



Appendix B

Storm Water Attenuation Calculations

Technical Note

280503-00

31 January 2022

4 Building Storm Network Details

The storm network is designed on Microdrainage 2015.1.1 using a 5 year return period. The pipe network and gradient are assigned using the Modified Rational Method where:

$$Q \text{ (l/s)} = C_v * C_r * (2.78 * I \text{ (mm/hr)} * A \text{ (ha)})$$

$$C_v = 0.75 \text{ and } C_r = 1.3 \text{ (as recommended by the Wallingford Procedure)}$$

The programme uses the M5-60 (16.900mm) and ratio (0.272) to calculate the intensity/duration/ frequency characteristics for any location in Ireland.

The storm network has one online flow control device (Hydro-brake), located immediately after the Attenuation Pond. The Hydro-brake design head is of 1.500m and design flow of 8.06 l/s.

This is in line with extract from Table 6.3 of the Greater Dublin Regional Code of Practice for Drainage Works and South Dublin County Council requirements with maximum allowable discharge QBAR. The proposed overall site area to be incorporated into the proposed surface water system is 4.053 ha. The remaining area will be part of the watercourse catchment and the existing surface water system along The Fairways road. See Arup Drawing C-0105 for further information on catchment areas.

	4.3	100	Maximum discharge rate of QBAR or 2 l/s/ha, whichever is the greater, for all attenuation storage where separate "long term" storage cannot be provided.
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Table 6.3 Criteria for New Development Drainage

The allowable discharge rate was calculated based on the below:

Site Easting: 303941

Site Northing: 230229

Total Site Area: 4.053 hectares

FSR Soil Class: 2

M5-60 16.900

r: 0.272

Annual Rainfall (SAAR): 754mm (Based on Met Eireann 1981-2010 Rainfall Grids)

$$Q_{BARrural} = 0.00108 A^{0.89} SAAR^{1.17} SOIL^{2.17}$$

Resulting then in a Qbar of 1.99 l/s/ha and a total allowable discharge rate of 8.06 l/s.

The storm water network has one online attenuation pond. The attenuation pond will intercept surface water runoff in the network and limit the discharge to the 8.06 l/s according to the allowable 1.99 l/s/ha through use of Hydro-brake.

The storm water attenuation facility will provide storage volume of 2498.0 m3, which is designed to cater for storms up to and including the 1 in 100 year return period plus 20% for climate change. Please refer to attached copy of storm attenuation simulation calculation for details. Refer to Arup drawings C-0104 and C-0105 for further information.

Technical Note

280503-00

31 January 2022

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Cid dos Santos Junior	Kieran Dowdall	John MacCarthy
Signature			

The Arup Campus
 Blyth Gate
 Solihull B90 8AE



Date 31/01/2021
 File ATTENUATION POND.SRCX

Designed by Cid Dos Santos J...
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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	74.154	0.726	8.1	1078.6	O K
120 min Winter	74.312	0.884	8.1	1349.3	O K
180 min Winter	74.409	0.981	8.1	1521.1	O K
240 min Winter	74.478	1.050	8.1	1647.4	O K
360 min Winter	74.575	1.147	8.1	1830.1	O K
480 min Winter	74.643	1.215	8.1	1960.5	O K
600 min Winter	74.694	1.266	8.1	2060.3	O K
720 min Winter	74.734	1.306	8.1	2139.6	O K
960 min Winter	74.793	1.365	8.1	2257.8	O K
1440 min Winter	74.862	1.434	8.1	2399.1	O K
2160 min Winter	74.903	1.475	8.1	2486.3	O K
2880 min Winter	74.909	1.481	8.1	2498.0	O K
4320 min Winter	74.887	1.459	8.1	2452.6	O K
5760 min Winter	74.854	1.426	8.1	2383.8	O K
7200 min Winter	74.811	1.383	8.1	2296.0	O K
8640 min Winter	74.763	1.335	8.1	2198.9	O K
10080 min Winter	74.712	1.284	8.1	2097.0	O K

← Storage Volume Required

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	39.777	0.0	1054.4	64
120 min Winter	25.154	0.0	1276.1	122
180 min Winter	19.082	0.0	1287.1	182
240 min Winter	15.649	0.0	1261.4	240
360 min Winter	11.804	0.0	1220.8	358
480 min Winter	9.651	0.0	1196.9	476
600 min Winter	8.250	0.0	1183.8	594
720 min Winter	7.256	0.0	1179.1	710
960 min Winter	5.924	0.0	1189.8	942
1440 min Winter	4.450	0.0	1210.6	1400
2160 min Winter	3.340	0.0	2435.0	2072
2880 min Winter	2.721	0.0	2394.8	2708
4320 min Winter	2.036	0.0	2353.3	3376
5760 min Winter	1.657	0.0	4367.3	4328
7200 min Winter	1.411	0.0	4589.9	5264
8640 min Winter	1.238	0.0	4480.3	6216
10080 min Winter	1.108	0.0	4259.7	7064

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Model Details

Storage is Online Cover Level (m) 75.405

Tank or Pond Structure

Invert Level (m) 73.428

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1306.4	1.500	2109.3	1.850	2404.2	1.990	3382.4

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0125-8100-1500-8100

Design Head (m)	1.500
Design Flow (l/s)	8.1


Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	125
Invert Level (m)	73.428
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points Head (m) Flow (l/s)















Design Point (Calculated)	1.500	8.1
Flush-Flo™	0.437	8.1
Kick-Flo®	0.922	6.4
Mean Flow over Head Range	-	7.1

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	4.5	1.200	7.3	3.000	11.2	7.000	16.8
0.200	7.3	1.400	7.8	3.500	12.1	7.500	17.4
0.300	7.9	1.600	8.3	4.000	12.9	8.000	17.9
0.400	8.1	1.800	8.8	4.500	13.6	8.500	18.5
0.500	8.1	2.000	9.3	5.000	14.3	9.000	19.0
0.600	7.9	2.200	9.7	5.500	15.0	9.500	19.5
0.800	7.3	2.400	10.1	6.000	15.6		
1.000	6.7	2.600	10.5	6.500	16.2		


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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section	Type	Auto Design
S4.002	6.772	0.023	294.4	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit		
S3.005	40.195	0.134	300.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit		
S3.006	56.354	0.188	299.8	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit		
S5.000	27.436	0.110	250.0	0.097	3.00	0.0	0.600		o	375	Pipe/Conduit		
S5.001	37.989	0.177	214.3	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit		
S6.000	69.226	0.346	200.0	0.306	3.00	0.0	0.600		o	450	Pipe/Conduit		
S7.000	8.164	0.010	816.4	0.138	3.00	0.0		0.045	4 \=/	500	1:4 Swale		
S7.001	97.966	0.122	803.0	0.008	0.00	0.0		0.045	4 \=/	500	1:4 Swale		
S7.002	0.897	0.001	896.9	0.004	0.00	0.0		0.045	4 \=/	500	1:4 Swale		
S7.003	19.444	0.024	810.2	0.000	0.00	0.0		0.045	4 \=/	500	1:4 Swale		
S7.004	4.239	0.005	847.7	0.000	0.00	0.0		0.045	4 \=/	500	1:4 Swale		
S7.005	4.747	0.006	791.2	0.000	0.00	0.0		0.045	4 \=/	500	1:4 Swale		
S7.006	7.750	0.388	20.0	0.000	0.00	0.0		0.045	o	225	Pipe/Conduit		
S6.001	11.546	0.058	200.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit		

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.002	50.00	4.67	74.680	0.232	0.0	0.0	6.3	1.05	116.1	37.7
S3.005	50.00	5.30	74.657	0.671	0.0	0.0	18.2	1.17	185.9	109.0
S3.006	50.00	6.03	74.523	0.671	0.0	0.0	18.2	1.29	278.9	109.0
S5.000	50.00	3.40	74.855	0.097	0.0	0.0	2.6	1.14	126.1	15.8
S5.001	50.00	3.91	74.745	0.097	0.0	0.0	2.6	1.23	136.3	15.8
S6.000	50.00	3.80	74.960	0.306	0.0	0.0	8.3	1.43	228.1	49.8
S7.000	50.00	3.84	76.113	0.138	0.0	0.0	3.7	0.16	26.7	22.4
S7.001	40.17	13.84	76.103	0.146	0.0	0.0	3.7	0.16	26.9	22.4
S7.002	40.03	13.94	75.981	0.150	0.0	0.0	3.7	0.15	25.5	22.4
S7.003	37.35	15.93	75.980	0.150	0.0	0.0	3.7	0.16	26.8	22.4
S7.004	36.81	16.38	75.956	0.150	0.0	0.0	3.7	0.16	26.2	22.4
S7.005	36.25	16.86	75.951	0.150	0.0	0.0	3.7	0.16	27.1	22.4
S7.006	36.05	17.03	75.944	0.150	0.0	0.0	3.7	0.73	29.0	22.4
S6.001	35.90	17.17	74.614	0.457	0.0	0.0	8.9	1.43	228.1	53.3


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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.000	25.718	0.643	40.0	0.018	3.00	0.0	0.600		o	225	Pipe/Conduit	●
S11.001	15.756	0.263	59.9	0.035	0.00	0.0	0.600		o	225	Pipe/Conduit	●
S10.001	11.035	0.331	33.3	0.034	0.00	0.0	0.600		o	225	Pipe/Conduit	●
S3.011	10.768	0.036	299.1	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	●
S12.000	24.325	0.608	40.0	0.011	3.00	0.0	0.600		o	225	Pipe/Conduit	●
S12.001	12.052	0.500	24.1	0.028	0.00	0.0	0.600		o	225	Pipe/Conduit	●
S3.012	11.435	0.038	300.9	0.036	0.00	0.0	0.600		o	600	Pipe/Conduit	●
S3.013	11.575	0.039	296.8	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	●
S13.000	6.737	0.008	842.1	0.023	3.00	0.0		0.045	4 \=/	500	1:4 Swale	●
S13.001	4.659	0.006	776.5	0.000	0.00	0.0		0.045	4 \=/	500	1:4 Swale	●
S13.002	3.677	2.043	1.8	0.000	0.00	0.0		0.045	o	150	Pipe/Conduit	●
S3.014	10.821	0.036	300.6	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	●

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S11.000	50.00	3.21	75.425	0.018	0.0	0.0	0.5	2.07	82.5	2.9
S11.001	50.00	3.36	74.782	0.053	0.0	0.0	1.4	1.69	67.3	8.6
S10.001	50.00	3.46	74.519	0.127	0.0	0.0	3.4	2.27	90.4	20.6
S3.011	34.04	18.94	73.978	2.165	0.0	0.0	39.9	1.40	396.6	239.5
S12.000	50.00	3.20	75.425	0.011	0.0	0.0	0.3	2.07	82.5	1.8
S12.001	50.00	3.27	74.817	0.039	0.0	0.0	1.1	2.68	106.4	6.3
S3.012	33.91	19.08	73.942	2.240	0.0	0.0	41.1	1.40	395.4	246.8
S3.013	33.78	19.22	73.904	2.240	0.0	0.0	41.1	1.41	398.2	246.8
S13.000	50.00	3.78	76.215	0.023	0.0	0.0	0.6	0.14	18.0	3.7
S13.001	50.00	4.25	76.207	0.023	0.0	0.0	0.6	0.17	27.4	3.7
S13.002	50.00	4.28	76.201	0.023	0.0	0.0	0.6	1.86	32.8	3.7
S3.014	33.66	19.35	73.865	2.262	0.0	0.0	41.2	1.40	395.7	247.5


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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S16.006	6.942	0.347	20.0	0.000	0.00	0.0		0.045	o	225	Pipe/Conduit	
S15.002	12.426	0.124	100.2	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S15.003	20.722	0.207	100.1	0.019	0.00	0.0	0.600		o	300	Pipe/Conduit	
S3.017	11.584	0.039	297.0	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	
S18.000	6.275	0.141	44.5	0.014	3.00	0.0		0.045	4 \=/	600	1:4 Swale	
S18.001	6.625	1.656	4.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S3.018	18.671	0.062	301.2	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	
S3.019	10.769	0.036	299.1	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	
S19.000	29.627	0.296	100.1	0.048	3.00	0.0	0.600		o	150	Pipe/Conduit	
S19.001	10.001	0.100	100.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S19.002	3.390	0.034	99.7	0.082	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.020	8.810	0.040	220.3	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	
S3.021	8.541	0.028	305.0	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S16.006	31.99	21.22	75.802	0.177	0.0	0.0	4.2	0.73	29.0	25.1
S15.002	31.88	21.35	74.520	0.544	0.0	0.0	9.9	1.57	111.0	59.6
S15.003	31.70	21.57	74.396	0.563	0.0	0.0	9.9	1.57	111.1	59.6
S3.017	31.59	21.71	73.754	2.914	0.0	0.0	49.9	1.41	398.0	299.1
S18.000	50.00	3.16	76.341	0.014	0.0	0.0	0.4	0.64	88.1	2.4
S18.001	50.00	3.19	76.200	0.014	0.0	0.0	0.4	5.07	89.7	2.4
S3.018	31.41	21.93	73.715	2.928	0.0	0.0	49.9	1.40	395.3	299.1
S3.019	31.31	22.06	73.653	2.928	0.0	0.0	49.9	1.40	396.6	299.1
S19.000	50.00	3.49	74.500	0.048	0.0	0.0	1.3	1.00	17.7	7.8
S19.001	50.00	3.66	74.204	0.048	0.0	0.0	1.3	1.00	17.8	7.8
S19.002	50.00	3.70	74.029	0.130	0.0	0.0	3.5	1.31	52.1	21.2
S3.020	31.24	22.15	73.617	3.058	0.0	0.0	51.7	1.64	462.8	310.5
S3.021	31.16	22.25	73.577	3.058	0.0	0.0	51.7	1.39	392.7	310.5

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	o	375	S1	76.640	75.365	0.900	Open Manhole	1350
S3.001	o	375	S2	76.700	75.252	1.073	Open Manhole	1350
S3.002	o	375	S3	76.660	75.159	1.126	Open Manhole	1350
S3.003	o	375	S4	76.660	74.992	1.293	Open Manhole	1350
S3.004	o	375	S5	76.660	74.856	1.429	Open Manhole	1350
S4.000	o	375	S6	76.430	75.005	1.050	Open Manhole	1350
S4.001	o	375	S7	76.430	74.721	1.334	Open Manhole	1350
S4.002	o	375	S8	76.430	74.680	1.375	Open Manhole	1350
S3.005	o	450	S9	76.430	74.657	1.323	Open Manhole	1350
S3.006	o	525	S10	76.667	74.523	1.619	Open Manhole	1500
S5.000	o	375	S11	76.430	74.855	1.200	Open Manhole	1350
S5.001	o	375	S12	76.430	74.745	1.310	Open Manhole	1350
S6.000	o	450	S13	76.310	74.960	0.900	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	22.561	200.0	S2	76.700	75.252	1.073	Open Manhole	1350
S3.001	18.677	200.0	S3	76.660	75.159	1.126	Open Manhole	1350
S3.002	33.300	200.0	S4	76.660	74.992	1.293	Open Manhole	1350
S3.003	27.200	200.0	S5	76.660	74.856	1.429	Open Manhole	1350
S3.004	30.424	200.0	S9	76.430	74.704	1.351	Open Manhole	1350
S4.000	85.240	300.1	S7	76.430	74.721	1.334	Open Manhole	1350
S4.001	12.169	296.8	S8	76.430	74.680	1.375	Open Manhole	1350
S4.002	6.772	294.4	S9	76.430	74.657	1.398	Open Manhole	1350
S3.005	40.195	300.0	S10	76.667	74.523	1.694	Open Manhole	1500
S3.006	56.354	299.8	S18	76.550	74.335	1.690	Open Manhole	1500
S5.000	27.436	250.0	S12	76.430	74.745	1.310	Open Manhole	1350
S5.001	37.989	214.3	S17	76.430	74.568	1.487	Open Manhole	1500
S6.000	69.226	200.0	S15	76.400	74.614	1.336	Open Manhole	1350

The Arup Campus
Blyth Gate
Solihull B90 8AE

Surface Water Drainage Network

Date 31/01/2021

Designed by Cid Dos Santos Ju...

File Drainage Network Design ...

Checked by

XP Solutions

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PIPELINE SCHEDULES for StormUpstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.008	o	525	SNode 1	76.550	74.326	1.699	Junction	
S3.009	o	525	S20	76.550	74.170	1.855	Open Manhole	1500
S9.000	4 \=/	500	SSwale Node 9	76.550	76.425	-0.025	Junction	
S9.001	o	150	S21	76.550	76.349	0.051	Junction	
S3.010	o	525	S22	76.550	74.081	1.944	Open Manhole	1500
S10.000	o	225	S23	76.800	75.155	1.420	Open Manhole	1200
S11.000	o	225	S24	76.850	75.425	1.200	Open Manhole	1200
S11.001	o	225	S25	76.050	74.782	1.043	Open Manhole	1200
S10.001	o	225	S26	76.050	74.519	1.306	Open Manhole	1200
S3.011	o	600	S27	76.550	73.978	1.972	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.008	46.665	299.1	S20	76.550	74.170	1.855	Open Manhole	1500
S3.009	26.662	299.6	S22	76.550	74.081	1.944	Open Manhole	1500
S9.000	60.720	798.9	S21	76.550	76.349	0.051	Junction	
S9.001	2.955	1.5	S22	76.550	74.379	2.021	Open Manhole	1500
S3.010	31.013	301.1	S27	76.550	73.978	2.047	Open Manhole	1500
S10.000	38.156	60.0	S26	76.050	74.519	1.306	Open Manhole	1200
S11.000	25.718	40.0	S25	76.050	74.782	1.043	Open Manhole	1200
S11.001	15.756	59.9	S26	76.050	74.519	1.306	Open Manhole	1200
S10.001	11.035	33.3	S27	76.550	74.188	2.137	Open Manhole	1500
S3.011	10.768	299.1	S30	76.340	73.942	1.798	Open Manhole	1500

The Arup Campus
Blyth Gate
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Surface Water Drainage Network



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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S15.000	o	225	S35	76.550	75.050	1.275	Open Manhole	1200
S15.001	o	300	S36	76.550	74.775	1.475	Open Manhole	1200
S16.000	4 \=/	500	SSwale Node 13	76.340	76.023	0.167	Junction	
S16.001	4 \=/	500	SSwale Node 14	76.340	76.008	0.182	Junction	
S16.002	4 \=/	500	SSwale Node 15	76.340	75.972	0.218	Junction	
S16.003	4 \=/	500	SSwale Node 16	76.550	75.841	0.559	Junction	
S16.004	4 \=/	500	SSwale Node 17	76.550	75.839	0.561	Junction	
S16.005	4 \=/	500	SSwale Node 18	76.550	75.809	0.591	Junction	
S17.000	4 \=/	500	SSwale Node 19	76.550	76.023	0.377	Junction	
S16.006	o	225	S37	76.550	75.802	0.523	Junction	
S15.002	o	300	S38	76.550	74.520	1.730	Open Manhole	1200
S15.003	o	300	S39	76.630	74.396	1.934	Open Manhole	1200
S3.017	o	600	S40	76.630	73.754	2.276	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S15.000	55.038	200.1	S36	76.550	74.775	1.550	Open Manhole	1200
S15.001	50.950	199.8	S38	76.550	74.520	1.730	Open Manhole	1200
S16.000	12.107	807.1	SSwale Node 14	76.340	76.008	0.182	Junction	
S16.001	28.931	803.6	SSwale Node 15	76.340	75.972	0.218	Junction	
S16.002	105.113	802.4	SSwale Node 16	76.550	75.841	0.559	Junction	
S16.003	1.265	632.6	SSwale Node 17	76.550	75.839	0.561	Junction	
S16.004	23.985	799.5	SSwale Node 18	76.550	75.809	0.591	Junction	
S16.005	5.677	811.0	S37	76.550	75.802	0.598	Junction	
S17.000	9.281	299.4	S37	76.550	75.992	0.408	Junction	
S16.006	6.942	20.0	S38	76.550	75.455	0.870	Open Manhole	1200
S15.002	12.426	100.2	S39	76.630	74.396	1.934	Open Manhole	1200
S15.003	20.722	100.1	S40	76.630	74.189	2.141	Open Manhole	1500
S3.017	11.584	297.0	SNode 4	76.200	73.715	1.885	Junction	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
3.000	Classification	Footpath	95	0.029	0.027	0.027
	Classification	Porous Carpark	50	0.006	0.003	0.030
	Classification	Porous Carpark	50	0.006	0.003	0.034
	Classification	Porous Carpark	50	0.004	0.002	0.036
	Classification	Green Roof	40	0.058	0.023	0.059
3.001	Classification	Grass	40	0.004	0.002	0.002
3.002	Classification	Roof	100	0.188	0.188	0.188
3.003	-	-	100	0.000	0.000	0.000
3.004	Classification	Roof	100	0.190	0.190	0.190
4.000	Classification	Road	100	0.051	0.051	0.051
	Classification	Footpath	95	0.002	0.002	0.053
	Classification	Concrete Slab	100	0.170	0.170	0.223
	Classification	Grass	40	0.022	0.009	0.232
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
3.005	-	-	100	0.000	0.000	0.000
3.006	-	-	100	0.000	0.000	0.000
5.000	Classification	Road	100	0.014	0.014	0.014
	Classification	Grass	40	0.001	0.000	0.015
	Classification	Footpath	95	0.005	0.004	0.019
	Classification	Concrete Slab	100	0.078	0.078	0.097
	Classification	Grass	40	0.000	0.000	0.097
5.001	-	-	100	0.000	0.000	0.000
6.000	Classification	Road	100	0.053	0.053	0.053
	Classification	Concrete Slab	100	0.225	0.225	0.278
	Classification	Concrete Slab	100	0.024	0.024	0.303
	Classification	Grass	40	0.010	0.004	0.306
7.000	Classification	Road	100	0.076	0.076	0.076
	Classification	Grass	40	0.143	0.057	0.134
	Classification	Grass	40	0.005	0.002	0.135
	Classification	Footpath	95	0.003	0.002	0.138
7.001	Classification	Footpath	95	0.006	0.006	0.006
	Classification	Grass	40	0.003	0.001	0.007
	Classification	Grass	40	0.004	0.002	0.008
7.002	Classification	Grass	40	0.001	0.000	0.000
	Classification	Grass	40	0.003	0.001	0.001
	Classification	Footpath	95	0.003	0.003	0.004
7.003	-	-	100	0.000	0.000	0.000
7.004	-	-	100	0.000	0.000	0.000
7.005	-	-	100	0.000	0.000	0.000
7.006	-	-	100	0.000	0.000	0.000
6.001	-	-	100	0.000	0.000	0.000
6.002	-	-	100	0.000	0.000	0.000
5.002	-	-	100	0.000	0.000	0.000
3.007	Classification	Roof	100	0.181	0.181	0.181

The Arup Campus
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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Footpath	95	0.004	0.004	0.051
	Classification	Green Roof	40	0.043	0.017	0.068
	Classification	Footpath	95	0.008	0.008	0.076
	Classification	Grass	40	0.006	0.002	0.078
	Classification	Grass	40	0.002	0.001	0.079
	Classification	Grass	40	0.001	0.000	0.079
14.000	Classification	Grass	40	0.010	0.004	0.004
	Classification	Footpath	95	0.006	0.005	0.009
14.001	-	-	100	0.000	0.000	0.000
3.016	-	-	100	0.000	0.000	0.000
15.000	Classification	Roof	100	0.183	0.183	0.183
15.001	Classification	Roof	100	0.183	0.183	0.183
16.000	Classification	Road	100	0.095	0.095	0.095
	Classification	Grass	40	0.148	0.059	0.154
16.001	-	-	100	0.000	0.000	0.000
16.002	Classification	Grass	40	0.001	0.000	0.000
	Classification	Grass	40	0.016	0.006	0.006
	Classification	Footpath	95	0.015	0.014	0.020
16.003	-	-	100	0.000	0.000	0.000
16.004	-	-	100	0.000	0.000	0.000
16.005	-	-	100	0.000	0.000	0.000
17.000	Classification	Footpath	95	0.002	0.002	0.002
16.006	-	-	100	0.000	0.000	0.000
15.002	-	-	100	0.000	0.000	0.000
15.003	Classification	Green Roof	40	0.048	0.019	0.019
3.017	-	-	100	0.000	0.000	0.000
18.000	Classification	Grass	40	0.003	0.001	0.001
	Classification	Road	100	0.006	0.006	0.007
	Classification	Footpath	95	0.007	0.007	0.014
	Classification	Porous Carpark	50	0.000	0.000	0.014
	Classification	Porous Carpark	50	0.000	0.000	0.014
18.001	-	-	100	0.000	0.000	0.000
3.018	-	-	100	0.000	0.000	0.000
3.019	-	-	100	0.000	0.000	0.000
19.000	Classification	Roof	100	0.048	0.048	0.048
19.001	-	-	100	0.000	0.000	0.000
19.002	Classification	Footpath	95	0.012	0.011	0.011
	Classification	Footpath	95	0.005	0.005	0.016
	Classification	Footpath	95	0.003	0.003	0.018
	Classification	Footpath	95	0.005	0.005	0.023
	Classification	Footpath	95	0.003	0.003	0.026
	Classification	Porous Carpark	50	0.081	0.041	0.067
	Classification	Grass	40	0.003	0.001	0.068
	Classification	Grass	40	0.000	0.000	0.068
	Classification	Grass	40	0.000	0.000	0.068

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	5	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.900	Storm Duration (mins)	30
Ratio R	0.272		

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Storage Structures for Storm

Tank or Pond Manhole: SPond Outlet, DS/PN: S3.025

Invert Level (m) 73.428

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1306.4	1.500	2109.3	1.850	2404.2	1.990	3382.4

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5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Surcharged Flooded			Flow / Cap.	Half Drain Time (mins)	Pipe Flow (l/s)
			Level (m)	Depth (m)	Volume (m³)			
S3.000	S1	75.453	-0.287	0.000	0.12		14.3	
S3.001	S2	75.352	-0.275	0.000	0.12		14.6	
S3.002	S3	75.317	-0.216	0.000	0.37		46.4	
S3.003	S4	75.151	-0.217	0.000	0.37		45.5	
S3.004	S5	75.072	-0.160	0.000	0.61		76.8	
S4.000	S6	75.203	-0.177	0.000	0.45		49.5	
S4.001	S7	74.973	-0.123	0.000	0.46		41.0	
S4.002	S8	74.961	-0.094	0.000	0.51		39.2	
S3.005	S9	74.953	-0.154	0.000	0.67		110.1	
S3.006	S10	74.896	-0.152	0.000	0.39		99.1	
S5.000	S11	74.976	-0.254	0.000	0.21		23.4	
S5.001	S12	74.877	-0.243	0.000	0.14		16.9	
S6.000	S13	75.150	-0.260	0.000	0.34		71.7	
S7.000	SSwale Node 1	76.286	-0.144	0.000	0.19		31.5	

PN	US/MH Name	Status	Level Exceeded
S3.000	S1	OK	
S3.001	S2	OK	
S3.002	S3	OK	
S3.003	S4	OK	
S3.004	S5	OK	
S4.000	S6	OK	
S4.001	S7	OK	
S4.002	S8	OK	
S3.005	S9	OK	
S3.006	S10	OK	
S5.000	S11	OK	
S5.001	S12	OK	
S6.000	S13	OK	
S7.000	SSwale Node 1	FLOOD RISK*	

**Level of Service:
 No flood risk or flooding**

The Arup Campus
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5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S7.001	SSwale Node 2		76.266	-0.164	0.000	0.17			25.6
S7.002	SSwale Node 3		76.112	-0.318	0.000	0.01			15.5
S7.003	SSwale Node 4		76.116	-0.314	0.000	0.06			13.9
S7.004	SSwale Node 5		76.076	-0.354	0.000	0.02			14.5
S7.005	SSwale Node 6		76.068	-0.272	0.000	0.03			14.4
S7.006	S14		76.056	-0.113	0.000	0.50			14.4
S6.001	S15		74.891	-0.173	0.000	0.34			56.8
S6.002	S16		74.880	-0.126	0.000	0.22			53.6
S5.002	S17		74.872	-0.071	0.000	0.24			59.6
S3.007	S18		74.860	0.000	0.000	1.01			173.4
S8.000	SSwale Node 7		76.468	-0.062	0.000	0.15			4.1
S8.001	SSwale Node 8		76.452	-0.098	0.000	0.07			3.8
S8.002	S19		76.426	-0.115	0.000	0.12			3.9
S3.008	SNode 1		74.780	-0.071	0.000	0.63			175.5
S3.009	S20		74.719	0.024	0.000	0.93			212.3
S9.000	SSwale Node 9		76.537	-0.013	0.000	0.69			12.9
S9.001	S21		76.407	-0.092	0.000	0.32			11.5
S3.010	S22		74.644	0.038	0.000	0.93			217.6
S10.000	S23		75.216	-0.164	0.000	0.15			9.6
S11.000	S24		75.461	-0.189	0.000	0.06			4.5
S11.001	S25		74.845	-0.162	0.000	0.17			10.2
S10.001	S26		74.610	-0.134	0.000	0.34			25.9
S3.011	S27		74.555	-0.023	0.000	0.89			227.7
S12.000	S28		75.453	-0.197	0.000	0.04			2.8
S12.001	S29		74.860	-0.182	0.000	0.08			7.4
S3.012	S30		74.523	-0.019	0.000	0.91			234.0
S3.013	S31		74.488	-0.016	0.000	0.89			234.1
S13.000	SSwale Node 10		76.288	-0.052	0.000	0.19			5.2
S13.001	SSwale Node 11		76.271	-0.529	0.000	0.00			5.2
S13.002	S32		76.241	-0.110	0.000	0.16			5.1
S3.014	SNode 2		74.453	-0.012	0.000	0.68			235.9
S3.015	S33		74.432	0.003	0.000	1.00			242.2
S14.000	SSwale Node 12		76.629	-0.101	0.000	0.05			2.3
S14.001	S34		76.516	-0.134	0.000	0.03			2.3
S3.016	SNode 3		74.401	0.002	0.000	0.70			243.5
S15.000	S35		75.396	0.121	0.000	1.11			39.1
S15.001	S36		75.006	-0.069	0.000	0.93			68.5
S16.000	SSwale Node 13		76.204	-0.136	0.000	0.31			35.2
S16.001	SSwale Node 14		76.175	-0.165	0.000	0.24			31.4
S16.002	SSwale Node 15		76.126	-0.214	0.000	0.13			25.1
S16.003	SSwale Node 16		75.976	-0.574	0.000	0.00			16.6

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5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
S15.000		S35 SURCHARGED	
S15.001		S36	OK
S16.000	SSwale Node 13	FLOOD RISK*	
S16.001	SSwale Node 14	FLOOD RISK*	
S16.002	SSwale Node 15	FLOOD RISK*	
S16.003	SSwale Node 16		OK
S16.004	SSwale Node 17		OK

**Level of service:
No flood risk or flooding**

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5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S3.023	SPond aux.1		74.232	-0.150	0.000	0.09		37.8
S3.024	SPond aux.2		74.231	-0.120	0.000	0.10		37.5
S3.025	SPond Outlet		74.231	0.578	0.000	0.12		8.1
S3.026	S47		73.262	-0.176	0.000	0.11		8.1

PN	US/MH Name	Status	Level Exceeded
S16.005	SSwale Node 18	OK	
S17.000	SSwale Node 19	OK	
S16.006	S37	OK*	
S15.002	S38	OK	
S15.003	S39	OK	
S3.017	S40	SURCHARGED	
S18.000	SSwale Node 20	FLOOD RISK*	
S18.001	SSwale Node 21	FLOOD RISK*	
S3.018	SNode 4	SURCHARGED*	
S3.019	S41	SURCHARGED	
S19.000	S42	OK	
S19.001	S43	OK	
S19.002	S44	OK	
S3.020	S45	SURCHARGED	
S3.021	S46	SURCHARGED	
S3.022	SPond Inlet	OK	
S3.023	SPond aux.1	OK	
S3.024	SPond aux.2	OK	
S3.025	SPond Outlet	SURCHARGED	
S3.026	S47	OK	

**Level of service:
No flood risk or flooding**



30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Surcharged Flooded			Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
			Level (m)	Depth (m)	Volume (m³)			
S3.000	S1		75.588	-0.152	0.000	0.13		15.5
S3.001	S2		75.583	-0.044	0.000	0.13		15.7
S3.002	S3		75.579	0.045	0.000	0.51		63.7
S3.003	S4		75.560	0.193	0.000	0.47		58.1
S3.004	S5		75.545	0.313	0.000	0.80		100.5
S4.000	S6		75.564	0.184	0.000	0.53		58.2
S4.001	S7		75.535	0.439	0.000	0.43		38.1
S4.002	S8		75.521	0.466	0.000	0.55		42.9
S3.005	S9		75.513	0.406	0.000	0.70		115.2
S3.006	S10		75.477	0.429	0.000	0.41		102.4
S5.000	S11		75.479	0.249	0.000	0.23		25.4
S5.001	S12		75.472	0.351	0.000	0.16		20.2
S6.000	S13		75.512	0.102	0.000	0.37		78.8
S7.000	SSwale Node 1		76.324	-0.106	0.000	0.28		47.6

PN	US/MH Name	Status	Level Exceeded
S3.000	S1	OK	
S3.001	S2	OK	
S3.002	S3	SURCHARGED	
S3.003	S4	SURCHARGED	
S3.004	S5	SURCHARGED	
S4.000	S6	SURCHARGED	
S4.001	S7	SURCHARGED	
S4.002	S8	SURCHARGED	
S3.005	S9	SURCHARGED	
S3.006	S10	SURCHARGED	
S5.000	S11	SURCHARGED	
S5.001	S12	SURCHARGED	
S6.000	S13	SURCHARGED	
S7.000	SSwale Node 1	FLOOD RISK*	

**Level of service:
No flood risk or flooding**

30 year Return Period

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S7.001	SSwale Node 2		76.303	-0.127	0.000	0.25		38.1
S7.002	SSwale Node 3		76.139	-0.291	0.000	0.02		22.9
S7.003	SSwale Node 4		76.142	-0.288	0.000	0.09		19.9
S7.004	SSwale Node 5		76.103	-0.327	0.000	0.03		21.5
S7.005	SSwale Node 6		76.096	-0.244	0.000	0.05		21.3
S7.006	S14		76.088	-0.081	0.000	0.73		21.3
S6.001	S15		75.490	0.426	0.000	0.39		64.1
S6.002	S16		75.475	0.469	0.000	0.27		64.9
S5.002	S17		75.463	0.520	0.000	0.36		89.6
S3.007	S18		75.448	0.588	0.000	1.26		216.5
S8.000	SSwale Node 7		76.484	-0.046	0.000	0.23		6.1
S8.001	SSwale Node 8		76.466	-0.084	0.000	0.11		5.9
S8.002	S19		76.436	-0.105	0.000	0.19		6.0
S3.008	SNode 1		74.851	0.000	0.000	0.77		216.3
S3.009	S20		75.351	0.656	0.000	1.15		263.2
S9.000	SSwale Node 9		76.547	-0.003	0.000	0.91		16.9
S9.001	S21		76.421	-0.078	0.000	0.46		16.4
S3.010	S22		75.255	0.649	0.000	1.14		267.6
S10.000	S23		75.230	-0.150	0.000	0.22		14.2
S11.000	S24		75.470	-0.180	0.000	0.09		6.6
S11.001	S25		75.168	0.161	0.000	0.23		13.8
S10.001	S26		75.156	0.412	0.000	0.43		32.7
S3.011	S27		75.135	0.557	0.000	1.07		273.9
S12.000	S28		75.459	-0.191	0.000	0.05		4.1
S12.001	S29		75.102	0.060	0.000	0.11		10.2
S3.012	S30		75.095	0.553	0.000	1.09		282.2
S3.013	S31		75.052	0.548	0.000	1.06		276.8
S13.000	SSwale Node 10		76.305	-0.035	0.000	0.29		7.9
S13.001	SSwale Node 11		76.286	-0.514	0.000	0.01		8.0
S13.002	S32		76.251	-0.100	0.000	0.24		7.9
S3.014	SNode 2		74.465	0.000	0.000	0.80		278.4
S3.015	S33		74.983	0.554	0.000	1.19		287.3
S14.000	SSwale Node 12		76.635	-0.095	0.000	0.07		3.4
S14.001	S34		76.520	-0.130	0.000	0.04		3.5
S3.016	SNode 3		74.811	0.412	0.000	0.82		284.6
S15.000	S35		75.907	0.632	0.000	1.42		49.9
S15.001	S36		75.319	0.244	0.000	1.15		84.9
S16.000	SSwale Node 13		76.243	-0.097	0.000	0.47		53.5
S16.001	SSwale Node 14		76.211	-0.129	0.000	0.36		47.1
S16.002	SSwale Node 15		76.163	-0.177	0.000	0.19		38.0
S16.003	SSwale Node 16		76.005	-0.545	0.000	0.01		24.8

The Arup Campus
 Blyth Gate
 Solihull B90 8AE

Surface Water Drainage Network



Date 31/01/2021

Designed by Cid Dos Santos Ju...

File Drainage Network Design ...

Checked by


XP Solutions

Network 2020.1.3

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
 for Storm

PN	US/MH Name	Status	Level Exceeded
S15.000		S35 SURCHARGED	
S15.001		S36 SURCHARGED	
S16.000	SSwale Node 13	FLOOD RISK*	
S16.001	SSwale Node 14	FLOOD RISK*	
S16.002	SSwale Node 15	FLOOD RISK*	
S16.003	SSwale Node 16	OK	
S16.004	SSwale Node 17	OK	

**Level of service:
 No flood risk or flooding**


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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S3.023	SPond aux.1		74.585	0.203	0.000	0.10		41.0
S3.024	SPond aux.2		74.584	0.233	0.000	0.11		40.7
S3.025	SPond Outlet		74.584	0.931	0.000	0.12		8.1
S3.026	S47		73.262	-0.176	0.000	0.11		8.1

PN	US/MH Name	Status	Level Exceeded
S16.005	SSwale Node 18	OK	
S17.000	SSwale Node 19	OK	
S16.006	S37	OK*	
S15.002	S38	SURCHARGED	
S15.003	S39	SURCHARGED	
S3.017	S40	SURCHARGED	
S18.000	SSwale Node 20	FLOOD RISK*	
S18.001	SSwale Node 21	FLOOD RISK*	
S3.018	SNode 4	SURCHARGED*	
S3.019	S41	SURCHARGED	
S19.000	S42	SURCHARGED	
S19.001	S43	SURCHARGED	
S19.002	S44	SURCHARGED	
S3.020	S45	SURCHARGED	
S3.021	S46	SURCHARGED	
S3.022	SPond Inlet	SURCHARGED	
S3.023	SPond aux.1	SURCHARGED	
S3.024	SPond aux.2	SURCHARGED	
S3.025	SPond Outlet	SURCHARGED	
S3.026	S47	OK	

**Level of service:
No flood risk or flooding**

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Surface Water Drainage Network

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Overflow Act.	Water Surcharged Flooded			Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
			Level (m)	Depth (m)	Volume (m³)				
S3.000	S1		76.454	0.714	0.000	0.16		19.6	
S3.001	S2		76.448	0.821	0.000	0.18		21.4	
S3.002	S3		76.444	0.910	0.000	0.59		73.9	
S3.003	S4		76.416	1.048	0.000	0.51		62.6	
S3.004	S5		76.391	1.159	0.000	0.86		106.9	
S4.000	S6		76.405	1.025	0.000	0.62		68.3	
S4.001	S7		76.369	1.273	0.000	0.54		48.1	
S4.002	S8		76.353	1.298	0.000	0.55		42.3	
S3.005	S9		76.342	1.235	0.000	0.67		111.4	
S3.006	S10		76.288	1.240	0.000	0.45		113.7	
S5.000	S11		76.278	1.048	0.000	0.27		30.2	
S5.001	S12		76.269	1.149	0.000	0.17		21.1	
S6.000	S13		76.303	0.893	0.000	0.46		96.8	
S7.000	SSwale Node 1		76.349	-0.081	0.000	0.37		63.0	

PN	US/MH Name	Status	Level Exceeded
S3.000	S1	FLOOD RISK	
S3.001	S2	FLOOD RISK	
S3.002	S3	FLOOD RISK	
S3.003	S4	FLOOD RISK	
S3.004	S5	FLOOD RISK	
S4.000	S6	FLOOD RISK	
S4.001	S7	FLOOD RISK	
S4.002	S8	FLOOD RISK	
S3.005	S9	FLOOD RISK	
S3.006	S10	SURCHARGED	
S5.000	S11	FLOOD RISK	
S5.001	S12	FLOOD RISK	
S6.000	S13	FLOOD RISK	
S7.000	SSwale Node 1	FLOOD RISK*	

**Level of service:
No flooding**

The Arup Campus
Blyth Gate
Solihull B90 8AE

Surface Water Drainage Network



Date 31/01/2021

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File Drainage Network Design ...


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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm


PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S7.001	SSwale Node 2		76.329	-0.101	0.000	0.33			49.9
S7.002	SSwale Node 3		76.200	-0.230	0.000	0.02			25.2
S7.003	SSwale Node 4		76.203	-0.227	0.000	0.12			25.5
S7.004	SSwale Node 5		76.195	-0.235	0.000	0.04			27.9
S7.005	SSwale Node 6		76.195	-0.145	0.000	0.07			28.7
S7.006	S14		76.195	0.026	0.000	1.02			29.7
S6.001	S15		76.275	1.211	0.000	0.46			75.4
S6.002	S16		76.266	1.260	0.000	0.33			78.9
S5.002	S17		76.259	1.316	0.000	0.40			98.3
S3.007	S18		76.248	1.388	0.000	1.34			230.9
S8.000	SSwale Node 7		76.496	-0.034	0.000	0.30			8.0
S8.001	SSwale Node 8		76.477	-0.073	0.000	0.15			8.0
S8.002	S19		76.443	-0.098	0.000	0.25			7.9
S3.008	SNode 1		74.851	0.000	0.000	0.80			223.1
S3.009	S20		76.123	1.428	0.000	1.36			311.0
S9.000	SSwale Node 9		76.549	-0.001	0.000	0.98			18.0
S9.001	S21		76.424	-0.075	0.000	0.49			17.5
S3.010	S22		75.990	1.384	0.000	1.37			321.1
S10.000	S23		75.860	0.480	0.000	0.22			13.8
S11.000	S24		75.864	0.214	0.000	0.08			6.1
S11.001	S25		75.859	0.852	0.000	0.29			17.3
S10.001	S26		75.847	1.103	0.000	0.48			36.5
S3.011	S27		75.823	1.245	0.000	1.29			329.9
S12.000	S28		75.779	0.129	0.000	0.05			3.8
S12.001	S29		75.776	0.734	0.000	0.14			12.8
S3.012	S30		75.768	1.226	0.000	1.29			333.9
S3.013	S31		75.707	1.203	0.000	1.27			331.6
S13.000	SSwale Node 10		76.317	-0.023	0.000	0.38			10.3
S13.001	SSwale Node 11		76.298	-0.502	0.000	0.01			10.5
S13.002	S32		76.258	-0.093	0.000	0.32			10.4
S3.014	SNode 2		74.465	0.000	0.000	0.88			305.1
S3.015	S33		75.616	1.187	0.000	1.44			347.1
S14.000	SSwale Node 12		76.640	-0.090	0.000	0.09			4.4
S14.001	S34		76.522	-0.128	0.000	0.05			4.5
S3.016	SNode 3		74.811	0.412	0.000	0.90			313.2
S15.000	S35		76.505	1.230	0.000	1.69			59.7
S15.001	S36		76.033	0.958	0.000	1.31			96.9
S16.000	SSwale Node 13		76.269	-0.071	0.000	0.62			70.8
S16.001	SSwale Node 14		76.237	-0.103	0.000	0.46			60.3
S16.002	SSwale Node 15		76.189	-0.151	0.000	0.25			50.2
S16.003	SSwale Node 16		76.032	-0.518	0.000	0.01			32.1

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Status	Level Exceeded
S15.000		S35	FLOOD RISK
S15.001		S36	SURCHARGED
S16.000	SSwale Node 13	FLOOD RISK*	
S16.001	SSwale Node 14	FLOOD RISK*	
S16.002	SSwale Node 15	FLOOD RISK*	
S16.003	SSwale Node 16	OK	
S16.004	SSwale Node 17	OK	

**Level of service:
No flooding**

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Overflow Act.	Water Surcharged Flooded			Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
			Level (m)	Depth (m)	Volume (m ³)				
S3.023	SPond aux.1		74.853	0.471	0.000	0.12		49.7	
S3.024	SPond aux.2		74.853	0.502	0.000	0.13		49.4	
S3.025	SPond Outlet		74.852	1.199	0.000	0.12		8.1	
S3.026	S47		73.262	-0.176	0.000	0.11		8.1	

PN	US/MH Name	Status	Level Exceeded
S16.005	SSwale Node 18	OK	
S17.000	SSwale Node 19	OK	
S16.006	S37	OK*	
S15.002	S38	SURCHARGED	
S15.003	S39	SURCHARGED	
S3.017	S40	SURCHARGED	
S18.000	SSwale Node 20	FLOOD RISK*	
S18.001	SSwale Node 21	FLOOD RISK*	
S3.018	SNode 4	SURCHARGED*	
S3.019	S41	SURCHARGED	
S19.000	S42	SURCHARGED	
S19.001	S43	SURCHARGED	
S19.002	S44	SURCHARGED	
S3.020	S45	SURCHARGED	
S3.021	S46	SURCHARGED	
S3.022	SPond Inlet	SURCHARGED	
S3.023	SPond aux.1	SURCHARGED	
S3.024	SPond aux.2	SURCHARGED	
S3.025	SPond Outlet	SURCHARGED	
S3.026	S47	OK	

**Level of service:
No flooding**

Pre-connection enquiry form



Business developments, mixed use developments, housing developments

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. If completing this form by hand, please use BLOCK CAPITALS and black ink.

Please refer to the **Guide to completing the pre-connection enquiry form** on page 13 of this document when completing the form.

* Denotes mandatory/ required field. Please note, if mandatory fields are not completed the application will be returned.

Section A | Applicant details

1 *Applicant details:

Registered company name (if applicable): DIGITAL NETHERLAND

SVIII BV CO DIGITAL REALTY

Trading name (if applicable):

Company registration number (if applicable): IE906549

If you are not a registered company/business, please provide the applicant's name:

*Contact name:

*Postal address:

*Eircode:

*Telephone:

Mobile:

*Email:

2 Agent details (if applicable):

Contact name: CID DOS SANTOS JUNIOR

Company name (if applicable): Arup

Postal address: 50 Ringsend Road Dublin 4

Eircode: D04T6X0

Telephone: 012334455

Email: cid.dos-santos-junior@

arup.com

Section C | Development details

8 Please outline the domestic and/or industry/business use proposed:

Property type	Number of units	Property type	Number of units	Property type	Number of units
House		Apartments		Agricultural	
Office	3	School		Retail unit	
Residential care home		Institution		Industrial unit	3
Hotel		Factory		Other	
Other (please specify type)					

9 *Approximate start date of proposed development:

/ /

10 *Is the development multi-phased?

Yes No

If 'Yes', application must include a master-plan identifying the development phases and the current phase number.

If 'Yes', please provide details of variations in water demand volumes and wastewater discharge loads due to phasing requirements.

11 *Please indicate the type of connection required by ticking the appropriate box below:

- Water** Please go to Section D
- Wastewater** Please go to Section E
- Both** Please complete both Sections D and E

Calculations

Water demand

TOTAL INDUSTRIAL COOLING WATER:

Process Humidification = 11,600 L (5,800 each Data Centre Building)

Storage Replenishment Criteria = 4 hours at peak demand

Storage Replenishment Rate = 0.80 litres / sec

Storage Replenishment Rate * Pf Ind = $0.80 \times 5 = 4.00$ litres / sec (Section 3.7.2 of IW-CDS-5020-03)

TOTAL STAFF ACCOMMODATION:

Number of Staff:

DUB15 Data Centre Building: 59

DUB16 Data Centre Building: 59

Energy Centre Buildings: 8

Total Staff: 126

Daily consumption (G) = 45 litre per head per day (Irish Water Code of Practice for Water Infrastructure Doc. No. IW-CDS-5020-03 Section 3.28)

Dry Weather Flow (DWF) = $126 \times 45 / (24 \times 60 \times 60) = 0.066$ litres / sec

Pf Ind = $1.25 \times 5 = 6.25$ (Section 3.7.2 of IW-CDS-5020-03)

Design Flow = DWF x Pf Ind = $0.066 \times 6.25 = 0.41$ litres / sec

CAMPUS PHASING ACCORDING TO WATER DEMAND:

PHASE 1&2:

Process Humidification = 5,800 L

Storage Replenishment Rate = 0.40 litres / sec

Storage Replenishment Rate x Pf Ind = $0.40 \times 5 = 2.00$ litres / sec

Number of Staff:

DUB15 Data Centre Building: 59

Energy Centre Buildings: 8

Total Staff: 67

Design Flow = 0.218 litres / sec

PHASE 3&4:

Process Humidification = 5,800 L

Storage Replenishment Rate = 0.40 litres / sec

Storage Replenishment Rate x Pf Ind = $0.40 \times 5 = 2.00$ litres / sec

Number of Staff:

DUB16 Data Centre Building: 59

Design Flow = 0.192 litres / sec

Foul wastewater discharge

Number of Staff:

DUB15 Data Centre Building: 59

DUB16 Data Centre Building: 59

Energy Centre Buildings: 8

Total Staff: 126

Daily Consumption (G_e) = 50 litres per head per day (Irish Water Code of Practice for Wastewater Infrastructure, Document No. IW-CDS-5030-03, Appendix C)

Peak Water Mist Valve Room Discharge: 10.4 litres / sec (5.2 litres / sec for each Data Centre Building)

Peak Data Hall Area Discharge: 3.74 litres / sec (1.87 litres / sec for each Data Centre Building)

Dry Weather Flow (DWF) = $P * G + E$

$DWF = 126 * 50 / (24 * 60 * 60) + 10.4 + 3.74 = 14.213$ litres / sec

P_f Dom,Ind = 4.5 (Irish Water Code of Practice for Wastewater Infrastructure, Document No. IW-CDS-5030-03, Appendix B)

Design Foul Flow (DFF) = $P_f \text{ Dom,Ind} * P_e * G_e + E$

$DFF = 4.5 * 126 * 50 / (24 * 60 * 60) + 10.4 + 3.74 = 14.47$ litres / sec

CAMPUS PHASING ACCORDING TO FOUL WASTEWATER DISCHARGE:

PHASE 1&2:

Peak Water Mist Valve Room Discharge: 5.2 litres / sec

Peak Data Hall Area Discharge: 1.87 litres / sec

Number of Staff:

DUB15 Data Centre Building: 59

Energy Centre Buildings: 8

Total Staff: 67

Dry Weather Flow (DWF) = 7.109 litres / sec

Design Foul Flow = 7.245 litres / sec

PHASE 3&4:

Peak Water Mist Valve Room Discharge: 5.2 litres / sec

Peak Data Hall Area Discharge: 1.87 litres / sec

Number of Staff:

DUB16 Data Centre Building: 59

Dry Weather Flow (DWF) = 7.104 litres / sec

Design Foul Flow = 7.224 litres / sec

Guide to completing the pre-connection enquiry form

This form should be completed by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure.

The Irish Water Codes of Practice are available at www.water.ie for reference.

Section A | Applicant Details

Question 1: This question requires the applicant or company enquiring about the feasibility of a connection to identify themselves, their postal address, and to provide their contact details.

Question 2: If the applicant has employed a consulting engineer or an agent to manage the enquiry on their behalf, the agent's address and contact details should be recorded here.

Question 3: Please indicate whether it is the applicant or the agent who should receive future correspondence in relation to the enquiry.

Section B | Site details

Question 4: This is the address of the site requiring the water/wastewater service connection and for which this enquiry is being made.

Question 5: Please provide the Irish Grid co-ordinates of the proposed site. Irish grid positions on maps are expressed in two dimensions as Eastings (E or X) and Northings (N or Y) relative to an origin. You will find these coordinates on your Ordnance Survey map which is required to be submitted with an application.

Question 6: Please identify the Local Authority that is or will be dealing with your planning application, for example Cork City Council.

Question 7: Please indicate if planning permission has been granted for this application, and if so, please provide the planning permission reference number.

Section C | Development details

Question 8: Please specify the number of different property/premises types by filling in the tables provided.

Question 9: Please indicate the approximate commencement date of works on the development.

Question 10: Please indicate if a phased building approach is to be adopted when developing the site. If so, please provide details of the phase master-plan and the proposed variation in water demand/wastewater discharge as a result of the phasing of the development.

Question 11: Please indicate the type of connection required by ticking the appropriate box and proceed to complete the appropriate section or sections.

Section D | Water connection and demand details

Question 12: Please indicate if a water connection already exists for this site.

Question 12.1: Please indicate if this enquiry concerns an additional connection to one already installed on the site.

Question 12.2: Please indicate if you are proposing to upgrade the water connection to facilitate an increase in water demand. Irish Water will determine what impact this will have on our infrastructure.

Question 13: Please indicate the approximate date that the proposed connection to the water infrastructure will be required.

Question 14: Please indicate what diameter of water connection is required to service this development.

Question 15: Please indicate if more than one connection is required to service this development. Please note that the connection size provided may be used to determine the connection charge.

Question 16: If this connection enquiry concerns a business premises, please provide calculations for the water demand and include your calculations on the calculation sheet provided. Business premises include shops, offices, hotels, schools, etc. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 29: Please specify the maximum and average concentrations and the maximum daily load of each of the wastewater characteristics listed in the wastewater organic load table (if not domestic effluent), and also specify if any other significant concentrations are expected in the effluent. Please complete the table and provide additional supporting documentation if relevant. Note that the concentration shall be in mg/l and the load shall be in kg/day. Note that for business premises (shops, offices, schools, hotels, etc.) for which only domestic effluent will be discharged (excluding discharge from canteens/restaurants which would require a Trade Effluent Discharge licence), there is no need to complete this question.

Question 30: In exceptional circumstances, such as brownfield sites, where the only practical outlet for storm/surface water is to a combined sewer, Irish Water will consider permitting a restricted attenuated flow to the combined sewer. Storm/surface water will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer and the applicant must demonstrate how the storm/surface water flow from the proposed site is minimised using sustainable urban drainage system (SUDS). This type of connection will only be considered on a case by case basis. Please advise if the proposed development intends discharging surface water to the combined wastewater collection system.

Question 31: Please specify if the development needs to pump its wastewater discharge to gain access to Irish Water infrastructure.

Question 32: Please specify the ground level at the location where connection to the public sewer will be made. This is required to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 33: Please specify the lowest floor level of the proposed development. This is required in order to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 34: Please specify the proposed invert level of the pipe exiting the property to the public road.

Section F | Supporting documentation

Please provide additional information as listed.

Section G | Declaration

Please review the declaration, sign, and return the completed application form to Irish Water by email or by post using the contact details provided in Section G.

