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Registered office: Laval House

KNAPP HICKS & PARTNERS LTD

CONSULTING STRUCTURAL, CIVIL & GEOTECHNICAL ENGINEERS



SURFACE WATER DRAINAGE DESIGN

ADDENDIUM TO 34109/R004/AJB

HOWE BARRACKS

April 2018 34109/R004/AJB



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Phase 1, 1 in 100 Year Calculation Infiltration Test Results

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Date 23/05/2018 16:58	Designed by AJB	Desipage
File PHASE 1 SW REV.MDX	Checked by	Drainage
Causeway	Network 2015.1	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000
Foul Sewage per hectare (1/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 8 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.379
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.800 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status
ON
DVD Status
ON
Inertia Status

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,

Return Period(s) (years) 100
Climate Change (%) 20

	US/MH			Return	Climate	First	: (X)	First	(Y)	First	(Z)	Overflow	Water Level
PN	Name	S	torm	Period	Change	Surch	arge	Floo		Overf	low	Act.	(m)
1.000	ASV2		Winter	100		100/15							50.281
1.001	ASV1		Winter	100		100/15							50.277
1.002	AS1	60	Winter	100		100/15							50.266
2.000	AS13	60	Winter	100	+20%	100/60	Winter						50.300
2.001	AS14	60	Winter	100	+20%	100/60	Winter						50.295
2.002	AS15	60	Winter	100	+20%	100/15	Summer						50.273
2.003	AS16	60	Winter	100	+20%	100/15	Winter						50.262
1.003	AS2	60	Winter	100	+20%	100/15	Summer						50.244
3.000	AS17	60	Winter	100	+20%	100/30	Summer						50.271
3.001	AS18	60	Winter	100	+20%	100/15	Winter						50.263
3.002	AS19	60	Winter	100	+20%	100/15	Summer						50.249
1.004	AS3	60	Winter	100	+20%	100/15	Summer						50.242
1.005	AS4	60	Winter	100	+20%	100/15	Summer						50.239
1.006	AS5	60	Winter	100	+20%	100/15	Summer						50.236
4.000	AS20	180	Winter	100	+20%	100/60	Winter						49.348
4.001	AS21	180	Winter	100	+20%	100/60	Winter						49.348
4.002	AS22	180	Winter	100	+20%	100/60	Winter						49.348
4.003	AS23	180	Winter	100	+20%	100/60	Summer						49.323
5.000	AS24	15	Winter	100	+20%								49.557
6.000	AS26	15	Winter	100	+20%								49.832
5.001	AS25	180	Winter	100	+20%								49.300
				(0	1982-2	015 VI	2 00111	tions					

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

											Water	
	US/MH		Return	Climate	First	(X)	First	(Y)	First (Z)	Overflow	Level	ı
PN	Name	Storm	Period	Change	Surch	arge	Flo	ood	Overflow	Act.	(m)	l
1 000	200	100 77/	. 100	0.00	100/20	a						ı
1.007	AS6	180 Winter	100	+20%	,	Summer					49.300	Н
7.000	AS27	180 Winter	100	+20%	100/120	Summer					48.952	L
1.008	AS7	180 Winter	100	+20%	100/15	Summer					48.952	ı
1.009	AS8	180 Winter	100	+20%	100/15	Winter					48.593	ı
1.010	AS9	180 Winter	100	+20%	100/30	Winter					48.212	ı
8.000	AS28	360 Winter	100	+20%	100/60	Summer					47.827	
9.000	AS30	360 Winter	100	+20%	100/60	Winter					47.827	l
8.001	AS29	360 Winter	100	+20%	100/60	Summer	100/180	Winter			47.827	
1.011	AS10	360 Winter	100	+20%	100/30	Summer	100/120	Winter			47.828	
1.012	AS11	240 Winter	100	+20%	100/15	Summer	100/120	Winter			47.850	
1.013	AS12	360 Winter	100	+20%	100/15	Summer	100/120	Winter			47.862	

		Surcharged	Flooded			Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Flow		Level
PN	Name	(m)	(m³)	Cap.	(1/s)	(1/s)	Status	Exceeded
1.007	AS6	1.225	0.000	0.01		27.6	SURCHARGED	
7.000	AS27	0.767	0.000	0.01		1.9	SURCHARGED	
1.008	AS7	2.092	0.000	0.01		16.5	SURCHARGED	
1.009	AS8	2.068	0.000	0.02		17.0	SURCHARGED	
1.010	AS9	1.927	0.000	0.01		17.3	SURCHARGED	
8.000	AS28	1.272	0.000	0.01		4.9	FLOOD RISK	
9.000	AS30	0.812	0.000	0.01		1.6	FLOOD RISK	
8.001	AS29	1.707	6.702	0.02		7.8	FLOOD	4
1.011	AS10	2.088	27.858	0.04		37.5	FLOOD	9
1.012	AS11	2.315	0.368	0.03		26.3	FLOOD	8
1.013	AS12	3.077	0.055	0.40		15.1	FLOOD	6



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Length

The infiltration rate (f) is given by;

Soakaway Test

Site Royal Parade Job No. 34109 Borehole SS101

Trial Pit Dimensions Width 0.45 m

Filled Water Level 0.269 m

75% effective depth 0.36425 m

50% effective depth 0.4595 m

25% effective depth 0.55475 m

Soil type at test depth Made Ground

m

where:

 V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth

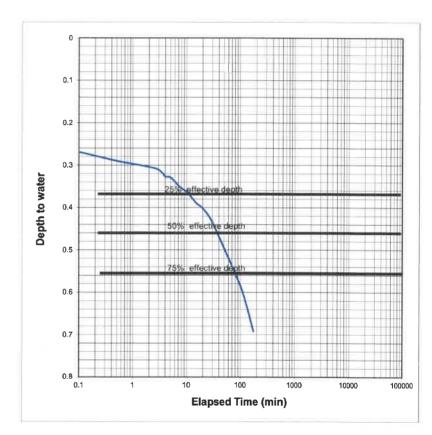
Depth

0.65 m

a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area

including the base area t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth

Time	Depth
(mins)	m
0.1	0.269
0.5	0.29
1	0.297
1.5	0.301
2.5	0.307
3	0.311
3.5	0.318
4	0.327
5	0.329
7.5	0.352
10	0.363
15	0.389
20	0.402
30	0.435
92	0.573
123	0.62
174	0.692



 $V_{p75-25} = 0.0942975 \text{ m}3$

m3

 $a_{p50} = 1.08555 \text{ m2}$

Infiltration factor

t_{p75-25} =

4200 seconds

f = 2.06824E-05 ms⁻¹

Note

* Indicates that the full drainage was not achieved within the duration of the test. Consequently, the infiltration valu has been calculated using the reduced depth test as outlined in BRE 365. Caution should be applied to the value obtained and where possible further long term testing carried out.



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Soakaway Test

Royal Parade Job No. 34109 Borehole SS102

Width Trial Pit Dimensions 0.45 m

Length 1.2 m Depth 0.7 m

Filled Water Level 0.269 m

The infiltration rate (f) is given by; $f = \frac{V_{p76-25}}{a_{p50} x} t_{p76-25}$

75% effective depth 50% effective depth 0.37675 m

0.4845 m

where: V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth

25% effective depth

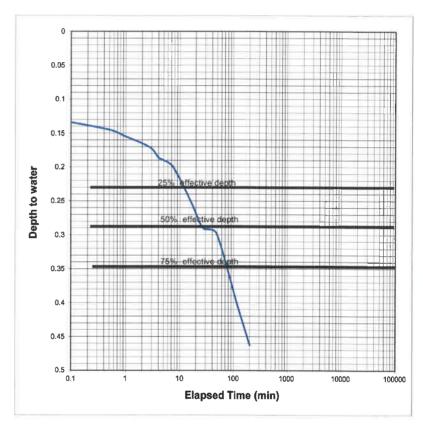
0.59225 m

 a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area $t_{\rm p76-25}$ = the time for the water level to fall from 75% to 25% effective depth

Soil type at test depth

Made Ground

Time	Depth
(mins)	m
0.1	0.134
0.5	0.145
1	0.155
2	0.165
3	0.173
4	0.186
5	0.19
7.5	0.2
16.5	0.253
27	0.29
48	0.298
119	0.405
201	0.463



 $V_{p75-25} =$

0.11637 m3

m3

1.25115 m2

Infiltration factor

3900 seconds

2.38488E-05 ms⁻¹

*Indicates that the full drainage was not achieved within the duration of the test. Consequently, the infiltration valu has been calculated using the reduced depth test as outlined in BRE 365. Caution should be applied to the value obtained and where possible further long term testing carried out.



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Soakaway Test

Royal Parade 34109 Site Job No. Borehole SS103 Test 1

Width Trial Pit Dimensions 0.45 m Length 1.0 m Depth 0.62 m

Filled Water Level 0.193 m

The infiltration rate (f) is given by;

75% effective depth

0.29975 m

50% effective depth

0.4065 m

25% effective depth

0.51325 m

where:

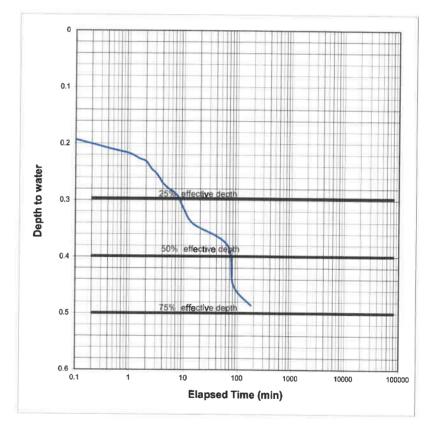
 $V_{\text{p75-25}}$ = the effective storage volume of water in the trial pit between 75% and 25% effective depth

 a_{p50} = the internal surface area of the trial pit up to 50% effective depth and

including the base area t_{p.75-25} = the time for the water level to fall from 75% to 25% effective depth

Soil type at test depth Made Ground

Time	Depth
(mins)	m
0.1	0.193
0.5	0.21
1	0.217
1.5	0.226
2	0.231
2.5	0.244
3	0.251
3.5	0.26
4	0.269
5	0.278
7.5	0.291
10	0.316
15	0.342
65	0.38
82.5	0.45
178	0.486



 $V_{p75-25} =$

0.096075 m3

m3

1.06915 m2

Infiltration factor

 $t_{p75-25} =$

8520 seconds

1.05471E-05 ms⁻¹

* Indicates that the full drainage was not achieved within the duration of the test. Consequently, the infiltration valu has been calculated using the reduced depth test as outlined in BRE 365. Caution should be applied to the value obtained and where possible further long term testing carried out.



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Royal Parade Job No. 34109 Borehole SS103 Test 2

Trial Pit Dimensions	Width 0.45 m
Filled Water Level	0.146 m
75% effective depth	0.2645 m
50% effective depth	0.383 m
25% effective depth	0.5015 m

Soil type at test depth Made Ground

Length	Depth
1.0 m	0.62 m

The infiltration rate (f) is given by;

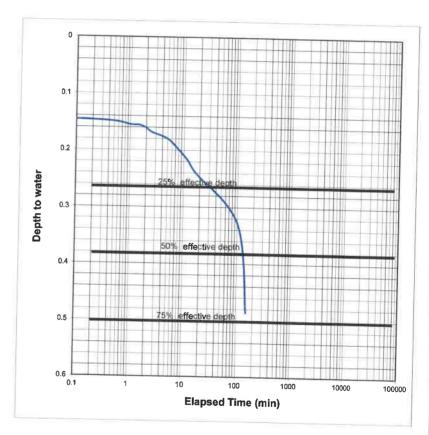
$$f = \frac{V_{p76-25}}{a_{p50} \times t_{p76-25}}$$

 $V_{p75,25}$ = the effective storage volume of water in the trial pit between 75% and 25% effective depth

a₀₅₀ = the internal surface area of the trial pit up to 50% effective depth and including the base area $t_{\rm p75-25}$ = the time for the water level to fall from 75% to 25% effective depth

Soakaway Test

Depth
m
0.146
0.149
0.155
0.156
0.161
0.168
0.18
0.199
0.219
0.238
0.328
0.486





a_{p50} = 1.1373 m2

Infiltration factor

8520 seconds

1.10064E-05 ms⁻¹

* Indicates that the full drainage was not achieved within the duration of the test. Consequently, the infiltration valu has been calculated using the reduced depth test as outlined in BRE 365. Caution should be applied to the value obtained and where possible further long term testing carried out.