Appendix D Surface Water Attenuation Storage Critical Storm Events

Surface Water Attenuation Requirement for 1 in 30 Year Storm Event

Total Site Area =	0.86	hectares (ha)
Total Impermeable Area =	0.47	hectares (ha)
PIMP =	54.82	%

(See section 2.5.5 of the Engineering Services Report Drainage and Water Services)

Duration, (min)	Rainfall			Intensity (mm/hr)	Total Impermeable Area (ha)	Inflow Rate	Inflow Volume, I	Inflow Rate	Ouflow Volume, O	Required Storage, S	Comments
	30 Year Event[1] (mm)	+20% CC Allowance	Rainfall (mm)			$Q = 2.78*C*I*A$ [2] (l/s)	(m^3)	Q_{BAR} (l/s)	(m^3)	(m^3)	
5	12.1	1.2	14.52	174.24	0.474	229.63	68.890	1.728	0.518	68.372	
10	16.9	1.2	20.28	121.68	0.474	160.36	96.218	1.728	1.037	95.182	
15	19.8	1.2	23.76	95.04	0.474	125.25	112.729	1.728	1.555	111.174	
30	24.8	1.2	29.76	59.52	0.474	78.44	141.196	1.728	3.110	138.086	
60	31.1	1.2	37.32	37.32	0.474	49.18	177.065	1.728	6.221	170.844	
120	38.9	1.2	46.68	23.34	0.474	30.76	221.473	1.728	12.442	209.032	
180	44.4	1.2	53.28	17.76	0.474	23.41	252.787	1.728	18.662	234.125	
240	48.8	1.2	58.56	14.64	0.474	19.29	277.838	1.728	24.883	252.955	
360	55.6	1.2	66.72	11.12	0.474	14.66	316.553	1.728	37.325	279.228	
540	63.5	1.2	76.2	8.47	0.474	11.16	361.531	1.728	55.987	305.544	
720	69.7	1.2	83.64	6.97	0.474	9.19	396.830	1.728	74.650	322.180	
1080	79.5	1.2	95.4	5.30	0.474	6.98	452.625	1.728	111.974	340.651	
1440	87.2	1.2	104.64	4.36	0.474	5.75	496.464	1.728	149.299	347.165	**Critical Volume**
2880	98.9	1.2	118.68	2.47	0.474	3.26	563.077	1.728	298.598	264.479	

Notes:

1. See Appendix D for Met Eireaan rainfall data during a 1 in 30 year storm event

2. $Q = 2.78*C*I*A = 2.78*I*(C_{RF}*A_{RF}+C_{CONC}*A_{CONC}+C_{GRAS}* A_{GRAS})$

Surface Water Attenuation Required for 1 in 100 Year Storm Event

Total Site Area =	0.86	hectares (ha)
Total Impermeable Area =	0.47	hectares (ha)
PIMP =	54.82	%

(See section 2.5.5 of the Engineering Services Report Drainage and Water Services)

Duration, (min)	Rainfall			Intensity (mm/hr)	Total Impermeable Area (ha)	Inflow Rate	Inflow Volume, I (m^3)	Inflow Rate	Ouflow Volume, O (m^3)	Required Storage, S (m^3)	Comments
	100 Year Event[1] (mm)	+20% CC Allowance	Rainfall (mm)			$Q = 2.78*C*I*A$ [2] (l/s)		Q_{BAR} (l/s)			
5	17.7	1.2	21.24	254.88	0.474	335.91	100.773	1.728	0.518	100.255	
10	24.6	1.2	29.52	177.12	0.474	233.43	140.058	1.728	1.037	139.021	
15	29.0	1.2	34.8	139.20	0.474	183.45	165.109	1.728	1.555	163.553	
30	35.8	1.2	42.96	85.92	0.474	113.24	203.824	1.728	3.110	200.713	
60	44.3	1.2	53.16	53.16	0.474	70.06	252.218	1.728	6.221	245.997	
120	54.8	1.2	65.76	32.88	0.474	43.33	311.998	1.728	12.442	299.557	
180	62.0	1.2	74.4	24.80	0.474	32.68	352.991	1.728	18.662	334.328	
240	67.8	1.2	81.36	20.34	0.474	26.81	386.013	1.728	24.883	361.129	
360	76.7	1.2	92.04	15.34	0.474	20.22	436.684	1.728	37.325	399.359	
540	86.9	1.2	104.28	11.59	0.474	15.27	494.756	1.728	55.987	438.769	
720	94.9	1.2	113.88	9.49	0.474	12.51	540.304	1.728	74.650	465.654	
1080	107.4	1.2	128.88	7.16	0.474	9.44	611.471	1.728	111.974	499.497	
1440	117.3	1.2	140.76	5.87	0.474	7.73	667.836	1.728	149.299	518.537	**Critical Volume**
2880	129.9	1.2	155.88	3.25	0.474	4.28	739.573	1.728	298.598	440.974	

Notes:

1. See Appendix D for Met Eireaan rainfall data during a 1 in 100 year storm event

2. $Q = 2.78*C*I*A = 2.78*I*(C_{RF}*A_{RF}+C_{CONC}*A_{CONC}+C_{GRAS}* A_{GRAS})$

Appendix E Attenuation Sizing Calculations

STORMTECH Stormwater Management System Design Tool

ver: Jun14

PROJECT REF:	22_112
LOCATION:	Calmount Road - A1
DATE:	22/08/2022
CREATED BY:	Kyle Brill

Instructions: Fill in blue highlighted cells
Set width to maximum allowance
Adjust site parameters and system dimension until volume achieved
For Rectangular systems only, for irregular shape dig contact Microstrain

STEM PARAMETERS

quired Total Storage	55	m^3
ormtech chamber model	MC3500	
mber of Isolator Rows for TSS Removal	1	

TE PARAMETERS

ximum Width at Excavation Base	5	m	
one Porosity	43%		
cavation Batter Angle (degrees)	60	°	*Minimum Requirement*
one Below Chambers	0.23	m	*0.23*
one Above Chambers	0.305	m	*0.30*
ditional Storage. E.g manholes, pipe	0	m^3	

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	MC3500	
Unit Width	1.955	m
Unit Length	2.18	m
Unit Height	1.145	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	3.11	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	112	
Area of Dig at Base of System	50	m^2
Area of Dig at Top of System	83	m^2
Void Ratio	57%	
Stone Requirement - tonne	137	tonne

LCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
mber of Rows	2		ea
mber of units per Row	4		ea
mber of MC3500 Chambers	8		ea
mber of MC3500 Endcaps	4		ea
stem Installed Storage Depth (effective storage depth)	1.680		m
nk overall installed Width at base	4.74	5	m
nk overall installed Length at Base	10.46	10	m
tal Effective System Storage	**63.1**	**63.3**	m^3

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Subsurface Stormwater Management™

STORMTECH Stormwater Management System Design Tool

ver. Jun14

PROJECT REF:	22_112
LOCATION:	Calmount Road - A2
DATE:	22/08/2022
CREATED BY:	Kyle Brill

Instructions: Fill in blue highlighted cells
Set width to maximum allowance
Adjust site parameters and system dimension until volume achieved
For Rectangular systems only, for irregular shape dig contact Microstrain

STEM PARAMETERS

quired Total Storage	260	m^3
rmtech chamber model	MC3500	
mber of Isolator Rows for TSS Removal	1	

E PARAMETERS

ximum Width at Excavation Base	3.2	m	
ne Porosity	43%		
avation Batter Angle (degrees)	60	°	*Minimum Requirement*
ne Below Chambers	0.23	m	*0.23*
ne Above Chambers	0.425	m	*0.30*
ditional Storage. E.g manholes, pipe	126.7812	m^3	

LCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
mber of Rows	1		ea
mber of units per Row	16		ea
mber of MC3500 Chambers	16		ea
mber of MC3500 Endcaps	2		ea
stem Installed Storage Depth (effective storage depth)	1.800		m
nk overall installed Width at base	2.56	3.2	m
nk overall installed Length at Base	36.62	42	m
tal Effective System Storage	**260.8**	**297.2**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	MC3500	
Unit Width	1.955	m
Unit Length	2.18	m
Unit Height	1.145	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	3.11	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	330	
Area of Dig at Base of System	134	m^2
Area of Dig at Top of System	233	m^2
Void Ratio	90%	
Stone Requirement - tonne	456	tonne

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STORMTECH Stormwater Management System Design Tool

ver Jun14

PROJECT REF:	22_112
LOCATION:	Calmount Road - A3
DATE:	22/08/2022
CREATED BY:	Kyle Brill

Instructions:
- Fill in blue highlighted cells
- Set width to maximum allowance
- Adjust site parameters and system dimension until volume achieved
- For Rectangular systems only, for irregular shape dig contact Microstrain

STEM PARAMETERS

quired Total Storage	105	m^3
rmtech chamber model	SC740	
mber of Isolator Rows for TSS Removal	1	

E PARAMETERS

ximum Width at Excavation Base	9.5	m	
ne Porosity	43%		
cavation Batter Angle (degrees)	60	°	*Minimum Requirement*
ne Below Chambers	0.15	m	*0.15*
ne Above Chambers	0.15	m	*0.15*
ditional Storage. E.g manholes, pipe	0	m^3	

LCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
mber of Rows	6		ea
mber of units per Row	7		ea
mber of SC740 Chambers	42		ea
mber of SC740 Endcaps	12		ea
stem Installed Storage Depth (effective storage depth)	1.060		m
nk overall installed Width at base	9.12	9.5	m
nk overall installed Length at Base	15.89	15.4	m
tal Effective System Storage	**105.2**	**105.8**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	SC740	
Unit Width	1.295	m
Unit Length	2.17	m
Unit Height	0.76	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	1.3	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	172	
Area of Dig at Base of System	146	m^2
Area of Dig at Top of System	178	m^2
Void Ratio	61%	
Stone Requirement - tonne	191	tonne

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Appendix F Met Éireann

ET ÉIREANN RAINFALL DATA

81-2010 Annual Average Rainfall Grid:

Eastin and Northing Irish Grid Co-ordinates

east	north	Annual Average Rainfall(mm)
310000	227000	824
310000	228000	763
310000	229000	721
310000	230000	700
310000	231000	702
310000	232000	718
310000	233000	733
310000	234000	746

eturn Period Rainfall depths for Sliding Durations:

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 309895, Northing: 230126,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.4,	3.6,	4.3,	5.3,	6.0,	6.6,	8.4,	10.6,	12.1,	14.2,	16.2,	17.7,	20.1,	21.9,	23.5,	N/A ,
10 mins	3.4,	5.0,	5.9,	7.4,	8.4,	9.1,	11.7,	14.8,	16.9,	19.8,	22.5,	24.6,	28.0,	30.6,	32.8,	N/A ,
15 mins	4.0,	5.9,	7.0,	8.7,	9.8,	10.7,	13.8,	17.4,	19.8,	23.3,	26.5,	29.0,	32.9,	36.0,	38.6,	N/A ,
30 mins	5.2,	7.7,	9.1,	11.2,	12.6,	13.7,	17.5,	21.9,	24.8,	29.0,	32.9,	35.8,	40.5,	44.2,	47.2,	N/A ,
1 hours	6.9,	10.1,	11.8,	14.4,	16.2,	17.6,	22.2,	27.5,	31.1,	36.2,	40.7,	44.3,	49.9,	54.2,	57.8,	N/A ,
2 hours	9.2,	13.1,	15.3,	18.5,	20.7,	22.4,	28.1,	34.6,	38.9,	45.1,	50.5,	54.8,	61.4,	66.5,	70.8,	N/A ,
3 hours	10.8,	15.3,	17.8,	21.5,	24.0,	25.9,	32.3,	39.6,	44.4,	51.2,	57.3,	62.0,	69.3,	75.0,	79.7,	N/A ,
4 hours	12.1,	17.1,	19.8,	23.8,	26.6,	28.7,	35.6,	43.5,	48.8,	56.1,	62.7,	67.8,	75.6,	81.7,	86.7,	N/A ,
6 hours	14.3,	20.0,	23.0,	27.6,	30.7,	33.1,	41.0,	49.8,	55.6,	63.8,	71.1,	76.7,	85.4,	92.1,	97.7,	N/A ,
9 hours	16.8,	23.3,	26.8,	32.0,	35.5,	38.2,	47.0,	57.0,	63.5,	72.6,	80.6,	86.9,	96.4,	103.8,	110.0,	N/A ,
12 hours	18.8,	26.1,	29.9,	35.6,	39.4,	42.3,	51.9,	62.6,	69.7,	79.5,	88.2,	94.9,	105.1,	113.1,	119.6,	N/A ,
18 hours	22.2,	30.4,	34.8,	41.2,	45.5,	48.9,	59.6,	71.6,	79.5,	90.4,	100.0,	107.4,	118.7,	127.5,	134.7,	N/A ,
24 hours	24.9,	34.0,	38.7,	45.8,	50.5,	54.1,	65.8,	78.8,	87.2,	99.0,	109.3,	117.3,	129.4,	138.8,	146.5,	173.2,
2 days	31.1,	41.4,	46.8,	54.6,	59.7,	63.7,	76.2,	90.0,	98.9,	111.1,	121.8,	129.9,	142.3,	151.7,	159.5,	186.2,
3 days	36.1,	47.4,	53.2,	61.6,	67.2,	71.4,	84.7,	99.2,	108.5,	121.2,	132.2,	140.6,	153.3,	163.0,	170.9,	197.9,
4 days	40.5,	52.7,	58.9,	67.8,	73.6,	78.1,	92.1,	107.2,	116.8,	130.0,	141.4,	150.0,	163.0,	172.9,	181.0,	208.5,
6 days	48.2,	61.8,	68.6,	78.4,	84.8,	89.6,	104.8,	121.0,	131.3,	145.2,	157.2,	166.3,	179.9,	190.3,	198.6,	227.1,
8 days	55.0,	69.8,	77.2,	87.7,	94.6,	99.7,	115.9,	133.0,	143.8,	158.5,	171.0,	180.5,	194.7,	205.4,	214.0,	243.4,
10 days	61.2,	77.1,	85.0,	96.2,	103.4,	108.9,	125.9,	143.9,	155.2,	170.4,	183.4,	193.3,	207.9,	219.0,	227.9,	258.1,
12 days	67.0,	83.9,	92.2,	104.0,	111.6,	117.3,	135.1,	153.8,	165.6,	181.4,	194.9,	205.0,	220.1,	231.5,	240.7,	271.6,
16 days	77.8,	96.3,	105.5,	118.3,	126.6,	132.8,	151.9,	172.0,	184.6,	201.4,	215.6,	226.3,	242.2,	254.2,	263.8,	296.1,
20 days	87.7,	107.8,	117.7,	131.5,	140.3,	146.9,	167.3,	188.5,	201.7,	219.4,	234.4,	245.6,	262.2,	274.6,	284.7,	318.2,
25 days	99.4,	121.2,	131.8,	146.7,	156.1,	163.2,	184.9,	207.5,	221.5,	240.1,	255.9,	267.6,	285.0,	298.0,	308.5,	343.4,