APPENDIX A
SITE WALKOVER PHOTOGRAPHS

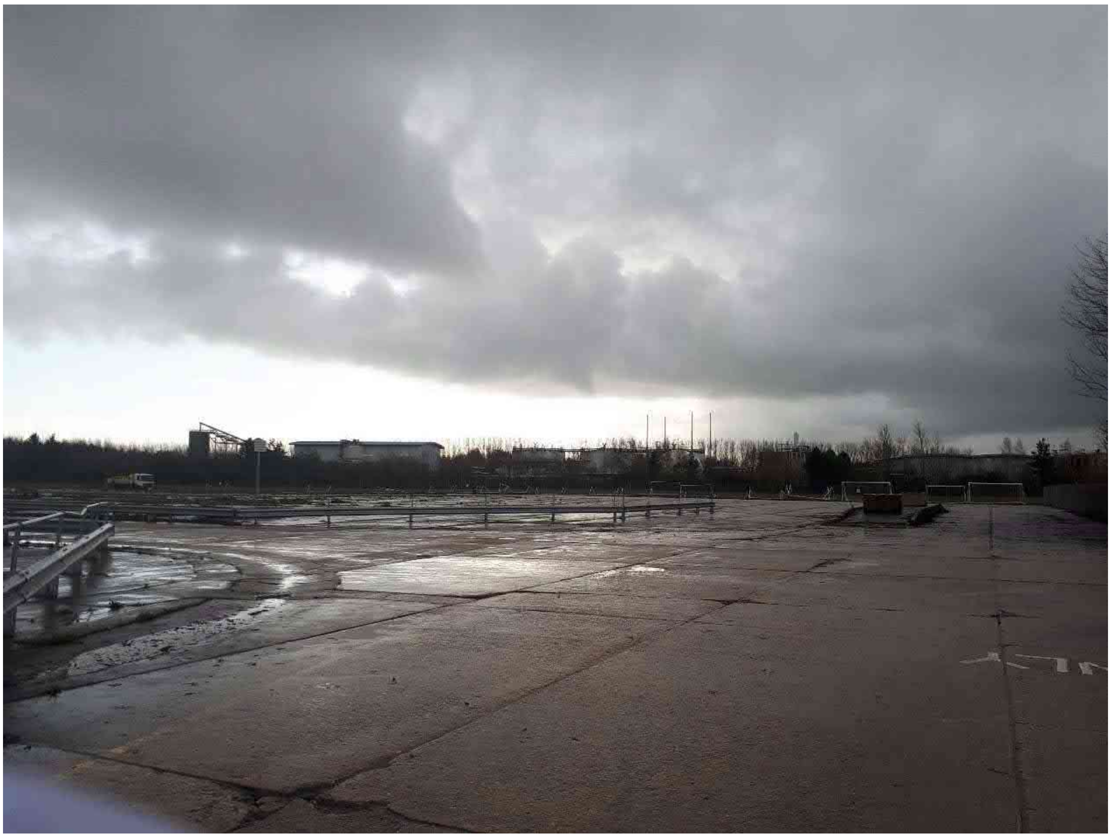
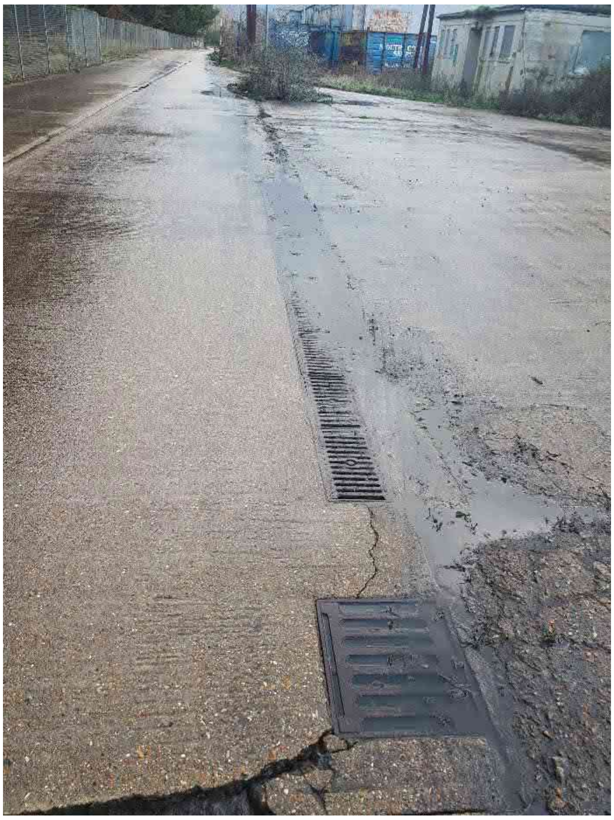


Photo A.1: View from the southeast corner of the site

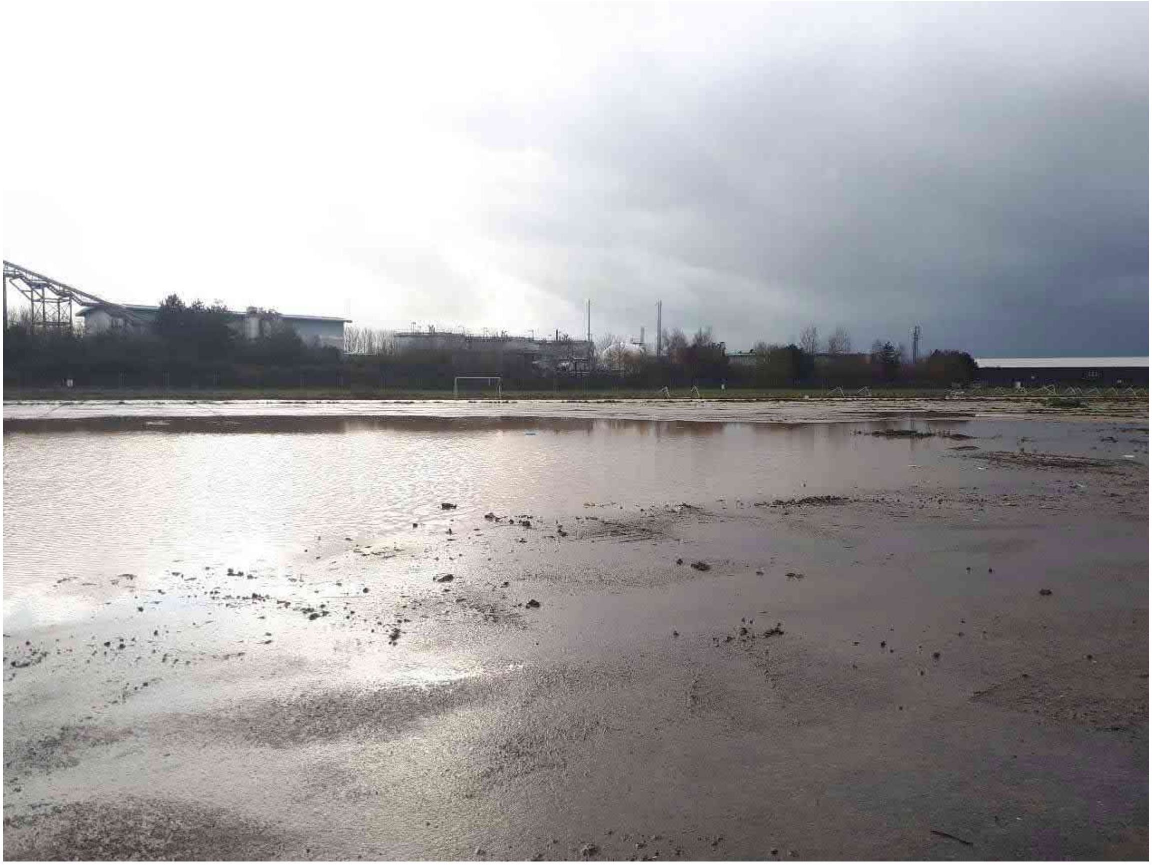
Photo A.2: View of Unit 1 (Hangar 1)

Photos A.3 – A.6: Rainwater pipes in existing buildings



Photos A.7 – A.9: Existing drainage features

Photos A.10 & A.11: Surface water flooding (between WTS and Units 1/2)



Photos A.12 & A.13: Surface water flooding (along the south boundary of the site)

APPENDIX B
GREENFIELD RUNOFF RATES

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	SAAR (mm)	750	Urban	0.000
Area (ha)	7.140	Soil	0.400	Region Number	Region 7

Results	**l/s**
QBAR Rural	26.3
QBAR Urban	26.3
Q2 years	23.2
Q1 year	22.4
Q30 years	59.7
Q100 years	84.0

ICP SUDS Mean Annual Flood

Input

Return Period (years)	10	SAAR (mm)	750	Urban	0.000
Area (ha)	7.140	Soil	0.400	Region Number	Region 7

Results	**l/s**
QBAR Rural	26.3
QBAR Urban	26.3
Q10 years	42.7
Q1 year	22.4
Q30 years	59.7
Q100 years	84.0

APPENDIX C
PRE-DEVELOPMENT RUNOFF RATES

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min$ = **12.3** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.61**
Rainfall for 15min storm with 1 year return period	$M1\_15min = Z2 \times M5\_15min_i$ = **7.6** mm
Design rainfall intensity	$I_{max} = M1\_15min / D$ = **30.3** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **93** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **559.3** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **2** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min$ = **12.3** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.79**
Rainfall for 15min storm with 2 year return period	$M2\_15min = Z2 \times M5\_15min_i$ = **9.8** mm
Design rainfall intensity	$I_{max} = M2\_15min / D$ = **39.2** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **93** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **723.1** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **5** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **12.3** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.03**
Rainfall for 15min storm with 5 year return period	M5_15min = Z2 × $M5\_15min_i$ = **12.7** mm
Design rainfall intensity	I_{max} = M5_15min / D = **50.8** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **93** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **937.3** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **10** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min$ = **12.3** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.23**
Rainfall for 15min storm with 10 year return period	$M10\_15min = Z2 \times M5\_15min_i$ = **15.2** mm
Design rainfall intensity	$I_{max} = M10\_15min / D$ = **60.6** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **93** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **1118.6** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min$ = **12.3** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.51**
Rainfall for 15min storm with 30 year return period	$M30\_15min = Z2 \times M5\_15min_i$ = **18.6** mm
Design rainfall intensity	$I_{max} = M30\_15min / D$ = **74.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **93** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **1371.4** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min$ = **12.3** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.95**
Rainfall for 15min storm with 100 year return period	$M100\_15min = Z2 \times M5\_15min_i$ = **24.0** mm
Design rainfall intensity	$I_{max} = M100\_15min / D$ = **96.1** mm/hr

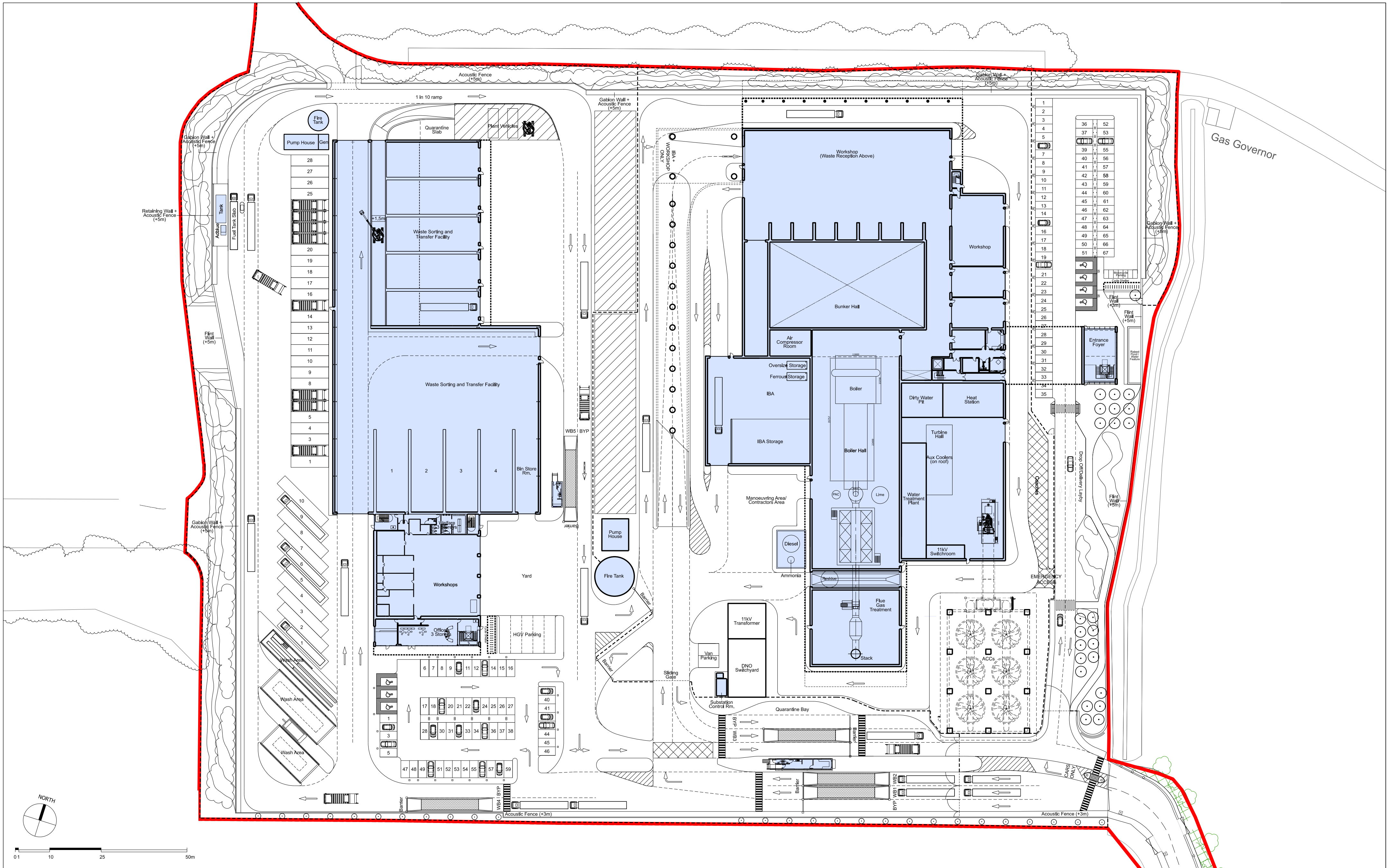
Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **93** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **1772.0** l/s

APPENDIX D
SOUTHERN WATER ASSET RECORDS

Not received at the time of writing.

APPENDIX E
PROPOSED SITE LAYOUT



NOTE

1. THIS DRAWING IS COPYRIGHT GSDA LTD.
2. THE CONTRACTOR MUST NOT SCALE FROM THE DRAWING ALL DIMENSIONS TO BE TAKEN FROM DIMENSION STRINGS.
3. WHERE ANY DISCREPANCIES ARE FOUND BETWEEN DIMENSIONS THESE MUST BE BROUGHT TO THE ATTENTION OF THE ARCHITECTS FOR RESOLUTION.
4. WHERE DISCREPANCIES EXIST BETWEEN REFERENCE OR ASSEMBLY DRAWINGS & DETAIL DRAWINGS, THE LATTER TAKE PREFERENCE.

Key

- - - - Fencing Line
━━━━ Red Line Boundary

PROJECT	FORD CIRCULAR TECHNOLOGY PARK	
DRAWING	Proposed Site Layout	
FOR INFORMATION		- 20/06/10 Issued for information
1:500@A1 SCALE	20/06/10 DATE	
1404 PL106 DWG. NO.	- REVISION	

GSDA
GARRY STEWART DESIGN ASSOCIATES
Highlands House, Office 300A, 165 The Broadway, Wimbledon, London, SW19 1NE
T. 020 8544 8085

APPENDIX F
POST-DEVELOPMENT RUNOFF RATES

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **40** %
Factor Z1 (W allingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min \times (1 + p_{climate})$ = **17.3** mm
Factor Z2 (W allingford procedure)	Z2 = **0.63**
Rainfall for 15min storm with 1 year return period	$M1\_15min = Z2 \times M5\_15min_i$ = **10.9** mm
Design rainfall intensity	$I_{max} = M1\_15min / D$ = **43.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **84** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **723.8** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **2** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **40** %
Factor Z1 (W allingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min \times (1 + p_{climate})$ = **17.3** mm
Factor Z2 (W allingford procedure)	Z2 = **0.80**
Rainfall for 15min storm with 2 year return period	$M2\_15min = Z2 \times M5\_15min_i$ = **13.9** mm
Design rainfall intensity	$I_{max} = M2\_15min / D$ = **55.6** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **84** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **925.7** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **10** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **40** %
Factor Z1 (W allingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min \times (1 + p_{climate})$ = **17.3** mm
Factor Z2 (W allingford procedure)	Z2 = **1.24**
Rainfall for 15min storm with 10 year return period	$M10\_15min = Z2 \times M5\_15min_i$ = **21.4** mm
Design rainfall intensity	$I_{max} = M10\_15min / D$ = **85.6** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **84** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **1426.8** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **40** %
Factor Z1 (W allingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min \times (1 + p_{climate})$ = **17.3** mm
Factor Z2 (W allingford procedure)	Z2 = **1.53**
Rainfall for 15min storm with 30 year return period	$M30\_15min = Z2 \times M5\_15min_i$ = **26.5** mm
Design rainfall intensity	$I_{max} = M30\_15min / D$ = **106.0** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **84** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **1765.4** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Brighton
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **20.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **40** %
Factor Z1 (W allingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min \times (1 + p_{climate})$ = **17.3** mm
Factor Z2 (W allingford procedure)	Z2 = **2.01**
Rainfall for 15min storm with 100 year return period	$M100\_15min = Z2 \times M5\_15min_i$ = **34.7** mm
Design rainfall intensity	$I_{max} = M100\_15min / D$ = **138.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **71400** m^2
Percentage of area that is impermeable	p = **84** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **2310.7** l/s

APPENDIX G
STORAGE VOLUME CALCULATIONS

Job No.	Wallingford Calculations	Prepared by	CS	Date	06/04/2020
		Checked by	AG	Date	07/04/2020

1 in 1 year storm event

Total Depth of rainfall - The Manual Method According to the Wallingford Procedure

Wallingford Modified Rational Method is a procedure for converting design storm into a rate of flow. Uses average rainfall corresponding to a 1 in 5 year event, 60 minutes in duration. Uniform intensity design requires an average rate of rainfall of a given return period for a series of durations.

i) M5-60 = 20 mm
r = 0.35

ii) **M5-D = Z1 (M5-60)**

Storm Duration	Total Rainfall	Z1	Z2
M5-15	12.53 mm	0.63	0.62
M5-30	15.80 mm	0.79	0.62
M5-60	20.00 mm	1.00	0.64
M5-120	24.33 mm	1.22	0.66
M5-240	30.33 mm	1.52	0.68
M5-360	32.67 mm	1.63	0.69
M5-600	39.33 mm	1.97	0.70
M5-1440	50.67 mm	2.53	0.72

Z2	
M5 Rainfall (mm)	M1
10.00	0.610
12.53	0.615
15.00	0.620
15.80	0.623
20.00	0.640
20.00	0.640
24.33	0.657
25.00	0.660
30.33	0.681
32.67	0.691
30.00	0.680
39.33	0.699
40.00	0.700
50.67	0.721
50.00	0.720
75.00	0.760

Forecast	
10	*0.61*
15	*0.62*
20	*0.64*
25	*0.66*
30	*0.68*
40	*0.70*
50	*0.72*
75	*0.76*

iii) **MT-D = Z2 (M5-D)**

Storm Duration	Total Rainfall	Total Rainfall + 40% CC	Intensity	Intensity + CC
M1-15	7.7 mm	10.8 mm	30.8 mm/hr	43.2 mm/hr
M1-30	9.8 mm	13.8 mm	19.7 mm/hr	27.6 mm/hr
M1-60	12.8 mm	17.9 mm	12.8 mm/hr	17.9 mm/hr
M1-120	16.0 mm	22.4 mm	8.0 mm/hr	11.2 mm/hr
M1-240	20.7 mm	28.9 mm	5.2 mm/hr	7.2 mm/hr
M1-360	22.6 mm	31.6 mm	3.8 mm/hr	5.3 mm/hr
M1-600	27.5 mm	38.5 mm	2.7 mm/hr	3.8 mm/hr
M1-1440	36.5 mm	51.2 mm	1.5 mm/hr	2.1 mm/hr

Impermeable Area	
6.64 ha	Existing
6.02 ha	Proposed

Peak run-off calculated using Modified Rational Method
Peak Run-off -- Qp = 3.61CviA (l/s)

Allowable Rate (l/s) 60

Storm Event	Existing Peak Runoff (l/s)	Post-Development Peak Runoff (inc CC) (l/s)	Increase over existing (l/s)	Storage Required (m³)	Increase over allowable (l/s)	Storage Required (m³)	
M1-15	554	704	149	134	644	579	
M1-30	354	449	95	172	389	701	
M1-60	230	292	62	223	232	835	
M1-120	144	182	39	279	122	882	
M1-240	93	118	25	360	58	834	
M1-360	68	86	18	393	26	557	
M1-600	49	63	13	479	3	97	
M1-1440	27	35	7	637	-25	-2,182	882

Storm Event	Total Volume Existing imp. Area (m³)	Proposed Development Total Volume (incl. CC) (m³)	Increase Over Existing (m³)
M2-15	512	650	138
M2-30	654	830	176
M2-60	850	1079	229
M2-120	1062	1348	286
M2-240	1372	1742	370
M2-360	1498	1902	403
M2-600	1825	2316	491
M2-1440	2427	3080	653

Job No.	Wallingford Calculations	Prepared by	CS	Date	06/04/2020
		Checked by	AG	Date	07/04/2020

1 in 2 year storm event

Total Depth of rainfall - The Manual Method According to the Wallingford Procedure

i) M5-60 = 20 mm
r = 0.35

ii) **M5-D = Z1 (M5-60)**

Storm Duration	Total Rainfall	Z1	Z2
M5-15	12.53 mm	0.63	0.80
M5-30	15.80 mm	0.79	0.80
M5-60	20.00 mm	1.00	0.81
M5-120	24.33 mm	1.22	0.82
M5-240	30.33 mm	1.52	0.83
M5-360	32.67 mm	1.63	0.84
M5-600	39.33 mm	1.97	0.84
M5-1440	50.67 mm	2.53	0.85

iii) **MT-D = Z2 (M5-D)**

Storm Duration	Total Rainfall	Total Rainfall + 40% CC	Intensity	Intensity + CC
M2-15	10.0 mm	14.0 mm	39.9 mm/hr	55.8 mm/hr
M2-30	12.7 mm	17.7 mm	25.3 mm/hr	35.5 mm/hr
M2-60	16.2 mm	22.7 mm	16.2 mm/hr	22.7 mm/hr
M2-120	19.9 mm	27.9 mm	10.0 mm/hr	13.9 mm/hr
M2-240	25.2 mm	35.3 mm	6.3 mm/hr	8.8 mm/hr
M2-360	27.3 mm	38.2 mm	4.5 mm/hr	6.4 mm/hr
M2-600	33.0 mm	46.2 mm	3.3 mm/hr	4.6 mm/hr
M2-1440	43.1 mm	60.3 mm	1.8 mm/hr	2.5 mm/hr

Z2	
M5 Rainfall (mm)	M1
10.00	0.790
12.53	0.795
15.00	0.800
15.80	0.802
20.00	0.810
20.00	0.810
24.33	0.819
25.00	0.820
30.33	0.831
32.67	0.835
30.00	0.830
39.33	0.839
40.00	0.840
50.67	0.851
50.00	0.850
75.00	0.870

Forecast	
10	*0.79*
15	*0.80*
20	*0.81*
25	*0.82*
30	*0.83*
40	*0.84*
50	*0.85*
75	*0.87*

Impermeable Area	
6.64 ha	Existing
6.02 ha	Proposed

Allowable Rate (l/s)	60

Peak run-off calculated using Modified Rational Method
Peak Run-off -- Qp = 3.61CviA (l/s)

Storm Event	Existing Peak Runoff (l/s)	Post-Development Peak Runoff (inc CC) (l/s)	Increase over existing (l/s)	Storage Required (m³)
M2-15	717	910	193	174
M2-30	455	578	123	221
M2-60	291	370	78	282
M2-120	179	227	48	347
M2-240	113	144	30	439
M2-360	82	104	22	476
M2-600	59	75	16	575
M2-1440	32	41	9	751

Increase over allowable (l/s)	Storage Required (m³)	
850	765	
518	932	
310	1,115	
167	1,204	
84	1,206	
44	946	
15	552	
-19	-1,643	1,206

Storm Event	Total Volume Existing imp. Area (m³)	Proposed Development Total Volume (incl. CC) (m³)	Increase Over Existing (m³)
M2-15	662	840	178
M2-30	841	1067	226
M2-60	1076	1365	290
M2-120	1323	1679	356
M2-240	1673	2124	451
M2-360	1812	2300	488
M2-600	2192	2782	590
M2-1440	2862	3633	771

Job No.	Wallingford Calculations	Prepared by	CS	Date	06/04/2020
		Checked by	AG	Date	07/04/2020

1 in 10 year storm event

Total Depth of rainfall - The Manual Method According to the Wallingford Procedure

i)

M5-60 =	20	mm
r =	0.35	

ii) **M5-D = Z1 (M5-60)**

Storm Duration	Total Rainfall	Z1	Z2
M5-15	12.53 mm	0.63	1.23
M5-30	15.80 mm	0.79	1.24
M5-60	20.00 mm	1.00	1.24
M5-120	24.33 mm	1.22	1.24
M5-240	30.33 mm	1.52	1.22
M5-360	32.67 mm	1.63	1.21
M5-600	39.33 mm	1.97	1.19
M5-1440	50.67 mm	2.53	1.17

iii) **MT-D = Z2 (M5-D)**

Storm Duration	Total Rainfall	Total Rainfall + 40% CC	Intensity	Intensity + CC
M10-15	15.4 mm	21.6 mm	61.7 mm/hr	86.3 mm/hr
M10-30	19.6 mm	27.4 mm	39.2 mm/hr	54.9 mm/hr
M10-60	24.8 mm	34.7 mm	24.8 mm/hr	34.7 mm/hr
M10-120	30.2 mm	42.2 mm	15.1 mm/hr	21.1 mm/hr
M10-240	37.0 mm	51.8 mm	9.2 mm/hr	12.9 mm/hr
M10-360	39.5 mm	55.3 mm	6.6 mm/hr	9.2 mm/hr
M10-600	46.9 mm	65.6 mm	4.7 mm/hr	6.6 mm/hr
M10-1440	59.2 mm	82.9 mm	2.5 mm/hr	3.5 mm/hr

Z2	
M5 Rainfall (mm)	M1
10.00	1.220
12.53	1.230
15.00	1.240
15.80	1.240
20.00	1.240
20.00	1.240
24.33	1.240
25.00	1.240
30.33	1.219
32.67	1.209
30.00	1.220
39.33	1.191
40.00	1.190
50.67	1.169
50.00	1.170
75.00	1.140

Forecast	
10	*1.22*
15	*1.24*
20	*1.24*
25	*1.24*
30	*1.22*
40	*1.19*
50	*1.17*
75	*1.14*

Impermeable Area	
6.64 ha	Existing
6.02 ha	Proposed

Peak run-off calculated using Modified Rational Method
Peak Run-off -- Qp = 3.61CviA (l/s)

Allowable Rate (l/s)	60

Storm Event	Existing Peak Runoff (l/s)	Post-Development Peak Runoff (inc CC) (l/s)	Increase over existing (l/s)	Storage Required (m³)
M10-15	1109	1407	299	269
M10-30	704	894	190	341
M10-60	446	566	120	432
M10-120	271	344	73	526
M10-240	166	211	45	644
M10-360	118	150	32	688
M10-600	84	107	23	817
M10-1440	44	56	12	1032

Increase over allowable (l/s)	Storage Required (m³)	
1347	1,213	
834	1,501	
506	1,821	
284	2,047	
151	2,173	
90	1,949	
47	1,689	
-4	-320	2,173

Storm Event	Total Volume Existing imp. Area (m³)	Proposed Development Total Volume (incl. CC) (m³)	Increase Over Existing (m³)
M10-15	1024	1299	276
M10-30	1301	1651	350
M10-60	1647	2090	443
M10-120	2004	2543	539
M10-240	2455	3116	661
M10-360	2623	3329	706
M10-600	3111	3949	838
M10-1440	3932	4990	1059

Job No.	Wallingford Calculations	Prepared by	CS	Date	06/04/2020
		Checked by	AG	Date	07/04/2020

1 in 30 year storm event

Total Depth of rainfall - The Manual Method According to the Wallingford Procedure

i) M5-60 = 20 mm
r = 0.35

ii) **M5-D = Z1 (M5-60)**

Storm Duration	Total Rainfall	Z1	Z2
M5-15	12.53 mm	0.63	1.51
M5-30	15.80 mm	0.79	1.53
M5-60	20.00 mm	1.00	1.54
M5-120	24.33 mm	1.22	1.53
M5-240	30.33 mm	1.52	1.51
M5-360	32.67 mm	1.63	1.50
M5-600	39.33 mm	1.97	1.47
M5-1440	50.67 mm	2.53	1.42

iii) **MT-D = Z2 (M5-D)**

Storm Duration	Total Rainfall	Total Rainfall + 40% CC	Intensity	Intensity + CC
M30-15	18.9 mm	26.5 mm	75.7 mm/hr	106.0 mm/hr
M30-30	24.2 mm	33.9 mm	48.4 mm/hr	67.8 mm/hr
M30-60	30.8 mm	43.1 mm	30.8 mm/hr	43.1 mm/hr
M30-120	37.3 mm	52.2 mm	18.6 mm/hr	26.1 mm/hr
M30-240	45.8 mm	64.1 mm	11.4 mm/hr	16.0 mm/hr
M30-360	49.0 mm	68.6 mm	8.2 mm/hr	11.4 mm/hr
M30-600	58.0 mm	81.1 mm	5.8 mm/hr	8.1 mm/hr
M30-1440	71.8 mm	100.5 mm	3.0 mm/hr	4.2 mm/hr

Impermeable Area	
6.64 ha	Existing
6.02 ha	Proposed

Z2	
M5 Rainfall (mm)	M1
10.00	1.490
12.53	1.510
15.00	1.530
15.80	1.532
20.00	1.540
20.00	1.540
24.33	1.531
25.00	1.530
30.33	1.509
32.67	1.499
30.00	1.510
39.33	1.473
40.00	1.470
50.67	1.417
50.00	1.420
75.00	1.340

Forecast	
10	*1.49*
15	*1.53*
20	*1.54*
25	*1.53*
30	*1.51*
40	*1.47*
50	*1.42*
75	*1.34*

Peak run-off calculated using Modified Rational Method
Peak Run-off -- Qp = 3.61CviA (l/s)

Storm Event	Existing Peak Runoff (l/s)	Post-Development Peak Runoff (inc CC) (l/s)	Increase over existing (l/s)	Storage Required (m³)
M30-15	1361	1728	367	330
M30-30	870	1104	234	422
M30-60	554	703	149	537
M30-120	335	425	90	649
M30-240	206	261	55	798
M30-360	147	186	40	854
M30-600	104	132	28	1010
M30-1440	54	68	14	1251

Allowable Rate (l/s)	60

Increase over allowable (l/s)	Storage Required (m³)	
1668	1,501	
1044	1,880	
643	2,314	
365	2,629	
201	2,895	
126	2,727	
72	2,601	
8	712	2,895

Storm Event	Total Volume Existing imp. Area (m³)	Proposed Development Total Volume (incl. CC) (m³)	Increase Over Existing (m³)
M30-15	1257	1595	338
M30-30	1607	2040	433
M30-60	2045	2596	551
M30-120	2474	3140	666
M30-240	3039	3857	818
M30-360	3252	4128	876
M30-600	3848	4884	1036
M30-1440	4766	6049	1283

RAMBOLL

Job No.	Wallingford Calculations	Prepared by	CS	Date	06/04/2020
		Checked by	AG	Date	07/04/2020

1 in 100 year storm event

Total Depth of rainfall - The Manual Method According to the Wallingford Procedure

i)

M5-60 =	20	mm
r =	0.35	

ii) **M5-D = Z1 (M5-60)**

Storm Duration	Total Rainfall	Z1	Z2
M5-15	12.53 mm	0.63	1.95
M5-30	15.80 mm	0.79	2.00
M5-60	20.00 mm	1.00	2.03
M5-120	24.33 mm	1.22	2.01
M5-240	30.33 mm	1.52	1.97
M5-360	32.67 mm	1.63	1.95
M5-600	39.33 mm	1.97	1.90
M5-1440	50.67 mm	2.53	1.80

iii) **MT-D = Z2 (M5-D)**

Storm Duration	Total Rainfall	Total Rainfall + 40% CC	Intensity	Intensity + CC
M100-15	24.4 mm	34.2 mm	97.8 mm/hr	136.9 mm/hr
M100-30	31.5 mm	44.2 mm	63.1 mm/hr	88.3 mm/hr
M100-60	40.6 mm	56.8 mm	40.6 mm/hr	56.8 mm/hr
M100-120	49.0 mm	68.6 mm	24.5 mm/hr	34.3 mm/hr
M100-240	59.7 mm	83.5 mm	14.9 mm/hr	20.9 mm/hr
M100-360	63.7 mm	89.1 mm	10.6 mm/hr	14.9 mm/hr
M100-600	74.5 mm	104.4 mm	7.5 mm/hr	10.4 mm/hr
M100-1440	91.4 mm	128.0 mm	3.8 mm/hr	5.3 mm/hr

Z2	
M5 Rainfall (mm)	M1
10.00	1.910
12.53	1.951
15.00	1.990
15.80	1.996
20.00	2.030
20.00	2.030
24.33	2.013
25.00	2.010
30.33	1.967
32.67	1.949
30.00	1.970
39.33	1.895
40.00	1.890
50.67	1.805
50.00	1.810
75.00	1.640

Forecast	
10	*1.91*
15	*1.99*
20	*2.03*
25	*2.01*
30	*1.97*
40	*1.89*
50	*1.81*
75	*1.64*

Impermeable Area	
6.64 ha	Existing
6.02 ha	Proposed

Peak run-off calculated using Modified Rational Method
Peak Run-off -- Qp = 3.61CviA (l/s)

Allowable Rate (l/s)	60

Storm Event	Existing Peak Runoff (l/s)	Post-Development Peak Runoff (inc CC) (l/s)	Increase over existing (l/s)	Storage Required (m³)
M100-15	1758	2231	473	426
M100-30	1134	1440	305	550
M100-60	730	926	197	708
M100-120	440	559	119	854
M100-240	268	340	72	1040
M100-360	191	242	51	1109
M100-600	134	170	36	1299
M100-1440	68	87	18	1594

Increase over allowable (l/s)	Storage Required (m³)	
2171	1,954	
1380	2,483	
866	3,119	
499	3,591	
280	4,038	
182	3,933	
110	3,964	
27	2,327	4,038

Storm Event	Total Volume Existing imp. Area (m³)	Proposed Development Total Volume (incl. CC) (m³)	Increase Over Existing (m³)
M100-15	1623	2060	437
M100-30	2094	2658	564
M100-60	2696	3422	726
M100-120	3252	4128	876
M100-240	3962	5029	1067
M100-360	4227	5365	1138
M100-600	4950	6283	1333
M100-1440	6071	7706	1635

APPENDIX H
EA, WSCC CONSULTATION & SCOPING RESPONSE

Environment Agency

Our reference: SSD157384

SENT BY EMAIL ONLY: chara.sifaki@ramboll.co.uk

3 March 2020

Dear Chara,

Thank you for your request of 26 February 2020 to use Environment Agency Product 4 data, for the site at Ford Circular Technology Park, BN18 0XL.

Response to your request

The Environment Agency's records indicate that the above site is located in Flood Zone 1 (land assessed as having less than 0.1% (1 in 1,000) chance of flooding in any given year from **rivers or the sea**). Therefore, the likelihood of flooding from rivers and sea in this area is estimated as 'very low'.

Proximity to Flood Zones 2 or 3

The above main site is approximately 440 metres away from Flood Zone 3. We are therefore unable to provide data from our detailed fluvial or tidal models which is relevant to your site.

More information on Flood Zones can be found on the GOV.UK website:

http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-1-flood-zones/

Surface water flooding

Our mapping indicates that this site **is** at risk of surface water flooding.

For information on flooding from all other sources, such as surface water, please contact the Lead Local Flood Authority, which in this case is West Sussex County Council. A link to their information available online is shown below:

https://www.westsussex.gov.uk/fire-emergencies-and-crime/dealing-with-extreme-weather/dealing-with-flooding/flood-risk-management/local-flood-risk-management-strategy/

Please note that the above is a link to an external website which the Environment Agency does not control or maintain. Therefore, the link may not be the most up-to-date at the date of this letter. If the link does not work, and you are unable to find the information about surface water flooding on the relevant website, please contact the authority named above directly.

Where you can find further information

- Detailed long-term flood information and maps can be found on the GOV.UK website:

  https://flood-warning-information.service.gov.uk/long-term-flood-risk/

- Flood maps for planning can be found on the GOV.UK website:

  https://flood-map-for-planning.service.gov.uk/

- Please be aware that in February 2016 the Environment Agency updated its guidance on climate change allowances. The standard allowance of adding 20% to peak flows – as per previous guidance in the National Planning Policy Framework, may not be applicable for the purposes of informing development proposals. It is possible that our current modelling has under estimated flood risk when taking climate change into consideration. This does not however have an effect on Flood Zones 2 or 3. For further information please visit:

  https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

- Further details about the Environment Agency information supplied can be found on the GOV.UK website:

  https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

- If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency information for Flood Risk Assessments:

  https://www.gov.uk/planning-applications-assessing-flood-risk

  https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

If you have any queries or would like to discuss the content of this letter further please call us on 03708 506 506, or reply to the email sent to you with this letter attached.

Please get in touch if you have any further queries or contact us within two (2) months if you would like us to review the information we have sent.

For information on what you can expect from us and our full service commitment to you, please click on this link:

https://www.gov.uk/government/publications/environment-agency-customer-service-commitment--2/environment-agency-customer-service-commitment

Yours sincerely,

Nick Allen

Customers and Engagement Officer

Environment Agency | Romsey District Office, Canal Walk, Romsey, SO51 7LP

Chara Sifaki

From:	SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Sent:	03 March 2020 11:40
To:	Chara Sifaki
Subject:	200303 SSD157384 - Product 4 Data Request - Ford Circular Technology Park, Arundel
Attachments:	200303 FZ1 letter SSD157384.pdf; Risk of Flooding from Surface Water.pdf

Dear Chara,

Thank you for your below email providing clarification of the site location. Please be advised, as this site is within Flood Zone 1, please see the attached letter and surface water map for further details.

This information is supplied subject to the notice which can be viewed via the following link:
http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Please get in touch if you have any further queries or contact us within two months if you would like us to review the information we have sent.

Kind regards

Nick

Customers & Engagement Team| Environmental Planning and Engagement | Solent and South Downs Area |
Environment Agency | Romsey District Office, Canal Walk, Romsey, SO51 7LP

SSDEnquiries@environment-agency.gov.uk
National Customer Contact Centre 03708 506506

From: Chara Sifaki [mailto:chara.sifaki@ramboll.co.uk]
Sent: 26 February 2020 12:10
To: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Subject: RE: 200203 SSD157384 - Product 4 Data Request - Ford Circular Technology Park, Arundel

Hi Nick,

Excuse me for my late response, I was on annual leave. Please find attached a more precise boundary for the site (Figure_1_Site_Location_Plan.pdf) and the respective shapefile (Site_boundary.shp).

Please let me know if you need additional information.

Kind regards
Chara Sifaki
Graduate Consultant

D +44 (797) 0509416
M +44 (797) 0509416
chara.sifaki@ramboll.co.uk

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Registered office: 240 Blackfriars Road, London SE1 8NW

From: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Sent: 03 February 2020 13:04
To: Chara Sifaki <chara.sifaki@ramboll.co.uk>
Subject: 200203 SSD157384 - Product 4 Data Request - Ford Circular Technology Park, Arundel

Dear Chara,

Thank you for your email of 15 January 2020; I can confirm that we have received your request for Product 4 information and it has been sent on to the appropriate technical team.

During their investigation, the team have asked if you could please send a more precise and accurate site boundary of the location that you require information – the Shapefile and site map PDF is too broad to provide accurate information.

If you have any queries please contact our team directly on the email below and quote the reference number SSD157384, which is to be used in all future correspondence regarding this enquiry.

Kind regards

Nick

Customers & Engagement Team| Environmental Planning and Engagement | Solent and South Downs Area | **Environment Agency** | Romsey District Office, Canal Walk, Romsey, SO51 7LP

SSDEnquiries@environment-agency.gov.uk
National Customer Contact Centre 03708 506506

From: Chara Sifaki [mailto:chara.sifaki@ramboll.co.uk]
Sent: 15 January 2020 11:47
To: Enquiries, Unit <enquiries@environment-agency.gov.uk>
Subject: 200116/KG02 Product 4 Data Request - Ford Circular Technology Park, Arundel

Good morning,

I would like to request Product 4 data for Ford Circular Technology Park, Arundel – Address: Ford Circular Technology Park, Ford Road, Ford, Arundel, West Sussex, BN18 0XL.

Please find attached the following information of the site:

- Figure 1 – Site Location Plan;
- Figure 2 – Aerial Image (with NGR coordinates); and
- GIS polygon file of the boundary

Thank you in advance for your time and cooperation. I am looking forward to hearing from you soon.

Kind regards
Chara Sifaki

MSc MEng GMICE
Graduate Consultant
1622761 - Water - Southampton

D +44 (797) 0509416
M +44 (797) 0509416
chara.sifaki@ramboll.co.uk
____

Connect with us

Ramboll
Carlton House
Ringwood Road
Woodlands
Southampton
SO40 7HT
United Kingdom
https://uk.ramboll.com

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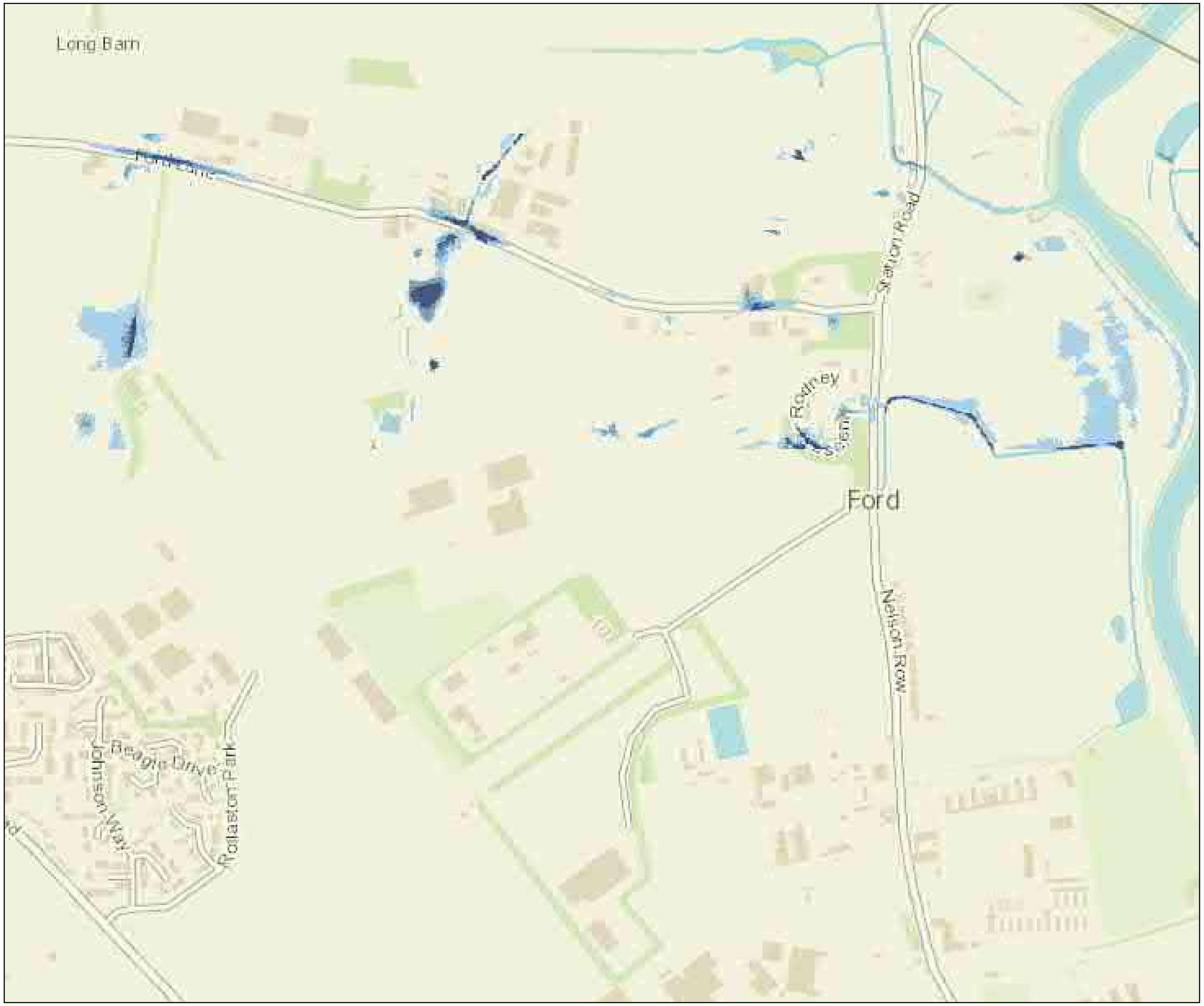
Risk of flooding from Surface Water - Ford Circular Technology Park



Environment Agency

1: 10,000

0 Metres 250

N W E S

Likelihood of flooding from Surface Water

- High (>=3.3%)
- Medium (3.3% - 1%)
- Low (1% - 01%)
- Very Low

Likelihood of flooding from Surface Water

High:	Greater than or equal to 3.3% (1 in 30) chance in any given year
Medium:	Less than 3.3% (1 in 30) but greater than or equal to 1% (1 in 100) chance in any given year
Low:	Less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance in any given year
Very Low:	Less than 0.1% (1 in 1,000) chance in any given year

This information is shown on the Risk of Flooding from Surface Water map on GOV.UK.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). E-mail: enquires@environment-agency.gov.uk

Chara Sifaki

From: Ray Drabble <Ray.Drabble@westsussex.gov.uk>
Sent: 26 March 2020 11:21
To: Chara Sifaki
Cc: Kevin Macknay; Paul Cann
Subject: RE: Drainage Requirements | Ford Circular Technology Park

Chara,

I hope that this finds you well.

Further to your email, I acknowledge that my initial scoping response could have been better worded and has sent mixed messages.

The LLFA Policy for the Management of Surface Water is what you are asked to work to (third of your 3 bullets); the second bullet is an interpretation of that policy that you were referred to in my original scoping response.

The LLFA recommends that the applicant restricts flows to the 1:30 Greenfield rate for all events up to a 1:30 storm event. Exceedance flows beyond the 1:30 storm event can be discharged uncontrolled to the drainage system.

I hope that this clarifies the position for you.

Kind regards

Ray Drabble
Flood Risk Engineer (Sustainable Drainage)
Economy, Infrastructure and Environment
Highways and Transport
West Sussex County Council

CALL IM EMAIL

Location: Western Area Office, Drayton Lane, Nr. Chichester, West Sussex. PO20 2AJ.
Contact: Internal: 24077 | **External:** +44 (0)330 2224077 | **Mobile:** +44 (0)7590183138 | **E-mail:** Ray.Drabble@westsussex.gov.uk

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From: Chara Sifaki [mailto:chara.sifaki@ramboll.co.uk]
Sent: 23 March 2020 14:23
To: Ray Drabble
Cc: Kevin Macknay
Subject: Drainage Requirements | Ford Circular Technology Park
Importance: High

Hi Ray,

Thank you for your quick response, much appreciated.

I’m sending this email as I would like to clarify the surface water drainage approach that the LLFA is content to accept with respect to Ford Circular Technology Park. We have received the following three approaches:

- In the Scoping response (17/02/2020, refer to attached document) produced explicitly for this site, it is stated that *‘In accordance with LLFA Policy we would expect the applicant to demonstrate 50% betterment in terms of reduction in discharge rates for the proposed brownfield development’*.
- In your response to my email (12/03/2020, refer to email below), it is stated that ‘*The LLFA would like to see a much lower discharge rate from any proposed attenuation say to a value of 32 l/s (1:30 event) and exceedance flows for storm events in excess of 1:30 could bypass the flow restriction and discharge unrestricted to the drainage network’*.
- In addition, in the LLFA policy document, it is stated that ‘*In all cases, including on brownfield sites, runoff should where possible be restricted to the greenfield of 1 in 1 year runoff rate during all events up to and including the 1 in 100 year rainfall event with climate change*’ and that ‘*…If it is deemed that this is not achievable, evidence must be provided and developers should still seek to achieve no increase in runoff from greenfield sites and a 50% betterment of existing run off rates on brownfield sites (provided this does not result in a runoff rate less than greenfield)’*.

Could you please advise on what the LLFA would like Ramboll to take forward?

Please note that greenfield runoff rates were calculated for the site (7.14 ha) using the Interim Code of Practice for Sustainable Drainage Systems (ICP SuDS) method* in MicroDrainage 2018. The existing (pre-development) runoff rates from the site in its current configuration were calculated using Tekla Tedds (Version 2.0.00, 2017). The critical storm duration is 15 minutes. The outputs from MicroDrainage and Tekla Tedds are shown in Table 1 below.

Table 1: Greenfield and Pre-development Runoff Rate Calculations

Return Period (years)	1-in-1	1-in-2	1-in-10	1-in-30	1-in-100
Greenfield runoff rates (l/s)	22.5	23	43	60	84
Pre-development runoff rates (l/s)	559	723	1,119	1,371	1,772

*The ICP SuDS method is considered to be the most appropriate method for calculating runoff rates for a site of this size. MicroDrainage (2018) advises that it is unusual to use the IH124 method with an area <50 ha. The Interim Code of Practice recommends that the IH124 method is applied with 50 ha (or more) and the resulting discharge is linearly interpolated for the required area.

Considering the proposed type of the development (Waste Transfer Station and conventional Energy Recovery Facility), the extensive built footprint within the development boundary and most importantly, the hydrogeological setting of the site (very high groundwater levels), there a limited number of SuDS techniques that would be practically feasible and suitable. Lined below ground storage is considered to be a suitable option for the site but again restricted due to limited available area, groundwater levels and cost.

Considering the above, Ramboll have suggested to restrict runoff from the whole development to 280 l/s, providing 50% betterment on the existing peak brownfield runoff rates for an 1-in-1 year event. Could you please advise on whether this is an acceptable approach that the LLFA would consider?

Thank you for your time and cooperation, much appreciated. I am looking forward to hearing back from you.

Kind regards
Chara Sifaki

MSc MEng GMICE
Graduate Consultant
1621784 - E&H - Southampton

D +44 (797) 0509416
M +44 (797) 0509416
chara.sifaki@ramboll.co.uk

Connect with us

Ramboll
Carlton House
Ringwood Road

Woodlands
Southampton
SO40 7HT
United Kingdom
https://uk.ramboll.com

Chara,

Further to your telephone call and email, the relevant section of our policy for the management of surface water:
https://www.westsussex.gov.uk/media/12230/ws_llfa_policy_for_management_of_surface_water.pdf
states:

5.4.4 Redevelopment on brownfield land has the potential to rectify or reduce flood risk. In all cases, including on brownfield sites, runoff should where possible be restricted to the greenfield 1 in 1 year runoff rate during all events up to and including the 1 in 100 year rainfall event with climate change. An alternative approach would be for discharge rates to be limited to a range of greenfield rates, based on the 1 in 1, 1 in 30 and 1 in 100 year storm events. However, the use of this method to restrict discharge rates requires the inclusion of on-line long-term storage, sized to take account of the increased post development volumes, discharging at no greater than 2l/s/ha. While discharging at no greater than 2 l/s/ha is acceptable, it is still the LLFA's preference that the former approach is used wherever possible. If it is deemed that this is not achievable, evidence must be provided and developers should still seek to achieve no increase in runoff from greenfield sites and a 50% betterment of existing run off rates on brownfield sites (provided this does not result in a runoff rate less than greenfield). For further guidance see Susdrain Fact sheet on Designing attenuation storage for redeveloped sites: http://www.susdrain.org/files/resources/fact_sheets/01_15_fact_sheet_attenuation_for_redeveloped.pdf

Having reviewed the above guidance, and assessed the greenfield run-off for the site (see attached) the LLFA does not consider restricting the discharge from the site to 228 l/s aligned with the above policy although I appreciate that the wording leaves some room for interpretation. The LLFA would like to see a much lower discharge rate from any proposed attenuation say to a value of 32 l/s (1:30 event) and exceedance flows for storm events in excess of 1:30 could bypass the flow restriction and discharge unrestricted to the drainage network (see method 2 in Susdrain Fact sheet). Clearly there is the scope for the development to incorporate SuDS and implement source control that could very significantly reduce the run-off from hardstanding areas into the drainage and the LLFA would be happy to discuss any options under consideration for this.

I hope this answers your query.

If not, please come back to me.

Kind regards

Ray Drabble
Flood Risk Engineer (Sustainable Drainage)
Economy, Infrastructure and Environment
Highways and Transport
West Sussex County Council

CALL IM EMAIL

Location: Western Area Office, Drayton Lane, Nr. Chichester, West Sussex. PO20 2AJ.
Contact: Internal: 24077 | **External:** +44 (0)330 2224077 | **Mobile:** +44 (0)7590183138 | **E-mail:** Ray.Drabble@westsussex.gov.uk

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From: Chara Sifaki [mailto:chara.sifaki@ramboll.co.uk]
Sent: 11 March 2020 16:19
To: Ray Drabble
Subject: RE: Drainage requirements | Ford Circular Technology Park

Hi Ray,

Following our phone conversation, please find below the calculated pre-development runoff rates (Table 1). In your scoping response (17/02/2020), it is mentioned that the WSCC 'would expect the applicant to demonstrate 50% betterment in terms of reduction in discharge rates for the proposed brownfield development'.

We are therefore proposing to restrict runoff from the whole development to 280 l/s providing 50% betterment on the existing peak runoff rates for a 1-in-1 year event.

Table 1: Pre-development Runoff Rate Calculations

Return Period (years)	1-in-1	1-in-2	1-in-10	1-in-30	1-in-100
Pre-development runoff rates (l/s)	559	723	1,119	1,371	1,772

Could you please confirm that you are happy with the above so that I can then proceed with developing the Surface Water Drainage Strategy for Ford Circular Technology Park?

Thank you in advance for your time and cooperation.

Kind regards
Chara Sifaki
Graduate Consultant

D +44 (797) 0509416
M +44 (797) 0509416
chara.sifaki@ramboll.co.uk

From: Ray Drabble <Ray.Drabble@westsussex.gov.uk>
Sent: 26 February 2020 10:00
To: Chara Sifaki <chara.sifaki@ramboll.co.uk>
Subject: RE: Drainage requirements | Ford Circular Technology Park

Chara,

I attach a copy of our recent scoping response that should provide you with the information that you are seeking.

If you have any further queries, please come back to me.

Kind regards

Ray Drabble
Flood Risk Engineer (Sustainable Drainage)
Economy, Infrastructure and Environment
Highways and Transport
West Sussex County Council

CALL IM EMAIL

Location: Western Area Office, Drayton Lane, Nr. Chichester, West Sussex. PO20 2AJ.
Contact: Internal: 24077 | **External:** +44 (0)330 2224077 | **Mobile:** +44 (0)7590183138 | **E-mail:** Ray.Drabble@westsussex.gov.uk

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From: Chara Sifaki [mailto:chara.sifaki@ramboll.co.uk]
Sent: 25 February 2020 17:10
To: Ray Drabble
Subject: Drainage requirements | Ford Circular Technology Park

Good afternoon,

Ramboll have been commissioned to complete a flood risk assessment and an outline surface water drainage strategy of the proposed Ford Circular Technology Park (the former Tarmac blockworks site) to the west of the village of Ford. I would be grateful if you could advise on the WSCC drainage requirements and the level of detail you are expecting to see in the outline surface water drainage strategy. Information about the current site and proposed development is provided below.

Current site
The 7.14 ha site is partially used for existing waste transfer station (WTS) operations and is partially vacant. The existing WTS building is located towards the centre of the site and portacabins, parking and containers associated with this operation are situated to the west of the WTS. There are two vacant, derelict former hangar buildings towards the north of the site and a large area of hardstanding is situated towards the south and east of the site.

Proposed development
Ford EfW Ltd, a joint venture between Grundon Waste Management Limited and Viridor, is now proposing to build and operate a conventional energy recovery facility (ERF) at the site. Grundon Waste Management, the sole owner/operator of the existing WTS, is proposing to continue this operation in a new, purpose built facility on site. A full planning application, including the ERF and WTS and ancillary uses, will be submitted later this year. As part of this application Ramboll will be providing the flood risk assessment and an outline surface water drainage strategy.

Please do not hesitate to contact me if you need more information.

Kind regards
Chara Sifaki

MSc MEng GMICE
Graduate Consultant
1621784 - E&H - Southampton

D +44 (797) 0509416
M +44 (797) 0509416
chara.sifaki@ramboll.co.uk

Connect with us

Ramboll
Carlton House
Ringwood Road
Woodlands
Southampton

SO40 7HT
United Kingdom
https://uk.ramboll.com

APPENDIX I
SUDS OPTIONS

A Surface Water Drainage strategy for the proposed development is necessary to ensure that flood risk is not increased to downstream receptors. In addition, for sustainable management of surface water runoff from a new development, the use of SuDS is recommended. SuDS options for attenuating surface water runoff are presented in Table I.1 together with an indication of whether they are likely to be suitable for use at the site.

Table I.1: Options of SuDS

SuDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
Retention	Balancing pond		Provides both storm water attenuation and treatment. Runoff from each rain event is detained and treated in the pool. The retention time promotes pollutant removal through sedimentation	Good removal of pollutants, can be used where groundwater is vulnerable, good community acceptability, high ecological, and amenity benefits	No reduction in runoff volume, land take may limit use in high density sites	✗ The space within the site boundary is considered to be limited for this option
	Sub-surface storage		Oversized pipes, tank systems and modular geocellular systems that can be used to create a below ground storage structure	Modular and flexible, dual usage (infiltration/storage, high void ratios), can be installed beneath trafficked and soft landscaped areas	No water quality treatment	✓ Sub-surface storage is appropriate for use though consideration needs to be given to groundwater levels
Wetland	Shallow wetland Extended detention wetland Pond wetland Pocket wetland Submerged gravel wetland Wetland channel		Wetlands provide stormwater attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands detain flows for an extended period to allow sediments to settle and to remove contaminants They can provide significant ecological benefits	Good pollutant removal and if lined can be used where groundwater is vulnerable. Good community acceptability, ecological and amenity benefits	Land take is high, requires baseflow, little reduction in runoff volume, not suitable for steep sites	✗ The space within the site boundary is considered to be limited for this option
Infiltration	Infiltration trench		Surface water runoff can be discharged directly to ground for infiltration by soakaways, basins,	Reduces the volume of runoff, effective at pollutant removal,	Requires appropriate pre-treatment, basins require	✗

SuDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
	Infiltration basin Soakaway		or trenches. A prerequisite is that both groundwater and ground conditions are appropriate to receive the quality and quantity of water generated	contributes to groundwater recharge, simple and cost-effective, easy performance observation	a large flat area, offset from foundations	Considering the hydrogeology of the site, infiltration is a not considered a suitable option
	Porous paving Permeable paving		Block or porous paving allows runoff to infiltrate through to sub base layer Water can then be infiltrated into ground or conveyed into storage or drainage systems	Reduces the volume of runoff and if designed for infiltration contributes towards groundwater recharge. Easy to install and retrofit. Simple to manage. If lined can be used where groundwater is sensitive	Not suitable for heavily trafficked areas or adoptable roads. Requires regular sweeping to prevent clogging with dirt	✓ Permeable paving can be utilised on the site for access routes, car parking and bike storage areas
Filtration	Surface sand filter Sub-surface sand filter Perimeter sand filter		Structures designed to treat surface water runoff through filtration using a sand bed filter medium. The filters can be designed with or without infiltration. Temporary storage of runoff is achieved through ponding above the filter layer. They are used where particularly high pollutant removal is required	Flexibility of design, efficient in removing pollutants, suitable for retrofits and in tightly constrained urban locations	Not for high sediment content, detention times can support algae growth, minimum hydraulic head of 1.2 m required, possible odour problems, high capital and maintenance cost	✗ There is no requirement for high pollution reduction at the site
	Bioretention /filter swale		Vegetated strips of land designed to accept runoff as overland sheet flow between a hard-surfaced area and a receiving system	Landscaping features, effective in removing pollutants, flexible layout to fit into landscape, suited for highly impervious areas, good retrofit capability, effective pre-treatment option	Requires landscaping and management, large land requirement, not suitable for steep sites; no significant attenuation or reduction of flows	✓ Filter swales may be a suitable option, but limited availability of space will need to be considered
	Filter trench /drain		Shallow excavations filled with rubble or stone that create temporary subsurface storage for filtration of storm water runoff Receive lateral inflow from an adjacent impermeable surface	Hydraulic benefits achieved with filter trenches, trenches can be incorporated into site landscaping and fit well beside roads and car parks	High clogging potential without effective pre-treatment, limited to small catchments, high cost of replacing filter material	✗ Not suitable due to the hydrogeology of the site

SuDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
Detention	Detention basin		Surface storage basins that provide flow control through attenuation. Normally dry and in certain situations the land may also function as a recreational facility.	Cater for a wide range of rainfall events, can be used where groundwater is vulnerable, potential for dual land use, easy to maintain	Land take, little reduction in runoff volume, detention depths constrained by levels	✗ Not suitable due to the limited availability of space within the site boundary
	Enhanced dry swale Enhanced wet swale		Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate.	Incorporate into landscaping, good removal of pollutants, reduces runoff rates and volumes, low cost	Not suitable for steep areas, significant land take, not suitable in areas with roadside parking	✗ Not suitable due to the limited availability of space within the site boundary
Conveyance	Conveyance swales Rills		Formal linear drainage features in which surface water can be stored or conveyed. They can be incorporated with water features such as ponds or waterfalls where appropriate.	Negate the need for underground pipework. Can provide some attenuation Possible reduction in runoff volume via plant uptake and infiltration	Potential trip/wheel hazard, disabled access issues	✗ Conveyance swales/rills might cause disabled access issues and thus, these options are not considered suitable for the proposed development
	Rainwater harvesting		Uses rainwater coming from roofs to supply toilets, washing machines and irrigation systems. Harvested rainwater is stored underground and is substituted for potable water mains supply, reducing both site discharge and water consumption	Can provide source control of storm water runoff, reduces demand on mains water	Use is dependent on demand requirements, contributing surface water and seasonal rainfall characteristics, maintenance	✓ Rainwater harvesting comprises a suitable option for the proposed development. Harvested rainwater can be used for watering plants, car washing etc