advant ENGINEERS

Client:	MR MARTIN FARGIE
Project No & Title:	45-47 MORTIMER STREET, HEALEY, BATLEY, WF17 8BW
Sheet Title:	SOAKAWAY RESULTS - PIT 1 - TEST 1

By	Date	Chkd	Date	Sheet No.	Rev
MJM	01.07.22	MJM	01.07.22	1	A

$$\text{Soil Infiltration Rate} = \frac{Vp_{75\text{-}25}}{ap_{50} \times tp_{75\text{-}25}}$$

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

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

$tp_{75\text{-}25}$ = the time for the water level to fall from 75% to 25% effective depth

---

$Vp_{75\text{-}25}$ = 0.3 x 0.3 x 0.9 = $\underline{0.08m^3}$

ap_{50} = Base Area = 0.3 x 0.3 = $0.09m^2$

Side Wall = (0.3 x 0.9) x 4 = $1.08m^2$

TOTAL = 0.09 + 1.08= $\underline{1.08m^2}$

$tp_{75\text{-}25}$ 32 minutes x 60 = 1920 seconds

$$\therefore \quad \frac{0.08}{1.17 \times 1920} = 3.56^{x10\text{-}5}$$

advant ENGINEERS

Client:	MR MARTIN FARGIE
Project No & Title:	45-47 MORTIMER STREET, HEALEY, BATLEY, WF17 8BW
Sheet Title:	SOAKAWAY RESULTS - PIT 1 - TEST 2

By	Date	Chkd	Date	Sheet No.	Rev
MJM	01.07.22	MJM	01.07.22	2	A

$$\text{Soil Infiltration Rate} = \frac{Vp_{75\text{-}25}}{ap_{50} \times tp_{75\text{-}25}}$$

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

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

$tp_{75\text{-}25}$ = the time for the water level to fall from 75% to 25% effective depth

---

$Vp_{75\text{-}25}$ = 0.3 x 0.3 x 0.9 = $\underline{0.08m^3}$

ap_{50} = Base Area = 0.3 x 0.3 = $0.09m^2$

Side Wall = (0.3 x 0.9) x 4 = $1.08m^2$

TOTAL = 0.09 + 1.08= $\underline{1.08m^2}$

$tp_{75\text{-}25}$ 44 minutes x 60 = 2640 seconds

$$\therefore \quad \frac{0.08}{1.17 \times 2640} = 2.59^{x10\text{-}5}$$

advant ENGINEERS

Client:	MR MARTIN FARGIE
Project No & Title:	45-47 MORTIMER STREET, HEALEY, BATLEY, WF17 8BW
Sheet Title:	SOAKAWAY RESULTS - PIT 1 - TEST 3

By	Date	Chkd	Date	Sheet No.	Rev
MJM	01.07.22	MJM	01.07.22	3	A

$$\text{Soil Infiltration Rate} = \frac{Vp_{75\text{-}25}}{ap_{50} \times tp_{75\text{-}25}}$$

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

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

$tp_{75\text{-}25}$ = the time for the water level to fall from 75% to 25% effective depth

---

$Vp_{75\text{-}25}$ = 0.3 x 0.3 x 0.9 = $\underline{0.08m^3}$

ap_{50} = Base Area = 0.3 x 0.3 = $0.09m^2$

Side Wall = (0.3 x 0.9) x 4 = $1.08m^2$

TOTAL = 0.09 + 1.08= $\underline{1.08m^2}$

$tp_{75\text{-}25}$ 56 minutes x 60 = 3360 seconds

$$\therefore \quad \frac{0.08}{1.17 \times 3360} = 2.03^{x10\text{-}5}$$

advant ENGINEERS

Client:	MR MARTIN FARGIE
Project No & Title:	45-47 MORTIMER STREET, HEALEY, BATLEY, WF17 8BW
Sheet Title:	CONCLUSION

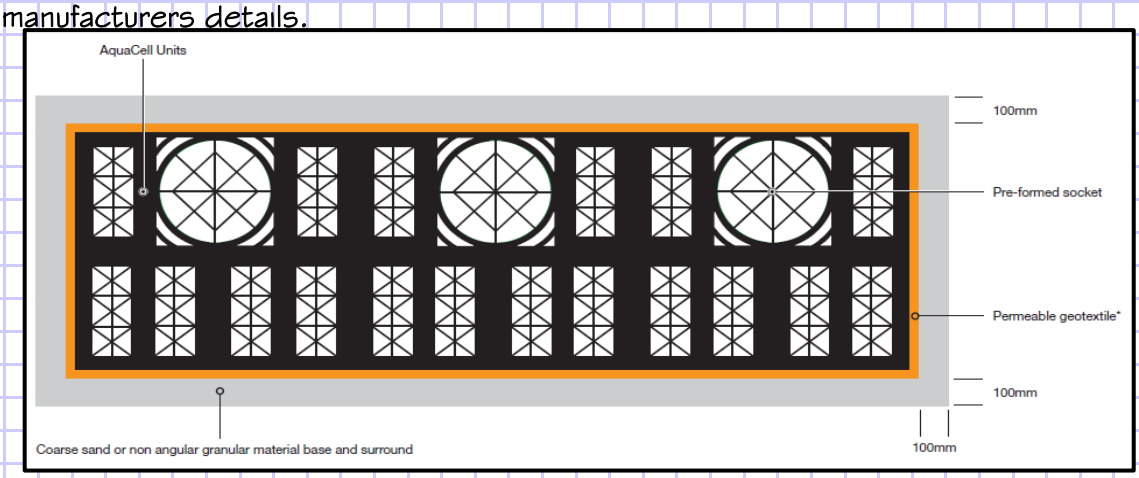
By	Date	Chkd	Date	Sheet No.	Rev
MJM	01.07.22	MJM	01.07.22	4	A

CONCLUSION

The infiltration rates have been calcauted as follows:

3.56^{x10-5}
2.59^{x10-5}
2.03^{x10-5}

We have therefore taken the worst of these results of 2.03^{x10-5} to design our soakaways, we have proposed to use cellualr crates wrapped in permeable geotextile, typical detail below from Wavin and should be installed in accordance with the manufacturers details.



It is proposed that each house should have its own soakaway therefore the constributing area from one dwelling = 9.5m x 5.9m = 56m2

The soakways have been designed for the 1 in 100 year + 40% climate change rainfall event and it has been determined that a soakway sized as follows will be sufficient (see following pages for calcs):

2.0m x 1.5m x 0.8m

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100	150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1	0.006	5.00	20.000	600	0.600
S2			20.000	600	0.685

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	5.000	0.600	19.400	19.315	0.085	58.8	100	5.08	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.006	7.9	0.8	0.500	0.585	0.006	0.0	21	0.642

Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	5.000	58.8	100	Circular	20.000	19.400	0.500	20.000	19.315	0.585

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	20.000	0.600	600	0	1.000	19.400	100
S2	20.000	0.685	600	1	1.000	19.315	100

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node S2 Soakaway Storage Structure

BRE-365: Volume (m³)	0.100	Side Inf Coefficient (m/hr)	0.28935	Pit Width (m)	1.500
BRE-365: Area (m²)	1.080	Safety Factor	2.0	Pit Length (m)	2.000
BRE-365: Time (hrs)	0.320	Porosity	0.95	Depth (m)	0.800
BRE-365: Inf Coef (m/hr)	0.28935	Invert Level (m)	19.315	Inf Depth (m)	
Base Inf Coefficient (m/hr)	0.28935	Time to half empty (mins)	52	Number Required	1

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	100 year 15 minute summer	348.738	98.681
1 year 15 minute winter	76.857	30.991	100 year 15 minute winter	244.728	98.681
1 year 30 minute summer	71.439	20.215	100 year 30 minute summer	228.965	64.789
1 year 30 minute winter	50.133	20.215	100 year 30 minute winter	160.677	64.789
1 year 60 minute summer	48.435	12.800	100 year 60 minute summer	153.288	40.510
1 year 60 minute winter	32.179	12.800	100 year 60 minute winter	101.841	40.510
1 year 120 minute summer	30.053	7.942	100 year 120 minute summer	92.562	24.461
1 year 120 minute winter	19.966	7.942	100 year 120 minute winter	61.496	24.461
1 year 180 minute summer	23.233	5.979	100 year 180 minute summer	69.806	17.964
1 year 180 minute winter	15.102	5.979	100 year 180 minute winter	45.376	17.964
1 year 240 minute summer	18.475	4.882	100 year 240 minute summer	54.269	14.342
1 year 240 minute winter	12.274	4.882	100 year 240 minute winter	36.055	14.342
1 year 360 minute summer	14.169	3.646	100 year 360 minute summer	40.484	10.418
1 year 360 minute winter	9.210	3.646	100 year 360 minute winter	26.315	10.418
1 year 480 minute summer	11.185	2.956	100 year 480 minute summer	31.414	8.302
1 year 480 minute winter	7.431	2.956	100 year 480 minute winter	20.871	8.302
1 year 600 minute summer	9.182	2.511	100 year 600 minute summer	25.431	6.956
1 year 600 minute winter	6.274	2.511	100 year 600 minute winter	17.376	6.956
1 year 720 minute summer	8.203	2.199	100 year 720 minute summer	22.452	6.017
1 year 720 minute winter	5.513	2.199	100 year 720 minute winter	15.089	6.017
1 year 960 minute summer	6.768	1.782	100 year 960 minute summer	18.166	4.784
1 year 960 minute winter	4.483	1.782	100 year 960 minute winter	12.033	4.784
1 year 1440 minute summer	4.949	1.326	100 year 1440 minute summer	12.896	3.456
1 year 1440 minute winter	3.326	1.326	100 year 1440 minute winter	8.667	3.456
30 year 15 minute summer	268.706	76.035	100 year +40% CC 15 minute summer	488.233	138.153
30 year 15 minute winter	188.566	76.035	100 year +40% CC 15 minute winter	342.620	138.153
30 year 30 minute summer	174.929	49.499	100 year +40% CC 30 minute summer	320.551	90.705
30 year 30 minute winter	122.757	49.499	100 year +40% CC 30 minute winter	224.948	90.705
30 year 60 minute summer	116.589	30.811	100 year +40% CC 60 minute summer	214.603	56.713
30 year 60 minute winter	77.459	30.811	100 year +40% CC 60 minute winter	142.577	56.713
30 year 120 minute summer	70.438	18.615	100 year +40% CC 120 minute summer	129.587	34.246
30 year 120 minute winter	46.797	18.615	100 year +40% CC 120 minute winter	86.094	34.246
30 year 180 minute summer	53.298	13.715	100 year +40% CC 180 minute summer	97.729	25.149
30 year 180 minute winter	34.645	13.715	100 year +40% CC 180 minute winter	63.526	25.149
30 year 240 minute summer	41.604	10.995	100 year +40% CC 240 minute summer	75.977	20.078
30 year 240 minute winter	27.641	10.995	100 year +40% CC 240 minute winter	50.477	20.078
30 year 360 minute summer	31.221	8.034	100 year +40% CC 360 minute summer	56.677	14.585
30 year 360 minute winter	20.295	8.034	100 year +40% CC 360 minute winter	36.841	14.585
30 year 480 minute summer	24.324	6.428	100 year +40% CC 480 minute summer	43.979	11.622
30 year 480 minute winter	16.160	6.428	100 year +40% CC 480 minute winter	29.219	11.622
30 year 600 minute summer	19.756	5.404	100 year +40% CC 600 minute summer	35.604	9.738
30 year 600 minute winter	13.498	5.404	100 year +40% CC 600 minute winter	24.327	9.738
30 year 720 minute summer	17.490	4.687	100 year +40% CC 720 minute summer	31.433	8.424
30 year 720 minute winter	11.754	4.687	100 year +40% CC 720 minute winter	21.125	8.424
30 year 960 minute summer	14.215	3.743	100 year +40% CC 960 minute summer	25.432	6.697
30 year 960 minute winter	9.416	3.743	100 year +40% CC 960 minute winter	16.847	6.697
30 year 1440 minute summer	10.161	2.723	100 year +40% CC 1440 minute summer	18.055	4.839
30 year 1440 minute winter	6.829	2.723	100 year +40% CC 1440 minute winter	12.134	4.839

Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	19.422	0.022	0.8	0.0104	0.0000	OK
30 minute winter	S2	26	19.417	0.102	0.7	0.3190	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	S1	1.000	S2	0.8	0.602	0.101	0.0193
30 minute winter	S2	Infiltration		0.1			

Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S1	58	19.583	0.183	1.1	0.0882	0.0000	SURCHARGED
60 minute winter	S2	58	19.582	0.267	0.9	0.8379	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute winter	S1	1.000	S2	0.9	0.573	0.108	0.0391
60 minute winter	S2	Infiltration		0.2			

Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S1	56	19.688	0.288	1.4	0.1389	0.0000	SURCHARGED
60 minute winter	S2	56	19.688	0.373	1.1	1.1672	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute winter	S1	1.000	S2	1.1	0.608	0.140	0.0391
60 minute winter	S2	Infiltration		0.2			

Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S1	96	19.862	0.462	1.2	0.2230	0.0000	FLOOD RISK
120 minute winter	S2	96	19.862	0.547	1.0	1.7125	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
120 minute winter	S1	1.000	S2	1.0	0.528	0.122	0.0391
120 minute winter	S2	Infiltration		0.3			

Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd