Construction Design Solutions
Consulting Civil, Structural, Highway & Drainage Engineers

Drainage Assessment



Development :

Former Goodfellows School Development,
Spalding Common
Lincolnshire

Client :
Country Court Care Ltd.

CDS Project Reference : 2014.5563

Revision A - December 2016

Prepared By:

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Revision A - Dec 2016 - Updated Storm Water Strategy Following New Outfall Surveys

Storm Drainage

The existing site is a former school house and separate dwelling with large gardens to the North.

There are storm collection points on and around the existing buildings in the form of rainwater pipes and gullies. The former playground has a concrete 'slot' type drain along the southern boundary of the site.

A detailed tracing survey was carried out by Drainage 2000 in November 2016.

The playground slot drain runs to a pair of manhole soakaways. By today's standards, these existing soakaways are of insufficient capacity and appear to have silted and blocked completely. A CDS survey saw these full to cover level with water, even in dry weather. The water from this system simply overflows into the gravity off site storm system.

A 150mm storm gravity outfall pipe leaves the site in a southerly direction and enters the off site storm network within Spalding Common (road parallel to main road - also called Spalding Common). This then combines with the local highway drainage network which eventually contributes to the local ditch network.

This outfall pipe is currently live and carrying all unrestricted storm flow from the existing building and impermeable areas. This pipe appears to be of Riparian Ownership and as such, a continued right to connect is assumed.

It should be noted that this outfall pipe is relatively shallow and careful consideration should be given to the location and depth of the storage tank at full design stage.

There is no evidence to suggest that the adopted foul system within the site was once 'combined' as is the case in many urban developments. Storm and foul systems appear to be historically separate.

A ground investigation has been completed and percolation values calculated for two locations within the site. To the north, the better percolation values are found with K = 5.33x10(-5) m/s. This is an acceptable value for consideration of SUDS systems. However, the site constraints include an easement for the adjacent railway. As such, soakaways cannot be located within that zone. Soakaways were considered in the southern zone of the site, outside the easement line, however, standard percolation testing yielded relatively poor results. Deep bore

soakaways were also considered, but dismissed following discussions with the LPA and the assessment of the associated costs.

Water table levels indicate that water will be struck at 1.7 - 2.0m typically, and as such, any storm attenuation systems will need to be sited above this level to prevent floating.

The existing runoff for the development is calculated as 13 l/s. The existing unrestricted flow coming from 950 sqm.

Using current best practice, the site runoff will be reduced by 30% to a discharge of 9 l/s using a flow control device on the outfall manhole within the site.

The attenuated storage volume will be based upon the design criteria of a 1/100 year storm with 30% climate change.

Initial Source Control calculations suggest a stored volume of 56 cubicM based upon the above criteria.

The underground positive drainage collection system will be designed in accordance with BS EN752. Pipes will not surcharge for a 1 in 2 year design storm and will not flood for a 1 in 30 year design storm.

A petrol interceptor is not deemed as necessary for this development.

In an exceedence event over and above the design storm criteria, local topography will be set below the floor level and will allow overland flows to run off site without disruption or loss of amenity to any personnel.

Foul Drainage

Foul drainage will be collected in a positive underground gravity drainage system and exit the site using the existing outfall pipes to Anglian Water Manhole ref 3402.

The existing foul sewer within the development will have an easement. The width of this will need to be clarified when Anglian Water approval is sought for the development.

The new connection will require an Indirect Section 106 application. The lead contractor is responsible for this application.

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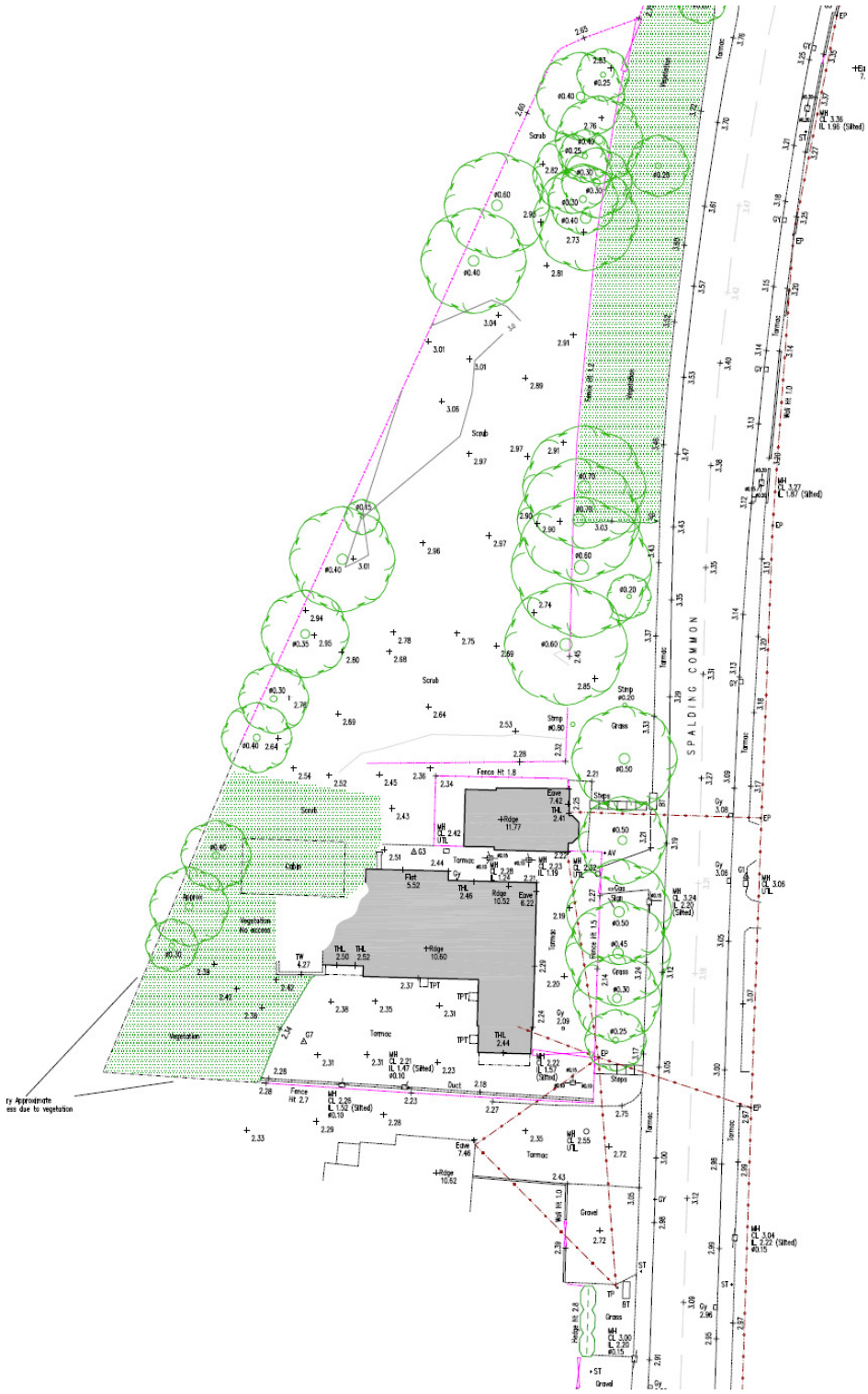
Prepared By S Nicoll - CDS Consulting
B.Eng hons



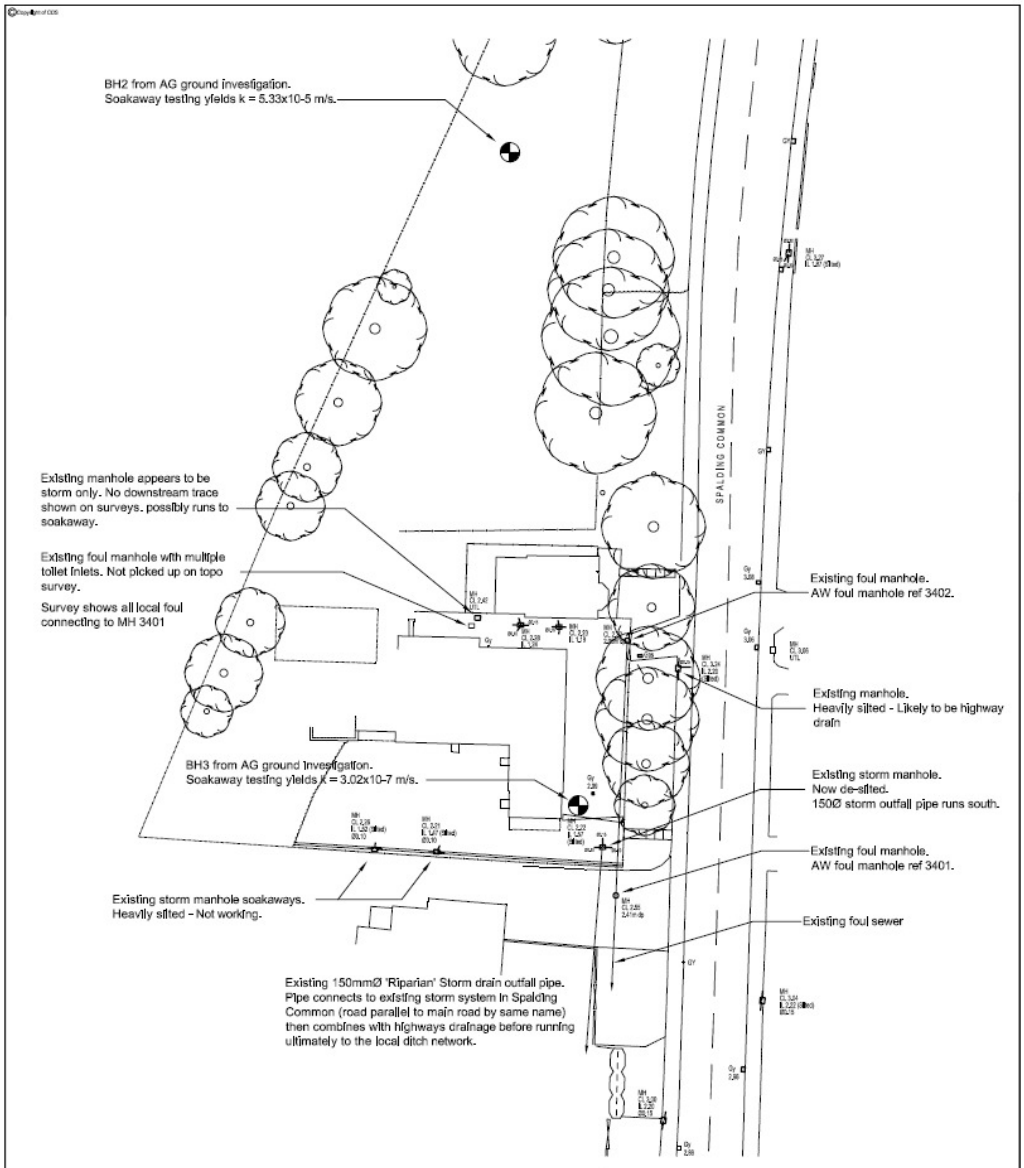
Date of revision 16.12.16

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Appendix 1 - Existing Site Topo Survey & Drainage Survey



Appendix 2 - Existing Site Drainage Notes - CDS

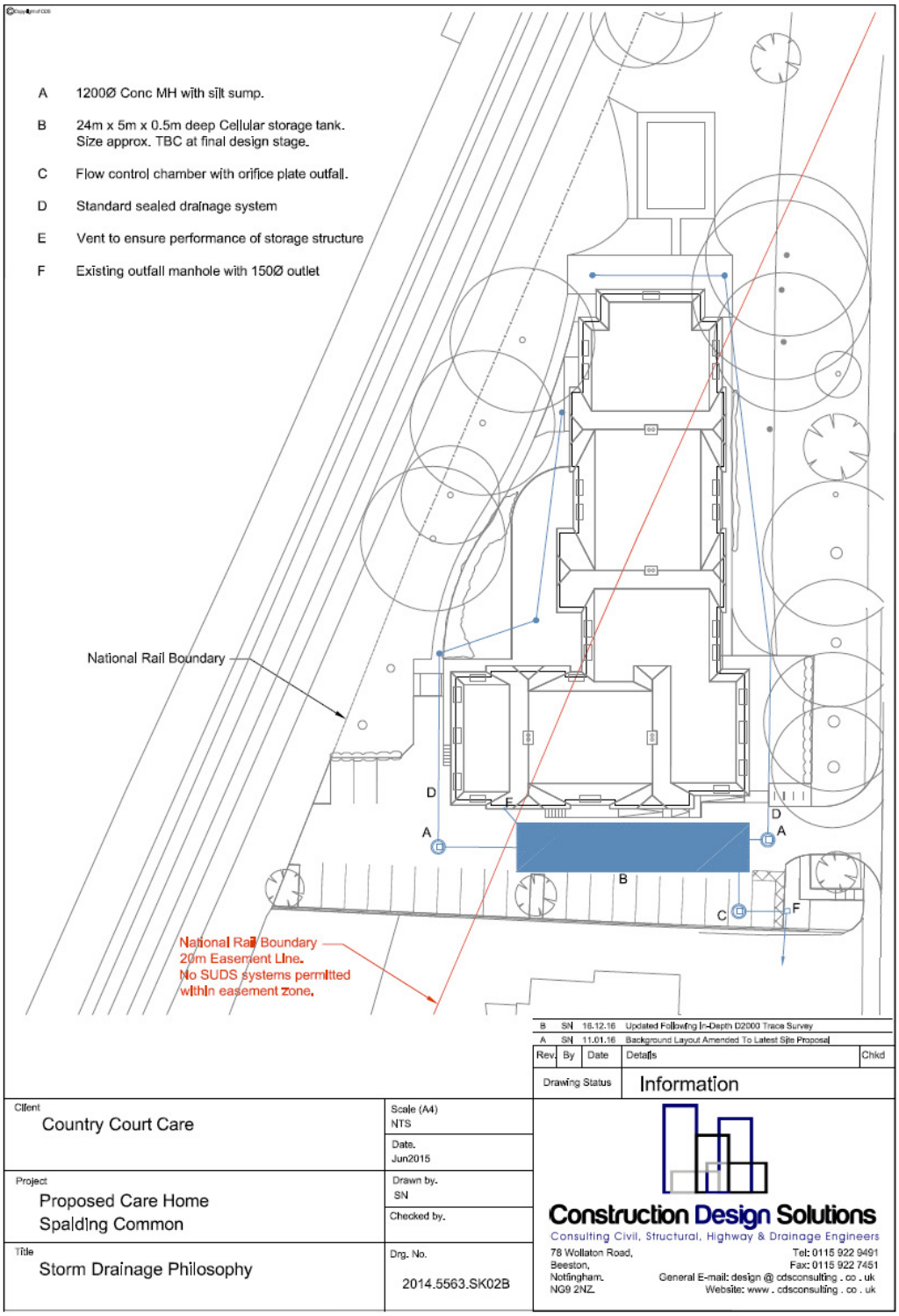


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Appendix 3 - Anglian Water Sewer Records

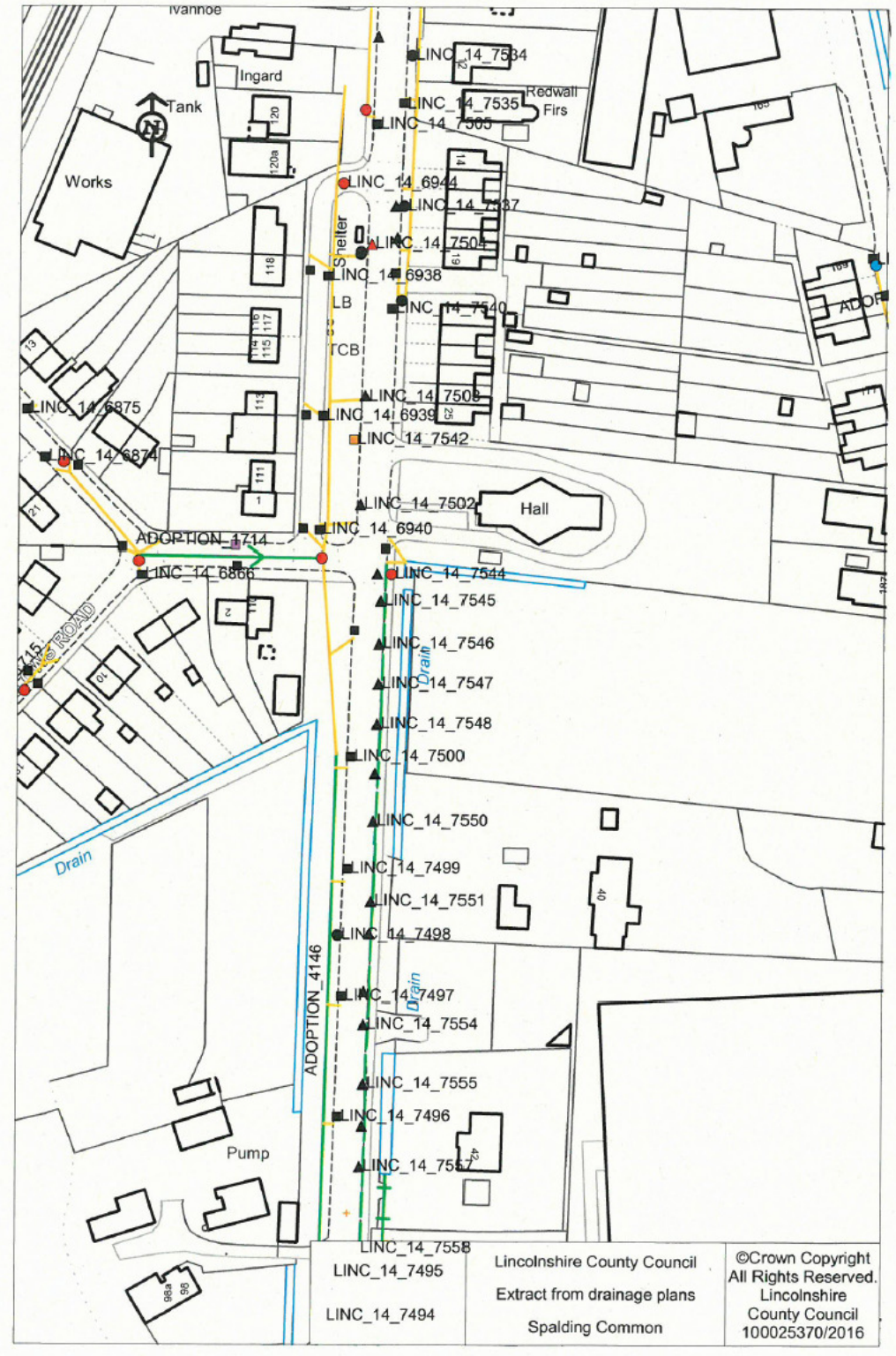


Appendix 4 - CDS Proposed Drainage Philosophy Sketch



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Appendix 5 - LPA Asset Map



Appendix 6 - Initial Storm Storage Estimate Calculations

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Date 16/12/2016 13:59 File Riparian outfall at 9 1...	Designed by SN Checked by	
Micro Drainage	Source Control 2015.1	

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 66 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	100.305	0.305	0.0	6.7	6.7	34.7	O K
30 min Summer	100.381	0.381	0.0	7.6	7.6	43.4	O K
60 min Summer	100.428	0.428	0.0	8.1	8.1	48.8	O K
120 min Summer	100.443	0.443	0.0	8.3	8.3	50.5	O K
180 min Summer	100.432	0.432	0.0	8.2	8.2	49.3	O K
240 min Summer	100.413	0.413	0.0	8.0	8.0	47.1	O K
360 min Summer	100.372	0.372	0.0	7.5	7.5	42.4	O K
480 min Summer	100.335	0.335	0.0	7.1	7.1	38.2	O K
600 min Summer	100.303	0.303	0.0	6.7	6.7	34.6	O K
720 min Summer	100.276	0.276	0.0	6.3	6.3	31.5	O K
960 min Summer	100.234	0.234	0.0	5.7	5.7	26.6	O K
1440 min Summer	100.177	0.177	0.0	4.8	4.8	20.2	O K
2160 min Summer	100.131	0.131	0.0	3.9	3.9	14.9	O K
2880 min Summer	100.109	0.109	0.0	3.4	3.4	12.4	O K
4320 min Summer	100.089	0.089	0.0	2.5	2.5	10.1	O K
5760 min Summer	100.077	0.077	0.0	2.0	2.0	8.8	O K
7200 min Summer	100.069	0.069	0.0	1.7	1.7	7.9	O K
8640 min Summer	100.063	0.063	0.0	1.4	1.4	7.2	O K
10080 min Summer	100.058	0.058	0.0	1.3	1.3	6.6	O K
15 min Winter	100.343	0.343	0.0	7.2	7.2	39.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.269	0.0	39.5	23
30 min Summer	79.695	0.0	52.0	34
60 min Summer	49.937	0.0	65.4	56
120 min Summer	30.267	0.0	79.3	88
180 min Summer	22.297	0.0	87.6	122
240 min Summer	17.851	0.0	93.6	156
360 min Summer	12.957	0.0	101.9	222
480 min Summer	10.330	0.0	108.3	288
600 min Summer	8.659	0.0	113.5	350
720 min Summer	7.492	0.0	117.8	412
960 min Summer	5.959	0.0	124.9	532
1440 min Summer	4.309	0.0	135.4	772
2160 min Summer	3.110	0.0	146.9	1128
2880 min Summer	2.466	0.0	155.2	1476
4320 min Summer	1.775	0.0	167.5	2208
5760 min Summer	1.405	0.0	176.9	2936
7200 min Summer	1.171	0.0	184.3	3672
8640 min Summer	1.008	0.0	190.5	4408
10080 min Summer	0.889	0.0	195.7	5136
15 min Winter	121.269	0.0	44.2	23

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	100.429	0.429	0.0	8.1	8.1	48.9	O K
60 min Winter	100.484	0.484	0.0	8.7	8.7	55.2	O K
120 min Winter	100.493	0.493	0.0	8.8	8.8	56.2	O K
180 min Winter	100.471	0.471	0.0	8.6	8.6	53.7	O K
240 min Winter	100.441	0.441	0.0	8.3	8.3	50.2	O K
360 min Winter	100.379	0.379	0.0	7.6	7.6	43.2	O K
480 min Winter	100.328	0.328	0.0	7.0	7.0	37.4	O K
600 min Winter	100.286	0.286	0.0	6.5	6.5	32.6	O K
720 min Winter	100.252	0.252	0.0	6.0	6.0	28.7	O K
960 min Winter	100.200	0.200	0.0	5.2	5.2	22.8	O K
1440 min Winter	100.140	0.140	0.0	4.1	4.1	16.0	O K
2160 min Winter	100.104	0.104	0.0	3.2	3.2	11.9	O K
2880 min Winter	100.089	0.089	0.0	2.5	2.5	10.2	O K
4320 min Winter	100.073	0.073	0.0	1.8	1.8	8.3	O K
5760 min Winter	100.064	0.064	0.0	1.4	1.4	7.2	O K
7200 min Winter	100.056	0.056	0.0	1.2	1.2	6.4	O K
8640 min Winter	100.050	0.050	0.0	1.0	1.0	5.8	O K
10080 min Winter	100.046	0.046	0.0	0.9	0.9	5.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	79.695	0.0	58.2	35
60 min Winter	49.937	0.0	73.3	58
120 min Winter	30.267	0.0	88.8	94
180 min Winter	22.297	0.0	98.2	132
240 min Winter	17.851	0.0	104.8	168
360 min Winter	12.957	0.0	114.1	236
480 min Winter	10.330	0.0	121.3	302
600 min Winter	8.659	0.0	127.1	366
720 min Winter	7.492	0.0	132.0	428
960 min Winter	5.959	0.0	139.9	550
1440 min Winter	4.309	0.0	151.7	784
2160 min Winter	3.110	0.0	164.5	1124
2880 min Winter	2.466	0.0	173.9	1480
4320 min Winter	1.775	0.0	187.6	2212
5760 min Winter	1.405	0.0	198.2	2936
7200 min Winter	1.171	0.0	206.4	3672
8640 min Winter	1.008	0.0	213.3	4416
10080 min Winter	0.889	0.0	219.2	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.175

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.058	4	8	0.058	8	12	0.058

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Model Details

Storage is Online Cover Level (m) 101.000

Cellular Storage Structure

Invert Level (m) 100.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	120.0	120.0	0.600	0.0	149.0
0.500	120.0	149.0			

Orifice Outflow Control

Diameter (m) 0.079 Discharge Coefficient 0.600 Invert Level (m) 100.000

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