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BARWICK ROAD, DOVER

Flood Risk Assessment and Drainage Strategy – Volume 4 of 5

APPENDIX H

Location : **Barwick Road, Dover**

M5-60 : 20 mm

r : 0.45

Wallingford Method - maps

For different durations,

From Table 1

Duration, D	Z1			
15 min	0.65	M5-15:	Z1 x M5-60	13.00 mm
30 min	0.82	M5-30:	Z1 x M5-60	16.40 mm
60 min	1	M5-60:	Z1 x M5-60	20.00 mm
6hr	1.51	M5-360:	Z1 x M5-60	30.20 mm

For different return intervals,

From Table 2*

		Z2	
Duration, D	M1	M30	M100
15 min	0.62	1.52	1.96
30 min	0.62	1.53	2.00
60 min	0.64	1.54	2.03
6 hr	0.68	1.51	1.97

Average point intensity, API = I/(D/60)

	D min	Calculation	I mm	API mm/hr
M 1-15	15	M5-15*Z2(M1)	8.06	32.24
M 1-30	30	M5-30*Z2(M1)	10.17	20.34
M 1-60	30	M5-360*Z2(M1)	12.80	25.60
M1-360	360	M5-360*Z2(M1)	20.54	3.42
M 30-15	15	M5-15*Z2(M30)	19.76	79.04
M 30-30	30	M5-30*Z2(M30)	25.09	50.18
M 30-60	60	M5-60*Z2(M30)	30.80	30.80
M30-360	360	M5-360*Z2(M30)	45.60	7.60
M 100-15	15	M5-15*Z2(M100)	25.48	101.92
M 100-30	30	M5-30*Z2(M100)	32.80	65.60
M100-60	60	M5-60*Z2(M100)	40.60	40.60
M100-360	360	M5-360*Z2(M100)	59.49	9.92

Peak Runoff

Q=2.78CiA Rational Method, SUDS Manual Section 4.3.3

where: (1) C = Cv Cr

Cv = 1 **

Cr = 1.3 constant value for design purposes

therefore , C = 1.3

* The rainfall depths from cells E8-E11 are compared with the depths given in cells J29-J40 and Z2 interpolated accordingly for each return period

** Cv varies between 0.6 (rapidly draining soils) and 0.9 (heavy clay) with an average of 0.75 taken if ground conditions not known.

2.78*C= 3.614

(2) i = API, defined above

Q=2.78CiA

(3) A = areas measured for subcatchments

		Contributing Impermeable Area Ha	
	i mm/hr	Site	Per hectare
		0.97	1
M 1-15	32.24	113.02	116.52
M 1-30	20.34	71.29	73.49
M 1-60	25.60	89.74	73.49
M1-360	3.42	12.00	12.37
M 30-15	79.04	277.08	285.65
M 30-30	50.18	175.92	181.36

		Contributing Impermeable Area Ha	
	i mm/hr	Site	Per hectare
		0.97	1
M 30-60	30.80	107.97	181.36
M30-360	7.60	26.64	27.47
M 100-15	101.92	357.29	368.34
M 100-30	65.60	229.97	237.08
M 100-60	40.60	142.33	237.08
M100-360	9.92	34.76	35.84

Table 1

Rainfall Duration D											
Minutes						Hours					
r	5	10	15	30		1	2	4	6	10	24
0.12	0.22	0.34	0.45	0.67		1.00	1.48	2.17	2.75	3.70	6.00
0.15	0.25	0.38	0.48	0.69		1.00	1.42	2.02	2.46	3.32	4.90
0.18	0.27	0.41	0.51	0.71		1.00	1.36	1.86	2.25	2.86	4.30
0.21	0.29	0.43	0.54	0.73		1.00	1.33	1.77	2.12	2.62	3.60
0.24	0.31	0.46	0.56	0.75		1.00	1.30	1.71	2.00	2.40	3.35
0.27	0.33	0.48	0.58	0.76		1.00	1.27	1.64	1.88	2.24	3.10
0.30	0.34	0.49	0.59	0.77		1.00	1.25	1.57	1.78	2.12	2.84
0.33	0.35	0.50	0.61	0.78		1.00	1.23	1.53	1.73	2.04	2.60
0.36	0.36	0.51	0.62	0.79		1.00	1.22	1.48	1.67	1.90	2.42
0.39	0.37	0.52	0.63	0.80		1.00	1.21	1.46	1.62	1.82	2.28
0.42	0.38	0.53	0.64	0.81		1.00	1.20	1.42	1.57	1.74	2.16
0.45	0.39	0.54	0.65	0.82		1.00	1.19	1.38	1.51	1.68	2.03

Table 2 - England and Wales

Growth Factor Z2											
M5 rainfall	M1	M2	M3	M4	M5	M10	M20	M50	M100	M30 interpolated	
5.00	0.62	0.79	0.89	0.97	1.02	1.19	1.36	1.56	1.79	1.25	
10.00	0.61	0.79	0.90	0.97	1.03	1.22	1.41	1.65	1.91	1.49	
15.00	0.62	0.80	0.90	0.97	1.03	1.24	1.44	1.70	1.99	1.53	
20.00	0.64	0.81	0.90	0.97	1.03	1.24	1.45	1.73	2.03	1.54	
25.00	0.66	0.82	0.91	0.97	1.03	1.24	1.44	1.72	2.01	1.53	
30.00	0.68	0.83	0.91	0.97	1.03	1.22	1.42	1.70	1.97	1.51	
40.00	0.70	0.84	0.92	0.97	1.02	1.19	1.38	1.64	1.89	1.47	
50.00	0.72	0.85	0.93	0.98	1.02	1.17	1.34	1.58	1.81	1.42	
75.00	0.76	0.87	0.93	0.98	1.02	1.14	1.28	1.47	1.64	1.34	
100.00	0.78	0.88	0.94	0.98	1.02	1.13	1.25	1.40	1.54	1.30	
150.00	0.78	0.88	0.94	0.98	1.01	1.12	1.21	1.33	1.45	1.25	
200.00	0.78	0.88	0.94	0.98	1.01	1.11	1.19	1.30	1.40	1.23	

APPENDIX I

IoH 124 Calculation of Greenfield Runoff Rate

Project:	P22-2678 Barwick Road Dover			
OS Location	629836	E	142038	N
Date:	02/08/2022			
Written By:	GGB	Checked By:		

SAAR	801	mm
Pro Rata Site Area =	50	ha
	0.5	km ²
Soil WRA Class	1	
Soil Type SPR Value	0.1	

$$Q_{bar}_{rural} = 0.00108 \times (AREA)0.89 \times (SAAR)1.17 \times (SOIL)2.17$$

$$Q_{bar-50ha} = 0.010 \text{ m}^3/\text{s}$$

From Regional Growth Curve Factor

Region: 7

Return period	1	2	5	10	25	30	50	100	500
Growth Factor	0.85	0.88	1.28	1.62	2.14	2.24	2.62	3.19	4.49

Q₁ 50ha =	0.008	m ³ /s	=	8.36	l/s	=	0.167	l/s/ha
Q₂ 50ha =	0.009	m ³ /s	=	8.65	l/s	=	0.173	l/s/ha
Q₅ 50ha =	0.013	m ³ /s	=	12.59	l/s	=	0.252	l/s/ha
Q₁₀ 50ha =	0.016	m ³ /s	=	15.93	l/s	=	0.319	l/s/ha
Q₂₅ 50ha =	0.021	m ³ /s	=	21.05	l/s	=	0.421	l/s/ha
Q₃₀ 50ha =	0.022	m ³ /s	=	22.03	l/s	=	0.441	l/s/ha
Q₅₀ 50ha =	0.026	m ³ /s	=	25.77	l/s	=	0.515	l/s/ha
Q₁₀₀ 50ha =	0.031	m ³ /s	=	31.37	l/s	=	0.627	l/s/ha
Q₅₀₀ 50ha =	0.044	m ³ /s	=	44.16	l/s	=	0.883	l/s/ha

Factored for Development Impermeable Area

Site Area = 2.207

Q_{bar} site =	0.000	m ³ /s	=	0.4	l/s	=	0.2	l/s/ha
Q₁ site =	0.000	m ³ /s	=	0.4	l/s	=	0.2	l/s/ha
Q₂ site =	0.000	m ³ /s	=	0.4	l/s	=	0.2	l/s/ha
Q₅ site =	0.001	m ³ /s	=	0.6	l/s	=	0.3	l/s/ha
Q₁₀ site =	0.001	m ³ /s	=	0.7	l/s	=	0.3	l/s/ha
Q₂₅ site =	0.001	m ³ /s	=	0.9	l/s	=	0.4	l/s/ha
Q₃₀ site =	0.001	m ³ /s	=	1.0	l/s	=	0.4	l/s/ha
Q₅₀ site =	0.001	m ³ /s	=	1.1	l/s	=	0.5	l/s/ha
Q₁₀₀ site =	0.001	m ³ /s	=	1.4	l/s	=	0.6	l/s/ha
Q₅₀₀ site =	0.002	m ³ /s	=	1.9	l/s	=	0.9	l/s/ha

Note: For greenfield site, the critical duration is generally not relevant and the prediction of the peak rate of runoff using IoH124 does not require consideration of storm duration.

IoH 124 Calculation of Greenfield Runoff Rate

Project:	P22-2678			
	Barwick Road, Dover			
OS Location	629800	E	142020	N
Date:	16/08/2022			
Written By:	GGB	Checked By:		

SAAR	801	mm
Pro Rata Site Area =	50	ha
	0.5	km ²
Soil WRA Class	1	
Soil Type SPR Value	0.15	

$$Q_{bar}_{rural} = 0.00108 \times (AREA)0.89 \times (SAAR)1.17 \times (SOIL)2.17$$

$$Q_{bar-50ha} = 0.024 \text{ m}^3/\text{s}$$

From Regional Growth Curve Factor

Region: 7

Return period	1	2	5	10	25	30	50	100	500
Growth Factor	0.85	0.88	1.28	1.62	2.14	2.24	2.62	3.19	4.49

Q₁ 50ha =	0.020	m ³ /s	=	20.15	l/s	=	0.403	l/s/ha
Q₂ 50ha =	0.021	m ³ /s	=	20.86	l/s	=	0.417	l/s/ha
Q₅ 50ha =	0.030	m ³ /s	=	30.34	l/s	=	0.607	l/s/ha
Q₁₀ 50ha =	0.038	m ³ /s	=	38.41	l/s	=	0.768	l/s/ha
Q₂₅ 50ha =	0.051	m ³ /s	=	50.73	l/s	=	1.015	l/s/ha
Q₃₀ 50ha =	0.053	m ³ /s	=	53.10	l/s	=	1.062	l/s/ha
Q₅₀ 50ha =	0.062	m ³ /s	=	62.11	l/s	=	1.242	l/s/ha
Q₁₀₀ 50ha =	0.076	m ³ /s	=	75.63	l/s	=	1.513	l/s/ha
Q₅₀₀ 50ha =	0.106	m ³ /s	=	106.44	l/s	=	2.129	l/s/ha

Factored for Development Impermeable Area

Site Area = 1.47

Q_{bar} site =	0.001	m ³ /s	=	0.7	l/s	=	0.5	l/s/ha
Q₁ site =	0.001	m ³ /s	=	0.6	l/s	=	0.4	l/s/ha
Q₂ site =	0.001	m ³ /s	=	0.6	l/s	=	0.4	l/s/ha
Q₅ site =	0.001	m ³ /s	=	0.9	l/s	=	0.6	l/s/ha
Q₁₀ site =	0.001	m ³ /s	=	1.1	l/s	=	0.8	l/s/ha
Q₂₅ site =	0.001	m ³ /s	=	1.5	l/s	=	1.0	l/s/ha
Q₃₀ site =	0.002	m ³ /s	=	1.6	l/s	=	1.1	l/s/ha
Q₅₀ site =	0.002	m ³ /s	=	1.8	l/s	=	1.2	l/s/ha
Q₁₀₀ site =	0.002	m ³ /s	=	2.2	l/s	=	1.5	l/s/ha
Q₅₀₀ site =	0.003	m ³ /s	=	3.1	l/s	=	2.1	l/s/ha

Note: For greenfield site, the critical duration is generally not relevant and the prediction of the peak rate of runoff using IoH124 does not require consideration of storm duration.

APPENDIX J

Flow+ - Untitled

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Pre-development discharge

Site Makeup: Brownfield

Brownfield Method: Greenfield

Greenfield Method: FSR/FEH

Positively Drained Area (ha): 0.970

Soil Index: 5

SPR: 0.53

Catchment Wetness Index: 120.148

Return Period (years): 2

Climate Change (%): 0

Storm Duration (mins): 360

Betterment (%): 0

PR: 0.518

Runoff Volume (m³): 135

OK

Cancel

Calc

Calc

Figure 1. Brownfield Run-off Volume for the 1 in 2 year Event.

Flow+ - Untitled

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Link Types

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Preferences

Pre-development discharge

Site Makeup: Brownfield

Brownfield Method: Greenfield

Greenfield Method: FSR/FEH

Positively Drained Area (ha): 0.970

Soil Index: 5

SPR: 0.53

Catchment Wetness Index: 120.148

Return Period (years): 30

Climate Change (%): 40

Storm Duration (mins): 360

Betterment (%): 0

PR: 0.574

Runoff Volume (m³): 427

OK

Cancel

Calc

Calc

Figure 2. Brownfield Run-off Volume for the 1 in 30 year plus 40% Climate Change Allowance Event.

Flow+ - Untitled

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Approval Results

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Manhole Types

Link Types

Networks

Preferences

Pre-development discharge

Site Makeup	Brownfield	OK
Brownfield Method	Greenfield	Cancel
Greenfield Method	FSR/FEH	
Positively Drained Area (ha)	0.970	
Soil Index	5	
SPR	0.53	
Catchment Wetness Index	120.148	Calc
Return Period (years)	100	
Climate Change (%)	45	
Storm Duration (mins)	360	
Betterment (%)	0	
	Calc	
PR	0.600	
Runoff Volume (m³)	603	

Figure 3. Brownfield Run-off Volume for the 1 in 100 year plus 45% Climate Change Allowance Event.

APPENDIX K

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<u>Summary of Results for 2 year Return Period</u> Half Drain Time : 18 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>41.016</td><td>0.216</td><td>0.0</td><td>52.1</td><td>52.1</td><td>65.6</td><td>O K</td></tr><tr><td>30 min Summer</td><td>41.040</td><td>0.240</td><td>0.0</td><td>52.9</td><td>52.9</td><td>73.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>41.040</td><td>0.240</td><td>0.0</td><td>52.9</td><td>52.9</td><td>72.8</td><td>O K</td></tr><tr><td>120 min Summer</td><td>41.044</td><td>0.244</td><td>0.0</td><td>53.0</td><td>53.0</td><td>74.1</td><td>O K</td></tr><tr><td>180 min Summer</td><td>41.024</td><td>0.224</td><td>0.0</td><td>52.3</td><td>52.3</td><td>68.1</td><td>O K</td></tr><tr><td>240 min Summer</td><td>41.002</td><td>0.202</td><td>0.0</td><td>51.6</td><td>51.6</td><td>61.6</td><td>O K</td></tr><tr><td>360 min Summer</td><td>40.970</td><td>0.170</td><td>0.0</td><td>45.8</td><td>45.8</td><td>51.5</td><td>O K</td></tr><tr><td>480 min Summer</td><td>40.944</td><td>0.144</td><td>0.0</td><td>40.7</td><td>40.7</td><td>43.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>40.926</td><td>0.126</td><td>0.0</td><td>36.6</td><td>36.6</td><td>38.2</td><td>O K</td></tr><tr><td>720 min Summer</td><td>40.911</td><td>0.111</td><td>0.0</td><td>33.0</td><td>33.0</td><td>33.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>40.889</td><td>0.089</td><td>0.0</td><td>27.8</td><td>27.8</td><td>26.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>40.862</td><td>0.062</td><td>0.0</td><td>21.5</td><td>21.5</td><td>18.7</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>40.839</td><td>0.039</td><td>0.0</td><td>16.5</td><td>16.5</td><td>11.8</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>40.825</td><td>0.025</td><td>0.0</td><td>13.7</td><td>13.7</td><td>7.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>40.809</td><td>0.009</td><td>0.0</td><td>10.7</td><td>10.7</td><td>2.8</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>40.800</td><td>0.000</td><td>0.0</td><td>9.1</td><td>9.1</td><td>0.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>40.800</td><td>0.000</td><td>0.0</td><td>8.0</td><td>8.0</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>40.800</td><td>0.000</td><td>0.0</td><td>7.3</td><td>7.3</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>40.800</td><td>0.000</td><td>0.0</td><td>6.8</td><td>6.8</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>41.047</td><td>0.247</td><td>0.0</td><td>53.1</td><td>53.1</td><td>75.0</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>33.395</td><td>0.0</td><td>94.2</td><td>14</td></tr><tr><td>30 min Summer</td><td>21.826</td><td>0.0</td><td>123.6</td><td>23</td></tr><tr><td>60 min Summer</td><td>13.829</td><td>0.0</td><td>156.0</td><td>40</td></tr><tr><td>120 min Summer</td><td>9.649</td><td>0.0</td><td>217.8</td><td>74</td></tr><tr><td>180 min Summer</td><td>7.635</td><td>0.0</td><td>259.8</td><td>104</td></tr><tr><td>240 min Summer</td><td>6.406</td><td>0.0</td><td>290.0</td><td>134</td></tr><tr><td>360 min Summer</td><td>4.933</td><td>0.0</td><td>334.9</td><td>196</td></tr><tr><td>480 min Summer</td><td>4.054</td><td>0.0</td><td>367.0</td><td>256</td></tr><tr><td>600 min Summer</td><td>3.466</td><td>0.0</td><td>392.5</td><td>316</td></tr><tr><td>720 min Summer</td><td>3.042</td><td>0.0</td><td>413.2</td><td>376</td></tr><tr><td>960 min Summer</td><td>2.468</td><td>0.0</td><td>447.0</td><td>494</td></tr><tr><td>1440 min Summer</td><td>1.838</td><td>0.0</td><td>499.3</td><td>736</td></tr><tr><td>2160 min Summer</td><td>1.376</td><td>0.0</td><td>561.1</td><td>1104</td></tr><tr><td>2880 min Summer</td><td>1.129</td><td>0.0</td><td>614.0</td><td>1468</td></tr><tr><td>4320 min Summer</td><td>0.871</td><td>0.0</td><td>710.4</td><td>2200</td></tr><tr><td>5760 min Summer</td><td>0.735</td><td>0.0</td><td>799.1</td><td>0</td></tr><tr><td>7200 min Summer</td><td>0.651</td><td>0.0</td><td>884.5</td><td>0</td></tr><tr><td>8640 min Summer</td><td>0.593</td><td>0.0</td><td>967.4</td><td>0</td></tr><tr><td>10080 min Summer</td><td>0.551</td><td>0.0</td><td>1048.7</td><td>0</td></tr><tr><td>15 min Winter</td><td>33.395</td><td>0.0</td><td>106.0</td><td>15</td></tr></table>								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	41.016	0.216	0.0	52.1	52.1	65.6	O K	30 min Summer	41.040	0.240	0.0	52.9	52.9	73.1	O K	60 min Summer	41.040	0.240	0.0	52.9	52.9	72.8	O K	120 min Summer	41.044	0.244	0.0	53.0	53.0	74.1	O K	180 min Summer	41.024	0.224	0.0	52.3	52.3	68.1	O K	240 min Summer	41.002	0.202	0.0	51.6	51.6	61.6	O K	360 min Summer	40.970	0.170	0.0	45.8	45.8	51.5	O K	480 min Summer	40.944	0.144	0.0	40.7	40.7	43.9	O K	600 min Summer	40.926	0.126	0.0	36.6	36.6	38.2	O K	720 min Summer	40.911	0.111	0.0	33.0	33.0	33.7	O K	960 min Summer	40.889	0.089	0.0	27.8	27.8	26.9	O K	1440 min Summer	40.862	0.062	0.0	21.5	21.5	18.7	O K	2160 min Summer	40.839	0.039	0.0	16.5	16.5	11.8	O K	2880 min Summer	40.825	0.025	0.0	13.7	13.7	7.6	O K	4320 min Summer	40.809	0.009	0.0	10.7	10.7	2.8	O K	5760 min Summer	40.800	0.000	0.0	9.1	9.1	0.0	O K	7200 min Summer	40.800	0.000	0.0	8.0	8.0	0.0	O K	8640 min Summer	40.800	0.000	0.0	7.3	7.3	0.0	O K	10080 min Summer	40.800	0.000	0.0	6.8	6.8	0.0	O K	15 min Winter	41.047	0.247	0.0	53.1	53.1	75.0	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	33.395	0.0	94.2	14	30 min Summer	21.826	0.0	123.6	23	60 min Summer	13.829	0.0	156.0	40	120 min Summer	9.649	0.0	217.8	74	180 min Summer	7.635	0.0	259.8	104	240 min Summer	6.406	0.0	290.0	134	360 min Summer	4.933	0.0	334.9	196	480 min Summer	4.054	0.0	367.0	256	600 min Summer	3.466	0.0	392.5	316	720 min Summer	3.042	0.0	413.2	376	960 min Summer	2.468	0.0	447.0	494	1440 min Summer	1.838	0.0	499.3	736	2160 min Summer	1.376	0.0	561.1	1104	2880 min Summer	1.129	0.0	614.0	1468	4320 min Summer	0.871	0.0	710.4	2200	5760 min Summer	0.735	0.0	799.1	0	7200 min Summer	0.651	0.0	884.5	0	8640 min Summer	0.593	0.0	967.4	0	10080 min Summer	0.551	0.0	1048.7	0	15 min Winter	33.395	0.0	106.0	15
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																																																																																																																																																																																																																																																																																	
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BIC108 - The MedBIC Alan Cherry Drive Chelmsford, CM1 15Q	BARWICK ROAD DOVER	
Date 29/09/2022 File GEOCELLULAR STORAGE FOR...	Designed by GGB Checked by TT	
Innovyze Source Control 2018.1.1		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 629836 142038 TR 29836 42038
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.510

Time (mins)	Area
From:	To: (ha)
0	4 1.510

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BIC108 - The MedBIC Alan Cherry Drive Chelmsford, CM1 15Q	BARWICK ROAD DOVER	
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Innovyze Source Control 2018.1.1		

Model Details

Storage is Online Cover Level (m) 44.000

Cellular Storage Structure

Invert Level (m) 40.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	2.001	0.0	0.0
2.000	320.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0296-5650-2100-5650
Design Head (m)	2.100
Design Flow (l/s)	56.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	296
Invert Level (m)	40.700
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.100	56.5
Flush-Flo™	0.636	56.4
Kick-Flo®	1.391	46.3
Mean Flow over Head Range	-	48.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.1	1.200	52.0	3.000	67.1	7.000	101.3
0.200	30.5	1.400	46.5	3.500	72.3	7.500	104.8
0.300	51.5	1.600	49.6	4.000	77.2	8.000	108.1
0.400	54.4	1.800	52.4	4.500	81.7	8.500	111.4
0.500	55.9	2.000	55.2	5.000	86.0	9.000	114.5
0.600	56.4	2.200	57.8	5.500	90.1	9.500	117.6
0.800	55.9	2.400	60.3	6.000	94.0		
1.000	54.6	2.600	62.6	6.500	97.7		

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<u>Summary of Results for 30 year Return Period (+40%)</u> Half Drain Time : 62 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>41.634</td><td>0.834</td><td>0.0</td><td>56.4</td><td>56.4</td><td>253.5</td><td>O K</td></tr><tr><td>30 min Summer</td><td>41.831</td><td>1.031</td><td>0.0</td><td>56.4</td><td>56.4</td><td>313.3</td><td>O K</td></tr><tr><td>60 min Summer</td><td>41.942</td><td>1.142</td><td>0.0</td><td>56.4</td><td>56.4</td><td>347.3</td><td>O K</td></tr><tr><td>120 min Summer</td><td>41.953</td><td>1.153</td><td>0.0</td><td>56.4</td><td>56.4</td><td>350.5</td><td>O K</td></tr><tr><td>180 min Summer</td><td>41.911</td><td>1.111</td><td>0.0</td><td>56.4</td><td>56.4</td><td>337.8</td><td>O K</td></tr><tr><td>240 min Summer</td><td>41.853</td><td>1.053</td><td>0.0</td><td>56.4</td><td>56.4</td><td>320.2</td><td>O K</td></tr><tr><td>360 min Summer</td><td>41.725</td><td>0.925</td><td>0.0</td><td>56.4</td><td>56.4</td><td>281.2</td><td>O K</td></tr><tr><td>480 min Summer</td><td>41.597</td><td>0.797</td><td>0.0</td><td>56.4</td><td>56.4</td><td>242.2</td><td>O K</td></tr><tr><td>600 min Summer</td><td>41.479</td><td>0.679</td><td>0.0</td><td>56.4</td><td>56.4</td><td>206.4</td><td>O K</td></tr><tr><td>720 min Summer</td><td>41.375</td><td>0.575</td><td>0.0</td><td>56.4</td><td>56.4</td><td>174.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>41.215</td><td>0.415</td><td>0.0</td><td>56.0</td><td>56.0</td><td>126.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>41.039</td><td>0.239</td><td>0.0</td><td>52.8</td><td>52.8</td><td>72.6</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>40.959</td><td>0.159</td><td>0.0</td><td>43.7</td><td>43.7</td><td>48.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>40.923</td><td>0.123</td><td>0.0</td><td>36.0</td><td>36.0</td><td>37.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>40.884</td><td>0.084</td><td>0.0</td><td>26.7</td><td>26.7</td><td>25.6</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>40.862</td><td>0.062</td><td>0.0</td><td>21.6</td><td>21.6</td><td>18.9</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>40.848</td><td>0.048</td><td>0.0</td><td>18.4</td><td>18.4</td><td>14.5</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>40.837</td><td>0.037</td><td>0.0</td><td>16.2</td><td>16.2</td><td>11.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>40.829</td><td>0.029</td><td>0.0</td><td>14.5</td><td>14.5</td><td>8.8</td><td>O K</td></tr><tr><td>15 min Winter</td><td>41.749</td><td>0.949</td><td>0.0</td><td>56.4</td><td>56.4</td><td>288.5</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>104.957</td><td>0.0</td><td>296.8</td><td>17</td></tr><tr><td>30 min Summer</td><td>69.697</td><td>0.0</td><td>394.1</td><td>31</td></tr><tr><td>60 min Summer</td><td>44.292</td><td>0.0</td><td>501.6</td><td>56</td></tr><tr><td>120 min Summer</td><td>27.497</td><td>0.0</td><td>622.9</td><td>88</td></tr><tr><td>180 min Summer</td><td>20.740</td><td>0.0</td><td>705.0</td><td>124</td></tr><tr><td>240 min Summer</td><td>16.965</td><td>0.0</td><td>768.9</td><td>158</td></tr><tr><td>360 min Summer</td><td>12.775</td><td>0.0</td><td>867.8</td><td>224</td></tr><tr><td>480 min Summer</td><td>10.439</td><td>0.0</td><td>945.0</td><td>288</td></tr><tr><td>600 min Summer</td><td>8.926</td><td>0.0</td><td>1010.3</td><td>350</td></tr><tr><td>720 min Summer</td><td>7.855</td><td>0.0</td><td>1067.4</td><td>408</td></tr><tr><td>960 min Summer</td><td>6.426</td><td>0.0</td><td>1164.2</td><td>522</td></tr><tr><td>1440 min Summer</td><td>4.852</td><td>0.0</td><td>1318.5</td><td>750</td></tr><tr><td>2160 min Summer</td><td>3.634</td><td>0.0</td><td>1481.3</td><td>1100</td></tr><tr><td>2880 min Summer</td><td>2.945</td><td>0.0</td><td>1600.7</td><td>1468</td></tr><tr><td>4320 min Summer</td><td>2.172</td><td>0.0</td><td>1771.2</td><td>2200</td></tr><tr><td>5760 min Summer</td><td>1.753</td><td>0.0</td><td>1905.1</td><td>2920</td></tr><tr><td>7200 min Summer</td><td>1.490</td><td>0.0</td><td>2024.6</td><td>3648</td></tr><tr><td>8640 min Summer</td><td>1.309</td><td>0.0</td><td>2134.9</td><td>4384</td></tr><tr><td>10080 min Summer</td><td>1.177</td><td>0.0</td><td>2240.0</td><td>5040</td></tr><tr><td>15 min Winter</td><td>104.957</td><td>0.0</td><td>332.7</td><td>17</td></tr></table>								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	41.634	0.834	0.0	56.4	56.4	253.5	O K	30 min Summer	41.831	1.031	0.0	56.4	56.4	313.3	O K	60 min Summer	41.942	1.142	0.0	56.4	56.4	347.3	O K	120 min Summer	41.953	1.153	0.0	56.4	56.4	350.5	O K	180 min Summer	41.911	1.111	0.0	56.4	56.4	337.8	O K	240 min Summer	41.853	1.053	0.0	56.4	56.4	320.2	O K	360 min Summer	41.725	0.925	0.0	56.4	56.4	281.2	O K	480 min Summer	41.597	0.797	0.0	56.4	56.4	242.2	O K	600 min Summer	41.479	0.679	0.0	56.4	56.4	206.4	O K	720 min Summer	41.375	0.575	0.0	56.4	56.4	174.8	O K	960 min Summer	41.215	0.415	0.0	56.0	56.0	126.3	O K	1440 min Summer	41.039	0.239	0.0	52.8	52.8	72.6	O K	2160 min Summer	40.959	0.159	0.0	43.7	43.7	48.2	O K	2880 min Summer	40.923	0.123	0.0	36.0	36.0	37.6	O K	4320 min Summer	40.884	0.084	0.0	26.7	26.7	25.6	O K	5760 min Summer	40.862	0.062	0.0	21.6	21.6	18.9	O K	7200 min Summer	40.848	0.048	0.0	18.4	18.4	14.5	O K	8640 min Summer	40.837	0.037	0.0	16.2	16.2	11.3	O K	10080 min Summer	40.829	0.029	0.0	14.5	14.5	8.8	O K	15 min Winter	41.749	0.949	0.0	56.4	56.4	288.5	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	104.957	0.0	296.8	17	30 min Summer	69.697	0.0	394.1	31	60 min Summer	44.292	0.0	501.6	56	120 min Summer	27.497	0.0	622.9	88	180 min Summer	20.740	0.0	705.0	124	240 min Summer	16.965	0.0	768.9	158	360 min Summer	12.775	0.0	867.8	224	480 min Summer	10.439	0.0	945.0	288	600 min Summer	8.926	0.0	1010.3	350	720 min Summer	7.855	0.0	1067.4	408	960 min Summer	6.426	0.0	1164.2	522	1440 min Summer	4.852	0.0	1318.5	750	2160 min Summer	3.634	0.0	1481.3	1100	2880 min Summer	2.945	0.0	1600.7	1468	4320 min Summer	2.172	0.0	1771.2	2200	5760 min Summer	1.753	0.0	1905.1	2920	7200 min Summer	1.490	0.0	2024.6	3648	8640 min Summer	1.309	0.0	2134.9	4384	10080 min Summer	1.177	0.0	2240.0	5040	15 min Winter	104.957	0.0	332.7	17
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																																																																																																																																																																																																																																																																																	
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2160 min Summer	40.959	0.159	0.0	43.7	43.7	48.2	O K																																																																																																																																																																																																																																																																																	
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BIC108 - The MedBIC

Alan Cherry Drive

Chelmsford, CM1 15Q

BARWICK ROAD

DOVER

Date 29/09/2022

File GEOCELLULAR STORAGE FOR...

Designed by GGB

Checked by TT

Innovyze

Source Control 2018.1.1

Summary of Results for 30 year Return Period (+40%)

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	41.988	1.188		0.0	56.4	56.4	361.2 O K
60 min Winter	42.147	1.347		0.0	56.4	56.4	409.5 O K
120 min Winter	42.148	1.348		0.0	56.4	56.4	409.8 O K
180 min Winter	42.077	1.277		0.0	56.4	56.4	388.3 O K
240 min Winter	41.970	1.170		0.0	56.4	56.4	355.8 O K
360 min Winter	41.744	0.944		0.0	56.4	56.4	287.1 O K
480 min Winter	41.534	0.734		0.0	56.4	56.4	223.1 O K
600 min Winter	41.356	0.556		0.0	56.4	56.4	168.9 O K
720 min Winter	41.216	0.416		0.0	56.0	56.0	126.6 O K
960 min Winter	41.043	0.243		0.0	53.0	53.0	74.0 O K
1440 min Winter	40.954	0.154		0.0	42.7	42.7	46.7 O K
2160 min Winter	40.908	0.108		0.0	32.3	32.3	32.7 O K
2880 min Winter	40.882	0.082		0.0	26.3	26.3	24.9 O K
4320 min Winter	40.852	0.052		0.0	19.4	19.4	15.8 O K
5760 min Winter	40.835	0.035		0.0	15.7	15.7	10.5 O K
7200 min Winter	40.823	0.023		0.0	13.3	13.3	7.0 O K
8640 min Winter	40.815	0.015		0.0	11.7	11.7	4.4 O K
10080 min Winter	40.808	0.008		0.0	10.5	10.5	2.4 O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	69.697	0.0	442.2	31
60 min Winter	44.292	0.0	562.3	60
120 min Winter	27.497	0.0	697.1	98
180 min Winter	20.740	0.0	788.7	136
240 min Winter	16.965	0.0	861.0	172
360 min Winter	12.775	0.0	971.8	242
480 min Winter	10.439	0.0	1058.9	306
600 min Winter	8.926	0.0	1131.9	364
720 min Winter	7.855	0.0	1195.4	420
960 min Winter	6.426	0.0	1303.9	522
1440 min Winter	4.852	0.0	1476.8	738
2160 min Winter	3.634	0.0	1659.1	1100
2880 min Winter	2.945	0.0	1792.8	1468
4320 min Winter	2.172	0.0	1983.7	2184
5760 min Winter	1.753	0.0	2133.9	2936
7200 min Winter	1.490	0.0	2267.5	3648
8640 min Winter	1.309	0.0	2391.0	4392
10080 min Winter	1.177	0.0	2508.9	5064

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Date 29/09/2022 File GEOCELLULAR STORAGE FOR...	Designed by GGB Checked by TT	
Innovyze Source Control 2018.1.1		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 629836 142038 TR 29836 42038
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.510

	Time (mins)	Area
From:	To:	(ha)
	0	4 1.510

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Model Details

Storage is Online Cover Level (m) 44.000

Cellular Storage Structure

Invert Level (m) 40.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	2.001	0.0	0.0
2.000	320.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0296-5650-2100-5650
Design Head (m)	2.100
Design Flow (l/s)	56.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	296
Invert Level (m)	40.700
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.100	56.5
Flush-Flo™	0.636	56.4
Kick-Flo®	1.391	46.3
Mean Flow over Head Range	-	48.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.1	1.200	52.0	3.000	67.1	7.000	101.3
0.200	30.5	1.400	46.5	3.500	72.3	7.500	104.8
0.300	51.5	1.600	49.6	4.000	77.2	8.000	108.1
0.400	54.4	1.800	52.4	4.500	81.7	8.500	111.4
0.500	55.9	2.000	55.2	5.000	86.0	9.000	114.5
0.600	56.4	2.200	57.8	5.500	90.1	9.500	117.6
0.800	55.9	2.400	60.3	6.000	94.0		
1.000	54.6	2.600	62.6	6.500	97.7		

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Alan Cherry Drive

Chelmsford, CM1 15Q

Barwick Road

Dover

Date 29/09/2022

File GEOCELLULAR STORAGE FOR...

Designed by GGB

Checked by TT

Innovyze

Source Control 2018.1.1

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 94 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	41.945	1.145	0.0	56.4	56.4	348.2	O K
30 min Summer	42.268	1.468	0.0	56.4	56.4	446.2	O K
60 min Summer	42.481	1.681	0.0	56.4	56.4	511.1	O K
120 min Summer	42.500	1.700	0.0	56.4	56.4	516.8	O K
180 min Summer	42.485	1.685	0.0	56.4	56.4	512.3	O K
240 min Summer	42.461	1.661	0.0	56.4	56.4	505.1	O K
360 min Summer	42.402	1.602	0.0	56.4	56.4	486.9	O K
480 min Summer	42.339	1.539	0.0	56.4	56.4	468.0	O K
600 min Summer	42.266	1.466	0.0	56.4	56.4	445.6	O K
720 min Summer	42.181	1.381	0.0	56.4	56.4	419.8	O K
960 min Summer	41.946	1.146	0.0	56.4	56.4	348.4	O K
1440 min Summer	41.535	0.735	0.0	56.4	56.4	223.4	O K
2160 min Summer	41.156	0.356	0.0	55.3	55.3	108.1	O K
2880 min Summer	41.005	0.205	0.0	51.7	51.7	62.3	O K
4320 min Summer	40.934	0.134	0.0	38.5	38.5	40.8	O K
5760 min Summer	40.901	0.101	0.0	30.8	30.8	30.7	O K
7200 min Summer	40.880	0.080	0.0	25.8	25.8	24.3	O K
8640 min Summer	40.865	0.065	0.0	22.3	22.3	19.8	O K
10080 min Summer	40.854	0.054	0.0	19.8	19.8	16.4	O K
15 min Winter	42.103	1.303	0.0	56.4	56.4	396.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.943	0.0	393.1	18
30 min Summer	93.252	0.0	528.1	32
60 min Summer	59.499	0.0	673.7	60
120 min Summer	36.341	0.0	823.4	98
180 min Summer	27.429	0.0	932.1	130
240 min Summer	22.560	0.0	1022.1	166
360 min Summer	17.257	0.0	1172.4	236
480 min Summer	14.385	0.0	1303.5	306
600 min Summer	12.515	0.0	1417.7	376
720 min Summer	11.173	0.0	1518.8	446
960 min Summer	9.318	0.0	1688.8	570
1440 min Summer	7.130	0.0	1937.9	806
2160 min Summer	5.336	0.0	2175.5	1128
2880 min Summer	4.300	0.0	2337.5	1468
4320 min Summer	3.131	0.0	2553.2	2200
5760 min Summer	2.493	0.0	2709.9	2936
7200 min Summer	2.088	0.0	2837.7	3656
8640 min Summer	1.809	0.0	2949.6	4384
10080 min Summer	1.604	0.0	3051.2	5112
15 min Winter	138.943	0.0	440.7	18

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BIC108 - The MedBIC Alan Cherry Drive Chelmsford, CM1 15Q			Barwick Road Dover				
Date 29/09/2022 File GEOCELLULAR STORAGE FOR...			Designed by GGB Checked by TT				
Innovyze			Source Control 2018.1.1				
<u>Summary of Results for 100 year Return Period (+45%)</u>							
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	42.470	1.670		0.0	56.4	56.4	507.7 O K
60 min Winter	42.734	1.934		0.0	56.4	56.4	587.9 O K
120 min Winter	42.766	1.966		0.0	56.4	56.4	597.6 O K
180 min Winter	42.740	1.940		0.0	56.4	56.4	589.7 O K
240 min Winter	42.692	1.892		0.0	56.4	56.4	575.2 O K
360 min Winter	42.570	1.770		0.0	56.4	56.4	538.2 O K
480 min Winter	42.442	1.642		0.0	56.4	56.4	499.1 O K
600 min Winter	42.300	1.500		0.0	56.4	56.4	455.9 O K
720 min Winter	42.133	1.333		0.0	56.4	56.4	405.1 O K
960 min Winter	41.722	0.922		0.0	56.4	56.4	280.3 O K
1440 min Winter	41.203	0.403		0.0	55.9	55.9	122.6 O K
2160 min Winter	40.977	0.177		0.0	47.2	47.2	53.9 O K
2880 min Winter	40.933	0.133		0.0	38.3	38.3	40.4 O K
4320 min Winter	40.889	0.089		0.0	27.9	27.9	27.1 O K
5760 min Winter	40.865	0.065		0.0	22.2	22.2	19.7 O K
7200 min Winter	40.849	0.049		0.0	18.6	18.6	14.8 O K
8640 min Winter	40.837	0.037		0.0	16.2	16.2	11.3 O K
10080 min Winter	40.828	0.028		0.0	14.3	14.3	8.5 O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	93.252	0.0	591.4	32			
60 min Winter	59.499	0.0	753.8	60			
120 min Winter	36.341	0.0	921.5	110			
180 min Winter	27.429	0.0	1044.2	140			
240 min Winter	22.560	0.0	1144.6	178			
360 min Winter	17.257	0.0	1313.3	256			
480 min Winter	14.385	0.0	1459.7	332			
600 min Winter	12.515	0.0	1587.8	406			
720 min Winter	11.173	0.0	1700.6	482			
960 min Winter	9.318	0.0	1891.3	596			
1440 min Winter	7.130	0.0	2170.3	808			
2160 min Winter	5.336	0.0	2436.5	1104			
2880 min Winter	4.300	0.0	2618.0	1468			
4320 min Winter	3.131	0.0	2859.7	2200			
5760 min Winter	2.493	0.0	3035.0	2936			
7200 min Winter	2.088	0.0	3178.3	3600			
8640 min Winter	1.809	0.0	3303.6	4400			
10080 min Winter	1.604	0.0	3417.5	5008			
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BIC108 - The MedBIC Alan Cherry Drive Chelmsford, CM1 15Q	Barwick Road Dover	
Date 29/09/2022 File GEOCELLULAR STORAGE FOR...	Designed by GGB Checked by TT	
Innovyze Source Control 2018.1.1		

Model Details

Storage is Online Cover Level (m) 44.000

Cellular Storage Structure

Invert Level (m) 40.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	2.001	0.0	0.0
2.000	320.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0296-5650-2100-5650
Design Head (m)	2.100
Design Flow (l/s)	56.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	296
Invert Level (m)	40.700
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.100	56.5
Flush-Flo™	0.636	56.4
Kick-Flo®	1.391	46.3
Mean Flow over Head Range	-	48.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.1	1.200	52.0	3.000	67.1	7.000	101.3
0.200	30.5	1.400	46.5	3.500	72.3	7.500	104.8
0.300	51.5	1.600	49.6	4.000	77.2	8.000	108.1
0.400	54.4	1.800	52.4	4.500	81.7	8.500	111.4
0.500	55.9	2.000	55.2	5.000	86.0	9.000	114.5
0.600	56.4	2.200	57.8	5.500	90.1	9.500	117.6
0.800	55.9	2.400	60.3	6.000	94.0		
1.000	54.6	2.600	62.6	6.500	97.7		

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APPENDIX L

Appendix C. Drainage Strategy Summary



1. Site details	
Site/development name	Barwick Road, Dover
Address including post code	42 Barwick Road, Dover, CT17 0LH
Grid reference	E 629815 N 142032
LPA reference	
Type of application	Outline ☐ Full ☒ Discharge of Conditions ☐ Other ☐
Site condition	Greenfield ☐ Brownfield ☒

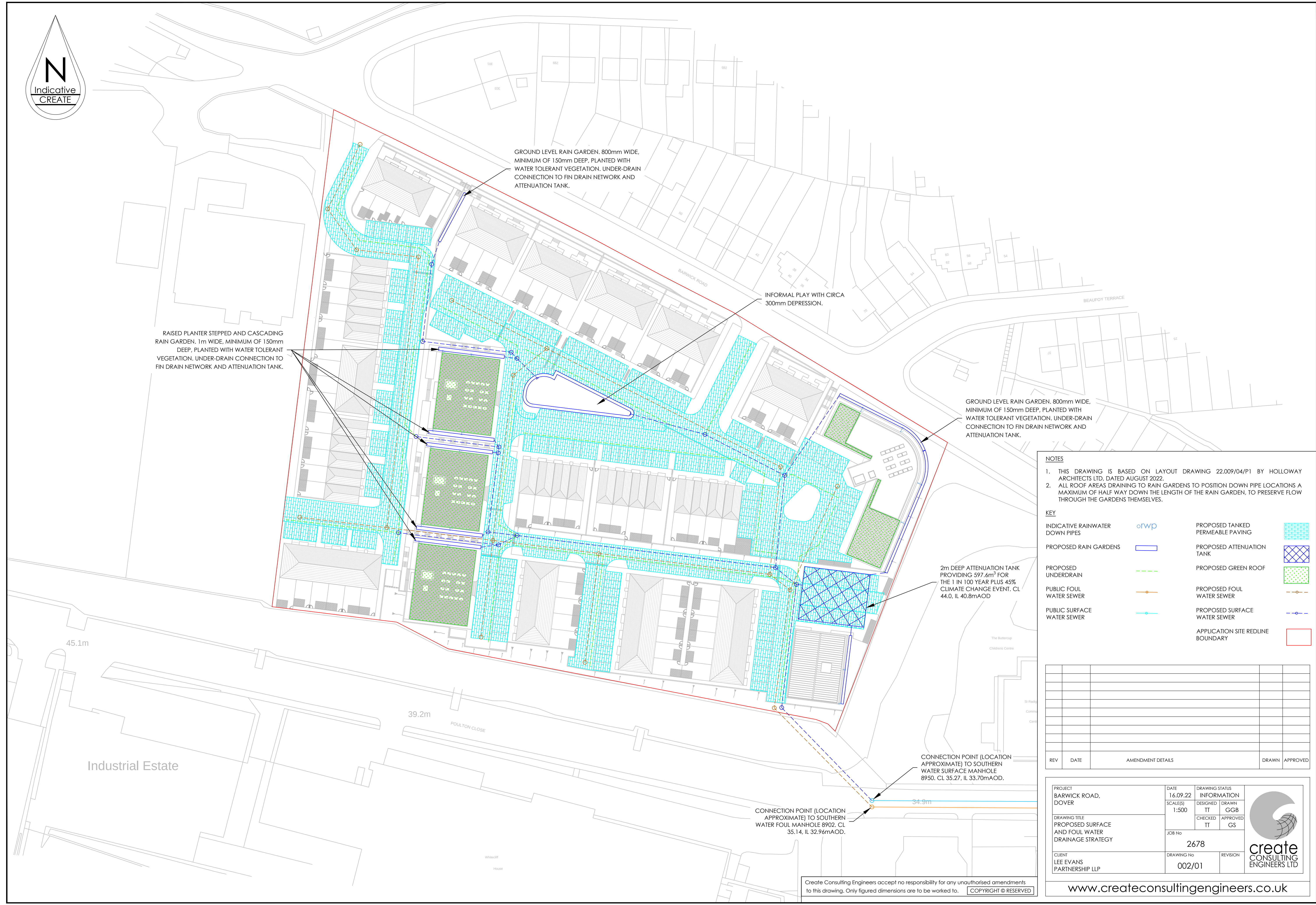
2. Existing drainage		Document/Plan where information is stated:	
Total site area (ha)	2.207ha		
Impermeable area (ha)	0.97ha		
Final discharge location	Infiltration ☐ Watercourse ☐ Sewer ☒ Tidal reach/sea ☐		
Greenfield discharge rate (l/s) for existing site area	QBAR (l/s) 0.4 1 in 1 year (l/s) 0.4 1 in 30 year (l/s) 1.0 1 in 100 year (l/s) 1.4		
3. Proposed drainage areas		Document/Plan where information is stated:	
Impermeable area (ha)	Roof	0.6034	
	Highway/road	0.4159	
	Other paved areas	0.45177	
	Total	1.47	
Permeable area (ha)	Open space	0.737	
	Other permeable areas		
	Total	0.737	
Final discharge location	Infiltration ☐ Infiltration rate _____ m/s Watercourse ☐ Sewer ☒ Tidal reach/sea ☐		
Climate change allowance included in design	20% ☐ 30% ☐ 40% ☒	45% included as new standard	

4. Post-Development Discharge rates, without mitigation			Document/Plan where information is stated:
Developed discharge rates (l/s)	1 in 1 year	0.6	
	1 in 30 year	1.6	
	1 in 100 year	2.2	
	1 in 100 year + CC		
5. Post-Development Discharge rates, with mitigation			Document/Plan where information is stated:
Describe development drainage strategy in general terms: Due to the Site being based on a previous landfill site, it is unfeasible to build infiltrating drainage. Furthermore, due to the geology of the site, the greenfield runoff rates are too low to design attenuated drainage. Therefore, in accordance with Kent SuDS correspondence, to design appropriate drainage for the site flows will be attenuated half that of the 1 in 1 year brownfield rate.			
(a) No control required, all flows infiltrating ☐			
(b) Controlled developed discharge rates (l/s)	1 in 1 year	56.5	Half the 1 in 1 year brownfield is the accepted rate by Kent County Council.
	1 in 30 year	56.5	
	1 in 100 year	56.5	
	1 in 100 year + CC	56.5	
6. Discharge Volumes			Document/Plan where information is stated:
	Existing volume (m ³)	Proposed volume (m ³)	
1 in 1 year	135	147.1	1 in 2 year rate used
1 in 30 year	427	741.4	1 in 30 year + 40%cc
1 in 100 year			
1 in 100 year + CC	603	980.4	1 in 100 year + 45%cc

All information presented above should be contained within the attached Flood Risk Assessment, Drainage Strategy or Statement and be substantiated through plans and appropriate calculations.

Form completed by	George Baker
Qualifications	MSc. Climate Change and International Development BSc. Geology
Company	Create Consulting Engineers
Telephone	01603 877010
Email	george.baker@createconsultingengineers.co.uk
On behalf of (client's details)	Mulberry Tree Holdings Ltd.
Date	27/09/2022

PLANS



CONNECTION POINT (LOCATION
APPROXIMATE) TO SOUTHERN
WATER SURFACE MANHOLE
8950. CL 35.27, IL 33.70m AOD.

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