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6 Benton Office Park, Bennett Avenue, Horbury, Wakefield,
West Yorkshire, WF4 5RA
01924 654108 ~ hello@advantengineeers.co.uk

12th March 2024

RE: DISCHARGE OF CONDITION 13
DENBY LANE, GRANGE MOOR

We have produced the following correspondence, calculations and drawings to discharge the planning condition 13 that requests the following.

13. Development shall not commence until an assessment of the effects of 1 in 100 year storm events, with an additional allowance for climate change, blockage scenarios and exceedance events on drainage infrastructure and surface water run-off pre and post development between the development and the surrounding area (both upstream and downstream of the development), has been submitted to and approved in writing by the Local Planning Authority. No part of the development shall be brought into use (dwellings shall not be occupied) until the works comprising the approved scheme have been completed, and such approved scheme shall be retained thereafter.

Therefore, to consider the above we have simulated an exceedance event for the surface water drainage system and produced a flood flow path drawing.

Attached to this correspondence we have included the following:

- S104 Drainage Plan 24017-101(P).
- Surface water drainage calcs showing 'no flooding' in the 1 in 100 year + 45% climate change rainfall event.
- Surface water drainage calcs for a 1 in 800 year rainfall event showing 'flooding'.
- Flood exceedance drawing 24017-113(C).
- Topographical Survey.

<u>Drainage Design</u>

We have included the S104 Drawing (24017-101) and Surface water calculations demonstrating the system is sized to accommodate the 1 in 100 year + 45% climate change rainfall event without any flooding in the surface water system.

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Flood Exceedance Event

The surface water drainage calculations were then rerun for the 1 in 800 year rainfall event which is the point that the surface water system floods, this flooding occurs at manholes S2, S3 and S15.

We have shown this on the Flood Exceedance Plan (24017-113) this drawing shows the flow path for an exceedance event, but also in an event of a blockage at any point on the system, which would cause the surface water to flood from the upstream manhole of any blockage, the subsequent flooding would then follow the fall of the highway contained within the kerbs, it then flows around the properties on the northern boundary and into the watercourse.

This mimics the pre-development scenario as the land falls in the same direction as the development and any overland flows would still flow towards the watercourse, this can be seen on the topographical survey that includes existing contours of the land.

Yours sincerely,

Michael Micklethwaite BSc(hons)
Director

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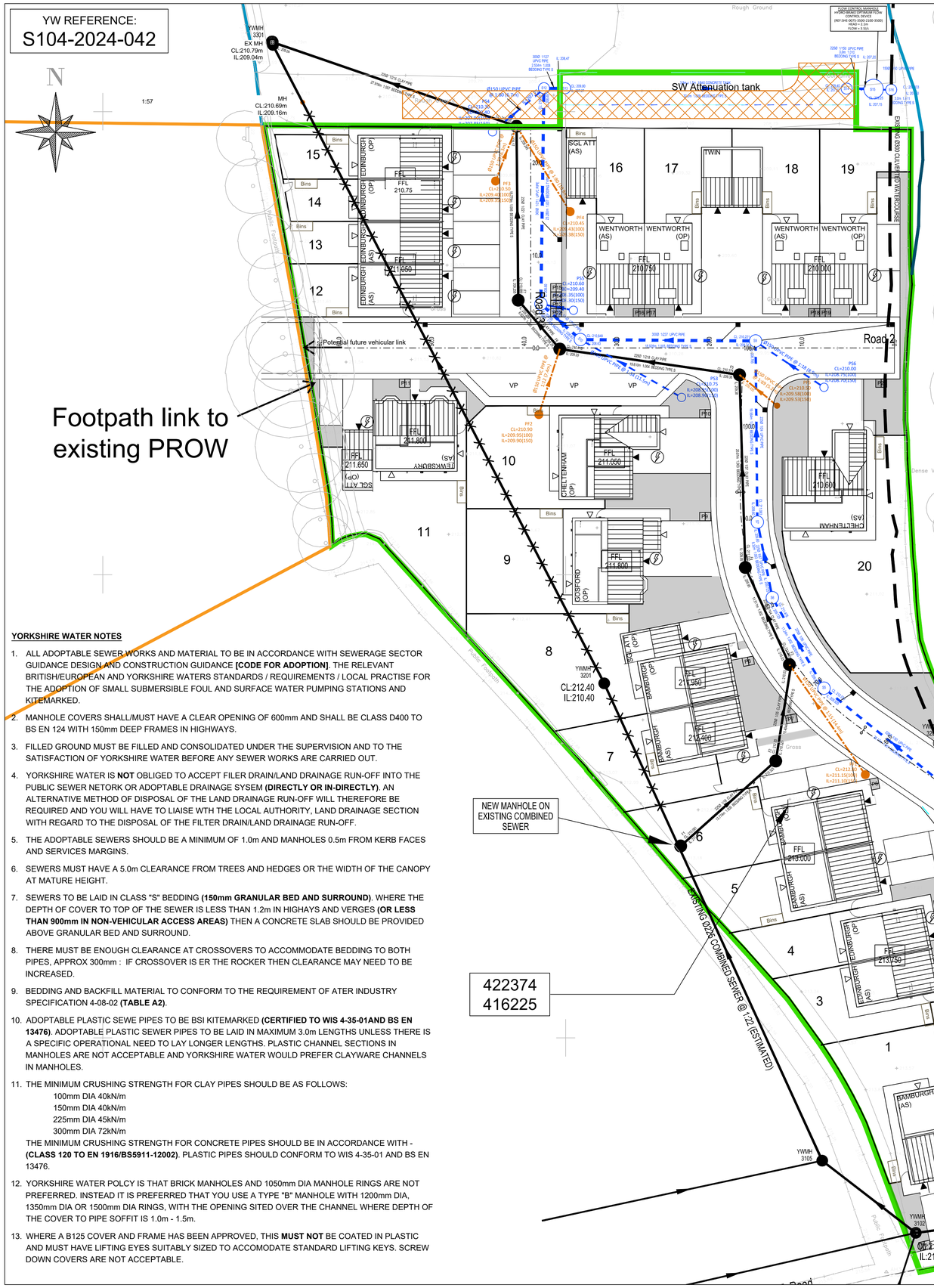
S104 DRAINAGE DRAWING

YW REFERENCE:
S104-2024-042



ALL LEVELS ARE TO GPS CO-ORDINATES

YORKSHIRE WATER NOTES

1. ALL ADOPTABLE SEWER WORKS AND MATERIAL TO BE IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE DESIGN AND CONSTRUCTION GUIDANCE **(CODE FOR ADOPTION)**. THE RELEVANT BRITISH/EUROPEAN AND YORKSHIRE WATERS STANDARDS / REQUIREMENTS / LOCAL PRACTISE FOR THE ADOPTION OF SMALL SUBMERSIBLE FOUL AND SURFACE WATER PUMPING STATIONS AND KITEMARKED.
2. MANHOLE COVERS SHALL/MUST HAVE A CLEAR OPENING OF 600mm AND SHALL BE CLASS D400 TO BS EN 124 WITH 150mm DEEP FRAMES IN HIGHWAYS.
3. FILLED GROUND MUST BE FILLED AND CONSOLIDATED UNDER THE SUPERVISION AND TO THE SATISFACTION OF YORKSHIRE WATER BEFORE ANY SEWER WORKS ARE CARRIED OUT.
4. YORKSHIRE WATER IS **NOT** OBLIGED TO ACCEPT FILER DRAIN/LAND DRAINAGE RUN-OFF INTO THE PUBLIC SEWER NETORK OR ADOPTABLE DRAINAGE SYSEM **(DIRECTLY OR IN-DIRECTLY)**. AN ALTERNATIVE METHOD OF DISPOSAL OF THE LAND DRAINAGE RUN-OFF WILL THEREFORE BE REQUIRED AND YOU WILL HAVE TO LIAISE WTH THE LOCAL AUTHORITY, LAND DRAINAGE SECTION WITH REGARD TO THE DISPOSAL OF THE FILTER DRAIN/LAND DRAINAGE RUN-OFF.
5. THE ADOPTABLE SEWERS SHOULD BE A MINIMUM OF 1.0m AND MANHOLES 0.5m FROM KERB FACES AND SERVICES MARGINS.
6. SEWERS MUST HAVE A 5.0m CLEARANCE FROM TREES AND HEDGES OR THE WIDTH OF THE CANOPY AT MATURE HEIGHT.
7. SEWERS TO BE LAID IN CLASS "S" BEDDING **(150mm GRANULAR BED AND SURROUND)**. WHERE THE DEPTH OF COVER TO TOP OF THE SEWER IS LESS THAN 1.2m IN HIGHAYS AND VERGES **(OR LESS THAN 900mm IN NON-VEHICULAR ACCESS AREAS)** THEN A CONCRETE SLAB SHOULD BE PROVIDED ABOVE GRANULAR BED AND SURROUND.
8. THERE MUST BE ENOUGH CLEARANCE AT CROSSOVERS TO ACCOMMODATE BEDDING TO BOTH PIPES, APPROX 300mm : IF CROSSOVER IS ER THE ROCKER THEN CLEARANCE MAY NEED TO BE INCREASED.
9. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENT OF ATER INDUSTRY SPECIFICATION 4-08-02 **(TABLE A2)**.
10. ADOPTABLE PLASTIC SEWE PIPES TO BE BSI KITEMARKED **(CERTIFIED TO WIS 4-35-01AND BS EN 13476)**. ADOPTABLE PLASTIC SEWER PIPES TO BE LAID IN MAXIMUM 3.0m LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER LENGTHS. PLASTIC CHANNEL SECTIONS IN MANHOLES ARE NOT ACCEPTABLE AND YORKSHIRE WATER WOULD PREFER CLAYWARE CHANNELS IN MANHOLES.
11. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS:
    - 100mm DIA 40kN/m
    - 150mm DIA 40kN/m
    - 225mm DIA 45kN/m
    - 300mm DIA 72kN/m

    THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE IN ACCORDANCE WITH - **(CLASS 120 TO EN 1916/BS5911-12002)**. PLASTIC PIPES SHOULD CONFORM TO WIS 4-35-01 AND BS EN 13476.
12. YORKSHIRE WATER POLCY IS THAT BRICK MANHOLES AND 1050mm DIA MANHOLE RINGS ARE NOT PREFERRED. INSTEAD IT IS PREFERRED THAT YOU USE A TYPE "B" MANHOLE WITH 1200mm DIA, 1350mm DIA OR 1500mm DIA RINGS, WITH THE OPENING SITED OVER THE CHANNEL WHERE DEPTH OF THE COVER TO PIPE SOFFIT IS 1.0m - 1.5m.
13. WHERE A B125 COVER AND FRAME HAS BEEN APPROVED, THIS **MUST NOT** BE COATED IN PLASTIC AND MUST HAVE LIFTING EYES SUITABLY SIZED TO ACCOMODATE STANDARD LIFTING KEYS. SCREW DOWN COVERS ARE NOT ACCEPTABLE.

MANHOLE SCHEDULE (S104)

MH No.	MANHOLE DIAMETER (mm)	MANHOLE TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)	COVER SIZE	COVER TYPE	PIPE SIZES
S1	1200	Type C	214.390	212.900	1.340	422402.767	416196.199	600x600	D400	150
S3	1200	Type B	213.174	210.425	2.524	422397.501	416221.986	600x600	D400	150/225
S5	1200	Type B	212.030	209.925	1.880	422377.890	416237.757	600x600	D400	225/225
S6	1200	Type C	211.476	209.725	1.526	422372.318	416247.523	600x600	D400	225/225
S7	1350	Type C	211.063	209.600	1.238	422370.695	416255.678	600x600	D400	225/225
S9	1350	Type C	210.221	208.710	1.211	422370.508	416275.241	600x600	D400	225/300
S10	1200	Type B	210.648	208.630	1.718	422351.581	416275.390	600x600	D400	300/300
S11	1200	Type B	210.638	208.600	1.738	422347.316	416279.243	600x600	D400	150/300
S12	1200	Type C	210.000	208.490	1.210	422347.646	416302.521	600x600	D400	300/300
S13	TANK INSPECTION CHAMBER - REFER TO TANK SPECIFICATION DRAWING							TWIN 600x600	D400	TANK
S14	TANK INSPECTION CHAMBER - REFER TO TANK SPECIFICATION DRAWING							TWIN 600x600	D400	TANK
S15	REFER TO DWG 24017-107					422383.593	416302.371	TWIN 600x600	D400	225/150
S16	1200	Type B	208.333	207.100	1.583	422388.173	416302.322	600x600	D400	150

DEMARCATION SCHEDULE

MH No.	MANHOLE DIAMETER (mm)	MANHOLE TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)	COVER TYPE	MANUFACTUR0ER (or similar approved)
PS1	450	Type E	214.800	213.700	0.950	422400.228	416184.428	B125	WAVIN
PS2	450	Type E	213.550	211.100	2.300	422385.076	416225.034	B125	WAVIN
PS3	450	Type E	210.750	208.900	1.700	422360.334	416270.546	B125	WAVIN
PS4	450	Type E	210.300	207.850	2.300	422342.116	416297.025	B125	WAVIN
PS5	450	Type E	210.600	208.300	2.150	422350.831	416278.554	B125	WAVIN
PS6	450	Type E	210.000	208.700	1.150	422379.186	416270.113	B125	WAVIN
PS7	450	Type E	214.500	213.150	1.200	422407.426	416197.302	B125	WAVIN
PF1	450	Type E	212.800	211.100	1.550	422377.840	416230.514	B125	WAVIN
PF2	450	Type E	210.900	209.900	0.850	422346.237	416269.244	B125	WAVIN
PF3	450	Type E	210.500	209.350	1.000	422342.377	416291.712	B125	WAVIN
PF4	450	Type E	210.450	209.380	0.920	422350.482	416289.204	B125	WAVIN
PF5	450	Type E	210.500	209.530	0.820	422373.824	416268.135	B125	WAVIN

NOTES

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KEY

- EXISTING COMBINED SEWER
- EXISTING SURFACE WATER SEWER
- DIVERTED COMBINED SEWER
- PROP S104 SURFACE WATER SEWER
- SEWER TO BE ABANDONED
- SITE BOUNDARY
- SEWER EASEMENT
- YW ACCESS ROAD

REV	AMENDMENTS	BY	DATE
P	LEVELS AMENDED	MJM	27.08.25
O	SCHEDULE UPDATED	RR	20.08.25
N	LATERAL CONNECTIONS UPDATED	MJM	11.08.25
M	MANUFACTURER AMENDED	MJM	06.08.25
L	LAYOUT UPDATED	MJM	05.08.25
K	UPDATED TO YW COMMENTS	MJM	01.05.25
J	LAYOUT UPDATED	MJM	06.03.25
I	UPDATED TO LLFA COMMENTS	MJM	13.12.24
H	UPDATED TO YW COMMENTS	MJM	01.10.24
G	DRAINAGE UPDATED	MJM	22.07.24
F	LAYOUT UPDATED	MJM	12.07.24
E	LEVELS UPDATED	MJM	03.07.24
D	DRAINAGE DIVERSIONS UPDATED	MJM	28.05.24
C	DRAINAGE & LAYOUT UPDATED	MJM	20.05.24
B	FOUL SEWER DIVERSION UPDATED	MJM	15.05.24
A	INITIAL ISSUE	MJM	20.03.24

FOR APPROVAL

STATUS	CHK'D
PRELIMINARY	MJM
FOR COMMENT	MJM
FOR APPROVAL	MJM
FOR CONSTRUCTION	
AS BUILT	

advant ENGINEERS
Unit 6 Benton Office Park, Bennett Avenue
Horbury, Wakefield, West Yorkshire, WF4 5RA
01924 654108
wakefield@advantengineers.co.uk

CLIENT
ORION HOMES LTD

CONTRACT
DENBY LANE
GRANGE MOOR

TITLE
S104 DRAINAGE LAYOUT

DRAWN	MJM	CHK'D	MJM
SCALE	1:250 @ A1	DATE	20.03.24

JOB No	DRG No	REV
24017	101	P

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1 in 100 YEAR + 45% RAINFALL EVENT DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	5.00
Return Period (years)	1	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)	20.000	Minimum Backdrop Height (m)	1.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Tank 1500 Link Type

Shape	Closed Rectangular	Auto Increment (mm)	500
Barrels	1	Follow Ground	x
Height (mm)	1500		

Available Diameters (mm)

500

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.061	5.00	214.280	1350	422403.754	416196.599	1.380
S2	0.006	5.00	212.317	1350	422399.763	416218.201	1.417
S3	0.018	5.00	211.950	1350	422396.636	416224.208	1.450
S4	0.024	5.00	211.754	1200	422389.188	416230.463	1.529
S5	0.020	5.00	211.640	1200	422378.408	416238.445	1.715
S6	0.017	5.00	211.420	1200	422372.603	416247.561	1.695
S7	0.041	5.00	211.103	1200	422370.695	416255.678	1.503
S9	0.072	5.00	210.294	1200	422370.508	416275.241	1.584
S10	0.007	5.00	210.689	1200	422351.581	416275.390	2.059
S11	0.054	5.00	210.557	1200	422347.316	416279.243	1.957
S12	0.017	5.00	210.000	1200	422347.646	416302.521	1.510
S13			209.800	1350	422350.180	416302.521	2.530
S14			209.400	1350	422380.580	416302.486	2.180

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S15			209.250	2100	422383.593	416302.371	2.100
S16			208.333	1200	422388.173	416302.322	1.233

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)
1.000	S1	S2	21.967	0.600	212.900	210.900	2.000	11.0	150	5.00	50.0
1.001	S2	S3	6.773	0.600	210.900	210.500	0.400	16.9	150	5.00	50.0
1.002	S3	S4	9.725	0.600	210.500	210.300	0.200	48.6	150	5.00	50.0
1.003	S4	S5	13.414	0.600	210.225	209.925	0.300	44.7	225	5.00	50.0
1.004	S5	S6	10.807	0.600	209.925	209.725	0.200	54.0	225	5.00	50.0
1.005	S6	S7	8.338	0.600	209.725	209.600	0.125	66.7	225	5.00	50.0
1.006	S7	S9	19.564	0.600	209.600	208.785	0.815	24.0	225	5.00	50.0
1.007	S9	S10	18.928	0.600	208.710	208.630	0.080	236.6	300	5.00	50.0
1.008	S10	S11	5.747	0.600	208.630	208.600	0.030	191.6	300	5.00	50.0
1.009	S11	S12	23.280	0.600	208.600	208.490	0.110	211.6	300	5.00	50.0
1.010	S12	S13	2.534	0.600	208.490	208.470	0.020	126.7	300	5.00	50.0
1.011	S13	S14	32.000	0.600	207.270	207.220	0.050	640.0	3800	5.00	50.0
1.012	S14	S15	3.015	0.600	207.220	207.200	0.020	150.8	225	5.00	50.0
1.013	S15	S16	4.581	0.600	207.150	207.100	0.050	91.6	150	5.00	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)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	3.057	54.0	8.3	1.230	1.267	0.061	0.0	40	2.220
1.001	2.460	43.5	9.1	1.267	1.300	0.067	0.0	47	1.954
1.002	1.446	25.6	11.5	1.300	1.304	0.085	0.0	71	1.409
1.003	1.961	78.0	14.8	1.304	1.490	0.109	0.0	66	1.520
1.004	1.783	70.9	17.5	1.490	1.470	0.129	0.0	76	1.484
1.005	1.603	63.7	19.8	1.470	1.278	0.146	0.0	86	1.417
1.006	2.681	106.6	25.3	1.278	1.284	0.187	0.0	74	2.206
1.007	1.018	71.9	35.1	1.284	1.759	0.259	0.0	148	1.012
1.008	1.132	80.0	36.0	1.759	1.657	0.266	0.0	141	1.103
1.009	1.077	76.1	43.4	1.657	1.210	0.320	0.0	163	1.111
1.010	1.395	98.6	45.7	1.210	1.030	0.337	0.0	143	1.369
1.011	2.104	11991.9	45.7	1.030	0.680	0.337	0.0	33	0.356
1.012	1.062	42.2	45.7	1.955	1.825	0.337	0.0	225	1.082
1.013	1.050	18.6	45.7	1.950	1.083	0.337	0.0	150	1.070

Pipeline Schedule

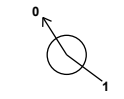
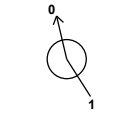
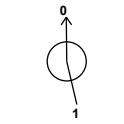
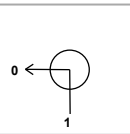
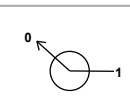
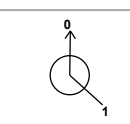
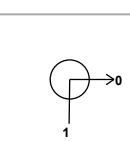
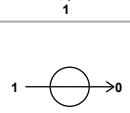
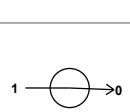
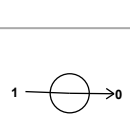
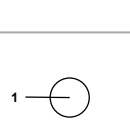
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	21.967	11.0	150	Circular	214.280	212.900	1.230	212.317	210.900	1.267
1.001	6.773	16.9	150	Circular	212.317	210.900	1.267	211.950	210.500	1.300
1.002	9.725	48.6	150	Circular	211.950	210.500	1.300	211.754	210.300	1.304
1.003	13.414	44.7	225	Circular	211.754	210.225	1.304	211.640	209.925	1.490
1.004	10.807	54.0	225	Circular	211.640	209.925	1.490	211.420	209.725	1.470
1.005	8.338	66.7	225	Circular	211.420	209.725	1.470	211.103	209.600	1.278
1.006	19.564	24.0	225	Circular	211.103	209.600	1.278	210.294	208.785	1.284
1.007	18.928	236.6	300	Circular	210.294	208.710	1.284	210.689	208.630	1.759
1.008	5.747	191.6	300	Circular	210.689	208.630	1.759	210.557	208.600	1.657
1.009	23.280	211.6	300	Circular	210.557	208.600	1.657	210.000	208.490	1.210
1.010	2.534	126.7	300	Circular	210.000	208.490	1.210	209.800	208.470	1.030
1.011	32.000	640.0	3800	Tank 1500	209.800	207.270	1.030	209.400	207.220	0.680
1.012	3.015	150.8	225	Circular	209.400	207.220	1.955	209.250	207.200	1.825
1.013	4.581	91.6	150	Circular	209.250	207.150	1.950	208.333	207.100	1.083

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	S2	1350	Manhole	Adoptable
1.001	S2	1350	Manhole	Adoptable	S3	1350	Manhole	Adoptable
1.002	S3	1350	Manhole	Adoptable	S4	1200	Manhole	Adoptable
1.003	S4	1200	Manhole	Adoptable	S5	1200	Manhole	Adoptable
1.004	S5	1200	Manhole	Adoptable	S6	1200	Manhole	Adoptable
1.005	S6	1200	Manhole	Adoptable	S7	1200	Manhole	Adoptable
1.006	S7	1200	Manhole	Adoptable	S9	1200	Manhole	Adoptable
1.007	S9	1200	Manhole	Adoptable	S10	1200	Manhole	Adoptable
1.008	S10	1200	Manhole	Adoptable	S11	1200	Manhole	Adoptable
1.009	S11	1200	Manhole	Adoptable	S12	1200	Manhole	Adoptable
1.010	S12	1200	Manhole	Adoptable	S13	1350	Manhole	Adoptable
1.011	S13	1350	Manhole	Adoptable	S14	1350	Manhole	Adoptable
1.012	S14	1350	Manhole	Adoptable	S15	2100	Manhole	Adoptable
1.013	S15	2100	Manhole	Adoptable	S16	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	422403.754	416196.599	214.280	1.380	1350				
						0	1.000	212.900	150
S2	422399.763	416218.201	212.317	1.417	1350		1	1.000	210.900	150
						0	1.001	210.900	150
S3	422396.636	416224.208	211.950	1.450	1350		1	1.001	210.500	150
						0	1.002	210.500	150
S4	422389.188	416230.463	211.754	1.529	1200		1	1.002	210.300	150
						0	1.003	210.225	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S5	422378.408	416238.445	211.640	1.715	1200		1	1.003	209.925	225
							0	1.004	209.925	225
S6	422372.603	416247.561	211.420	1.695	1200		1	1.004	209.725	225
							0	1.005	209.725	225
S7	422370.695	416255.678	211.103	1.503	1200		1	1.005	209.600	225
							0	1.006	209.600	225
S9	422370.508	416275.241	210.294	1.584	1200		1	1.006	208.785	225
							0	1.007	208.710	300
S10	422351.581	416275.390	210.689	2.059	1200		1	1.007	208.630	300
							0	1.008	208.630	300
S11	422347.316	416279.243	210.557	1.957	1200		1	1.008	208.600	300
							0	1.009	208.600	300
S12	422347.646	416302.521	210.000	1.510	1200		1	1.009	208.490	300
							0	1.010	208.490	300
S13	422350.180	416302.521	209.800	2.530	1350		1	1.010	208.470	300
							0	1.011	207.270	3800
S14	422380.580	416302.486	209.400	2.180	1350		1	1.011	207.220	3800
							0	1.012	207.220	225
S15	422383.593	416302.371	209.250	2.100	2100		1	1.012	207.200	225
							0	1.013	207.150	150
S16	422388.173	416302.322	208.333	1.233	1200		1	1.013	207.100	150

Simulation Settings

Rainfall Methodology	FSR	Winter CV	0.840
Rainfall Events	Singular	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	1440
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Starting Level (m)	

Simulation Settings

Check Discharge Rate(s) x | Check Discharge Volume x

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 %)
1	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Node S15 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	207.150	Product Number	CTL-SHE-0075-3500-2100-3500
Design Depth (m)	2.100	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.5	Min Node Diameter (mm)	0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	30 year 15 minute winter	188.566	76.035
1 year 15 minute winter	76.857	30.991	30 year 30 minute summer	174.929	49.499
1 year 30 minute summer	71.439	20.215	30 year 30 minute winter	122.757	49.499
1 year 30 minute winter	50.133	20.215	30 year 60 minute summer	116.589	30.811
1 year 60 minute summer	48.435	12.800	30 year 60 minute winter	77.459	30.811
1 year 60 minute winter	32.179	12.800	30 year 120 minute summer	70.438	18.615
1 year 120 minute summer	30.053	7.942	30 year 120 minute winter	46.797	18.615
1 year 120 minute winter	19.966	7.942	30 year 180 minute summer	53.298	13.715
1 year 180 minute summer	23.233	5.979	30 year 180 minute winter	34.645	13.715
1 year 180 minute winter	15.102	5.979	30 year 240 minute summer	41.604	10.995
1 year 240 minute summer	18.475	4.882	30 year 240 minute winter	27.641	10.995
1 year 240 minute winter	12.274	4.882	30 year 360 minute summer	31.221	8.034
1 year 360 minute summer	14.169	3.646	30 year 360 minute winter	20.295	8.034
1 year 360 minute winter	9.210	3.646	30 year 480 minute summer	24.324	6.428
1 year 480 minute summer	11.185	2.956	30 year 480 minute winter	16.160	6.428
1 year 480 minute winter	7.431	2.956	30 year 600 minute summer	19.756	5.404
1 year 600 minute summer	9.182	2.511	30 year 600 minute winter	13.498	5.404
1 year 600 minute winter	6.274	2.511	30 year 720 minute summer	17.490	4.687
1 year 720 minute summer	8.203	2.199	30 year 720 minute winter	11.754	4.687
1 year 720 minute winter	5.513	2.199	30 year 960 minute summer	14.215	3.743
1 year 960 minute summer	6.768	1.782	30 year 960 minute winter	9.416	3.743
1 year 960 minute winter	4.483	1.782	30 year 1440 minute summer	10.161	2.723
1 year 1440 minute summer	4.949	1.326	30 year 1440 minute winter	6.829	2.723
1 year 1440 minute winter	3.326	1.326	100 year 15 minute summer	348.738	98.681
30 year 15 minute summer	268.706	76.035	100 year 15 minute winter	244.728	98.681

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 30 minute summer	228.965	64.789	100 year +45% CC 15 minute winter	354.856	143.087
100 year 30 minute winter	160.677	64.789	100 year +45% CC 30 minute summer	332.000	93.944
100 year 60 minute summer	153.288	40.510	100 year +45% CC 30 minute winter	232.982	93.944
100 year 60 minute winter	101.841	40.510	100 year +45% CC 60 minute summer	222.268	58.739
100 year 120 minute summer	92.562	24.461	100 year +45% CC 60 minute winter	147.669	58.739
100 year 120 minute winter	61.496	24.461	100 year +45% CC 120 minute summer	134.215	35.469
100 year 180 minute summer	69.806	17.964	100 year +45% CC 120 minute winter	89.169	35.469
100 year 180 minute winter	45.376	17.964	100 year +45% CC 180 minute summer	101.219	26.047
100 year 240 minute summer	54.269	14.342	100 year +45% CC 180 minute winter	65.795	26.047
100 year 240 minute winter	36.055	14.342	100 year +45% CC 240 minute summer	78.690	20.795
100 year 360 minute summer	40.484	10.418	100 year +45% CC 240 minute winter	52.280	20.795
100 year 360 minute winter	26.315	10.418	100 year +45% CC 360 minute summer	58.701	15.106
100 year 480 minute summer	31.414	8.302	100 year +45% CC 360 minute winter	38.157	15.106
100 year 480 minute winter	20.871	8.302	100 year +45% CC 480 minute summer	45.550	12.038
100 year 600 minute summer	25.431	6.956	100 year +45% CC 480 minute winter	30.262	12.038
100 year 600 minute winter	17.376	6.956	100 year +45% CC 600 minute summer	36.875	10.086
100 year 720 minute summer	22.452	6.017	100 year +45% CC 600 minute winter	25.195	10.086
100 year 720 minute winter	15.089	6.017	100 year +45% CC 720 minute summer	32.556	8.725
100 year 960 minute summer	18.166	4.784	100 year +45% CC 720 minute winter	21.879	8.725
100 year 960 minute winter	12.033	4.784	100 year +45% CC 960 minute summer	26.340	6.936
100 year 1440 minute summer	12.896	3.456	100 year +45% CC 960 minute winter	17.448	6.936
100 year 1440 minute winter	8.667	3.456	100 year +45% CC 1440 minute summer	18.700	5.012
100 year +45% CC 15 minute summer	505.670	143.087	100 year +45% CC 1440 minute winter	12.567	5.012

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	212.940	0.040	8.6	0.0578	0.0000	OK
15 minute winter	S2	10	210.947	0.047	9.3	0.0674	0.0000	OK
15 minute winter	S3	10	210.577	0.077	11.8	0.1098	0.0000	OK
15 minute winter	S4	10	210.294	0.068	15.0	0.0774	0.0000	OK
15 minute winter	S5	10	210.006	0.081	17.7	0.0913	0.0000	OK
15 minute winter	S6	11	209.821	0.096	20.0	0.1084	0.0000	OK
15 minute winter	S7	10	209.676	0.076	25.6	0.0859	0.0000	OK
15 minute winter	S9	11	208.873	0.163	35.6	0.1844	0.0000	OK
15 minute winter	S10	11	208.808	0.178	36.4	0.2011	0.0000	OK
15 minute winter	S11	11	208.775	0.175	43.7	0.1977	0.0000	OK
15 minute winter	S12	11	208.660	0.170	46.1	0.1925	0.0000	OK
120 minute winter	S13	110	207.481	0.211	15.5	0.3023	0.0000	OK
120 minute winter	S14	114	207.481	0.261	9.8	0.3738	0.0000	SURCHARGED
120 minute winter	S15	114	207.481	0.331	3.0	1.1469	0.0000	SURCHARGED
15 minute summer	S16	1	207.100	0.000	2.5	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	S1	1.000	S2	8.5	2.003	0.158	0.0938	
15 minute winter	S2	1.001	S3	9.3	1.352	0.213	0.0467	
15 minute winter	S3	1.002	S4	11.6	1.350	0.455	0.0839	
15 minute winter	S4	1.003	S5	14.9	1.300	0.191	0.1542	
15 minute winter	S5	1.004	S6	17.7	1.226	0.249	0.1561	
15 minute winter	S6	1.005	S7	20.1	1.447	0.315	0.1160	
15 minute winter	S7	1.006	S9	25.6	2.022	0.240	0.2555	
15 minute winter	S9	1.007	S10	35.5	0.863	0.493	0.7819	
15 minute winter	S10	1.008	S11	36.5	0.848	0.456	0.2474	
15 minute winter	S11	1.009	S12	43.8	1.045	0.576	0.9758	
15 minute winter	S12	1.010	S13	46.0	1.240	0.466	0.0939	
120 minute winter	S13	1.011	S14	9.8	0.120	0.001	28.7095	
120 minute winter	S14	1.012	S15	3.0	0.520	0.070	0.1199	
120 minute winter	S15	Hydro-Brake®	S16	2.6				44.7

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	212.965	0.065	21.1	0.0930	0.0000	OK
15 minute winter	S2	11	210.992	0.092	23.1	0.1320	0.0000	OK
15 minute winter	S3	11	210.761	0.261	28.5	0.3730	0.0000	SURCHARGED
15 minute winter	S4	11	210.340	0.115	36.0	0.1299	0.0000	OK
15 minute winter	S5	11	210.070	0.145	42.6	0.1636	0.0000	OK
15 minute winter	S6	11	209.897	0.172	48.1	0.1940	0.0000	OK
15 minute winter	S7	11	209.751	0.151	61.6	0.1703	0.0000	OK
15 minute winter	S9	11	209.324	0.614	84.8	0.6943	0.0000	SURCHARGED
15 minute winter	S10	11	209.173	0.543	86.5	0.6144	0.0000	SURCHARGED
15 minute winter	S11	11	209.099	0.499	103.8	0.5639	0.0000	SURCHARGED
15 minute winter	S12	11	208.831	0.341	109.1	0.3856	0.0000	SURCHARGED
240 minute winter	S13	240	207.979	0.709	21.6	1.0140	0.0000	OK
240 minute winter	S14	240	207.979	0.759	12.4	1.0856	0.0000	SURCHARGED
240 minute winter	S15	240	207.979	0.828	3.1	2.8698	0.0000	SURCHARGED
15 minute summer	S16	1	207.100	0.000	2.6	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	S1	1.000	S2	21.0	2.445	0.389	0.2022	
15 minute winter	S2	1.001	S3	22.3	1.516	0.514	0.0981	
15 minute winter	S3	1.002	S4	28.2	1.602	1.103	0.1695	
15 minute winter	S4	1.003	S5	36.1	1.521	0.462	0.3175	
15 minute winter	S5	1.004	S6	42.6	1.431	0.602	0.3213	
15 minute winter	S6	1.005	S7	48.2	1.718	0.756	0.2531	
15 minute winter	S7	1.006	S9	61.4	1.989	0.576	0.6652	
15 minute winter	S9	1.007	S10	84.2	1.196	1.171	1.3329	
15 minute winter	S10	1.008	S11	86.2	1.225	1.077	0.4047	
15 minute winter	S11	1.009	S12	103.6	1.471	1.361	1.6394	
15 minute winter	S12	1.010	S13	109.0	1.559	1.105	0.1699	
240 minute winter	S13	1.011	S14	12.4	0.101	0.001	89.2149	
240 minute winter	S14	1.012	S15	3.1	0.498	0.073	0.1199	
240 minute winter	S15	Hydro-Brake®	S16	2.6				124.6

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	212.976	0.075	27.4	0.1080	0.0000	OK
15 minute winter	S2	11	211.158	0.257	30.0	0.3685	0.0000	SURCHARGED
15 minute winter	S3	11	210.921	0.421	35.1	0.6025	0.0000	SURCHARGED
15 minute winter	S4	12	210.454	0.229	44.6	0.2592	0.0000	SURCHARGED
15 minute winter	S5	12	210.333	0.408	52.1	0.4619	0.0000	SURCHARGED
15 minute winter	S6	12	210.187	0.462	56.1	0.5223	0.0000	SURCHARGED
15 minute winter	S7	12	210.029	0.429	71.2	0.4857	0.0000	SURCHARGED
15 minute winter	S9	11	209.582	0.872	99.9	0.9862	0.0000	SURCHARGED
15 minute winter	S10	11	209.373	0.742	102.3	0.8397	0.0000	SURCHARGED
15 minute winter	S11	11	209.268	0.668	124.7	0.7558	0.0000	SURCHARGED
15 minute winter	S12	11	208.883	0.393	131.6	0.4445	0.0000	SURCHARGED
240 minute winter	S13	240	208.259	0.989	28.2	1.4158	0.0000	OK
240 minute winter	S14	240	208.259	1.039	15.5	1.4873	0.0000	SURCHARGED
240 minute winter	S15	240	208.259	1.109	3.2	3.8421	0.0000	SURCHARGED
15 minute summer	S16	1	207.100	0.000	2.6	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	S1	1.000	S2	27.3	2.483	0.505	0.2908	
15 minute winter	S2	1.001	S3	27.5	1.561	0.632	0.1192	
15 minute winter	S3	1.002	S4	34.5	1.962	1.352	0.1712	
15 minute winter	S4	1.003	S5	43.1	1.514	0.553	0.5335	
15 minute winter	S5	1.004	S6	51.7	1.427	0.729	0.4298	
15 minute winter	S6	1.005	S7	59.2	1.712	0.929	0.3316	
15 minute winter	S7	1.006	S9	72.8	1.958	0.682	0.7781	
15 minute winter	S9	1.007	S10	99.3	1.410	1.380	1.3329	
15 minute winter	S10	1.008	S11	102.2	1.451	1.277	0.4047	
15 minute winter	S11	1.009	S12	124.4	1.767	1.634	1.6394	
15 minute winter	S12	1.010	S13	131.5	1.869	1.333	0.1743	
240 minute winter	S13	1.011	S14	15.5	0.122	0.001	123.3566	
240 minute winter	S14	1.012	S15	3.2	0.525	0.075	0.1199	
240 minute winter	S15	Hydro-Brake®	S16	2.6				162.6

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	11	213.018	0.118	39.7	0.1692	0.0000	OK
15 minute winter	S2	12	212.231	1.331	42.7	1.9046	0.0000	FLOOD RISK
15 minute winter	S3	13	211.939	1.439	42.2	2.0596	0.0000	FLOOD RISK
15 minute winter	S4	12	211.357	1.132	50.0	1.2804	0.0000	SURCHARGED
15 minute winter	S5	12	211.197	1.272	58.4	1.4387	0.0000	SURCHARGED
15 minute winter	S6	12	211.003	1.278	67.2	1.4450	0.0000	SURCHARGED
15 minute winter	S7	12	210.790	1.190	86.7	1.3461	0.0000	SURCHARGED
15 minute winter	S9	11	210.106	1.396	125.8	1.5785	0.0000	FLOOD RISK
15 minute winter	S10	11	209.777	1.147	128.8	1.2968	0.0000	SURCHARGED
15 minute winter	S11	11	209.613	1.013	160.8	1.1456	0.0000	SURCHARGED
360 minute winter	S12	352	209.242	0.752	29.8	0.8502	0.0000	SURCHARGED
360 minute winter	S13	352	209.242	1.972	29.8	2.8214	0.0000	SURCHARGED
360 minute winter	S14	352	209.242	2.022	16.5	2.8930	0.0000	FLOOD RISK
360 minute winter	S15	352	209.241	2.091	3.9	7.2443	0.0000	FLOOD RISK
15 minute summer	S16	1	207.100	0.000	2.6	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	S1	1.000	S2	38.8	2.507	0.718	0.3569	
15 minute winter	S2	1.001	S3	31.1	1.764	0.714	0.1192	
15 minute winter	S3	1.002	S4	40.1	2.278	1.569	0.1712	
15 minute winter	S4	1.003	S5	51.8	1.521	0.664	0.5335	
15 minute winter	S5	1.004	S6	62.3	1.568	0.879	0.4298	
15 minute winter	S6	1.005	S7	72.2	1.815	1.132	0.3316	
15 minute winter	S7	1.006	S9	89.5	2.252	0.840	0.7781	
15 minute winter	S9	1.007	S10	125.2	1.778	1.740	1.3329	
15 minute winter	S10	1.008	S11	130.1	1.847	1.625	0.4047	
15 minute winter	S11	1.009	S12	160.0	2.273	2.103	1.6394	
360 minute winter	S12	1.010	S13	29.8	1.107	0.302	0.1784	
360 minute winter	S13	1.011	S14	16.5	0.082	0.001	182.5000	
360 minute winter	S14	1.012	S15	3.9	0.435	0.093	0.1199	
360 minute winter	S15	Hydro-Brake®	S16	3.5				257.5

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West Yorkshire, WF4 5RA
01924 654108 ~ hello@advantengineeers.co.uk

1 in 800 YEAR RAINFALL EVENT
DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	5.00
Return Period (years)	1	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)	20.000	Minimum Backdrop Height (m)	1.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Tank 1500 Link Type

Shape	Closed Rectangular	Auto Increment (mm)	500
Barrels	1	Follow Ground	x
Height (mm)	1500		

Available Diameters (mm)

500

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.061	5.00	214.280	1350	422403.754	416196.599	1.380
S2	0.006	5.00	212.317	1350	422399.763	416218.201	1.417
S3	0.018	5.00	211.950	1350	422396.636	416224.208	1.450
S4	0.024	5.00	211.754	1200	422389.188	416230.463	1.529
S5	0.020	5.00	211.640	1200	422378.408	416238.445	1.715
S6	0.017	5.00	211.420	1200	422372.603	416247.561	1.695
S7	0.041	5.00	211.103	1200	422370.695	416255.678	1.503
S9	0.072	5.00	210.294	1200	422370.508	416275.241	1.584
S10	0.007	5.00	210.689	1200	422351.581	416275.390	2.059
S11	0.054	5.00	210.557	1200	422347.316	416279.243	1.957
S12	0.017	5.00	210.000	1200	422347.646	416302.521	1.510
S13			209.800	1350	422350.180	416302.521	2.530
S14			209.400	1350	422380.580	416302.486	2.180

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S15			209.250	2100	422383.593	416302.371	2.100
S16			208.333	1200	422388.173	416302.322	1.233

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)
1.000	S1	S2	21.967	0.600	212.900	210.900	2.000	11.0	150	5.00	50.0
1.001	S2	S3	6.773	0.600	210.900	210.500	0.400	16.9	150	5.00	50.0
1.002	S3	S4	9.725	0.600	210.500	210.300	0.200	48.6	150	5.00	50.0
1.003	S4	S5	13.414	0.600	210.225	209.925	0.300	44.7	225	5.00	50.0
1.004	S5	S6	10.807	0.600	209.925	209.725	0.200	54.0	225	5.00	50.0
1.005	S6	S7	8.338	0.600	209.725	209.600	0.125	66.7	225	5.00	50.0
1.006	S7	S9	19.564	0.600	209.600	208.785	0.815	24.0	225	5.00	50.0
1.007	S9	S10	18.928	0.600	208.710	208.630	0.080	236.6	300	5.00	50.0
1.008	S10	S11	5.747	0.600	208.630	208.600	0.030	191.6	300	5.00	50.0
1.009	S11	S12	23.280	0.600	208.600	208.490	0.110	211.6	300	5.00	50.0
1.010	S12	S13	2.534	0.600	208.490	208.470	0.020	126.7	300	5.00	50.0
1.011	S13	S14	32.000	0.600	207.270	207.220	0.050	640.0	3800	5.00	50.0
1.012	S14	S15	3.015	0.600	207.220	207.200	0.020	150.8	225	5.00	50.0
1.013	S15	S16	4.581	0.600	207.150	207.100	0.050	91.6	150	5.00	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)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	3.057	54.0	8.3	1.230	1.267	0.061	0.0	40	2.220
1.001	2.460	43.5	9.1	1.267	1.300	0.067	0.0	47	1.954
1.002	1.446	25.6	11.5	1.300	1.304	0.085	0.0	71	1.409
1.003	1.961	78.0	14.8	1.304	1.490	0.109	0.0	66	1.520
1.004	1.783	70.9	17.5	1.490	1.470	0.129	0.0	76	1.484
1.005	1.603	63.7	19.8	1.470	1.278	0.146	0.0	86	1.417
1.006	2.681	106.6	25.3	1.278	1.284	0.187	0.0	74	2.206
1.007	1.018	71.9	35.1	1.284	1.759	0.259	0.0	148	1.012
1.008	1.132	80.0	36.0	1.759	1.657	0.266	0.0	141	1.103
1.009	1.077	76.1	43.4	1.657	1.210	0.320	0.0	163	1.111
1.010	1.395	98.6	45.7	1.210	1.030	0.337	0.0	143	1.369
1.011	2.104	11991.9	45.7	1.030	0.680	0.337	0.0	33	0.356
1.012	1.062	42.2	45.7	1.955	1.825	0.337	0.0	225	1.082
1.013	1.050	18.6	45.7	1.950	1.083	0.337	0.0	150	1.070

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)
1.000	21.967	11.0	150	Circular	214.280	212.900	1.230	212.317	210.900	1.267
1.001	6.773	16.9	150	Circular	212.317	210.900	1.267	211.950	210.500	1.300
1.002	9.725	48.6	150	Circular	211.950	210.500	1.300	211.754	210.300	1.304
1.003	13.414	44.7	225	Circular	211.754	210.225	1.304	211.640	209.925	1.490
1.004	10.807	54.0	225	Circular	211.640	209.925	1.490	211.420	209.725	1.470
1.005	8.338	66.7	225	Circular	211.420	209.725	1.470	211.103	209.600	1.278
1.006	19.564	24.0	225	Circular	211.103	209.600	1.278	210.294	208.785	1.284
1.007	18.928	236.6	300	Circular	210.294	208.710	1.284	210.689	208.630	1.759
1.008	5.747	191.6	300	Circular	210.689	208.630	1.759	210.557	208.600	1.657
1.009	23.280	211.6	300	Circular	210.557	208.600	1.657	210.000	208.490	1.210
1.010	2.534	126.7	300	Circular	210.000	208.490	1.210	209.800	208.470	1.030
1.011	32.000	640.0	3800	Tank 1500	209.800	207.270	1.030	209.400	207.220	0.680
1.012	3.015	150.8	225	Circular	209.400	207.220	1.955	209.250	207.200	1.825
1.013	4.581	91.6	150	Circular	209.250	207.150	1.950	208.333	207.100	1.083

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	S2	1350	Manhole	Adoptable
1.001	S2	1350	Manhole	Adoptable	S3	1350	Manhole	Adoptable
1.002	S3	1350	Manhole	Adoptable	S4	1200	Manhole	Adoptable
1.003	S4	1200	Manhole	Adoptable	S5	1200	Manhole	Adoptable
1.004	S5	1200	Manhole	Adoptable	S6	1200	Manhole	Adoptable
1.005	S6	1200	Manhole	Adoptable	S7	1200	Manhole	Adoptable
1.006	S7	1200	Manhole	Adoptable	S9	1200	Manhole	Adoptable
1.007	S9	1200	Manhole	Adoptable	S10	1200	Manhole	Adoptable
1.008	S10	1200	Manhole	Adoptable	S11	1200	Manhole	Adoptable
1.009	S11	1200	Manhole	Adoptable	S12	1200	Manhole	Adoptable
1.010	S12	1200	Manhole	Adoptable	S13	1350	Manhole	Adoptable
1.011	S13	1350	Manhole	Adoptable	S14	1350	Manhole	Adoptable
1.012	S14	1350	Manhole	Adoptable	S15	2100	Manhole	Adoptable
1.013	S15	2100	Manhole	Adoptable	S16	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	422403.754	416196.599	214.280	1.380	1350				
						0	1.000	212.900	150
S2	422399.763	416218.201	212.317	1.417	1350		1	1.000	210.900	150
						0	1.001	210.900	150
S3	422396.636	416224.208	211.950	1.450	1350		1	1.001	210.500	150
						0	1.002	210.500	150
S4	422389.188	416230.463	211.754	1.529	1200		1	1.002	210.300	150
						0	1.003	210.225	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S5	422378.408	416238.445	211.640	1.715	1200	1	1.003	209.925	225
						0	1.004	209.925	225
S6	422372.603	416247.561	211.420	1.695	1200	1	1.004	209.725	225
						0	1.005	209.725	225
S7	422370.695	416255.678	211.103	1.503	1200	1	1.005	209.600	225
						0	1.006	209.600	225
S9	422370.508	416275.241	210.294	1.584	1200	1	1.006	208.785	225
						0	1.007	208.710	300
S10	422351.581	416275.390	210.689	2.059	1200	1	1.007	208.630	300
						0	1.008	208.630	300
S11	422347.316	416279.243	210.557	1.957	1200	1	1.008	208.600	300
						0	1.009	208.600	300
S12	422347.646	416302.521	210.000	1.510	1200	1	1.009	208.490	300
						0	1.010	208.490	300
S13	422350.180	416302.521	209.800	2.530	1350	1	1.010	208.470	300
						0	1.011	207.270	3800
S14	422380.580	416302.486	209.400	2.180	1350	1	1.011	207.220	3800
						0	1.012	207.220	225
S15	422383.593	416302.371	209.250	2.100	2100	1	1.012	207.200	225
						0	1.013	207.150	150
S16	422388.173	416302.322	208.333	1.233	1200	1	1.013	207.100	150

Simulation Settings

Rainfall Methodology	FSR	Winter CV	0.840
Rainfall Events	Singular	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	1440
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Starting Level (m)	

Simulation Settings

Check Discharge Rate(s) x | Check Discharge Volume x

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 %)
800	0	0	0

Node S15 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	207.150	Product Number	CTL-SHE-0075-3500-2100-3500
Design Depth (m)	2.100	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.5	Min Node Diameter (mm)	0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
800 year 15 minute summer	547.078	154.804	800 year 360 minute summer	63.408	16.317
800 year 15 minute winter	383.915	154.804	800 year 360 minute winter	41.217	16.317
800 year 30 minute summer	364.491	103.139	800 year 480 minute summer	48.864	12.913
800 year 30 minute winter	255.783	103.139	800 year 480 minute winter	32.464	12.913
800 year 60 minute summer	245.913	64.987	800 year 600 minute summer	39.337	10.759
800 year 60 minute winter	163.379	64.987	800 year 600 minute winter	26.877	10.759
800 year 120 minute summer	148.359	39.207	800 year 720 minute summer	34.564	9.263
800 year 120 minute winter	98.566	39.207	800 year 720 minute winter	23.229	9.263
800 year 180 minute summer	111.247	28.628	800 year 960 minute summer	27.747	7.306
800 year 180 minute winter	72.314	28.628	800 year 960 minute winter	18.380	7.306
800 year 240 minute summer	85.881	22.696	800 year 1440 minute summer	19.467	5.217
800 year 240 minute winter	57.057	22.696	800 year 1440 minute winter	13.083	5.217

Results for 800 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	12	213.330	0.430	43.0	0.6157	0.0000	SURCHARGED
15 minute winter	S2	12	212.317	1.417	45.3	2.0277	0.2411	FLOOD
15 minute winter	S3	12	211.950	1.450	44.3	2.0750	1.1346	FLOOD
15 minute winter	S4	12	211.531	1.306	51.1	1.4774	0.0000	FLOOD RISK
15 minute winter	S5	12	211.392	1.467	59.2	1.6589	0.0000	FLOOD RISK
15 minute winter	S6	12	211.206	1.481	67.7	1.6746	0.0000	FLOOD RISK
15 minute winter	S7	12	210.990	1.390	89.0	1.5725	0.0000	FLOOD RISK
15 minute winter	S9	11	210.256	1.546	132.4	1.7489	0.0000	FLOOD RISK
15 minute winter	S10	11	209.893	1.263	135.4	1.4281	0.0000	SURCHARGED
15 minute winter	S11	11	209.712	1.112	169.9	1.2578	0.0000	SURCHARGED
240 minute winter	S12	184	209.255	0.765	44.8	0.8648	0.0000	SURCHARGED
240 minute winter	S13	184	209.254	1.984	44.8	2.8386	0.0000	SURCHARGED
240 minute winter	S14	184	209.254	2.034	24.5	2.9102	0.0000	FLOOD RISK
240 minute winter	S15	184	209.250	2.100	11.8	7.2744	15.6104	FLOOD
15 minute summer	S16	1	207.100	0.000	2.6	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	S1	1.000	S2	41.1	2.474	0.762	0.3867	
15 minute winter	S2	1.001	S3	34.2	1.945	0.788	0.1192	
15 minute winter	S3	1.002	S4	40.7	2.310	1.592	0.1712	
15 minute winter	S4	1.003	S5	52.1	1.568	0.669	0.5335	
15 minute winter	S5	1.004	S6	62.8	1.580	0.887	0.4298	
15 minute winter	S6	1.005	S7	73.1	1.871	1.147	0.3316	
15 minute winter	S7	1.006	S9	91.6	2.304	0.859	0.7781	
15 minute winter	S9	1.007	S10	131.5	1.867	1.828	1.3329	
15 minute winter	S10	1.008	S11	136.9	1.944	1.710	0.4047	
15 minute winter	S11	1.009	S12	168.9	2.399	2.220	1.6394	
240 minute winter	S12	1.010	S13	44.8	1.232	0.454	0.1784	
240 minute winter	S13	1.011	S14	24.5	0.125	0.002	182.5000	
240 minute winter	S14	1.012	S15	11.8	0.483	0.278	0.1199	
240 minute winter	S15	Hydro-Brake®	S16	3.5				240.5

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01924 654108 ~ hello@advantengineeers.co.uk

FLOOD EXCEEDANCE DRAWING

YW REFERENCE:
S104-2024-042

N

FLOW TOWARDS WATERCOURSE

FLOW CONTROL MANHOLE
HYDRO-BRAKE OPTIMUM FLOW CONTROL DEVICE
(REF:SHE-0075-2400-2100-3500)
HEAD = 2.1m
FLOW =3.5l/s

SW Attenuation tank
3.8m x 1.5m 1/640 CONCRETE TANK
32.0m 1.011 BEDDING TYPE S

2250 1/151 UPVC PIPE
3.015m 1.012
BEDDING TYPE S
IL: 206.30

150Ø 1/92 UPVC PIPE

300Ø 1/127
CLAY PIPE
2.534m 1.010
BEDDING TYPE S
IL: 208.47

Ø150 UPVC PIPE
@ 1:80 (6.7m)
IL=207.72

PS4
CL=210.30
BD=209.40
IL=207.90(100)
IL=207.85(150)

S12 CL: 210.00 IL: 208.48
S13 CL: 209.80 IL: 207.27
S14 CL: 209.40 IL: 207.22
S15 CL: 209.25 IL: 207.15
S16 CL: 208.333 IL: 207.10

4.580m 1.013
BEDDING TYPE S

3.5m
3.0m

Bins
SGL ATT (AS)
TWIN
16
17
18
19
WENTWORTH (AS)
WENTWORTH (OP)

FFL 210.750
FFL 210.000

Ø150 UPVC PIPE @ 1:39 (6.3m)
Ø150 UPVC PIPE @ 1:80 (10.9m)

PF3
CL=210.50
IL=209.40(100)
IL=209.35(150)

PF4
CL=210.45
IL=209.43(100)
IL=209.38(150)

2250 1/221 CLAY PIPE
23.288m 1.009 BEDDING TYPE S

300Ø 1/211 UPVC PIPE

PS5
CL=210.60
BD=209.40
IL=208.35(100)
IL=208.30(150)

P15 P14 P13 P12 P16 P17 P18 P19

S11 S10 S9 S8 S7 S6 S5

Ø150 UPVC PIPE @ 1:14 (7.4m)

3000 1/236 UPVC PIPE
19.610m 1.004 BEDDING TYPE S

2250 1/216 CLAY PIPE
Ø150 UPVC PIPE @ 1:34 (11.5m)

PS3
CL=210.75
IL=208.95(100)
IL=208.90(150)

F5 CL: 210.374 IL: 209.374

Ø150 UPVC PIPE @ 1:80 (6.0m)

PS6
CL=210.00
IL=208.75(100)
IL=208.70(150)

PF5
CL=210.50
IL=209.58(100)
IL=209.53(150)

P20

PF2
CL=210.90
IL=209.95(100)
IL=209.90(150)

P10

FFL 211.050
FFL 210.600

CHELTENHAM (OP)
CHELTENHAM (AS)

P9

FFL 211.800

9
10
20

VP
Bins
Grass
Dense Vegetation

future vehicular link

FFL 213.000

PF7
CL=212.30
IL=211.15(100)
IL=211.10(150)

PF6

2250 1/45 UPVC PIPE
10.404m 1.001 BEDDING TYPE S

Ø150 UPVC PIPE @ 1:15 (144.4m)

YWMH 3203

S3 CL: 213.174 IL: 210.674

Ø150 UPVC PIPE @ 1:10 (106.6m)

YWMH 4203

P5 P4

PS2
CL=213.55
IL=211.15(100)
IL=211.10(150)

DS2 CL: 213.678 IL: 211.000

1500 1/11 UPVC PIPE
6.234m 1.000 BEDDING TYPE S

FFL 213.300

BAMBURGH (AS)
BAMBURGH (OP)
EDINBURGH (OP)
EDINBURGH (AS)

FFL 213.750

4
3
2
1

P3

Ø150 UPVC PIPE @ 1:10 (2.8m)

S1 CL: 213.200 IL: 212.700

FFL 214.950

YWMH 3105

P2

Ø150 UPVC PIPE @ 1:15 (11.5m)

PS1
CL=214.80
IL=213.75(100)
IL=213.70(150)

DS1 CL: 213.300 IL: 211.800

YWMH 4102

P21

NOTES

1. THIS DRAWING IS PRODUCED FOR USE IN THIS PROJECT ONLY AND MAY NOT BE USED FOR ANY OTHER PURPOSE. THE CONSULTING ENGINEERS ACCEPT NO LIABILITY FOR THE USE OF THIS DRAWING OTHER THAN THE PURPOSE FOR WHICH IT WAS INTENDED IN CONNECTION WITH THIS PROJECT AS RECORDED ON THE TITLE BLOCK FIELDS 'PURPOSE FOR ISSUE' AND 'FILE STATUS CODE'.
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5. DISCREPANCIES MUST BE REPORTED BACK TO THE ENGINEER PRIOR TO CONSTRUCTION.
6. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ADVANT ENGINEERS DRAWINGS AND SPECIFICATIONS.

KEY

FLOOD EXCEEDANCE EVENT

FLOOD FLOW ROUTE

REV	AMENDMENTS	BY	DATE
C	LAYOUT UPDATED	MJM	06.08.25
B	UPDATED TO LLFA COMMENTS	MJM	13.12.24
A	INITIAL ISSUE	MJM	01.10.24

FOR APPROVAL

STATUS	CHK'D
PRELIMINARY	MJM
FOR COMMENT	MJM
FOR APPROVAL	MJM
FOR CONSTRUCTION	
AS BUILT	

advant ENGINEERS
Unit 6 Benton Office Park, Bennett Avenue
Horbury, Wakefield, West Yorkshire, WF4 5RA
01924 654108
wakefield@advantengineers.co.uk

CLIENT
ORION HOMES LTD

CONTRACT
DENBY LANE
GRANGE MOOR

TITLE
FLOOD EXCEEDANCE
LAYOUT PLAN

DRAWN	MJM	CHK'D	MJM
SCALE	1:125 @ A1	DATE	01.10.24

JOB No	DRG No	REV
24017	113	C

advant ENGINEERS
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Drainage Strategies • Flood Risk Assessments • Drainage Design & Drainage Calculations
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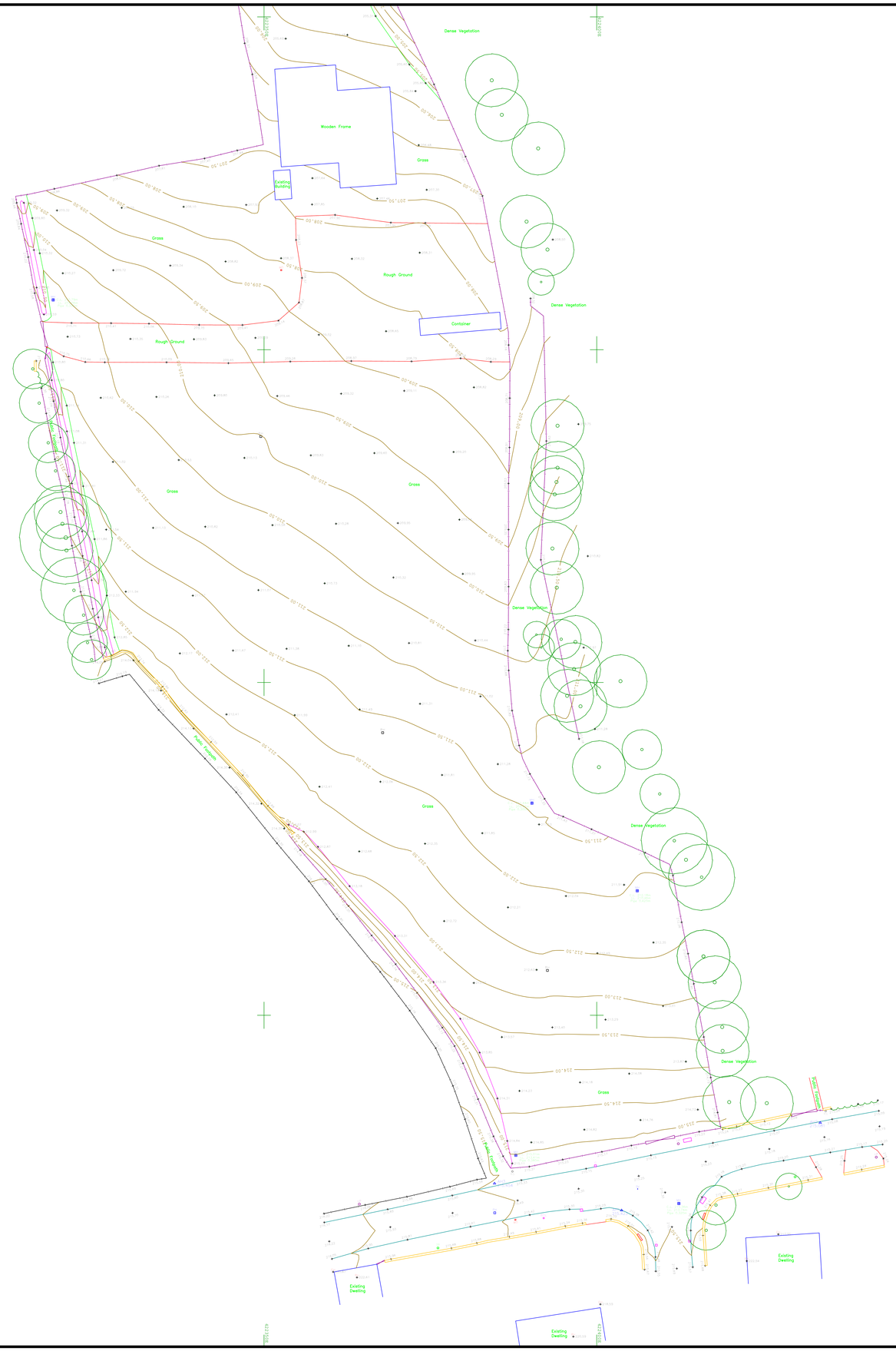
6 Benton Office Park, Bennett Avenue, Horbury, Wakefield,
West Yorkshire, WF4 5RA
01924 654108 ~ hello@advantengineeers.co.uk

TOPOGRAPHICAL SURVEY



Notes:

1. The accuracy and content of this drawing are dependent on the surveyed scale and survey specification, care should be taken when working with other plotted scales or from CAD.

Station Co-Ordinates:

AH1	422403.732	416170.701	215.423
AH2	422433.577	416183.861	215.081
AH3	422384.637	416174.934	215.454

Survey Control Data:

Datum for Levels: OS GPS Datum (OSGM15)
Bench Mark: AH1
Value: 215.423m
Grid: Local Grid Based on OSGB36(15) at AH1

Standard Symbols:

MH	Manhole Cover
IC	Inspection Cover
WDH	Water Outlet Hydrant
FH	Fire Hydrant
SV	Stop Valve
GV	Gas Valve
WM	Water Meter
UC	Unidentified Cover
BT	Telecom Cover
LP	Lamp Post
TP	Telegraph Pole
EP	Electricity Pole
SIGN	Sign Post
BUS	Bus Stop
FP	Flag Pole
RTS	Road Traffic Sign
TL	Traffic Light
CB	Control Box (Traffic)
TC	Tree
RE	Rodding Eye
BH	Borehole
TrP	Trial Pit
JB	Junction Box
BOL	Bollard
LB	Litter Bin
PB	Pillar Box
TCB	Telephone Call Box
MILE	Milestone
MP	Marker Post
EC	Electricity Cable
GP	Gas Pipe
RWP	Rain Water Pipe
SVP	Soil and Vent Pipe
SP	Soil Pipe
VP	Vent Pipe
WP	Waste Pipe
S/COB	Stone Cobbles
SPS	Stone Paving Slabs
CPS	Concrete Paving Slabs
B/S	Brick Setts
ELEC	Electricity Cover
OHW	Overhead Wire
FL	Floor Level
SL	Step Level
CL	Cover Level
IL	Invert Level
B/W	Barbed Wire
C/B	Close Boarded
C/L	Chain Link
W/P	Wood Paling
H/R	Hand Rail
I/R	Iron Railing
M/W	Metal Mesh
O/B	Open Boarded
WP/R	Wood Post and Rail
CP/R	Concrete Post and Rail
CP/T	Concrete Post and Timber Panel
P/W	Post and Wire
CP/D	Concrete Post and Dropper
PAL	Palisade
T/S	Tube Steel
R/W	Retaining Wall
EH	Eaves Height
RH	Ridge Height
TH	Tree Height
SH	Sill Height
WH	Wall Height

Existing Contour

Existing Tree

Tree Stump

Canopy Line

Rev	Description of revision	Date

Stamford Geomatics Ltd
LAND SURVEYING AND VOLUMETRICS
Office 4, The Rear Walled Garden,
The Nostell Estate,
Nostell,
WF4 1AB
Tel: 01924 862646, 07710 349592
email: surveys@stamfordgeomatics.co.uk

Site Name:
Denby Lane,
Grange Moor,
West Yorkshire.

Surveyed:	Drawn:	Checked:
AH	AH	CSm

Title
Topographical Survey.

Plotted Scale:	Date:	Sheet Size:
1:200	20 Mar 24	A0

Drawing No.	Revision
2795/001	a