

MLM

Page 1

North Kiln Felaw Maltings 46 Felaw Street Ipswich IP2 8PN	668050 - Kiln Court Unit 5
Date November 2017 File 668050-CALC-SBU-C-Unit_...	Designed by Darragh O'Connell Checked by CB/BF
XP Solutions	Source Control 2016.1

Micro Drainage

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

Half Drain Time : 24 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	43.438	1.188	0.0	3.4	3.4	7.7	O K
30 min Summer	43.429	1.179	0.0	3.4	3.4	7.6	O K
60 min Summer	43.370	1.120	0.0	3.4	3.4	6.8	O K
120 min Summer	42.880	0.630	0.0	3.4	3.4	5.1	O K
180 min Summer	42.685	0.435	0.0	3.4	3.4	3.5	O K
240 min Summer	42.555	0.305	0.0	3.4	3.4	2.5	O K
360 min Summer	42.420	0.170	0.0	3.2	3.2	1.4	O K
480 min Summer	42.381	0.131	0.0	3.0	3.0	1.1	O K
600 min Summer	42.370	0.120	0.0	2.8	2.8	1.0	O K
720 min Summer	42.361	0.111	0.0	2.6	2.6	0.9	O K
960 min Summer	42.346	0.096	0.0	2.3	2.3	0.8	O K
1440 min Summer	42.326	0.076	0.0	1.7	1.7	0.6	O K
2160 min Summer	42.314	0.064	0.0	1.2	1.2	0.5	O K
2880 min Summer	42.307	0.057	0.0	1.0	1.0	0.5	O K
4320 min Summer	42.298	0.048	0.0	0.7	0.7	0.4	O K
5760 min Summer	42.293	0.043	0.0	0.5	0.5	0.3	O K
7200 min Summer	42.290	0.040	0.0	0.4	0.4	0.3	O K
8640 min Summer	42.287	0.037	0.0	0.4	0.4	0.3	O K
10080 min Summer	42.285	0.035	0.0	0.3	0.3	0.3	O K
15 min Winter	43.516	1.266	0.0	3.5	3.5	8.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	214.874	0.0	10.2	17
30 min Summer	124.391	0.0	12.4	27
60 min Summer	72.011	0.0	15.1	44
120 min Summer	41.687	0.0	18.1	78
180 min Summer	30.279	0.0	20.1	108
240 min Summer	24.133	0.0	21.7	136
360 min Summer	17.528	0.0	24.0	192
480 min Summer	13.971	0.0	25.7	264
600 min Summer	11.716	0.0	27.1	322
720 min Summer	10.147	0.0	28.3	378
960 min Summer	8.088	0.0	30.3	492
1440 min Summer	5.874	0.0	33.3	734
2160 min Summer	4.267	0.0	36.5	1092
2880 min Summer	3.401	0.0	38.9	1460
4320 min Summer	2.381	0.0	40.6	2168
5760 min Summer	1.848	0.0	41.8	2936
7200 min Summer	1.519	0.0	42.7	3632
8640 min Summer	1.294	0.0	43.4	4344
10080 min Summer	1.130	0.0	43.9	5128
15 min Winter	214.874	0.0	11.9	18

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MLM							Page 2
North Kiln Felaw Maltings 46 Felaw Street Ipswich IP2 8PN				668050 - Kiln Court Unit 5			
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<u>Summary of Results for 100 year Return Period (+30%)</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	43.513	1.263	0.0	3.5	3.5	8.7	O K
60 min Winter	43.430	1.180	0.0	3.4	3.4	7.6	O K
120 min Winter	42.969	0.719	0.0	3.4	3.4	5.8	O K
180 min Winter	42.668	0.418	0.0	3.4	3.4	3.4	O K
240 min Winter	42.514	0.264	0.0	3.4	3.4	2.1	O K
360 min Winter	42.405	0.155	0.0	3.1	3.1	1.3	O K
480 min Winter	42.369	0.119	0.0	2.8	2.8	1.0	O K
600 min Winter	42.352	0.102	0.0	2.4	2.4	0.8	O K
720 min Winter	42.341	0.091	0.0	2.1	2.1	0.7	O K
960 min Winter	42.326	0.076	0.0	1.7	1.7	0.6	O K
1440 min Winter	42.314	0.064	0.0	1.2	1.2	0.5	O K
2160 min Winter	42.304	0.054	0.0	0.9	0.9	0.4	O K
2880 min Winter	42.299	0.049	0.0	0.7	0.7	0.4	O K
4320 min Winter	42.292	0.042	0.0	0.5	0.5	0.3	O K
5760 min Winter	42.288	0.038	0.0	0.4	0.4	0.3	O K
7200 min Winter	42.285	0.035	0.0	0.3	0.3	0.3	O K
8640 min Winter	42.283	0.033	0.0	0.3	0.3	0.3	O K
10080 min Winter	42.281	0.031	0.0	0.2	0.2	0.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	124.391	0.0	14.5	29			
60 min Winter	72.011	0.0	17.4	48			
120 min Winter	41.687	0.0	20.8	94			
180 min Winter	30.279	0.0	23.1	124			
240 min Winter	24.133	0.0	24.8	154			
360 min Winter	17.528	0.0	27.4	210			
480 min Winter	13.971	0.0	29.3	262			
600 min Winter	11.716	0.0	30.9	316			
720 min Winter	10.147	0.0	32.3	372			
960 min Winter	8.088	0.0	34.5	492			
1440 min Winter	5.874	0.0	37.9	736			
2160 min Winter	4.267	0.0	41.5	1100			
2880 min Winter	3.401	0.0	44.2	1464			
4320 min Winter	2.381	0.0	46.2	2188			
5760 min Winter	1.848	0.0	47.6	2824			
7200 min Winter	1.519	0.0	48.6	3568			
8640 min Winter	1.294	0.0	49.4	4280			
10080 min Winter	1.130	0.0	50.1	4960			
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MLM		Page 3
North Kiln Felaw Maltings 46 Felaw Street Ipswich IP2 8PN	668050 - Kiln Court Unit 5	
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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 528450 185200 TQ 28450 85200
C (1km)	-0.026
D1 (1km)	0.331
D2 (1km)	0.331
D3 (1km)	0.240
E (1km)	0.334
F (1km)	2.478
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.026

Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:
0	4 0.018	4	8 0.008

Green Roof

Area (m ³)	100	Evaporation (mm/day)	3
Depression Storage (mm)	40	Decay Coefficient	0.050

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:	From:	To:
0	4 0.001817	32	36 0.000367	64	68 0.000074	96	100 0.000015
4	8 0.001488	36	40 0.000300	68	72 0.000061	100	104 0.000012
8	12 0.001218	40	44 0.000246	72	76 0.000050	104	108 0.000010
12	16 0.000997	44	48 0.000201	76	80 0.000041	108	112 0.000008
16	20 0.000817	48	52 0.000165	80	84 0.000033	112	116 0.000007
20	24 0.000669	52	56 0.000135	84	88 0.000027	116	120 0.000006
24	28 0.000547	56	60 0.000111	88	92 0.000022		
28	32 0.000448	60	64 0.000090	92	96 0.000018		

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MLM		Page 4
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Model Details

Storage is Online Cover Level (m) 43.800

Complex Structure

Cellular Storage

Invert Level (m) 42.250 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	8.5	7.5	0.900	0.0	17.9
0.800	8.5	17.9			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	9.6
Max Percolation (l/s)	12.8	Slope (1:X)	250.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	43.350	Membrane Depth (m)	0

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SCL-0081-3400-1200-3400
Design Head (m)	1.200
Design Flow (l/s)	3.4
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	81
Invert Level (m)	42.260
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.4
Flush-Flo™	0.295	3.4
Kick-Flo®	0.663	2.6
Mean Flow over Head Range	-	2.9

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

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