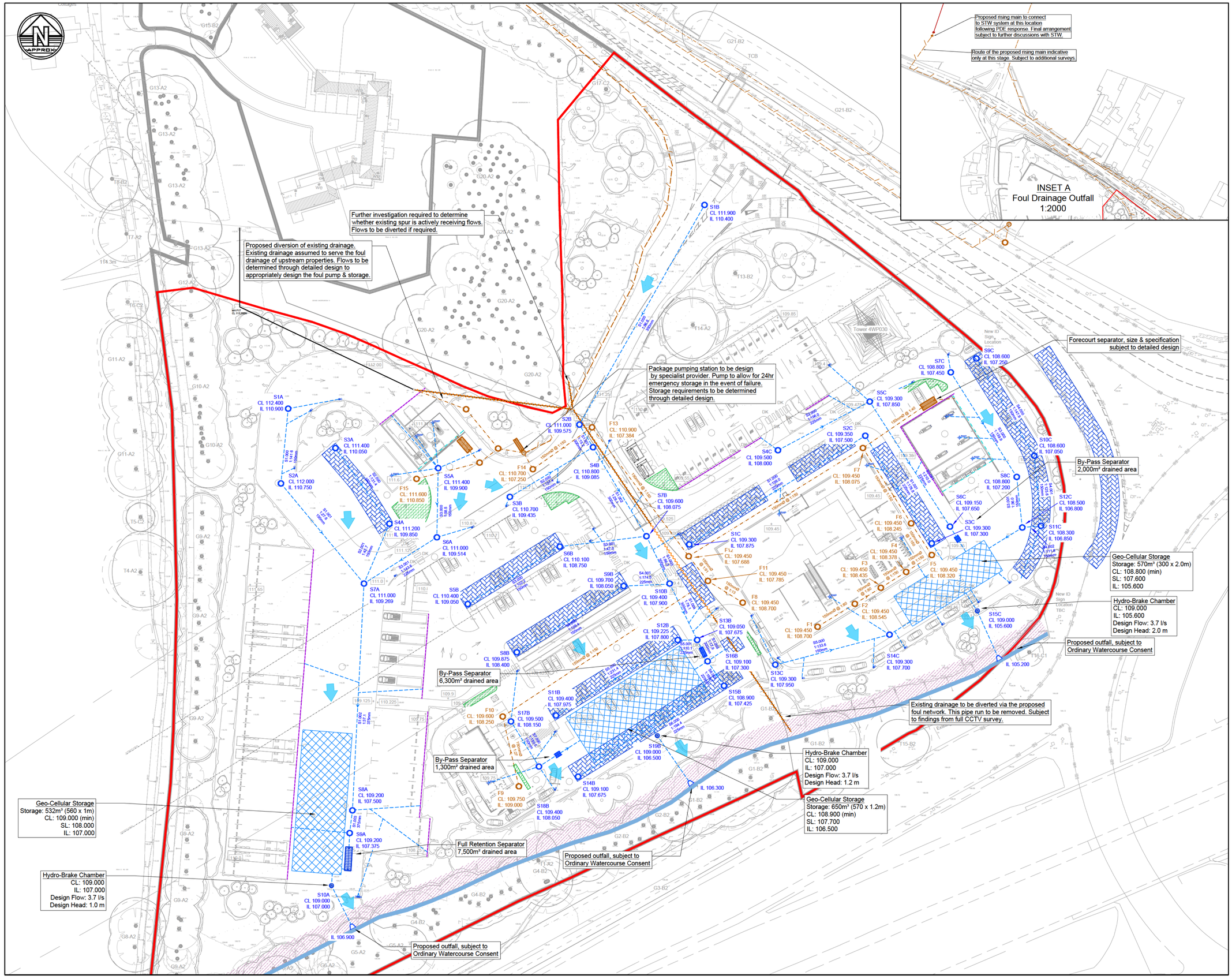

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Not suitable for costing or construction. This drawing is provided for planning purposed only. Design subject to further coordination and approvals through detailed design.
6. Layout & FFLs based on ADS Design drawing '1415-26b'
7. Attenuation sized for the 1 in 100 year storm event plus 40% climate change for an estimated impermeable area of 2.448ha.
8. The proposed discharge rate is based on the QBAR rate of 11.1 l/s for the estimated developable area of 2.53ha.
9. RWP locations assumed at this stage, to be confirmed by Architect / M&E through detailed design.
10. RWP & SVP below ground connections to be coordinated with foundation design through detailed design.
11. Additional CCTV survey required to fully understand the existing drainage.
12. Connection to the existing public sewer subject to S106 approval with STW.
13. Cover levels estimated only at this stage, subject to detailed external levels design.
14. There are 3 distinct networks proposed, refer to separate calculation sheets for each. The suffix on each manhole denotes the network i.e Network A, B or C.

Legend

- Red Line Boundary
- Proposed Surface Water Drainage
- Proposed Foul Water Drainage
- Channel / Slot Drain (Surface Water)
- Channel / Slot Drain (Foul Water)
- Gully
- Surface Water Flow Control Chamber
- Headwall
- Oil Interceptor
- Forecourt Separator
- Foul Water Package Pumping Station
- Geo-Cellular Attenuation Tank
- Permeable Paving
- Rain Garden
- Existing Private Drainage
- Existing STW Sewers
- Exceedance Routing

Rev	Date	Details of issue / revision	Drw	Rev
P02	22.08.23	Updated to Latest Site Layout	RJ	GL
P01	18.08.23	Preliminary Issue	RJ	GL

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Client
Welcome Break Ltd

Project Title
Stretton Court MSA, Hinckley

Drawing Title
Drainage Strategy

Drawn:	R. Jobling	Reviewed:	G. Littlewood
BWB Ref: 232728	Date: 18.08.23	Scale@A1:	1:500

Drawing Status
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
SCH-BWB-ZZ-XX-DR-CD-0001	S2	P02

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Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Proposed levels strategy has been developed to inform drainage proposals only and is subject to further review through detailed design.

Legend

- Ex.108.06m — Existing Boundary Levels
- Pr.108.6m — Indicative Proposed Levels
- Proposed Retaining

Rev	Date	Details of issue / revision	Drw	Rev
P02	22.08.23	Updated to Latest Site Layout	RJ	GL
P01	18.08.23	Preliminary Issue	RJ	GL

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Client
Welcome Break Ltd

Project Title
Stretton Court, Hinckley

Drawing Title
Indicative Levels Strategy

Drawn:	R. Jobling	Reviewed:	G. Littlewood
BWB Ref: 232728	Date: 18.08.23	Scale@A1:	1:500

Drawing Status
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
SCH-BWB-ZZ-XX-DR-CD-0002	S2	P02

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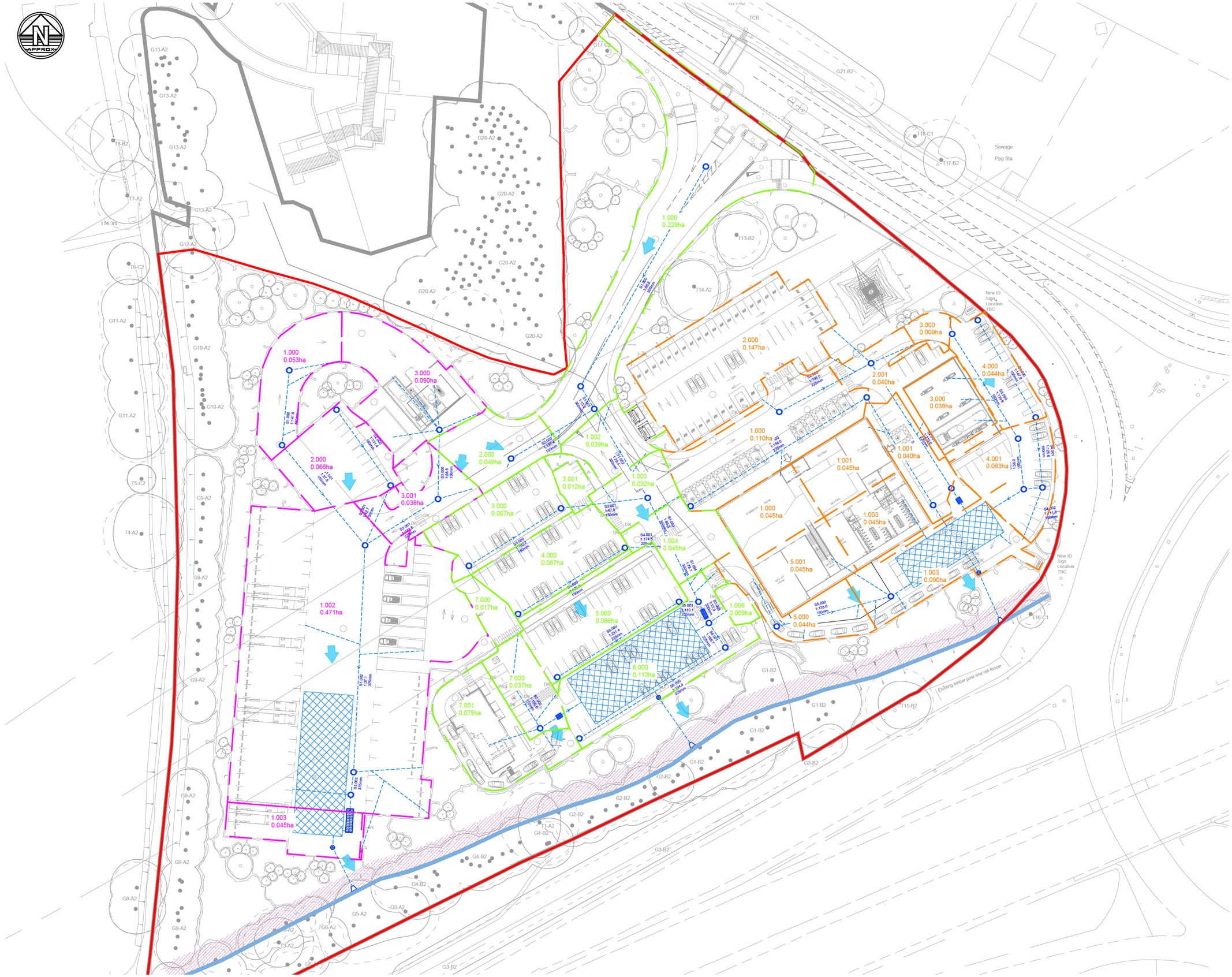

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Areas are approximate only and subject to change through detailed design as a detailed external levels design is progressed.

Legend

Catchment A Impermeable Areas
Total Contributing Area: 0.763ha

Catchment B Impermeable Areas
Total Contributing Area: 0.879ha

Catchment C Impermeable Areas
Total Contributing Area: 0.806ha

Rev	Date	Details of issue / revision	Drw	Rev
P02	22.08.23	Preliminary Issue	RJ	GL
P01	18.08.23	Preliminary Issue	RJ	GL

Issues & Revisions

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Client
Welcome Break Ltd

Project Title
Stretton Court, Hinckley

Drawing Title
Proposed Impermeable Area Plan

Drawn:	R. Jobling	Reviewed:	G. Littlewood
BWB Ref:	232728	Date: 18.08.23	Scale@A1: 1:500

Drawing Status
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
SCH-BWB-ZZ-XX-DR-CD-0003	S2	P02

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Appendix 6: MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 443182 291018 SP 43182 91018
Data Type	Point
Maximum Rainfall (mm/hr)	50
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)	0.200
Maximum Backdrop Height (m)	1.500
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	0.590	4-8	0.173

Total Area Contributing (ha) = 0.763

Total Pipe Volume (m³) = 14.006

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	21.245	0.150	141.6	0.053	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	36.779	1.256	29.3	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)
S1.000	50.00	5.42	110.900	0.053	0.0	0.0	0.0	0.84	14.9	7.2
S1.001	50.00	5.75	110.750	0.053	0.0	0.0	0.0	1.87	33.0	7.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	26.280	0.200	131.4	0.066	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	18.385	0.431	42.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	18.199	0.311	58.5	0.090	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	24.420	0.170	143.6	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	64.053	1.769	36.2	0.471	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.003	6.219	0.125	49.8	0.045	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	16.238	0.375	43.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.005	12.170	0.208	58.5	0.000	0.00	0.0	0.600	o	375	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)
S2.000	50.00	5.50	110.050	0.066	0.0	0.0	0.0	0.88	15.5	8.9
S2.001	50.00	5.70	109.850	0.066	0.0	0.0	0.0	1.55	27.3	8.9
S3.000	50.00	5.23	109.900	0.090	0.0	0.0	0.0	1.32	23.3	12.2
S3.001	50.00	5.60	109.514	0.128	0.0	0.0	0.0	1.09	43.3	17.3
S1.002	50.00	6.10	109.269	0.718	0.0	0.0	0.0	3.02	333.5	97.2
S1.003	50.00	6.14	107.500	0.763	0.0	0.0	0.0	2.57	284.3	103.3
S1.004	50.00	6.24	107.375	0.763	0.0	0.0	0.0	2.76	304.9	103.3
S1.005	50.00	6.33	107.000	0.763	0.0	0.0	0.0	2.37	262.1	103.3

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.053	0.053	0.053
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.066	0.066	0.066
2.001	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.090	0.090	0.090
3.001	-	-	100	0.038	0.038	0.038
1.002	-	-	100	0.471	0.471	0.471
1.003	-	-	100	0.045	0.045	0.045
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.763	0.763	0.763

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)
S1.005	S	108.000	106.792	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	0.000
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	2
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
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 443182 291018 SP 43182 91018
Data Type	Point
Summer Storms	Yes
Winter Storms	No
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S10, DS/PN: S1.005, Volume (m³): 4.5

Unit Reference	MD-SHE-0091-3700-1000-3700
Design Head (m)	1.000
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	91
Invert Level (m)	107.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.000	3.7
Flush-Flo™	0.299	3.7
Kick-Flo®	0.631	3.0
Mean Flow over Head Range	-	3.2

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	2.9	1.200	4.0	3.000	6.2	7.000	9.2
0.200	3.6	1.400	4.3	3.500	6.6	7.500	9.5
0.300	3.7	1.600	4.6	4.000	7.1	8.000	9.8
0.400	3.6	1.800	4.9	4.500	7.5	8.500	10.1
0.500	3.5	2.000	5.1	5.000	7.8	9.000	10.4
0.600	3.2	2.200	5.3	5.500	8.2	9.500	10.6
0.800	3.3	2.400	5.6	6.000	8.6		
1.000	3.7	2.600	5.8	6.500	8.9		

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Storage Structures for Storm

Porous Car Park Manhole: S4, DS/PN: S2.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	27.7
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	38.5	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	110.720	Cap Volume Depth (m)	0.350

Cellular Storage Manhole: S10, DS/PN: S1.005

Invert Level (m)	107.000	Safety Factor	2.0
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	560.0	0.0	1.100	0.0	0.0
1.000	560.0	0.0			

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2 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	0.000
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	2
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	2013
Site Location	GB 443182 291018 SP 43182 91018
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	2	+0%	30/15 Summer			
S1.001	S2	15 Winter	2	+0%	100/15 Summer			
S2.000	S3	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S2.001	S4	15 Winter	2	+0%	30/15 Summer			
S3.000	S5	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S3.001	S6	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S1.002	S7	15 Winter	2	+0%	30/15 Summer			
S1.003	S8	15 Winter	2	+0%	30/15 Summer			
S1.004	S9	15 Winter	2	+0%	30/15 Summer			
S1.005	S10	480 Winter	2	+0%	30/30 Winter			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	110.982	-0.068	0.000	0.56			7.8	OK	
S1.001	S2	110.801	-0.099	0.000	0.25			7.9	OK	
S2.000	S3	110.141	-0.059	0.000	0.66			9.8	OK	4
S2.001	S4	109.915	-0.085	0.000	0.39		6	9.8	OK	
S3.000	S5	109.987	-0.063	0.000	0.62			13.6	OK	4
S3.001	S6	109.622	-0.117	0.000	0.46			18.3	OK	2
S1.002	S7	109.412	-0.232	0.000	0.31			95.7	OK	
S1.003	S8	107.740	-0.135	0.000	0.73			101.4	OK	
S1.004	S9	107.544	-0.206	0.000	0.42			101.1	OK	
S1.005	S10	107.231	-0.144	0.000	0.02		384	3.7	OK	

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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 0.000
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 2
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 2013
Site Location GB 443182 291018 SP 43182 91018
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 35, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	30	+35%	30/15 Summer			
S1.001	S2	15 Winter	30	+35%	100/15 Summer			
S2.000	S3	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S2.001	S4	15 Winter	30	+35%	30/15 Summer			
S3.000	S5	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S3.001	S6	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S1.002	S7	15 Winter	30	+35%	30/15 Summer			
S1.003	S8	15 Winter	30	+35%	30/15 Summer			
S1.004	S9	15 Winter	30	+35%	30/15 Summer			
S1.005	S10	600 Winter	30	+35%	30/30 Winter			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	111.309	0.259	0.000	1.64			23.0	SURCHARGED
S1.001	S2	110.845	-0.055	0.000	0.71			22.7	OK
S2.000	S3	110.979	0.779	0.000	1.72			25.4	SURCHARGED
S2.001	S4	110.402	0.402	0.000	1.17		4	29.8	SURCHARGED
S3.000	S5	111.164	1.114	0.000	1.70			37.1	FLOOD RISK
S3.001	S6	110.303	0.564	0.000	1.35			53.8	SURCHARGED
S1.002	S7	110.079	0.435	0.000	0.92			287.4	SURCHARGED
S1.003	S8	108.563	0.688	0.000	2.18			302.3	SURCHARGED
S1.004	S9	107.960	0.210	0.000	1.26			302.0	SURCHARGED
S1.005	S10	107.705	0.330	0.000	0.02			3.7	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S2.000	S3	4
S2.001	S4	
S3.000	S5	4
S3.001	S6	2
S1.002	S7	
S1.003	S8	
S1.004	S9	
S1.005	S10	

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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 0.000
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 2
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 2013
Site Location GB 443182 291018 SP 43182 91018
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	100	+40%	30/15 Summer			
S1.001	S2	15 Winter	100	+40%	100/15 Summer			
S2.000	S3	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S2.001	S4	15 Winter	100	+40%	30/15 Summer			
S3.000	S5	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S3.001	S6	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S1.002	S7	15 Winter	100	+40%	30/15 Summer			
S1.003	S8	15 Winter	100	+40%	30/15 Summer			
S1.004	S9	15 Winter	100	+40%	30/15 Summer			
S1.005	S10	720 Winter	100	+40%	30/30 Winter			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	112.133	1.083	0.000	1.91			26.8	FLOOD RISK
S1.001	S2	111.566	0.666	0.000	1.02			32.6	SURCHARGED
S2.000	S3	111.402	1.202	2.226	1.71			25.2	FLOOD
S2.001	S4	110.882	0.882	0.000	1.71		5	43.8	SURCHARGED
S3.000	S5	111.405	1.355	5.416	2.23			48.5	FLOOD
S3.001	S6	111.002	1.263	2.247	1.75			69.9	FLOOD
S1.002	S7	110.969	1.325	0.000	1.07			335.6	FLOOD RISK
S1.003	S8	108.998	1.123	0.000	2.56			353.6	FLOOD RISK
S1.004	S9	108.171	0.421	0.000	1.47			353.4	SURCHARGED
S1.005	S10	108.015	0.640	0.000	0.02		1404	3.7	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S2.000	S3	4
S2.001	S4	
S3.000	S5	4
S3.001	S6	2
S1.002	S7	
S1.003	S8	
S1.004	S9	
S1.005	S10	

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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)	2
FEH Rainfall Version	2013
Site Location	GB 443182 291018 SP 43182 91018
Data Type	Point
Maximum Rainfall (mm/hr)	50
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)	0.200
Maximum Backdrop Height (m)	1.500
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	0.524	4-8	0.355

Total Area Contributing (ha) = 0.879

Total Pipe Volume (m³) = 20.113

Network Design Table for Storm

« - Indicates pipe capacity < flow

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	71.482	0.825	86.6	0.229	5.00	0.0	0.600	o	300	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	50.00	5.70	110.400	0.229	0.0	0.0	0.0	1.69	119.5	31.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.001	7.461	0.490	15.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	27.480	0.200	137.4	0.049	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	29.351	1.010	29.1	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	30.671	0.300	102.2	0.067	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	24.700	0.525	47.0	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	15.094	0.175	86.3	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	35.573	0.275	129.4	0.067	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	13.088	0.075	174.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	17.571	0.225	78.1	0.045	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	40.502	0.175	231.4	0.088	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	5.507	0.050	110.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	6.704	0.375	17.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	48.609	0.250	194.4	0.113	5.00	0.0	0.600	o	225	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)
S1.001	50.00	5.74	109.575	0.229	0.0	0.0	0.0	4.05	286.2	31.0
S2.000	50.00	5.54	109.435	0.049	0.0	0.0	0.0	0.86	15.1	6.6
S1.002	50.00	5.90	109.085	0.317	0.0	0.0	0.0	2.93	206.9	42.9
S3.000	50.00	5.51	109.050	0.067	0.0	0.0	0.0	0.99	17.6	9.1
S3.001	50.00	5.79	108.750	0.079	0.0	0.0	0.0	1.47	26.0	10.7
S1.003	50.00	6.05	108.075	0.428	0.0	0.0	0.0	1.69	119.7	58.0
S4.000	50.00	5.67	108.400	0.067	0.0	0.0	0.0	0.88	15.6	9.1
S4.001	50.00	5.89	108.050	0.067	0.0	0.0	0.0	0.99	39.2	9.1
S1.004	50.00	6.22	107.900	0.540	0.0	0.0	0.0	1.78	125.9	73.1
S5.000	50.00	5.79	107.975	0.088	0.0	0.0	0.0	0.86	34.0	11.9
S5.001	50.00	5.86	107.800	0.088	0.0	0.0	0.0	1.25	49.5	11.9
S1.005	50.00	6.25	107.675	0.628	0.0	0.0	0.0	3.74	264.1	85.0
S6.000	50.00	5.87	107.675	0.113	0.0	0.0	0.0	0.93	37.1	15.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.001	8.337	0.050	166.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	25.414	0.800	31.8	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.000	15.000	0.100	150.0	0.054	5.00	0.0	0.600	o	150	Pipe/Conduit	
S7.001	34.594	1.550	22.3	0.075	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	16.741	0.286	58.5	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)
S6.001	50.00	6.00	107.425	0.113	0.0	0.0	0.0	1.01	40.1	15.3
S1.006	50.00	6.40	107.300	0.750	0.0	0.0	0.0	2.80	197.9	101.6
S7.000	50.00	5.31	108.150	0.054	0.0	0.0	0.0	0.82	14.5	7.3
S7.001	50.00	5.57	108.050	0.129	0.0	0.0	0.0	2.14	37.8	17.5
S1.007	50.00	6.61	106.500	0.879	0.0	0.0	0.0	1.32	23.3«	119.0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.229	0.229	0.229
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.049	0.049	0.049
1.002	-	-	100	0.039	0.039	0.039
3.000	-	-	100	0.067	0.067	0.067
3.001	-	-	100	0.012	0.012	0.012
1.003	-	-	100	0.032	0.032	0.032
4.000	-	-	100	0.067	0.067	0.067
4.001	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.045	0.045	0.045
5.000	-	-	100	0.088	0.088	0.088
5.001	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.113	0.113	0.113
6.001	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.009	0.009	0.009
7.000	-	-	100	0.054	0.054	0.054
7.001	-	-	100	0.075	0.075	0.075
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.879	0.879	0.879

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)
S1.007	S	107.000	106.214	106.200	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	0.000
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	5
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
Return Period (years)	2
FEH Rainfall Version	2013

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Synthetic Rainfall Details

Site Location GB 443182 291018 SP 43182 91018	
Data Type	Point
Summer Storms	Yes
Winter Storms	No
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S19, DS/PN: S1.007, Volume (m³): 5.1

Unit Reference	MD-SHE-0088-3700-1200-3700
Design Head (m)	1.200
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	88
Invert Level (m)	106.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.7
Flush-Flo™	0.361	3.7
Kick-Flo®	0.743	3.0
Mean Flow over Head Range	-	3.2

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	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.5	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.7	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.7	1.800	4.5	4.500	6.9	8.500	9.3
0.500	3.6	2.000	4.7	5.000	7.2	9.000	9.5
0.600	3.5	2.200	4.9	5.500	7.5	9.500	9.8
0.800	3.1	2.400	5.1	6.000	7.9		
1.000	3.4	2.600	5.3	6.500	8.2		

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Storage Structures for Storm

Porous Car Park Manhole: S6, DS/PN: S3.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	32.5
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	45.1	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	109.620	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S9, DS/PN: S4.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	38.5
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	53.5	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	109.220	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S12, DS/PN: S5.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	42.5
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	59.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	108.745	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S15, DS/PN: S6.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	55.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	76.4	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	108.420	Cap Volume Depth (m)	0.350

Cellular Storage Manhole: S19, DS/PN: S1.007

Invert Level (m)	106.500	Safety Factor	2.0
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	570.0	0.0	1.210	0.0	0.0
1.200	570.0	0.0			

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2 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 0.000
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 5
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 2013
Site Location GB 443182 291018 SP 43182 91018
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	2	+0%	100/15 Summer			
S1.001	S2	15 Winter	2	+0%	30/15 Winter			
S2.000	S3	15 Winter	2	+0%	30/15 Summer	100/15 Winter		
S1.002	S4	15 Winter	2	+0%	30/15 Summer			
S3.000	S5	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S3.001	S6	15 Winter	2	+0%	30/15 Summer			
S1.003	S7	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S4.000	S8	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S4.001	S9	15 Winter	2	+0%	30/15 Summer			
S1.004	S10	15 Winter	2	+0%	30/15 Summer			
S5.000	S11	15 Winter	2	+0%	30/15 Summer			
S5.001	S12	15 Winter	2	+0%	30/15 Summer			
S1.005	S13	15 Winter	2	+0%	30/15 Summer			
S6.000	S14	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S6.001	S15	15 Winter	2	+0%	30/15 Summer			
S1.006	S16	15 Winter	2	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	110.513	-0.187	0.000	0.29			33.7	OK	
S1.001	S2	109.664	-0.211	0.000	0.19			33.7	OK	
S2.000	S3	109.512	-0.073	0.000	0.51			7.3	OK	1
S1.002	S4	109.186	-0.199	0.000	0.25			46.1	OK	
S3.000	S5	109.134	-0.066	0.000	0.59			9.9	OK	4
S3.001	S6	108.816	-0.084	0.000	0.40		7	10.0	OK	
S1.003	S7	108.242	-0.133	0.000	0.60			60.0	OK	4
S4.000	S8	108.491	-0.059	0.000	0.67			10.1	OK	4
S4.001	S9	108.134	-0.141	0.000	0.30		7	10.2	OK	
S1.004	S10	108.086	-0.114	0.000	0.70			75.0	OK	
S5.000	S11	108.076	-0.124	0.000	0.40			12.9	OK	
S5.001	S12	107.900	-0.125	0.000	0.41		7	12.9	OK	
S1.005	S13	107.840	-0.135	0.000	0.57			87.9	OK	
S6.000	S14	107.786	-0.114	0.000	0.46			16.4	OK	2
S6.001	S15	107.540	-0.110	0.000	0.51		5	16.2	OK	
S1.006	S16	107.468	-0.132	0.000	0.60			105.7	OK	

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2 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.
S7.000	S17	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S7.001	S18	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S1.007	S19	600 Winter	2	+0%	2/60 Winter			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S7.000	S17	108.235	-0.065	0.000	0.60			8.0	OK
S7.001	S18	108.124	-0.076	0.000	0.48			17.6	OK
S1.007	S19	106.771	0.121	0.000	0.17		460	3.6	SURCHARGED

PN	US/MH Name	Level Exceeded
S7.000	S17	4
S7.001	S18	4
S1.007	S19	

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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 0.000
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 5
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 2013
Site Location GB 443182 291018 SP 43182 91018
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	30	+35%	100/15 Summer			
S1.001	S2	15 Winter	30	+35%	30/15 Winter			
S2.000	S3	15 Winter	30	+35%	30/15 Summer	100/15 Winter		
S1.002	S4	15 Winter	30	+35%	30/15 Summer			
S3.000	S5	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S3.001	S6	15 Winter	30	+35%	30/15 Summer			
S1.003	S7	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S4.000	S8	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S4.001	S9	15 Winter	30	+35%	30/15 Summer			
S1.004	S10	15 Winter	30	+35%	30/15 Summer			
S5.000	S11	15 Winter	30	+35%	30/15 Summer			
S5.001	S12	15 Winter	30	+35%	30/15 Summer			
S1.005	S13	15 Winter	30	+35%	30/15 Summer			
S6.000	S14	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S6.001	S15	15 Winter	30	+35%	30/15 Summer			
S1.006	S16	15 Winter	30	+35%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	110.623	-0.077	0.000	0.87			99.8	OK
S1.001	S2	109.979	0.104	0.000	0.54			94.9	SURCHARGED
S2.000	S3	110.119	0.534	0.000	1.35			19.5	SURCHARGED
S1.002	S4	109.871	0.486	0.000	0.63			117.8	SURCHARGED
S3.000	S5	110.271	1.071	0.000	1.37			23.2	FLOOD RISK
S3.001	S6	109.716	0.816	0.000	1.28		4	31.7	SURCHARGED
S1.003	S7	109.529	1.154	0.000	1.35			135.2	FLOOD RISK
S4.000	S8	109.861	1.311	0.000	1.46			22.0	FLOOD RISK
S4.001	S9	109.254	0.979	0.000	0.77		5	26.1	SURCHARGED
S1.004	S10	109.226	1.026	0.000	1.50			162.1	FLOOD RISK
S5.000	S11	108.914	0.714	0.000	1.05			33.8	SURCHARGED
S5.001	S12	108.757	0.732	0.000	0.93		6	29.2	SURCHARGED
S1.005	S13	108.727	0.752	0.000	1.24			189.6	SURCHARGED
S6.000	S14	108.549	0.649	0.000	1.23			43.8	SURCHARGED
S6.001	S15	108.243	0.593	0.000	1.27		6	40.1	SURCHARGED
S1.006	S16	108.160	0.560	0.000	1.31			231.3	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S2.000	S3	1
S1.002	S4	
S3.000	S5	4
S3.001	S6	
S1.003	S7	4
S4.000	S8	4
S4.001	S9	
S1.004	S10	
S5.000	S11	
S5.001	S12	
S1.005	S13	
S6.000	S14	2
S6.001	S15	
S1.006	S16	

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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.
S7.000	S17	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S7.001	S18	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S1.007	S19	720 Winter	30	+35%	2/60 Winter			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S7.000	S17	109.429	1.129	0.000	1.61			21.4	FLOOD RISK
S7.001	S18	109.209	1.009	0.000	1.27			46.4	FLOOD RISK
S1.007	S19	107.328	0.678	0.000	0.17		1200	3.7	SURCHARGED

PN	US/MH Name	Level Exceeded
S7.000	S17	4
S7.001	S18	4
S1.007	S19	

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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 0.000
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 5
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 2013
Site Location GB 443182 291018 SP 43182 91018
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	100	+40%	100/15 Summer			
S1.001	S2	15 Winter	100	+40%	30/15 Winter			
S2.000	S3	15 Winter	100	+40%	30/15 Summer	100/15 Winter		
S1.002	S4	15 Winter	100	+40%	30/15 Summer			
S3.000	S5	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S3.001	S6	15 Winter	100	+40%	30/15 Summer			
S1.003	S7	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S4.000	S8	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S4.001	S9	15 Winter	100	+40%	30/15 Summer			
S1.004	S10	15 Winter	100	+40%	30/15 Summer			
S5.000	S11	15 Winter	100	+40%	30/15 Summer			
S5.001	S12	15 Winter	100	+40%	30/15 Summer			
S1.005	S13	15 Winter	100	+40%	30/15 Summer			
S6.000	S14	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S6.001	S15	15 Winter	100	+40%	30/15 Summer			
S1.006	S16	15 Winter	100	+40%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	111.485	0.785	0.000	1.11			127.6	SURCHARGED
S1.001	S2	110.529	0.654	0.000	0.68			118.8	SURCHARGED
S2.000	S3	110.700	1.115	0.381	1.52			22.0	FLOOD
S1.002	S4	110.303	0.918	0.000	0.82			152.9	SURCHARGED
S3.000	S5	110.402	1.202	2.110	1.52			25.6	FLOOD
S3.001	S6	109.819	0.919	0.000	1.60		5	39.5	FLOOD RISK
S1.003	S7	109.611	1.236	10.559	1.39			139.9	FLOOD
S4.000	S8	109.878	1.328	2.940	1.59			23.9	FLOOD
S4.001	S9	109.343	1.068	0.000	1.69		6	57.5	SURCHARGED
S1.004	S10	109.316	1.116	0.000	1.58			170.3	FLOOD RISK
S5.000	S11	109.262	1.062	0.000	1.47			47.4	FLOOD RISK
S5.001	S12	108.875	0.850	0.000	1.19		4	37.6	SURCHARGED
S1.005	S13	108.842	0.867	0.000	1.33			203.4	FLOOD RISK
S6.000	S14	109.100	1.200	0.503	1.62			57.5	FLOOD
S6.001	S15	108.448	0.798	0.000	1.76		8	55.5	SURCHARGED
S1.006	S16	108.293	0.693	0.000	1.37			242.7	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S2.000	S3	1
S1.002	S4	
S3.000	S5	4
S3.001	S6	
S1.003	S7	4
S4.000	S8	4
S4.001	S9	
S1.004	S10	
S5.000	S11	
S5.001	S12	
S1.005	S13	
S6.000	S14	2
S6.001	S15	
S1.006	S16	

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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.
S7.000	S17	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S7.001	S18	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S1.007	S19	720 Winter	100	+40%	2/60 Winter			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S7.000	S17	109.504	1.204	3.813	2.52			33.7	FLOOD
S7.001	S18	109.402	1.202	1.539	1.33			48.6	FLOOD
S1.007	S19	107.683	1.033	0.000	0.17		1668	3.7	SURCHARGED

PN	US/MH Name	Level Exceeded
S7.000	S17	4
S7.001	S18	4
S1.007	S19	

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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)	2
FEH Rainfall Version	2013
Site Location	GB 443182 291018 SP 43182 91018
Data Type	Point
Maximum Rainfall (mm/hr)	50
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)	0.200
Maximum Backdrop Height (m)	1.500
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	0.534	4-8	0.272

Total Area Contributing (ha) = 0.806

Total Pipe Volume (m³) = 12.182

Network Design Table for Storm

« - Indicates pipe capacity < flow

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	58.517	0.375	156.0	0.155	5.00	0.0	0.600	o	225	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	50.00	5.93	107.875	0.155	0.0	0.0	0.0	1.04	41.5	21.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.001	35.753	0.200	178.8	0.085	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	22.907	1.700	13.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	29.394	0.150	196.0	0.147	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	41.999	0.200	210.0	0.040	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	24.047	2.050	11.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	34.977	0.250	139.9	0.048	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	14.394	0.400	36.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.000	29.589	0.200	147.9	0.044	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	25.128	0.200	125.6	0.063	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.002	5.588	0.050	111.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.002	23.917	1.200	19.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S5.000	33.395	0.250	133.6	0.044	5.00	0.0	0.600	o	150	Pipe/Conduit	
S5.001	28.559	2.100	13.6	0.045	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	15.428	0.500	30.9	0.135	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)
S1.001	50.00	6.55	107.500	0.240	0.0	0.0	0.0	0.97	38.8	32.5
S1.002	50.00	6.65	107.300	0.240	0.0	0.0	0.0	3.58	142.5	32.5
S2.000	50.00	5.53	108.000	0.147	0.0	0.0	0.0	0.93	37.0	19.9
S2.001	50.00	6.31	107.850	0.187	0.0	0.0	0.0	0.90	35.7	25.3
S2.002	50.00	6.41	107.650	0.187	0.0	0.0	0.0	3.84	152.8	25.3
S3.000	50.00	5.69	107.450	0.048	0.0	0.0	0.0	0.85	15.0	6.5
S3.001	50.00	5.83	107.200	0.048	0.0	0.0	0.0	1.68	29.7	6.5
S4.000	50.00	5.60	107.250	0.044	0.0	0.0	0.0	0.82	14.6	6.0
S4.001	50.00	6.07	107.050	0.107	0.0	0.0	0.0	0.90	15.8	14.5
S4.002	50.00	6.16	106.850	0.107	0.0	0.0	0.0	0.95	16.8	14.5
S3.002	50.00	6.34	106.800	0.155	0.0	0.0	0.0	2.27	40.1	21.0
S5.000	50.00	5.64	107.950	0.044	0.0	0.0	0.0	0.87	15.3	6.0
S5.001	50.00	5.81	107.700	0.089	0.0	0.0	0.0	2.75	48.5	12.1
S1.003	50.00	6.79	105.600	0.806	0.0	0.0	0.0	1.82	32.1«	109.1

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.155	0.155	0.155
1.001	-	-	100	0.085	0.085	0.085
1.002	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.147	0.147	0.147
2.001	-	-	100	0.040	0.040	0.040
2.002	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.048	0.048	0.048
3.001	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.044	0.044	0.044
4.001	-	-	100	0.063	0.063	0.063
4.002	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.044	0.044	0.044
5.001	-	-	100	0.045	0.045	0.045
1.003	-	-	100	0.135	0.135	0.135
				Total	Total	Total
				0.806	0.806	0.806

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)
S1.003	S	106.000	105.100	105.000	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	0.000
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	6
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
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 443182 291018 SP 43182 91018
Data Type	Point
Summer Storms	Yes
Winter Storms	No

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Synthetic Rainfall Details

Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S15, DS/PN: S1.003, Volume (m³): 6.5

Unit Reference	MD-SHE-0078-3700-2000-3700
Design Head (m)	2.000
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	78
Invert Level (m)	105.600
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	3.7
Flush-Flo™	0.347	2.8
Kick-Flo®	0.701	2.3
Mean Flow over Head Range	-	2.8

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	2.2	1.200	2.9	3.000	4.5	7.000	6.6
0.200	2.7	1.400	3.1	3.500	4.8	7.500	6.9
0.300	2.8	1.600	3.3	4.000	5.1	8.000	7.1
0.400	2.8	1.800	3.5	4.500	5.4	8.500	7.3
0.500	2.8	2.000	3.7	5.000	5.7	9.000	7.5
0.600	2.6	2.200	3.9	5.500	5.9	9.500	7.7
0.800	2.4	2.400	4.0	6.000	6.2		
1.000	2.7	2.600	4.2	6.500	6.4		

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Storage Structures for Storm

Porous Car Park Manhole: S1, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	26.4
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	36.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	108.820	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S2, DS/PN: S1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	19.2
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	26.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	108.870	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S3, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	32.2
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	44.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	108.820	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S10, DS/PN: S4.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	33.5
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	46.5	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	108.120	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S11, DS/PN: S4.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	30.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	41.7	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	107.820	Cap Volume Depth (m)	0.350

Cellular Storage Manhole: S15, DS/PN: S1.003

Invert Level (m)	105.600	Infiltration Coefficient Side (m/hr)	0.00000
Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0

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Cellular Storage Manhole: S15, DS/PN: S1.003

Porosity 0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	300.0	0.0	2.100	0.0	0.0
2.000	300.0	0.0			

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2 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	0.000
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	6
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	2013
Site Location	GB 443182 291018 SP 43182 91018
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	2	+0%	30/15 Summer			
S1.001	S2	15 Winter	2	+0%	30/15 Summer			
S1.002	S3	15 Winter	2	+0%	100/480 Winter			
S2.000	S4	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S2.001	S5	15 Winter	2	+0%	30/15 Summer			
S2.002	S6	15 Winter	2	+0%				
S3.000	S7	15 Winter	2	+0%	30/15 Summer			
S3.001	S8	15 Winter	2	+0%	30/15 Summer			
S4.000	S9	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
S4.001	S10	15 Winter	2	+0%	30/15 Summer			
S4.002	S11	15 Winter	2	+0%	30/15 Summer			
S3.002	S12	15 Winter	2	+0%	30/15 Summer			
S5.000	S13	15 Winter	2	+0%	30/15 Summer			
S5.001	S14	15 Winter	2	+0%	100/15 Summer			
S1.003	S15	480 Winter	2	+0%	2/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	108.000	-0.100	0.000	0.56		6	22.5	OK
S1.001	S2	107.667	-0.058	0.000	0.89		5	32.4	OK
S1.002	S3	107.376	-0.149	0.000	0.25		7	32.5	OK
S2.000	S4	108.132	-0.093	0.000	0.63			21.7	OK
S2.001	S5	108.000	-0.075	0.000	0.77			26.0	OK
S2.002	S6	107.715	-0.160	0.000	0.19			26.1	OK
S3.000	S7	107.526	-0.074	0.000	0.49			7.1	OK
S3.001	S8	107.252	-0.098	0.000	0.26			7.1	OK
S4.000	S9	107.323	-0.077	0.000	0.47			6.5	OK
S4.001	S10	107.167	-0.033	0.000	0.95		7	14.3	OK
S4.002	S11	106.983	-0.017	0.000	1.00		4	13.9	OK
S3.002	S12	106.879	-0.071	0.000	0.55			20.7	OK
S5.000	S13	108.021	-0.079	0.000	0.44			6.5	OK
S5.001	S14	107.752	-0.098	0.000	0.26			12.2	OK
S1.003	S15	106.080	0.330	0.000	0.09		472	2.8	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S2.000	S4	4
S2.001	S5	
S2.002	S6	
S3.000	S7	
S3.001	S8	
S4.000	S9	4
S4.001	S10	
S4.002	S11	
S3.002	S12	
S5.000	S13	
S5.001	S14	
S1.003	S15	

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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	0.000
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	6
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	2013
Site Location	GB 443182 291018 SP 43182 91018
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	30	+35%	30/15 Summer			
S1.001	S2	15 Summer	30	+35%	30/15 Summer			
S1.002	S3	15 Winter	30	+35%	100/480 Winter			
S2.000	S4	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S2.001	S5	15 Winter	30	+35%	30/15 Summer			
S2.002	S6	15 Winter	30	+35%				
S3.000	S7	15 Winter	30	+35%	30/15 Summer			
S3.001	S8	15 Winter	30	+35%	30/15 Summer			
S4.000	S9	15 Winter	30	+35%	30/15 Summer	100/15 Summer		
S4.001	S10	15 Winter	30	+35%	30/15 Summer			
S4.002	S11	15 Winter	30	+35%	30/15 Summer			
S3.002	S12	15 Winter	30	+35%	30/15 Summer			
S5.000	S13	15 Winter	30	+35%	30/15 Summer			
S5.001	S14	15 Winter	30	+35%	100/15 Summer			
S1.003	S15	720 Winter	30	+35%	2/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	108.975	0.875	0.000	1.37		3	55.0	SURCHARGED
S1.001	S2	108.540	0.815	0.000	2.15		7	78.8	SURCHARGED
S1.002	S3	107.427	-0.098	0.000	0.61		9	80.0	OK
S2.000	S4	109.342	1.117	0.000	1.74			60.0	FLOOD RISK
S2.001	S5	108.870	0.795	0.000	2.17			73.9	SURCHARGED
S2.002	S6	107.766	-0.109	0.000	0.52			73.6	OK
S3.000	S7	107.860	0.260	0.000	1.39			20.0	SURCHARGED
S3.001	S8	107.503	0.153	0.000	0.64			17.6	SURCHARGED
S4.000	S9	108.531	1.131	0.000	1.23			17.2	FLOOD RISK
S4.001	S10	108.215	1.015	0.000	2.10		4	31.7	SURCHARGED
S4.002	S11	107.584	0.584	0.000	2.02		6	28.1	SURCHARGED
S3.002	S12	107.396	0.446	0.000	1.09			41.3	SURCHARGED
S5.000	S13	108.265	0.165	0.000	1.26			18.7	SURCHARGED
S5.001	S14	107.807	-0.043	0.000	0.83			38.4	OK
S1.003	S15	107.032	1.282	0.000	0.11		1296	3.2	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S2.000	S4	4
S2.001	S5	
S2.002	S6	
S3.000	S7	
S3.001	S8	
S4.000	S9	4
S4.001	S10	
S4.002	S11	
S3.002	S12	
S5.000	S13	
S5.001	S14	
S1.003	S15	

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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 0.000
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 6
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 2013
Site Location GB 443182 291018 SP 43182 91018
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	100	+40%	30/15 Summer			
S1.001	S2	15 Summer	100	+40%	30/15 Summer			
S1.002	S3	720 Winter	100	+40%	100/480 Winter			
S2.000	S4	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S2.001	S5	15 Summer	100	+40%	30/15 Summer			
S2.002	S6	15 Winter	100	+40%				
S3.000	S7	15 Winter	100	+40%	30/15 Summer			
S3.001	S8	15 Winter	100	+40%	30/15 Summer			
S4.000	S9	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S4.001	S10	15 Winter	100	+40%	30/15 Summer			
S4.002	S11	15 Winter	100	+40%	30/15 Summer			
S3.002	S12	15 Winter	100	+40%	30/15 Summer			
S5.000	S13	15 Winter	100	+40%	30/15 Summer			
S5.001	S14	15 Winter	100	+40%	100/15 Summer			
S1.003	S15	720 Winter	100	+40%	2/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	109.184	1.084	0.000	1.50		6	60.0	FLOOD RISK
S1.001	S2	108.785	1.060	0.000	2.41		11	88.0	SURCHARGED
S1.002	S3	107.631	0.106	0.000	0.09		204	12.3	SURCHARGED
S2.000	S4	109.505	1.280	4.701	2.01			69.4	FLOOD
S2.001	S5	109.105	1.030	0.000	2.39			81.3	FLOOD RISK
S2.002	S6	107.774	-0.101	0.000	0.58			82.0	OK
S3.000	S7	108.413	0.813	0.000	1.74			25.2	SURCHARGED
S3.001	S8	107.884	0.534	0.000	0.77			21.1	SURCHARGED
S4.000	S9	108.601	1.201	1.257	1.33			18.5	FLOOD
S4.001	S10	108.315	1.115	0.000	2.14		6	32.2	FLOOD RISK
S4.002	S11	107.816	0.816	0.000	2.08		10	28.9	SURCHARGED
S3.002	S12	107.665	0.715	0.000	1.15			43.7	SURCHARGED
S5.000	S13	108.690	0.590	0.000	1.62			24.0	SURCHARGED
S5.001	S14	108.015	0.165	0.000	0.99			46.1	SURCHARGED
S1.003	S15	107.628	1.878	0.000	0.13		1584	3.7	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S2.000	S4	4
S2.001	S5	
S2.002	S6	
S3.000	S7	
S3.001	S8	
S4.000	S9	4
S4.001	S10	
S4.002	S11	
S3.002	S12	
S5.000	S13	
S5.001	S14	
S1.003	S15	

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Appendix 7: SuDS O&M

A CAF GROUP COMPANY

ENVIRONMENT

Welcome Break Ltd
Stretton Court
Hinckley
SuDS O&M Plan

August 2023

Document Number:	SCH-BWB-ZZ-XX-RP-CD-0002_SuDS O&M Plan
BWB Reference:	232728_O&M

Revision	Date of Issue	Status	Author:	Checked:	Approved:
P01	21/08/23	S2	Catherine Thorpe BSc (Hons) MCInstCES	Rowan Jobling BEng (Hons)	Rowan Jobling BEng (Hons)

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The information presented, and conclusions drawn, are based on statistical data and are for guidance purposes only. The study provides no guarantee against flooding of the study site or elsewhere, nor of the absolute accuracy of water levels, flow rates and associated probabilities.

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1. INTRODUCTION

1.1 This Sustainable Drainage System (SuDS) Operation and Maintenance (O&M) Plan has been prepared on behalf of Welcome Break Ltd in respect of the SuDS proposed to accompany a potential development of a new Motorway Services Area (MSA) at Stretton Court, Hinckley.

1.2 The proposed drainage system for the development adopts a series of SuDS to control the rate of storm water discharge and the quality of the water in line with current best practice and local and national policy. It is important that the drainage system is maintained, to ensure that SuDS elements operate effectively for their lifetime.

1.3 All drainage systems require regular maintenance. The maintenance of the drainage systems should be included alongside other regular maintenance tasks. The tables in **Section 2** give an overview of typical maintenance tasks and the frequency with which they need to be undertaken for each element of the drainage system.

1.4 This SuDS O&M Plan should be incorporated within the Operation and Maintenance manual for the site and be accessible to those who undertake maintenance. It is anticipated that the O&M manual will be developed by the civil contractor appointed to undertake the construction of the proposed development.

1.5 This SuDS O&M Plan should be read in conjunction with the Sustainable Drainage Statement (SDS) (ref: SCH-BWB-ZZ-XX-RP-CD-0001_SDS) produced by BWB Consulting. Any specialist or proprietary products that are specified at construction design should have a manufacturer specific maintenance regime which should be included within the O&M manual.

2. GUIDANCE AND THE SuDS MANUAL

Local Guidance

2.1 Warwickshire County Council have produced a local guidance document, Flood Risk & Sustainable Drainage Local Guidance for Developers[1], which provides information on the relevant policies and guidance for sustainable drainage for new developments.

2.2 Leicestershire County Council have also published online SuDS guidance for new developments which includes a Statutory Consultation Checklist[2] and Interim LLFA Guidance Note[3].

2.3 LLFA guidance from both Warwickshire County Council and Leicestershire County Council has been reviewed in the production of this report.

The SuDS Manual

2.4 The CIRIA SuDS Manual C753[4] provides guidance for the planning, design, construction and maintenance of SuDS to assist with their effective implementation within both new and existing developments. The SuDS Manual has been used to inform maintenance schedules for the specific SuDS proposed within the SDS.

Proprietary Treatment Systems

2.5 The SuDS Manual maintenance schedule for proprietary treatment systems, is shown in **Table 2.1**.

Table 2.1: The SuDS Manual Typical Maintenance Schedule for Proprietary Treatment Systems

Maintenance Schedule	Typical Frequency	Required Action
Routine Maintenance	Six monthly	• Remove litter and debris and inspect for sediment, oil and grease accumulation.
	As recommended by manufacturer	• Change the filter media.
	As necessary – indicated by system inspections or immediately following significant spill	• Remove sediment, oil, grease and floatables.
Remedial Actions	As required	• Replace malfunctioning parts or structures.

[1] Flood Risk & Sustainable Drainage Local Guidance for Developers (WCC January 2023)
[2] Lead Local Flood Authority Statutory Consultation Checklist (Leicestershire County Council October 2018)
[3] Interim LLFA Guidance Note: Planning and Development in Leicestershire (Leicestershire County Council October 2018)
[4] The SuDS Manual C753 (CIRIA 2015)

Maintenance Schedule	Typical Frequency	Required Action
Monitoring	Six monthly	• Inspect for evidence of poor operation; and • Inspect filter media and establish appropriate replacement frequencies.
	Monthly during first half year of operation, then every six months	• Inspect sediment accumulation rates and establish appropriate removal frequencies.

Filter Drains (if Used)

2.6 The SuDS Manual maintenance schedule for filter drains, is shown in **Table 2.2**.

Table 2.2: The SuDS Manual Typical Maintenance Schedule for Filter Drains

Maintenance Schedule	Typical Frequency	Required Action
Regular Maintenance	Monthly (or as required)	• Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices.
	Monthly	• Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage.
	Six monthly (or as required)	• Remove sediment from pre-treatment devices.
	Six monthly	• Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies.
Occasional Maintenance	Five yearly, or as required	• At locations with high pollution loads, remove surface geotextiles and replace, and wash or replace overlying filter medium.
	As required	• Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998:2010); and • Clear perforated pipework of blockages.

Bioretention Systems

2.7 The SuDS Manual maintenance schedule for bioretention systems, is shown in **Table 2.3**.

Table 2.3: The SuDS Manual Typical Maintenance Schedule for Bioretention Systems

Maintenance Schedule	Typical Frequency	Required Action
Regular Inspections	Quarterly	• Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary; • Assess plants for disease infection, poor growth, invasive species etc and replace as necessary; and • Inspect inlets and outlets for blockage.
	Annually	• Check operation of underdrains by inspection of flows after rain.
Regular Maintenance	Quarterly (or more frequently for tidiness or aesthetic reasons)	• Remove litter and surface debris and weeds.
	As required	• Replace any plants, to maintain planting density.
	Quarterly to biannually	• Remove sediment, litter and debris build-up from around inlets or from forebays.
Occasional Maintenance	As required	• Infill any holes or scour in the filter medium, improve erosion protection if required; and • Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch.
Remedial Actions	As required (but likely to be > 20 years)	• Remove and replace filter medium and vegetation above.

Trees

2.8 The SuDS Manual maintenance schedule for trees, is shown in **Table 2.4**.

Table 2.4: The SuDS Manual Typical Maintenance Schedule for Trees

Maintenance Schedule	Typical Frequency	Required Action
Regular Maintenance	Monthly (or as required)	• Remove litter and debris.
	Monthly (at start, then as required).	• Manage other vegetation and remove nuisance plants.
	Inspect monthly	• Inspect inlets and outlets.
Occasional Maintenance	Half yearly	• Inspect silt accumulation rates and establish appropriate removal frequencies.

Maintenance Schedule	Typical Frequency	Required Action
	As required (in periods of drought)	• Water.
	Annually, or as required	• Remove silt build-up from inlets and surface and replace mulch as necessary.
Monitoring	Annually	• Check tree health and manage tree; and • appropriately.

Pervious Pavements

2.9 The SuDS Manual maintenance schedule for pervious pavements, is shown in **Table 2.5**.

Table 2.5: The SuDS Manual Typical Maintenance Schedule for Pervious Pavements

Maintenance Schedule	Typical Frequency	Required Action
Regular Maintenance	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment	• Brushing and vacuuming (standard cosmetic sweep over whole surface)
Occasional Maintenance	As required	• Stabilise and mow contributing and adjacent areas.
	As required (once per year on less frequently used pavements)	• Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying.
Monitoring	Annually	• Check tree health and manage tree; and • appropriately.
Remedial Actions	As required	• Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving; and • Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a

Maintenance Schedule	Typical Frequency	Required Action
		hazard to users, and replace lost jointing material.
	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging	• Rehabilitation of surface and upper substrate by remedial sweeping.
Monitoring	Monthly for three months after installation	• Initial inspection.
	Three-monthly, 48 h after large storms in first six months	• Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.
	Annually	• Inspect silt accumulation rates and establish appropriate brushing frequencies; and • Monitor inspection chambers.

Attenuation Storage Tanks

2.10 The SuDS Manual maintenance schedule for attenuation storage tanks, is shown in **Table 2.6**.

Table 2.6: The SuDS Manual Typical Maintenance Schedule for Attenuation Storage Tanks

Maintenance Schedule	Typical Frequency	Required Action
Regular Maintenance	Monthly for 3 months, then annually	• Inspect and identify any areas that are not operating correctly. If required, take remedial action.
	Monthly	• Inspect and identify any areas that are not operating correctly. If required, take remedial action.
	Annually	• For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.
	Annually, or as required	• Remove sediment from pre-treatment structures and/or internal forebays.
Remedial Actions	As required	• Repair/rehabilitate inlets, outlet, overflows and vents.
Remedial Action	Annually	• Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.

Maintenance Schedule	Typical Frequency	Required Action
	Every 5 years or as required	• Survey inside of tank for sediment build-up and remove if necessary

Vortex Flow Controls

2.11 Restriction of surface water flow rates of the site are proposed to be provided by a vortex flow control structure. A typical maintenance schedule for flow control structures is shown in **Table 2.7**.

Table 2.7: Typical Maintenance Schedule for Flow Control Structures

Maintenance Schedule	Typical Frequency	Required Action
Regular Maintenance	Monthly	• Inspect and identify any areas that are not operating correctly (for three months following installation).
	Every 6 months	• Inspect and identify any areas that are not operating correctly. Take remedial action if required. • Remove sediment from pre-treatment structures.
Remedial Actions	Following all significant storm events	• Inspect and carry out any essential recovery works to return the feature to full working order.

3. OPERATION AND MAINTEANCE

3.1 Regular inspections and maintenance are crucial for the effective operation of drainage infrastructure. During the development of the site and thereafter, a maintenance and management regime will be adopted. The future success of the drainage system is largely dependent on the standard and frequency of the subsequent maintenance and management it receives.

3.2 Maintenance responsibility should always be placed with an appropriate, long-term, accountable organisation.

3.3 The maintenance responsibilities of the proposed SuDS features and wider drainage system will be confirmed at the construction design phase, prior to the commencement of works within the site.

Maintenance and Access

3.4 For the proposed drainage systems to perform effectively, it is essential that all inlet, outlets, flow control devices, gullies, pipes, manhole structures and attenuation features are monitored to ensure they remain operational. Any specific manufacturer recommendations should be adhered to in the first instance.

3.5 Adequate access for inspection and maintenance should be available as necessary for the relevant parties, including appropriate equipment and vehicles.

Proprietary Systems

3.6 Many proprietary systems are beneath the ground, and malfunctioning is not easy to detect, and it is therefore often ignored unless alarms are provided or the system is designed to cause localised surface ponding if full.

3.7 Lack of routine maintenance is more likely to cause poor outflow water quality than with other SuDS due to resuspension of solids and anaerobic conditions developing within the device.

3.8 Harmful vapours may develop in subsurface filtration or hydrodynamic separation units, as hydrocarbons may remain there for extended periods of time. Appropriate testing for harmful vapours and venting should be undertaken whenever access for maintenance is required. Removal of oil, silt and other pollutants must be in accordance with the appropriate waste management legislation.

Filter Drains

3.9 If filter drains are implemented within private property, owners should be educated on their routine maintenance needs, and should understand the long-term Maintenance Plan and any legally binding maintenance agreement.

3.10 Sediment testing may be required before sediment excavation, to determine its classification and appropriate disposal methods. Any damage due to sediment removal or erosion should be repaired and immediately reseeded or planted.

Bioretention Systems

3.11 The main cause of failure of bioretention systems is clogging of the surface. During the first few months after installation, the system should be visually inspected after rainfall events, and the amount of deposition measured, to give the operator an idea of the expected rate of sediment deposition. After this initial period, systems should be inspected each quarter, to verify the appropriate level of maintenance.

3.12 All vegetation management activities should take account of the need to maximise biosecurity and prevent the spread of invasive species.

3.13 Sediment testing may be required before sediment excavation, to determine its classification and appropriate disposal methods. Any damage due to sediment removal or erosion should be repaired and immediately reseeded or planted.

Trees

3.14 Maintenance requirements of trees will be greatest within the first few years, when they are becoming established. Early maintenance should involve regular inspections and removal of any invasive species.

3.15 To establish an appropriate irrigation schedule, it may be necessary to consult an arboriculturist with adequate expertise and local knowledge.

3.16 The trees should be appropriately planted to enhance the amenity and biodiversity offering of the site.

3.17 Sediment testing may be required before sediment excavation, to determine its classification and appropriate disposal methods. Any damage due to sediment removal or erosion should be repaired and immediately reseeded or planted.

Pervious Paving

3.18 The pavement should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

3.19 Pervious pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. The frequency of sweeping should be adjusted to suit site-specific circumstances and should be informed by inspection reports. If the surface has clogged, then more specialist equipment may be required.

3.20 Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours and is not likely to pose a hazard to vehicle movements.

Attenuation Storage Tanks

3.21 If the proposed attenuation storage tank is below ground, generally it is not easily accessible so upstream treatment for sediment removal is required. The proposed drainage strategy should include silt traps on downpipes and gullies to reduce the frequency with which access to the tank is required.

Vortex Flow Control

3.22 Any manufacturer's guidance should be adhered to in the first instance. If a maintenance schedule is not provided by the manufacturer, then the maintenance schedule outlined in **Table 2.7** should be considered as a guide.

Inspection routine

3.23 In the absence of specific manufacturer's guidance on inspections, the following section should be used as a guide.

3.24 During operational monitoring, the structures should be assessed against a range of criteria: condition, structural performance, hydraulic performance, environmental performance and health and safety.

3.25 The maintenance guidance for the surface water systems on-site is recorded in **Section 2**. In line with CIRIA definitions, inspections are separated into two categories, General and Principal, which are defined as follows:

- A general inspection is the examination of all parts of a structure that can be inspected without specialist equipment.
- A principal inspection is defined as a close examination of all accessible parts, including adjacent earthworks, with man-entry or CCTV inspection taking place. Note that pressure jetting may be required prior to CCTV inspection

3.26 All inspections carried out should be recorded and retained on file.

Appendix 8: Sewer Records & Pre-Development Enquiry

WONDERFUL ON TAP

SEVERN TRENT

Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

www.stwater.co.uk

Email:
Network.Solutions@SevernTrent.co.uk
Page Barot
Tel:
Our ref: 1090482

BWB Consulting Ltd,
5th Floor Waterfront House,
Station Street,
Nottingham
NG2 3DQ

F.A.O: Alex Eaton

10.08.2023

Dear Sir/Madam,

Proposed Development: (2 commercial) Stretton Court, Wolvey Road, Burbage, Hinckley, LE10 3JB, 443189, 291030

I refer to your 'Development Enquiry Request' in respect of the above named site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) which refer to surface water disposal from development sites.

Protective Strip

Sewer Records show a public 100mm pressurised sewer and associated manhole along side Roman Road. This sewer will require a 8m clearance about the pipe's centreline (4m each side) where no planting of trees or construction shall be permitted.

Sewer Records also show a public 225mm foul sewer and associated manhole along side Roman Road. This sewer will require a 6m clearance about the pipe's centreline (3m each side) where no planting of trees or construction shall be permitted.

Due to a change in legislation on 1 October 2011 there may be former private sewers on the site which have transferred to the responsibility of Severn Trent Water Ltd, which are not shown on the statutory sewer records, but are located in your client's land. These sewers would require protective strips of 3 metres either side of the sewer's centreline that we will not allow to be built over. If such sewers are identified to be present on the site, please contact us for further guidance.

Please note: there is no guarantee that you will be able to build over or close to any Severn Trent sewers, and where a diversion is required there is no guarantee that you will be able to undertake those works on a self-lay basis. Every approach to build near to or divert our assets has to be assessed on its own merit and the decision of what is or isn't permissible is taken based on the risk to the asset and the wider catchment it serves. It is vital therefore that you contact us at the earliest opportunity to discuss the implications of our assets crossing your site. Failure to do so could significantly affect the costs and timescales of your project if it transpires diversionary works need to be carried out by Severn Trent.

Foul Water Drainage

The 225mm foul sewer, MH SP42919301 along Rufford Close would be the most suitable connection point for your development. The network can accommodate flows for 2 commercial units. Therefore, a connection is acceptable to the company subject to a S106 submission. A pressurised sewer will be needed to reach the connection point.

The Foul sewer located north of the site MH - SP43911101 would not be suitable for your units as it would be able to handle the flows.

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If these are found to be unsuitable, satisfactory evidence will need to be submitted. The evidence should be either percolation test results or by the submission of a statement from the SI consultant (extract or a supplementary letter).

Severn Trent Water expects all surface water from the development to be drained in a sustainable way to the nearest watercourse or land drainage channel, subject to the developer discussing all aspects of the developments surface water drainage with the Local Lead Flood Authority (LLFA). Any discharge rate to a watercourse or drainage ditch will be determined by the LLFA / EA.

Sewer records show a watercourse that runs south of the site. It is advised to pursue a connection to this if feasible, with flow rates to be agreed by the LLFA.

Connections

For any new connections (including the re-use of existing connections) to the public sewerage system, the developer will need to submit a Section 106 application form. Our Developer Services department are responsible for handling all new connections enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 7076600 or download from www.stwater.co.uk.

Please quote the above reference in any future correspondence (including e-mails) with STW Limited. Please note that Developer Enquiry responses are only valid for 6 months from the date of this letter.

Yours sincerely

[redacted]

Page Barot
Network Solutions
Developer Services