Clifton Scannell Emerson Associates

Proposed Surface Water Attenuation Overview

Unit 1, M50 Business Park

Client: Creighton Properties LLC

Date: 4th April 2023

Job Number: 22_112

CONSULTING ENGINEERS

Civil Engineering | Structural Engineering | Transport Engineering | Environmental Engineering | Project Management | Health and Safety

Clifton Scannell Emerson Associates

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Document Control Sheet

Project Name:	Unit 1, M50 Business Park
Project Number:	22_112
Report Title:	Proposed Surface Water Attenuation Overview
Filename:	RPT-22_112-005

Issue No.	Issue Status	Date	Prepared by	Checked by
P01	DRAFT	10/03/2022	KB	CD
P02	PLANNING	04/04/2023	KB	CD

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1 Introduction

1.1 Background

This Proposed Surface Water Attenuation Overview report has been prepared by Clifton Scannell Emerson Associates (CSEA) on behalf of Creighton Properties LLC in response to Further Information Request No. 3 (E) as issued by South Dublin County Council in response to application for planning permission submitted for development at Unit 1, M50 Business Park, Ballymount, Dublin 12 (Reg Ref SD22A/0460).

1.2 Overview

This Proposed Surface Water Attenuation Overview report is to be read in conjunction with the RPT-22_112-004 SuDS Management Plan report. In this report the areas and runoff coefficients of different surface types are defined. Surface water attenuation is calculated to ensure that the Greenfield runoff rate for the site is maintained at the outfall manhole during the 1 in 100 year critical storm event, inclusive of the climate change allowance.

1.3 Existing Site

The existing site is located in the Urban Fringe/Periurban area of the Green Infrastructure (GI) network of the County. Although the site is not partially or wholly within the Riparian Corridors, urbanisation disrupts the land-water linkages. Surface water runoff from existing hardstanding areas are collected in a sealed system of pipes and gullies and outfalls via a bypass petrol interceptor to the existing M50 Business Park drainage network. There is no existing provision for surface water attenuation thus increasing flood risk within the site and is likely to increase flood risk elsewhere during critical storm events.

2 Determination of Greenfield Runoff Rate

The allowable discharge rate, Q_{BAR}, is given by the following equation in accordance with the Institute of Hydrology Report No. 124 (IH 124 method):

$$Q_{BAR} = 0.00108AREA^{0.89}SAAR^{1.17}SOIL^{2.17}$$

However, the total site area is less than 50 hectares. Therefore, Q_{BAR} is calculated for 50 hectares and linearly interpolated to 0.86 hectares. See calculations below.

IH 124 method for 50 hectare site area:

AREA = 0.5 km^2 (i.e. 50 ha)
SAAR = 700 mm (Met Eireann SAAR, see Appendix D)
SOIL = 0.3 (SOIL TYPE 2, see Table D1 of Appendix D of Volume 2 of GDSDS)

Q_{BAR} = $0.00108(0.5)^{0.89}(700)^{1.17}(0.3)^{2.17}$
= 0.09 m^3/s for 50 ha site area

Interpolation for 0.86 hectares:

Q_{BAR} = (0.09 m^3/s / 50 ha) x 0.86 ha
= 0.002 m^3/s

Therefore, Q_{BAR} = 1.57 l/s.

Check whichever is greater for the maximum discharge rate of Q_{bar} or 2 l/s/ha in accordance with Criterion 4.3 of Table 6.3 of Volume 2 the GDSDS.

Q_{BAR} = 1.57 l/s

2 l/s/ha = 1.73 l/s for 0.86 ha site

Therefore, the maximum allowable discharge for the site is **1.73 l/s** at a design head of **2.0m**. Discharge from the site will be controlled by means of an online hydrobrake vortex control (Unit Reference SHE-0053-1730-2000-1730). Details of the hydrobrake proposed are provided in **Appendix A**.

3 Coefficients of Runoff for Contributing Impermeable Areas

The proposed development contains the following impermeable areas:

Roof Area (A_{RF})	= 0.236 ha
Green Roof Area (A_{GRF})	= 0.004 ha
Concrete Area (A_{CONC})	= 0.216 ha
Gravel Area (A_{GRAV})	= 0.028 ha
Grasscrete Area (A_{GCRETE})	= 0.147 ha

Section 8.4.4.1 of the 'SDCC SuDS explanatory design and evaluation guide' states that the runoff co-efficient of 0.95 for roofs and 0.9 for paved areas would be accepted by SDCC where no more detailed assessment is undertaken and notes that the designer must evaluate the runoff coefficient for the types of surfaces contributing to the storage location. As there are a number of other surfaces with varying co-efficient of runoff contributing to the design of the attenuation system CSEA have undertaken a review of best practice in relation to co-efficient of run-off for various surfaces and have located detailed guidance for same in Table 9 of the German standard DIN 1986-100:2016-12 (refer to **Appendix B,** note text is in German). The run-off co-efficients adopted are outlined below:

Roof Coefficients of Runoff (C_{RF})	= 0.95
Green Roof Coefficients of Runoff (C_{GRF})	= 0.40
Concrete Coefficients of Runoff (C_{CONC})	= 0.90
Gravel Coefficients of Runoff (C_{GRAV})	= 0.70
Grasscrete Coefficients of Runoff (C_{GCRETE})	= 0.30

Therefore, total impermeable are for the site is calculated as follows:

$$\text{Total Impermeable Area} = A_{RF} \times C_{RF} + A_{GRF} \times C_{GRF} + A_{CONC} \times C_{CONC} + A_{GRAV} \times C_{GRAV} + A_{GCRETE} \times C_{GCRETE}$$

$$= 0.236 \times 0.95 + 0.004 \times 0.40 + 0.216 \times 0.90 + 0.028 \times 0.70 + 0.147 \times 0.30$$

$$= 0.484 \text{ ha}$$

Refer to **Appendix C** for the drawing showing the different surface types, area and respective runoff coefficients.

4 Required Surface Water Attenuation Storage

In order to account for climate change, an additional allowance of 20% in rainfall intensities have been allowed as per Section 8.4.6.4 of SDDCC Sustainable Drainage Explanatory Design & Evaluation Guide which exceeds the requirements of Table 6.1 of Volume 2 of the GDSDS (10%).

Analysis of the 1 in 30 year storm event yields a critical required storage volume of 357.607 m^3 during the critical 1440 minute storm event. Similarly, analysis of the 1 in 100 year storm event yields a critical required storage volume of 532.583 m^3 during the 1440 minute storm event. See **Appendix D** for analysis the 1 in 30 and 1 in 100 year storm event.

As a result, the required surface water storage is **532.583** m^3 during the critical 1440 minute of the 1 in 100 year storm event.

Considering the site constraints and underground service congestion, 3 no. StormTech™ systems by Cubic M^3 or similar is being proposed. These systems have been modified to use storage volume within the gravel media rather than tanked storage where possible. See **Appendix E** for further details.

5 Surface Water Network Flooding Check for Critical Storm Event

The critical storm event occurs during the 1440 minute of the 1 in 100 year storm event for which 532.583 m^3 of surface water attenuation storage is required. During this storm event the Top Water Level (TWL) = 66.60 m in the surface water network.

As a result, the surface water volume of **532.583 m^3** is stored in the network as follows:

- Attenuation A1
  - Cover Level (CL) = 67.47 m
  - Invert Level (IL) = 64.88 m
  - Plan Area = 96.55 m^2
  - Top of Attenuation System level = 66.56 m
  - Top Water Level (TWL) during Critical Storm = 66.56 m
  - Storage Volume Contribution during Critical Storm = 75 m^3 (100 % of Capacity)

- Attenuation A2 (Inclusive of additional 127 m^3 Porous Stone)
  - Cover Level (CL) = 67.52 m
  - Invert Level (IL) = 64.68 m
  - Plan Area = 357.77 m^2
  - Top of Attenuation System level = 66.48 m
  - Top Water Level (TWL) during Critical Storm = 66.48 m
  - Storage Volume Contribution during Critical Storm = 300 m^3 (103 % of Capacity)

- Attenuation A3
  - Cover Level (CL) = 66.61 m
  - Invert Level (IL) = 65.03 m
  - Attenuation System Plan Area = 169.85 m^2
  - Top of Attenuation System level = 66.09 m
  - Top Water Level (TWL) during Critical Storm = 66.09 m
  - Storage Volume Contribution during Critical Storm = 105 m^3 (100 % of Capacity)

- Manhole Storage
  - Top Water Level (TWL) during Critical Storm = 66.60 m
  - Storage Volume Contribution during Critical Storm = 34.965 m^3 (53 % of Capacity)

- Pipes Storage
  - Top Water Level (TWL) during Critical Storm = 66.19 m
  - Storage Volume Contribution during Critical Storm = 17.618 m^3 (92 % of Capacity)

- Total Provided Storage (during Critical Storm) = Attenuation A1 + Attenuation A2 + Attenuation A3 + Manhole Storage + Pipe Storage
  = 75 + 300 + 105 + 34.965 + 17.618
  = **532.583 m^3**

As the proposed drainage system, inclusive of the attenuation systems provided as outlined above, has greater capacity that the estimated storage volume required during the critical1440 minute during the 1 in 100 year storm event it can be concluded that the site will not be subject to flooding during the critical storm period.

Refer to **Appendix G** for the drawing showing surface water attenuation capacity during 1440 minute of 1 in 100 year critical storm event. Refer to **Appendix H** for the drawing demonstrating the SuDS treatment train and proposed source and site controls.

6 Conclusion

This report provides a comprehensive response to Additional Information Request 3 in respect of the Planning Application for the above scheme (Reg Ref SD22A/0460). As described in the report surface water attenuation has been provided such that there is sufficient storage during the 1440 minute of the 1 in 100 year critical storm, inclusive of the provision for the 20% climate change allowance to ensure improved resilience against future shocks and disruptions. A hydrobrake has been provisioned to ensure that the site outfalls to the Greenfield runoff rate.

Attenuated surface water runoff means that flood risk within the proposed development is reduced and the likelihood of flood risk occurring downstream of the proposed development during critical storm events will be decreased due to the significant reduction in surface water discharge from the site.

Appendix A - Flow Control Device Details

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	1.730
Flush-Flo™	0.233	1.105
Kick-Flo®	0.473	0.907
Mean Flow		1.271

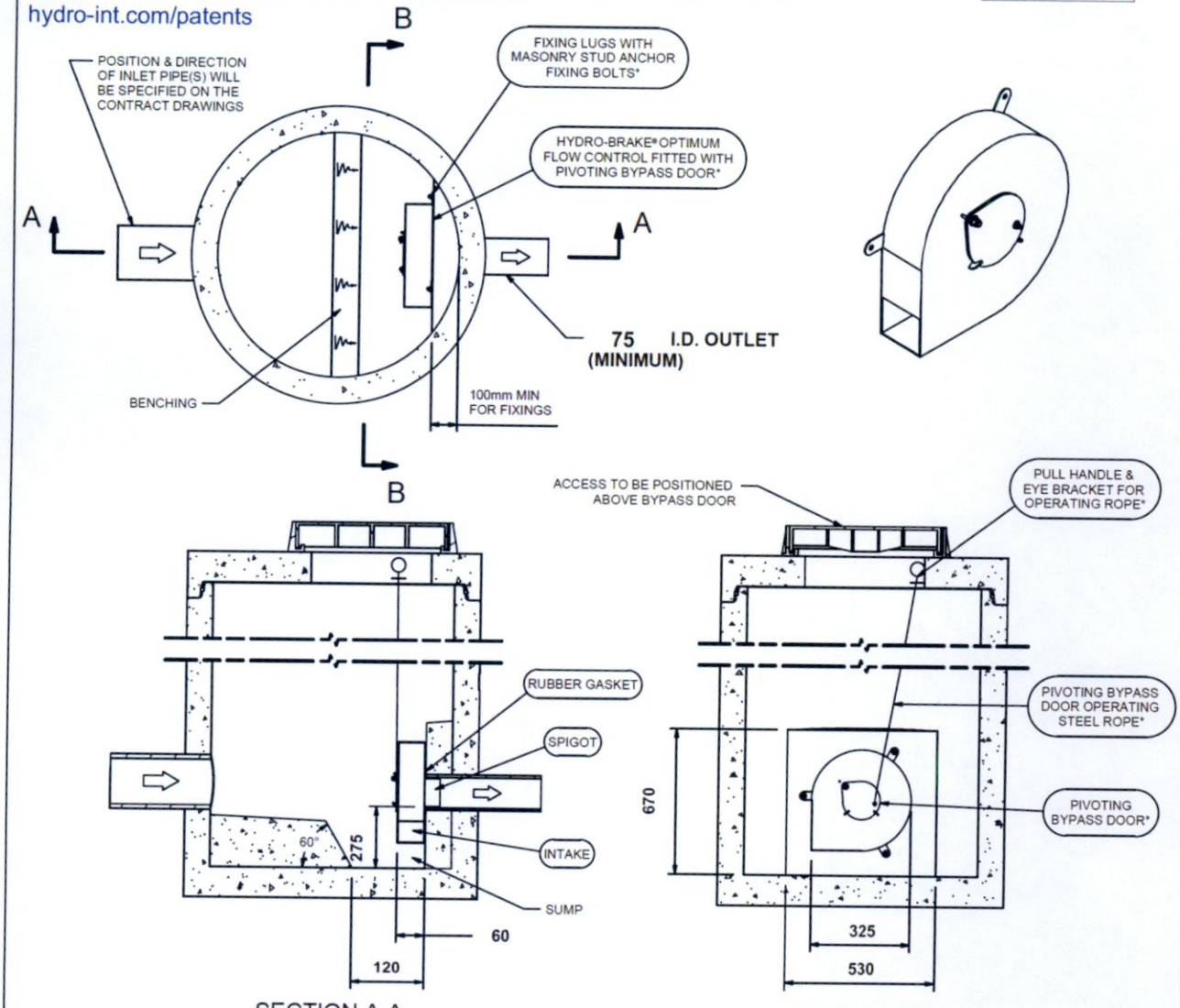
Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Indicative Weight: 49 kg

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 08/4595

WRc Approved
PT/329/0412

hydro-int.com/patents



SECTION A-A

SECTION B-B

IMPORTANT: ⬭ LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE !

The head/flow characteristics of this SHE-0053-1730-2000-1730 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International®

DATE	30/08/2022 09:26
SITE	Unit 1, M50 Business Park
DESIGNER	Kyle Brill
REF	22_112

SHE-0053-1730-2000-1730
Hydro-Brake® Optimum

kyle.brill@csea.ie

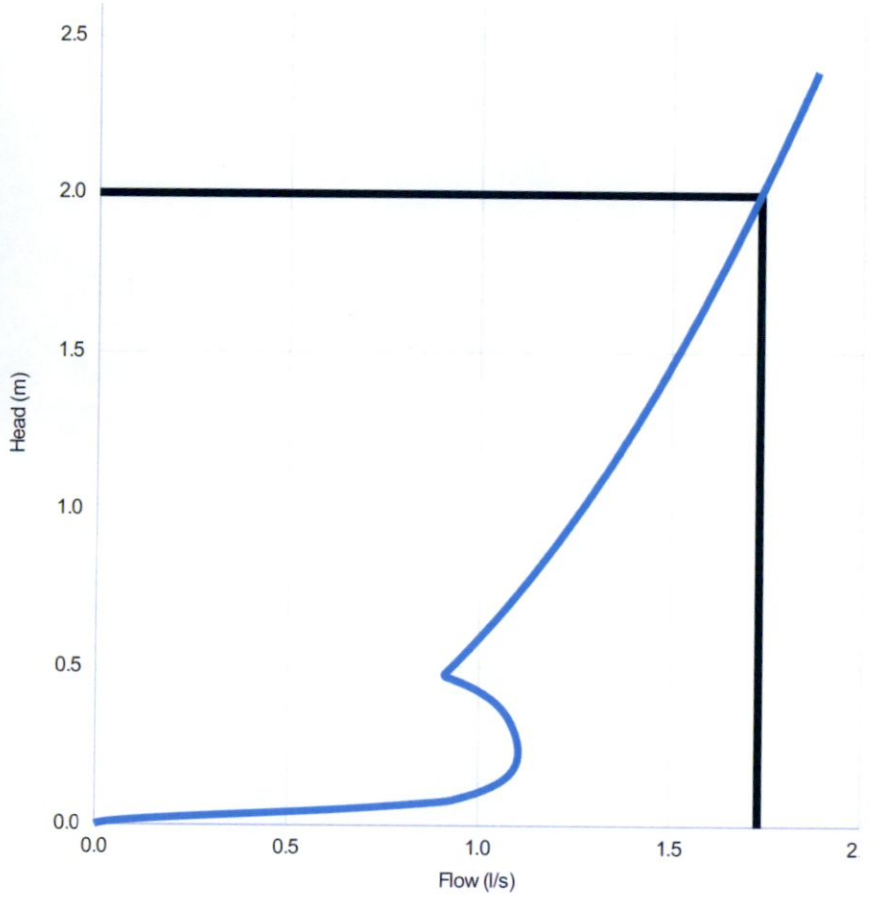
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	1.730
Flush-Flo	0.233	1.105
Kick-Flo®	0.473	0.907
Mean Flow		1.271

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.069	0.839
0.138	1.057
0.207	1.103
0.276	1.100
0.345	1.075
0.414	1.016
0.483	0.915
0.552	0.970
0.621	1.022
0.690	1.071
0.759	1.117
0.828	1.161
0.897	1.204
0.966	1.244
1.034	1.283
1.103	1.321
1.172	1.358
1.241	1.393
1.310	1.427
1.379	1.461
1.448	1.493
1.517	1.525
1.586	1.556
1.655	1.586
1.724	1.616
1.793	1.645
1.862	1.674
1.931	1.702
2.000	1.729

DESIGN ADVICE

The head/flow characteristics of this SHE-0053-1730-2000-1730 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

! **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

Hydro International®

DATE	30/08/2022 09:26
Site	Unit 1, M50 Business Park
DESIGNER	Kyle Brill
Ref	22_112

SHE-0053-1730-2000-1730

Hydro-Brake Optimum®

Appendix B Table 9 of DIN 1986-100:2016-12 (German Standard)

14.2.3 Abflussbeiwerte

Tabelle 9 — Abflussbeiwerte *C* zur Ermittlung des Regenwasserabflusses

Nr.	Art der Flächen Die Abflussbeiwerte beziehen sich ausschließlich auf Flächen, die potentiell einen Abfluss zum Entwässerungssystem haben.	Spitzen-abflussbei-wert C_s	Mittlerer Abflussbeiwert[c] C_m Berechnung von V_{RRR}
1	Wasserundurchlässige Flächen, z. B. Dachflächen — Schrägdach — Metall, Glas, Schiefer, Faserzement — Ziegel, Abdichtungsbahnen — Flachdach (Neigung bis 3° oder etwa 5 % — Metall, Glas, Faserzement — Abdichtungsbahnen — Kiesschüttung — Begrünte Dachflächen[a] — Extensivbegrünung (> 5°) — Intensivbegrünung, ab 30 cm Aufbaudicke (≤ 5°) — Extensivbegrünung, ab 10 cm Aufbaudicke (≤ 5°) — Extensivbegrünung, unter 10 cm Aufbaudicke (≤ 5°) **Verkehrsflächen (Straßen, Plätze, Zufahrten, Wege)** — Betonflächen — Schwarzdecken (Asphalt) — befestigte Flächen mit Fugendichtung, z. B. Pflaster mit Fugenverguss **Rampen** — Neigung zum Gebäude, unabhängig von der Neigung und der Befestigungsart	 1,0 1,0 1,0 1,0 0,8 0,7 0,2 0,4 0,5 1,0 1,0 1,0 1,0	 0,9 0,8 0,9 0,9 0,8 0,4 0,1 0,2 0,3 0,9 0,9 0,8 1,0
2	**Teildurchlässige und schwach ableitende Flächen, z. B. Verkehrsflächen (Straßen, Plätze, Zufahrten, Wege)** — Betonsteinpflaster, in Sand oder Schlacke verlegt, Flächen mit Platten — Pflasterflächen, mit Fugenanteil > 15 %, z. B. 10 cm × 10 cm und kleiner oder fester Kiesbelag — wassergebundene Flächen — lockerer Kiesbelag, Schotterrasen, z. B. Kinderspielplätze — Verbundsteine mit Sickerfugen, Sicker-/Drainsteine — Rasengittersteine (mit häufigen Verkehrsbelastungen, z. B. Parkplatz) — Rasengittersteine (ohne häufige Verkehrsbelastungen, z. B. Feuerwehrzufahrt) **Sportflächen mit Dränung** — Kunststoff-Flächen, Kunststoffrasen — Tennenflächen — Rasenflächen	 0,9 0,7 0,9 0,3 0,4 0,4 0,2 0,6 0,3 0,2	 0,7 0,6 0,7 0,2 0,25 0,2 0,1 0,5 0,2 0,1
3	**Parkanlagen, Rasenflächen, Gärten** — flaches Gelände — steiles Gelände	 0,2[b] 0,3[b]	 0,1 0,2

[a] Siehe auch [7] für die Planung, Ausführung und Pflege von Dachbegrünungen, die dort genannten Werte sind C_s-Werte

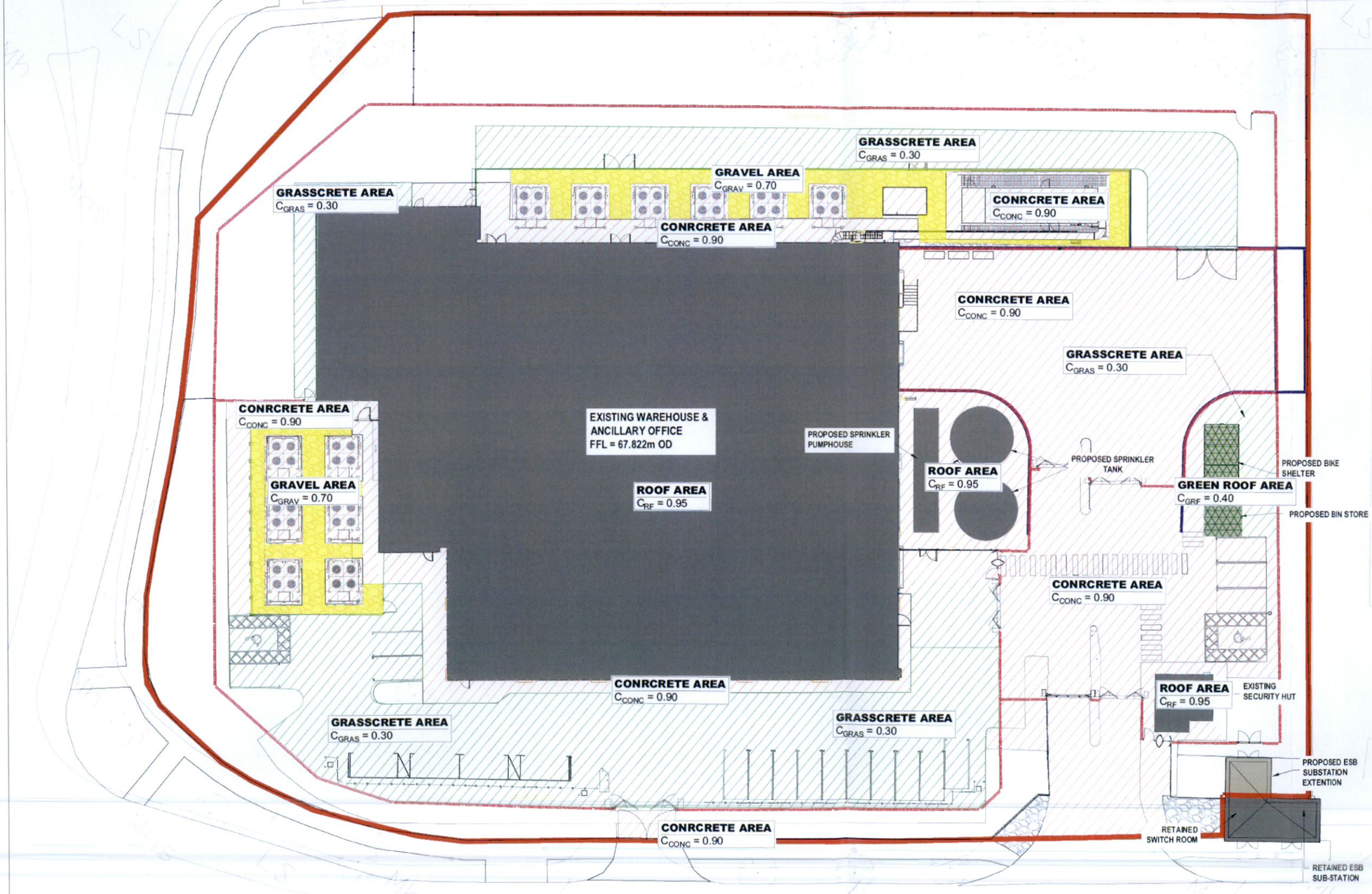
[b] Bei diesen Flächen ist für den Überflutungsnachweis ein möglicher höherer Abflussbeitrag je nach örtlichen Gegebenheiten (z. B. Gefälle, Boden, Vegetation) zu prüfen.

[c] Aufgrund der Anwendung einer einheitlichen Wiederkehrzeit (T = 2 a) und des begrenzten Anwendungsspektrums für die Bemessung von V_{RRR} wird hier jeweils nur ein Wert für C_m genannt. Die in den DWA-Regelwerken genannten Wertespektren beziehen sich auf unterschiedliche Wiederkehrzeiten und Planungssituationen.

Appendix C Surface Types, Areas and Runoff Coefficients

TABLE OF IMPERMEABLE AREAS

SURFACE TYPE	AREA (m²)
ROOFF	2,363
GREEN ROOF	36
CONRETE	2,164
GRAVEL	277
GRASSCRETE	1,466



NOTES

KEYNOTES

LEGEND

SITE LEGEND:

- OUTLINE OF THE SITE SUBJECT TO THIS APPLICATION
- RETAINING WALLS
- EXISTING FENCE
- PROPOSED FENCE
- PROPOSED PLANT SCREEN
- LOW LEVEL BARRIER

IMPERMEABLE AREAS LEGEND:

- ROOF AREA
- GREEN ROOF AREA
- CONCRETE PAVING
- GRAVEL AREA
- GRASSCRETE AREA

REV.	DATE	DESCRIPTION	DRN	ENG	CHK	APP

MECHANICAL & ELECTRICAL ENGINEER

CIVIL & STRUCTURAL ENGINEER: Clifton Scannell Emerson Associates

ARCHITECT: KAVANAGH TUITE ARCHITECTS

FIRE ENGINEER: BB7

SECURITY ENGINEER: CUNDALL

OTHER ENGINEER

PROJECT: Unit 1, M50 Business Park

TITLE: COEFFICIENTS OF RUNOFF FOR IMPERMEABLE AREAS

DRAWING NO.: 22_112-CSE-00-XX-SK-C-2111

A1 | SCALE: 1:200 | AGILE No.: | REV: P01

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 = 0.484 hectares (ha) (See Section 3)
PIMP = 56.02 %

Duration	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
	30 Year Event (mm)	+20% CC Allowance	Rainfall (mm)			$Q = 2.78*C*I*A$ [1] (l/s)		Q_{BAR} (l/s)			
5	12.1	1.2	14.52	174.24	0.484	234.46	70.339	1.728	0.518	69.821	
10	16.9	1.2	20.28	121.68	0.484	163.74	98.242	1.728	1.037	97.205	
15	19.8	1.2	23.76	95.04	0.484	127.89	115.100	1.728	1.555	113.545	
30	24.8	1.2	29.76	59.52	0.484	80.09	144.166	1.728	3.110	141.056	
60	31.1	1.2	37.32	37.32	0.484	50.22	180.789	1.728	6.221	174.568	
120	38.9	1.2	46.68	23.34	0.484	31.41	226.131	1.728	12.442	213.690	
180	44.4	1.2	53.28	17.76	0.484	23.90	258.104	1.728	18.662	239.441	
240	48.8	1.2	58.56	14.64	0.484	19.70	283.681	1.728	24.883	258.798	
360	55.6	1.2	66.72	11.12	0.484	14.96	323.211	1.728	37.325	285.886	
540	63.5	1.2	76.2	8.47	0.484	11.39	369.135	1.728	55.987	313.147	
720	69.7	1.2	83.64	6.97	0.484	9.38	405.176	1.728	74.650	330.527	
1080	79.5	1.2	95.4	5.30	0.484	7.13	462.145	1.728	111.974	350.171	
1440	87.2	1.2	104.64	4.36	0.484	5.87	506.906	1.728	149.299	**357.607**	**Critical Volume**
2880	98.9	1.2	118.68	2.47	0.484	3.33	574.920	1.728	298.598	276.322	

Notes:

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

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

Surface Water Attenuation Requirement for 1 in 100 Year Storm Event

Total Site Area = 0.86 hectares (ha)
Total Impermeable Area = 0.484 hectares (ha) (See Section 3)
PIMP = 56.02 %

Duration	Rainfall			Intensity (mm/hr)	Total Impermeable Area (ha)	Inflow Rate	Inflow Volume, I	Inflow Rate	Ouflow Volume, O	Required Storage, S	Comments
	100 Year Event (mm)	+20% CC Allowance	Rainfall (mm)			$Q = 2.78*C*I*A$ [1] (l/s)	(m^3)	Q_{BAR} (l/s)	(m^3)	(m^3)	
5	17.7	1.2	21.24	254.88	0.484	342.98	102.893	1.728	0.518	102.374	
10	24.6	1.2	29.52	177.12	0.484	238.34	143.003	1.728	1.037	141.967	
15	29.0	1.2	34.8	139.20	0.484	187.31	168.581	1.728	1.555	167.026	
30	35.8	1.2	42.96	85.92	0.484	115.62	208.111	1.728	3.110	205.000	
60	44.3	1.2	53.16	53.16	0.484	71.53	257.522	1.728	6.221	251.301	
120	54.8	1.2	65.76	32.88	0.484	44.24	318.560	1.728	12.442	306.119	
180	62.0	1.2	74.4	24.80	0.484	33.37	360.415	1.728	18.662	341.753	
240	67.8	1.2	81.36	20.34	0.484	27.37	394.131	1.728	24.883	369.248	
360	76.7	1.2	92.04	15.34	0.484	20.64	445.868	1.728	37.325	408.543	
540	86.9	1.2	104.28	11.59	0.484	15.59	505.162	1.728	55.987	449.175	
720	94.9	1.2	113.88	9.49	0.484	12.77	551.667	1.728	74.650	477.018	
1080	107.4	1.2	128.88	7.16	0.484	9.63	624.332	1.728	111.974	512.357	
1440	117.3	1.2	140.76	5.87	0.484	7.89	681.882	1.728	149.299	**532.583**	**Critical Volume**
2880	129.9	1.2	155.88	3.25	0.484	4.37	755.127	1.728	298.598	456.529	

Notes:

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

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

Appendix E Attenuation Sizing Calculations

STORMTECH Stormwater Management System Design Tool

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

SYSTEM PARAMETERS

Required Total Storage	75	m^3
Stormtech chamber model	MC3500	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

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

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows	2		ea
Number of units per Row	5		ea
Number of MC3500 Chambers	10		ea
Number of MC3500 Endcaps	4		ea
System Installed Storage Depth (effective storage depth)	1.680		m
Tank overall installed Width at base	4.74	5	m
Tank overall installed Length at Base	12.64	12	m
Total Effective System Storage	**75.6**	**75.4**	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	132	
Area of Dig at Base of System	60	m^2
Area of Dig at Top of System	97	m^2
Void Ratio	57%	
Stone Requirement - tonne	159	tonne

StormTech®
Detention • Retention • Recharge
Subsurface Stormwater Management℠

STORMTECH Stormwater Management System Design Tool

ver Jan-14

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

SYSTEM PARAMETERS

Required Total Storage	276	m^3
Stormtech chamber model	MC3500	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

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

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows	1		ea
Number of units per Row	18		ea
Number of MC3500 Chambers	18		ea
Number of MC3500 Endcaps	2		ea
System Installed Storage Depth (effective storage depth)	1.800		m
Tank overall installed Width at base	2.56	3.2	m
Tank overall installed Length at Base	40.98	42	m
Total Effective System Storage	**276.5**	**300.8**	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	91%	
Stone Requirement - tonne	445	tonne

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STORMTECH Stormwater Management System Design Tool

ver Jun'14

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

SYSTEM PARAMETERS

Required Total Storage	105	m^3
Stormtech chamber model	SC740	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

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

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows	6		ea
Number of units per Row	7		ea
Number of SC740 Chambers	42		ea
Number of SC740 Endcaps	12		ea
System Installed Storage Depth (effective storage depth)	1.060		m
Tank overall installed Width at base	9.12	9.5	m
Tank overall installed Length at Base	15.89	15.4	m
Total 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

MET ÉIREANN RAINFALL DATA

1981-2010 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

Return 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,

Appendix G Surface Water Attenuation Capacity During 1 in 100 Year Critical Storm Event

SURFACE WATER CAPACITY FOR CRITICAL STORM EVENT

(REFER TO SECTION 5: SURFACE WATER NETWORK FLOODING CHECK FOR CRITICAL STORM EVENT)

CRITICAL STORM EVENT:

Return Period: 1 in 100 year storm event during 1440 minute
Top Water Level (TWL): 66.60m

ATTENUATED SURFACE WATER VOLUMES STORED DURING CRITICAL STORM:

Attenuation A1:	75.000 m³ (100 % Capacity)
Attenuation A2:	300.000 m³ (100 % Capacity)
Attenuation A3:	105.000 m³ (100 % Capacity)
Manhole Storage:	34.965 m³ (53 % Capacity)
Pipe Storage:	17.618 m³ (92 % Capacity)

Total Attenuated Surface Water Volume Stored (TWL = 66.60m): 532.583 m³

ATTENUATION, A1:

STORAGE CAPACITY AVAILABLE: 75m³
COVER LEVEL: CL = 67.50m OD
OUTLET INVERT LEVEL: IL = 64.88m

ATTENUATION, A2:

STORAGE CAPACITY AVAILABLE: 300m³
COVER LEVEL: CL = 67.48m OD
OUTLET INVERT LEVEL: IL = 64.69m

ATTENUATION, A3:

STORAGE CAPACITY AVAILABLE: 105m³
COVER LEVEL: CL = 66.61m OD
OUTLET INVERT LEVEL: IL = 64.03m

EXISTING WAREHOUSE & ANCILLARY OFFICE
FFL = 67.822m OD

PROPOSED SPRINKLER PUMPHOUSE

PROPOSED SPRINKLER TANK

PROPOSED FULL RETENTION INTERCEPTOR.

PROPOSED BIKE SHELTER

PROPOSED BIN STORE

EXISTING SECURITY HUT

PROPOSED ESB SUBSTATION EXTENTION

RETAINED ESB SUB-STATION

RETAINED SWITCH ROOM

EXISTING MANHOLE TO BE REPLACED WITH NEW HYDROBRAKE MANHOLE. HYDROBRAKE TO REGULATE SURFACE WATER DISCHARGE FROM THE SITE TO GREENFIELDS RUN-OFF RATE OF 1.73 l/s.

EXISTING BYPASS INTERCEPTOR TO BE RETAINED.

EXISTING OUTFALL TO DRAINAGE SYSTEM IN INDUSTRIAL ESTATE TO BE RETAINED.

NOTES

KEYNOTES

LEGEND

SITE LEGEND:

- OUTLINE OF THE SITE SUBJECT TO THIS APPLICATION
- RETAINING WALLS
- EXISTING FENCE
- PROPOSED FENCE
- PROPOSED PLANT SCREEN
- LOW LEVEL BARRIER

IMPERMEABLE AREAS LEGEND:

- ROOF AREA
- GREEN ROOF AREA
- CONCRETE PAVING
- GRAVEL AREA
- GRASSCRETE AREA

SURFACE WATER LEGEND:

- EXISTING SURFACE WATER PIPE TO BE RETAINED
- EXISTING SURFACE WATER PIPE TO BE REMOVED
- PROPOSED SURFACE WATER PIPE
- PROPOSED SURFACE WATER MANHOLE
- EXISTING SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER ATTENUATION
- BASE OF ATTENUATION AREA
- INTERNAL DRAINAGE PIPE

REV.	DATE	DESCRIPTION	DRN	ENG	CHK	APP

MECHANICAL & ELECTRICAL ENGINEER

CIVIL & STRUCTURAL ENGINEER: Clifton Scannell Emerson Associates

ARCHITECT: KAVANAGH TUITE ARCHITECTS

FIRE ENGINEER: BB7

SECURITY ENGINEER: CUNDALL

OTHER ENGINEER

PROJECT.: Unit 1, M50 Business Park

TITLE.: SURFACE WATER ATTENUATION CAPACITY DURING 1 IN 100 YEAR EVENT CRITICAL STORM

DRAWING NO.: 22_112-CSE-00-XX-SK-C-2110

A1 | SCALE: 1:200 | AGILE No.: | REV: P01

Appendix H SuDS Management During Critical Storm Event

SUDS MANAGEMENT TRAIN AND FLOW CONTROLS DURING CRITICAL STORM

ROAD RUNOFF

- 2-STAGE TREATMENT: GRASSCRETE AREAS

  STAGE 1 - GRASSCRETE AND STAGE 2 - WITHIN THE BYPASS OR FULL RETENTION INTERCEPTOR.
- 1 - STAGE TREATMENT: CONCRETE AREAS

  STAGE 1 - WITHIN THE FULL RETENTION INTERCEPTOR OR THE BYPASS INTERCEPTOR

ROOF RUNOFF

- 2-STAGE TREATMENT: GREEN ROOF AREAS

  STAGE 1 - GREEN ROOF AND STAGE 2 - WITHIN THE BYPASS INTERCEPTOR.
- 1 - STAGE TREATMENT: ROOF AREAS:

  STAGE 1 - WITHIN THE FULL RETENTION INTERCEPTOR OR THE BYPASS INTERCEPTOR

SOURCE CONTROL: GRASSCRETE
2-STAGE TREATMENT

SOURCE CONTROL: GRASSCRETE
2-STAGE TREATMENT

SITE CONTROL: ATTENUATION A3

STORAGE CAPACITY AVAILABLE:	105m³
COVER LEVEL:	CL = 66.61m OD
OUTLET INVERT LEVEL:	IL = 64.03m

SOURCE CONTROL: GRASSCRETE
2-STAGE TREATMENT

POLLUTION CONTROL: INTERCEPTOR
PROPOSED FULL RETENTION INTERCEPTOR.

EXISTING WAREHOUSE & ANCILLARY OFFICE
FFL = 67.822m OD

PROPOSED SPRINKLER PUMPHOUSE

PROPOSED SPRINKLER TANK

SOURCE CONTROL: GREEN ROOF
2-STAGE TREATMENT

PROPOSED BIKE SHELTER

PROPOSED BIN STORE

ROOF AREA
1-STAGE TREATMENT

ROOF AREA
1-STAGE TREATMENT

SOURCE CONTROL: GREEN ROOF
2-STAGE TREATMENT

CONCRETE AREA
1-STAGE TREATMENT

SITE CONTROL: ATTENUATION A2

STORAGE CAPACITY AVAILABLE:	300m³
COVER LEVEL:	CL = 67.48m OD
OUTLET INVERT LEVEL:	IL = 64.69m

SITE CONTROL: ATTENUATION A1

STORAGE CAPACITY AVAILABLE:	75m³
COVER LEVEL:	CL = 67.50m OD
OUTLET INVERT LEVEL:	IL = 64.88m

ROOF AREA
1-STAGE TREATMENT

EXISTING SECURITY HUT

SOURCE CONTROL: GRASSCRETE
2-STAGE TREATMENT

FLOW CONTROL: HYDROBRAKE
EXISTING MANHOLE TO BE REPLACED WITH NEW HYDROBRAKE MANHOLE. HYDROBRAKE TO REGULATE SURFACE WATER DISCHARGE FROM THE SITE TO GREENFIELDS RUN-OFF RATE OF 1.73l/s.

PROPOSED ESB SUBSTATION EXTENTION

POLLUTION CONTROL: INTERCEPTOR
EXISTING BYPASS INTERCEPTOR TO BE RETAINED.

RETAINED SWITCH ROOM

RETAINED ESB SUB-STATION

EXISTING OUTFALL TO DRAINAGE SYSTEM IN INDUSTRIAL ESTATE TO BE RETAINED.

NOTES

KEYNOTES

LEGEND

SITE LEGEND:

- OUTLINE OF THE SITE SUBJECT TO THIS APPLICATION
- RETAINING WALLS
- EXISTING FENCE
- PROPOSED FENCE
- PROPOSED PLANT SCREEN
- LOW LEVEL BARRIER

IMPERMEABLE AREAS LEGEND:

- ROOF AREA
- GREEN ROOF AREA
- CONCRETE PAVING
- GRAVEL AREA
- GRASSCRETE AREA

SURFACE WATER LEGEND:

- EXISTING SURFACE WATER PIPE TO BE RETAINED
- EXISTING SURFACE WATER PIPE TO BE REMOVED
- PROPOSED SURFACE WATER PIPE
- PROPOSED SURFACE WATER MANHOLE
- EXISTING SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER ATTENUATION
- BASE OF ATTENUATION AREA
- INTERNAL DRAINAGE PIPE

REV.	DATE	DESCRIPTION	DRN	ENG	CHK	APP

MECHANICAL & ELECTRICAL ENGINEER

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ARCHITECT
KAVANAGH TUITE ARCHITECTS

FIRE ENGINEER
BB7

SECURITY ENGINEER
CUNDALL

OTHER ENGINEER

PROJECT:
Unit 1, M50 Business Park

TITLE:
SUDS MANAGEMENT TRAIN AND FLOW CONTROL DURING CRITICAL STORM EVENT

DRAWING NO.:
22_112-CSE-00-XX-SK-C-2112

SCALE:	AGILE No.:	REV:
A1 1:200		P01