Millimetres 0 10 100

DO NOT SCALE

NORTH

N

10 L/S

PRIVATE PUMPING STATION
INLET IL: 5.90m

GRAVITY NETWORK
225mm DIAMETER

450m3 COLLEGE
ATTENUATION TANK
AREA: 450m2
TANK DEPTH: 1m
TANK IL: 6.06m
OUTFLOW:10 L/S

GRAVITY NETWORK TO
CONNECT INTO EXISTING
THAMES WATER MH 2901
IL:8.53m, CL:9.30m

CONNECTION FROM COLLEGE
SURFACE WATER NETWORK
IL:6.64m, CL: 9.15m

PHASE 1
COLLEGE

PHASE 3
TECH HUB

PHASE 1
SCHOOL SITE

STEM

PHASE 2
COLLEGE

SPORTS

GRAVITY NETWORK
AT 1:225 Gradient
225mm Diameter

1000m3 RESIDENTIAL
ATTENUATION TANK
AREA: 1700m2
TANK DEPTH: 0.6m
TANK IL: 7.30m
OUTFLOW: 5 L/S

CENTRAL GRAVITY
COLLECTOR DRAIN
AT 1:225 Gradient
225mm Diameter

5 L/S

CONNECTION FROM RESIDENTIAL
SURFACE WATER NETWORK
IL: 6.86m
CL: 9.20m

PHASE 3
RESIDENTIAL
DEVELOPMENT ZONE

PHASE 2
SPORTS PITCHES

LEGEND:
EXISTING UTILITIES
PROPOSED GRAVITY SURFACE WATER

FIGURE 2 - SURFACE WATER STRATEGY

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

UNKNOWN BURIED SERVICES – REFER TO SERVICES PLANS AND USE CABLE AVOIDANCE TOOLS BEFORE DIGGING. HIGH PRESSURE GAS MAINS – EXERCISE EXTREME CAUTION IN THEIR VICINITY. CONTAMINATED LAND IN THE PROCESS OF REMEDIATION – CONFIRM THE STATUS OF EACH AREA BEFORE DIGGING AND PRECAUTIONS TO BE TAKEN AT DIFFERENT LEVELS. IF IN DOUBT – STOP WORK AND ASK

MAINTENANCE/CLEANING

MULTIPLE BURIED SERVICES INCLUDING HIGH PRESSURE GAS MAINS – CONSULT SERVICES PLANS AND HOST UTILITY COMPANIES AND USE CABLE AVOIDANCE TOOLS BEFORE DIGGING. REMEDIATED BROWN FIELD SITE – DO NOT EXCAVATE BELOW THE MARKER LAYER WITHOUT A SITE SPECIFIC METHOD STATEMENT FOR THE LOCATION IN HAND. IF IN DOUBT – STOP WORK AND ASK.

DECOMMISSIONING/DEMOLITION

MULTIPLE BURIED SERVICES INCLUDING HIGH PRESSURE GAS MAINS – CONSULT SERVICES PLANS AND HOST UTILITY COMPANIES AND USE CABLE AVOIDANCE TOOLS BEFORE DIGGING. REMEDIATED BROWN FIELD SITE – DO NOT EXCAVATE BELOW THE MARKER LAYER WITHOUT A SITE SPECIFIC METHOD STATEMENT FOR THE LOCATION IN HAND. IF IN DOUBT – STOP WORK AND ASK.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

GENERAL NOTES:

1. TO BE USED FOR PRICING ONLY WITH REFERRENCE TO FEASIBILITY OPTIONS SCHEDULE
2. ALL LEVELS REFER TO ABOVE ORDNANCE DATUM

Rev.	Date	Description	By	Chk'd	App'd
P1	22/12/2016	FOR PRICING	SO	JT	

Drawing Status: FIT FOR INFORMATION
Suitability: S2

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Client: Richmond upon Thames College

Project Title: RICHMOND UPON THAMES COLLEGE REDEVELOPMENT

Drawing Title: SITE WIDE SURFACE WATER DRAINAGE PLAN OPTION 1

Scale	Designed	Drawn	Checked	Authorised
1:1000	SO	SO	JT	
Original Size	Date	Date	Date	Date
A1	22/12/2016	22/12/2016	22/12/2016	22/12/2016

Drawing Number: 5137894-ATK-00-XX-SK-C-0010
Revision: P1.0

Appendix E – Foul and Surface Water Drainage Strategy

Brownfield Calculations

Greenfield Calculations

Sweco drawing 66202961-SWE-ZZXX-DR-C-0100 - Surface & Foul Water Drainage Strategy

Sweco drawing 66202961-SWE-ZZXX-DR-C-0110 - Drainage Strategy Contributing Areas

Microdrainage Calculations

Richmond SuDS Proforma (this will be included once full extent of rainwater harvesting etc has been decided)

SWECO	Project	**Richmond Upon Thames College**		Made TM	Ref 66202961
	Section	**Brownfield Run-off Rates**		Checked JRC	Sheet No. 1 of 1
	Rev P01	Date 23.04.21	Description	Made	Checked

Ref.	Calculation	Output

1. Brownfield Run-off Calculation

Based on the Modified Rational Method the current discharge rate from the site for the 100%, 3.3% and 1% annual exceedance probability (AEP) events (1, 30 & 100 year) can be calculated as:

Q = 3.61 CiA

C = Volumetric run-off co-efficient	0.9	
i = Rainfall intensity	see below	mm / hr
A = Contributing Area	1.523	ha

Rainfall intensity taken from MicroDrainage Rainfall Generator

100%	33.467	mm / hr
3.3%	106.360	mm / hr
1%	161.135	mm / hr

Discharge rate

100%	165.602	l / s
3.3%	526.293	l / s
1%	797.333	l / s

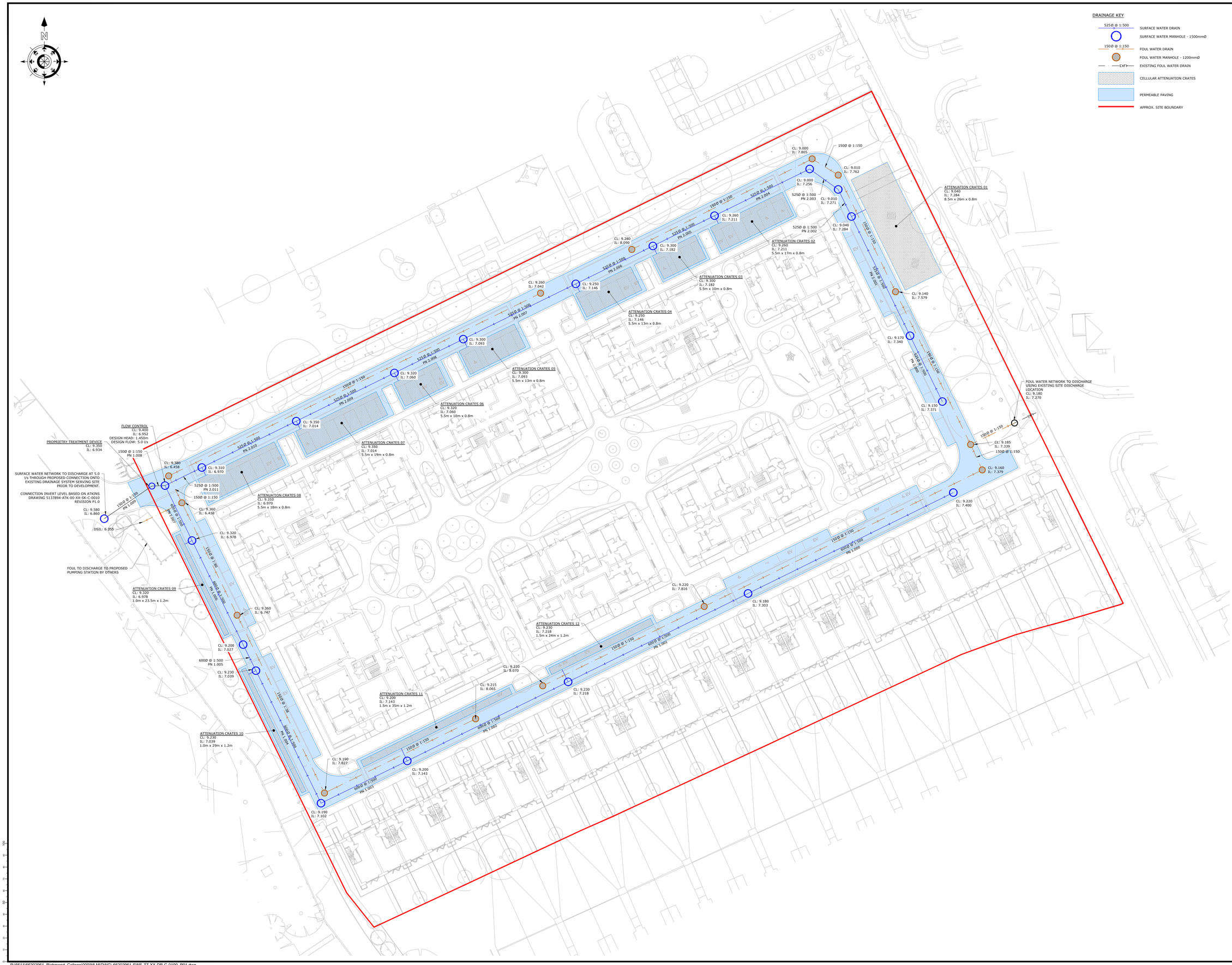
ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	1.090	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	1.7
QBAR Urban	1.7
Q100 years	5.3
Q1 year	1.4
Q30 years	3.8
Q100 years	5.3



NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.
2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM SWECO PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.
3. THIS DRAINAGE STRATEGY SHOWS HOW SURFACE WATER RUN-OFF COULD BE MANAGED ON-SITE USING A RESTRICTED OFF-SITE DISCHARGE, FOR ALL RAINFALL EVENTS UP TO AND INCLUDING THE 100 YEAR RETURN PERIOD EVENT PLUS 40% CLIMATE CHANGE ALLOWANCE TO ENSURE NO INCREASED FLOOD RISK TO OTHERS AS A RESULT OF THIS PROPOSED DEVELOPMENT.

   THIS IS NOT INTENDED TO BE A DETAILED DESIGN AT THIS STAGE. PLEASE NOTE THAT THE FINAL LAYOUT MAY BE SUBJECT TO REFINEMENT TO MEET CERTAIN TECHNICAL CRITERIA.
4. THE LOCATION AND INVERT LEVELS OF THE OUTFALLS SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY AND WILL BE SUBJECT TO DETAILED SITE INVESTIGATION PRIOR TO COMMENCEMENT OF WORKS.

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015

DESIGNERS HAZARD INFORMATION FOR CONSTRUCTION

1. IF YOU DO NOT FULLY UNDERSTAND THE RISKS INVOLVED DURING THE CONSTRUCTION OF THE ITEMS INDICATED ON THIS DRAWING ASK YOUR MANAGER, HEALTH & SAFETY ADVISOR OR A MEMBER OF THE DESIGN TEAM BEFORE PROCEEDING.

2. TO BE COMPLETED AT DETAILED DESIGN STAGE.

THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.

REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.

Rev	Date	Amendment Details	Drn	Chk	App
P01	23.04.21	FIRST ISSUE	TM	JRC	JRC

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Client

BARTON WILLMORE

Project Title

RICHMOND UPON THAMES COLLEGE

Drawing Title

SURFACE & FOUL WATER DRAINAGE STRATEGY

Purpose Of Issue: PRELIMINARY

Status: S0 — Status Description: INITIAL STATUS OR WIP

Designed	Drawn	Checked	Approved
TM	TM	JRC	JRC

Sheet Size	Scale	SWECO Ref.	Revision
A0	1:250	66202961	P01

Drawing Number: 66202961-SWE-ZZ-XX-DR-C-0100

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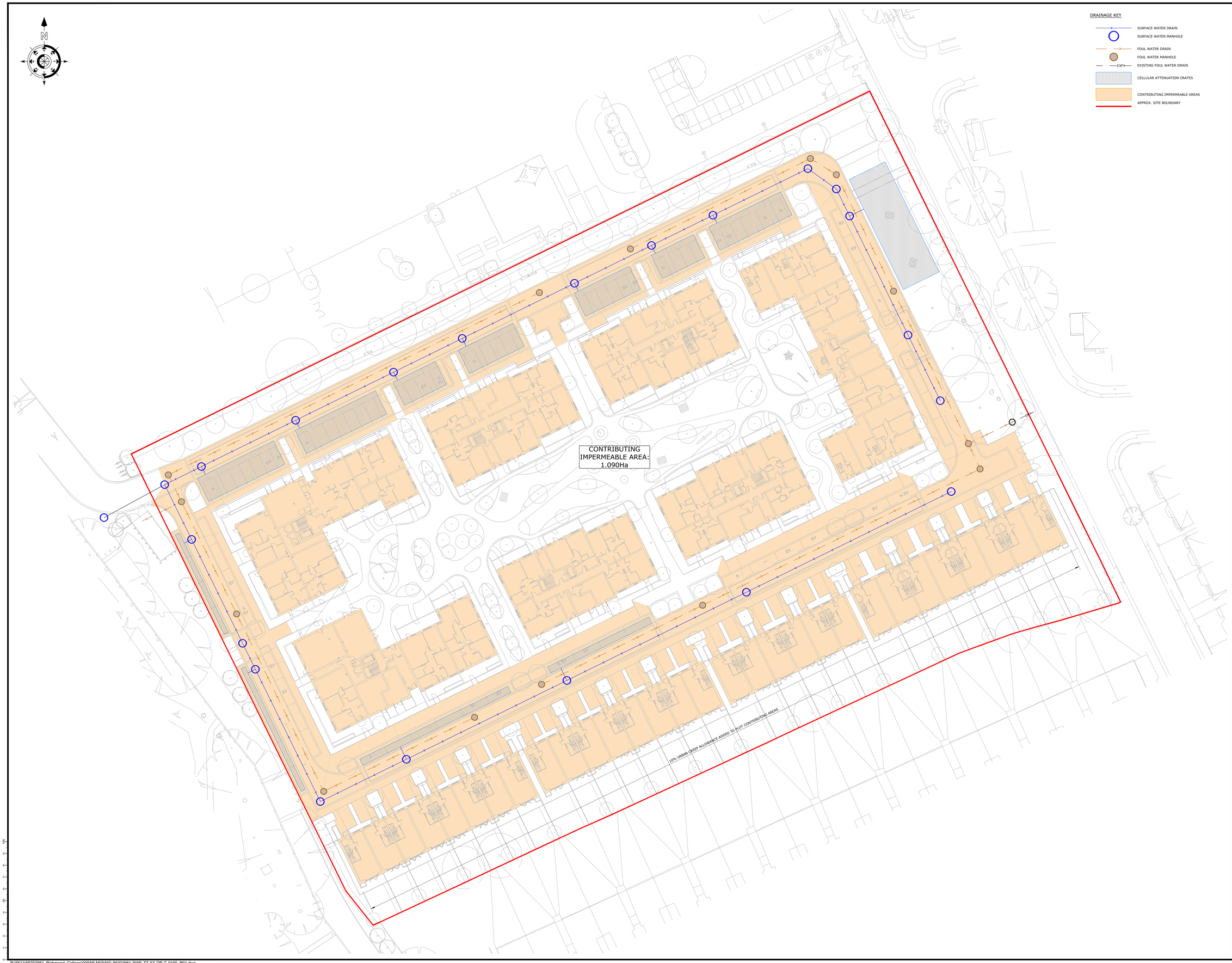

NOTES

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2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM SWECO PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.
3. THIS DRAINAGE STRATEGY SHOWS HOW SURFACE WATER RUN-OFF COULD BE MANAGED ON-SITE USING A RESTRICTED OFF-SITE DISCHARGE, FOR ALL RAINFALL EVENTS UP TO AND INCLUDING THE 100 YEAR RETURN PERIOD EVENT PLUS 40% CLIMATE CHANGE ALLOWANCE TO ENSURE NO INCREASED FLOOD RISK TO OTHERS AS A RESULT OF THIS PROPOSED DEVELOPMENT.

   THIS IS NOT INTENDED TO BE A DETAILED DESIGN AT THIS STAGE. PLEASE NOTE THAT THE FINAL LAYOUT MAY BE SUBJECT TO REFINEMENT TO MEET CERTAIN TECHNICAL CRITERIA.
4. FOR DRAINAGE STRATEGY INFORMATION, REFER TO 66202961-SWE-ZZ-XX-DR-C-0100

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015

DESIGNERS HAZARD INFORMATION FOR CONSTRUCTION

1. IF YOU DO NOT FULLY UNDERSTAND THE RISKS INVOLVED DURING THE CONSTRUCTION OF THE ITEMS INDICATED ON THIS DRAWING ASK YOUR MANAGER, HEALTH & SAFETY ADVISOR OR A MEMBER OF THE DESIGN TEAM BEFORE PROCEEDING.

2. TO BE COMPLETED AT DETAILED DESIGN STAGE.

THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.

REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.

Rev	Date	Amendment Details	Drn	Chk	App
P01	23.04.21	FIRST ISSUE	TM	JRC	JRC

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Client
BARTON WILLMORE

Project Title
RICHMOND UPON THAMES COLLEGE

Drawing Title
DRAINAGE STRATEGY CONTRIBUTING AREAS PLAN

Purpose Of Issue
PRELMINARY

Status	Status Description
S0	INITIAL STATUS OR WIP

Designed	Drawn	Checked	Approved
TM	TM	JRC	JRC

Sheet Size	Scale	SWECO Ref	Revision
A0	1:250	66202961	P01

Drawing Number
66202961-SWE-ZZ-XX-DR-C-0110

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 516200 173750 TQ 16200 73750
C (1km)	-0.025
D1 (1km)	0.297
D2 (1km)	0.319
D3 (1km)	0.231
E (1km)	0.307
F (1km)	2.536
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.467	4-8	0.648

Total Area Contributing (ha) = 1.115

Total Pipe Volume (m^3) = 108.864

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	48.384	0.097	500.0	0.145	3.00	0.0	0.600	o	600	Pipe/Conduit	
S1.001	42.410	0.085	500.0	0.141	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.002	37.909	0.076	500.0	0.152	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.003	20.327	0.041	500.0	0.078	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.004	31.234	0.062	500.0	0.091	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.005	6.141	0.012	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.006	24.525	0.049	500.0	0.030	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.007	12.950	0.026	500.0	0.010	0.00	0.0	0.600	o	600	Pipe/Conduit	
S2.000	15.506	0.031	500.2	0.022	3.00	0.0	0.600	o	525	Pipe/Conduit	
S2.001	28.100	0.056	500.0	0.102	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.002	6.380	0.013	500.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.003	7.430	0.015	500.0	0.007	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.004	22.419	0.045	500.0	0.023	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.005	14.528	0.029	500.0	0.018	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.006	18.181	0.036	500.0	0.070	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.007	26.520	0.053	500.0	0.031	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.008	16.224	0.032	500.0	0.068	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.009	23.130	0.046	500.0	0.028	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.010	22.252	0.045	500.0	0.092	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.011	8.682	0.017	500.0	0.007	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	0.00	3.75	7.400	0.145	0.0	0.0	0.0	1.08	306.0	0.0
S1.001	0.00	4.40	7.303	0.286	0.0	0.0	0.0	1.08	306.0	0.0
S1.002	0.00	4.98	7.218	0.438	0.0	0.0	0.0	1.08	306.0	0.0
S1.003	0.00	5.30	7.143	0.516	0.0	0.0	0.0	1.08	306.0	0.0
S1.004	0.00	5.78	7.102	0.607	0.0	0.0	0.0	1.08	306.0	0.0
S1.005	0.00	5.87	7.039	0.607	0.0	0.0	0.0	1.08	306.0	0.0
S1.006	0.00	6.25	7.027	0.637	0.0	0.0	0.0	1.08	306.0	0.0
S1.007	0.00	6.45	6.978	0.647	0.0	0.0	0.0	1.08	306.0	0.0
S2.000	0.00	3.26	7.371	0.022	0.0	0.0	0.0	0.99	215.3	0.0
S2.001	0.00	3.73	7.340	0.124	0.0	0.0	0.0	0.99	215.4	0.0
S2.002	0.00	3.84	7.284	0.124	0.0	0.0	0.0	0.99	215.4	0.0
S2.003	0.00	3.96	7.271	0.131	0.0	0.0	0.0	0.99	215.4	0.0
S2.004	0.00	4.34	7.256	0.154	0.0	0.0	0.0	0.99	215.4	0.0
S2.005	0.00	4.58	7.211	0.172	0.0	0.0	0.0	0.99	215.4	0.0
S2.006	0.00	4.89	7.182	0.242	0.0	0.0	0.0	0.99	215.4	0.0
S2.007	0.00	5.33	7.146	0.273	0.0	0.0	0.0	0.99	215.4	0.0
S2.008	0.00	5.60	7.093	0.341	0.0	0.0	0.0	0.99	215.4	0.0
S2.009	0.00	5.99	7.060	0.369	0.0	0.0	0.0	0.99	215.4	0.0
S2.010	0.00	6.36	7.014	0.461	0.0	0.0	0.0	0.99	215.4	0.0
S2.011	0.00	6.51	6.970	0.468	0.0	0.0	0.0	0.99	215.4	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.008	13.786	0.092	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.008	0.00	6.79	6.952	1.115	0.0	0.0	0.0	0.82	14.5	0.0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.145	0.145	0.145
1.001	-	-	100	0.141	0.141	0.141
1.002	-	-	100	0.152	0.152	0.152
1.003	-	-	100	0.078	0.078	0.078
1.004	-	-	100	0.091	0.091	0.091
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.030	0.030	0.030
1.007	-	-	100	0.010	0.010	0.010
2.000	-	-	100	0.022	0.022	0.022
2.001	-	-	100	0.102	0.102	0.102
2.002	-	-	100	0.000	0.000	0.000
2.003	-	-	100	0.007	0.007	0.007
2.004	-	-	100	0.023	0.023	0.023
2.005	-	-	100	0.018	0.018	0.018
2.006	-	-	100	0.070	0.070	0.070
2.007	-	-	100	0.031	0.031	0.031
2.008	-	-	100	0.068	0.068	0.068
2.009	-	-	100	0.028	0.028	0.028
2.010	-	-	100	0.092	0.092	0.092
2.011	-	-	100	0.007	0.007	0.007
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.115	1.115	1.115

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.008	S	9.650	6.860	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model FEH

Synthetic Rainfall Details

Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 516200 173750 TQ 16200 73750
C (1km)	-0.025
D1 (1km)	0.297
D2 (1km)	0.319
D3 (1km)	0.231
E (1km)	0.307
F (1km)	2.536
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S21, DS/PN: S1.008, Volume (m³): 9.1

Unit Reference	MD-SHE-0099-5000-1450-5000
Design Head (m)	1.450
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	99
Invert Level (m)	6.952
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.450	5.0
Flush-Flo™	0.432	5.0
Kick-Flo®	0.882	4.0
Mean Flow over Head Range	-	4.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.6	3.000	7.0	7.000	10.5
0.200	4.5	1.400	4.9	3.500	7.5	7.500	10.8
0.300	4.9	1.600	5.2	4.000	8.0	8.000	11.2
0.400	5.0	1.800	5.5	4.500	8.5	8.500	11.5
0.500	5.0	2.000	5.8	5.000	8.9	9.000	11.8
0.600	4.9	2.200	6.1	5.500	9.3	9.500	12.1
0.800	4.4	2.400	6.3	6.000	9.7		
1.000	4.2	2.600	6.6	6.500	10.1		

Storage Structures for Storm

Cellular Storage Manhole: S3, DS/PN: S1.002

Invert Level (m) 7.218 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	36.0	0.0	1.201	0.0	0.0
1.200	36.0	0.0			

Cellular Storage Manhole: S4, DS/PN: S1.003

Invert Level (m) 7.143 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	73.0	0.0	1.201	0.0	0.0
1.200	73.0	0.0			

Cellular Storage Manhole: S6, DS/PN: S1.005

Invert Level (m) 7.039 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	29.0	0.0	1.201	0.0	0.0
1.200	29.0	0.0			

Cellular Storage Manhole: S8, DS/PN: S1.007

Invert Level (m) 6.978 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	23.5	0.0	1.201	0.0	0.0
1.200	23.5	0.0			

Cellular Storage Manhole: S11, DS/PN: S2.002

Invert Level (m) 7.284 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Cellular Storage Manhole: S11, DS/PN: S2.002

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	170.0	0.0	0.801	0.0	0.0
0.800	170.0	0.0			

Cellular Storage Manhole: S14, DS/PN: S2.005

Invert Level (m) 7.211 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	93.5	0.0	0.801	0.0	0.0
0.800	93.5	0.0			

Cellular Storage Manhole: S15, DS/PN: S2.006

Invert Level (m) 7.182 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	55.0	0.0	0.801	0.0	0.0
0.800	55.0	0.0			

Cellular Storage Manhole: S16, DS/PN: S2.007

Invert Level (m) 7.146 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	71.5	0.0	0.801	0.0	0.0
0.800	71.5	0.0			

Cellular Storage Manhole: S17, DS/PN: S2.008

Invert Level (m) 7.093 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	71.5	0.0	0.801	0.0	0.0
0.800	71.5	0.0			

Cellular Storage Manhole: S18, DS/PN: S2.009

Invert Level (m) 7.060 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	55.0	0.0	0.801	0.0	0.0
0.800	55.0	0.0			

Cellular Storage Manhole: S19, DS/PN: S2.010

Invert Level (m) 7.014 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	104.5	0.0	0.801	0.0	0.0
0.800	104.5	0.0			

Cellular Storage Manhole: S20, DS/PN: S2.011

Invert Level (m) 6.970 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	99.0	0.0	0.801	0.0	0.0
0.800	99.0	0.0			

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 516200 173750 TQ 16200 73750
C (1km)	-0.025
D1 (1km)	0.297
D2 (1km)	0.319
D3 (1km)	0.231
E (1km)	0.307
F (1km)	2.536
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	60 Summer	1	+0%	100/60 Winter				7.504
S1.001	S2	60 Summer	1	+0%	100/60 Summer				7.440
S1.002	S3	60 Summer	1	+0%	100/60 Summer				7.375
S1.003	S4	60 Winter	1	+0%	100/60 Summer				7.312
S1.004	S5	60 Winter	1	+0%	100/60 Summer				7.278
S1.005	S6	480 Winter	1	+0%	100/60 Summer				7.255
S1.006	S7	480 Winter	1	+0%	100/60 Summer				7.255
S1.007	S8	480 Winter	1	+0%	100/60 Summer				7.255
S2.000	S9	60 Summer	1	+0%	100/240 Winter				7.433
S2.001	S10	60 Summer	1	+0%	100/240 Winter				7.422
S2.002	S11	60 Winter	1	+0%	100/120 Winter				7.339

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.496	0.000	0.05		13.3	OK	
S1.001	S2	-0.463	0.000	0.09		23.4	OK	
S1.002	S3	-0.444	0.000	0.12		31.0	OK	
S1.003	S4	-0.430	0.000	0.13		27.6	OK	
S1.004	S5	-0.424	0.000	0.13		31.7	OK	
S1.005	S6	-0.384	0.000	0.04		9.1	OK	
S1.006	S7	-0.372	0.000	0.04		9.5	OK	
S1.007	S8	-0.323	0.000	0.06		8.8	OK	
S2.000	S9	-0.463	0.000	0.02		2.0	OK	
S2.001	S10	-0.443	0.000	0.06		10.4	OK	
S2.002	S11	-0.470	0.000	0.02		2.7	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.003	S12	60 Winter	1	+0%	100/120 Winter				7.328
S2.004	S13	120 Winter	1	+0%	100/120 Winter				7.313
S2.005	S14	120 Winter	1	+0%	100/60 Winter				7.274
S2.006	S15	360 Winter	1	+0%	100/60 Winter				7.260
S2.007	S16	480 Winter	1	+0%	100/60 Summer				7.257
S2.008	S17	480 Winter	1	+0%	100/60 Summer				7.256
S2.009	S18	480 Winter	1	+0%	100/60 Summer				7.256
S2.010	S19	480 Winter	1	+0%	100/60 Summer				7.255
S2.011	S20	480 Winter	1	+0%	30/240 Winter				7.255
S1.008	S21	480 Winter	1	+0%	1/60 Summer				7.256

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.003	S12	-0.468	0.000	0.02		2.8	OK	
S2.004	S13	-0.468	0.000	0.02		3.2	OK	
S2.005	S14	-0.462	0.000	0.03		3.1	OK	
S2.006	S15	-0.448	0.000	0.02		3.2	OK	
S2.007	S16	-0.414	0.000	0.01		2.6	OK	
S2.008	S17	-0.362	0.000	0.02		2.5	OK	
S2.009	S18	-0.330	0.000	0.01		2.3	OK	
S2.010	S19	-0.284	0.000	0.02		2.9	OK	
S2.011	S20	-0.240	0.000	0.03		3.9	OK	
S1.008	S21	0.154	0.000	0.37		4.9	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 516200 173750 TQ 16200 73750
C (1km)	-0.025
D1 (1km)	0.297
D2 (1km)	0.319
D3 (1km)	0.231
E (1km)	0.307
F (1km)	2.536
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	60 Winter	30	+0%	100/60 Winter				7.609
S1.001	S2	60 Winter	30	+0%	100/60 Summer				7.604
S1.002	S3	60 Winter	30	+0%	100/60 Summer				7.588
S1.003	S4	60 Winter	30	+0%	100/60 Summer				7.557
S1.004	S5	60 Winter	30	+0%	100/60 Summer				7.540
S1.005	S6	480 Winter	30	+0%	100/60 Summer				7.526
S1.006	S7	480 Winter	30	+0%	100/60 Summer				7.526
S1.007	S8	480 Winter	30	+0%	100/60 Summer				7.524
S2.000	S9	480 Winter	30	+0%	100/240 Winter				7.525
S2.001	S10	480 Winter	30	+0%	100/240 Winter				7.525
S2.002	S11	480 Winter	30	+0%	100/120 Winter				7.525

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.391	0.000	0.11		29.6	OK	
S1.001	S2	-0.299	0.000	0.21		55.5	OK	
S1.002	S3	-0.230	0.000	0.30		77.3	OK	
S1.003	S4	-0.185	0.000	0.35		72.4	OK	
S1.004	S5	-0.162	0.000	0.34		85.7	OK	
S1.005	S6	-0.113	0.000	0.07		15.0	OK	
S1.006	S7	-0.101	0.000	0.07		15.9	OK	
S1.007	S8	-0.054	0.000	0.09		14.5	OK	
S2.000	S9	-0.371	0.000	0.01		0.9	OK	
S2.001	S10	-0.340	0.000	0.03		5.1	OK	
S2.002	S11	-0.283	0.000	0.02		3.7	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.003	S12	480 Winter	30	+0%	100/120 Winter				7.525
S2.004	S13	480 Winter	30	+0%	100/120 Winter				7.525
S2.005	S14	480 Winter	30	+0%	100/60 Winter				7.526
S2.006	S15	480 Winter	30	+0%	100/60 Winter				7.526
S2.007	S16	480 Winter	30	+0%	100/60 Summer				7.526
S2.008	S17	480 Winter	30	+0%	100/60 Summer				7.525
S2.009	S18	480 Winter	30	+0%	100/60 Summer				7.525
S2.010	S19	480 Winter	30	+0%	100/60 Summer				7.525
S2.011	S20	480 Winter	30	+0%	30/240 Winter				7.524
S1.008	S21	480 Winter	30	+0%	1/60 Summer				7.524

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.003	S12	-0.271	0.000	0.03		4.0	OK	
S2.004	S13	-0.256	0.000	0.03		4.9	OK	
S2.005	S14	-0.211	0.000	0.03		3.2	OK	
S2.006	S15	-0.182	0.000	0.03		4.3	OK	
S2.007	S16	-0.145	0.000	0.02		3.2	OK	
S2.008	S17	-0.092	0.000	0.02		2.7	OK	
S2.009	S18	-0.060	0.000	0.02		2.8	OK	
S2.010	S19	-0.014	0.000	0.02		3.3	OK	
S2.011	S20	0.029	0.000	0.03		4.2	SURCHARGED	
S1.008	S21	0.422	0.000	0.37		5.0	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 516200 173750 TQ 16200 73750
C (1km)	-0.025
D1 (1km)	0.297
D2 (1km)	0.319
D3 (1km)	0.231
E (1km)	0.307
F (1km)	2.536
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	960 Winter	100	+40%	100/60 Winter				8.418
S1.001	S2	960 Winter	100	+40%	100/60 Summer				8.418
S1.002	S3	960 Winter	100	+40%	100/60 Summer				8.418
S1.003	S4	960 Winter	100	+40%	100/60 Summer				8.418
S1.004	S5	960 Winter	100	+40%	100/60 Summer				8.418
S1.005	S6	960 Winter	100	+40%	100/60 Summer				8.418
S1.006	S7	960 Winter	100	+40%	100/60 Summer				8.418
S1.007	S8	960 Winter	100	+40%	100/60 Summer				8.418
S2.000	S9	960 Winter	100	+40%	100/240 Winter				8.418
S2.001	S10	960 Winter	100	+40%	100/240 Winter				8.418
S2.002	S11	960 Winter	100	+40%	100/120 Winter				8.418

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.418	0.000	0.02		6.2	SURCHARGED	
S1.001	S2	0.515	0.000	0.04		11.6	SURCHARGED	
S1.002	S3	0.600	0.000	0.07		19.0	SURCHARGED	
S1.003	S4	0.676	0.000	0.13		26.7	SURCHARGED	
S1.004	S5	0.716	0.000	0.11		27.5	SURCHARGED	
S1.005	S6	0.779	0.000	0.11		23.7	SURCHARGED	
S1.006	S7	0.791	0.000	0.11		27.1	SURCHARGED	
S1.007	S8	0.839	0.000	0.16		25.9	SURCHARGED	
S2.000	S9	0.522	0.000	0.02		2.6	SURCHARGED	
S2.001	S10	0.553	0.000	0.03		5.2	SURCHARGED	
S2.002	S11	0.609	0.000	0.04		6.3	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.003	S12	960 Winter	100	+40%	100/120 Winter				8.418
S2.004	S13	960 Winter	100	+40%	100/120 Winter				8.418
S2.005	S14	960 Winter	100	+40%	100/60 Winter				8.418
S2.006	S15	960 Winter	100	+40%	100/60 Winter				8.418
S2.007	S16	960 Winter	100	+40%	100/60 Summer				8.418
S2.008	S17	960 Winter	100	+40%	100/60 Summer				8.418
S2.009	S18	960 Winter	100	+40%	100/60 Summer				8.418
S2.010	S19	960 Winter	100	+40%	100/60 Summer				8.418
S2.011	S20	960 Winter	100	+40%	30/240 Winter				8.418
S1.008	S21	960 Winter	100	+40%	1/60 Summer				8.417

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.003	S12	0.622	0.000	0.06		7.6	SURCHARGED	
S2.004	S13	0.637	0.000	0.05		7.3	SURCHARGED	
S2.005	S14	0.682	0.000	0.06		7.1	SURCHARGED	
S2.006	S15	0.711	0.000	0.05		6.6	SURCHARGED	
S2.007	S16	0.747	0.000	0.03		5.3	SURCHARGED	
S2.008	S17	0.800	0.000	0.04		5.2	SURCHARGED	
S2.009	S18	0.833	0.000	0.03		5.6	SURCHARGED	
S2.010	S19	0.879	0.000	0.05		7.3	SURCHARGED	
S2.011	S20	0.923	0.000	0.07		8.5	SURCHARGED	
S1.008	S21	1.315	0.000	0.38		5.0	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.406
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	1	+0%					7.534
S1.001	S2	15 Winter	1	+0%					7.463
S1.002	S3	15 Winter	1	+0%	100/60 Winter				7.388
S1.003	S4	30 Winter	1	+0%	100/60 Summer				7.322
S1.004	S5	30 Winter	1	+0%	100/60 Winter				7.281
S1.005	S6	60 Winter	1	+0%	100/60 Summer				7.246
S1.006	S7	60 Winter	1	+0%	100/60 Summer				7.242
S1.007	S8	60 Winter	1	+0%	100/60 Summer				7.229
S2.000	S9	15 Winter	1	+0%					7.453
S2.001	S10	15 Winter	1	+0%					7.443
S2.002	S11	60 Winter	1	+0%					7.340
S2.003	S12	60 Winter	1	+0%					7.328
S2.004	S13	60 Winter	1	+0%					7.313
S2.005	S14	60 Winter	1	+0%					7.272
S2.006	S15	60 Winter	1	+0%					7.244
S2.007	S16	60 Winter	1	+0%					7.215
S2.008	S17	60 Winter	1	+0%					7.208
S2.009	S18	60 Winter	1	+0%	100/60 Winter				7.207
S2.010	S19	60 Winter	1	+0%	100/60 Summer				7.206

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.466	0.000	0.08		22.6	OK	
S1.001	S2	-0.440	0.000	0.13		34.2	OK	
S1.002	S3	-0.431	0.000	0.16		42.5	OK	
S1.003	S4	-0.421	0.000	0.16		32.9	OK	
S1.004	S5	-0.421	0.000	0.15		36.7	OK	
S1.005	S6	-0.393	0.000	0.14		28.8	OK	
S1.006	S7	-0.385	0.000	0.12		29.6	OK	
S1.007	S8	-0.349	0.000	0.17		26.9	OK	
S2.000	S9	-0.443	0.000	0.03		3.3	OK	
S2.001	S10	-0.422	0.000	0.09		15.3	OK	
S2.002	S11	-0.469	0.000	0.02		2.8	OK	
S2.003	S12	-0.468	0.000	0.02		2.9	OK	
S2.004	S13	-0.468	0.000	0.02		3.5	OK	
S2.005	S14	-0.464	0.000	0.02		2.9	OK	
S2.006	S15	-0.463	0.000	0.03		3.9	OK	
S2.007	S16	-0.456	0.000	0.02		3.9	OK	
S2.008	S17	-0.410	0.000	0.03		4.5	OK	
S2.009	S18	-0.379	0.000	0.02		3.6	OK	
S2.010	S19	-0.333	0.000	0.02		3.2	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.011	S20	60 Winter	1	+0%	100/30 Winter				7.207
S1.008	S21	60 Winter	1	+0%	1/15 Summary				7.223

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.011	S20	-0.288	0.000	0.03		3.9	OK	
S1.008	S21	0.121	0.000	0.36		4.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.406
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%					7.635
S1.001	S2	15 Winter	30	+0%					7.589
S1.002	S3	15 Winter	30	+0%	100/60 Winter				7.526
S1.003	S4	60 Winter	30	+0%	100/60 Summer				7.496
S1.004	S5	60 Winter	30	+0%	100/60 Winter				7.480
S1.005	S6	60 Winter	30	+0%	100/60 Summer				7.450
S1.006	S7	60 Winter	30	+0%	100/60 Summer				7.445
S1.007	S8	60 Winter	30	+0%	100/60 Summer				7.423
S2.000	S9	15 Summer	30	+0%					7.527
S2.001	S10	15 Summer	30	+0%					7.520
S2.002	S11	60 Winter	30	+0%					7.397
S2.003	S12	60 Winter	30	+0%					7.392
S2.004	S13	60 Winter	30	+0%					7.395
S2.005	S14	60 Winter	30	+0%					7.396
S2.006	S15	60 Winter	30	+0%					7.397
S2.007	S16	60 Winter	30	+0%					7.398
S2.008	S17	60 Winter	30	+0%					7.399
S2.009	S18	60 Winter	30	+0%	100/60 Winter				7.401
S2.010	S19	60 Winter	30	+0%	100/60 Summer				7.404

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.365	0.000	0.20		53.4	OK	
S1.001	S2	-0.315	0.000	0.35		92.8	OK	
S1.002	S3	-0.292	0.000	0.46		119.4	OK	
S1.003	S4	-0.247	0.000	0.31		65.1	OK	
S1.004	S5	-0.222	0.000	0.30		76.4	OK	
S1.005	S6	-0.189	0.000	0.30		62.2	OK	
S1.006	S7	-0.182	0.000	0.27		65.0	OK	
S1.007	S8	-0.155	0.000	0.35		56.8	OK	
S2.000	S9	-0.369	0.000	0.07		8.5	OK	
S2.001	S10	-0.345	0.000	0.25		45.4	OK	
S2.002	S11	-0.412	0.000	0.07		10.8	OK	
S2.003	S12	-0.404	0.000	0.08		11.4	OK	
S2.004	S13	-0.386	0.000	0.08		13.4	OK	
S2.005	S14	-0.340	0.000	0.09		11.4	OK	
S2.006	S15	-0.310	0.000	0.10		14.2	OK	
S2.007	S16	-0.273	0.000	0.07		12.2	OK	
S2.008	S17	-0.218	0.000	0.10		13.2	OK	
S2.009	S18	-0.184	0.000	0.05		8.0	OK	
S2.010	S19	-0.135	0.000	0.04		6.6	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.011	S20	60 Winter	30	+0%	100/30 Winter				7.410
S1.008	S21	60 Winter	30	+0%	1/15 Summer				7.415

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.011	S20	-0.085	0.000	0.03		3.6	OK	
S1.008	S21	0.313	0.000	0.37		5.0	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.406
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	60 Winter	100	+40%					8.000
S1.001	S2	30 Winter	100	+40%					7.903
S1.002	S3	60 Winter	100	+40%	100/60 Winter				7.821
S1.003	S4	60 Winter	100	+40%	100/60 Summer				7.815
S1.004	S5	60 Winter	100	+40%	100/60 Winter				7.808
S1.005	S6	60 Winter	100	+40%	100/60 Summer				7.804
S1.006	S7	60 Winter	100	+40%	100/60 Summer				7.803
S1.007	S8	60 Winter	100	+40%	100/60 Summer				7.793
S2.000	S9	60 Winter	100	+40%					7.604
S2.001	S10	60 Winter	100	+40%					7.604
S2.002	S11	60 Winter	100	+40%					7.604
S2.003	S12	60 Winter	100	+40%					7.604
S2.004	S13	60 Winter	100	+40%					7.605
S2.005	S14	60 Winter	100	+40%					7.605
S2.006	S15	60 Winter	100	+40%					7.606
S2.007	S16	60 Winter	100	+40%					7.607
S2.008	S17	60 Winter	100	+40%					7.616
S2.009	S18	60 Winter	100	+40%	100/60 Winter				7.623
S2.010	S19	60 Winter	100	+40%	100/60 Summer				7.632

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.000	0.17		46.7	OK	
S1.001	S2	0.000	0.000	0.49		127.9	OK	
S1.002	S3	0.002	0.000	0.44		112.8	SURCHARGED	
S1.003	S4	0.072	0.000	0.46		95.1	SURCHARGED	
S1.004	S5	0.107	0.000	0.46		115.7	SURCHARGED	
S1.005	S6	0.164	0.000	0.50		104.1	SURCHARGED	
S1.006	S7	0.176	0.000	0.47		110.8	SURCHARGED	
S1.007	S8	0.215	0.000	0.55		87.7	SURCHARGED	
S2.000	S9	-0.292	0.000	0.06		7.2	OK	
S2.001	S10	-0.261	0.000	0.22		40.1	OK	
S2.002	S11	-0.205	0.000	0.15		21.9	OK	
S2.003	S12	-0.192	0.000	0.17		23.3	OK	
S2.004	S13	-0.177	0.000	0.18		28.5	OK	
S2.005	S14	-0.131	0.000	0.15		18.3	OK	
S2.006	S15	-0.101	0.000	0.19		26.4	OK	
S2.007	S16	-0.064	0.000	0.10		17.8	OK	
S2.008	S17	-0.002	0.000	0.15		19.1	OK	
S2.009	S18	0.038	0.000	0.06		9.9	SURCHARGED	
S2.010	S19	0.093	0.000	0.05		7.5	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.011	S20	60 Winter	100	+40%	100/30 Winter				7.647
S1.008	S21	60 Winter	100	+40%	1/15 Summer				7.839

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S2.011	S20	0.153	0.000	0.01		1.3	SURCHARGED	
S1.008	S21	0.737	0.000	0.37		5.0	SURCHARGED	

The London Sustainable Drainage Proforma

Introduction

This proforma is intended to accompany a drainage strategy prepared for a planning application where required by national or local planning policy. It should be used to summarise the key outputs from the strategy to allow assessing officers at the Lead Local Flood Authority (LLFA) to quickly assess compliance with sustainable drainage (SuDS) planning

The proforma is divided into 4 sections, which are intended to be used as follows:

1. Site and project information - Provide summary details of the development, site and drainage
2. Proposed discharge arrangement – Summarise site ground conditions to determine potential for infiltration. Select a surface water discharge method (or mix of methods) following the hierarchical approach set out in the London Plan.
3. Drainage strategy – Prioritise SuDS measures that manage runoff as close to source as possible and contribute to the four main pillars of SuDS; amenity, biodiversity, water quality and water quantity.
4. Supporting information – Provide cross references to the page or section of the drainage strategy report where the detailed information to support each element can be found. This may be more than one reference for each

Policy

Drainage strategies for developments in the London Borough of Richmond upon Thames need to comply with the following policies on SuDS:

1. London Borough of Richmond upon Thames Local Plan policy LP21
2. London Plan policy 5.13 and draft New London Plan policy SI13
3. The National Planning Policy Framework (NPPF)

Technical Guidance

- Post-development surface water discharge rate should be limited to greenfield runoff rates. Proposals for higher discharge rates should be agreed with the LLFA ahead of submission of the Planning Application. Clear evidence should be provided with the Planning Application to show why greenfield rates cannot be achieved.
- Greenfield runoff rate is the runoff rate from a site in its natural state, prior to any development. This should be calculated using one of the runoff estimation methods set out in Table 24.1 of CIRIA C753 The SuDS Manual.
- Attenuation storage volumes required to reduce post-development discharge rates to greenfield rates should be calculated using one of the runoff estimation methods set out in Table 24.1 of CIRIA C753 The SuDS Manual.
- 'CC' refers to climate change allowance from the current Environment Agency guidance.
- An operation and maintenance strategy for proposed SuDS measures should be submitted with the Planning Application and include the details set out in section 32.2 of CIRIA C753 The SuDS Manual. The manual should be site-specific and not directly reproduce parts of The SuDS Manual.
- Other useful sources of guidance are:
  - Richmond upon Thames Sustainable Drainage guidance
  - The London Plan Sustainable Design and Construction SPG
  - DEFRA non-statutory technical standards for sustainable drainage
  - Environment Agency climate change guidance
  - CIRIA C753 The SuDS Manual

LONDON BOROUGH OF RICHMOND UPON THAMES

GREATER**LONDON**AUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	
Address & post code	
OS Grid ref. (Easting, Northing)	E N
LPA reference (if applicable)	
Brief description of proposed work	
Total site Area	m^2
Total existing impervious area	m^2
Total proposed impervious area	m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	
Existing drainage connection type and location	
Designer Name	
Designer Position	
Designer Company	

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	
Bedrock geology classification	
Site infiltration rate	m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use		
2 use infiltration techniques, such as porous surfaces in non-clay areas		
3 attenuate rainwater in ponds or open water features for gradual release		
4 attenuate rainwater by storing in tanks or sealed water features for gradual release		
5 discharge rainwater direct to a watercourse		
6 discharge rainwater to a surface water sewer/drain		
7 discharge rainwater to the combined sewer.		

2c. Proposed Discharge Details

Proposed discharge location	
Has the owner/regulator of the discharge location been consulted?	

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar				
1 in 1				
1 in 30				
1 in 100				
1 in 100 + CC				
Climate change allowance used		40%		
3b. Principal Method of Flow Control				

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		0
Total	**0**	**0**	**0**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	
Drainage hierarchy (2b)	
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	
Proposed SuDS measures & specifications (3b)	
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	
Detailed drainage design drawings, including exceedance flow routes	
Detailed landscaping plans	
Maintenance strategy	
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	
b) biodiversity?	
c) amenity?	