity Pipe (see drawing for pipe dimensions, dia. and falls)
- New PPIC 225mm dia. 'Type E' surface water inspection chamber
- New 600mm dia. Silt Trap
- New ACO MultiDrain MD 100mm linear drain. A15 cover to Architect's specification.
- Polystorm PSM1A Modular Soakaway Wrapped in Terram T1000 Geotextile

P04	Revised Tank Levels/Dimensions	PA	PA	PA	18/02/2026
P03	Revised Tank Levels/Dimensions	PA	PA	PA	23/01/2026
P02	Condition Discharge Application	PA	PA	PA	23/12/2025
P01	First Issue	LJ	PA	PA	16/12/2024
Rev.	Description	Drm	Chk	App	Date

Drawing Status:

FOR PLANNING
NOT FOR CONSTRUCTION

motion

Guildford - Reading - London
www.motion.co.uk

Client:

Hassocks Farley Properties

Project:

19 Farncombe Road, Worthing

Title:

Surface Water Drainage Strategy

Scale: 1:100 (@ A1)

Drawing:
2409049-0500

Revision:
P04

