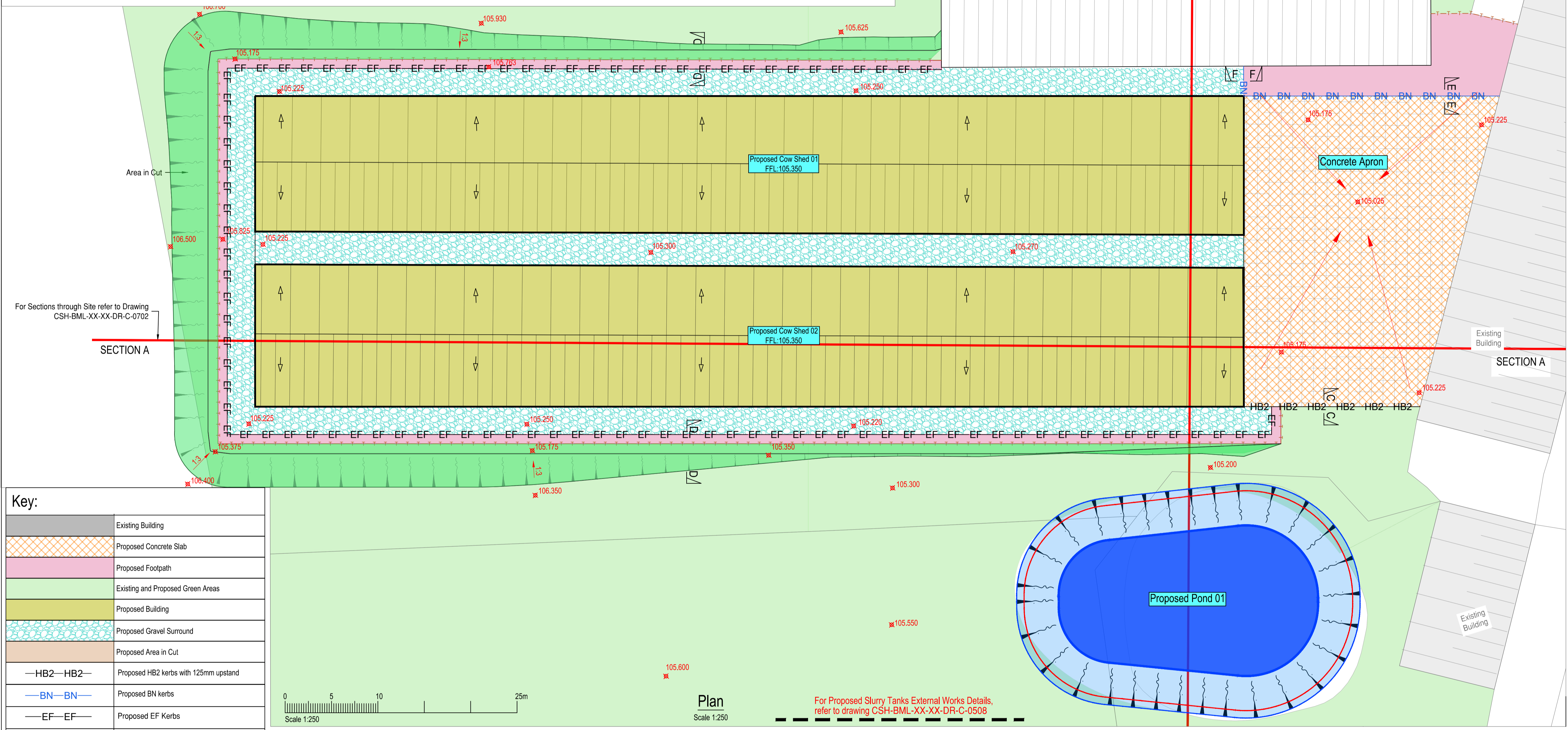


**Dropped BN Kerb (0mm upstand) & Base Detail**  
Scale 1:10



**Key:**

	Existing Building
	Proposed Concrete Slab
	Proposed Footpath
	Existing and Proposed Green Areas
	Proposed Building
	Proposed Gravel Surround
	Proposed Area in Cut
	Proposed HB2 kerbs with 125mm upstand
	Proposed BN kerbs
	Proposed EF Kerbs
	Proposed Timber Edging
	Design Levels

**Safety, Health & Environmental Information:**  
In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below.

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION and described below:

**Construction/Maintenance/Cleaning/Demolition**  
Refer to Drawing:

- General Notes:**
- Do not scale from this drawing.
  - All dimensions are in millimetres (mm), all levels in metres (m) unless noted otherwise.
  - Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
  - Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.
  - The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
  - The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.
  - This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

- Notes:**
- The contractor is to check all information provided prior to commencing works, and seek clarification from the engineer in respect to any ambiguities found.
  - Assumed CBR for the site is < 2% - contractor to check insitu CBR at time of construction
  - Frost susceptibility - All materials, including sub-grade within 450mm of the finished road level shall be non-frost susceptible. Where the sub-grade is within 450mm of the finished road level, it shall be tested for frost susceptibility and if found to be so, shall be removed and replaced with suitable non-frost susceptible material to Clause 602.19 of the Specification for Highway Works.
  - Bituminous sealing grit to be applied to binder course if left exposed for more than 5 days.
  - Sub formation / formation shall be proof rolled and any soft spots removed and replaced with adequately compacted 6F2 material. Testing to be undertaken to ensure a minimum CBR of 2.5% is achieved at any point.
  - To ensure continuity of foundation drainage at all times, the bottom of new sub-base must not be above the bottom of existing sub-base, therefore thickness of new sub-base to be increased to match bottom of existing sub-base where necessary.
  - All bound surfaces shall be treated with Polymer modified bond coat prior to placing of each successive layer to BS434 and in accordance SHW clause 920.
  - All Retaining Walls to have Edge protection to Architecture Details
- | Rev | By / Chkd | Date       | Description              |
|-----|-----------|------------|--------------------------|
| P04 | DH/AM     | 06/02/2024 | External Details updated |
| P03 | DH/AM     | 26/01/2024 | External Details updated |
| P02 | DH/AM     | 15/08/23   | Details updated          |
| P01 | DH/AM     | 2/07/2023  | Preliminary Issue        |

**PRELIMINARY DRAWING**  
This drawing is not to be used for construction

Client:

BarnsleyMarshall Limited  
1 Birch Court  
Blackpole East  
Worcester  
WR3 6SG

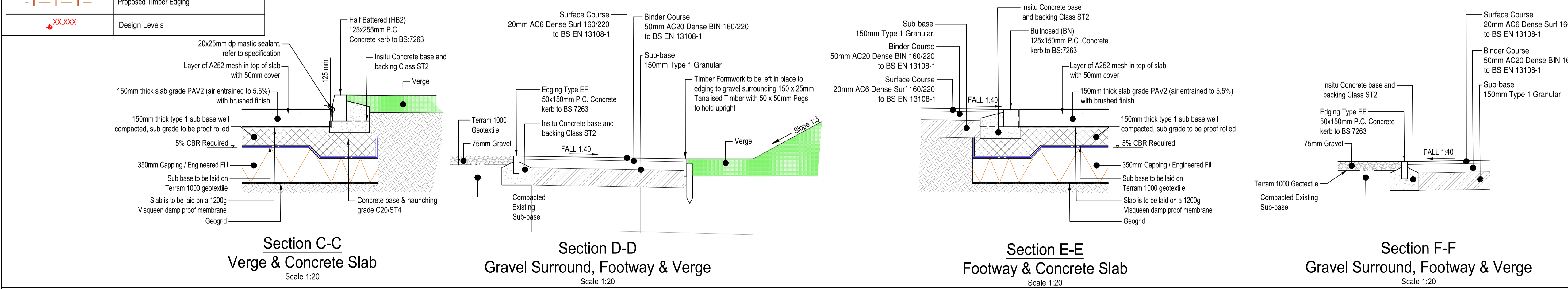
Tel: 01905 330550  
Email: design@barnsleymarshall.co.uk  
Web: www.barnsleymarshall.co.uk

Project: **Cow Shed**  
Elmridge Lane, Preston,  
PR3 2NY

Drawing: **External Works 01**  
Main Site

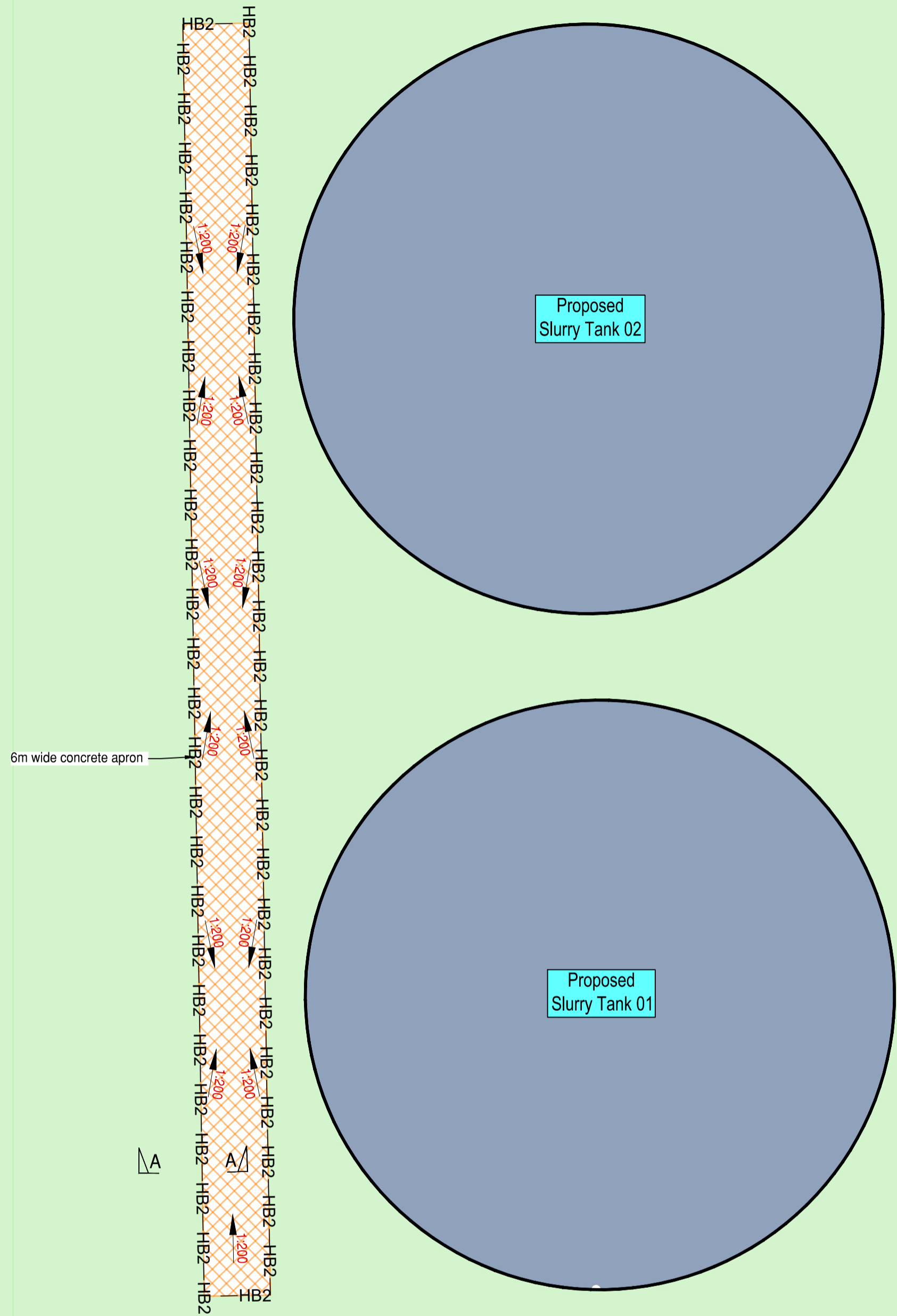
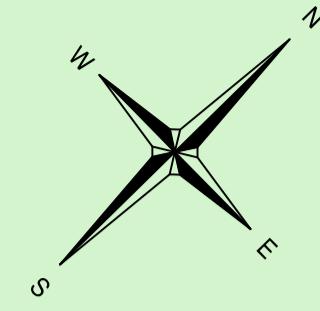
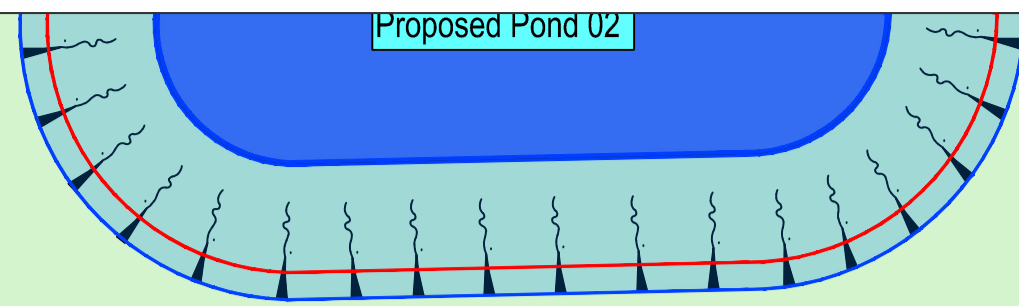
By/Chkd	RA/GM	Date	Revision
CSH-BML-XX-XX-DR-C-0700		05/04/2023	P04
BML Job No. 1000-05			Status -

Drawing Scale at A1: As Shown  
CAD Filename: Y:\Project 100-05 Cow Shed\external - External Works 01 - External Works





For Proposed Buildings External Works details, refer to drawing CSH-BML-XX-XX-DR-C-0700



**Safety, Health & Environmental Information:**

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below.

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

**Construction/Maintenance/Cleaning/Demolition**  
Refer to Drawing:

**General Notes:**

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- The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
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**Notes:**

- The contractor is to check all information provided prior to commencing works, and seek clarification from the engineer in respect to any ambiguities found.
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- Frost susceptibility - All materials, including sub-grade within 450mm of the finished road level shall be non-frost susceptible. Where the sub-grade is within 450mm of the finished road level, it shall be tested for frost susceptibility and if found to be so, shall be removed and replaced with suitable non-frost susceptible material to Clause 602.19 of the Specification for Highway Works.
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- All bound surfaces shall be treated with Polymer modified bond coat prior to placing of each successive layer to BS434 and in accordance SHW clause 920.
- All Retaining Walls to have Edge protection to Architecture Details

P03	DH/AM	26/02/2024	External Details updated
P02	DH/AM	06/02/2024	External Details updated
P01	DH/AM	15/08/23	Preliminary Issue
Rev	By / Chk'd	Date	Description

**PRELIMINARY DRAWING**  
This drawing is not to be used for construction

Client



BarnsleyMarshall Limited  
1 Birch Court  
Blackpole East  
Worcester  
WR3 6SG



Tel: 01905 330560  
Email: design@barnsleymarshall.co.uk  
Web: www.barnsleymarshall.co.uk

Project

**Cow Shed**  
Elmridge Lane, Preston,  
PR3 2NY

Drawing

**External Works 02**  
Slurry Tanks

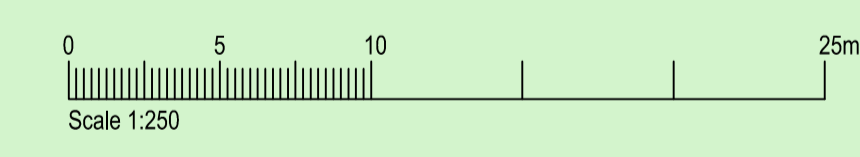
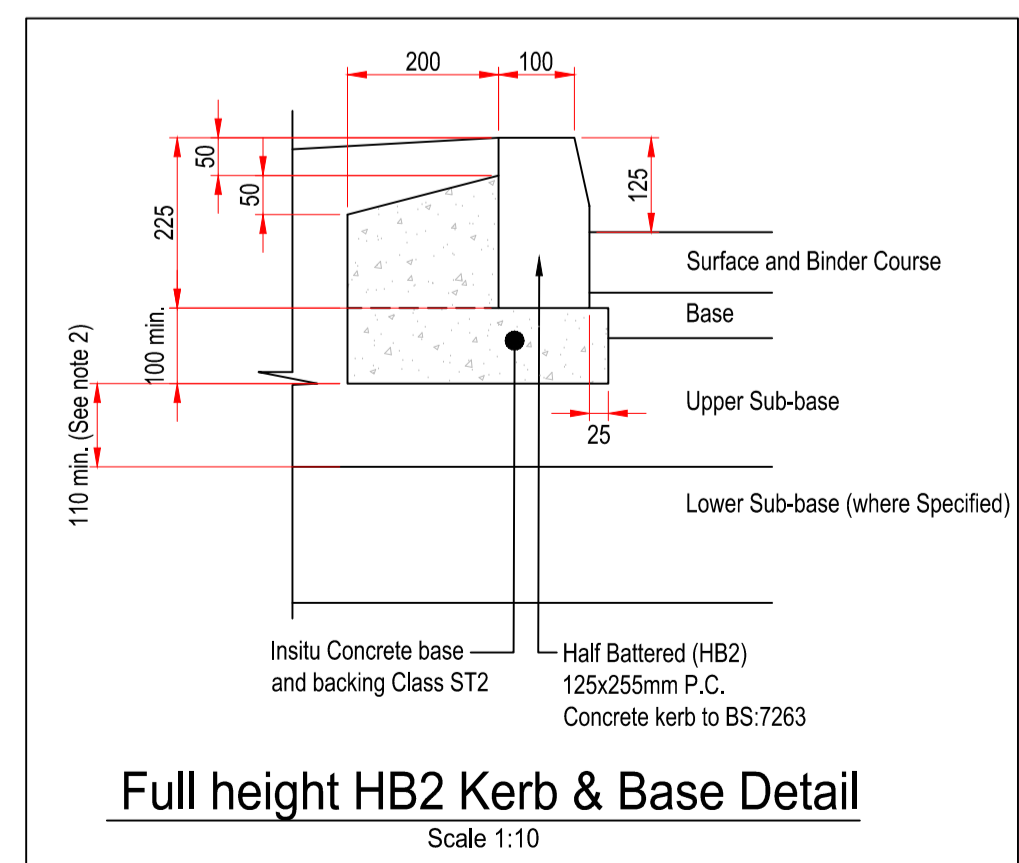
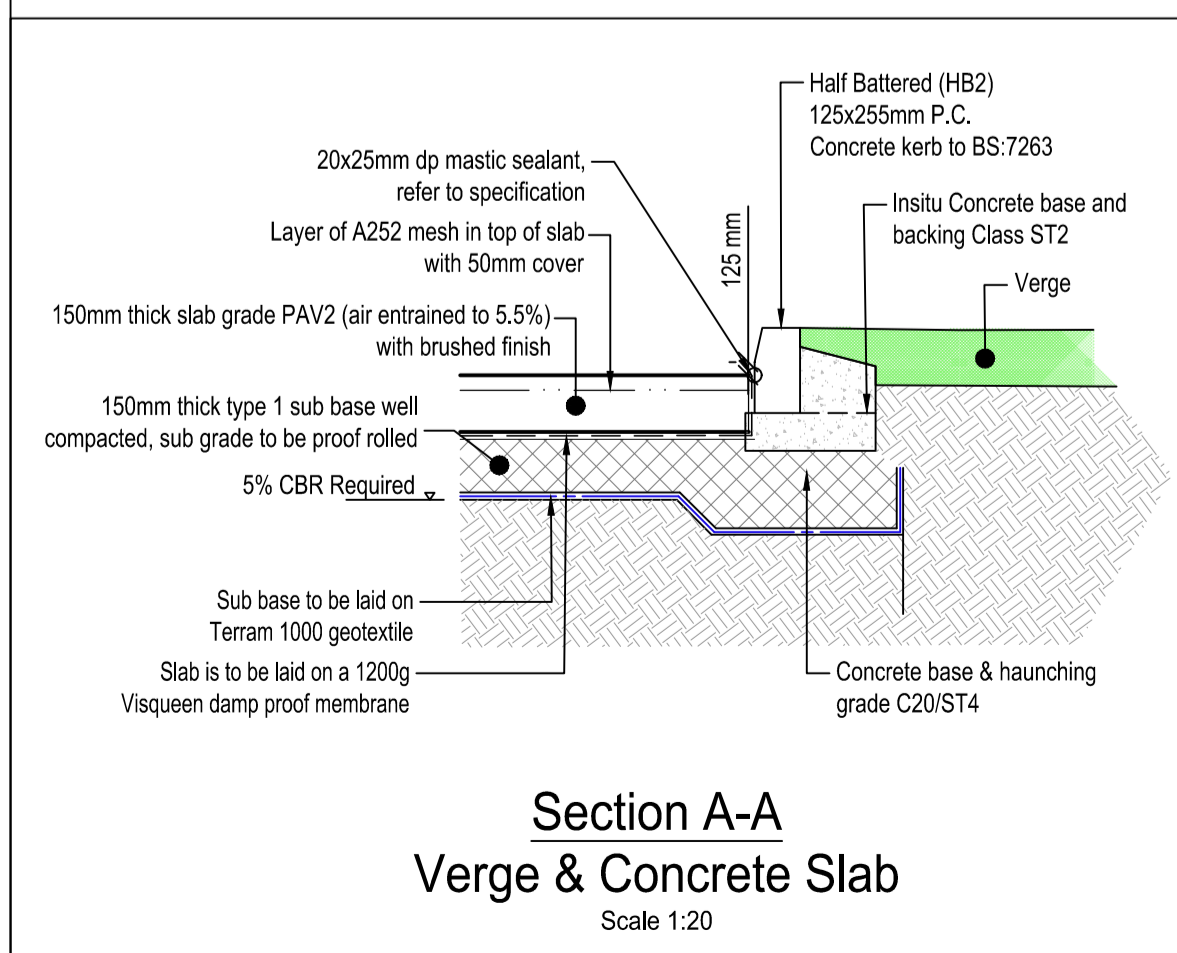
By/Chk'd	RA/GM	Date	05/04/2023
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Drawing No. CSH-BML-XX-XX-DR-C-0701 Revision P03

BML Job No. 1000-05 Status -

Drawing Scale at A1: As Shown

CAD Filename: Y:\Project\100-05 Cow Shed\external - External Works\CSH-BML-XX-XX-DR-C-0701-03.dwg




**Key:**

	Proposed Slurry Tank
	Proposed Concrete Slab
	Existing and Proposed Green Areas
	Proposed Gravel Surround
	Proposed HB2 kerbs with 125mm upstand
	Design Levels

# Appendix E

## Hydraulic Calculations

Barnsley Marshall		Page 1
1 Birch Court Blackpole East Worcester, WR3 8SG		
Date 25/01/2024 14:51 File 654m3 (Pond01 502.6m3+P...	Designed by AlexMavhunga Checked by	
Innovyze		Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes Alex003

FSR Rainfall Model - England and Wales

Return Period (years)	3	PIMP (%)	100
M5-60 (mm)	18.500	Add Flow / Climate Change (%)	40
Ratio R	0.334	Minimum Backdrop Height (m)	4.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.500
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm





Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	4-8	0.102	8-12	0.634	12-16	0.138

Total Area Contributing (ha) = 0.874

Total Pipe Volume (m³) = 50.471

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	51.808	0.176	294.4	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	31.531	0.764	41.3	0.022	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	33.308	0.488	68.2	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	5.854	0.414	14.1	0.009	0.00	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	6.14	104.593	0.085	0.0	0.0	4.6	0.76	30.1	16.1
S2.000	50.00	5.26	106.083	0.022	0.0	0.0	1.2	2.04	81.2	4.2
S2.001	50.00	5.61	105.320	0.039	0.0	0.0	2.1	1.59	63.1	7.4
S2.002	50.00	5.64	104.832	0.048	0.0	0.0	2.6	3.50	139.2	9.1



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	53.261	0.125	426.5	0.065	0.00	0.0	0.600	o	300	Pipe/Conduit		
S1.002	18.299	0.043	426.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit		
S3.000	51.694	0.176	294.4	0.110	5.00	0.0	0.600	o	225	Pipe/Conduit		
S3.001	53.305	0.231	230.5	0.097	0.00	0.0	0.600	o	300	Pipe/Conduit		
S1.003	18.300	0.051	361.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit		
S4.000	51.810	0.176	294.4	0.076	5.00	0.0	0.600	o	225	Pipe/Conduit		
S4.001	53.421	0.181	294.4	0.065	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.004	20.574	0.294	70.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit		
S5.000	51.683	0.395	130.8	0.020	5.00	0.0	0.600	o	225	Pipe/Conduit		
S5.001	48.995	0.439	111.6	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit		
S5.002	38.381	0.629	61.0	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit		
S5.003	33.261	0.761	43.7	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.005	16.057	0.129	124.2	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit		
S1.006	59.632	0.480	124.2	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)
S1.001	50.00	7.32	104.342	0.198	0.0	0.0	10.7	0.76	53.4	37.5
S1.002	50.00	7.72	104.217	0.198	0.0	0.0	10.7	0.76	53.4	37.5
S3.000	50.00	6.14	104.656	0.110	0.0	0.0	6.0	0.76	30.1	20.9
S3.001	50.00	7.00	104.406	0.207	0.0	0.0	11.2	1.03	72.9	39.3
S1.003	50.00	8.04	104.099	0.405	0.0	0.0	21.9	0.95	104.6	76.8
S4.000	50.00	6.14	104.556	0.076	0.0	0.0	4.1	0.76	30.1	14.4
S4.001	50.00	7.32	104.380	0.141	0.0	0.0	7.7	0.76	30.1	26.8
S1.004	50.00	8.18	103.974	0.546	0.0	0.0	29.6	2.43	386.9	103.6
S5.000	50.00	5.75	106.130	0.020	0.0	0.0	1.1	1.14	45.4	3.8
S5.001	50.00	6.41	105.734	0.050	0.0	0.0	2.7	1.24	49.2	9.5
S5.002	50.00	6.80	105.295	0.065	0.0	0.0	3.5	1.68	66.7	12.3
S5.003	50.00	7.08	104.666	0.067	0.0	0.0	3.6	1.98	78.9	12.8
S1.005	50.00	8.33	103.680	0.645	0.0	0.0	34.9	1.82	289.9	122.3
S1.006	50.00	9.43	103.551	0.645	0.0	0.0	34.9	0.90	15.9<	122.3



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
S6.000	44.948	0.150	300.0	0.060	5.00	0.0	0.600	o	300	Pipe/Conduit	
S6.001	44.433	0.148	300.0	0.104	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.002	42.374	0.088	480.2	0.046	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.003	8.770	0.083	106.1	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	79.685	0.566	140.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	126.233	0.897	140.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.009	13.884	0.099	140.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.010	38.555	1.500	25.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.011	42.348	1.659	25.5	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)
S6.000	50.00	5.83	103.540	0.060	0.0	0.0	3.3	0.90	63.8	11.4
S6.001	50.00	6.65	103.390	0.164	0.0	0.0	8.9	0.90	63.8	31.2
S6.002	50.00	7.64	103.242	0.211	0.0	0.0	11.4	0.71	50.2	39.9
S6.003	50.00	7.79	103.154	0.229	0.0	0.0	12.4	0.98	17.2<	43.4
S1.007	46.81	11.01	103.071	0.874	0.0	0.0	44.3	0.85	14.9<	155.1
S1.008	41.99	13.49	102.505	0.874	0.0	0.0	44.3	0.85	14.9<	155.1
S1.009	41.53	13.77	101.608	0.874	0.0	0.0	44.3	0.85	15.0<	155.1
S1.010	41.00	14.09	101.509	0.874	0.0	0.0	44.3	1.99	35.2<	155.1
S1.011	40.44	14.44	100.009	0.874	0.0	0.0	44.3	2.00	35.4<	155.1



1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



Date 25/01/2024 14:51  
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 Checked by

Innovyze Network 2020.1.3

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backd (mm)
S01	105.259	0.666	Open Manhole	600	S1.000	104.593	225				
S02	106.808	0.725	Open Manhole	1200	S2.000	106.083	225				
S03	106.045	0.725	Open Manhole	1200	S2.001	105.320	225	S2.000	105.320	225	
S04	105.557	0.725	Open Manhole	1200	S2.002	104.832	225	S2.001	104.832	225	
S05	105.200	0.858	Open Manhole	600	S1.001	104.342	300	S1.000	104.417	225	
								S2.002	104.417	225	
S06	105.200	0.983	Open Manhole	1200	S1.002	104.217	300	S1.001	104.217	300	
S07	105.322	0.666	Open Manhole	600	S3.000	104.656	225				
S08	105.200	0.794	Open Manhole	600	S3.001	104.406	300	S3.000	104.481	225	
S09	105.182	1.083	Open Manhole	1500	S1.003	104.099	375	S1.002	104.174	300	
								S3.001	104.174	300	
S10	105.222	0.666	Open Manhole	600	S4.000	104.556	225				
S11	105.200	0.820	Open Manhole	600	S4.001	104.380	225	S4.000	104.380	225	
S12	105.202	1.228	Open Manhole	1500	S1.004	103.974	450	S1.003	104.049	375	
								S4.001	104.199	225	
S13	106.795	0.665	Open Manhole	1200	S5.000	106.130	225				
S14	106.400	0.666	Open Manhole	1200	S5.001	105.734	225	S5.000	105.735	225	
S15	105.961	0.666	Open Manhole	1200	S5.002	105.295	225	S5.001	105.295	225	
S16	105.332	0.666	Open Manhole	1200	S5.003	104.666	225	S5.002	104.666	225	
S17	105.175	1.495	Open Manhole	1500	S1.005	103.680	450	S1.004	103.680	450	
								S5.003	103.905	225	
S18	105.068	1.517	Open Manhole	1500	S1.006	103.551	150	S1.005	103.551	450	
S19	104.340	0.800	Open Manhole	1200	S6.000	103.540	300				
S20	104.360	0.970	Open Manhole	1200	S6.001	103.390	300	S6.000	103.390	300	
S21	104.389	1.148	Open Manhole	1200	S6.002	103.242	300	S6.001	103.242	300	
S22	104.790	1.636	Open Manhole	1200	S6.003	103.154	150	S6.002	103.154	300	
S23	104.880	1.809	Open Manhole	450	S1.007	103.071	150	S1.006	103.071	150	
								S6.003	103.071	150	
S24	103.889	1.384	Open Manhole	450	S1.008	102.505	150	S1.007	102.505	150	
S25	102.500	0.892	Open Manhole	450	S1.009	101.608	150	S1.008	101.608	150	
S26	102.400	0.891	Open Manhole	1200	S1.010	101.509	150	S1.009	101.509	150	
S27	100.900	0.891	Open Manhole	1200	S1.011	100.009	150	S1.010	100.009	150	
SexDitch	99.100	0.750	Open Manhole	0		OUTFALL		S1.011	98.350	150	



1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



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 File 654m3 (Pond01 502.6m3+P...

Designed by AlexMavhunga  
 Checked by

Innovyze

Network 2020.1.3

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S01	360036.501	440289.729	360036.501	440289.729	Required	
S02	360020.768	440286.561	360020.768	440286.561	Required	
S03	360044.533	440307.283	360044.533	440307.283	Required	
S04	360068.454	440330.460	360068.454	440330.460	Required	
S05	360072.874	440326.622	360072.874	440326.622	Required	
S06	360110.315	440364.501	360110.315	440364.501	Required	
S07	360049.533	440276.959	360049.533	440276.959	Required	
S08	360085.878	440313.719	360085.878	440313.719	Required	
S09	360123.337	440351.644	360123.337	440351.644	Required	
S10	360062.487	440264.025	360062.487	440264.025	Required	
S11	360098.876	440300.905	360098.876	440300.905	Required	
S12	360136.449	440338.879	360136.449	440338.879	Required	
S13	360022.435	440284.874	360022.435	440284.874	Required	
S14	360060.474	440249.887	360060.474	440249.887	Required	
S15	360094.945	440284.705	360094.945	440284.705	Required	

1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



Date 25/01/2024 14:51  
 File 654m3 (Pond01 502.6m3+P...

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Network 2020.1.3

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S16	360119.256	440314.404	360119.256	440314.404	Required	
S17	360151.001	440324.335	360151.001	440324.335	Required	
S18	360166.812	440327.133	360166.812	440327.133	Required	
S19	360272.815	440254.553	360272.815	440254.553	Required	
S20	360240.204	440285.486	360240.204	440285.486	Required	
S21	360207.804	440315.892	360207.804	440315.892	Required	
S22	360215.384	440357.582	360215.384	440357.582	Required	
S23	360212.235	440365.768	360212.235	440365.768	Required	
S24	360266.740	440423.897	360266.740	440423.897	Required	
S25	360377.757	440483.980	360377.757	440483.980	Required	
S26	360374.901	440497.568	360374.901	440497.568	Required	
S27	360412.722	440505.058	360412.722	440505.058	Required	
SexDitch	360421.730	440546.437			No Entry	



PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S01	105.259	104.593	0.441	Open Manhole	600
S2.000	o	225	S02	106.808	106.083	0.500	Open Manhole	1200
S2.001	o	225	S03	106.045	105.320	0.500	Open Manhole	1200
S2.002	o	225	S04	105.557	104.832	0.500	Open Manhole	1200
S1.001	o	300	S05	105.200	104.342	0.558	Open Manhole	600
S1.002	o	300	S06	105.200	104.217	0.683	Open Manhole	1200
S3.000	o	225	S07	105.322	104.656	0.441	Open Manhole	600
S3.001	o	300	S08	105.200	104.406	0.494	Open Manhole	600
S1.003	o	375	S09	105.182	104.099	0.708	Open Manhole	1500
S4.000	o	225	S10	105.222	104.556	0.441	Open Manhole	600
S4.001	o	225	S11	105.200	104.380	0.595	Open Manhole	600
S1.004	o	450	S12	105.202	103.974	0.778	Open Manhole	1500
S5.000	o	225	S13	106.795	106.130	0.440	Open Manhole	1200
S5.001	o	225	S14	106.400	105.734	0.441	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	51.808	294.4	S05	105.200	104.417	0.558	Open Manhole	600
S2.000	31.531	41.3	S03	106.045	105.320	0.500	Open Manhole	1200
S2.001	33.308	68.2	S04	105.557	104.832	0.500	Open Manhole	1200
S2.002	5.854	14.1	S05	105.200	104.417	0.558	Open Manhole	600
S1.001	53.261	426.5	S06	105.200	104.217	0.683	Open Manhole	1200
S1.002	18.299	426.5	S09	105.182	104.174	0.708	Open Manhole	1500
S3.000	51.694	294.4	S08	105.200	104.481	0.494	Open Manhole	600
S3.001	53.305	230.5	S09	105.182	104.174	0.708	Open Manhole	1500
S1.003	18.300	361.8	S12	105.202	104.049	0.778	Open Manhole	1500
S4.000	51.810	294.4	S11	105.200	104.380	0.595	Open Manhole	600
S4.001	53.421	294.4	S12	105.202	104.199	0.778	Open Manhole	1500
S1.004	20.574	70.0	S17	105.175	103.680	1.045	Open Manhole	1500
S5.000	51.683	130.8	S14	106.400	105.735	0.440	Open Manhole	1200
S5.001	48.995	111.6	S15	105.961	105.295	0.441	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.002	o	225	S15	105.961	105.295	0.441	Open Manhole	1200
S5.003	o	225	S16	105.332	104.666	0.441	Open Manhole	1200
S1.005	o	450	S17	105.175	103.680	1.045	Open Manhole	1500
S1.006	o	150	S18	105.068	103.551	1.367	Open Manhole	1500
S6.000	o	300	S19	104.340	103.540	0.500	Open Manhole	1200
S6.001	o	300	S20	104.360	103.390	0.670	Open Manhole	1200
S6.002	o	300	S21	104.389	103.242	0.847	Open Manhole	1200
S6.003	o	150	S22	104.790	103.154	1.486	Open Manhole	1200
S1.007	o	150	S23	104.880	103.071	1.659	Open Manhole	450
S1.008	o	150	S24	103.889	102.505	1.234	Open Manhole	450
S1.009	o	150	S25	102.500	101.608	0.742	Open Manhole	450
S1.010	o	150	S26	102.400	101.509	0.741	Open Manhole	1200
S1.011	o	150	S27	100.900	100.009	0.741	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.002	38.381	61.0	S16	105.332	104.666	0.441	Open Manhole	1200
S5.003	33.261	43.7	S17	105.175	103.905	1.045	Open Manhole	1500
S1.005	16.057	124.2	S18	105.068	103.551	1.067	Open Manhole	1500
S1.006	59.632	124.2	S23	104.880	103.071	1.659	Open Manhole	450
S6.000	44.948	300.0	S20	104.360	103.390	0.670	Open Manhole	1200
S6.001	44.433	300.0	S21	104.389	103.242	0.848	Open Manhole	1200
S6.002	42.374	480.2	S22	104.790	103.154	1.336	Open Manhole	1200
S6.003	8.770	106.1	S23	104.880	103.071	1.659	Open Manhole	450
S1.007	79.685	140.7	S24	103.889	102.505	1.234	Open Manhole	450
S1.008	126.233	140.7	S25	102.500	101.608	0.742	Open Manhole	450
S1.009	13.884	140.2	S26	102.400	101.509	0.741	Open Manhole	1200
S1.010	38.555	25.7	S27	100.900	100.009	0.741	Open Manhole	1200
S1.011	42.348	25.5	SexDitch	99.100	98.350	0.600	Open Manhole	0



1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



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Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S1.000	S01	600		360036.501	440289.729	360036.501	440289.729	
S2.000	S02	1200		360020.768	440286.561	360020.768	440286.561	
S2.001	S03	1200		360044.533	440307.283	360044.533	440307.283	
S2.002	S04	1200		360068.454	440330.460	360068.454	440330.460	
S1.001	S05	600		360072.874	440326.622	360072.874	440326.622	
S1.002	S06	1200		360110.315	440364.501	360110.315	440364.501	
S3.000	S07	600		360049.533	440276.959	360049.533	440276.959	
S3.001	S08	600		360085.878	440313.719	360085.878	440313.719	
S1.003	S09	1500		360123.337	440351.644	360123.337	440351.644	
S4.000	S10	600		360062.487	440264.025	360062.487	440264.025	
S4.001	S11	600		360098.876	440300.905	360098.876	440300.905	
S1.004	S12	1500		360136.449	440338.879	360136.449	440338.879	
S5.000	S13	1200		360022.435	440284.874	360022.435	440284.874	
S5.001	S14	1200		360060.474	440249.887	360060.474	440249.887	
S5.002	S15	1200		360094.945	440284.705	360094.945	440284.705	
S5.003	S16	1200		360119.256	440314.404	360119.256	440314.404	

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Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S1.005	S17	1500		360151.001	440324.335	360151.001	440324.335	
S1.006	S18	1500		360166.812	440327.133	360166.812	440327.133	
S6.000	S19	1200		360272.815	440254.553	360272.815	440254.553	
S6.001	S20	1200		360240.204	440285.486	360240.204	440285.486	
S6.002	S21	1200		360207.804	440315.892	360207.804	440315.892	
S6.003	S22	1200		360215.384	440357.582	360215.384	440357.582	
S1.007	S23	450		360212.235	440365.768	360212.235	440365.768	
S1.008	S24	450		360266.740	440423.897	360266.740	440423.897	
S1.009	S25	450		360377.757	440483.980	360377.757	440483.980	
S1.010	S26	1200		360374.901	440497.568	360374.901	440497.568	
S1.011	S27	1200		360412.722	440505.058	360412.722	440505.058	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.011	SexDitch	0		360421.730	440546.437	



Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.082	0.082	0.082
	User	-	30	0.010	0.003	0.085
2.000	User	-	100	0.022	0.022	0.022
2.001	User	-	100	0.014	0.014	0.014
	User	-	30	0.007	0.002	0.016
	User	-	30	0.003	0.001	0.017
2.002	User	-	100	0.009	0.009	0.009
1.001	User	-	100	0.065	0.065	0.065
1.002	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.107	0.107	0.107
	User	-	30	0.012	0.004	0.110
3.001	User	-	100	0.097	0.097	0.097
1.003	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.068	0.068	0.068
	User	-	30	0.027	0.008	0.076
4.001	User	-	100	0.061	0.061	0.061
	User	-	30	0.015	0.005	0.065
1.004	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.020	0.020	0.020
5.001	User	-	100	0.030	0.030	0.030
5.002	User	-	100	0.015	0.015	0.015
5.003	User	-	30	0.007	0.002	0.002
1.005	User	-	40	0.078	0.031	0.031
1.006	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.060	0.060	0.060
6.001	User	-	100	0.045	0.045	0.045
	User	-	100	0.059	0.059	0.104
6.002	User	-	100	0.046	0.046	0.046
6.003	User	-	40	0.046	0.018	0.018
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.005	0.874	0.874

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)
S1.011	SexDitch	99.100	98.350	98.350	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	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)	1920
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	16

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	1000	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	960
Ratio R	0.334		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S17, DS/PN: S1.005, Volume (m³): 6.9

Unit Reference	MD-SHE-0079-3000-1200-3000
Design Head (m)	1.200
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	79
Invert Level (m)	103.680
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200


Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.0
Flush-Flo™	0.348	2.9
Kick-Flo®	0.707	2.4
Mean Flow over Head Range	-	2.6

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	2.3	1.200	3.0	3.000	4.6	7.000	6.8
0.200	2.8	1.400	3.2	3.500	4.9	7.500	7.0
0.300	2.9	1.600	3.4	4.000	5.2	8.000	7.3
0.400	2.9	1.800	3.6	4.500	5.5	8.500	7.5
0.500	2.8	2.000	3.8	5.000	5.8	9.000	7.7
0.600	2.7	2.200	4.0	5.500	6.1	9.500	7.9
0.800	2.5	2.400	4.1	6.000	6.3		
1.000	2.8	2.600	4.3	6.500	6.6		

Hydro-Brake® Optimum Manhole: S22, DS/PN: S6.003, Volume (m³): 4.8

Unit Reference	MD-SHE-0063-2000-1300-2000
Design Head (m)	1.300
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	63
Invert Level (m)	103.154
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

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Hydro-Brake® Optimum Manhole: S22, DS/PN: S6.003, Volume (m³): 4.8

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	2.0
Flush-Flo™	0.280	1.7
Kick-Flo®	0.564	1.4
Mean Flow over Head Range	-	1.6

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	1.4	1.200	1.9	3.000	2.9	7.000	4.4
0.200	1.7	1.400	2.1	3.500	3.2	7.500	4.5
0.300	1.7	1.600	2.2	4.000	3.4	8.000	4.6
0.400	1.6	1.800	2.3	4.500	3.5	8.500	4.8
0.500	1.5	2.000	2.4	5.000	3.7	9.000	4.9
0.600	1.4	2.200	2.5	5.500	3.9	9.500	5.0
0.800	1.6	2.400	2.6	6.000	4.1		
1.000	1.8	2.600	2.7	6.500	4.2		



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Storage Structures for Storm

Tank or Pond Manhole: S17, DS/PN: S1.005

Invert Level (m) 103.680

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	233.0	1.195	467.4	1.495	538.9

Tank or Pond Manhole: S22, DS/PN: S6.003

Invert Level (m) 103.154

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	100.0	1.200	268.3	1.636	349.7

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m <sup>3</sup> /ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coefficient	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	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.279
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)		18.600 Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	0.0	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)		1, 30, 100
Climate Change (%)		0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S01	15 Winter	1	+0%	30/15	Summer		
S2.000	S02	15 Winter	1	+0%				
S2.001	S03	15 Winter	1	+0%				
S2.002	S04	15 Winter	1	+0%	100/15	Winter		
S1.001	S05	15 Winter	1	+0%	30/15	Summer		
S1.002	S06	15 Winter	1	+0%	30/15	Summer		
S3.000	S07	15 Winter	1	+0%	30/15	Summer		
S3.001	S08	15 Winter	1	+0%	30/15	Winter		
S1.003	S09	15 Winter	1	+0%	30/15	Summer		
S4.000	S10	15 Winter	1	+0%	30/15	Summer		
S4.001	S11	15 Winter	1	+0%	30/15	Summer		
S1.004	S12	15 Winter	1	+0%	30/120	Winter		
S5.000	S13	15 Winter	1	+0%				
S5.001	S14	15 Winter	1	+0%				
S5.002	S15	15 Winter	1	+0%				
S5.003	S16	15 Winter	1	+0%	100/360	Winter		
S1.005	S17	720 Winter	1	+0%	30/30	Summer		
S1.006	S18	960 Summer	1	+0%				
S6.000	S19	15 Winter	1	+0%	30/360	Winter		

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1 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 (m <sup>3</sup> )	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S01	104.683	-0.135	0.000	0.32		9.2	OK	
S2.000	S02	106.110	-0.198	0.000	0.03		2.5	OK	
S2.001	S03	105.359	-0.186	0.000	0.07		4.1	OK	
S2.002	S04	104.866	-0.191	0.000	0.06		5.0	OK	
S1.001	S05	104.475	-0.168	0.000	0.39		19.4	OK	
S1.002	S06	104.356	-0.161	0.000	0.43		18.5	OK	
S3.000	S07	104.761	-0.120	0.000	0.42		12.1	OK	
S3.001	S08	104.520	-0.186	0.000	0.30		20.7	OK	
S1.003	S09	104.273	-0.202	0.000	0.44		37.9	OK	
S4.000	S10	104.641	-0.140	0.000	0.28		8.2	OK	
S4.001	S11	104.492	-0.113	0.000	0.49		14.2	OK	
S1.004	S12	104.098	-0.326	0.000	0.17		51.9	OK	
S5.000	S13	106.163	-0.192	0.000	0.05		2.2	OK	
S5.001	S14	105.783	-0.176	0.000	0.11		5.0	OK	
S5.002	S15	105.343	-0.177	0.000	0.10		6.4	OK	
S5.003	S16	104.711	-0.180	0.000	0.09		6.6	OK	
S1.005	S17	104.029	-0.101	0.000	0.01		2.9	OK	
S1.006	S18	103.595	-0.106	0.000	0.19		2.9	OK	
S6.000	S19	103.608	-0.232	0.000	0.11		6.7	OK	

1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.001	S20	15 Winter	1	+0%	30/15 Summer				103.497
S6.002	S21	15 Winter	1	+0%	30/15 Summer				103.378
S6.003	S22	360 Winter	1	+0%	1/60 Winter				103.367
S1.007	S23	360 Winter	1	+0%					103.128
S1.008	S24	360 Winter	1	+0%					102.562
S1.009	S25	360 Winter	1	+0%					101.667
S1.010	S26	360 Winter	1	+0%					101.545
S1.011	S27	360 Winter	1	+0%					100.045

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Time (mins)				
S6.001	S20	-0.193	0.000	0.27			16.1		OK	
S6.002	S21	-0.164	0.000	0.42			19.5		OK	
S6.003	S22	0.063	0.000	0.11			1.7	SURCHARGED		
S1.007	S23	-0.093	0.000	0.31			4.6		OK	
S1.008	S24	-0.093	0.000	0.31			4.6		OK	
S1.009	S25	-0.091	0.000	0.33			4.6		OK	
S1.010	S26	-0.114	0.000	0.13			4.6		OK	
S1.011	S27	-0.114	0.000	0.13			4.6		OK	



Barnsley Marshall		Page 19
1 Birch Court Blackpole East Worcester, WR3 8SG		
Date 25/01/2024 14:51 File 654m3 (Pond01 502.6m3+P...	Designed by AlexMavhunga Checked by	
Innovyze	Network 2020.1.3	

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 \* 10m<sup>3</sup>/ha Storage 0.000  
Hot Start Level (mm)                      0                      Inlet Coefficient 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 2      Number of Time/Area Diagrams 0  
Number of Offline Controls 0      Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model                      FSR                      Ratio R 0.279  
Region England and Wales Cv (Summer) 0.750  
M5-60 (mm)                      18.600 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 0.0                      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)                      1, 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	S01	15 Winter	30	+35%	30/15	Summer		
S2.000	S02	15 Winter	30	+35%				
S2.001	S03	15 Winter	30	+35%				
S2.002	S04	15 Winter	30	+35%	100/15	Winter		
S1.001	S05	15 Winter	30	+35%	30/15	Summer		
S1.002	S06	960 Winter	30	+35%	30/15	Summer		
S3.000	S07	15 Winter	30	+35%	30/15	Summer		
S3.001	S08	960 Winter	30	+35%	30/15	Winter		
S1.003	S09	960 Winter	30	+35%	30/15	Summer		
S4.000	S10	15 Winter	30	+35%	30/15	Summer		
S4.001	S11	15 Winter	30	+35%	30/15	Summer		
S1.004	S12	960 Winter	30	+35%	30/120	Winter		
S5.000	S13	15 Winter	30	+35%				
S5.001	S14	15 Winter	30	+35%				
S5.002	S15	15 Winter	30	+35%				
S5.003	S16	15 Winter	30	+35%	100/360	Winter		
S1.005	S17	960 Winter	30	+35%	30/30	Summer		
S1.006	S18	4320 Winter	30	+35%				
S6.000	S19	600 Winter	30	+35%	30/360	Winter		

1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



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Innovyze Network 2020.1.3

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 (m <sup>3</sup> )	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S01	104.961	0.143	0.000	1.02		29.5	SURCHARGED
S2.000	S02	106.133	-0.175	0.000	0.11		8.3	OK
S2.001	S03	105.397	-0.148	0.000	0.25		14.8	OK
S2.002	S04	104.901	-0.156	0.000	0.20		18.4	OK
S1.001	S05	104.778	0.136	0.000	1.26		63.4	SURCHARGED
S1.002	S06	104.749	0.231	0.000	0.15		6.6	SURCHARGED
S3.000	S07	105.067	0.186	0.000	1.35		39.0	SURCHARGED
S3.001	S08	104.749	0.044	0.000	0.10		7.2	SURCHARGED
S1.003	S09	104.748	0.274	0.000	0.15		13.2	SURCHARGED
S4.000	S10	105.119	0.337	0.000	0.91		26.2	SURCHARGED
S4.001	S11	104.956	0.350	0.000	1.69		48.8	SURCHARGED
S1.004	S12	104.747	0.323	0.000	0.06		17.5	SURCHARGED
S5.000	S13	106.193	-0.162	0.000	0.17		7.4	OK
S5.001	S14	105.834	-0.125	0.000	0.39		18.5	OK
S5.002	S15	105.393	-0.127	0.000	0.38		24.1	OK
S5.003	S16	104.756	-0.135	0.000	0.34		25.0	OK
S1.005	S17	104.746	0.616	0.000	0.01		2.9	SURCHARGED
S1.006	S18	103.595	-0.106	0.000	0.19		2.9	OK
S6.000	S19	103.867	0.027	0.000	0.05		2.9	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S01	
S2.000	S02	
S2.001	S03	
S2.002	S04	
S1.001	S05	
S1.002	S06	
S3.000	S07	
S3.001	S08	
S1.003	S09	
S4.000	S10	
S4.001	S11	
S1.004	S12	
S5.000	S13	
S5.001	S14	
S5.002	S15	
S5.003	S16	
S1.005	S17	
S1.006	S18	
S6.000	S19	

1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



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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.	Water Level (m)
S6.001	S20	600	Winter	30	+35%	30/15	Summer		103.867
S6.002	S21	600	Winter	30	+35%	30/15	Summer		103.865
S6.003	S22	600	Winter	30	+35%	1/60	Winter		103.863
S1.007	S23	180	Winter	30	+35%				103.128
S1.008	S24	120	Winter	30	+35%				102.562
S1.009	S25	15	Winter	30	+35%				101.668
S1.010	S26	15	Winter	30	+35%				101.545
S1.011	S27	15	Winter	30	+35%				100.045

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Time (mins)				
S6.001	S20	0.177	0.000	0.12			7.3	SURCHARGED		
S6.002	S21	0.323	0.000	0.19			9.1	SURCHARGED		
S6.003	S22	0.559	0.000	0.11			1.7	SURCHARGED		
S1.007	S23	-0.093	0.000	0.31			4.6	OK		
S1.008	S24	-0.093	0.000	0.31			4.6	OK		
S1.009	S25	-0.090	0.000	0.33			4.6	OK		
S1.010	S26	-0.114	0.000	0.13			4.6	OK		
S1.011	S27	-0.114	0.000	0.13			4.6	OK		

Barnsley Marshall		Page 22
1 Birch Court Blackpole East Worcester, WR3 8SG		
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Innovyze	Network 2020.1.3	

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 \* 10m<sup>3</sup>/ha Storage 0.000  
Hot Start Level (mm) 0    Inlet Coefficient 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 2    Number of Time/Area Diagrams 0  
Number of Offline Controls 0    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model    FSR    Ratio R 0.279  
Region England and Wales Cv (Summer) 0.750  
M5-60 (mm)    18.600 Cv (Winter) 0.840  
Margin for Flood Risk Warning (mm) 0.0    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)    1, 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	S01	15 Winter	100	+40%	30/15 Summer			
S2.000	S02	15 Winter	100	+40%				
S2.001	S03	15 Winter	100	+40%				
S2.002	S04	15 Winter	100	+40%	100/15 Winter			
S1.001	S05	1440 Winter	100	+40%	30/15 Summer			
S1.002	S06	1440 Winter	100	+40%	30/15 Summer			
S3.000	S07	15 Winter	100	+40%	30/15 Summer			
S3.001	S08	1440 Winter	100	+40%	30/15 Winter			
S1.003	S09	1440 Winter	100	+40%	30/15 Summer			
S4.000	S10	15 Winter	100	+40%	30/15 Summer			
S4.001	S11	15 Winter	100	+40%	30/15 Summer			
S1.004	S12	1440 Winter	100	+40%	30/120 Winter			
S5.000	S13	15 Winter	100	+40%				
S5.001	S14	15 Winter	100	+40%				
S5.002	S15	15 Winter	100	+40%				
S5.003	S16	1440 Winter	100	+40%	100/360 Winter			
S1.005	S17	1440 Winter	100	+40%	30/30 Summer			
S1.006	S18	1440 Winter	100	+40%				
S6.000	S19	720 Winter	100	+40%	30/360 Winter			



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 (m <sup>3</sup> )	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S01	105.255	0.437	0.000	1.22		35.1	SURCHARGED
S2.000	S02	106.141	-0.168	0.000	0.15		11.0	OK
S2.001	S03	105.411	-0.134	0.000	0.33		19.7	OK
S2.002	S04	105.072	0.016	0.000	0.25		22.7	SURCHARGED
S1.001	S05	105.055	0.413	0.000	0.13		6.5	SURCHARGED
S1.002	S06	105.053	0.536	0.000	0.14		6.0	SURCHARGED
S3.000	S07	105.319	0.438	0.000	1.58		45.8	SURCHARGED
S3.001	S08	105.054	0.349	0.000	0.10		6.9	SURCHARGED
S1.003	S09	105.052	0.578	0.000	0.14		12.4	SURCHARGED
S4.000	S10	105.221	0.440	0.000	1.25		36.2	SURCHARGED
S4.001	S11	105.145	0.540	0.000	1.96		56.6	SURCHARGED
S1.004	S12	105.051	0.627	0.000	0.05		16.6	SURCHARGED
S5.000	S13	106.204	-0.151	0.000	0.23		9.9	OK
S5.001	S14	105.853	-0.106	0.000	0.53		24.8	OK
S5.002	S15	105.410	-0.110	0.000	0.51		32.2	OK
S5.003	S16	105.051	0.160	0.000	0.03		2.3	SURCHARGED
S1.005	S17	105.050	0.920	0.000	0.02		3.2	SURCHARGED
S1.006	S18	103.597	-0.104	0.000	0.20		3.2	OK
S6.000	S19	104.092	0.252	0.000	0.06		3.3	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S01	
S2.000	S02	
S2.001	S03	
S2.002	S04	
S1.001	S05	
S1.002	S06	
S3.000	S07	
S3.001	S08	
S1.003	S09	
S4.000	S10	
S4.001	S11	
S1.004	S12	
S5.000	S13	
S5.001	S14	
S5.002	S15	
S5.003	S16	
S1.005	S17	
S1.006	S18	
S6.000	S19	

1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



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 File 654m3 (Pond01 502.6m3+P...

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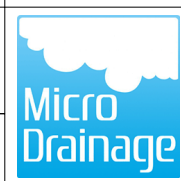
Network 2020.1.3

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.001	S20	720 Winter	100	+40%	30/15 Summer				104.093
S6.002	S21	720 Winter	100	+40%	30/15 Summer				104.091
S6.003	S22	720 Winter	100	+40%	1/60 Winter				104.088
S1.007	S23	960 Winter	100	+40%					103.130
S1.008	S24	960 Winter	100	+40%					102.564
S1.009	S25	960 Winter	100	+40%					101.670
S1.010	S26	960 Winter	100	+40%					101.547
S1.011	S27	960 Winter	100	+40%					100.046

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Time (mins)				
S6.001	S20	0.403	0.000	0.15		8.7		SURCHARGED		
S6.002	S21	0.549	0.000	0.24		11.2		SURCHARGED		
S6.003	S22	0.784	0.000	0.11		1.7		SURCHARGED		
S1.007	S23	-0.091	0.000	0.33		4.9		OK		
S1.008	S24	-0.091	0.000	0.33		4.9		OK		
S1.009	S25	-0.088	0.000	0.36		4.9		OK		
S1.010	S26	-0.112	0.000	0.14		4.9		OK		
S1.011	S27	-0.113	0.000	0.14		4.9		OK		

1 Birch Court  
Blackpole East  
Worcester, WR3 8SG



Date 15/08/2023 13:12  
File

Designed by AlexMavhunga  
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Innovyze Source Control 2020.1.3

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.916	Urban	0.000
SAAR (mm)	1057	Region Number	Region 10

**Results 1/s**

QBAR Rural 6.5  
QBAR Urban 6.5

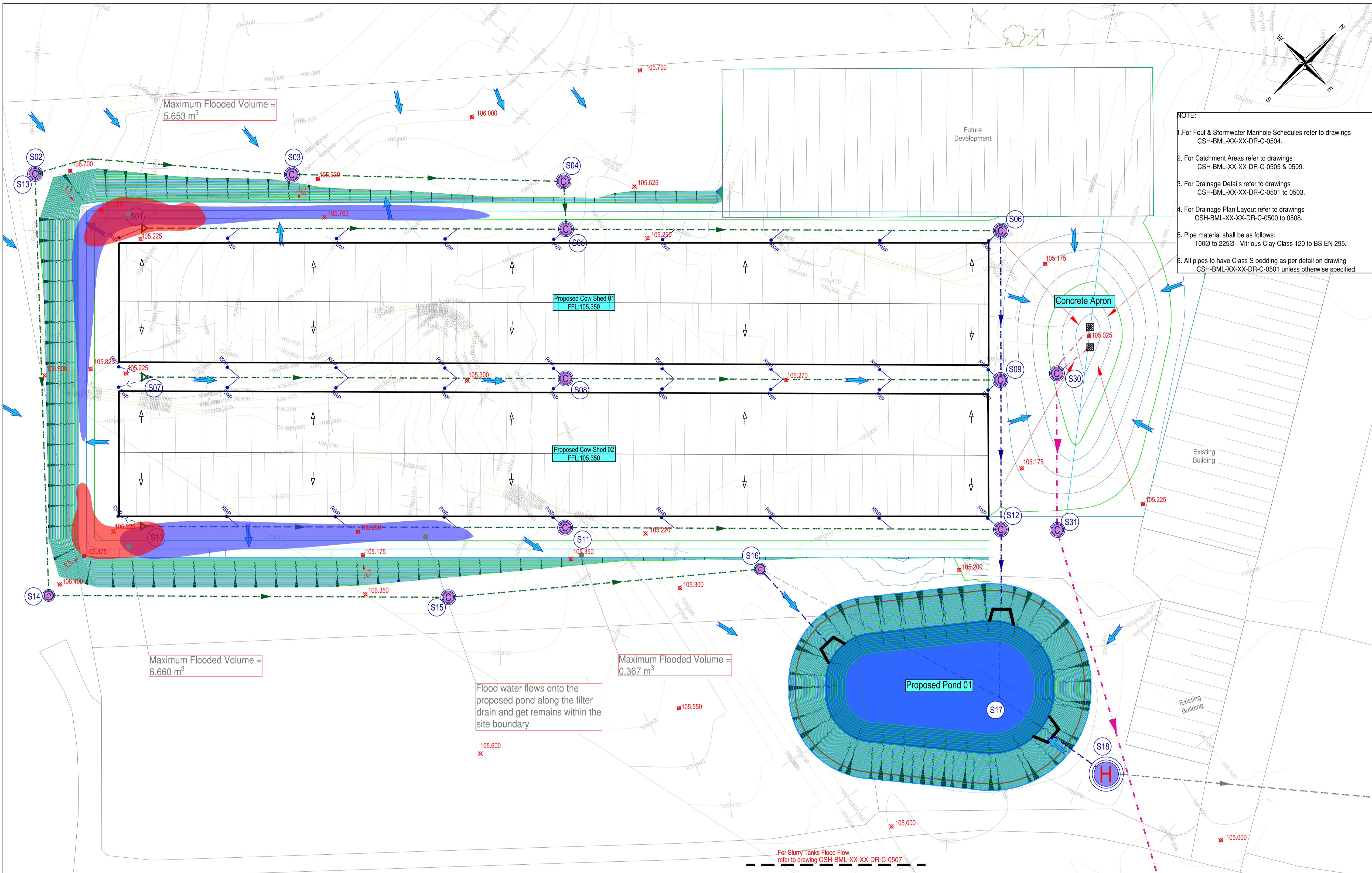
Q100 years 13.6

Q1 year 5.7  
Q30 years 11.0  
Q100 years 13.6

# Appendix F

## Floodflow Analysis





**NOTE:**

- For Foul & Stormwater Manhole Schedules refer to drawings CSH-BML-XX-XX-DR-C-0504.
- For Catchment Areas refer to drawings CSH-BML-XX-XX-DR-C-0505 & 0509.
- For Drainage Details refer to drawings CSH-BML-XX-XX-DR-C-0501 to 0503.
- For Drainage Plan Layout refer to drawings CSH-BML-XX-XX-DR-C-0500 to 0508.
- Pipe material shall be as follows:  
1000 to 2250 - Vitrious Clay Class 120 to BS EN 295.
- All pipes to have Class S bedding as per detail on drawing CSH-BML-XX-XX-DR-C-0501 unless otherwise specified.

**Safety, Health & Environmental Information:**  
In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below.

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION and described below:

**Construction/Maintenance/Cleaning/Demolition**  
Refer to Drawing:

**General Notes:**

- Do not scale from this drawing.
- All dimensions are in millimetres (mm), all levels in metres (m) unless noted otherwise.
- Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
- Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.
- The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
- The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.
- This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

**Drainage Key:**

	Proposed Stormwater
	Proposed Filter Drain
	Proposed Stormwater Manhole
	Proposed Ridgistor Separate Catchpit
	Proposed Stormwater Hydro-brake
	DN150 Gully / RWP Connector
	Proposed Rain Water Pipe
	Proposed Rodding Eye
	Direction of Flow
	Area of Flooding
	Design Levels

Rev	By / Chk'd	Date	Description
P05	IW/AM	28/02/2024	Drainage details updated
P04	IW/AM	06/02/2024	Drainage Plan Layout Updated
P03	IW/AM	25/01/24	Details Updated
P02	DH/AM	16/08/23	Details Updated
P01	KD/AM	20/07/23	Preliminary Issue

**PRELIMINARY DRAWING**  
This drawing is not to be used for construction

Client:

BarnsleyMarshall Limited  
1 Birch Court  
Blackpole East  
Worcester  
WR3 6SG

Tel: 01905 330550  
Email: design@barnsleymarshall.co.uk  
Web: www.barnsleymarshall.co.uk

Project: **Cow Shed**  
Elmridge Lane, Preston,  
PR3 2NY

Drawing: **Flood Flow Analysis - After Development**  
1 of 2  
1000 year+0% CC - 15min Winter Storm Event

By/Chk'd	RA/GM	Date	05/04/2023
Drawing No.	CSH-BML-XX-XX-DR-C-0506	Revision	P05
BML Job No.	1000-05	Status	-
Drawing Scale at A1:	1:250		
CAD Filename:	V:\Projects\1000 Cow Shed\BarnsleyMarshall\CSH-BML-XX-XX-DR-C-0506-001.rvt - BarnsleyMarshall 1000 year +0% CC.dwg		

**Flood Depth Bands**

Depth < (mm)	Hazard Rating <	Lower Colour	Upper Colour
0	0.00	Not Drawn	
50	0.75		
125	1.50		
300	2.50		
>			

**Greenfield Runoff Rates**

**ICP SUDS Mean Annual Flood**

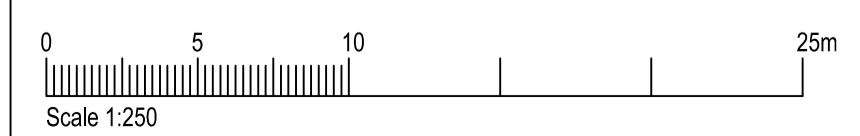
Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.916	Urban	0.000
SAAR (mm)	1057	Region Number	Region 10

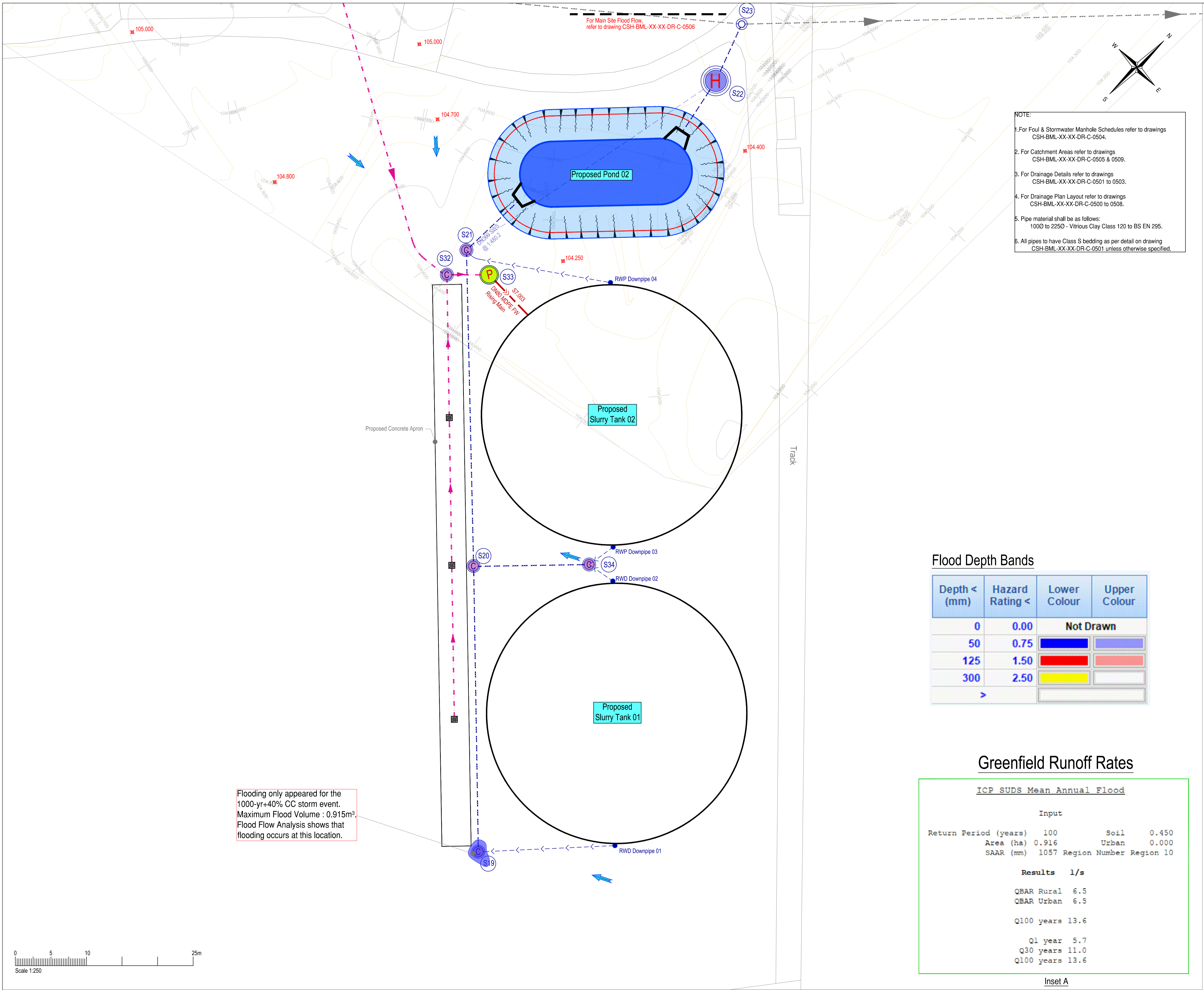
Results l/s

QBAR Rural	6.5
QBAR Urban	6.5
Q100 years	13.6
Q1 year	5.7
Q30 years	11.0
Q100 years	13.6

Inset A







Flooding only appeared for the 1000-yr+40% CC storm event. Maximum Flood Volume : 0.915m³. Flood Flow Analysis shows that flooding occurs at this location.

For Main Site Flood Flow, refer to drawing CSH-BML-XX-XX-DR-C-0506

- NOTE:
- For Foul & Stormwater Manhole Schedules refer to drawings CSH-BML-XX-XX-DR-C-0504.
  - For Catchment Areas refer to drawings CSH-BML-XX-XX-DR-C-0505 & 0509.
  - For Drainage Details refer to drawings CSH-BML-XX-XX-DR-C-0501 to 0503.
  - For Drainage Plan Layout refer to drawings CSH-BML-XX-XX-DR-C-0500 to 0508.
  - Pipe material shall be as follows:  
1000 to 2250 - Vitrious Clay Class 120 to BS EN 295.
  - All pipes to have Class S bedding as per detail on drawing CSH-BML-XX-XX-DR-C-0501 unless otherwise specified.

**Safety, Health & Environmental Information:**  
In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,  
 INDICATES A RESIDUAL RISK AS A WARNING  
 INDICATES A RESIDUAL RISK FOR INFORMATION  
and described below:

**Construction/Maintenance/Cleaning/Demolition**  
Refer to Drawing:

- General Notes:**
- Do not scale from this drawing.
  - All dimensions are in millimetres (mm), all levels in metres (m) unless noted otherwise.
  - Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
  - Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.
  - The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
  - The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.
  - This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

**Drainage Key:**

	Proposed Stormwater Sewer
	Proposed Filter Drain
	Proposed Dirty Water Sewer
	Proposed Stormwater Manhole
	Proposed Ridgiform Separate Catchpit
	Proposed Stormwater Hydro-brake
	DN150 Gully / RWP Connector
	Proposed Rain Water Pipe
	Proposed Rodding Eye
	Proposed Finish Floor Level
	Proposed Pumping Station. Refer to drawing CSH-BML-XX-XX-DR-C-0503 for details.
	Proposed Rising Main
	Proposed Inspection Chamber with Grilled Cover. For details Refer to drawing CSH-BML-XX-XX-DR-C-0503
	Design Levels

Rev	By / Chk'd	Date	Description
P04	IW/AM	28/02/2024	Drainage details updated
P03	IW/AM	06/02/2024	Drainage Plan Layout Updated
P02	IW/AM	26/01/24	Preliminary Issue
P01	DH/AM	16/08/23	Preliminary Issue

**PRELIMINARY DRAWING**  
This drawing is not to be used for construction

Client

BarnsleyMarshall Limited  
1 Birch Court  
Blackpole East  
Worcester  
WR3 6SG  
Tel: 01905 330550  
Email: design@barnsleymarshall.co.uk  
Web: www.barnsleymarshall.co.uk

Project  
**Cow Shed**  
Elmridge Lane, Preston,  
PR3 2NY

Drawing  
**Flood Flow Analysis - After Development**  
2 of 2  
1000-year+0% CC-15min Winter Storm Event

By/Chk'd	RA/GM	Date	05/04/2023
Drawing No.	CSH-BML-XX-XX-DR-C-0507	Revision	P04
BML Job No.	1000-05	Status	-
Drawing Scale at A1:	1:250		
CAD Filename:	\\p04\1000-05-Cow-Shed\Drawings - Storm\DWG\CSH-BML-XX-XX-DR-C-0507-P04 - Flood Flow Analysis 1000.ydr		

**Flood Depth Bands**

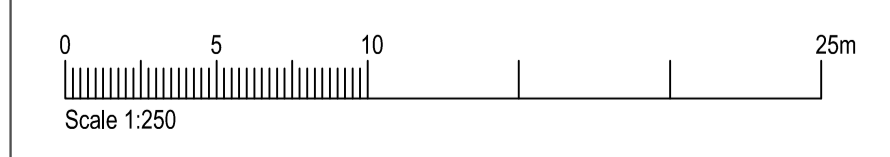
Depth < (mm)	Hazard Rating <	Lower Colour	Upper Colour
0	0.00	Not Drawn	
50	0.75		
125	1.50		
300	2.50		
>			

**Greenfield Runoff Rates**

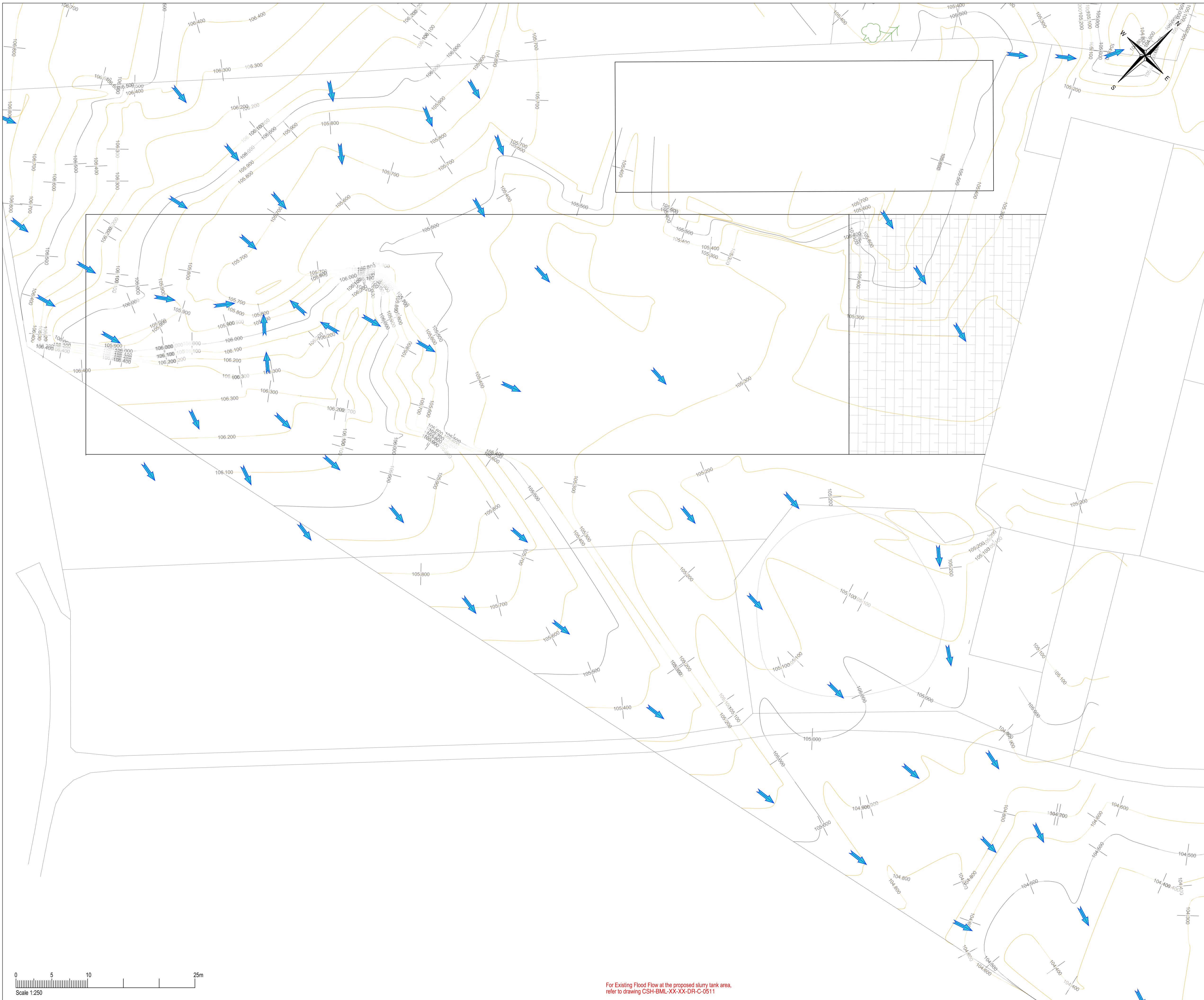
**ICP SUDS Mean Annual Flood**

Input			
Return Period (years)	100	Soil	0.450
Area (ha)	0.916	Urban	0.000
SAAR (mm)	1057	Region Number	Region 10
Results l/s			
QBAR Rural	6.5		
QBAR Urban	6.5		
Q100 years	13.6		
Q1 year	5.7		
Q30 years	11.0		
Q100 years	13.6		

Inset A







**Safety, Health & Environmental Information:**

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below.

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

**Construction/Maintenance/Cleaning/Demolition**  
Refer to Drawing:

**General Notes:**

1. Do not scale from this drawing.
2. All dimensions are in millimetres (mm), all levels in metres (m) unless noted otherwise.
3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
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5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.
7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

**NOTE:**

1. For Foul & Stormwater Manhole Schedules refer to drawings CSH-BML-XX-XX-DR-C-0504.
2. For Catchment Areas refer to drawings CSH-BML-XX-XX-DR-C-0505 & 0509.
3. For Flood Flow Analysis refer to drawings CSH-BML-XX-XX-DR-C-0506 & 0507.
4. For Drainage Details refer to drawings CSH-BML-XX-XX-DR-C-0501 to 0503.
5. For Drainage Plan Layout refer to drawings CSH-BML-XX-XX-DR-C-0500 to 0508.
6. Pipe material shall be as follows:  
1000 to 2250 - Vitrious Clay Class 120 to BS EN 295.
7. All pipes to have Class S bedding as per detail on drawing CSH-BML-XX-XX-DR-C-0501 unless otherwise specified.

**Key**

	Flow Direction
--	----------------

P01	IW/AM	26/01/24	Preliminary Issue
Rev	By / Chk'd	Date	Description

**PRELIMINARY DRAWING**  
This drawing is not to be used for construction

**Client**



**BarnsleyMarshall Limited**  
1 Birch Court  
Blackpole East  
Worcester  
WR3 6SG



Tel: 01905 335550  
Email: design@barnsleymarshall.co.uk  
Web: www.barnsleymarshall.co.uk

**Project**

**Cow Shed**  
Elmridge Lane, Preston,  
PR3 2NY

**Drawing**

**Flood Flow Analysis - Before Development**  
1 of 2

By/Chk'd	RA/GM	Date	05/04/2023
Drawing No.	CSH-BML-XX-XX-DR-C-0510		Revision <b>P01</b>
BML Job No.	1000-05		Status -

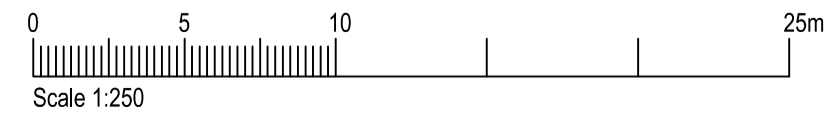
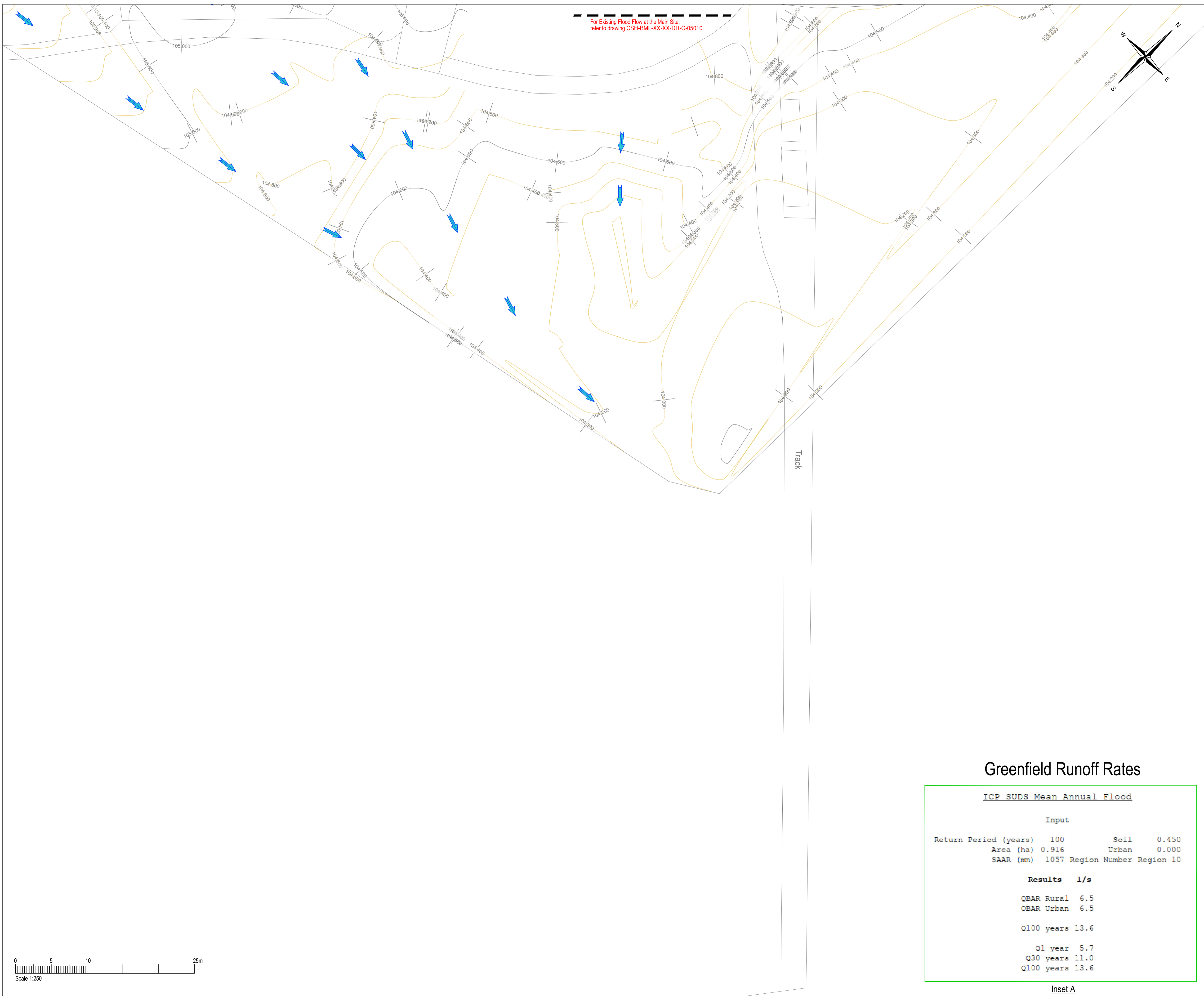
Drawing Scale at A1: 1:250

CAD Filename: Y:\projects\1000-05 Cow Shed\BarnsleyMarshall - Working\DWG\CSH-BML-XX-XX-DR-C-0510 - Flood Flow Analysis.dwg



For Existing Flood Flow at the proposed slurry tank area, refer to drawing CSH-BML-XX-XX-DR-C-0511





### Greenfield Runoff Rates

ICP SUDS Mean Annual Flood			
Input			
Return Period (years)	100	Soil	0.450
Area (ha)	0.916	Urban	0.000
SAAR (mm)	1057	Region Number	Region 10
Results l/s			
QBAR Rural	6.5		
QBAR Urban	6.5		
Q100 years	13.6		
Q1 year	5.7		
Q30 years	11.0		
Q100 years	13.6		

Inset A

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INDICATES A RESIDUAL RISK AS A WARNING

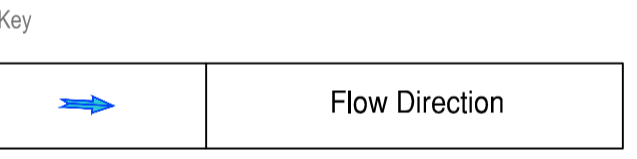
INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

**Construction/Maintenance/Cleaning/Demolition**  
 Refer to Drawing:

- General Notes:**
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- NOTE:**
- For Foul & Stormwater Manhole Schedules refer to drawings CSH-BML-XX-XX-DR-C-0504.
  - For Catchment Areas refer to drawings CSH-BML-XX-XX-DR-C-0505 & 0509.
  - For Flood Flow Analysis refer to drawings CSH-BML-XX-XX-DR-C-0506 & 0507.
  - For Drainage Details refer to drawings CSH-BML-XX-XX-DR-C-0501 to 0503.
  - For Drainage Plan Layout refer to drawings CSH-BML-XX-XX-DR-C-0500 to 0508.
  - Pipe material shall be as follows:  
1000 to 2250 - Vitrious Clay Class 120 to BS EN 295.
  - All pipes to have Class S bedding as per detail on drawing CSH-BML-XX-XX-DR-C-0501 unless otherwise specified.



Rev	By / Chk'd	Date	Description
P01	IW/AM	26/01/24	Preliminary Issue

**PRELIMINARY DRAWING**  
 This drawing is not to be used for construction

Client


**BarnsleyMarshall Limited**  
 1 Birch Court  
 Blackpole East  
 Worcester  
 WR3 6SG

Tel: 01905 330550  
 Email: design@barnsleymarshall.co.uk  
 Web: www.barnsleymarshall.co.uk

Project  
**Cow Shed**  
 Elmridge Lane, Preston,  
 PR3 2NY

Drawing  
**Flood Flow Analysis - Before Development**  
 2 of 2

By/Chk'd	RA/GM	Date	05/04/2023
Drawing No.	CSH-BML-XX-XX-DR-C-0511	Revision	P01
BML Job No.	1000-05	Status	-
Drawing Scale at A1:	1:250		
CAD Filename:	Y:\Project\1000-Cow Shed\Drawings - Working\DWG\CSH-BML-XX-XX-DR-C-0511-01 - Flood Flow Analysis.dwg		

Barnsley Marshall		Page 1
1 Birch Court Blackpole East Worcester, WR3 8SG		
Date 25/01/2024 15:09 File 654m3 (Pond01 502.6m3+P...	Designed by AlexMavhunga Checked by	
Innovyze		Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes Alex003

FSR Rainfall Model - England and Wales

Return Period (years)	3	PIMP (%)	100
M5-60 (mm)	18.500	Add Flow / Climate Change (%)	40
Ratio R	0.334	Minimum Backdrop Height (m)	4.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.500
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm





Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	4-8	0.102	8-12	0.634	12-16	0.138

Total Area Contributing (ha) = 0.874

Total Pipe Volume (m³) = 50.471

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	51.808	0.176	294.4	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	31.531	0.764	41.3	0.022	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	33.308	0.488	68.2	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	5.854	0.414	14.1	0.009	0.00	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	6.14	104.593	0.085	0.0	0.0	4.6	0.76	30.1	16.1
S2.000	50.00	5.26	106.083	0.022	0.0	0.0	1.2	2.04	81.2	4.2
S2.001	50.00	5.61	105.320	0.039	0.0	0.0	2.1	1.59	63.1	7.4
S2.002	50.00	5.64	104.832	0.048	0.0	0.0	2.6	3.50	139.2	9.1

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	53.261	0.125	426.5	0.065	0.00	0.0	0.600	o	300	Pipe/Conduit		
S1.002	18.299	0.043	426.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit		
S3.000	51.694	0.176	294.4	0.110	5.00	0.0	0.600	o	225	Pipe/Conduit		
S3.001	53.305	0.231	230.5	0.097	0.00	0.0	0.600	o	300	Pipe/Conduit		
S1.003	18.300	0.051	361.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit		
S4.000	51.810	0.176	294.4	0.076	5.00	0.0	0.600	o	225	Pipe/Conduit		
S4.001	53.421	0.181	294.4	0.065	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.004	20.574	0.294	70.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit		
S5.000	51.683	0.395	130.8	0.020	5.00	0.0	0.600	o	225	Pipe/Conduit		
S5.001	48.995	0.439	111.6	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit		
S5.002	38.381	0.629	61.0	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit		
S5.003	33.261	0.761	43.7	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.005	16.057	0.129	124.2	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit		
S1.006	59.632	0.480	124.2	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)
S1.001	50.00	7.32	104.342	0.198	0.0	0.0	10.7	0.76	53.4	37.5
S1.002	50.00	7.72	104.217	0.198	0.0	0.0	10.7	0.76	53.4	37.5
S3.000	50.00	6.14	104.656	0.110	0.0	0.0	6.0	0.76	30.1	20.9
S3.001	50.00	7.00	104.406	0.207	0.0	0.0	11.2	1.03	72.9	39.3
S1.003	50.00	8.04	104.099	0.405	0.0	0.0	21.9	0.95	104.6	76.8
S4.000	50.00	6.14	104.556	0.076	0.0	0.0	4.1	0.76	30.1	14.4
S4.001	50.00	7.32	104.380	0.141	0.0	0.0	7.7	0.76	30.1	26.8
S1.004	50.00	8.18	103.974	0.546	0.0	0.0	29.6	2.43	386.9	103.6
S5.000	50.00	5.75	106.130	0.020	0.0	0.0	1.1	1.14	45.4	3.8
S5.001	50.00	6.41	105.734	0.050	0.0	0.0	2.7	1.24	49.2	9.5
S5.002	50.00	6.80	105.295	0.065	0.0	0.0	3.5	1.68	66.7	12.3
S5.003	50.00	7.08	104.666	0.067	0.0	0.0	3.6	1.98	78.9	12.8
S1.005	50.00	8.33	103.680	0.645	0.0	0.0	34.9	1.82	289.9	122.3
S1.006	50.00	9.43	103.551	0.645	0.0	0.0	34.9	0.90	15.9<	122.3

1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



Date 25/01/2024 15:09  
 File 654m3 (Pond01 502.6m3+P...

Designed by AlexMavhunga  
 Checked by

Innovyze Network 2020.1.3

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
S6.000	44.948	0.150	300.0	0.060	5.00	0.0	0.600	o	300	Pipe/Conduit	
S6.001	44.433	0.148	300.0	0.104	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.002	42.374	0.088	480.2	0.046	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.003	8.770	0.083	106.1	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	79.685	0.566	140.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	126.233	0.897	140.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.009	13.884	0.099	140.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.010	38.555	1.500	25.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.011	42.348	1.659	25.5	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)
S6.000	50.00	5.83	103.540	0.060	0.0	0.0	3.3	0.90	63.8	11.4
S6.001	50.00	6.65	103.390	0.164	0.0	0.0	8.9	0.90	63.8	31.2
S6.002	50.00	7.64	103.242	0.211	0.0	0.0	11.4	0.71	50.2	39.9
S6.003	50.00	7.79	103.154	0.229	0.0	0.0	12.4	0.98	17.2<	43.4
S1.007	46.81	11.01	103.071	0.874	0.0	0.0	44.3	0.85	14.9<	155.1
S1.008	41.99	13.49	102.505	0.874	0.0	0.0	44.3	0.85	14.9<	155.1
S1.009	41.53	13.77	101.608	0.874	0.0	0.0	44.3	0.85	15.0<	155.1
S1.010	41.00	14.09	101.509	0.874	0.0	0.0	44.3	1.99	35.2<	155.1
S1.011	40.44	14.44	100.009	0.874	0.0	0.0	44.3	2.00	35.4<	155.1

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.082	0.082	0.082
	User	-	30	0.010	0.003	0.085
2.000	User	-	100	0.022	0.022	0.022
2.001	User	-	100	0.014	0.014	0.014
	User	-	30	0.007	0.002	0.016
	User	-	30	0.003	0.001	0.017
2.002	User	-	100	0.009	0.009	0.009
1.001	User	-	100	0.065	0.065	0.065
1.002	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.107	0.107	0.107
	User	-	30	0.012	0.004	0.110
3.001	User	-	100	0.097	0.097	0.097
1.003	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.068	0.068	0.068
	User	-	30	0.027	0.008	0.076
4.001	User	-	100	0.061	0.061	0.061
	User	-	30	0.015	0.005	0.065
1.004	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.020	0.020	0.020
5.001	User	-	100	0.030	0.030	0.030
5.002	User	-	100	0.015	0.015	0.015
5.003	User	-	30	0.007	0.002	0.002
1.005	User	-	40	0.078	0.031	0.031
1.006	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.060	0.060	0.060
6.001	User	-	100	0.045	0.045	0.045
	User	-	100	0.059	0.059	0.104
6.002	User	-	100	0.046	0.046	0.046
6.003	User	-	40	0.046	0.018	0.018
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.005	0.874	0.874

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)
S1.011	SexDitch	99.100	98.350	98.350	0	0



1 Birch Court  
 Blackpole East  
 Worcester, WR3 8SG



Date 25/01/2024 15:09  
 File 654m3 (Pond01 502.6m3+P...

Designed by AlexMavhunga  
 Checked by

Innovyze

Network 2020.1.3


Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	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	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	1000	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	15
Ratio R	0.334		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S17, DS/PN: S1.005, Volume (m³): 6.9

Unit Reference	MD-SHE-0079-3000-1200-3000
Design Head (m)	1.200
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	79
Invert Level (m)	103.680
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200


Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.0
Flush-Flo™	0.348	2.9
Kick-Flo®	0.707	2.4
Mean Flow over Head Range	-	2.6

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	2.3	1.200	3.0	3.000	4.6	7.000	6.8
0.200	2.8	1.400	3.2	3.500	4.9	7.500	7.0
0.300	2.9	1.600	3.4	4.000	5.2	8.000	7.3
0.400	2.9	1.800	3.6	4.500	5.5	8.500	7.5
0.500	2.8	2.000	3.8	5.000	5.8	9.000	7.7
0.600	2.7	2.200	4.0	5.500	6.1	9.500	7.9
0.800	2.5	2.400	4.1	6.000	6.3		
1.000	2.8	2.600	4.3	6.500	6.6		

Hydro-Brake® Optimum Manhole: S22, DS/PN: S6.003, Volume (m³): 4.8

Unit Reference	MD-SHE-0063-2000-1300-2000
Design Head (m)	1.300
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	63
Invert Level (m)	103.154
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200


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Hydro-Brake® Optimum Manhole: S22, DS/PN: S6.003, Volume (m³): 4.8

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	2.0
Flush-Flo™	0.280	1.7
Kick-Flo®	0.564	1.4
Mean Flow over Head Range	-	1.6

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	1.4	1.200	1.9	3.000	2.9	7.000	4.4
0.200	1.7	1.400	2.1	3.500	3.2	7.500	4.5
0.300	1.7	1.600	2.2	4.000	3.4	8.000	4.6
0.400	1.6	1.800	2.3	4.500	3.5	8.500	4.8
0.500	1.5	2.000	2.4	5.000	3.7	9.000	4.9
0.600	1.4	2.200	2.5	5.500	3.9	9.500	5.0
0.800	1.6	2.400	2.6	6.000	4.1		
1.000	1.8	2.600	2.7	6.500	4.2		

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Storage Structures for Storm

Tank or Pond Manhole: S17, DS/PN: S1.005

Invert Level (m) 103.680

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	233.0	1.195	467.4	1.495	538.9

Tank or Pond Manhole: S22, DS/PN: S6.003

Invert Level (m) 103.154

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	100.0	1.200	268.3	1.636	349.7

Summary of Results for 15 minute 1000 year Winter (Storm)

Margin for Flood Risk Warning (mm) 0.0      DVD Status ON  
 Analysis Timestep Fine Inertia Status ON  
 DTS Status OFF

WARNING: The analysis maybe unstable. Please see the method of analysis help for more details.

PN	US/MH Name	Water	Surcharged	Flooded	Half Drain		Pipe	Status
		Level (m)	Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (l/s)	Time (mins)	
S1.000	S01	105.263	0.444	5.653	1.16		33.5	FLOOD
S2.000	S02	106.148	-0.160	0.000	0.18		13.6	OK
S2.001	S03	105.422	-0.123	0.000	0.41		24.3	OK
S2.002	S04	105.237	0.180	0.000	0.35		31.5	SURCHARGED
S1.001	S05	105.192	0.550	0.000	1.77		89.3	SURCHARGED
S1.002	S06	104.794	0.277	0.000	2.08		88.7	SURCHARGED
S3.000	S07	105.355	0.474	7.133	1.57		45.5	FLOOD
S3.001	S08	105.102	0.396	0.000	1.41		97.2	SURCHARGED
S1.003	S09	104.632	0.158	0.000	2.09		181.3	SURCHARGED
S4.000	S10	105.252	0.471	6.660	1.10		31.9	FLOOD
S4.001	S11	105.189	0.584	0.367	2.01		58.2	FLOOD
S1.004	S12	104.298	-0.126	0.000	0.78		238.8	OK
S5.000	S13	106.213	-0.142	0.000	0.28		12.2	OK
S5.001	S14	105.870	-0.089	0.000	0.65		30.5	OK
S5.002	S15	105.426	-0.094	0.000	0.63		39.6	OK
S5.003	S16	104.785	-0.106	0.000	0.55		40.8	OK
S1.005	S17	104.259	0.129	0.000	0.01		2.9	SURCHARGED
S1.006	S18	103.595	-0.106	0.000	0.19		2.9	OK
S6.000	S19	104.341	0.501	0.915	0.63		37.6	FLOOD
S6.001	S20	104.340	0.650	0.000	1.46		86.9	SURCHARGED
S6.002	S21	103.973	0.431	0.000	2.30		107.9	SURCHARGED
S6.003	S22	103.603	0.299	0.000	0.11		1.7	SURCHARGED
S1.007	S23	103.128	-0.093	0.000	0.31		4.5	OK
S1.008	S24	102.561	-0.094	0.000	0.30		4.4	OK
S1.009	S25	101.666	-0.092	0.000	0.32		4.4	OK
S1.010	S26	101.545	-0.114	0.000	0.13		4.4	OK
S1.011	S27	100.044	-0.115	0.000	0.13		4.4	OK