



Drainage Strategy Report

Stinders Homes SPV1 Limited

Crossroads Nurseries Phase 2, Main Street Quadring

February 2022

Stinders Homes SPV1 Limited

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February 2021

**Quality Assurance**

Site name Crossroads Nurseries Phase 2, Main Street Quadring

Client name Stinders Homes SPV1 Limited

Type of report Drainage Strategy Report

Job Reference 8896

Prepared by John Russell

Date February 2022

Reviewed by Alasdair Rowlands

Date February 2022



Rev	Date	Details	Prepared by	Checked by
V.01	February 2022	Preliminary Issue	JR	AR



Introduction

Barter Hill Partnership Limited Consulting Engineers have been commissioned by Stinders Homes SPV1 Limited to prepare a Preliminary Drainage Strategy to serve the phase 2 residential development site comprising of 61 units. The aim of this strategy report is to explain the basic elements of the foul and surface water drainage design, as well as all necessary flood mitigation methods and SuDS features that are incorporated into the design; in accordance with information set out in the Flood Risk Assessment produced by SM Hemmings dated 21 September 2018.

Site Location and Proposals

The site is located in the centre of Quadring, north of Water Gate and east of Main Road (A152) in the village of Quadring. The National Grid Reference for the site is E522450, N333320. The development site area is approximately 3.7 ha. of which 9 plots on phase 1 comprising of 0.69ha is already approved.

The topography is generally flat and the site was a formerly used for a commercial plant nursery however phase 2 is entirely greenfield. The site is surrounded by farmland to the north and east with phase 1 to the west. There are well defined ordinary watercourses along all boundaries.

Foul & Surface Water Drainage Design

The proposed strategy is shown on the drawing no. 8896-501-01 P1 within the appendix.

Foul Water

A gravity system serving phase 1 of the development has been approved which connects to an existing Anglian Water 150mm dia. foul sewer located within Main Road (A152)

Due to existing site levels a pumped discharge from phase 2 will be required and as detailed on the strategy plan a pump station will be provided on the eastern boundary with a rising main connection to the new gravity system within the boundary of phase 1.

Surface Water

The site is identified as being underlain by Oxford Clays and as such has limited potential for infiltration. It is proposed therefore that surface water will drain via a piped network into an attenuation basin located at the east of the site.

The basin can be designed to incorporate multiple features of treatment including stilling ponds, a permanent wet basin and reed beds to form an integral part of the landscaping proposals to enhance on-site water treatment in accordance with the

Permeable paving will be utilised for source control and swales positioned within the surface water drainage design to provide additional upstream storage and surface water treatment, prior to discharge to the basin.

Initial consultations have been made with both Lincolnshire County Council, the Lead Local Flood Authority (LLFA) and Welland and Deeping Internal Drainage Board (IDB) and the greenfield runoff rate from the site, based on the developable area, has been calculated at 1.3 l/s. As this discharge rate is very low and more difficult to control with the potential for blockages, in addition flood risk is identified as very low in the aforementioned FRA it is therefore proposed that an acceptable rate of 5l/s will be appropriate.

The surface water drainage strategy has been designed to accommodate all storm events up to and including a 1 in 100 year + 40% climate change storm event (plus an additional 10% allowance for urban creep), without any on site flooding of the network. The design is in accordance with the Lincolnshire County Council LLFA Guidance 'SUDS Design & Evaluation Guide', Ciria SUDS Manual C753, Anglian Water's SUDS Guidance and Sewerage Sector Guidance Appendix C V2.0.

Management and maintenance of the various SUDS technique will be provided for as follows:

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove sediment and debris from inspection chambers and flow control chambers.	Annually
	Cleaning of gutters and any filters on downpipes.	Annually
	Remove any root ingress.	As required
Occasional Maintenance	CCTV survey of drains to check alignment, cracking and joint displacement.	10-year intervals

Table 1.1 Private Drainage Pipes Maintenance Schedule

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove sediment and debris from inspection chambers and flow control chambers.	Annually
	Remove any root ingress.	As required
Occasional Maintenance	CCTV survey of drains to check alignment, cracking and joint displacement.	10-year intervals

Table 1.2 Adoptable Drainage Pipes Maintenance Schedule

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for the first 3 months, then annually
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Where rainfall infiltrates into the tank from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Annually, or as required
	Remove sediment from pre-treatment structures (catchpit/silt traps) or internal forebays.	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents.	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years, or as required

Table 1.3 - Attenuation Tank Maintenance Schedule

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	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
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 hours after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers.	Annually

Table 1.4 - Private Permeable Pavements Maintenance Schedule

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (Spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at the start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework, etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May-October)
	Inspect silt accumulation rate in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half Yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before of growing season	Annually
	Remove sediment from any forebay	1-5 years or as required
Occasional Maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, e.g., every 25-50 years
Remedial Actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows	As required

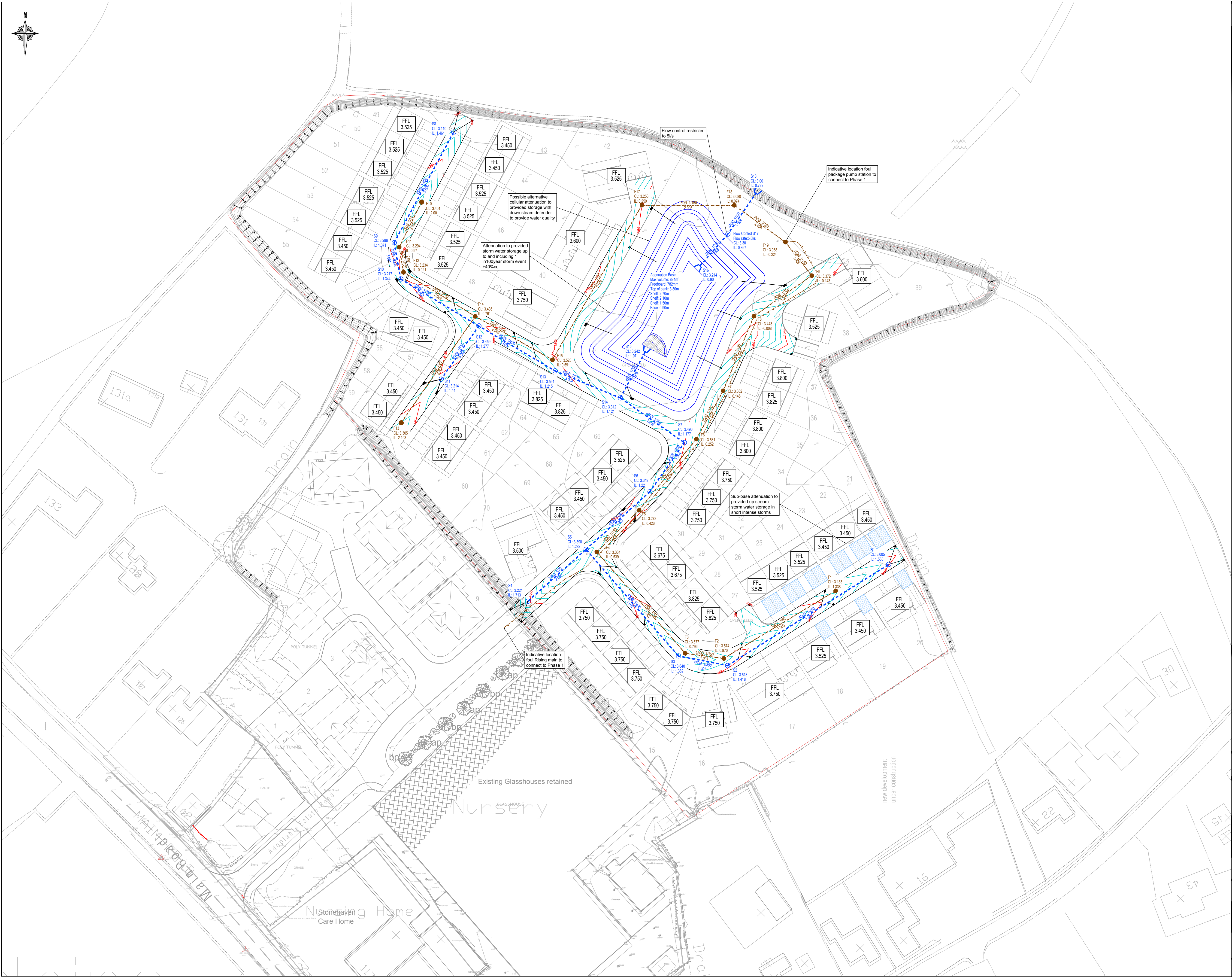
Table 1.5 Ponds / Swales Maintenance Schedule



Attachments

- 1** 8896-500-001 P1 Preliminary Drainage Strategy

- 2** MicroDrainage Calculations



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- Notes
1. **PRELIMINARY DRAWING:** This drawing should be read as a **PRELIMINARY** issue and should **NOT** be used for construction under any circumstances.
 2. The design has been carried out in accordance with all current working drawings provided by H A Architectural Services. Please refer to H A Architectural Services House Type working drawings to confirm locations of all drainage outlets. Any discrepancies should be reported to the engineer immediately, prior to commencement of any works on site.

DRAINAGE STRATEGY KEY

- S104 ADAPTABLE FOUL WATER PIPE-RUN DIAMETER GRADIENT
- S104 ADAPTABLE FOUL MANHOLE
- ADAPTABLE FOUL WATER RISING MAIN
- S104 ADAPTABLE STORM WATER PIPE-RUN DIAMETER GRADIENT
- S104 ADAPTABLE STORM WATER MANHOLE
- ADAPTABLE ROAD GULLY
- ADAPTABLE HEADWALL
- ATTENUATION BASIN
- PROPOSED CONTOURS
- PROPOSED FINISHED FLOOR LEVEL
- PERMEABLE PAVING - SUBBASE ATTENUATION

-	Preliminary Issue	AR	JR	24.02.22
Rev.	Description	By	Chk.	Date

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Client
H A Architectural Services

Project
**Phase 2, Crossroads Nursery
Quadrang**

Drawing Title
Drainage Strategy

Designed by AR	Drawn by AR	Checked by JR
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Scale @ A1 1:500	Date February 2022
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Drawing No. 8896-501-001	Revision -	Job Ref 8896
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Status
PLANNING ISSUE

Cad file P:8896/Drawings/8734-501-001	Contact Office Norwich
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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Surface Network 1

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
1.000	54.463	0.136	400.5	0.145	5.00	0.0	0.600	o	450	Pipe/Conduit	
1.001	14.316	0.036	397.7	0.039	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	40.393	0.101	399.9	0.075	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	22.322	0.281	79.4	0.019	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	24.664	0.062	397.8	0.079	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	17.165	0.043	399.2	0.058	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.005	22.362	0.056	399.3	0.057	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	35.988	0.090	399.9	0.076	5.00	0.0	0.600	o	450	Pipe/Conduit	
3.001	10.605	0.027	392.8	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.002	26.050	0.067	388.8	0.088	0.00	0.0	0.600	o	450	Pipe/Conduit	
4.000	18.650	0.163	114.4	0.079	5.00	0.0	0.600	o	450	Pipe/Conduit	
3.003	25.342	0.062	408.7	0.025	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.004	20.227	0.094	215.2	0.025	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	15.386	0.051	301.7	0.030	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.007	28.748	0.170	169.1	0.081	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.008	12.137	0.033	367.8	0.068	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.009	15.402	0.078	197.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL Σ (m)	I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.90	1.555	0.145	0.0	0.0	0.0	1.01	160.6	19.6
1.001	50.00	6.13	1.418	0.184	0.0	0.0	0.0	1.01	161.2	24.9
1.002	50.00	6.80	1.383	0.259	0.0	0.0	0.0	1.01	160.7	35.1
2.000	50.00	5.21	1.713	0.019	0.0	0.0	0.0	1.77	124.8	2.6
1.003	50.00	7.21	1.282	0.357	0.0	0.0	0.0	1.01	161.1	48.3
1.004	50.00	7.49	1.220	0.415	0.0	0.0	0.0	1.01	160.9	56.2
1.005	50.00	7.86	1.177	0.472	0.0	0.0	0.0	1.01	160.8	63.9
3.000	50.00	5.59	1.461	0.076	0.0	0.0	0.0	1.01	160.7	10.3
3.001	50.00	5.77	1.371	0.107	0.0	0.0	0.0	1.02	162.2	14.5
3.002	50.00	6.19	1.344	0.195	0.0	0.0	0.0	1.02	163.0	26.4
4.000	50.00	5.16	1.440	0.079	0.0	0.0	0.0	1.90	302.2	10.7
3.003	50.00	6.61	1.277	0.299	0.0	0.0	0.0	1.00	158.9	40.5
3.004	50.00	6.86	1.216	0.324	0.0	0.0	0.0	1.38	219.8	43.9
1.006	50.00	8.08	1.121	0.826	0.0	0.0	0.0	1.17	185.3	111.9
1.007	50.00	8.38	1.070	0.907	0.0	0.0	0.0	1.56	248.2	122.8
1.008	50.00	8.58	0.900	0.975	0.0	0.0	0.0	1.05	167.7	132.0
1.009	50.00	8.75	0.867	0.975	0.0	0.0	0.0	1.44	229.8	132.0

Manhole Schedules for Surface Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S21	3.005	1.450	Open Manhole	1350	1.000	1.555	450				
S20	3.518	2.100	Open Manhole	1350	1.001	1.418	450	1.000	1.419	450	1
S19	3.640	2.258	Open Manhole	1350	1.002	1.383	450	1.001	1.382	450	
S11	3.224	1.511	Open Manhole	1350	2.000	1.713	300				
S12	3.398	2.116	Open Manhole	1350	1.003	1.282	450	1.002	1.282	450	
								2.000	1.432	300	
S13	3.349	2.129	Open Manhole	1350	1.004	1.220	450	1.003	1.220	450	
S14	3.496	2.319	Open Manhole	1350	1.005	1.177	450	1.004	1.177	450	
S1	3.110	1.649	Open Manhole	1350	3.000	1.461	450				
S2	3.286	1.915	Open Manhole	1350	3.001	1.371	450	3.000	1.371	450	
S3	3.217	1.873	Open Manhole	1350	3.002	1.344	450	3.001	1.344	450	
S10	3.214	1.774	Open Manhole	1350	4.000	1.440	450				
S4	3.459	2.182	Open Manhole	1350	3.003	1.277	450	3.002	1.277	450	
								4.000	1.277	450	
S5	3.564	2.349	Open Manhole	1350	3.004	1.216	450	3.003	1.215	450	
S6	3.312	2.191	Open Manhole	1350	1.006	1.121	450	1.005	1.121	450	1
								3.004	1.122	450	
S7	3.242	2.172	Open Manhole	1350	1.007	1.070	450	1.006	1.070	450	
S8	3.214	2.314	Open Manhole	1350	1.008	0.900	450	1.007	0.900	450	
S9	3.300	2.433	Open Manhole	1350	1.009	0.867	450	1.008	0.867	450	
S22	3.000	2.211	Open Manhole	1350		OUTFALL		1.009	0.789	450	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S21	522547.250	333329.945	522547.250	333329.945	Required	
S20	522501.102	333301.020	522501.102	333301.020	Required	
S19	522487.050	333303.754	522487.050	333303.754	Required	
S11	522443.944	333319.431	522443.944	333319.431	Required	
S12	522460.604	333334.287	522460.604	333334.287	Required	
S13	522479.008	333350.707	522479.008	333350.707	Required	
S14	522488.751	333364.839	522488.751	333364.839	Required	
S1	522422.682	333453.777	522422.682	333453.777	Required	
S2	522405.633	333422.083	522405.633	333422.083	Required	
S3	522407.559	333411.655	522407.559	333411.655	Required	
S10	522419.102	333383.020	522419.102	333383.020	Required	
S4	522429.887	333398.235	522429.887	333398.235	Required	
S5	522451.730	333385.385	522451.730	333385.385	Required	
S6	522470.414	333377.638	522470.414	333377.638	Required	
S7	522477.712	333391.182	522477.712	333391.182	Required	

Wynters Farm Barn
Magdalen Laver Ongar
Essex CM5 0EW

Designed by ARowlands

Date 24/02/2022 14:13

Checked by

File SW Calcs 23.02.2022 Pond 21s.mdx

XP Solutions

Network 2019.1



Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S8	522493.196	333415.405	522493.196	333415.405	Required	
S9	522501.196	333424.532	522501.196	333424.532	Required	
S22	522509.931	333437.217			No Entry	

Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S9, DS/PN: 1.009, Volume (m³): 5.2

Unit Reference	MD-SHE-0097-5000-1600-5000	Sump Available	Yes
Design Head (m)	1.600	Diameter (mm)	97
Design Flow (l/s)	5.0	Invert Level (m)	0.867
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0	Kick-Flo®	0.865	3.8
Flush-Flo™	0.425	4.7	Mean Flow over Head Range	-	4.2

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	0.600	4.6	1.600	5.0	2.600	6.3	5.000	8.5	7.500	10.3
0.200	4.3	0.800	4.1	1.800	5.3	3.000	6.7	5.500	8.9	8.000	10.7
0.300	4.6	1.000	4.0	2.000	5.5	3.500	7.2	6.000	9.3	8.500	11.0
0.400	4.7	1.200	4.4	2.200	5.8	4.000	7.7	6.500	9.7	9.000	11.3
0.500	4.7	1.400	4.7	2.400	6.0	4.500	8.1	7.000	10.0	9.500	11.6

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 522850 333500 TF 22850 33500 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

								Water Surcharged Flooded						Pipe
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)
1.000	S21	15 Winter	2	+0%	100/15 Summer	100/15 Summer			1.678	-0.327	0.000	0.16		23.0
1.001	S20	15 Winter	2	+0%	30/360 Winter				1.586	-0.282	0.000	0.25		26.3
1.002	S19	15 Winter	2	+0%	30/15 Winter				1.554	-0.279	0.000	0.24		34.4
2.000	S11	15 Winter	2	+0%	100/15 Summer				1.747	-0.266	0.000	0.03		3.2
1.003	S12	15 Winter	2	+0%	30/15 Summer				1.497	-0.235	0.000	0.32		43.7
1.004	S13	15 Winter	2	+0%	30/15 Summer				1.458	-0.212	0.000	0.42		48.8
1.005	S14	240 Winter	2	+0%	30/15 Summer				1.435	-0.192	0.000	0.13		16.7
3.000	S1	15 Winter	2	+0%	30/480 Winter	100/15 Winter			1.565	-0.346	0.000	0.09		12.2
3.001	S2	15 Winter	2	+0%	30/240 Winter				1.517	-0.304	0.000	0.15		15.3
3.002	S3	15 Winter	2	+0%	30/240 Winter				1.503	-0.291	0.000	0.19		26.3
4.000	S10	15 Winter	2	+0%	30/360 Winter				1.510	-0.380	0.000	0.06		13.1
3.003	S4	15 Winter	2	+0%	30/15 Winter				1.461	-0.266	0.000	0.29		38.9
3.004	S5	240 Winter	2	+0%	30/15 Summer				1.435	-0.231	0.000	0.07		11.6
1.006	S6	240 Winter	2	+0%	30/15 Summer				1.434	-0.137	0.000	0.20		28.6
1.007	S7	240 Winter	2	+0%	30/15 Summer				1.433	-0.087	0.000	0.15		31.0
1.008	S8	240 Winter	2	+0%	2/120 Winter				1.431	0.081	0.000	0.29		32.0
1.009	S9	240 Winter	2	+0%	2/60 Winter				1.429	0.112	0.000	0.03		4.7

US/MH		Level	
PN	Name	Status	Exceeded
1.000	S21	OK	4
1.001	S20	OK	
1.002	S19	OK	
2.000	S11	OK	
1.003	S12	OK	
1.004	S13	OK	
1.005	S14	OK	
3.000	S1	OK	1
3.001	S2	OK	
3.002	S3	OK	
4.000	S10	OK	
3.003	S4	OK	
3.004	S5	OK	
1.006	S6	OK	
1.007	S7	OK	
1.008	S8	SURCHARGED	
1.009	S9	SURCHARGED	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 522850 333500 TF 22850 33500 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

									Water	Surcharged	Flooded			Pipe
US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Flow
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)
1.000	S21 480	Winter	30	+0%	100/15 Summer	100/15 Summer			1.915	-0.090	0.000	0.05		7.1
1.001	S20 480	Winter	30	+0%	30/360 Winter				1.915	0.047	0.000	0.07		7.8
1.002	S19 480	Winter	30	+0%	30/15 Winter				1.914	0.081	0.000	0.08		10.8
2.000	S11 480	Winter	30	+0%	100/15 Summer				1.914	-0.099	0.000	0.01		0.9
1.003	S12 480	Winter	30	+0%	30/15 Summer				1.914	0.182	0.000	0.10		13.8
1.004	S13 480	Winter	30	+0%	30/15 Summer				1.913	0.243	0.000	0.13		15.8
1.005	S14 480	Winter	30	+0%	30/15 Summer				1.912	0.285	0.000	0.14		18.3
3.000	S1 480	Winter	30	+0%	30/480 Winter	100/15 Winter			1.913	0.002	0.000	0.03		3.6
3.001	S2 480	Winter	30	+0%	30/240 Winter				1.913	0.092	0.000	0.04		4.2
3.002	S3 480	Winter	30	+0%	30/240 Winter				1.912	0.118	0.000	0.06		7.8
4.000	S10 480	Winter	30	+0%	30/360 Winter				1.912	0.022	0.000	0.02		3.7
3.003	S4 480	Winter	30	+0%	30/15 Winter				1.912	0.185	0.000	0.08		11.3
3.004	S5 480	Winter	30	+0%	30/15 Summer				1.911	0.245	0.000	0.07		11.8
1.006	S6 480	Winter	30	+0%	30/15 Summer				1.911	0.340	0.000	0.22		31.2
1.007	S7 480	Winter	30	+0%	30/15 Summer				1.909	0.389	0.000	0.16		34.8
1.008	S8 480	Winter	30	+0%	2/120 Winter				1.907	0.557	0.000	0.34		37.9
1.009	S9 480	Winter	30	+0%	2/60 Winter				1.906	0.588	0.000	0.03		4.7

US/MH		Level	
PN	Name	Status	Exceeded
1.000	S21	OK	4
1.001	S20	SURCHARGED	
1.002	S19	SURCHARGED	
2.000	S11	OK	
1.003	S12	SURCHARGED	
1.004	S13	SURCHARGED	
1.005	S14	SURCHARGED	
3.000	S1	SURCHARGED	1
3.001	S2	SURCHARGED	
3.002	S3	SURCHARGED	
4.000	S10	SURCHARGED	
3.003	S4	SURCHARGED	
3.004	S5	SURCHARGED	
1.006	S6	SURCHARGED	
1.007	S7	SURCHARGED	
1.008	S8	SURCHARGED	
1.009	S9	SURCHARGED	

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

Simulation Criteria

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Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

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

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 522850 333500 TF 22850 33500 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

									Water	Surcharged	Flooded			Pipe
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Flow
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)
1.000	S21	15 Winter	100	+40%	100/15 Summer	100/15 Summer			3.028	1.023	23.474	1.10		161.7
1.001	S20	15 Winter	100	+40%	30/360 Winter				3.211	1.343	0.000	1.61		170.8
1.002	S19	15 Winter	100	+40%	30/15 Winter				3.208	1.375	0.000	1.09		155.9
2.000	S11	15 Winter	100	+40%	100/15 Summer				3.195	1.182	0.000	0.14		15.0
1.003	S12	15 Winter	100	+40%	30/15 Summer				3.182	1.450	0.000	1.25		168.5
1.004	S13	15 Winter	100	+40%	30/15 Summer				3.143	1.473	0.000	1.52		178.2
1.005	S14	15 Winter	100	+40%	30/15 Summer				3.081	1.454	0.000	1.52		201.9
3.000	S1	15 Winter	100	+40%	30/480 Winter	100/15 Winter			3.111	1.200	1.925	0.34		47.7
3.001	S2	15 Winter	100	+40%	30/240 Winter				3.138	1.317	0.000	0.66		66.4
3.002	S3	15 Winter	100	+40%	30/240 Winter				3.131	1.337	0.000	0.69		95.1
4.000	S10	15 Winter	100	+40%	30/360 Winter				3.113	1.223	0.000	0.19		42.2
3.003	S4	15 Winter	100	+40%	30/15 Winter				3.097	1.370	0.000	1.08		143.9
3.004	S5	15 Winter	100	+40%	30/15 Summer				3.028	1.362	0.000	0.88		152.1
1.006	S6	15 Winter	100	+40%	30/15 Summer				2.959	1.388	0.000	2.53		360.5
1.007	S7	15 Winter	100	+40%	30/15 Summer				2.538	1.018	0.000	1.86		394.3
1.008	S8	960 Winter	100	+40%	2/120 Winter				2.519	1.169	0.000	0.47		51.6
1.009	S9	960 Winter	100	+40%	2/60 Winter				2.518	1.200	0.000	0.03		5.1

US/MH		Level	
PN	Name	Status	Exceeded
1.000	S21	FLOOD	4
1.001	S20	FLOOD RISK	
1.002	S19	FLOOD RISK	
2.000	S11	FLOOD RISK	
1.003	S12	FLOOD RISK	
1.004	S13	FLOOD RISK	
1.005	S14	FLOOD RISK	
3.000	S1	FLOOD	1
3.001	S2	FLOOD RISK	
3.002	S3	FLOOD RISK	
4.000	S10	FLOOD RISK	
3.003	S4	FLOOD RISK	
3.004	S5	SURCHARGED	
1.006	S6	FLOOD RISK	
1.007	S7	SURCHARGED	
1.008	S8	SURCHARGED	
1.009	S9	SURCHARGED	