Technical Note

Project: New Woodley School & 6th Form

To: Planning Officer at Kirklees Council

From: Kristen Jones at Hexa Consulting Ltd

Date: 28/04/2026

Subject: Flood Risk and Drainage Design – Non Material Amendment Application

Ref: NWSC-HEX-XX-XX-TN-C-0001-V01

This technical note has been prepared in support of the proposed Non-Material Amendment to planning application 2024/62/91998/W, submitted in 2024.

The proposed flood risk mitigation and drainage design for the proposed development has been revised following the submission of the 2024 application. The revisions have been undertaken in response to updated site layout proposals and alternative attenuation product, which necessitated amendments to the original engineering strategy prepared by BWB Consulting.

Notwithstanding these revisions, these updated proposals continue to be based upon the key design principles and approach set out within the flood risk and drainage documentation previously submitted as part of the application. In particular, the design has been developed in accordance with the following documents by BWB, which formed part of the original submission and were approved by the Lead Local Flood Authority (LLFA):

- Flood Risk Assessment ref: FRA 22 1180 – R0
- Sustainable Drainage Statement ref: 22315-BWB-ZZ-XX-RP-C-0001_SDS
- Supporting Letter ref: 22315-BWB-ZZ-XX-RP-C-0002_Drainage Planning Letter_S2-P01

Subsequent to the original submission, responsibility for the infrastructure and drainage design has been transferred from BWB Consulting to Hexa Consulting. Hexa Consulting has undertaken the redesign and refinement of the drainage proposals in accordance with the established principles, while incorporating the necessary updates arising from the consultation process.

The following documents, drawings, and calculations have been prepared to support the revised drainage design, which were accepted by the LLFA in January 2026 through meetings facilitated by Kirklees Council:

- NWSC-HEX-ZZ-ZZ-D-C-92001-P02_Drainage Layout
- 700298-HEX-XX-XX-CA-C-9200_Surface Water Calculations - P02
- Woodley School & College, Huddersfield, HD5 8JE-Attenuation Tank Details_Rev-B
- Woodley School & College, Huddersfield, HD5 8JE-Attenuation Tank Short Section Details_Rev_B
- HWMS C680 Structural Calculations Woodley - Frankische ST-A

These documents are included at **Appendix A** and should be read in conjunction with the previously submitted planning information and form the basis of the revised drainage strategy for the proposed development.

Prepared by:

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Appendix A – Supporting drawings and calculations

Ground Floor
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COORDINATION NOTES

KEY	NOTE
	POP-UP/RWP CLASHING WITH SUBSTRUCTURE. WOULD REQUIRE CAST IN. COORDINATION WITH M&E DESIGNER TO MITIGATE NUMBER OF CONNECTIONS COMING DOWN ON FOUNDATIONS.

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in meters unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. This drawing should be printed and read in colour.

Design Notes

1. DRAINAGE DESIGN BASED ON THE FOLLOWING INFORMATION:
   - NWSC-ONE-ZZ-ZZ-D-L-00002-P03_ProposedLandscapePlan
   - NWSC-ONE-ZZ-ZZ-D-L-00401_Outline External Levels
   - NWSC-GAH-01-00-D-M-02701_Mechanical & Public Health Ground Floor Above Grond Drainage Sheet 1
   - NWSC-GAH-01-00-D-M-02702_Mechanical & Public Health Ground Floor Above Grond Drainage Sheet 2
   - NWSC-GAH-01-00-D-M-02703_Mechanical & Public Health Ground Floor Above Grond Drainage Sheet 3
   - NWSC-GAH-01-00-D-M-02704_Mechanical & Public Health Ground Floor Above Grond Drainage Sheet 4
   - NWSC-DLA-01-00-D-A-20100_General Arrangement Plan - Ground Floor_P03

Legend

- RED LINE BOUNDARY
- PROPOSED SURFACE WATER
- PROPOSED FLOW CONTROL
- PROPOSED FOUL WATER
- PROPOSED BACKDROP CONNECTION
- EXISTING SURFACE WATER
- EXISTING COMBINED WATER
- PROPOSED ROAD GULLY
- PROPOSED SURFACE WATER YARD GULLY
- PROPOSED RWP CONNECTION
- PROPOSED SVP CONNECTION
- PROPOSED FLOOR GULLY CONNECTION
- PROPOSED CHANNEL DRAIN & SUMP UNIT
- PROPOSED KERB DRAIN & SUMP UNIT
- PROPOSED FILTER STRIP
- PROPOSED VENT PIPE
- PROPOSED ATTENUATION TANK

THE CCTV SURVEY INDICATES THE CAR PARK DRAINAGE CURRENTLY DRAINS NORTH INTO THE PUBLIC SEWER LOCATED WITHIN THE EXISTING HIGHWAY. EXISTING NURSERY CAR PARK ASSUMED TO BE RETAINED AS EXISTING. ANY REMEDIAL WORKS SUBJECT TO RECEIPT OF FURTHER CCTV SURVEY. ACCESS ROAD DRAINAGE TO BE CONFIRMED

SUBSTATION RAINWATER PIPE IS SHOWN INDICATIVELY. POSITION TO BE CONFIRMED.

SWALE OUTLET IL: 131.860m

PROPOSED SWALE
280mm DEEP
300mm WIDE BASE
850mm WIDE SLOPES AT 1:3
500mm OFFSET FROM TOP OF 1:3 BANKS

SWALE INLET IL: 132.450m

2NO. SVP CONNECTIONS SHOWN INDICATIVELY. POSITIONS TO BE CONFIRMED.

RAINWATER PIPE IS SHOWN INDICATIVELY. POSITION TO BE CONFIRMED.

FILTER DRAIN OUTFALL

S1.1 1,350 dia PCC CL: 131.776 IL: 130.606

S1.2 1,350 dia PCC CL: 131.869 IL: 130.432

S1.3 1,350 dia PCC CL: 131.230 IL: 129.450 FITTED WITH A NON-RETURN VALVE

S1.4 1,350 dia PCC CL: 132.593 IL: 129.330

S1.5 CL: 132.707 IL: 128.824 CLASS 1 BYPASS OIL SEPARATOR SPEL 204 C1/SC OR SIMILAR APPROVED. OIL SEPARATOR TO SERVE CIRCA. 6000m2 NB. SEPARATOR SIZE BASED ON AREA SERVED, A DIFFERENT UNIT MAY BE REQUIRED BASED ON THE INLET AND OUTLET PIPE DIAMETER.

CONNECTION TO PICK UP SPRINKLER COMPOUND LOCATION TBC.

S1.6 CL: 132.771 IL: 128.483 CATCHPIT 450mm IL IN: 128.48 225mm IL IN: 129.98 450mm IL OUT: 128.48

S1.7 1,200 dia PCC CL: 133.037 IL: 128.303

S1.8 2,700 dia PCC CL: 131.500 IL: 128.083 HYDROBRAKE FLOW CONTROL DISCHARGE RATE: 49.9l/s DESIGN HEAD: 2.330m

S2.1 600 PPIC CL: 135.333 IL: 133.605

S2.2 1,350 dia PCC CL: 133.607 IL: 132.608

S2.3 1,350 dia PCC CL: 133.407 IL: 132.513

S2.4 1,200 dia PCC CL: 133.535 IL: 131.755

S2.5 CL: 133.197 IL: 130.320 300mm IL IN: 131.32 100mm IL IN: 131.52 300mm IL OUT: 130.32

S2.6 1,200 dia PCC CL: 133.272 IL: 129.474 CATCHPIT

S3.1 450 PPIC CL: 133.450 IL: 131.961

S3.2 1,350 dia PCC CL: 133.429 IL: 132.273

S3.3 1,200 dia PCC CL: 133.117 IL: 130.337 CATCHPIT

S4.1 1,350 dia PCC CL: 132.915 IL: 131.838

S5.1 1,200 dia PCC CL: 133.373 IL: 131.385

S6.1 CL: 132.152 IL: 129.162 CLASS 1 BYPASS OIL SEPARATOR SPEL 204 C1/SC OR SIMILAR APPROVED. OIL SEPARATOR TO SERVE CIRCA. 2000m2 NB. SEPARATOR SIZE BASED ON AREA SERVED, A DIFFERENT UNIT MAY BE REQUIRED BASED ON THE INLET AND OUTLET PIPE DIAMETER.

450Ø OVERFLOW PIPE AS PER HYDRO WMS DETAILS

S7.1 1,200 dia PCC CL: 133.088 IL: 130.528 CATCHPIT

FRANKISCHE RIGOFILL ST-A ATTENUATION TANK TO HYDRO WMS DETAILS
ALL CHARACTERISTICS BELOW ARE APPROXIMATE AND TBC AT DETAILED DESIGN:
VOLUME: 953.75m³ (NET 96% VOIDS)
TOP OF TANK: VARIES 130.413 - 130.256m
INVERT LEVEL: VARIES 129.093 - 128.936m
TANK WIDTH: 9.6m
TANK LENGTH: 78.4m
450Ø LOW FLOW PERFORATED PIPE SITTING 630mm BELOW BASE OF TANK, SURROUNDED BY CLEAN STONE AND WRAPPED IN GEOTEXTILE MEMBRANE.

POP-UP NOTE
SPRINKLER FLUSH VALVE DISCHARGE VIA FLOOR GULLY IN LINE WITH ARCHITECTS SPECIFICATION TO SUIT REQUIRED FLOW RATE OF 1000L/MIN

S8.1 1,200 dia PCC CL: 133.181 IL: 130.519 CATCHPIT

S10.001 150Ø 1:20

S11.001 150Ø 1:20

S1.001 300Ø 1:60

S1.002 375Ø 1:44

S1.003 900Ø 1:317

S1.004 450Ø 1:12

S1.005 450Ø 1:22

S1.006 450Ø 1:500

S1.007 225Ø 1:16

S1.008 225Ø 1:16

S2.001 225Ø 1:16

S3.001 300Ø 1:60

S3.002 300Ø 1:60

S4.001 300Ø 1:150

S4.002 300Ø 1:25

S4.003 300Ø 1:25

S5.001 300Ø 1:19

S5.002 300Ø 1:40

S5.003 300Ø 1:40

S5.004 300Ø 1:141

S5.005 300Ø 1:27

S5.006 300Ø 1:27

S6.001 150Ø 1:12

F1.001 150Ø 1:150

F1.002 150Ø 1:150

F1.003 150Ø 1:150

F1.004 150Ø 1:150

F1.005 150Ø 1:150

F1.006 150Ø 1:150

F1.007 150Ø 1:150

F1.008 150Ø 1:150

F1.009 150Ø 1:150

F1.010 150Ø 1:150

F1.011 150Ø 1:150

F1.012 150Ø 1:150

F1.013 150Ø 1:80

F1.014 150Ø 1:80

F1.015 150Ø 1:80

F1.016 150Ø 1:80

F1.017 150Ø 1:80

F1.018 150Ø 1:80

F2.001 150Ø 1:150

F2.002 150Ø 1:150

F2.003 150Ø 1:150

F2.004 150Ø 1:150

F2.005 150Ø 1:150

F2.006 150Ø 1:150

F2.007 150Ø 1:27

F3.001 150Ø 1:150

F3.002 150Ø 1:150

F3.003 150Ø 1:150

F3.004 150Ø 1:150

F3.005 150Ø 1:150

F3.006 150Ø 1:150

F3.007 150Ø 1:150

F3.008 150Ø 1:150

F3.009 150Ø 1:150

F3.010 150Ø 1:150

F3.011 150Ø 1:150

F3.012 150Ø 1:19

EXISTING TENNIS COURT DRAINAGE TO CONNECT INTO NEW SURFACE WATER NETWORK

EXISTING DRAINAGE TO TENNIS COURTS AREA ASSUMED TO BE RETAINED AS EXISTING, ANY REMEDIAL WORKS SUBJECT TO RECEIPT OF FURTHER CCTV SURVEY

PROPOSED SURFACE AND FOUL WATER CONNECTION INTO EXISTING COMBINED WATER SEWER

EXISTING COMBINED DRAIN RETAINED AS SURFACE WATER AND FOUL WATER OUTFALL SUBJECT TO REPAIR OF STRUCTURAL DEFECTS IDENTIFIED WITHIN CCTV SURVEY

EXISTING MH56 CL: 128.650 IL: 126.830

EXISTING OFF-SITE CONNECTION TO PUBLIC SEWER RETAINED AS EXISTING

10m SCALE 1:500

Rev	Date	Details of Issue	Drawn	R'wd
P02	28.01.26	UPDATED TO SUIT COMMENTS	AR	KJ
P01	14.11.25	PRELIMINARY ISSUE	AR	KJ

Issues & Revisions

Consultant

HEXA

Client

KIRKLEES COUNCIL

Project Title

WOODLEY SCHOOL & 6TH FORM

Drawing Title

DRAINAGE LAYOUT

Drawn By	AR	Reviewed By	KR
Hexa Ref	700298	Scale at A1	1:500

Purpose of Issue: PRELIMINARY

Status: S3

Project - Originator - Zone - Level - Type - Role - Number: NWSC-HEX-ZZ-ZZ-D-C-92001

Revision: P02

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.340	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWALE INLET	0.123	20.00	132.730	1	416888.418	415880.294	0.280
SWALE OUTLET			132.160	1	416918.668	415925.698	0.300
S1.1	0.153	5.00	131.776	1350	416930.775	415918.780	1.170
S1.2	0.165	5.00	131.869	1350	416952.484	415909.117	1.437
GULLY1	0.018	5.00	130.900	450	417000.722	415903.868	0.750
S1.3	0.067	5.00	131.230	1350	416994.322	415897.333	1.780
S4.1	0.088	5.00	132.915	1200	416948.857	415871.052	1.077
S1.4			132.593	1350	416983.840	415860.778	3.263
S1.5			132.707	1350	416982.021	415854.434	3.883
S5.1	0.172	5.00	133.373	1200	416918.459	415866.115	3.883
S1.6			132.771	1350	416980.277	415848.352	4.288
S6.1	0.175	5.00	133.100	1200	416968.671	415782.692	3.938
S3.1	0.043	5.00	133.347	450	416911.703	415838.293	0.722
S3.2	0.315	5.00	133.413	450	416906.594	415814.603	0.940
S2.1	0.194	5.00	133.607	1200	416880.639	415847.826	0.999
S2.2	0.024	5.00	134.015	1200	416868.973	415805.688	1.669
S2.3	0.223	5.00	133.535	1200	416880.901	415785.294	1.406
TANK			133.037	1	416959.056	415764.959	4.734
TENNIS COURTS	0.268	5.00	131.670	1200	416944.423	415744.531	2.620
S1.7			131.500	2700	416963.215	415746.523	3.417
OUTFALL			128.650	1200	416983.214	415743.261	1.820

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
SWALE	SWALE INLET	SWALE OUTLET	65.774	0.012	132.450	131.860	0.590	111.5	300	20.48	50.0
S1.000	SWALE OUTLET	S1.1	13.944	0.012	131.860	130.756	1.104	12.6	300	20.54	50.0
S1.001	S1.1	S1.2	23.763	0.600	130.606	130.507	0.099	240.0	300	20.93	50.0
S1.002	S1.2	S1.3	45.743	0.600	130.432	129.450	0.982	46.6	375	21.22	50.0
GULLY LEAD	GULLY1	S1.3	9.147	0.600	130.150	129.750	0.400	22.9	150	5.07	50.0
S1.003	S1.3	S1.4	38.057	0.600	129.450	129.330	0.120	317.1	450	21.78	50.0
S2.001	S4.1	S1.4	39.042	0.600	131.838	129.555	2.283	17.1	225	5.20	50.0
S1.004	S1.4	S1.5	6.573	0.600	129.330	128.874	0.456	14.4	450	21.80	50.0
S1.005	S1.5	S1.6	6.327	0.600	128.824	128.782	0.042	150.6	450	21.86	50.0
S3.001	S5.1	S1.6	59.547	0.600	129.490	129.007	0.483	123.3	225	5.84	50.0
S1.006	S1.6	TANK	90.018	0.600	128.483	128.303	0.180	500.1	450	23.52	50.0
S4.001	S3.1	S3.2	24.235	0.600	132.625	132.473	0.152	159.4	300	5.33	50.0
S4.002	S3.2	TANK	57.642	0.600	132.473	128.733	3.740	15.4	300	5.56	50.0
S6.001	S6.1	TANK	4.313	0.600	129.162	128.733	0.429	10.1	150	5.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
SWALE	2.269	724.2	22.2	0.000	0.020	0.123	0.0
S1.000	4.170	294.8	22.2	0.000	0.720	0.123	0.0
S1.001	1.010	71.4	49.9	0.870	1.062	0.276	0.0
S1.002	2.660	293.8	79.7	1.062	1.405	0.441	0.0
GULLY LEAD	2.115	37.4	3.3	0.600	1.330	0.018	0.0
S1.003	1.136	180.7	95.0	1.330	2.813	0.526	0.0
S2.001	3.179	126.4	15.9	0.852	2.813	0.088	0.0
S1.004	5.375	854.9	110.9	2.813	3.383	0.614	0.0
S1.005	1.654	263.0	110.9	3.433	3.539	0.614	0.0
S3.001	1.176	46.8	31.1	3.658	3.539	0.172	0.0
S1.006	0.902	143.5	142.0	3.838	4.284	0.786	0.0
S4.001	1.242	87.8	7.8	0.422	0.640	0.043	0.0
S4.002	4.024	284.4	64.7	0.640	4.004	0.358	0.0
S6.001	3.196	56.5	31.6	3.788	4.154	0.175	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S5.001	S2.1	S2.2	43.723	0.600	132.608	132.346	0.262	166.9	300	5.60	50.0
S5.002	S2.2	S2.3	23.626	0.600	132.346	132.129	0.217	108.9	300	5.86	50.0
S5.003	S2.3	TANK	74.501	0.600	132.129	128.733	3.396	21.9	300	6.23	50.0
S1.007	TANK	S1.7	20.025	0.600	128.303	128.083	0.220	91.0	450	23.68	50.0
S7.001	TENNIS COURTS	S1.7	18.897	0.600	129.050	128.233	0.817	23.1	300	5.10	50.0
S1.008	S1.7	OUTFALL	20.263	0.600	128.083	126.830	1.253	16.2	300	23.77	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
S5.001	1.214	85.8	35.1	0.699	1.369	0.194	0.0
S5.002	1.506	106.5	39.4	1.369	1.106	0.218	0.0
S5.003	3.371	238.3	79.7	1.106	4.004	0.441	0.0
S1.007	2.131	339.0	318.0	4.284	2.967	1.760	0.0
S7.001	3.282	232.0	48.4	2.320	2.967	0.268	0.0
S1.008	3.928	277.7	366.5	3.117	1.520	2.028	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
SWALE	65.774	111.5	300	SWALE	132.730	132.450	0.000	132.160	131.860	0.020
S1.000	13.944	12.6	300	Concrete Pipe SI	132.160	131.860	0.000	131.776	130.756	0.720
S1.001	23.763	240.0	300	Concrete Pipe SI	131.776	130.606	0.870	131.869	130.507	1.062
S1.002	45.743	46.6	375	Concrete Pipe SI	131.869	130.432	1.062	131.230	129.450	1.405

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
SWALE	SWALE INLET	1	Manhole	Manhole PCC -3m	SWALE OUTLET	1	Manhole	Manhole PCC -3m
S1.000	SWALE OUTLET	1	Manhole	Manhole PCC -3m	S1.1	1350	Manhole	Manhole PCC -3m
S1.001	S1.1	1350	Manhole	Manhole PCC -3m	S1.2	1350	Manhole	Manhole PCC -3m
S1.002	S1.2	1350	Manhole	Manhole PCC -3m	S1.3	1350	Manhole	Manhole PCC -3m

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
GULLY LEAD	9.147	22.9	150	Concrete Pipe SI	130.900	130.150	0.600	131.230	129.750	1.330
S1.003	38.057	317.1	450	Concrete Pipe SI	131.230	129.450	1.330	132.593	129.330	2.813
S2.001	39.042	17.1	225	Concrete Pipe SI	132.915	131.838	0.852	132.593	129.555	2.813
S1.004	6.573	14.4	450	Concrete Pipe SI	132.593	129.330	2.813	132.707	128.874	3.383
S1.005	6.327	150.6	450	Concrete Pipe SI	132.707	128.824	3.433	132.771	128.782	3.539
S3.001	59.547	123.3	225	Concrete Pipe SI	133.373	129.490	3.658	132.771	129.007	3.539
S1.006	90.018	500.1	450	Concrete Pipe SI	132.771	128.483	3.838	133.037	128.303	4.284
S4.001	24.235	159.4	300	Concrete Pipe SI	133.347	132.625	0.422	133.413	132.473	0.640
S4.002	57.642	15.4	300	Concrete Pipe SI	133.413	132.473	0.640	133.037	128.733	4.004
S6.001	4.313	10.1	150	Concrete Pipe SI	133.100	129.162	3.788	133.037	128.733	4.154
S5.001	43.723	166.9	300	Concrete Pipe SI	133.607	132.608	0.699	134.015	132.346	1.369
S5.002	23.626	108.9	300	Concrete Pipe SI	134.015	132.346	1.369	133.535	132.129	1.106
S5.003	74.501	21.9	300	Concrete Pipe SI	133.535	132.129	1.106	133.037	128.733	4.004
S1.007	20.025	91.0	450	Concrete Pipe SI	133.037	128.303	4.284	131.500	128.083	2.967
S7.001	18.897	23.1	300	Concrete Pipe SI	131.670	129.050	2.320	131.500	128.233	2.967

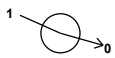
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
GULLY LEAD	GULLY1	450	Manhole	Manhole PCC -3m	S1.3	1350	Manhole	Manhole PCC -3m
S1.003	S1.3	1350	Manhole	Manhole PCC -3m	S1.4	1350	Manhole	Manhole PCC -3m
S2.001	S4.1	1200	Manhole	Manhole PCC -3m	S1.4	1350	Manhole	Manhole PCC -3m
S1.004	S1.4	1350	Manhole	Manhole PCC -3m	S1.5	1350	Manhole	Rectangular Manhole Rectangular cover
S1.005	S1.5	1350	Manhole	Rectangular Manhole Rectangular cover	S1.6	1350	Manhole	Rectangular Manhole Rectangular cover
S3.001	S5.1	1200	Manhole	Manhole PCC 3m+	S1.6	1350	Manhole	Rectangular Manhole Rectangular cover
S1.006	S1.6	1350	Manhole	Rectangular Manhole Rectangular cover	TANK	1	Manhole	Rectangular Manhole Rectangular cover
S4.001	S3.1	450	Manhole	PPIC	S3.2	450	Manhole	PPIC
S4.002	S3.2	450	Manhole	PPIC	TANK	1	Manhole	Rectangular Manhole Rectangular cover
S6.001	S6.1	1200	Manhole	Manhole PCC -3m	TANK	1	Manhole	Rectangular Manhole Rectangular cover
S5.001	S2.1	1200	Manhole	Manhole PCC -3m	S2.2	1200	Manhole	Manhole PCC -3m
S5.002	S2.2	1200	Manhole	Manhole PCC -3m	S2.3	1200	Manhole	Manhole PCC -3m
S5.003	S2.3	1200	Manhole	Manhole PCC -3m	TANK	1	Manhole	Rectangular Manhole Rectangular cover
S1.007	TANK	1	Manhole	Rectangular Manhole Rectangular cover	S1.7	2700	Manhole	Manhole PCC -3m
S7.001	TENNIS COURTS	1200	Manhole	Manhole PCC -3m	S1.7	2700	Manhole	Manhole PCC -3m

Pipeline Schedule

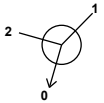
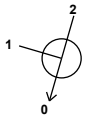
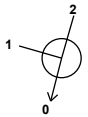
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S1.008	20.263	16.2	300	Concrete Pipe SI	131.500	128.083	3.117	128.650	126.830	1.520

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S1.008	S1.7	2700	Manhole	Manhole PCC -3m	OUTFALL	1200	Manhole	Manhole PCC -3m

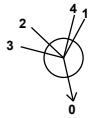
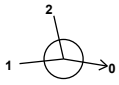
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWALE INLET	416888.418	415880.294	132.730	0.280	1	 0	SWALE	132.450	300
SWALE OUTLET	416918.668	415925.698	132.160	0.300	1	1  0	SWALE	131.860	300
						0	S1.000	131.860	300
S1.1	416930.775	415918.780	131.776	1.170	1350	1  0	S1.000	130.756	300
						0	S1.001	130.606	300
S1.2	416952.484	415909.117	131.869	1.437	1350	1  0	S1.001	130.507	300
						0	S1.002	130.432	375
GULLY1	417000.722	415903.868	130.900	0.750	450	 0	GULLY LEAD	130.150	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1.3	416994.322	415897.333	131.230	1.780	1350		1	GULLY LEAD	129.750	150
							2	S1.002	129.450	375
							0	S1.003	129.450	450
S4.1	416948.857	415871.052	132.915	1.077	1200					
							0	S2.001	131.838	225
S1.4	416983.840	415860.778	132.593	3.263	1350		1	S2.001	129.555	225
							2	S1.003	129.330	450
							0	S1.004	129.330	450
S1.5	416982.021	415854.434	132.707	3.883	1350		1	S1.004	128.874	450
							0	S1.005	128.824	450
S5.1	416918.459	415866.115	133.373	3.883	1200					
							0	S3.001	129.490	225
S1.6	416980.277	415848.352	132.771	4.288	1350		1	S3.001	129.007	225
							2	S1.005	128.782	450
							0	S1.006	128.483	450
S6.1	416968.671	415782.692	133.100	3.938	1200					
							0	S6.001	129.162	150
S3.1	416911.703	415838.293	133.347	0.722	450					
							0	S4.001	132.625	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S3.2	416906.594	415814.603	133.413	0.940	450	 1	S4.001	132.473	300
						0	S4.002	132.473	300
S2.1	416880.639	415847.826	133.607	0.999	1200	 0	S5.001	132.608	300
S2.2	416868.973	415805.688	134.015	1.669	1200	 1	S5.001	132.346	300
						0	S5.002	132.346	300
S2.3	416880.901	415785.294	133.535	1.406	1200	 1	S5.002	132.129	300
						0	S5.003	132.129	300
TANK	416959.056	415764.959	133.037	4.734	1	 1	S6.001	128.733	150
						2	S4.002	128.733	300
						3	S5.003	128.733	300
						4	S1.006	128.303	450
						0	S1.007	128.303	450
TENNIS COURTS	416944.423	415744.531	131.670	2.620	1200	 0	S7.001	129.050	300
S1.7	416963.215	415746.523	131.500	3.417	2700	 1	S7.001	128.233	300
						2	S1.007	128.083	450
						0	S1.008	128.083	300
OUTFALL	416983.214	415743.261	128.650	1.820	1200	1 	S1.008	126.830	300

SuDS Carriers

Link	US Node	DS Node	Link Type	Base Inf Coef (m/hr)	Sides Inf Coef (m/hr)	Safety Factor	Time to Half Empty (mins)
SWALE	SWALE INLET	SWALE OUTLET	SWALE	0.00000	0.00000	2.0	1

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Additional Storage (m³/ha)	0.0
Rainfall Events	Singular	Winter CV	0.840	Starting Level (m)	
FSR Region	England and Wales	Analysis Speed	Normal	Check Discharge Rate(s)	x
M5-60 (mm)	19.000	Skip Steady State	x	Check Discharge Volume	x
Ratio-R	0.340	Drain Down Time (mins)	240		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	100	45	0	0
30	40	0	0				

Node S1.7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	128.083	Product Number	CTL-SHE-0276-4990-2330-4990
Design Depth (m)	2.330	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	49.9	Min Node Diameter (mm)	2700

Node TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	128.936
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.96	Time to half empty (mins)	138

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	752.6	752.6	1.320	752.6	881.0	1.321	0.0	881.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.46%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	SWALE INLET	28	132.479	0.029	7.0	0.0000	0.0000	OK
30 minute winter	SWALE OUTLET	28	131.893	0.033	7.0	0.0000	0.0000	OK
15 minute winter	S1.1	11	130.727	0.121	23.0	0.1734	0.0000	OK
15 minute winter	S1.2	11	130.528	0.096	43.0	0.1368	0.0000	OK
15 minute winter	GULLY1	10	130.176	0.026	2.3	0.0041	0.0000	OK
15 minute winter	S1.3	11	129.619	0.169	53.1	0.2423	0.0000	OK
15 minute winter	S4.1	10	131.883	0.045	11.1	0.0511	0.0000	OK
15 minute winter	S1.4	11	129.416	0.086	64.2	0.1234	0.0000	OK
15 minute summer	S1.5	11	129.177	0.353	61.0	0.5054	0.0000	OK
15 minute winter	S5.1	10	129.596	0.106	21.8	0.1199	0.0000	OK
15 minute winter	S1.6	10	129.281	0.798	109.6	1.1415	0.0000	SURCHARGED
15 minute winter	S6.1	10	129.235	0.073	22.2	0.0821	0.0000	OK
15 minute winter	S3.1	10	132.675	0.050	5.4	0.0079	0.0000	OK
15 minute winter	S3.2	10	132.553	0.080	45.2	0.0127	0.0000	OK
15 minute winter	S2.1	10	132.720	0.112	24.6	0.1262	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	SWALE INLET	SWALE	SWALE OUTLET	7.0	0.584	0.010	0.7925	
30 minute winter	SWALE OUTLET	S1.000	S1.1	7.0	1.711	0.024	0.0571	
15 minute winter	S1.1	S1.001	S1.2	22.9	0.888	0.320	0.6125	
15 minute winter	S1.2	S1.002	S1.3	42.8	1.243	0.146	1.6097	
15 minute winter	GULLY1	GULLY LEAD	S1.3	2.3	1.149	0.061	0.0181	
15 minute winter	S1.3	S1.003	S1.4	53.6	1.448	0.296	1.4402	
15 minute winter	S4.1	S2.001	S1.4	10.9	1.946	0.086	0.2191	
15 minute winter	S1.4	S1.004	S1.5	62.9	2.275	0.074	0.4329	
15 minute summer	S1.5	S1.005	S1.6	100.4	1.137	0.382	0.8545	
15 minute winter	S5.1	S3.001	S1.6	21.4	1.139	0.458	1.7314	
15 minute winter	S1.6	S1.006	TANK	113.1	0.714	0.788	14.2628	
15 minute winter	S6.1	S6.001	TANK	22.1	2.538	0.391	0.0562	
15 minute winter	S3.1	S4.001	S3.2	5.3	0.477	0.061	0.2745	
15 minute winter	S3.2	S4.002	TANK	44.7	2.660	0.157	2.1121	
15 minute winter	S2.1	S5.001	S2.2	24.2	1.042	0.282	1.0137	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.46%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2.2	11	132.454	0.108	27.2	0.1218	0.0000	OK
15 minute winter	S2.3	11	132.226	0.096	54.6	0.1091	0.0000	OK
30 minute winter	TANK	28	129.010	0.707	177.7	53.6434	0.0000	SURCHARGED
15 minute winter	TENNIS COURTS	10	129.127	0.077	34.0	0.0870	0.0000	OK
30 minute winter	S1.7	28	129.004	0.921	88.0	5.2720	0.0000	SURCHARGED
15 minute winter	OUTFALL	9	126.916	0.085	49.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S2.2	S5.002	S2.3	27.1	1.282	0.254	0.4994	
15 minute winter	S2.3	S5.003	TANK	54.1	2.453	0.227	2.9015	
30 minute winter	TANK	S1.007	S1.7	63.0	0.583	0.186	3.1728	
15 minute winter	TENNIS COURTS	S7.001	S1.7	33.8	1.543	0.146	0.7999	
30 minute winter	S1.7	S1.008	OUTFALL	49.9	2.904	0.180	0.3481	158.6

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	SWALE INLET	26	132.506	0.056	24.2	0.0000	0.0000	OK
30 minute winter	SWALE OUTLET	26	131.921	0.061	24.2	0.0000	0.0000	OK
15 minute winter	S1.1	11	130.897	0.291	80.9	0.4167	0.0000	OK
15 minute winter	S1.2	11	130.617	0.185	148.7	0.2652	0.0000	OK
15 minute summer	GULLY1	10	130.198	0.048	7.4	0.0076	0.0000	OK
15 minute winter	S1.3	12	130.127	0.677	184.2	0.9692	0.0000	SURCHARGED
15 minute winter	S4.1	10	131.922	0.084	38.2	0.0952	0.0000	OK
15 minute winter	S1.4	12	129.999	0.669	206.5	0.9566	0.0000	SURCHARGED
15 minute winter	S1.5	12	129.934	1.110	198.5	1.5879	0.0000	SURCHARGED
15 minute winter	S5.1	11	130.971	1.481	74.6	1.6748	0.0000	SURCHARGED
15 minute winter	S1.6	12	129.870	1.387	262.1	1.9844	0.0000	SURCHARGED
15 minute winter	S6.1	11	130.341	1.179	75.9	1.3338	0.0000	SURCHARGED
15 minute winter	S3.1	10	132.718	0.093	18.7	0.0147	0.0000	OK
15 minute winter	S3.2	10	132.629	0.156	155.2	0.0248	0.0000	OK
15 minute winter	S2.1	10	132.862	0.254	84.1	0.2877	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	SWALE INLET	SWALE	SWALE OUTLET	24.2	0.890	0.033	1.8281	
30 minute winter	SWALE OUTLET	S1.000	S1.1	24.2	2.442	0.082	0.2056	
15 minute winter	S1.1	S1.001	S1.2	79.8	1.247	1.117	1.4895	
15 minute winter	S1.2	S1.002	S1.3	147.9	1.754	0.503	3.7634	
15 minute summer	GULLY1	GULLY LEAD	S1.3	7.4	1.579	0.197	0.0979	
15 minute winter	S1.3	S1.003	S1.4	169.4	1.694	0.937	6.0299	
15 minute winter	S4.1	S2.001	S1.4	38.0	2.675	0.301	1.0320	
15 minute winter	S1.4	S1.004	S1.5	198.5	2.281	0.232	1.0414	
15 minute winter	S1.5	S1.005	S1.6	198.0	1.250	0.753	1.0025	
15 minute winter	S5.1	S3.001	S1.6	69.8	1.755	1.492	2.3682	
15 minute winter	S1.6	S1.006	TANK	262.2	1.655	1.827	14.2628	
15 minute winter	S6.1	S6.001	TANK	72.2	4.103	1.279	0.0759	
15 minute winter	S3.1	S4.001	S3.2	18.5	0.672	0.211	0.6716	
15 minute winter	S3.2	S4.002	TANK	154.1	2.756	0.542	3.0952	
15 minute winter	S2.1	S5.001	S2.2	82.5	1.343	0.961	2.6802	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2.2	11	132.581	0.235	92.8	0.2658	0.0000	OK
15 minute winter	S2.3	10	132.326	0.197	187.7	0.2226	0.0000	OK
120 minute winter	TANK	118	129.640	1.337	255.1	509.0589	0.0000	SURCHARGED
120 minute winter	TENNIS COURTS	116	129.637	0.587	39.7	0.6636	0.0000	SURCHARGED
120 minute winter	S1.7	116	129.636	1.553	75.6	8.8933	0.0000	SURCHARGED
60 minute winter	OUTFALL	245	126.916	0.085	49.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S2.2	S5.002	S2.3	92.8	1.711	0.872	1.2771	
15 minute winter	S2.3	S5.003	TANK	185.5	2.832	0.779	4.4478	
120 minute winter	TANK	S1.007	S1.7	68.5	0.624	0.202	3.1728	
120 minute winter	TENNIS COURTS	S7.001	S1.7	38.6	1.286	0.166	1.3307	
120 minute winter	S1.7	S1.008	OUTFALL	49.9	2.904	0.180	0.3479	869.5

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	SWALE INLET	24	132.516	0.066	32.7	0.0000	0.0000	OK
30 minute winter	SWALE OUTLET	26	131.931	0.071	32.8	0.0000	0.0000	OK
15 minute winter	S1.1	12	131.541	0.935	108.3	1.3376	0.0000	FLOOD RISK
15 minute winter	S1.2	12	131.298	0.866	200.1	1.2395	0.0000	SURCHARGED
15 minute winter	GULLY1	12	130.900	0.750	10.5	0.1193	0.0569	FLOOD
15 minute winter	S1.3	12	130.878	1.428	220.6	2.0441	0.0000	SURCHARGED
15 minute winter	S4.1	10	131.937	0.099	51.0	0.1117	0.0000	OK
15 minute winter	S1.4	12	130.666	1.336	263.3	1.9120	0.0000	SURCHARGED
15 minute winter	S1.5	12	130.558	1.734	256.2	2.4814	0.0000	SURCHARGED
15 minute winter	S5.1	11	132.393	2.903	99.7	3.2832	0.0000	SURCHARGED
15 minute winter	S1.6	12	130.452	1.969	341.9	2.8171	0.0000	SURCHARGED
15 minute winter	S6.1	11	131.356	2.194	101.4	2.4816	0.0000	SURCHARGED
15 minute winter	S3.1	10	132.733	0.108	24.9	0.0171	0.0000	OK
15 minute winter	S3.2	10	132.660	0.187	207.2	0.0298	0.0000	OK
15 minute winter	S2.1	11	133.568	0.960	112.4	1.0862	0.0000	FLOOD RISK

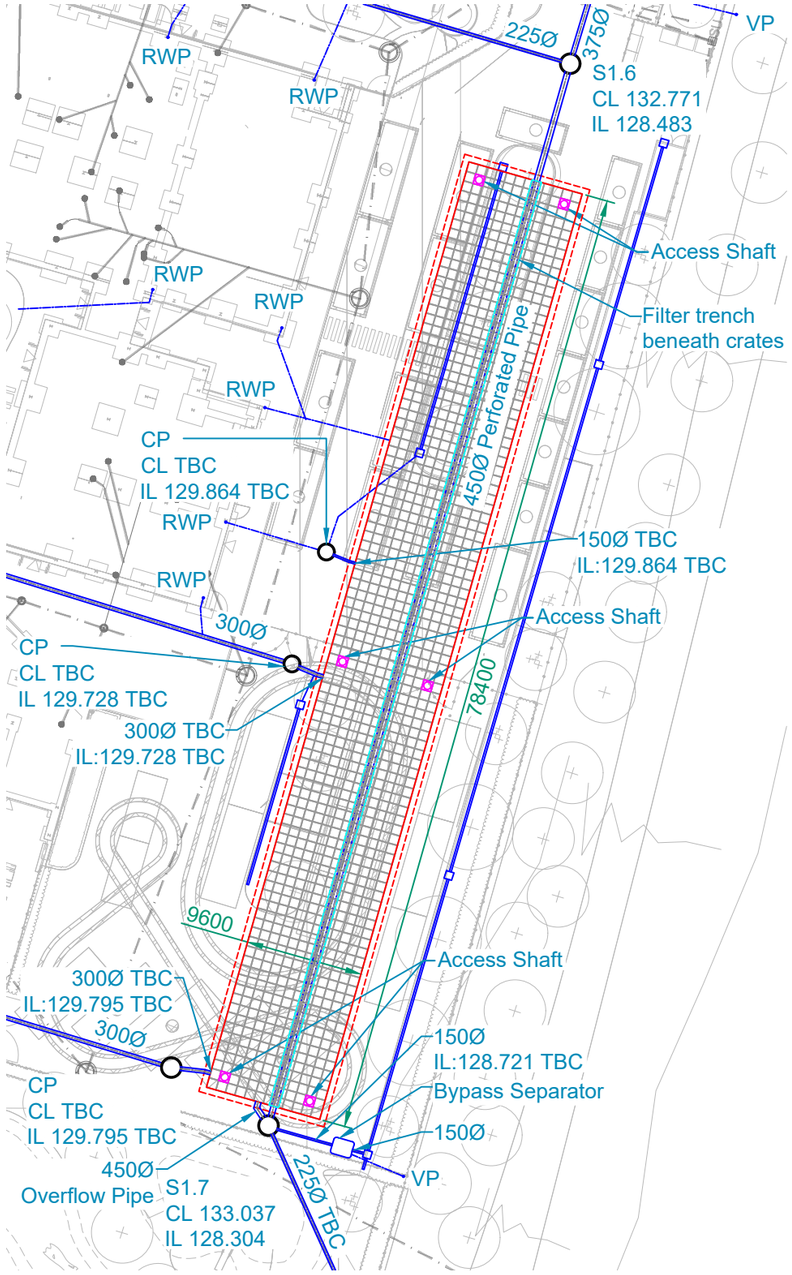
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	SWALE INLET	SWALE	SWALE OUTLET	32.8	0.977	0.045	2.2735	
30 minute winter	SWALE OUTLET	S1.000	S1.1	32.7	2.650	0.111	0.5673	
15 minute winter	S1.1	S1.001	S1.2	104.5	1.498	1.463	1.6734	
15 minute winter	S1.2	S1.002	S1.3	178.0	1.790	0.606	5.0453	
15 minute winter	GULLY1	GULLY LEAD	S1.3	10.3	1.617	0.275	0.1610	
15 minute winter	S1.3	S1.003	S1.4	214.7	1.763	1.188	6.0299	
15 minute winter	S4.1	S2.001	S1.4	50.8	2.728	0.402	1.1035	
15 minute winter	S1.4	S1.004	S1.5	256.2	2.319	0.300	1.0414	
15 minute winter	S1.5	S1.005	S1.6	255.5	1.613	0.971	1.0025	
15 minute winter	S5.1	S3.001	S1.6	91.2	2.294	1.951	2.3682	
15 minute winter	S1.6	S1.006	TANK	342.0	2.159	2.384	14.2628	
15 minute winter	S6.1	S6.001	TANK	96.2	5.464	1.703	0.0759	
15 minute winter	S3.1	S4.001	S3.2	24.7	0.717	0.281	0.8361	
15 minute winter	S3.2	S4.002	TANK	205.9	3.188	0.724	3.3630	
15 minute winter	S2.1	S5.001	S2.2	109.7	1.559	1.279	3.0789	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2.2	11	133.126	0.780	123.7	0.8820	0.0000	SURCHARGED
15 minute winter	S2.3	11	132.813	0.684	250.6	0.7736	0.0000	SURCHARGED
120 minute winter	TANK	120	130.040	1.736	342.9	797.6206	0.0000	SURCHARGED
120 minute winter	TENNIS COURTS	118	130.035	0.985	54.1	1.1145	0.0000	SURCHARGED
120 minute winter	S1.7	118	130.035	1.952	62.7	11.1765	0.0000	SURCHARGED
30 minute winter	OUTFALL	264	126.916	0.085	49.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S2.2	S5.002	S2.3	121.4	1.742	1.140	1.6637	
15 minute winter	S2.3	S5.003	TANK	242.4	3.447	1.017	5.2463	
120 minute winter	TANK	S1.007	S1.7	53.1	0.575	0.157	3.1728	
120 minute winter	TENNIS COURTS	S7.001	S1.7	53.6	1.233	0.231	1.3307	
120 minute winter	S1.7	S1.008	OUTFALL	49.9	2.904	0.180	0.3480	940.6

A3



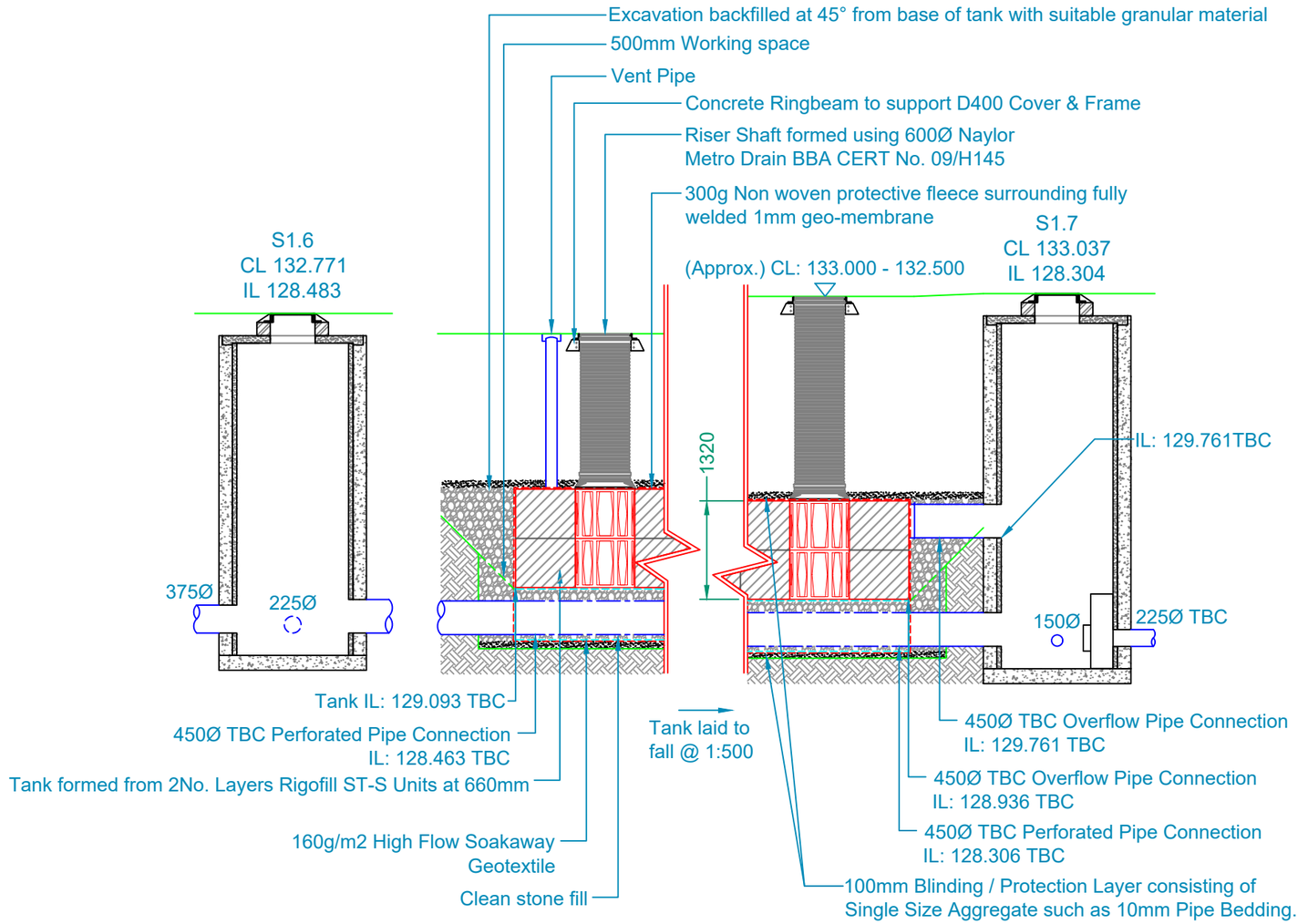
Proposed Plan
(Scale 1:500)

78.4 x 9.6 x 1.32m deep
Total Vol = 993.485m^3
Net Vol ≈ 953.745m^3
At 96% min Void Ratio
2352 Rigofill ST-A units

Extents of excavation to be an additional 500mm around the perimeter of the tank

NOTES

1. Proposed Hydro WMS layout.
2. All dimensions are in millimetres, all elevations in metres unless otherwise stated.
3. All temporary and enabling works by others.
4. All dimensions of fabricated items are nominal and may vary within manufacturing tolerances.



Proposed Section
(Scale 1:75)

REV	AMENDMENT	DATE
B	UPDATE TANK POSITION & DRAINAGE LAYOUT	27/01/2026
A	UPDATE TANK POSITION & DRAINAGE LAYOUT	20/01/2026

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Complete Water Management Solutions

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brian.byrne@hydro-wms.co.uk
www.hydro-wms.co.uk

CLIENT: -

JOB TITLE: Woodley School & College, Huddersfield, HD5 8JE

STATUS: FOR APPROVAL

DRAWING TITLE: Proposed Attenuation Tank Details

DATE	DRAWN	CHECKED
01/12/2025	WS	

SCALE	PROJECT No.
1:500@ A3	

DRAWING No.	REV.
001	B

A3

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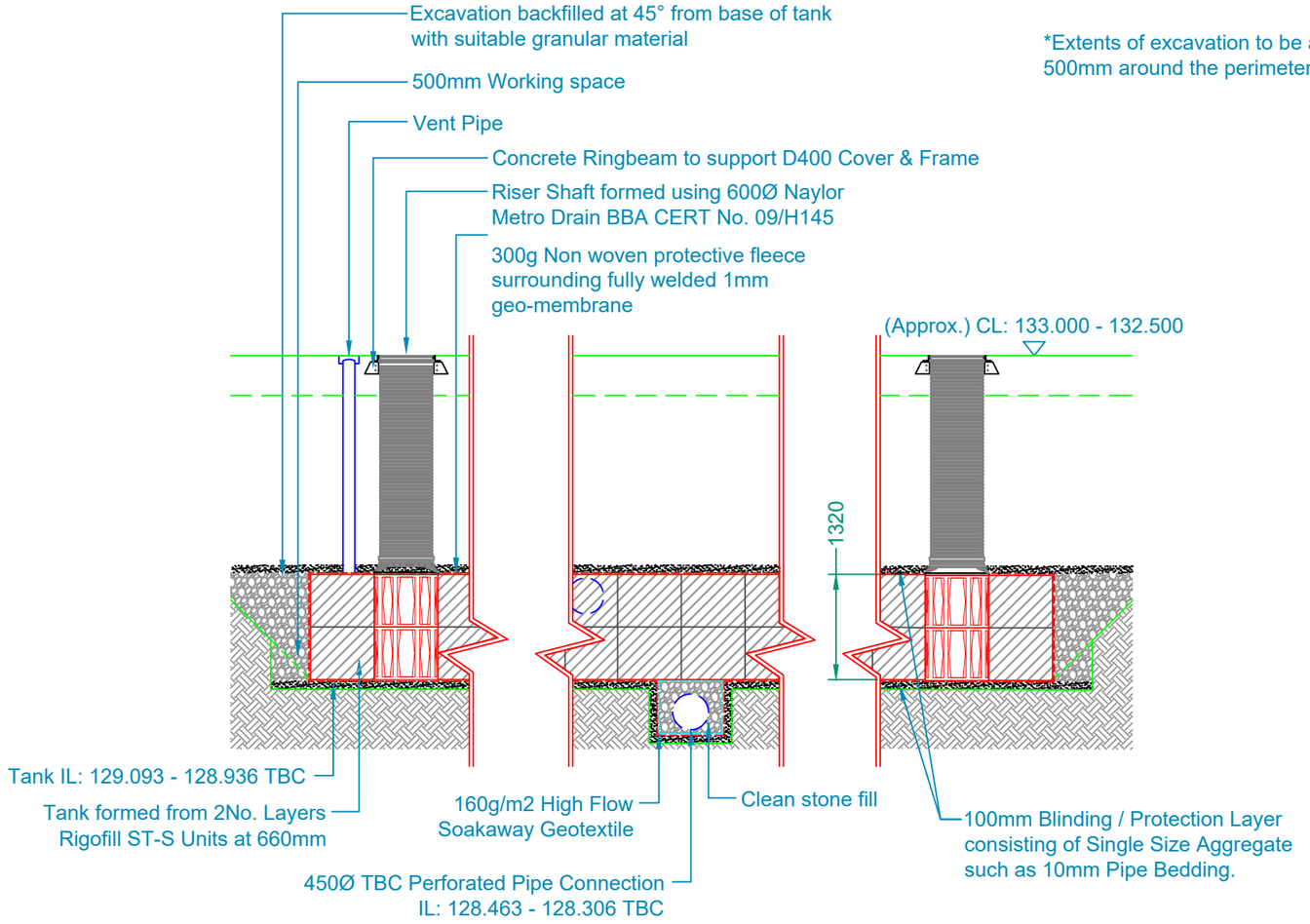

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JOB TITLE: Woodley School & College, Huddersfield, HD5 8JE

STATUS: FOR APPROVAL

DRAWING TITLE: Proposed Attenuation Tank Details

DATE: 01/12/2025 | DRAWN: WS | CHECKED:

SCALE: 1:75@ A3 | PROJECT No.:

DRAWING No.: 002 | REV.: B

Structural calculations to check compliance with Ciria C680

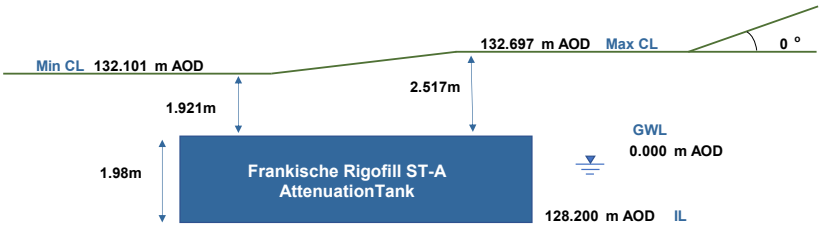
Detailed Analysis

Project: Woodley School
Customer: GRK
Contact: Nick Roberts

Hydro WMS Contact: Warren Gillen
Project ID:
15/07/2025

Supplier: Frankische
Product: Rigofill ST-A

Load Classification - Vehicles up to 30,000kg GVW eg 8 wheel bin lorry:



Surface Type: Asphalt

Lateral Backfill Material: Loose sand & gravel: AoF - 30 deg, Bulk Density - 18 kN/m3

Vertical Loads - Case 1 (shallowest cover)

Surcharge load

Depth of backfill =	1.921	m		
Bulk unit weight (averaged including weight of slab if present) =	18	kN/m^3		
Partial load factor for surcharge soil =	1.4			
Soil load = depth x weight x factor = 1.921 x 18 x 1.4 =			48.4	kN/m^2
Distrib. Load from vehicles (from table 4.2) =	10	kN/m^2		
Partial load factor for loading =	1.6			
Traffic load = load x factor = 10 x 1.6 =			16	kN/m^2
Total load = 48.4 + 16 =			**64.4**	kN/m^2
Material factor of safety =	2.75			
Vertical design strength of Rigofill ST-A units = 400 / 2.75 =			**145.5**	kN/m^2
Degree of utilisation			44.28%	✓

Wheel load

Wheel load classification is Vehicles up to 30,000kg GVW eg 8 wheel bin lorry				
Wheel load 50kN on a 0.4m x 0.2m area (from Table 4.2)				
Load spread angle (a) =	26.6	degrees		
Cover depth =	1.921	m		
Tan a = Tan (26.6) =			0.500	
Loaded area = [(2xdepthxTana)+ tyre area 1] x [(2xdepthxTana)+ tyre area 2]				
= [(2 x 1.92 x 0.5) + 0.4] x [(2 x 1.92 x 0.5) + 0.2] =			4.923	m²
Distributed wheel load on top of tank will be 50 ÷ 4.923 =			10.16	kN/m²
Partial factor for loading =	1.6			
Design load = 10.16 x 1.6 =			**16.3**	kN/m^2
Material factor of safety =	2.75			
Vertical design strength of Rigofill ST-A units = 400 / 2.75 =			**145.5**	kN/m^2
Degree of utilisation			11.17%	✓

Soil load + Wheel Load

Total load could be surcharge soil load plus wheel point load				
From above, design soil load is 18 x 1.921 x 1.4 =			48.4	kN/m^2
From above, wheel point load is 10.16 x 1.6 =			16.3	kN/m^2
Total of soil load + point wheel load = 48.41 + 16.25 =			**64.7**	kN/m^2
Vertical design strength of Rigofill ST-A units = 400 / 2.75 =			**145.5**	kN/m^2
Degree of utilisation			44.45%	✓

Accidental Load Case Check

No accidental load type considered

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Vertical Loads - Case 2 (deepest cover)

Surcharge load

Depth of backfill =	2.517	m		
Bulk unit weight (averaged including weight of slab if present) =	18	kN/m^3		
Partial load factor for surcharge soil =	1.4			
Soil load = depth x weight x factor = 2.517 x 18 x 1.4 =			63.4	kN/m^2
Distrib. Load from vehicles (from table 4.2) =	10	kN/m^2		
Partial load factor for loading =	1.6			
Traffic load = load x factor = 10 x 1.6 =			16	kN/m^2
Total load = 63.4 + 16 =			**79.4**	kN/m^2
Material factor of safety =	2.75			
Vertical design strength of Rigofill ST-A units = 400 / 2.75 =			**145.5**	kN/m^2
Degree of utilisation			**54.61%**	✓

Wheel load

Wheel load classification is				
Wheel load 50kN on a 0.4m x 0.2m area (from Table 4.2)				
Load spread angle (a) =	26.6	degrees		
Cover depth =	2.517	m		
Tan a = Tan (26.6) =			0.500	
Loaded area = [(2xdepthxTana)+ tyre area 1] x [(2xdepthxTana)+ tyre area 2]				
= [(2 x 2.52 x 0.5) + 0.4] x [(2 x 2.52 x 0.5) + 0.2] =			7.925	m²
Distributed wheel load on top of tank will be 50 ÷ 7.925 =			6.31	kN/m²
Partial factor for loading =	1.6			
Design load = 6.31 x 1.6 =			**10.1**	kN/m^2
Material factor of safety =	2.75			
Vertical design strength of Rigofill ST-A units = 400 / 2.75 =			**145.5**	kN/m^2
Degree of utilisation			**6.94%**	✓

Soil load + Wheel Load

Total load could be surcharge soil load plus wheel point load				
From above, design soil load is 18 x 2.517 x 1.4 =			63.4	kN/m^2
From above, wheel point load is 6.31 x 1.6 =			10.1	kN/m^2
Total of soil load + point wheel load = 63.43 + 10.09 =			**73.5**	kN/m^2
Vertical design strength of Rigofill ST-A units = 400 / 2.75 =			**145.5**	kN/m^2
Degree of utilisation			**50.55%**	✓

Accidental Load Case Check

No accidental load type considered

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Lateral Loads

Worst case will be with maximum depth of cover + vehicle loading

Internal angle of friction F'_{crit} =	30.00	degrees	
Active earth pressure coefficient Ka = (1-sinF'crit)/(1+sinF'crit)			
= (1-Sin 30)/(1 + Sin 30) =			0.333
Density of soil (averaged including weight of slab if present) = g_1 =	18	kN/m^3	
Calculation allows for the case where ground water level may be above the invert of the tank			
Then submerged density of soil $g_2 = g_1 - 10$ =			8 kN/m^3

Soil Load

Depth of soil for earth pressure calc = depth to invert - 200mm = 4.5 - 0.2 = Z =			4.297 m
Depth of soil for earth pressure calculation above ground water level = Z1 =			4.297 m
Depth of soil for earth pressure below ground water level = Z2 =			0.000 m
Partial load factor =	1.35		
Applied soil pressure = Ka x ($g_1Z_1 + g_2Z_2$) x factor			
= 0.333 x (18 x 4.297 + 8 x 0) x 1.35 =			34.81 kN/m^2
Vehicle surcharge load = q =	10	kN/m^2	
Partial load factor =	1.35		
Applied vehicle pressure = Ka x q x factor = 0.333 x 10 x 1.35 =			4.50 kN/m^2
Total load = 34.81 + 4.5 =			**39.31** kN/m^2
Material factor of safety =	2.75		
Lateral design strength of Rigofill ST-A units = 115 / 2.75 =			**41.82** kN/m^2
Degree of utilisation			93.99% ✓

Hydrostatic load

Depth of water above base of tank - 0.2m			0 m
Water pressure = density (1.0) x depth of water x g =			0.0 kN/m^2
Design load = Applied pressure x Load factor =			**0.0** kN/m^2
Total lateral load = soil load + hydrostatic load =			**39.3 kN/m^2**
Laterial strength of Rigofill ST-A units =			**41.82 kN/m^2**
Degree of utilisation			93.99% ✓

Floatation

There are three possible scenarios: water level below, part way up or over the tank
From the data given at the head of this calculation, the case is water level below the tank

Depth of water displaced =			0 m
Uplift force = depth of water displaced x buoyancy = 0 x 10 =			0 kN/m^2
Partial factor of safety for uplift =	1.5		
Design uplift force = Uplift force x factor = (0 x 1.5) =			**0.00** kN/m^2
Weight of soil, saturated soil and concrete slab if present =			34.58 kN/m^2
Partial factor of safety for soil =	0.95		
Design pressure = weight of soil x factor = 34.58 x 0.95 =			**32.85** kN/m^2
Therefore, design pressure is greater than design uplift			
Degree of utilisation			0.00% ✓

Surface Deflections

Deflection of Rigofill ST-A units is 1mm for every 45.1533333333333kN/m2 applied pressure
From above calcs for vertical loads (at shallowest cover)

Pressure from wheel loads on the top of the tank =	10.2	kN/m^2	
For serviceability analyses the factor of safety on live loads is 1.0			
This is a live load so the design load is 10.2 x 1.0 =	10.2	kN/m^2	
Deflection of the tank = 10.2 ÷ 45.1533333333333 =			**0.22 mm**

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