

To:	DELOITTE	Job number:	969/07
From:	CIVIC ENGINEERS	Date:	29/08/2023
Subject:	DRAINAGE FOR PLANNING	Cc:	

DRAINAGE FOR PLANNING FILE NOTE

This file note has been prepared to demonstrate how the below ground foul and surface water drainage satisfies planning condition 14 for the proposed development. The wording of the condition can be found below, alongside each point we have prepared a statement to indicate how the drainage strategy adheres to the point above.

Notwithstanding the details submitted within the Flood Risk Assessment and Drainage Strategy and Pollard ST Statutory Response stamped as received by the City Council, as Local Planning Authority, on the 29 October 2020 and 20 November 2020 respectively flood risk and drainage assessment stamped as received by the City Council, as Local Planning Authority, on the 1 May 2019, (a) a phase of the development, other than enabling works comprising site investigations and remediation, shall not commence until a scheme for the drainage of surface water from that phase of the new development shall be submitted for approval in writing by the City Council as the Local Planning Authority. This shall include:

- *Use of appropriate SuDS solutions demonstrated in the drainage layout;*

The below ground surface water drainage network design comprises of a porous surfacing course which allows surface water run off to permeate into an open graded sub-base, designed to support the required pedestrian/vehicle movement across the site. Below ground attenuation tanks provide the required storage volume for event up to and including the 100 year plus climate change event (Canal Outfall East/West). A SuDS pond has also been provided for one of the drainage networks (UU Outfall) to provide the required storage volume for event up to and including the 100 year plus climate change event. This will also add value to the amenity and biodiversity within the development. The below ground drainage general arrangements, calculations, details can be found in Appendix A.

- *No infiltration of surface water drainage into the ground on land affected by contamination is permitted other than with the express written consent of the local planning authority, which may be given for those parts of the site where it has been demonstrated that there is no resultant unacceptable risk to controlled waters. The development shall be carried out in accordance with the approval details;*

The LK Group undertook an intrusive investigation in December 2022. The general ground conditions found on site were as outlined below;

- Made ground between 1.90-3.50m below ground level.
- Natural Clay to between 15.0-19.40m below ground level.
- Bedrock encountered at 30.0m below ground level.

Due to the presence of significant depths of made ground and natural clay, surface water discharge via infiltration is not feasible. 2no. permeability tests were undertaken and both of these failed. LK SI report is included in Appendix B.

- *Ground investigation should be undertaken to determine if the site is affected by contamination. If the results demonstrate that infiltration is feasible, BRE365 infiltration testing should then be undertaken. If infiltration demonstrated as not feasible, evidence of alternative surface water disposal routes (as follows) is required:*

The LK Group undertook an intrusive investigation in December 2022. The general ground conditions

DRAINAGE FOR PLANNING FILE NOTE

found on site were as outlined below;

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- Natural Clay to between 15.0-19.40m below ground level.
- Bedrock encountered at 30.0m below ground level.

Due to the presence of significant depths of made ground and natural clay, surface water discharge via infiltration is not feasible. 2no. permeability tests were undertaken and both of these failed. LK SI report is included in Appendix B.

o Where surface water is connected to the canal, any works within or adjacent to the canal that would affect it would require consent from Canal and River Trust.

The Canal and River Trust in principle have agreed to the 2no surface water connection in their waterbody. The current status of this is with the developer and CRT to agree terms. See correspondences within Appendix C.

o Where surface water is connected to the public sewer, agreement in principle from United Utilities is required to confirm there is adequate spare capacity in the existing system taking future development requirements into account;

Consent to discharge to the public sewer for both foul and surface water has been granted by United Utilities, the surface water must be restricted to a maximum of 5.0l/s.

In the event that the CRT will not accept discharge of surface water to the canal as proposed, UU have agreed to accept discharge from the site at a combined total rate of 8l/s into their network. See Appendix D for correspondence.

o Discharge to the public sewer should be minimised due to the potential for canal discharge and green SuDS on site.

Noted, as demonstrated there are 2 proposed connections to the canal. Discussion with CRT are "Agreed In Principle, however legal agreements are ongoing with between MAC & CRT, see Appendix C for most recent correspondences with the CRT in regards to points of connection/agreements.

- Assessment of overland flow routes for extreme events that is diverted away from buildings (including basements). Overland flow routes need to be designed to convey the flood water in a safe manner in the event of a blockage or exceedance of the proposed drainage system capacity including inlet structures. A layout with overland flow routes needs to be presented with appreciation of these overland flow routes with regards to the properties on site and adjacent properties off site. This should depict how the proposed exceedance features (dry basins and swales) will operate effectively. Finished floor levels for all buildings need to be a minimum of 150mm above cover levels.

An overland flow assessment has been undertaken based on the proposed levels provided by planit-ie and has been incorporated onto the site wide below ground drainage plan included at the back of this report. Surface water drainage general arrangement in Appendix A with proposed levels provided by Planit-ie are included in Appendix D.

- Evidence that the drainage system has been designed (unless an area is designated to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event with allowance for climate change in any part of a building. Provide details of how any modelled flood volumes will be managed to ensure no flooding in any part of a building on site or on 3rd party land.

Surface water calculations have been provided for the three networks on the proposed development. Two of them show no flooding in the 100 year plus 40% climate change event (UU Outfall & Canal Outfall East). Canal Outfall West indicates a small amount of flooding at nodes 10 & 11, volume of flooding at these nodes

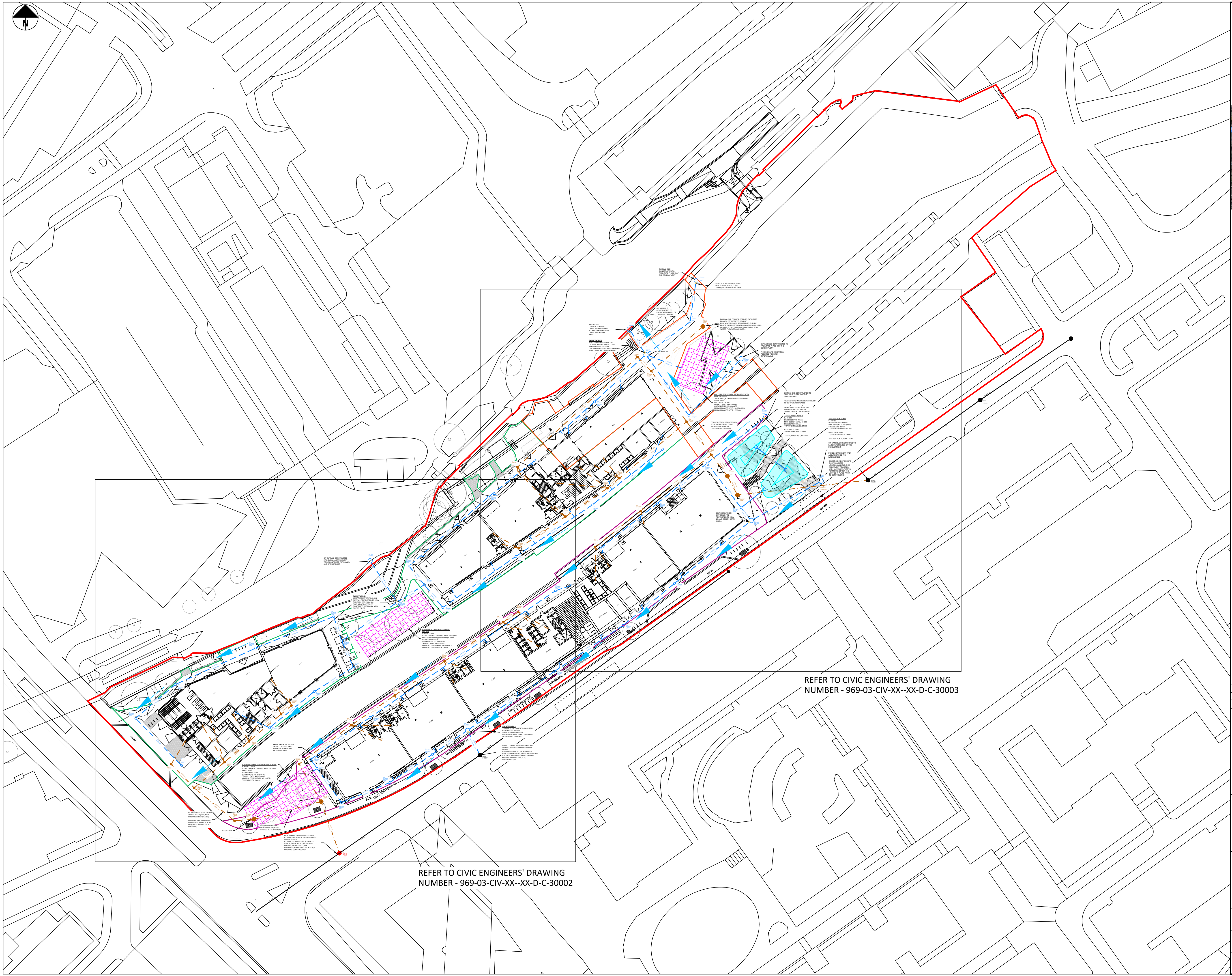
DRAINAGE FOR PLANNING FILE NOTE

is 0.72cu.m and 0.28cu.m respectively. The proposed site levels in this area fall away from the building, due to the small volume of water this will be stored on site before entering back into the below ground drainage system via the porous surfacing layer. Surface water calculations provided in Appendix A

- Construction details of flow control and SuDS elements.

Typical details for flow control devices and SuDS elements have been provided on the drainage detail sheets appended to this file note. See Appendix A.

Appendix A – Below ground drainage ga's, details and calculations.



Standard Notes

1. This drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings and the specification.

2. This drawing should not be scaled.

3. All dimensions are to be verified by the contractor on site.

4. All discrepancies should be reported to the C.A. prior to the commencement of the works.

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LOCALITY

NOTE:

1. SITE PLAN BY THE HAWKINS BROWN (DRAWING PLS-HBA-SW-ZZ-DR-A-00-0003'), RECEIVED 13 May 2022.

2. TOPOGRAPHICAL SURVEY CONDUCTED BY GREENHATCH GROUP IN JUNE 2020

3. LANDSCAPE PLAN BY PLANIT MAY 2022.

4. COVER & INVERT LEVELS SHOWN ARE mAOD.

5. THE STRATEGY SHOWN IS A WORK IN PROGRESS AND IS SUBJECT TO CONFIRMATION OF:

- FINAL PROPOSED SITE LEVELS
- DROP DOWN LOCATIONS
- CONSULTATIONS & AGREEMENTS WITH RELEVANT AUTHORITIES REGARDING DISCHARGE LOCATIONS, RATES AND UTILITY EASEMENTS
- ADOPTABILITY REQUIREMENTS OF NETWORK

LEGEND:

EXISTING FOUL WATER MANHOLE/SEWER

PROPOSED FOUL WATER MANHOLE/SEWER

PROPOSED SURFACE WATER DRAIN MANHOLE/SEWER

PROPOSED RWP WITH TRAPPED GULLY

PROPOSED SOIL VENT PIPE

DEVELOPMENT BOUNDARY

SW NETWORK 1

SW NETWORK 2

SW NETWORK 3

OVERLAND FLOW ROUTES

29.08.23

P02

ISSUED FOR INFORMATION

TC

AMG

15.11.22

P01

STAGE 3

LT

TC

Date

Rev

Description

Drawn

Chkd

Civic Engineers

MANCHESTER

LONDON

LEEDS

GLASGOW

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Grange Chambers, 45 Westgate, Glasgow, G2 2PL, Tel: 0143 170 1400

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Project

ELECTRIC PARK
POLLARD STREET
PHASE 1

Title

PROPOSED DRAINAGE STRATEGY
VALUE ENGINEERED PROPOSAL

Status

INFORMATION

Project Number

Scale @ A1

Date Created

Drawn

Checked

Suitability

969-03

1:500

15.11.22

LT

TC

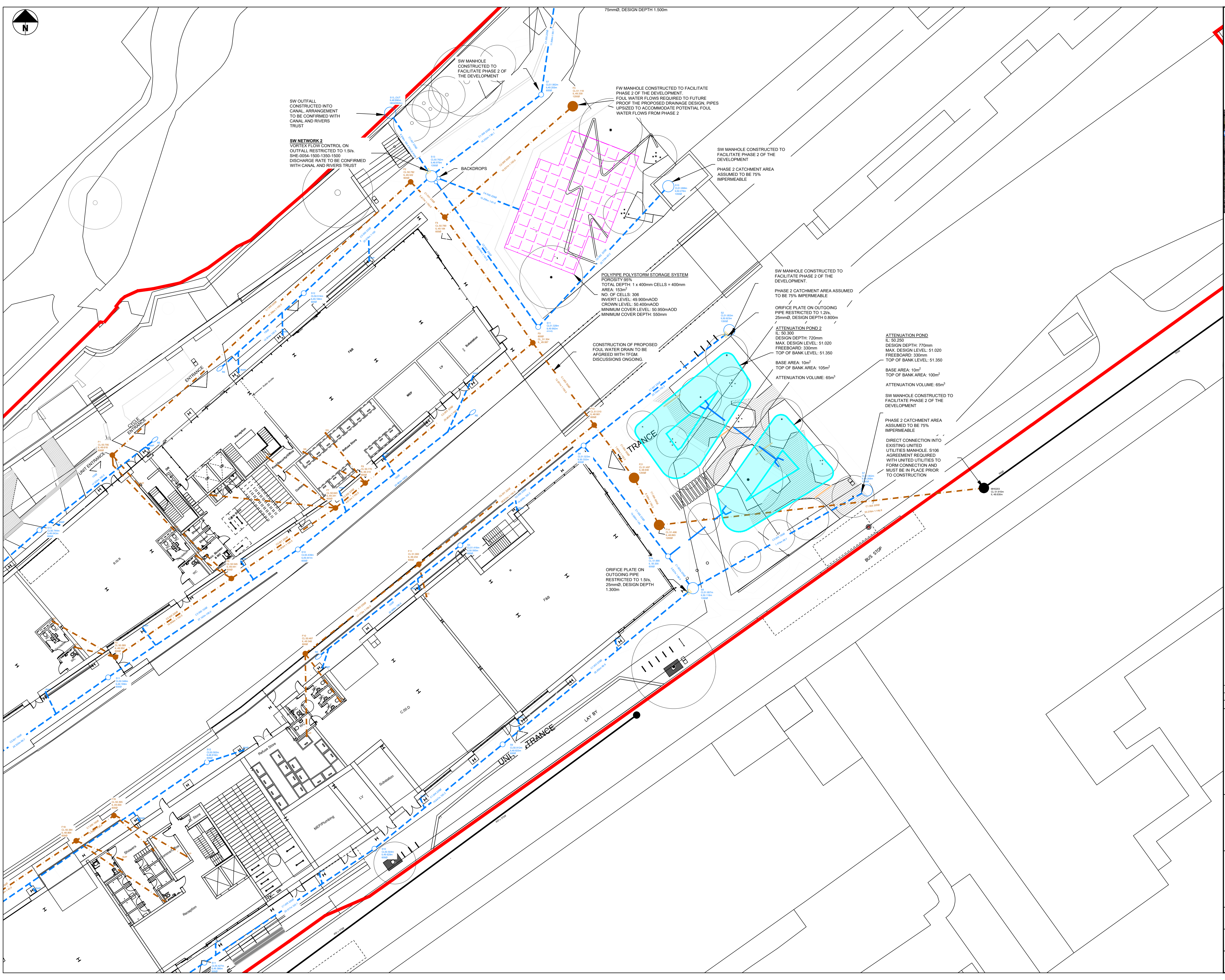
S4

Drawing Number

Revision

969-03-CIV-XX--XX-D-C-30001A

P02



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- PROPOSED RWP WITH TRAPPED GULLY
- PROPOSED SOIL VENT PIPE
- DEVELOPMENT BOUNDARY

29.08.23	P02	ISSUED FOR INFORMATION	TC	AMG
15.11.22	P01	STAGE 3	LT	TC
Date	Rev	Description	Drawn	Chkd

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Project

ELECTRIC PARK
POLLARD STREET
PHASE 1

Title

PROPOSED DRAINAGE STRATEGY
VALUE ENGINEERED PROPOSAL

Status

INFORMATION

Project Number	Scale @ A1	Date Created	Drawn	Checked	Suitability
969-03	1:200	15.11.22	LT	TC	S4
Drawing Number					Revision
969-03-CIV-XX--XX-D-C-30003A					P01

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	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)	17.000	Minimum Backdrop Height (m)	0.200
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	✓

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1		5.00		52.442	1350	385545.523	398339.899	1.686
2				52.400	1350	385535.719	398335.163	1.779
3				52.556	1350	385511.999	398338.788	2.237
4				50.861	1350	385474.241	398301.400	1.206
5				51.652	1350	385470.060	398295.685	2.085
6				51.195	1350	385458.939	398284.127	1.829
7	0.007	5.00	0.0	51.062	1350	385457.022	398271.376	1.857
8		5.00		51.970	1350	385525.451	398306.451	0.814
9				52.050	1350	385498.441	398283.408	1.337
10	0.032	5.00		51.899	1350	385472.124	398260.490	1.623
11	0.020	5.00		51.328	600	385456.665	398243.761	1.336
12	0.034	5.00		50.514	600	385428.814	398247.778	1.414
13	0.055	5.00		50.762	1350	385443.944	398261.726	1.783
13_OUT				50.000	1350	385439.076	398269.222	1.110
GEO E		5.00		50.952		385453.777	398258.810	1.052

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)
1.007	13	13_OUT	8.938	0.600	48.979	48.890	0.089	100.4	225	6.74	50.0
1.006	7	13	16.253	0.600	49.205	49.002	0.203	80.1	225	6.62	50.0
4.000	GEO E	13	10.256	0.600	49.900	49.788	0.112	91.6	225	5.13	50.0
2.003	11	13	22.014	0.600	49.992	49.788	0.204	107.9	225	6.35	50.0
3.000	12	13	20.578	0.600	49.100	48.979	0.121	170.1	225	5.34	50.0
2.002	10	11	22.778	0.600	50.276	49.992	0.284	80.2	225	6.06	50.0
2.001	9	10	34.897	0.600	50.713	50.276	0.437	79.9	225	5.80	50.0
2.000	8	9	35.504	0.600	51.156	50.713	0.443	80.1	225	5.40	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)
1.007	1.304	51.9	20.1	1.558	0.885	0.148	0.0	97	1.223
1.006	1.462	58.1	0.9	1.632	1.535	0.007	0.0	20	0.542
4.000	1.367	54.3	0.0	0.827	0.749	0.000	0.0	0	0.000
2.003	1.258	50.0	7.0	1.111	0.749	0.052	0.0	57	0.893
3.000	0.999	39.7	4.6	1.189	1.558	0.034	0.0	51	0.670
2.002	1.461	58.1	4.3	1.398	1.111	0.032	0.0	42	0.868
2.001	1.464	58.2	0.0	1.112	1.398	0.000	0.0	0	0.000
2.000	1.462	58.1	0.0	0.589	1.112	0.000	0.0	0	0.000

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)
1.005	6	7	12.894	0.600	49.366	49.205	0.161	80.1	225	6.44	50.0
1.004	5	6	16.039	0.600	49.567	49.366	0.201	79.8	225	6.29	50.0
1.003	4	5	7.081	0.600	49.655	49.567	0.088	80.5	150	6.11	50.0
1.002	3	4	53.137	0.600	50.319	49.655	0.664	80.0	225	6.00	50.0
1.001	2	3	24.114	0.600	50.621	50.319	0.302	79.8	225	5.40	50.0
1.000	1	2	10.780	0.600	50.756	50.621	0.135	79.9	225	5.12	50.0

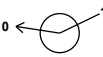
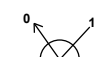
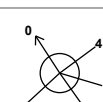
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.005	1.462	58.1	0.0	1.604	1.632	0.000	0.0	0	0.000
1.004	1.465	58.2	0.0	1.860	1.604	0.000	0.0	0	0.000
1.003	1.121	19.8	0.0	1.056	1.935	0.000	0.0	0	0.000
1.002	1.463	58.2	0.0	2.012	0.981	0.000	0.0	0	0.000
1.001	1.464	58.2	0.0	1.554	2.012	0.000	0.0	0	0.000
1.000	1.464	58.2	0.0	1.461	1.554	0.000	0.0	0	0.000

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)
1.007	8.938	100.4	225	Circular	50.762	48.979	1.558	50.000	48.890	0.885
1.006	16.253	80.1	225	Circular	51.062	49.205	1.632	50.762	49.002	1.535
4.000	10.256	91.6	225	Circular	50.952	49.900	0.827	50.762	49.788	0.749
2.003	22.014	107.9	225	Circular	51.328	49.992	1.111	50.762	49.788	0.749
3.000	20.578	170.1	225	Circular	50.514	49.100	1.189	50.762	48.979	1.558
2.002	22.778	80.2	225	Circular	51.899	50.276	1.398	51.328	49.992	1.111
2.001	34.897	79.9	225	Circular	52.050	50.713	1.112	51.899	50.276	1.398
2.000	35.504	80.1	225	Circular	51.970	51.156	0.589	52.050	50.713	1.112
1.005	12.894	80.1	225	Circular	51.195	49.366	1.604	51.062	49.205	1.632
1.004	16.039	79.8	225	Circular	51.652	49.567	1.860	51.195	49.366	1.604
1.003	7.081	80.5	150	Circular	50.861	49.655	1.056	51.652	49.567	1.935
1.002	53.137	80.0	225	Circular	52.556	50.319	2.012	50.861	49.655	0.981
1.001	24.114	79.8	225	Circular	52.400	50.621	1.554	52.556	50.319	2.012
1.000	10.780	79.9	225	Circular	52.442	50.756	1.461	52.400	50.621	1.554

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.007	13	1350	Manhole	Adoptable	13_OUT	1350	Manhole	Adoptable
1.006	7	1350	Manhole	Adoptable	13	1350	Manhole	Adoptable
4.000	GEO E		Junction		13	1350	Manhole	Adoptable
2.003	11	600	Manhole	Adoptable	13	1350	Manhole	Adoptable
3.000	12	600	Manhole	Adoptable	13	1350	Manhole	Adoptable
2.002	10	1350	Manhole	Adoptable	11	600	Manhole	Adoptable
2.001	9	1350	Manhole	Adoptable	10	1350	Manhole	Adoptable
2.000	8	1350	Manhole	Adoptable	9	1350	Manhole	Adoptable
1.005	6	1350	Manhole	Adoptable	7	1350	Manhole	Adoptable
1.004	5	1350	Manhole	Adoptable	6	1350	Manhole	Adoptable
1.003	4	1350	Manhole	Adoptable	5	1350	Manhole	Adoptable
1.002	3	1350	Manhole	Adoptable	4	1350	Manhole	Adoptable
1.001	2	1350	Manhole	Adoptable	3	1350	Manhole	Adoptable
1.000	1	1350	Manhole	Adoptable	2	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	385545.523	398339.899	52.442	1.686	1350		0	1.000	50.756	225
2	385535.719	398335.163	52.400	1.779	1350		1	1.000	50.621	225
						0	1.001	50.621	225	
3	385511.999	398338.788	52.556	2.237	1350		1	1.001	50.319	225
						0	1.002	50.319	225	
4	385474.241	398301.400	50.861	1.206	1350		1	1.002	49.655	225
						0	1.003	49.655	150	
5	385470.060	398295.685	51.652	2.085	1350		1	1.003	49.567	150
						0	1.004	49.567	225	
6	385458.939	398284.127	51.195	1.829	1350		1	1.004	49.366	225
						0	1.005	49.366	225	
7	385457.022	398271.376	51.062	1.857	1350		1	1.005	49.205	225
						0	1.006	49.205	225	
8	385525.451	398306.451	51.970	0.814	1350		0	2.000	51.156	225
9	385498.441	398283.408	52.050	1.337	1350		1	2.000	50.713	225
						0	2.001	50.713	225	
10	385472.124	398260.490	51.899	1.623	1350		1	2.001	50.276	225
						0	2.002	50.276	225	
11	385456.665	398243.761	51.328	1.336	600		1	2.002	49.992	225
						0	2.003	49.992	225	
12	385428.814	398247.778	50.514	1.414	600		0	3.000	49.100	225
13	385443.944	398261.726	50.762	1.783	1350		1	4.000	49.788	225
						2	3.000	48.979	225	
						3	2.003	49.788	225	
						4	1.006	49.002	225	
						0	1.007	48.979	225	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
13_OUT	385439.076	398269.222	50.000	1.110	1350	1	1.007	48.890	225
									
GEO E	385453.777	398258.810	50.952	1.052		0	4.000	49.900	225
									

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	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	40	0	0

Node 13 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	48.979	Product Number	CTL-SHE-0054-1500-1350-1500
Design Depth (m)	1.350	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.5	Min Node Diameter (mm)	1200

Node 6 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	49.366	Product Number	CTL-SHE-0052-1500-1500-1500
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.5	Min Node Diameter (mm)	1200

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.707
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.300	55.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	55.0	0.0			

Node 11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	203.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	203.0	0.0			

Node 12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	379.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	379.0	0.0			

Node 13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	550.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	550.0	0.0			

Node GEO E Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	153.0	0.0	0.400	153.0	0.0	0.401	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	50.756	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	1	50.621	0.000	0.0	0.0000	0.0000	OK
15 minute summer	3	1	50.319	0.000	0.0	0.0000	0.0000	OK
180 minute winter	4	144	49.836	0.181	0.7	0.2593	0.0000	SURCHARGED
180 minute winter	5	144	49.836	0.269	0.9	0.3852	0.0000	SURCHARGED
180 minute winter	6	144	49.836	0.470	1.1	0.6729	0.0000	SURCHARGED
30 minute winter	7	22	49.960	0.755	5.3	1.1370	0.0000	SURCHARGED
15 minute summer	8	1	51.156	0.000	0.0	0.0000	0.0000	OK
15 minute summer	9	1	50.713	0.000	0.0	0.0000	0.0000	OK
15 minute winter	10	11	50.314	0.038	3.8	0.0697	0.0000	OK
15 minute winter	11	11	50.045	0.053	6.1	0.0311	0.0000	OK
30 minute winter	12	22	49.960	0.860	3.5	0.6568	0.0000	SURCHARGED
30 minute winter	13	22	49.959	0.980	10.8	2.0066	0.0000	SURCHARGED
15 minute summer	13_OUT	1	48.890	0.000	1.3	0.0000	0.0000	OK
60 minute winter	GEO E	48	49.914	0.014	4.7	2.1269	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 summer	1	1.000	2	0.0	0.000	0.000	0.0000	
15 minute summer	2	1.001	3	0.0	0.000	0.000	0.0000	
15 minute summer	3	1.002	4	0.0	0.000	0.000	0.0035	
180 minute winter	4	1.003	5	-0.7	-0.065	-0.035	0.1247	
180 minute winter	5	1.004	6	-0.9	-0.026	-0.015	0.6379	
180 minute winter	6	Hydro-Brake®	7	0.8				
30 minute winter	7	1.006	13	-4.7	-0.126	-0.080	0.6464	
15 minute summer	8	2.000	9	0.0	0.000	0.000	0.0000	
15 minute summer	9	2.001	10	0.0	0.000	0.000	0.0755	
15 minute winter	10	2.002	11	3.7	0.642	0.063	0.1326	
15 minute winter	11	2.003	13	6.0	0.842	0.119	0.3607	
30 minute winter	12	3.000	13	1.9	0.161	0.047	0.8184	
30 minute winter	13	Hydro-Brake®	13_OUT	1.3				9.8
60 minute winter	GEO E	4.000	13	-4.7	-0.368	-0.087	0.1543	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	50.756	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	1	50.621	0.000	0.0	0.0000	0.0000	OK
15 minute summer	3	1	50.319	0.000	0.0	0.0000	0.0000	OK
180 minute winter	4	192	50.025	0.370	0.8	0.5294	0.0000	SURCHARGED
180 minute winter	5	192	50.025	0.458	0.9	0.6553	0.0000	SURCHARGED
180 minute winter	6	192	50.025	0.659	1.1	0.9431	0.0000	SURCHARGED
15 minute winter	7	10	50.070	0.865	11.8	1.3032	0.0000	SURCHARGED
15 minute summer	8	1	51.156	0.000	0.0	0.0000	0.0000	OK
15 minute summer	9	1	50.713	0.000	0.0	0.0000	0.0000	OK
15 minute winter	10	10	50.336	0.060	9.3	0.1093	0.0000	OK
15 minute winter	11	11	50.083	0.091	14.9	0.0530	0.0000	OK
15 minute winter	12	10	50.085	0.985	9.9	0.7528	0.0000	SURCHARGED
15 minute winter	13	11	50.071	1.092	40.6	2.2358	0.0000	SURCHARGED
15 minute summer	13_OUT	1	48.890	0.000	1.4	0.0000	0.0000	OK
180 minute winter	GEO E	176	50.030	0.130	7.6	19.9203	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 summer	1	1.000	2	0.0	0.000	0.000	0.0000	
15 minute summer	2	1.001	3	0.0	0.000	0.000	0.0000	
15 minute summer	3	1.002	4	0.0	0.000	0.000	1.0567	
180 minute winter	4	1.003	5	-0.8	-0.072	-0.038	0.1247	
180 minute winter	5	1.004	6	-0.9	-0.025	-0.016	0.6379	
180 minute winter	6	Hydro-Brake®	7	0.2				
15 minute winter	7	1.006	13	-10.2	-0.260	-0.175	0.6464	
15 minute summer	8	2.000	9	0.0	0.000	0.000	0.0000	
15 minute summer	9	2.001	10	0.0	0.000	0.000	0.1431	
15 minute winter	10	2.002	11	9.1	0.812	0.156	0.2668	
15 minute winter	11	2.003	13	15.4	0.939	0.307	0.6036	
15 minute winter	12	3.000	13	9.4	0.237	0.237	0.8184	
15 minute winter	13	Hydro-Brake®	13_OUT	1.4				18.0
180 minute winter	GEO E	4.000	13	-7.6	-0.391	-0.141	0.3260	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	50.756	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	1	50.621	0.000	0.0	0.0000	0.0000	OK
15 minute summer	3	1	50.319	0.000	0.0	0.0000	0.0000	OK
360 minute winter	4	360	50.239	0.584	0.7	0.8362	0.0000	SURCHARGED
360 minute winter	5	360	50.239	0.672	0.9	0.9621	0.0000	SURCHARGED
360 minute winter	6	360	50.239	0.873	1.1	1.2497	0.0000	SURCHARGED
15 minute winter	7	11	50.289	1.084	12.9	1.6334	0.0000	SURCHARGED
15 minute summer	8	1	51.156	0.000	0.0	0.0000	0.0000	OK
15 minute summer	9	1	50.713	0.000	0.0	0.0000	0.0000	OK
15 minute winter	10	11	50.372	0.096	16.8	0.1749	0.0000	OK
15 minute winter	11	11	50.355	0.363	26.8	0.2115	0.0000	SURCHARGED
15 minute winter	12	11	50.316	1.216	17.9	0.9293	0.0000	FLOOD RISK
15 minute winter	13	11	50.289	1.310	72.4	2.6822	0.0000	SURCHARGED
15 minute summer	13_OUT	1	48.890	0.000	1.5	0.0000	0.0000	OK
240 minute winter	GEO E	236	50.246	0.346	12.2	52.9114	0.0000	SURCHARGED

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 summer	1	1.000	2	0.0	0.000	0.000	0.0000	
15 minute summer	2	1.001	3	0.0	0.000	0.000	0.0000	
15 minute summer	3	1.002	4	0.0	0.000	0.000	1.0567	
360 minute winter	4	1.003	5	-0.7	-0.059	-0.037	0.1247	
360 minute winter	5	1.004	6	-0.9	-0.025	-0.016	0.6379	
360 minute winter	6	Hydro-Brake®	7	0.1				
15 minute winter	7	1.006	13	-11.4	-0.288	-0.196	0.6464	
15 minute summer	8	2.000	9	0.0	0.000	0.000	0.0000	
15 minute summer	9	2.001	10	0.0	0.000	0.000	0.2211	
15 minute winter	10	2.002	11	16.3	0.888	0.281	0.6363	
15 minute winter	11	2.003	13	28.0	1.008	0.560	0.8755	
15 minute winter	12	3.000	13	17.4	0.438	0.438	0.8184	
15 minute winter	13	Hydro-Brake®	13_OUT	1.5				20.1
240 minute winter	GEO E	4.000	13	-12.2	-0.376	-0.225	0.4079	

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	0.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
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	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.014	5.00	49.104	600	385306.785	398140.429	0.842
2	0.013	5.00	49.159	600	385293.305	398154.331	1.026
3	0.006	5.00	49.339	600	385304.982	398164.304	1.383
4	0.012	5.00	49.349	600	385328.717	398175.046	1.567
5	0.011	5.00	49.419	600	385351.750	398184.365	1.802
6	0.091	5.00	49.436	600	385333.023	398151.196	1.533
7	0.006	5.00	49.780	600	385346.256	398161.933	1.991
8	0.005	5.00	49.451	600	385357.638	398169.430	1.753
9	0.005	5.00	49.639	600	385354.133	398177.180	2.072
10	0.048	5.00	50.439	600	385428.115	398217.315	0.998
11	0.039	5.00	50.346	600	385405.568	398202.113	1.177
12	0.030	5.00	50.368	600	385383.989	398187.021	1.463
13	0.034	5.00	50.744	600	385397.406	398219.613	1.701
14	0.035	5.00	50.047	600	385374.018	398199.280	2.037
15	0.002	5.00	50.180	600	385378.549	398193.721	2.407
16	0.007	5.00	49.846	1200	385370.542	398188.605	2.413
16_OUT			48.000	1350	385362.529	398200.819	0.664
GEO W		5.00	50.199		385373.021	398185.316	2.699

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)
1.006	16	16_OUT	14.607	0.600	47.433	47.336	0.097	150.0	150	7.23	0.0
1.005	9	16	19.994	0.600	47.567	47.434	0.133	150.0	225	6.94	0.0
5.000	GEO W	16	4.119	0.600	47.500	47.433	0.067	61.5	150	5.05	0.0
3.003	15	16	9.531	0.600	47.773	47.455	0.318	30.0	225	6.10	0.0
3.002	12	15	8.673	0.600	48.905	48.819	0.086	100.8	150	6.03	0.0
4.001	14	15	7.129	0.600	48.010	47.773	0.237	30.1	225	5.27	0.0
4.000	13	14	30.991	0.600	49.043	48.010	1.033	30.0	225	5.22	0.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.006	0.818	14.5	0.0	2.263	0.514	0.358	0.0
1.005	1.065	42.3	0.0	1.847	2.187	0.163	0.0
5.000	1.285	22.7	0.0	2.549	2.263	0.000	0.0
3.003	2.398	95.4	0.0	2.182	2.166	0.188	0.0
3.002	1.000	17.7	0.0	1.313	1.211	0.117	0.0
4.001	2.394	95.2	0.0	1.812	2.182	0.069	0.0
4.000	2.397	95.3	0.0	1.476	1.812	0.034	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)
3.001	11	12	26.333	0.600	49.169	48.905	0.264	99.7	150	5.89	0.0
3.000	10	11	27.193	0.600	49.441	49.169	0.272	100.0	150	5.45	0.0
1.004	5	9	7.569	0.600	47.617	47.567	0.050	150.0	225	6.62	0.0
2.002	8	9	8.506	0.600	47.698	47.567	0.131	64.9	225	5.57	0.0
2.001	7	8	13.629	0.600	47.789	47.698	0.091	150.0	225	5.48	0.0
2.000	6	7	17.040	0.600	47.903	47.789	0.114	150.0	225	5.27	0.0
1.003	4	5	24.847	0.600	47.782	47.617	0.165	150.6	225	6.51	0.0
1.002	3	4	26.053	0.600	47.956	47.782	0.174	150.0	225	6.12	0.0
1.001	2	3	15.356	0.600	48.133	48.031	0.102	150.5	150	5.71	0.0
1.000	1	2	19.365	0.600	48.262	48.133	0.129	150.0	150	5.39	0.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
3.001	1.006	17.8	0.0	1.027	1.313	0.087	0.0
3.000	1.005	17.8	0.0	0.848	1.027	0.048	0.0
1.004	1.065	42.3	0.0	1.577	1.847	0.056	0.0
2.002	1.625	64.6	0.0	1.528	1.847	0.102	0.0
2.001	1.065	42.3	0.0	1.766	1.528	0.097	0.0
2.000	1.065	42.3	0.0	1.308	1.766	0.091	0.0
1.003	1.063	42.3	0.0	1.342	1.577	0.045	0.0
1.002	1.065	42.3	0.0	1.158	1.342	0.033	0.0
1.001	0.816	14.4	0.0	0.876	1.158	0.027	0.0
1.000	0.818	14.5	0.0	0.692	0.876	0.014	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)
1.006	14.607	150.0	150	Circular	49.846	47.433	2.263	48.000	47.336	0.514
1.005	19.994	150.0	225	Circular	49.639	47.567	1.847	49.846	47.434	2.187
5.000	4.119	61.5	150	Circular	50.199	47.500	2.549	49.846	47.433	2.263
3.003	9.531	30.0	225	Circular	50.180	47.773	2.182	49.846	47.455	2.166
3.002	8.673	100.8	150	Circular	50.368	48.905	1.313	50.180	48.819	1.211
4.001	7.129	30.1	225	Circular	50.047	48.010	1.812	50.180	47.773	2.182
4.000	30.991	30.0	225	Circular	50.744	49.043	1.476	50.047	48.010	1.812
3.001	26.333	99.7	150	Circular	50.346	49.169	1.027	50.368	48.905	1.313
3.000	27.193	100.0	150	Circular	50.439	49.441	0.848	50.346	49.169	1.027
1.004	7.569	150.0	225	Circular	49.419	47.617	1.577	49.639	47.567	1.847

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	16	1200	Manhole	Adoptable	16_OUT	1350	Manhole	Adoptable
1.005	9	600	Manhole	Adoptable	16	1200	Manhole	Adoptable
5.000	GEO W		Junction		16	1200	Manhole	Adoptable
3.003	15	600	Manhole	Adoptable	16	1200	Manhole	Adoptable
3.002	12	600	Manhole	Adoptable	15	600	Manhole	Adoptable
4.001	14	600	Manhole	Adoptable	15	600	Manhole	Adoptable
4.000	13	600	Manhole	Adoptable	14	600	Manhole	Adoptable
3.001	11	600	Manhole	Adoptable	12	600	Manhole	Adoptable
3.000	10	600	Manhole	Adoptable	11	600	Manhole	Adoptable
1.004	5	600	Manhole	Adoptable	9	600	Manhole	Adoptable

Pipeline Schedule

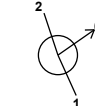
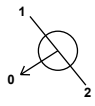
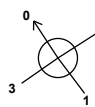
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.002	8.506	64.9	225	Circular	49.451	47.698	1.528	49.639	47.567	1.847
2.001	13.629	150.0	225	Circular	49.780	47.789	1.766	49.451	47.698	1.528
2.000	17.040	150.0	225	Circular	49.436	47.903	1.308	49.780	47.789	1.766
1.003	24.847	150.6	225	Circular	49.349	47.782	1.342	49.419	47.617	1.577
1.002	26.053	150.0	225	Circular	49.339	47.956	1.158	49.349	47.782	1.342
1.001	15.356	150.5	150	Circular	49.159	48.133	0.876	49.339	48.031	1.158
1.000	19.365	150.0	150	Circular	49.104	48.262	0.692	49.159	48.133	0.876

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.002	8	600	Manhole	Adoptable	9	600	Manhole	Adoptable
2.001	7	600	Manhole	Adoptable	8	600	Manhole	Adoptable
2.000	6	600	Manhole	Adoptable	7	600	Manhole	Adoptable
1.003	4	600	Manhole	Adoptable	5	600	Manhole	Adoptable
1.002	3	600	Manhole	Adoptable	4	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	600	Manhole	Adoptable
1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	385306.785	398140.429	49.104	0.842	600				
						0	1.000	48.262	150
2	385293.305	398154.331	49.159	1.026	600		1	1.000	48.133
						0	1.001	48.133	150
3	385304.982	398164.304	49.339	1.383	600		1	1.001	48.031
						0	1.002	47.956	225
4	385328.717	398175.046	49.349	1.567	600		1	1.002	47.782
						0	1.003	47.782	225
5	385351.750	398184.365	49.419	1.802	600		1	1.003	47.617
						0	1.004	47.617	225
6	385333.023	398151.196	49.436	1.533	600				
						0	2.000	47.903	225
7	385346.256	398161.933	49.780	1.991	600		1	2.000	47.789
						0	2.001	47.789	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
8	385357.638	398169.430	49.451	1.753	600		1	2.001	47.698	225
							0	2.002	47.698	225
9	385354.133	398177.180	49.639	2.072	600		1	2.002	47.567	225
							2	1.004	47.567	225
							0	1.005	47.567	225
10	385428.115	398217.315	50.439	0.998	600		0	3.000	49.441	150
11	385405.568	398202.113	50.346	1.177	600		1	3.000	49.169	150
							0	3.001	49.169	150
12	385383.989	398187.021	50.368	1.463	600		1	3.001	48.905	150
							0	3.002	48.905	150
13	385397.406	398219.613	50.744	1.701	600		0	4.000	49.043	225
14	385374.018	398199.280	50.047	2.037	600		1	4.000	48.010	225
							0	4.001	48.010	225
15	385378.549	398193.721	50.180	2.407	600		1	4.001	47.773	225
							2	3.002	48.819	150
							0	3.003	47.773	225
16	385370.542	398188.605	49.846	2.413	1200		1	5.000	47.433	150
							2	3.003	47.455	225
							3	1.005	47.434	225
							0	1.006	47.433	150
16_OUT	385362.529	398200.819	48.000	0.664	1350		1	1.006	47.336	150
GEO W	385373.021	398185.316	50.199	2.699			0	5.000	47.500	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	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	40		0		0						

Node 16 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	47.433	Product Number	CTL-SHE-0051-1500-1700-1500
Design Depth (m)	1.700	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.5	Min Node Diameter (mm)	1200

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.280
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	9

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.500	171.0	0.0	0.651	0.0	0.0
0.499	0.0	0.0	0.650	171.0	0.0			

Node 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.300	168.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	168.0	0.0			

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.450	56.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	56.0	0.0			

Node 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.300	152.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	152.0	0.0			

Node 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	155.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	155.0	0.0			

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	3

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	77.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	77.0	0.0			

Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	64.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	64.0	0.0			

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	45.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	45.0	0.0			

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.950
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	138.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	138.0	0.0			

Node 11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.950
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	144.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	144.0	0.0			

Node 12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.775
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	130.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	130.0	0.0			

Node 13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.950
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	290.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	290.0	0.0			

Node 14 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.925
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	300.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	300.0	0.0			

Node 15 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.466
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	114.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	114.0	0.0			

Node GEO W Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	47.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	168.0	0.0	1.200	168.0	0.0	1.201	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 97.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	48.296	0.034	1.7	0.0210	0.0000	OK
15 minute winter	2	11	48.182	0.049	3.2	0.0261	0.0000	OK
15 minute winter	3	11	48.001	0.045	3.8	0.0168	0.0000	OK
15 minute winter	4	13	47.845	0.063	5.1	0.0273	0.0000	OK
15 minute winter	5	12	47.843	0.226	7.8	0.0916	0.0000	SURCHARGED
15 minute winter	6	10	47.983	0.080	10.8	0.1178	0.0000	OK
15 minute winter	7	10	47.872	0.083	11.4	0.0284	0.0000	OK
15 minute winter	8	12	47.850	0.152	12.5	0.0516	0.0000	OK
15 minute winter	9	12	47.836	0.269	17.7	0.0889	0.0000	SURCHARGED
15 minute winter	10	10	49.499	0.058	5.7	0.0718	0.0000	OK
15 minute winter	11	10	49.250	0.081	10.2	0.0764	0.0000	OK
15 minute winter	12	11	49.013	0.108	13.6	0.0750	0.0000	OK
15 minute winter	13	10	49.075	0.032	4.1	0.0215	0.0000	OK
15 minute winter	14	10	48.054	0.044	8.2	0.0277	0.0000	OK
15 minute winter	15	11	47.846	0.073	21.6	0.0217	0.0000	OK
15 minute winter	16	12	47.820	0.387	35.0	0.4596	0.0000	SURCHARGED
15 minute summer	16_OUT	1	47.336	0.000	1.0	0.0000	0.0000	OK
240 minute winter	GEO W	232	47.703	0.203	7.0	32.4684	0.0000	SURCHARGED

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	1	1.000	2	1.7	0.425	0.114	0.0769	
15 minute winter	2	1.001	3	3.1	0.645	0.217	0.0746	
15 minute winter	3	1.002	4	3.8	0.605	0.090	0.1807	
15 minute winter	4	1.003	5	5.9	0.545	0.140	0.6023	
15 minute winter	5	1.004	9	7.7	0.426	0.181	0.3009	
15 minute winter	6	2.000	7	10.7	0.823	0.252	0.2209	
15 minute winter	7	2.001	8	11.9	0.993	0.280	0.2710	
15 minute winter	8	2.002	9	12.1	0.821	0.187	0.2902	
15 minute winter	9	1.005	16	19.1	0.480	0.451	0.7952	
15 minute winter	10	3.000	11	5.6	0.705	0.316	0.2164	
15 minute winter	11	3.001	12	10.0	0.867	0.565	0.3058	
15 minute winter	12	3.002	15	13.6	1.051	0.768	0.1120	
15 minute winter	13	4.000	14	4.0	0.917	0.042	0.1374	
15 minute winter	14	4.001	15	8.1	1.003	0.085	0.0587	
15 minute winter	15	3.003	16	21.7	0.908	0.228	0.2423	
15 minute winter	16	Hydro-Brake®	16_OUT	1.0				14.7
240 minute winter	GEO W	5.000	16	-7.0	-0.442	-0.309	0.0725	

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	13	48.470	0.208	4.1	0.1279	0.0000	SURCHARGED
15 minute winter	2	13	48.463	0.330	7.8	0.1768	0.0000	SURCHARGED
15 minute winter	3	13	48.444	0.488	9.6	0.1806	0.0000	SURCHARGED
15 minute winter	4	13	48.438	0.656	17.3	0.2862	0.0000	SURCHARGED
15 minute winter	5	13	48.430	0.813	12.4	0.3291	0.0000	SURCHARGED
15 minute winter	6	12	48.476	0.573	26.5	0.8423	0.0000	SURCHARGED
15 minute winter	7	13	48.456	0.667	26.3	0.2288	0.0000	SURCHARGED
15 minute winter	8	13	48.440	0.742	25.9	0.2522	0.0000	SURCHARGED
15 minute winter	9	13	48.426	0.859	27.8	0.2842	0.0000	SURCHARGED
15 minute winter	10	12	49.843	0.402	14.0	0.5002	0.0000	SURCHARGED
15 minute winter	11	12	49.703	0.534	22.0	0.5056	0.0000	SURCHARGED
15 minute winter	12	11	49.263	0.358	29.0	0.2479	0.0000	SURCHARGED
15 minute winter	13	10	49.092	0.049	9.9	0.0332	0.0000	OK
15 minute winter	14	13	48.438	0.428	20.0	0.2677	0.0000	SURCHARGED
15 minute winter	15	13	48.432	0.659	42.8	0.1971	0.0000	SURCHARGED
15 minute winter	16	13	48.354	0.921	69.6	1.0949	0.0000	SURCHARGED
15 minute summer	16_OUT	1	47.336	0.000	1.1	0.0000	0.0000	OK
600 minute winter	GEO W	585	48.105	0.605	8.3	96.6291	0.0000	SURCHARGED

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	1	1.000	2	4.0	0.535	0.277	0.3409	
15 minute winter	2	1.001	3	7.9	0.774	0.546	0.2703	
15 minute winter	3	1.002	4	9.5	0.646	0.225	1.0362	
15 minute winter	4	1.003	5	12.2	0.564	0.290	0.9882	
15 minute winter	5	1.004	9	14.4	0.369	0.340	0.3010	
15 minute winter	6	2.000	7	24.6	0.961	0.581	0.6777	
15 minute winter	7	2.001	8	24.4	1.050	0.576	0.5420	
15 minute winter	8	2.002	9	22.4	0.833	0.346	0.3383	
15 minute winter	9	1.005	16	28.0	0.705	0.662	0.7952	
15 minute winter	10	3.000	11	11.8	0.811	0.662	0.4787	
15 minute winter	11	3.001	12	21.3	1.211	1.199	0.4636	
15 minute winter	12	3.002	15	28.6	1.626	1.619	0.1511	
15 minute winter	13	4.000	14	9.8	1.160	0.103	0.7108	
15 minute winter	14	4.001	15	18.1	1.108	0.191	0.2835	
15 minute winter	15	3.003	16	42.2	1.060	0.442	0.3791	
15 minute winter	16	Hydro-Brake®	16_OUT	1.1				15.2
600 minute winter	GEO W	5.000	16	-8.3	-0.470	-0.364	0.0725	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	28	48.924	0.662	17.4	7.8001	0.0000	FLOOD RISK
30 minute winter	2	26	48.944	0.811	18.1	0.4346	0.0000	FLOOD RISK
30 minute winter	3	25	48.963	1.007	18.5	0.5939	0.0000	SURCHARGED
30 minute winter	4	24	48.965	1.183	19.0	1.2441	0.0000	SURCHARGED
15 minute winter	5	14	48.970	1.353	22.0	1.5107	0.0000	SURCHARGED
15 minute winter	6	11	49.165	1.262	47.9	1.8550	0.0000	FLOOD RISK
15 minute winter	7	13	49.066	1.277	46.9	3.1245	0.0000	SURCHARGED
15 minute winter	8	14	49.012	1.314	37.9	1.6417	0.0000	SURCHARGED
15 minute winter	9	14	48.972	1.405	38.1	0.7623	0.0000	SURCHARGED
15 minute winter	10	12	50.439	0.998	25.2	2.8768	0.7280	FLOOD
15 minute winter	11	10	50.346	1.177	32.7	1.1134	0.2810	FLOOD
15 minute winter	12	11	49.714	0.809	43.2	0.5603	0.0000	SURCHARGED
15 minute winter	13	12	49.212	0.169	17.9	0.1154	0.0000	OK
15 minute winter	14	12	49.194	1.184	36.2	0.7413	0.0000	SURCHARGED
15 minute winter	15	12	49.162	1.389	65.8	0.4154	0.0000	SURCHARGED
15 minute winter	16	12	48.937	1.504	92.4	1.7881	0.0000	SURCHARGED
15 minute summer	16_OUT	1	47.336	0.000	1.4	0.0000	0.0000	OK
720 minute winter	GEO W	705	48.868	1.368	13.1	191.5998	0.0000	SURCHARGED

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	1	1.000	2	18.1	1.029	1.253	0.3409	
30 minute winter	2	1.001	3	18.5	1.053	1.285	0.2703	
30 minute winter	3	1.002	4	19.0	0.613	0.449	1.0362	
30 minute winter	4	1.003	5	19.7	0.573	0.467	0.9882	
15 minute winter	5	1.004	9	23.9	0.601	0.565	0.3010	
15 minute winter	6	2.000	7	43.9	1.104	1.037	0.6777	
15 minute winter	7	2.001	8	35.3	1.074	0.832	0.5420	
15 minute winter	8	2.002	9	31.1	0.865	0.482	0.3383	
15 minute winter	9	1.005	16	38.5	0.968	0.909	0.7952	
15 minute winter	10	3.000	11	20.9	1.186	1.176	0.4787	
15 minute winter	11	3.001	12	27.4	1.555	1.540	0.4636	
15 minute winter	12	3.002	15	42.2	2.395	2.385	0.1527	
15 minute winter	13	4.000	14	17.8	1.185	0.186	1.1117	
15 minute winter	14	4.001	15	26.7	1.179	0.281	0.2835	
15 minute winter	15	3.003	16	65.3	1.641	0.685	0.3791	
15 minute winter	16	Hydro-Brake®	16_OUT	1.4				13.7
720 minute winter	GEO W	5.000	16	-13.1	-0.742	-0.575	0.0725	

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
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)	17.000	Minimum Backdrop Height (m)	0.200
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	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.000	5.00	52.132	1350	385535.983	398288.271	1.049
2	0.000	5.00	51.853	1350	385480.573	398241.727	1.230
3	0.019	5.00	51.416	600	385447.414	398217.809	0.821
4	0.027	5.00	51.523	600	385462.065	398229.666	1.116
7	0.082	5.00	51.852	1350	385495.721	398224.330	1.584
8	0.023	5.00	51.857	1350	385475.057	398212.715	1.739
9	0.031	5.00	50.912	600	385452.439	398194.150	1.087
10	0.022	5.00	50.504	600	385437.205	398181.742	0.875
11	0.028	5.00	50.427	600	385417.008	398168.200	1.041
12	0.035	5.00	50.502	600	385417.309	398192.030	1.886
13	0.063	5.00	49.463	600	385362.514	398154.586	1.069
14	0.020	5.00	49.335	600	385344.958	398142.220	1.011
15	0.022	5.00	49.216	600	385354.290	398129.140	0.946
16	0.013	5.00	49.342	600	385368.346	398135.373	1.123
17	0.015	5.00	49.921	600	385380.926	398143.687	1.753
18	0.053	5.00	49.994	1200	385391.272	398150.780	1.867
18_OUT			49.697	1200	385394.509	398145.223	1.626
POND UU			51.350		385476.135	398222.851	1.100
4a			51.637	600	385470.627	398218.244	1.437
14a			49.258	600	385346.874	398139.535	0.958
PERMAVOID UU		5.00	49.223		385345.110	398138.421	0.913
Pond UU 2		5.00	51.350		385474.531	398224.392	1.050

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)
1.007	18	18_OUT	8.331	0.600	48.127	48.071	0.056	150.0	300	8.25	36.7
1.006	11	18	31.077	0.600	49.386	48.127	1.259	24.7	225	7.81	37.7
4.005	17	18	12.544	0.600	48.168	48.127	0.041	306.0	300	8.15	36.9
4.004	16	17	15.080	0.600	48.219	48.168	0.051	295.7	300	7.91	37.5
4.003	15	16	15.430	0.600	48.270	48.219	0.051	302.5	300	7.64	38.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.007	1.281	90.6	45.0	1.567	1.326	0.453	0.0
1.006	2.644	105.1	23.7	0.816	1.642	0.232	0.0
4.005	0.893	63.1	16.8	1.453	1.567	0.168	0.0
4.004	0.909	64.3	15.5	0.823	1.453	0.153	0.0
4.003	0.898	63.5	14.5	0.646	0.823	0.140	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)
4.002a	14a	15	12.769	0.600	48.300	48.270	0.030	425.6	300	7.35	38.9
6.000	PERMAVOID UU	14a	2.086	0.600	48.310	48.300	0.010	208.6	300	5.03	46.5
4.002	14	14a	15.921	0.600	48.324	48.300	0.024	663.4	300	7.07	39.7
4.001	13	14	21.474	0.600	48.394	48.324	0.070	306.8	300	6.63	41.0
4.000	12	13	66.453	0.600	48.616	48.394	0.222	299.3	300	6.23	42.2
1.005	10	11	24.317	0.600	49.629	49.386	0.243	100.1	225	7.61	38.2
1.004	9	10	19.647	0.600	49.825	49.629	0.196	100.2	225	7.30	39.1
1.003	8	9	29.262	0.600	50.118	49.825	0.293	99.9	225	7.05	39.7
1.003_1	4a	8	7.085	0.600	50.200	50.118	0.082	86.4	225	6.68	40.8
3.000	7	8	7.474	0.600	50.268	50.193	0.075	99.7	150	5.12	46.2
1.002	4	4a	14.275	0.600	50.407	50.200	0.207	69.0	225	6.60	41.1
5.000	POND UU	4a	7.181	0.600	50.250	50.200	0.050	143.6	225	5.13	46.2
1.001	2	4	22.104	0.600	50.623	50.407	0.216	102.3	225	6.45	41.5
2.000	3	4	18.848	0.600	50.595	50.407	0.188	100.3	225	5.24	45.7
1.000	1	2	72.375	0.600	51.083	50.623	0.460	157.3	225	6.16	42.5
3.000_1	Pond UU 2	POND UU	2.224	0.600	50.300	50.250	0.050	44.5	225	5.02	46.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
4.002a	0.756	53.4	12.5	0.658	0.646	0.118	0.0
6.000	1.084	76.7	0.0	0.613	0.658	0.000	0.0
4.002	0.603	42.6	12.7	0.711	0.658	0.118	0.0
4.001	0.892	63.1	10.9	0.769	0.711	0.098	0.0
4.000	0.903	63.9	4.0	1.586	0.769	0.035	0.0
1.005	1.307	52.0	21.1	0.650	0.816	0.204	0.0
1.004	1.306	51.9	19.3	0.862	0.650	0.182	0.0
1.003	1.308	52.0	16.3	1.514	0.862	0.151	0.0
1.003_1	1.407	56.0	5.1	1.212	1.514	0.046	0.0
3.000	1.006	17.8	10.3	1.434	1.514	0.082	0.0
1.002	1.577	62.7	5.1	0.891	1.212	0.046	0.0
5.000	1.089	43.3	0.0	0.875	1.212	0.000	0.0
1.001	1.292	51.4	0.0	1.005	0.891	0.000	0.0
2.000	1.305	51.9	2.4	0.596	0.891	0.019	0.0
1.000	1.040	41.3	0.0	0.824	1.005	0.000	0.0
3.000_1	1.966	78.2	0.0	0.825	0.875	0.000	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)
1.007	8.331	150.0	300	Circular	49.994	48.127	1.567	49.697	48.071	1.326
1.006	31.077	24.7	225	Circular	50.427	49.386	0.816	49.994	48.127	1.642
4.005	12.544	306.0	300	Circular	49.921	48.168	1.453	49.994	48.127	1.567
4.004	15.080	295.7	300	Circular	49.342	48.219	0.823	49.921	48.168	1.453

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.007	18	1200	Manhole	Adoptable	18_OUT	1200	Manhole	Adoptable
1.006	11	600	Manhole	Adoptable	18	1200	Manhole	Adoptable
4.005	17	600	Manhole	Adoptable	18	1200	Manhole	Adoptable
4.004	16	600	Manhole	Adoptable	17	600	Manhole	Adoptable

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)
4.003	15.430	302.5	300	Circular	49.216	48.270	0.646	49.342	48.219	0.823
4.002a	12.769	425.6	300	Circular	49.258	48.300	0.658	49.216	48.270	0.646
6.000	2.086	208.6	300	Circular	49.223	48.310	0.613	49.258	48.300	0.658
4.002	15.921	663.4	300	Circular	49.335	48.324	0.711	49.258	48.300	0.658
4.001	21.474	306.8	300	Circular	49.463	48.394	0.769	49.335	48.324	0.711
4.000	66.453	299.3	300	Circular	50.502	48.616	1.586	49.463	48.394	0.769
1.005	24.317	100.1	225	Circular	50.504	49.629	0.650	50.427	49.386	0.816
1.004	19.647	100.2	225	Circular	50.912	49.825	0.862	50.504	49.629	0.650
1.003	29.262	99.9	225	Circular	51.857	50.118	1.514	50.912	49.825	0.862
1.003_1	7.085	86.4	225	Circular	51.637	50.200	1.212	51.857	50.118	1.514
3.000	7.474	99.7	150	Circular	51.852	50.268	1.434	51.857	50.193	1.514
1.002	14.275	69.0	225	Circular	51.523	50.407	0.891	51.637	50.200	1.212
5.000	7.181	143.6	225	Circular	51.350	50.250	0.875	51.637	50.200	1.212
1.001	22.104	102.3	225	Circular	51.853	50.623	1.005	51.523	50.407	0.891
2.000	18.848	100.3	225	Circular	51.416	50.595	0.596	51.523	50.407	0.891
1.000	72.375	157.3	225	Circular	52.132	51.083	0.824	51.853	50.623	1.005
3.000_1	2.224	44.5	225	Circular	51.350	50.300	0.825	51.350	50.250	0.875

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.003	15	600	Manhole	Adoptable	16	600	Manhole	Adoptable
4.002a	14a	600	Manhole	Adoptable	15	600	Manhole	Adoptable
6.000	PERMAVOID UU		Junction		14a	600	Manhole	Adoptable
4.002	14	600	Manhole	Adoptable	14a	600	Manhole	Adoptable
4.001	13	600	Manhole	Adoptable	14	600	Manhole	Adoptable
4.000	12	600	Manhole	Adoptable	13	600	Manhole	Adoptable
1.005	10	600	Manhole	Adoptable	11	600	Manhole	Adoptable
1.004	9	600	Manhole	Adoptable	10	600	Manhole	Adoptable
1.003	8	1350	Manhole	Adoptable	9	600	Manhole	Adoptable
1.003_1	4a	600	Manhole	Adoptable	8	1350	Manhole	Adoptable
3.000	7	1350	Manhole	Adoptable	8	1350	Manhole	Adoptable
1.002	4	600	Manhole	Adoptable	4a	600	Manhole	Adoptable
5.000	POND UU		Junction		4a	600	Manhole	Adoptable
1.001	2	1350	Manhole	Adoptable	4	600	Manhole	Adoptable
2.000	3	600	Manhole	Adoptable	4	600	Manhole	Adoptable
1.000	1	1350	Manhole	Adoptable	2	1350	Manhole	Adoptable
3.000_1	Pond UU 2		Junction		POND UU		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	385535.983	398288.271	52.132	1.049	1350				
						0	1.000	51.083	225
2	385480.573	398241.727	51.853	1.230	1350				
						1	1.000	50.623	225
						0	1.001	50.623	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
3	385447.414	398217.809	51.416	0.821	600				
						0	2.000	50.595	225
4	385462.065	398229.666	51.523	1.116	600		1 2	2.000 1.001	50.407 50.407
						0	1.002	50.407	225
7	385495.721	398224.330	51.852	1.584	1350		0	3.000	50.268
						0	3.000	50.193	150
8	385475.057	398212.715	51.857	1.739	1350		1 2	3.000 1.003_1	50.118 50.118
						0	1.003	50.118	225
9	385452.439	398194.150	50.912	1.087	600		1	1.003	49.825
						0	1.004	49.825	225
10	385437.205	398181.742	50.504	0.875	600		1	1.004	49.629
						0	1.005	49.629	225
11	385417.008	398168.200	50.427	1.041	600		1	1.005	49.386
						0	1.006	49.386	225
12	385417.309	398192.030	50.502	1.886	600		0	4.000	48.616
						0	4.000	48.394	300
13	385362.514	398154.586	49.463	1.069	600		1	4.001	48.394
						0	4.001	48.324	300
14	385344.958	398142.220	49.335	1.011	600		1	4.002	48.324
						0	4.002a	48.270	300
15	385354.290	398129.140	49.216	0.946	600		1	4.003	48.270
						0	4.003	48.219	300
16	385368.346	398135.373	49.342	1.123	600		1	4.004	48.219
						0	4.004	48.168	300
17	385380.926	398143.687	49.921	1.753	600		1	4.005	48.168
						0	4.005	48.168	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
18	385391.272	398150.780	49.994	1.867	1200		1 4.005	48.127	300
							2 1.006	48.127	225
							0 1.007	48.127	300
18_OUT	385394.509	398145.223	49.697	1.626	1200		1 1.007	48.071	300
POND UU	385476.135	398222.851	51.350	1.100			1 3.000_1	50.250	225
							0 5.000	50.250	225
4a	385470.627	398218.244	51.637	1.437	600		1 5.000	50.200	225
							2 1.002	50.200	225
							0 1.003_1	50.200	225
14a	385346.874	398139.535	49.258	0.958	600		1 6.000	48.300	300
							2 4.002	48.300	300
							0 4.002a	48.300	300
PERMAVOID UU	385345.110	398138.421	49.223	0.913					
							0 6.000	48.310	300
Pond UU 2	385474.531	398224.392	51.350	1.050					
							0 3.000_1	50.300	225

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160
30	120	240	480	720	1440	2880

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

Node 18 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.007	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0100-5000-1350-5000
Invert Level (m)	48.127	Min Outlet Diameter (m)	0.150
Design Depth (m)	1.350	Min Node Diameter (mm)	1200
Design Flow (l/s)	5.0		

Node 8 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.300	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.5		
Invert Level (m)	50.118	Diameter (m)	0.025		

Node 2 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.800	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.2		
Invert Level (m)	50.623	Diameter (m)	0.025		

Node 12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.140
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.450	120.0	0.0	0.600	0.0	0.0
0.449	0.0	0.0	0.599	120.0	0.0			

Node 13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.067
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.450	204.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	204.0	0.0			

Node 14 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.385
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.450	64.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	64.0	0.0			

Node 15 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.385
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.10	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.449	0.0	0.0	0.599	218.0	0.0
0.001	0.0	0.0	0.450	218.0	0.0	0.600	0.0	0.0

Node 18 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.290
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	97.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	97.0	0.0			

Node 11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.386
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	50.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	50.0	0.0			

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.775
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.300	40.0	0.0	0.451	0.0	0.0
0.299	0.0	0.0	0.450	40.0	0.0			

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.120
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.550	97.0	0.0	0.701	0.0	0.0
0.549	0.0	0.0	0.700	97.0	0.0			

Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.647
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.550	232.0	0.0	0.701	0.0	0.0
0.549	0.0	0.0	0.700	232.0	0.0			

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.745
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	46.0	0.0	0.600	0.0	0.0
0.449	0.0	0.0	0.599	46.0	0.0			

Node 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.745
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	89.0	0.0	0.600	0.0	0.0
0.449	0.0	0.0	0.599	89.0	0.0			

Node POND UU Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.250
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	10.0	0.0	1.000	100.6	0.0

Node 14 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.324
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	8

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	64.0	0.0	0.601	0.0	0.0
0.449	0.0	0.0	0.600	64.0	0.0			

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	51.382
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.450	120.0	0.0	0.600	0.0	0.0
0.449	0.0	0.0	0.599	120.0	0.0			

Node 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.982
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	0.0	0.0	0.550	459.0	0.0	0.701	0.0	0.0
0.549	0.0	0.0	0.700	459.0	0.0			

Node PERMAVOID UU Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.310
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	200.0	0.0	0.600	200.0	0.0	0.601	0.0	0.0

Node Pond UU 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	10.0	0.0	1.000	105.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	51.083	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	1	50.623	0.000	0.0	0.0000	0.0000	OK
15 minute winter	3	10	50.627	0.032	2.3	0.0237	0.0000	OK
120 minute winter	4	118	50.502	0.095	1.7	0.0730	0.0000	OK
120 minute winter	7	116	50.502	0.234	3.1	0.5782	0.0000	SURCHARGED
120 minute winter	8	118	50.502	0.384	3.8	0.6518	0.0000	SURCHARGED
15 minute winter	9	10	49.869	0.044	4.4	0.0372	0.0000	OK
15 minute winter	10	10	49.686	0.057	6.9	0.0451	0.0000	OK
15 minute winter	11	11	49.433	0.047	10.1	0.0383	0.0000	OK
15 minute winter	12	11	48.666	0.050	4.2	0.0327	0.0000	OK
15 minute winter	13	11	48.478	0.084	11.3	0.1224	0.0000	OK
15 minute winter	14	12	48.445	0.121	13.2	0.0821	0.0000	OK
15 minute winter	15	12	48.444	0.174	14.0	0.1303	0.0000	OK
15 minute winter	16	12	48.450	0.231	11.7	0.1186	0.0000	OK
15 minute winter	17	12	48.452	0.284	12.0	0.1288	0.0000	OK
15 minute winter	18	12	48.454	0.327	16.2	0.5550	0.0000	SURCHARGED
15 minute summer	18_OUT	1	48.071	0.000	5.0	0.0000	0.0000	OK
120 minute winter	POND UU	118	50.502	0.252	4.9	5.4065	0.0000	SURCHARGED
120 minute winter	4a	118	50.502	0.302	4.6	0.0856	0.0000	SURCHARGED
15 minute winter	14a	12	48.426	0.126	26.2	0.0355	0.0000	OK
60 minute winter	PERMAVOID UU	51	48.372	0.062	13.9	11.7525	0.0000	OK
120 minute winter	Pond UU 2	118	50.502	0.202	2.7	3.9669	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 summer	1	1.000	2	0.0	0.000	0.000	0.0000	
15 minute summer	2	Orifice	4	0.0				
15 minute winter	3	2.000	4	2.2	0.509	0.043	0.0837	
120 minute winter	4	1.002	4a	1.7	0.411	0.027	0.3980	
120 minute winter	7	3.000	8	2.9	0.437	0.162	0.1316	
120 minute winter	8	Orifice	9	0.8				
15 minute winter	9	1.004	10	4.3	0.650	0.083	0.1310	
15 minute winter	10	1.005	11	6.8	0.985	0.131	0.1687	
15 minute winter	11	1.006	18	10.0	0.407	0.095	0.7103	
15 minute winter	12	4.000	13	3.9	0.338	0.062	0.7890	
15 minute winter	13	4.001	14	11.0	0.550	0.174	0.4521	
15 minute winter	14	4.002	14a	12.4	0.646	0.292	0.4344	
15 minute winter	15	4.003	16	-11.8	0.461	-0.186	0.7758	
15 minute winter	16	4.004	17	-10.5	0.344	-0.164	0.9584	
15 minute winter	17	4.005	18	-10.3	0.166	-0.163	0.8743	
15 minute winter	18	Hydro-Brake®	18_OUT	5.0				23.3
120 minute winter	POND UU	5.000	4a	-4.4	-0.133	-0.103	0.2856	
120 minute winter	4a	1.003_1	8	-2.9	0.078	-0.052	0.2818	
15 minute winter	14a	4.002a	15	-13.7	0.413	-0.257	0.4492	
60 minute winter	PERMAVOID UU	6.000	14a	-13.9	-1.459	-0.182	0.0249	
120 minute winter	Pond UU 2	3.000_1	POND UU	4.9	0.495	0.063	0.0861	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.02%

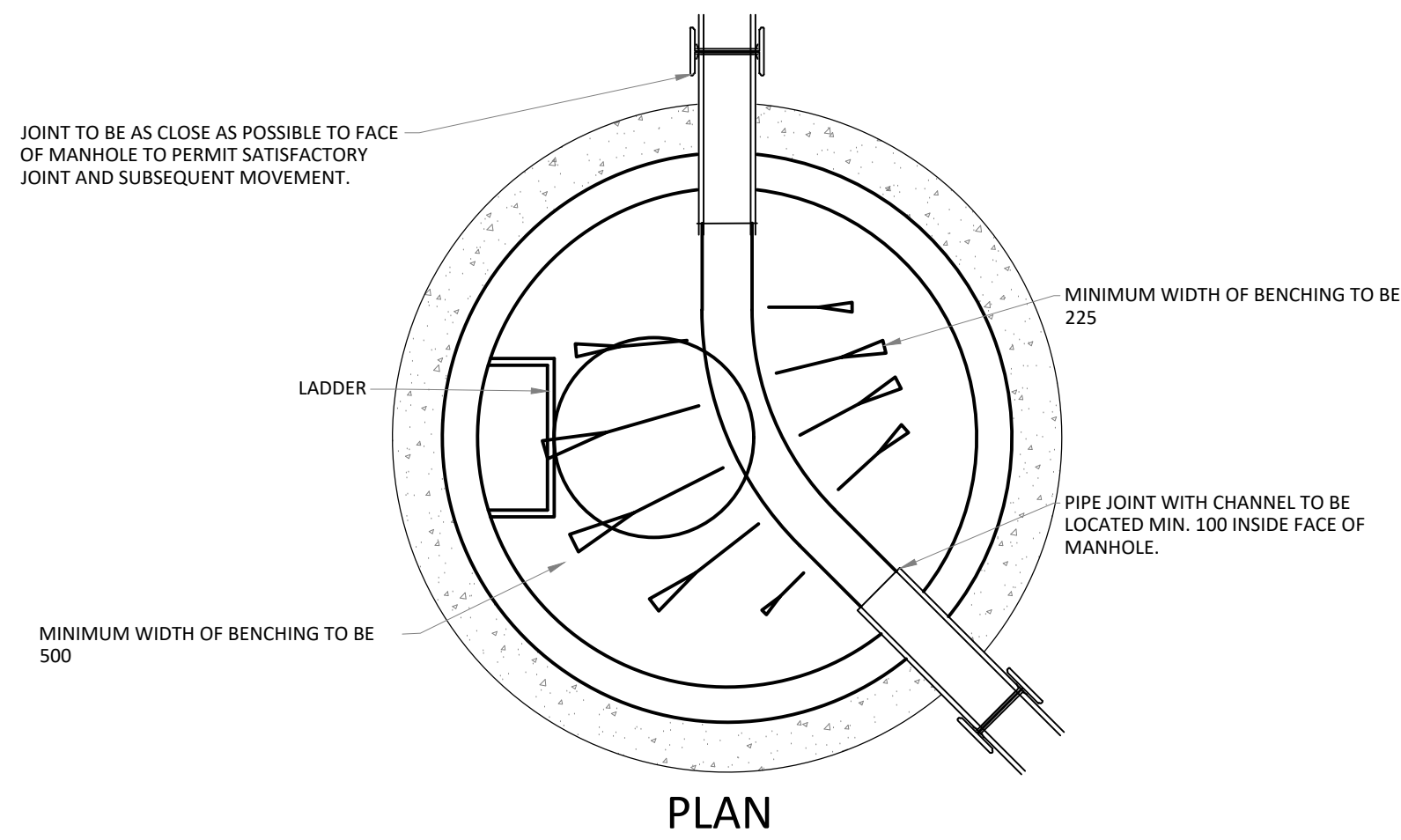
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	51.083	0.000	0.0	0.0000	0.0000	OK
240 minute winter	2	236	50.749	0.126	0.2	0.1806	0.0000	OK
240 minute winter	3	232	50.749	0.154	1.1	0.1149	0.0000	OK
240 minute winter	4	232	50.749	0.342	2.6	0.2621	0.0000	SURCHARGED
240 minute winter	7	232	50.749	0.481	4.5	1.1874	0.0000	SURCHARGED
240 minute winter	8	232	50.749	0.631	5.6	1.0705	0.0000	SURCHARGED
15 minute winter	9	10	49.891	0.066	9.8	0.0565	0.0000	OK
15 minute winter	10	10	49.719	0.090	16.1	0.0706	0.0000	OK
15 minute winter	11	10	49.458	0.072	24.0	0.0595	0.0000	OK
15 minute winter	12	11	48.694	0.078	10.2	0.0513	0.0000	OK
15 minute winter	13	11	48.552	0.158	27.9	0.2313	0.0000	OK
120 minute winter	14	116	48.542	0.218	10.8	0.1480	0.0000	OK
15 minute winter	15	11	48.558	0.288	47.8	0.2153	0.0000	OK
15 minute winter	16	11	48.588	0.369	41.7	0.1899	0.0000	SURCHARGED
15 minute winter	17	11	48.614	0.446	37.9	0.2025	0.0000	SURCHARGED
15 minute winter	18	11	48.632	0.505	39.2	0.8573	0.0000	SURCHARGED
15 minute summer	18_OUT	1	48.071	0.000	5.0	0.0000	0.0000	OK
240 minute winter	POND UU	232	50.749	0.499	6.7	16.2815	0.0000	SURCHARGED
240 minute winter	4a	232	50.749	0.549	6.8	0.1554	0.0000	SURCHARGED
120 minute winter	14a	116	48.542	0.242	21.9	0.0686	0.0000	OK
120 minute winter	PERMAVOID UU	116	48.542	0.232	21.5	44.1466	0.0000	OK
240 minute winter	Pond UU 2	232	50.749	0.449	3.2	14.0773	0.0000	SURCHARGED

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 summer	1	1.000	2	0.0	0.000	0.000	0.0000	
240 minute winter	2	Orifice	4	0.1				
240 minute winter	3	2.000	4	1.1	0.344	0.021	0.6481	
240 minute winter	4	1.002	4a	2.3	0.397	0.036	0.5677	
240 minute winter	7	3.000	8	4.3	0.415	0.242	0.1316	
240 minute winter	8	Orifice	9	1.0				
15 minute winter	9	1.004	10	9.7	0.795	0.187	0.2409	
15 minute winter	10	1.005	11	15.8	1.233	0.305	0.3137	
15 minute winter	11	1.006	18	23.8	0.786	0.226	0.7893	
15 minute winter	12	4.000	13	9.8	0.405	0.153	1.7379	
15 minute winter	13	4.001	14	26.0	0.609	0.413	0.9551	
120 minute winter	14	4.002	14a	10.3	0.445	0.241	0.9227	
15 minute winter	15	4.003	16	-41.8	-0.593	-0.658	1.0793	
15 minute winter	16	4.004	17	-38.1	-0.541	-0.593	1.0619	
15 minute winter	17	4.005	18	-33.8	-0.480	-0.536	0.8833	
15 minute winter	18	Hydro-Brake®	18_OUT	5.0				50.1
240 minute winter	POND UU	5.000	4a	-6.7	-0.169	-0.155	0.2856	
240 minute winter	4a	1.003_1	8	-4.6	-0.115	-0.081	0.2818	
120 minute winter	14a	4.002a	15	-11.7	0.374	-0.219	0.8183	
120 minute winter	PERMAVOID UU	6.000	14a	-21.5	-1.270	-0.280	0.1247	
240 minute winter	Pond UU 2	3.000_1	POND UU	-3.2	-0.084	-0.041	0.0885	

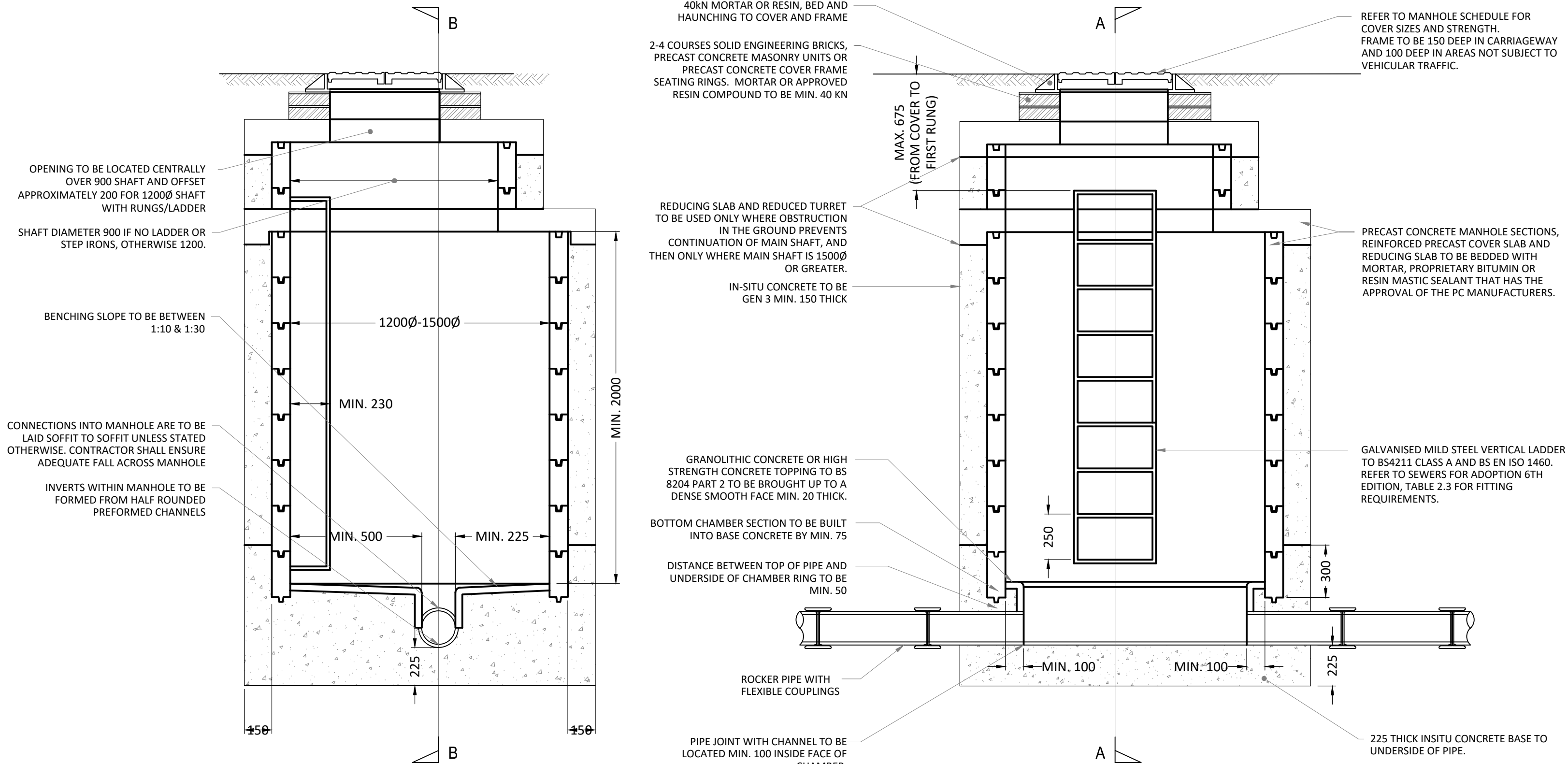
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	51.083	0.000	0.0	0.0000	0.0000	OK
360 minute winter	2	352	51.020	0.397	0.4	0.5677	0.0000	SURCHARGED
360 minute winter	3	352	51.020	0.425	1.4	0.3164	0.0000	SURCHARGED
360 minute winter	4	352	51.020	0.613	3.3	0.4694	0.0000	SURCHARGED
15 minute winter	7	11	51.311	1.043	43.1	2.5740	0.0000	SURCHARGED
360 minute winter	8	352	51.020	0.902	7.6	1.5294	0.0000	SURCHARGED
15 minute winter	9	10	49.917	0.092	17.3	0.0785	0.0000	OK
15 minute winter	10	10	49.755	0.126	28.8	0.0990	0.0000	OK
15 minute winter	11	11	49.493	0.107	43.1	0.0878	0.0000	OK
180 minute winter	12	176	48.851	0.235	4.4	0.1537	0.0000	OK
180 minute winter	13	180	48.851	0.457	12.3	0.6681	0.0000	SURCHARGED
180 minute winter	14	180	48.851	0.527	12.7	5.3867	0.0000	SURCHARGED
180 minute winter	15	180	48.850	0.580	18.5	0.7769	0.0000	SURCHARGED
180 minute winter	16	180	48.850	0.631	15.8	0.3243	0.0000	SURCHARGED
15 minute winter	17	11	48.901	0.733	71.7	0.3329	0.0000	SURCHARGED
15 minute winter	18	11	48.966	0.839	69.6	1.4259	0.0000	SURCHARGED
15 minute summer	18_OUT	1	48.071	0.000	5.0	0.0000	0.0000	OK
360 minute winter	POND UU	352	51.020	0.770	9.1	34.5423	0.0000	SURCHARGED
360 minute winter	4a	352	51.020	0.820	9.2	0.2320	0.0000	SURCHARGED
180 minute winter	14a	176	48.852	0.552	30.3	0.1562	0.0000	SURCHARGED
180 minute winter	PERMAVOID UU	180	48.851	0.541	30.0	102.7550	0.0000	SURCHARGED
360 minute winter	Pond UU 2	352	51.020	0.720	4.5	31.8077	0.0000	SURCHARGED

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 summer	1	1.000	2	0.0	0.000	0.000	0.3989	
360 minute winter	2	Orifice	4	0.0				
360 minute winter	3	2.000	4	1.3	0.307	0.026	0.7496	
360 minute winter	4	1.002	4a	2.8	0.391	0.045	0.5677	
15 minute winter	7	3.000	8	37.7	2.141	2.119	0.1316	
360 minute winter	8	Orifice	9	1.2				
15 minute winter	9	1.004	10	17.2	0.901	0.331	0.3744	
15 minute winter	10	1.005	11	28.4	1.393	0.546	0.4970	
15 minute winter	11	1.006	18	42.4	1.261	0.403	0.9070	
180 minute winter	12	4.000	13	4.4	0.315	0.069	4.3076	
180 minute winter	13	4.001	14	10.2	0.442	0.161	1.5122	
180 minute winter	14	4.002	14a	12.1	0.413	0.284	1.1211	
180 minute winter	15	4.003	16	-15.7	0.374	-0.247	1.0866	
180 minute winter	16	4.004	17	-14.2	0.297	-0.221	1.0619	
15 minute winter	17	4.005	18	-64.3	-0.913	-1.018	0.8833	
15 minute winter	18	Hydro-Brake®	18_OUT	5.0				74.5
360 minute winter	POND UU	5.000	4a	-9.1	-0.228	-0.210	0.2856	
360 minute winter	4a	1.003_1	8	-6.4	-0.161	-0.114	0.2818	
180 minute winter	14a	4.002a	15	-18.3	0.331	-0.343	0.8992	
180 minute winter	PERMAVOID UU	6.000	14a	-30.0	-0.921	-0.391	0.1469	
360 minute winter	Pond UU 2	3.000_1	POND UU	-4.5	-0.119	-0.057	0.0885	



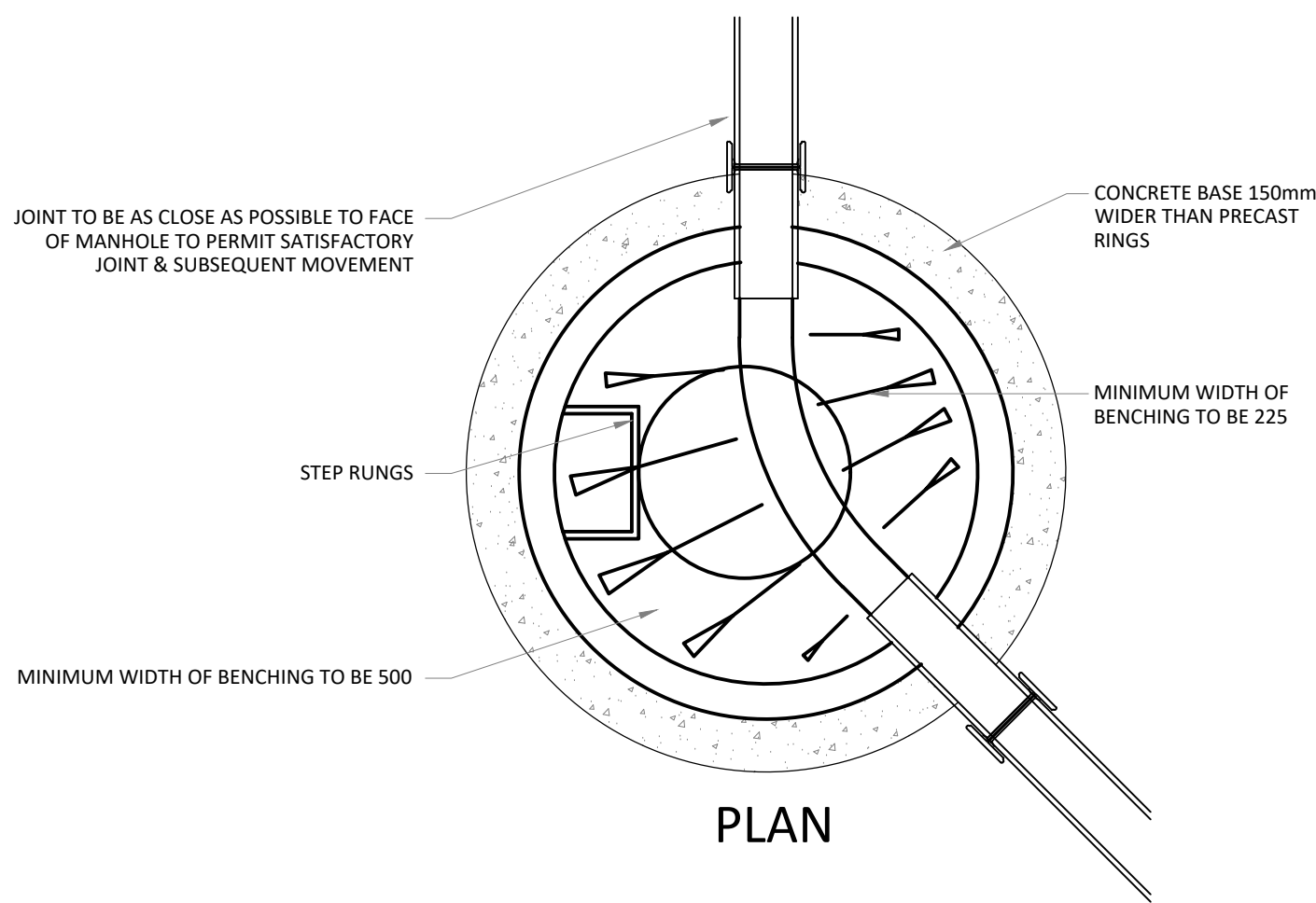
MANHOLE TYPE A
CIRCULAR PRECAST CONCRETE MANHOLE DETAIL
(MANHOLE DEPTH TO CROWN BETWEEN 3.00m - 6.00m)



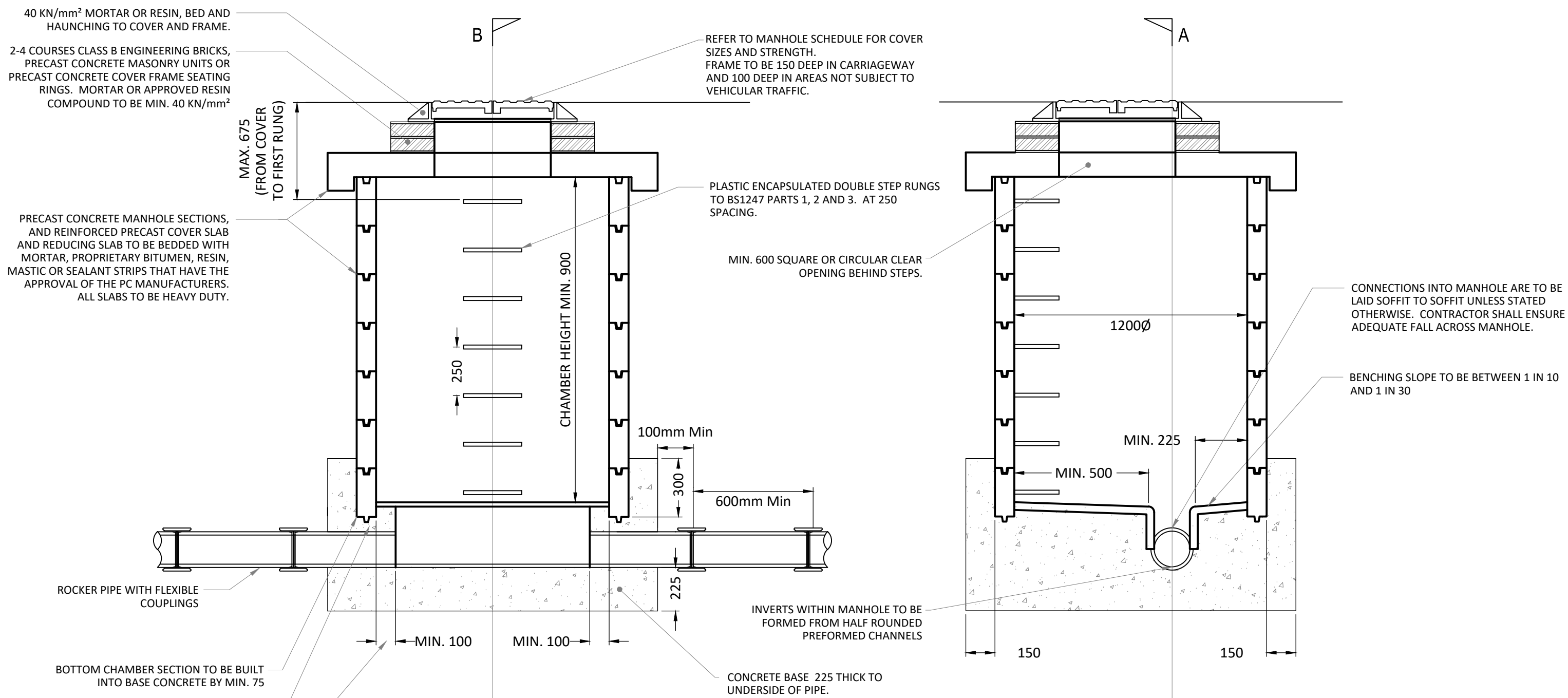
SECTION A-A

SECTION B-B

- NOTE:
- MANHOLES WITH CONNECTIONS OF GREATER THAN Ø600 TO HAVE SELF CLEANING TOE HOLES IN BENCHING. MANHOLES WITH CONNECTIONS OF Ø900 OR GREATER TO HAVE HAND HOLDS IN BENCHING.
 - CHAMBERS WITH OUTGOING PIPES GREATER THAN Ø600 SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER SAFETY DEVICES.
 - MANHOLES LESS THAN 3m DEEP TO HAVE DOUBLE ENCAPSULATED STEP RUNGS
 - MANHOLES MORE THAN 3m DEEP TO HAVE LADDERS (230mm WALL TO LADDER)



MANHOLE TYPE B
CIRCULAR PRECAST CONCRETE MANHOLE DETAIL
(MANHOLE DEPTH TO CROWN BETWEEN 1.50m - 3.00m)



SECTION A-A

SECTION B-B

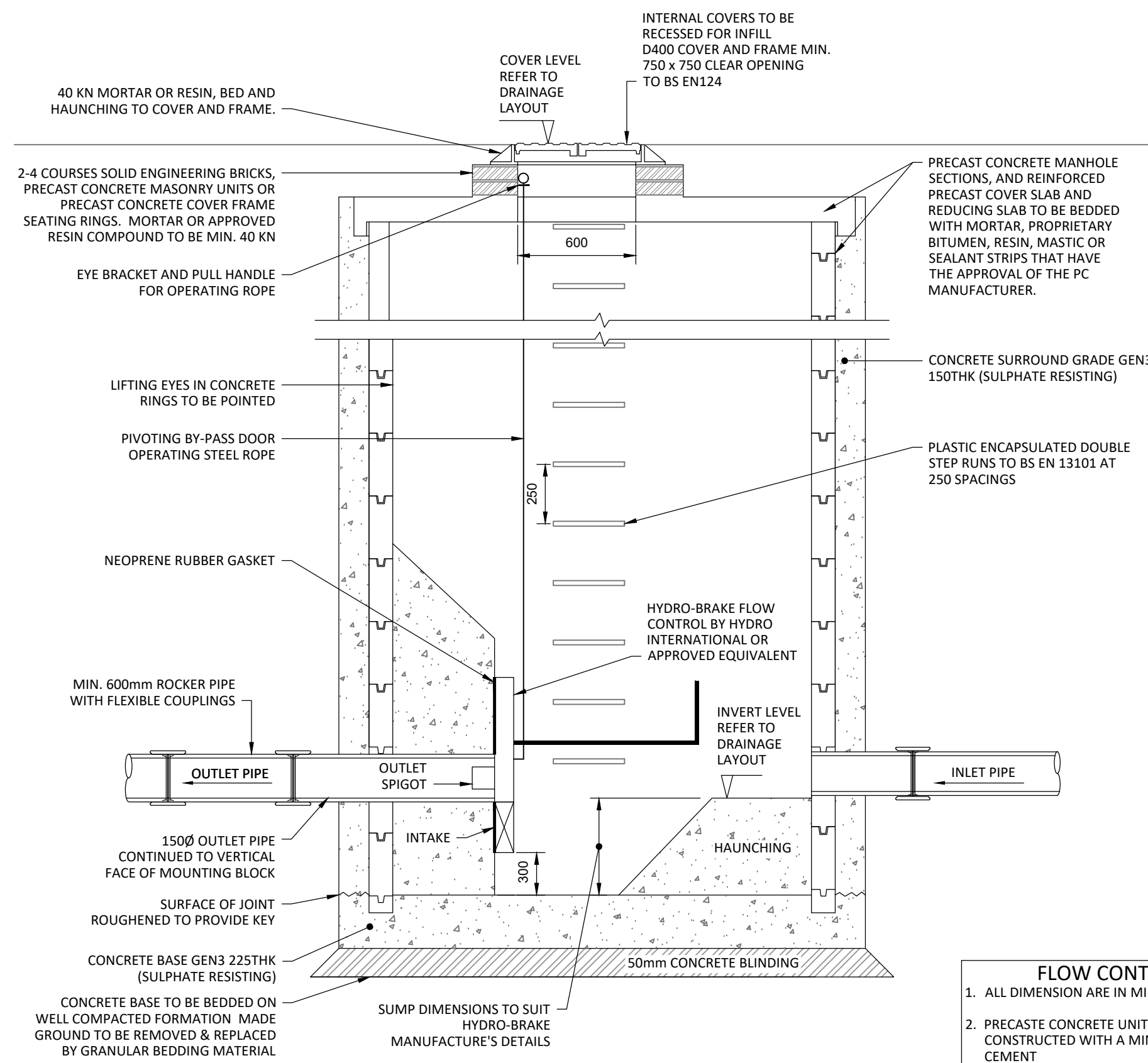
Standard Notes

- This drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings and the specification.
- This drawing should not be scaled.
- All dimensions are to be verified by the contractor on site.
- All discrepancies should be reported to the C.A. prior to the commencement of the works.

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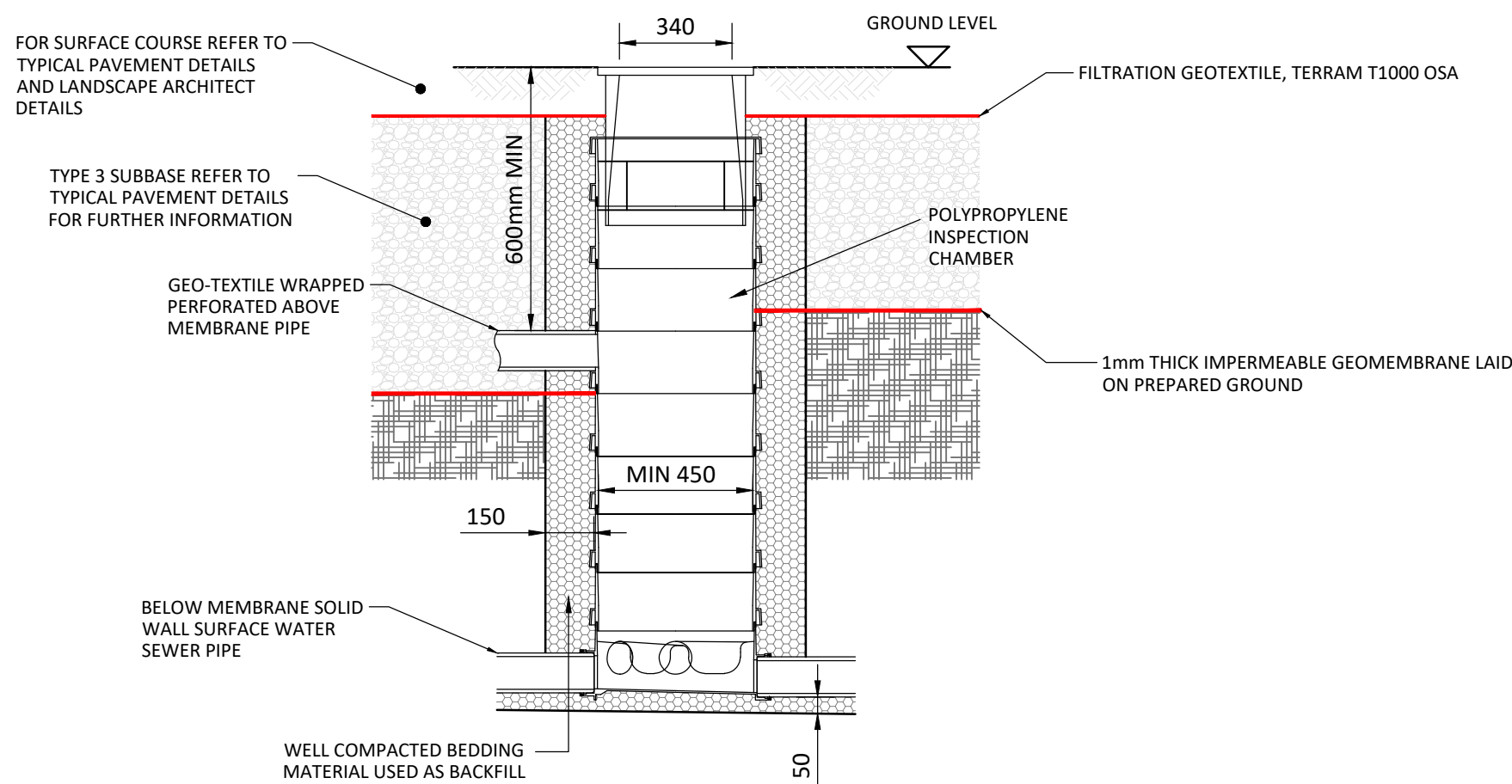
Notes and Keys

01.06.22	P01	STAGE 3		TC	CK
Date	Rev	Description		Drawn	Chkd
 MANCHESTER LONDON LEEDS GLASGOW Civic's Warehouse, 77 Dale Street, Manchester, M1 2HD. Tel: 0161 226 6701 Riverside Wharf, 33 Mill Street, London SE1 2AA. Tel: 020 7263 2977 Tower Works, Unit 02-03, Globe Road, Leeds, LS11 5DU. Tel: 0113 2025 130 Greenham Chambers, 45 West Nile St, Glasgow, G2 3NF. Tel: 0141 370 1809 www.civicingineers.com					
Project					
ELECTRIC PARK POLLARD STREET PHASE 1					
Title					
DRAINAGE DETAILS SHEET 1					
Status					
STAGE 3					
Project Number	Scale @ A1	Date Created	Drawn	Checked	Suitability
969-03	1:20	MAY 22	AMGRJW		--
Drawing Number					Revision
969-03-CIV-XX-XX-D-C-31001					P01

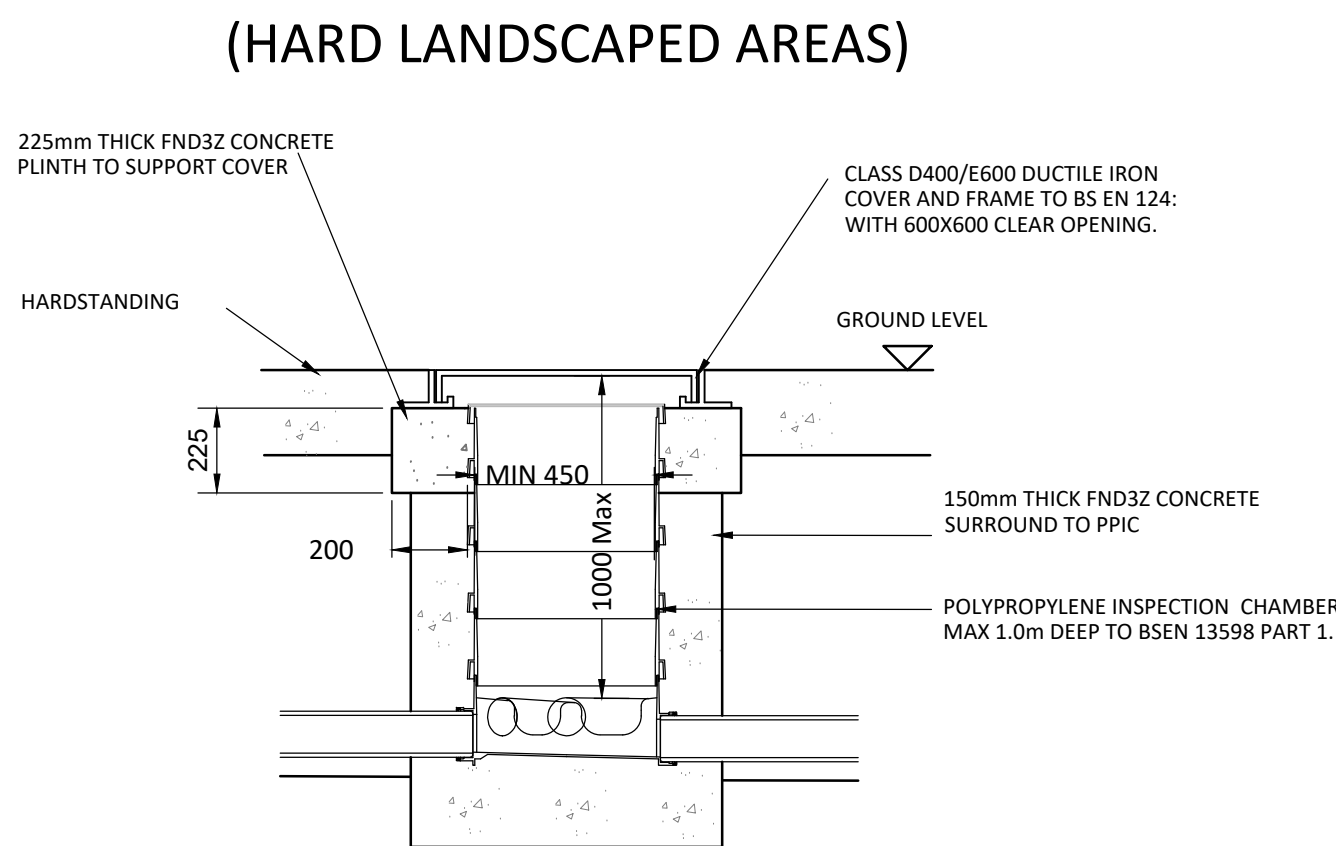


FLOW CONTROL MANHOLE DETAIL

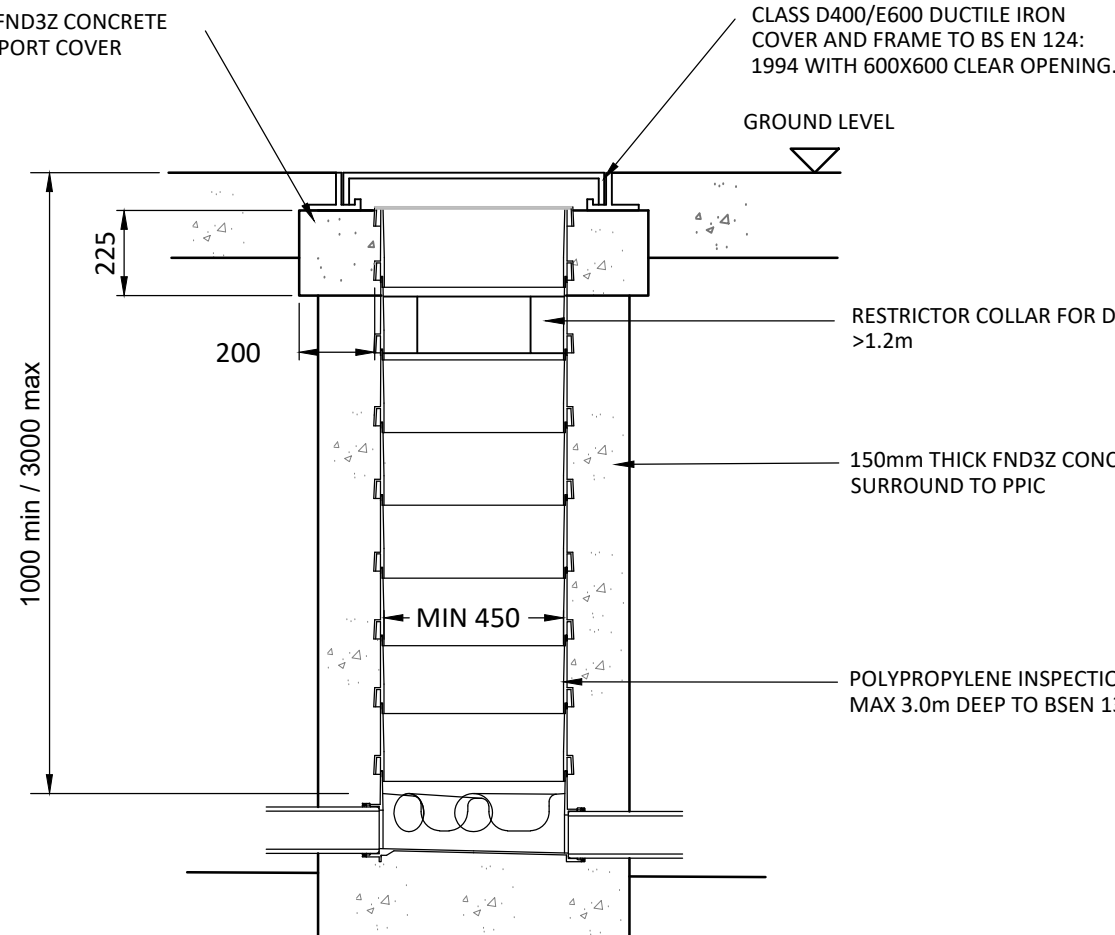
- FLOW CONTROL MANHOLE NOTES**
1. ALL DIMENSION ARE IN MILLIMETERS
 2. PRECAST CONCRETE UNITS TO BE BS5911 PART 200 AND TO BE CONSTRUCTED WITH A MINIMUM CLASS 3 SULPHATE RESISTING CEMENT
 3. ALL INSITU CONCRETE TO BE GEN3 SULPHATE RESISTING CONCRETE
 4. MATERIALS FOR JOINTING MANHOLE RINGS TO BE A RUBBER BITUMEN COMPOUND OF APPROVED MANUFACTURER 'TOKSTRIP' OR SIMILAR.
 5. ALL BRICKWORK TO BE CLASS B ENGINEERING - 2 COURSES MIN/4 COURSES MAX; 225mm THICK
 6. 20mm THICK GRANOLITHIC CONCRETE BENCHING TO BE BROUGHT UP TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS. WHERE BENCHING IS LESS THAN 450mm WIDE, SLOPE TO BE 1:10; MORE THAN 450mm, 1:30
 7. PIPES ENTERING MANHOLES TO HAVE A FLEXIBLE JOINT AS CLOSE AS FEASIBLE TO OUTSIDE FACE OF ANY STRUCTURE INTO WHICH THE PIPE IS BUILT IN ORDER TO FACILITATE MOVEMENT OF THE JOINT. THE LENGTH OF THE NEXT PIPE (ROCKER PIPELINES, BEDDING, LAYING AND JOINTING OF PIPES AND BACKFILLING OF TRENCHES SHALL BE IN ACCORDANCE WITH THE W.S.A.SPEC 'SEWERS FOR ADOPTION' - 7TH EDITION TOGETHER WITH ANY LOCAL AUTHORITY REQUIREMENTS.



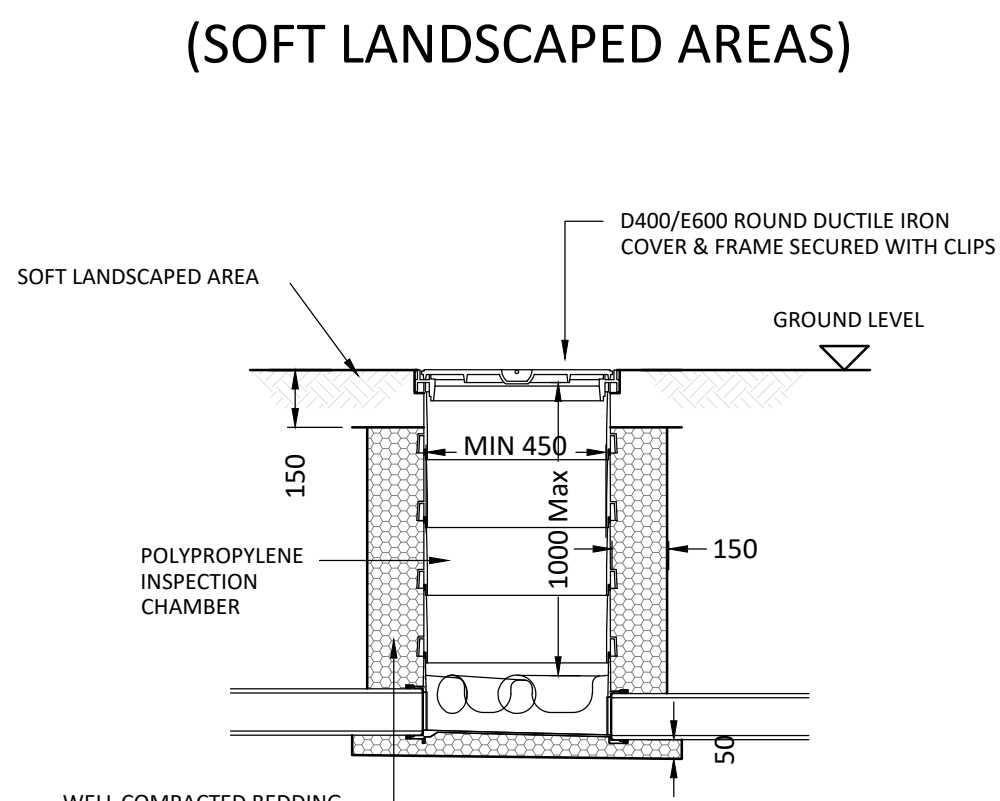
PERFORATED PIPE CONNECTION TO INSPECTION CHAMBER



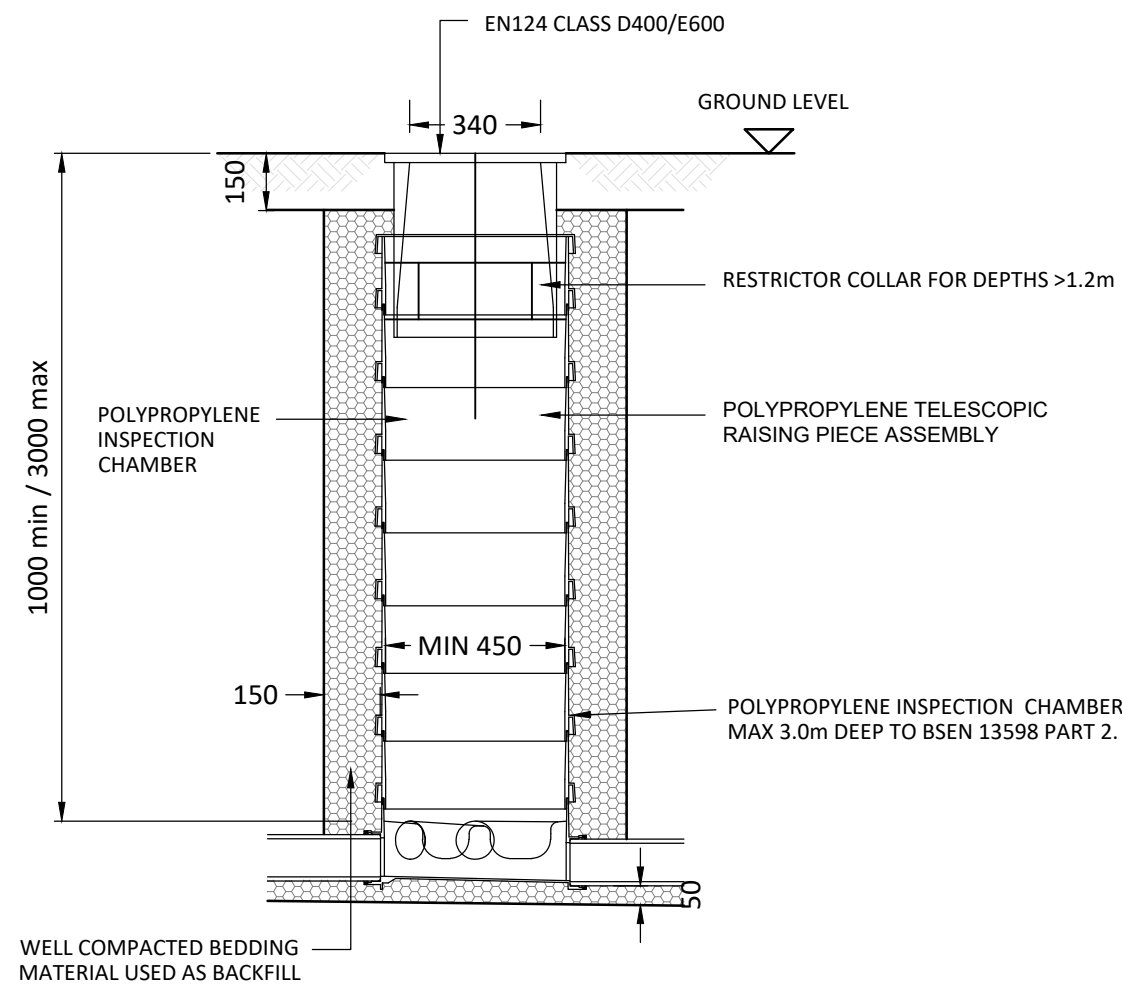
POLYPROPYLENE INSPECTION CHAMBER



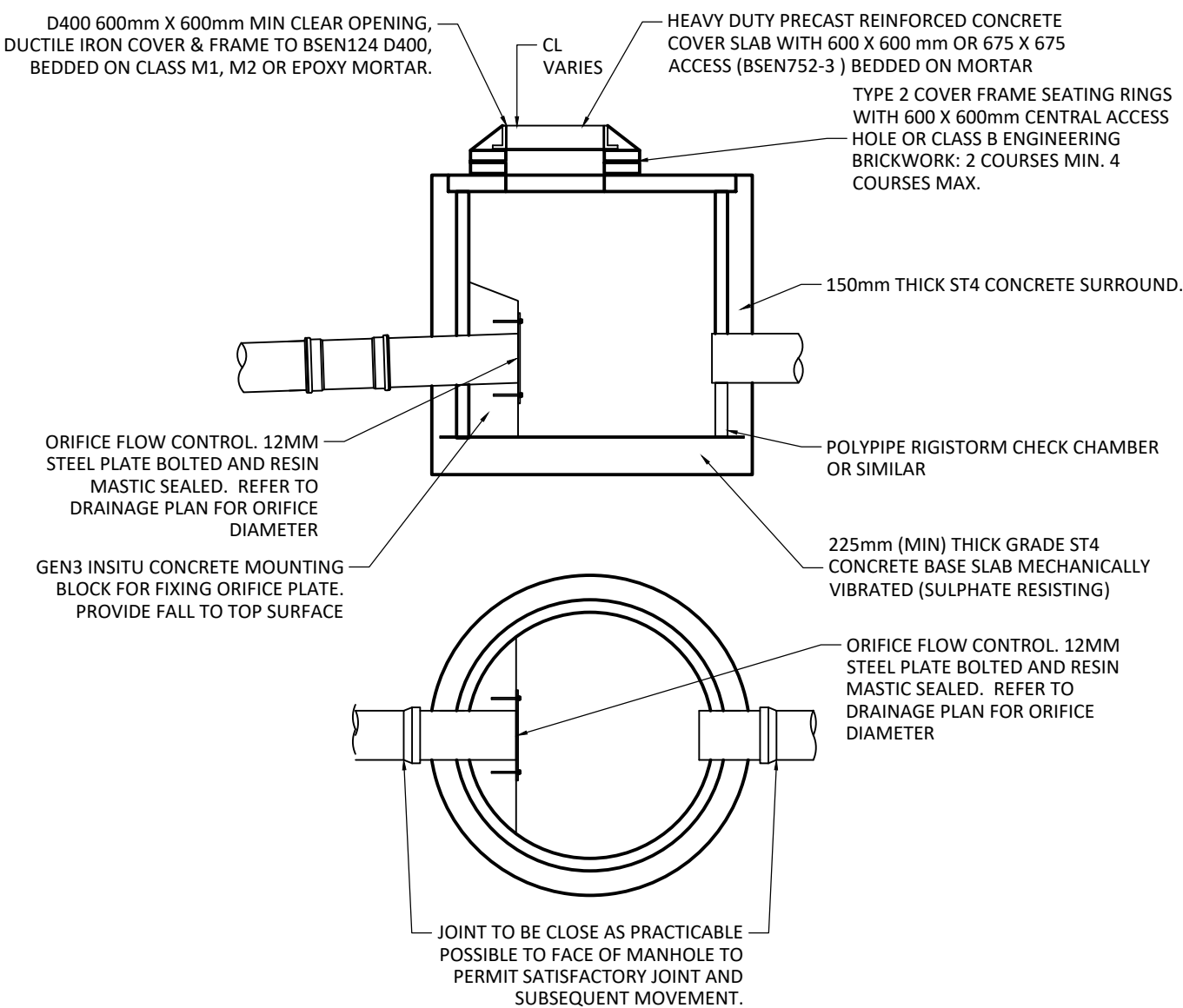
PPIC AND TYPE C - 1.0m - 3.0m



POLYPROPYLENE INSPECTION CHAMBER

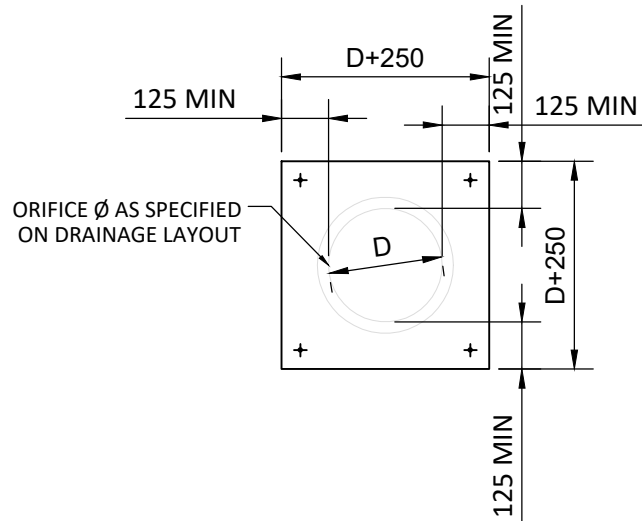


PPIC AND TYPE C - 1.0m - 3.0m



TYPICAL ORIFICE CONTROL MANHOLE

ALL PIPES ENTERING OR LEAVING MANHOLE SHALL HAVE A FLEXIBLE JOINT WITHIN 600mm OF THE INSIDE FACE OF THE MANHOLE. THE NEXT PIPE SHALL BE A SHORT ROCKER PIPE WITH LENGTH AS SHOWN IN THE TABLE BELOW



ORIFICE PLATE DETAIL

Standard Notes

1. This drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings and the specification.
2. This drawing should not be scaled.
3. All dimensions are to be verified by the contractor on site.
4. All discrepancies should be reported to the C.A. prior to the commencement of the works.

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01.06.22	P01	STAGE 3		TC	CK
Date	Rev	Description		Drawn	Chkd

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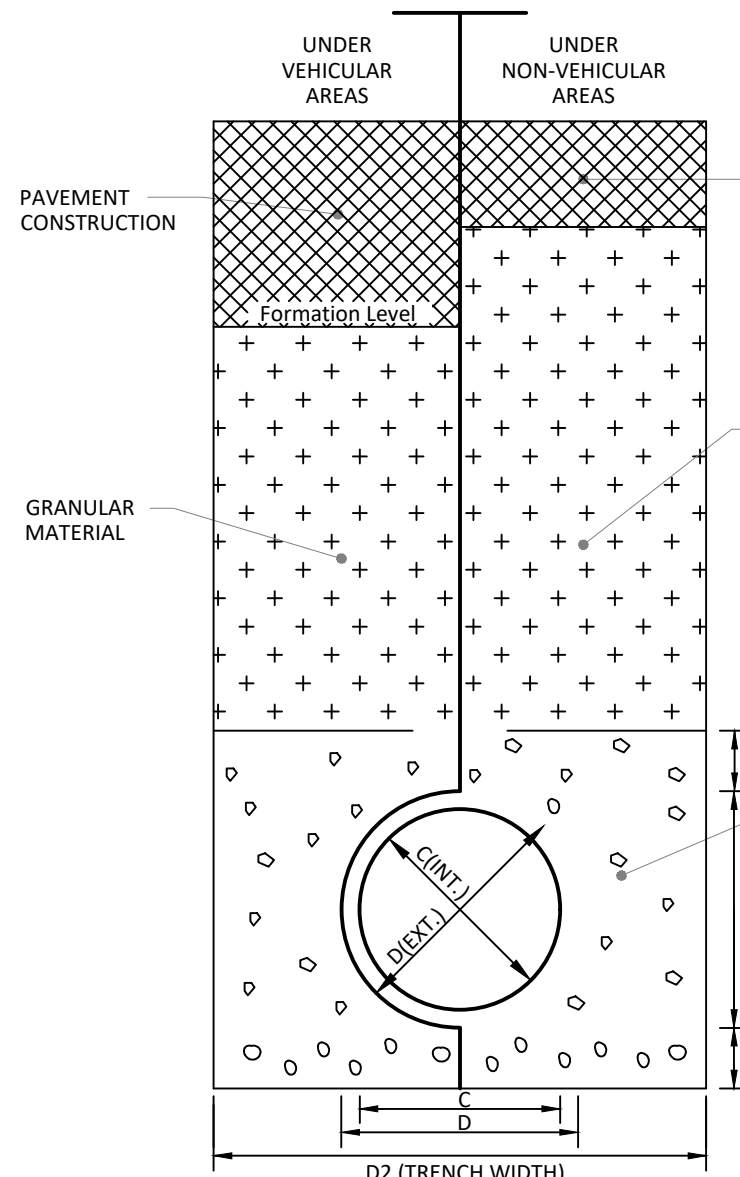
Project

**ELECTRIC PARK
POLLARD STREET
PHASE 1**

Title

**DRAINAGE DETAILS
SHEET 2**

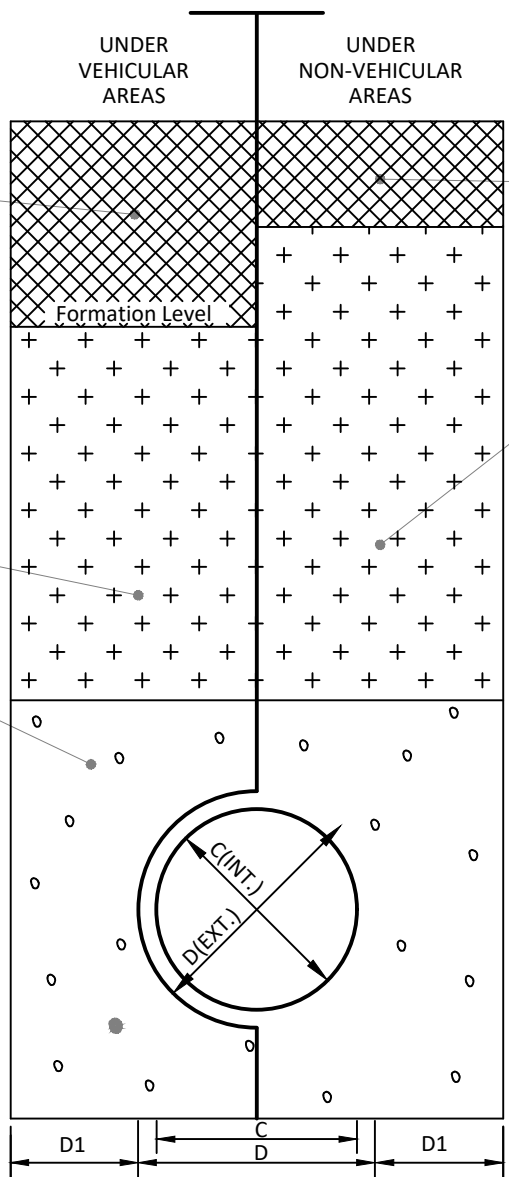
Status					
STAGE 3					
Project Number	Scale @ A1	Date Created	Drawn	Checked	Suitability
969-03	1:20	MAY 22	AMGRJW		--
Drawing Number					Revision
969-03-CIV-XX-XX-D-C-31002					P01



- TO BE USED UNDER:
1. VEHICULAR AREAS WHERE COVER TO PIPE SOFFIT IS GREATER THAN 900mm.
 2. ALL NON-VEHICULAR AREAS WHERE COVER TO PIPE SOFFIT IS GREATER THAN 350mm.

NOTE:
ALL PIPEWORK SHALL HAVE FLEXIBLE COUPLINGS

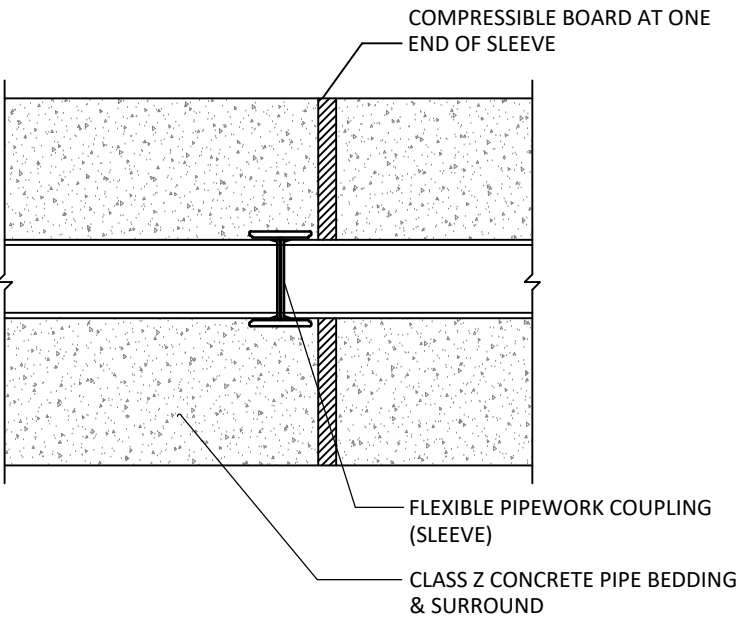
PIPE Ø (C) (mm)	D1 (mm)	D2 (mm)
100	150	450
150	150	600
225	150	700
300	150	850
375	200	1050
450	200	1150
525	200	1200
600	200	1350
675	200	1450
750	200	1500



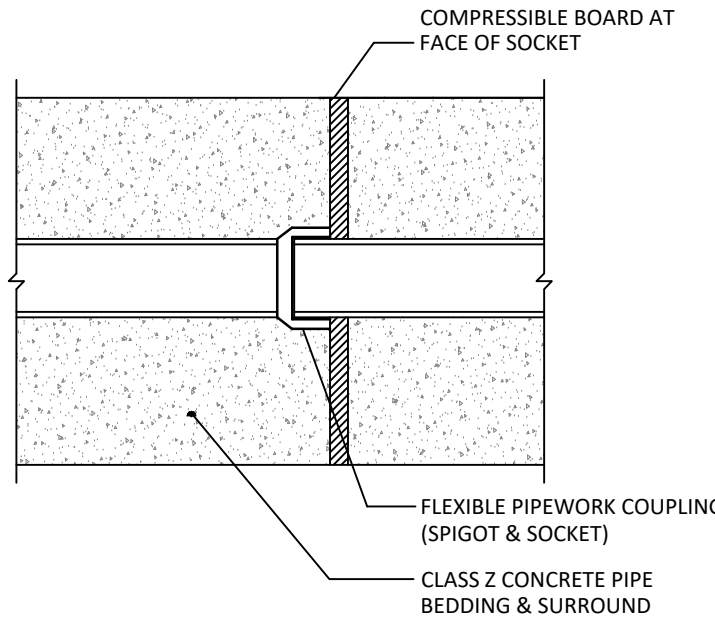
- TO BE USED UNDER:
1. VEHICULAR AREAS WHERE COVER TO PIPE SOFFIT IS EQUAL TO OR LESS THAN 900mm.
 2. ALL NON-VEHICULAR AREAS WHERE COVER TO PIPE SOFFIT IS EQUAL TO OR LESS THAN 350mm.

NOTE:
ALL PIPEWORK WITH CLASS Z (GEN 3/ST4) CONCRETE SURROUND SHALL HAVE FLEXIBLE COUPLINGS WITH FLEXI-BOARDS ON ALL JOINTS (REFER TO DETAIL D8)

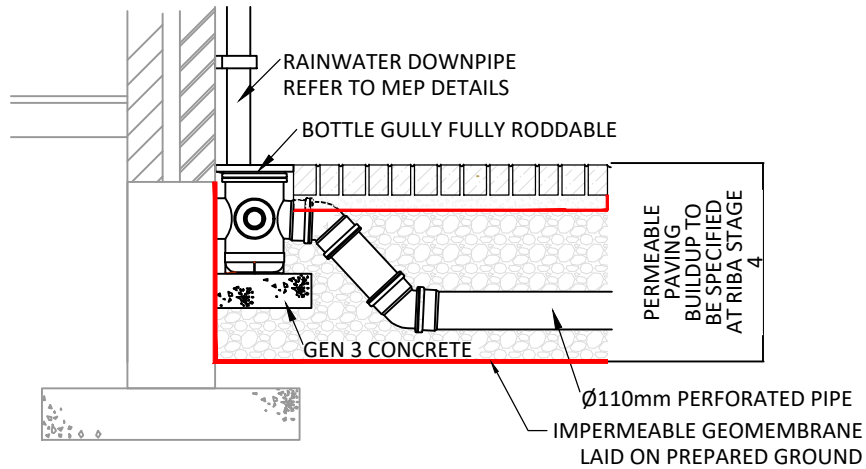
PIPE Ø (C) (mm)	D1 (mm)	D2 (mm)
100-600	150	400 - 900
675	150	975
750	150	1100
825	150	1125
900	150	1200
975	150	1275
1050	150	1350
1200	170	1540
1350	180	1710
1500	200	1900
1650	220	2090



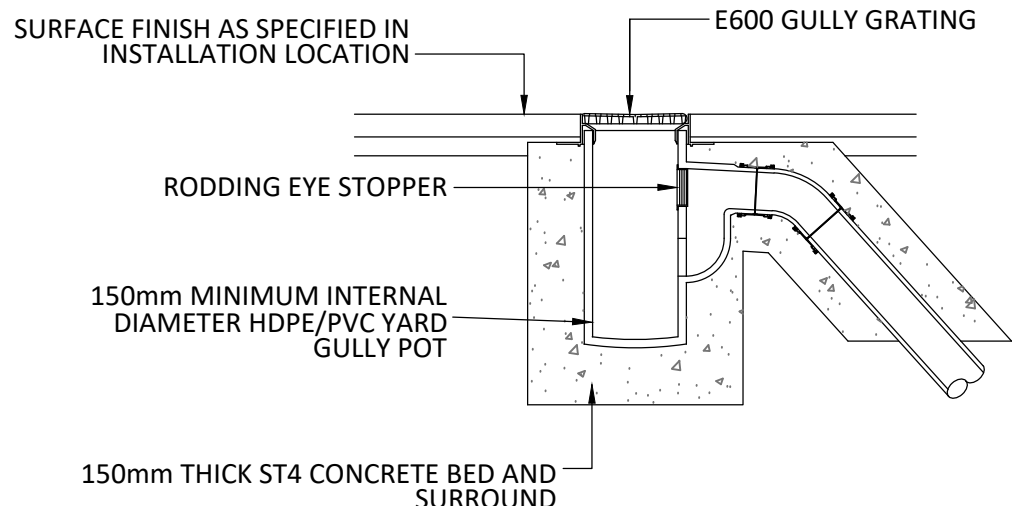
FLEXIBLE JOINT DETAIL FOR CONCRETE ENCASED SLEEVE JOINTED PIPES



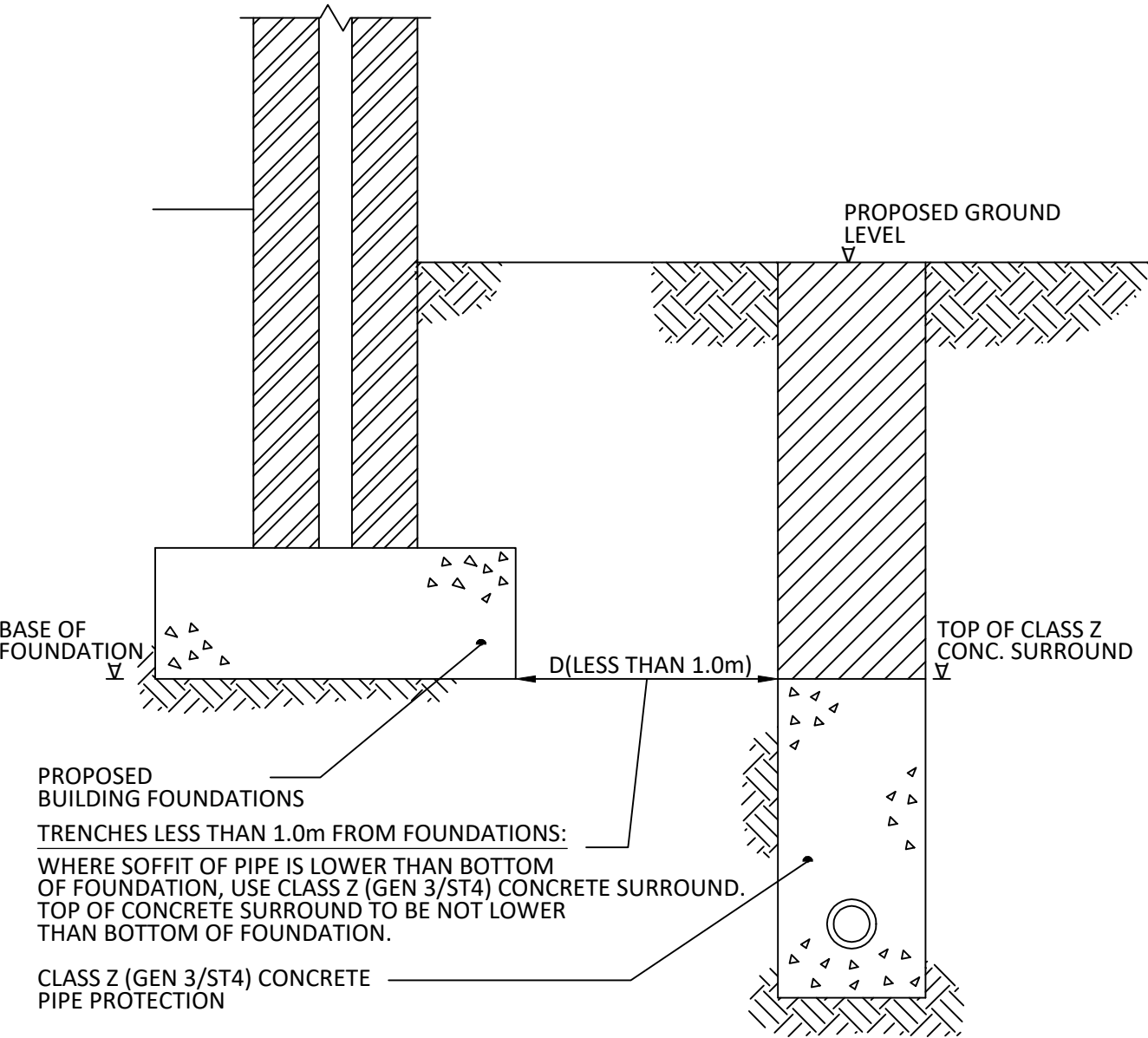
FLEXIBLE JOINT DETAIL FOR CONCRETE ENCASED PIPES (TO B.S. 1142)



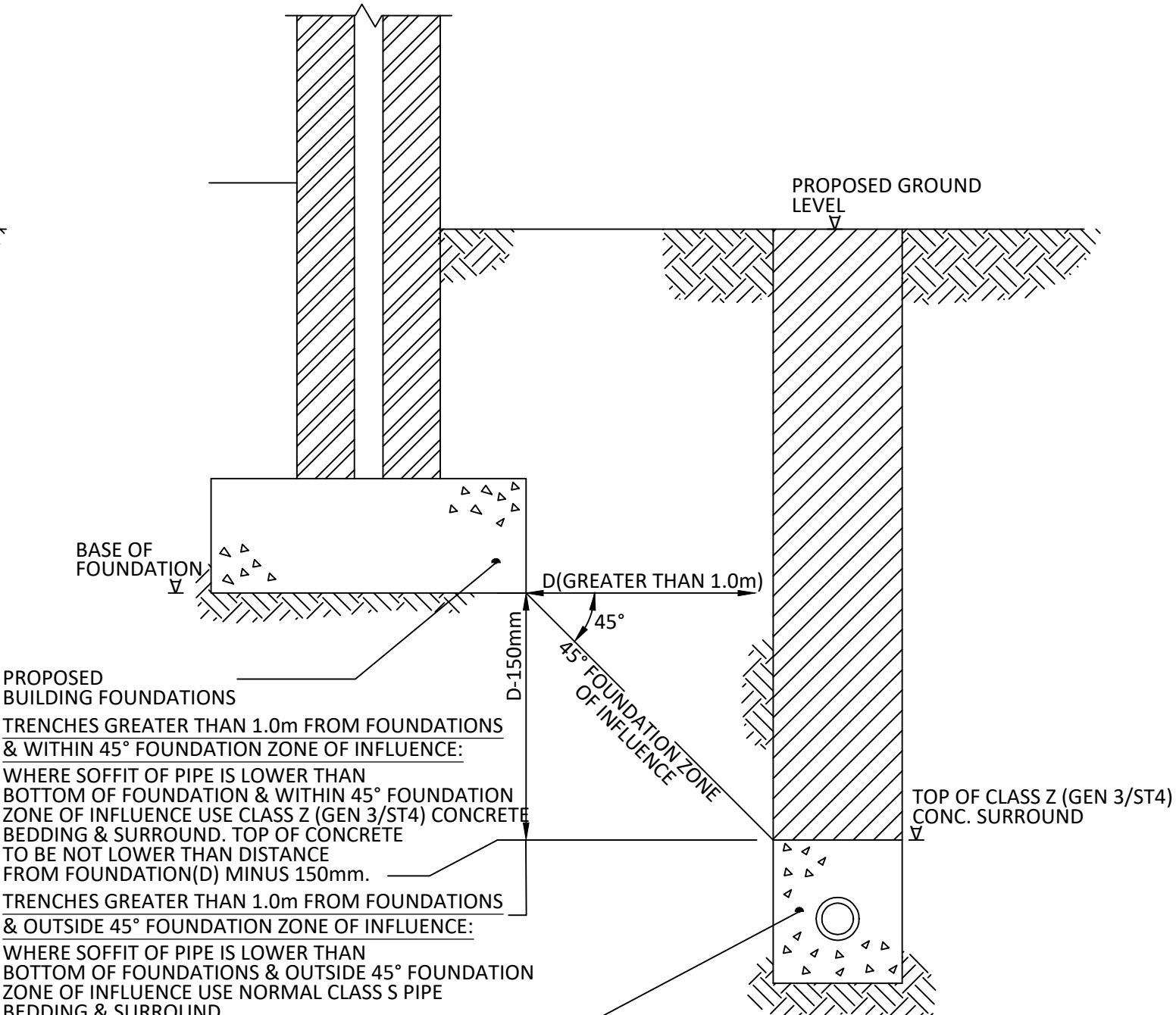
TYPICAL TRAPPED RWP/ BOTTLE GULLY DETAIL



TYPICAL YARD GULLY

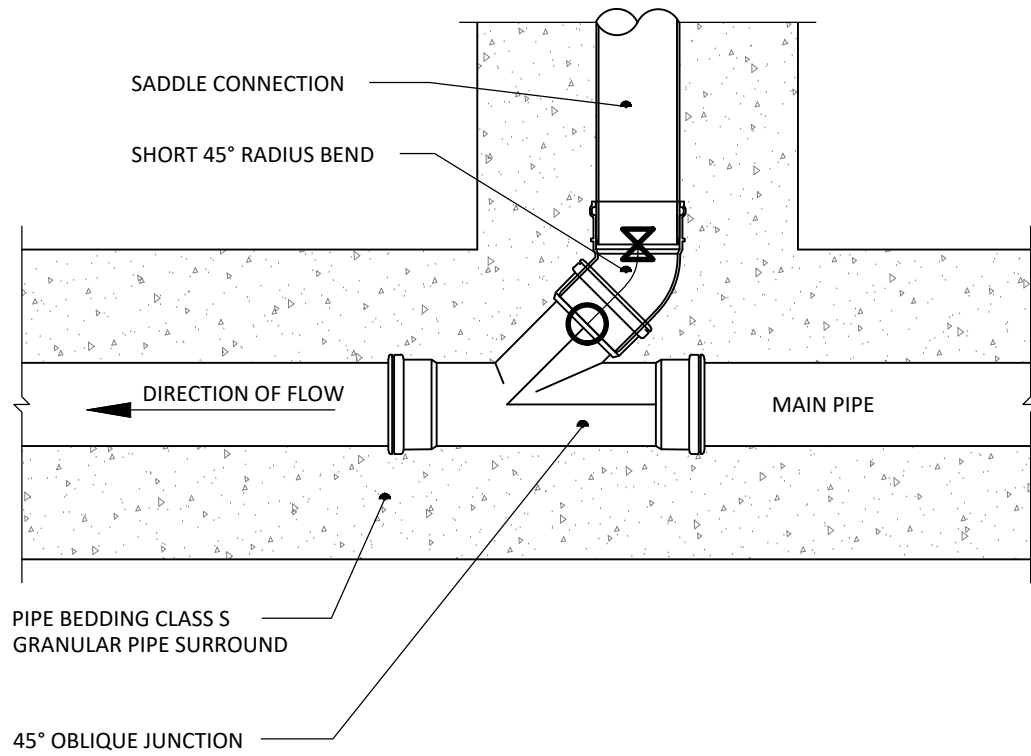


DRAINAGE TRENCH LESS THAN 1.0m FROM EXISTING/PROPOSED FOUNDATIONS

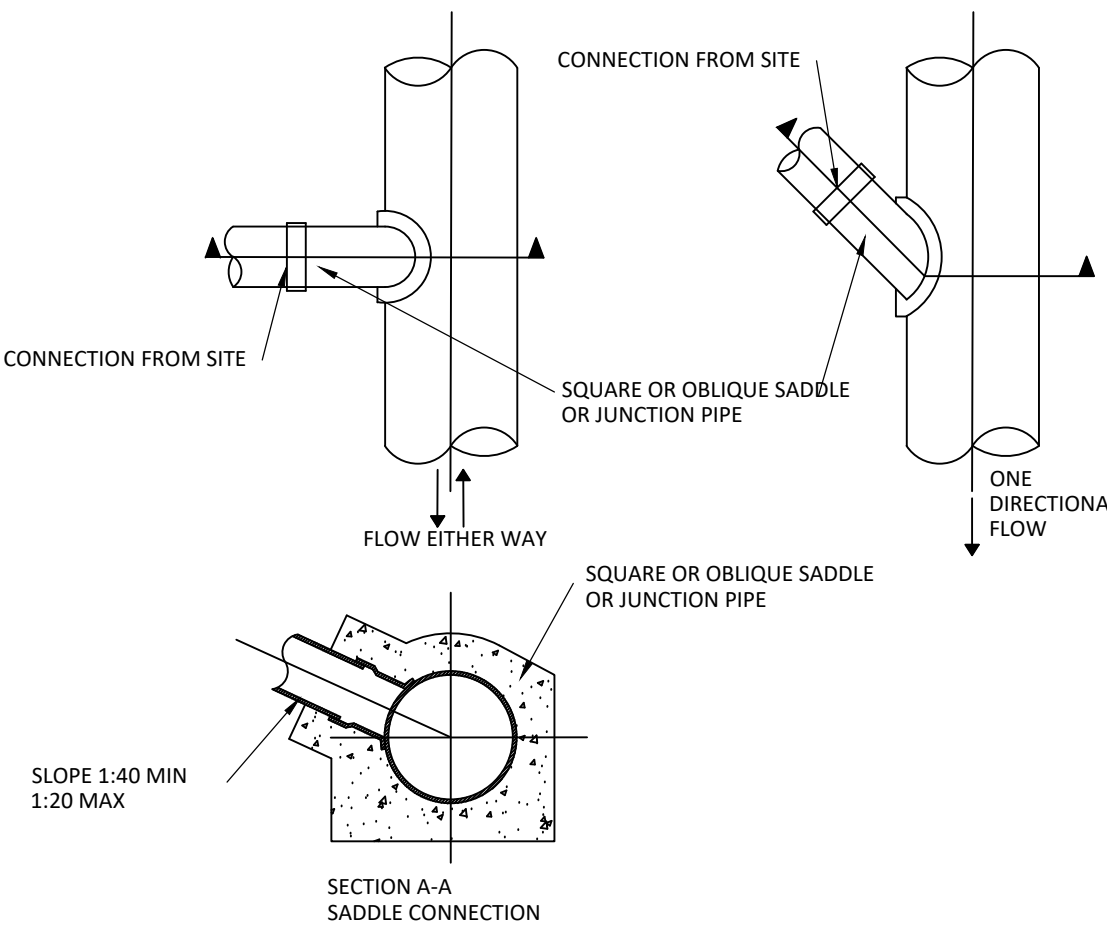


DRAINAGE TRENCH GREATER THAN 1.0m FROM EXISTING/PROPOSED FOUNDATIONS

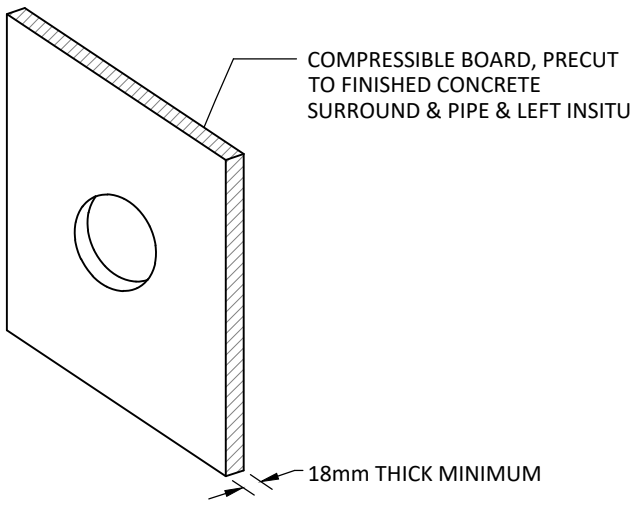
PIPE PROTECTION ADJACENT TO PROPOSED FOUNDATIONS



TYPICAL 45° PIPE JUNCTION CONNECTION DETAIL



TYPICAL SADDLE CONNECTION DETAIL



FLEXIBLE JOINT DETAIL FOR CONCRETE ENCASED SPIGOT & SOCKET JOINTED PIPES

Standard Notes

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01.06.22	P01	STAGE 3		TC	CK
Date	Rev	Description		Drawn	Chkd

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Project
**ELECTRIC PARK
POLLAR STREET
PHASE 1**

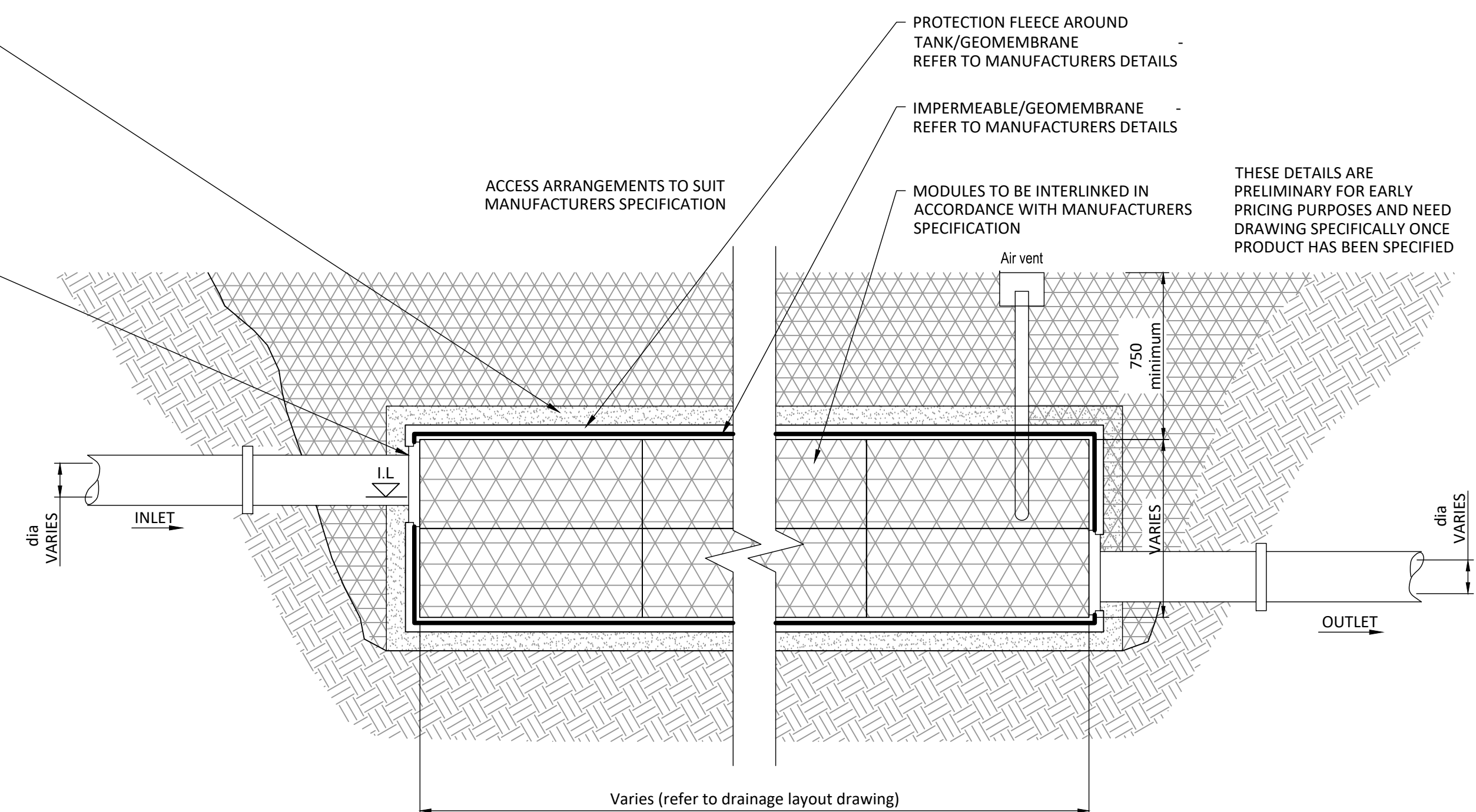
Title
**DRAINAGE DETAILS
SHEET 4**

Status	STAGE 3				
Project Number	Scale @ A1	Date Created	Drawn	Checked	Suitability
969-03	1:20	MAY 22	AMGRJW		--
Revision Number					Revision
969-03-CIV-XX-XX-D-C-31004					P01

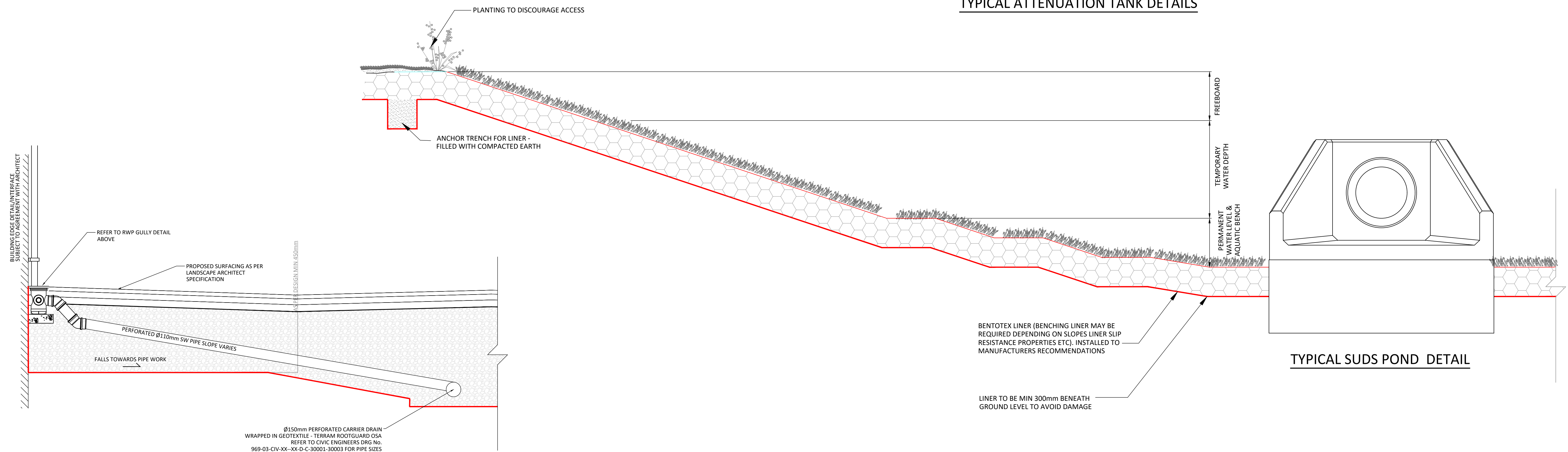


BACKFILL AROUND THE SIDES OF
MODULAR UNIT FOR 100 THICKNESS
USING COARSE SAND OR 6H SELECTED
GRANULAR MATERIAL. REMAINING
EXCAVATED AREAS TO BE BACKFILLED
WITH CLASS 6N OR 6P GRANULAR
MATERIAL IN ACCORDANCE WITH
MCHW VOLUME 1 OR SIMILARLY
APPROVED SPECIFICATION

PIPES CONNECTED TO THE ATTENUATION TANK USING HEAVY DUTY PIPE COLLARS (INSERTED INTO THE PERMEABLE MEMBRANE) WITH STAINLESS STEEL STRANGLE BANDS FOR FASTENING AROUND THE PIPE



TYPICAL ATTENUATION TANK DETAILS



TYPICAL SECTION PERMEABLE SURFACING SHOWING INTERACTION
BETWEEN RWP AND PERFORATED CARRIER DRAIN

SCALE: NTS

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							Title DRAINAGE DETAILS SHEET 5					MANCHESTER LONDON LEEDS GLASGOW Carver's Warehouse, 77 Dale Street, Manchester, M1 2HG, Tel: 0161 228 8701 Rusby Wharf, 33 Mill Street, London SE1 2AR, Tel: 020 7253 2977 Tower Works, Unit 82-83, Gilder Road, Leeds, LS11 5JQ, Tel: 0113 2015 130 Granville Chambers, 45 York Walk E, Glasgow, G1 2PT, Tel: 0141 370 1839 www.civicingengineers.com				
												Status STAGE 3				
© CIVIC ENGINEERS LIMITED		29.08.23	P02	ISSUED FOR INFORMATION		TC	AMG	Project Number	Scale @ A1	Date Created	Drawn	Checked	Suitability	Drawing Number		Revision
		01.06.22	P01	STAGE 3		TC	CK	969-03	1:20	MAY 22	AMGRJW	--		969-03-CIV-XX-XX-D-C-31005		P02
		Date	Rev	Description		Drawn	Chk									

Appendix B – LK Site Investigation.

Appendix I

Permeability Tests

Site : Pollard Street, Manchester

Client : General Projects

Engineer : LKC

Job Number

LKC 20 1301

Sheet

1 / 2

Location	Date	Level	Location
TP1	12/10/2022	49.50 mOD	

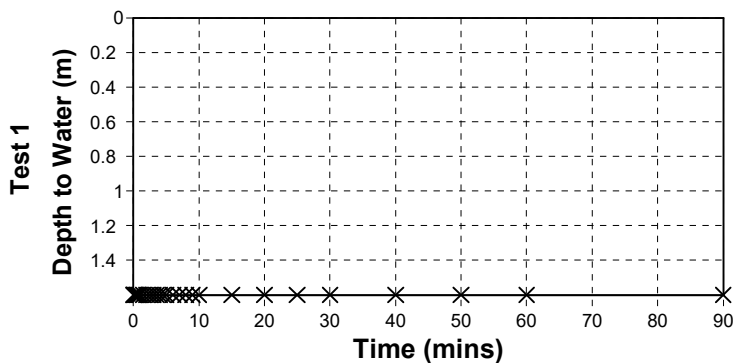
Pit Width (m)	0.60
Pit Depth (m)	1.60
Pit Length (m)	2.00

Soil type at test level	Made ground gravel
Groundwater	None
Drain discharge depth	None
Sidewall stability	Unstable
Stone filled or open pit	Open pit

	1
Effective depth (m)	0.00
Volume outflowing between 75% & 25% (m3)	0.00
Mean surface area through which outflow occurs (m2)	1.20
Time for outflow between 75% & 25% (min)	0.00
SOIL INFILTRATION RATE (ms-1), f	

Remarks

Elapsed time (hh:mm:ss)	Depth to Water Test 1
00:00:00	1.60
00:00:05	1.60
00:00:10	1.60
00:00:20	1.60
00:00:30	1.60
00:00:40	1.60
00:00:50	1.60
00:01:00	1.60
00:01:30	1.60
00:02:00	1.60
00:02:30	1.60
00:03:00	1.60
00:03:30	1.60
00:04:00	1.60
00:04:30	1.60
00:05:00	1.60
00:06:00	1.60
00:07:00	1.60
00:08:00	1.60
00:09:00	1.60
00:10:00	1.60
00:15:00	1.60
00:20:00	1.60
00:25:00	1.60
00:30:00	1.60
00:40:00	1.60
00:50:00	1.60
01:00:00	1.60
01:30:00	1.60



Site : Pollard Street, Manchester

Client : General Projects

Engineer : LKC

Job Number

LKC 20 1301

Sheet

2 / 2

Location	Date	Level	Location
TP8	04/10/2022		

Pit Width (m)	0.60
Pit Depth (m)	2.80
Pit Length (m)	2.00

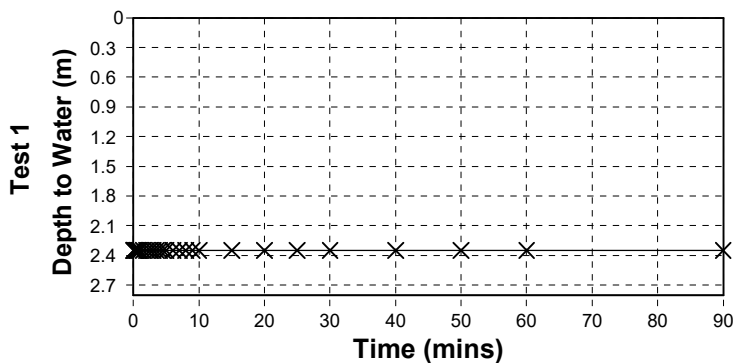
Soil type at test level	Clay
Groundwater	None
Drain discharge depth	None
Sidewall stability	Stable
Stone filled or open pit	Stone filled

	1
Effective depth (m)	0.45
Volume outflowing between 75% & 25% (m3)*	
Mean surface area through which outflow occurs (m2)	
Time for outflow between 75% & 25% (min)	
SOIL INFILTRATION RATE (ms-1), f	Test Failed

Remarks

* Volume outflowing reduced to account for granular backfill used during testing (30 % of free volume assumed).

Elapsed time (hh:mm:ss)	Depth to Water Test 1
00:00:00	2.35
00:00:05	2.35
00:00:10	2.35
00:00:20	2.35
00:00:30	2.35
00:00:40	2.35
00:00:50	2.35
00:01:00	2.35
00:01:30	2.35
00:02:00	2.35
00:02:30	2.35
00:03:00	2.35
00:03:30	2.35
00:04:00	2.35
00:04:30	2.35
00:05:00	2.35
00:06:00	2.35
00:07:00	2.35
00:08:00	2.35
00:09:00	2.35
00:10:00	2.35
00:15:00	2.35
00:20:00	2.35
00:25:00	2.35
00:30:00	2.35
00:40:00	2.35
00:50:00	2.35
01:00:00	2.35
01:30:00	2.35



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- » Geotechnical
- » Contaminated Land
- » Flood Risk and Drainage
- » Asbestos
- » Invasive Species
- » Land Remediation
- » Project Management
- » Land Drilling

Appendix C – The Canal and Rivers Trust Correspondence

Andrea McGee

From: Gareth Taylor <Gareth.Taylor@canalrivertrust.org.uk>
Sent: 03 November 2022 13:57
To: Andrea McGee
Subject: RE: TPW-NOR-2223-008 - Electric Park, Pollard Street development (SWD Acceptance)

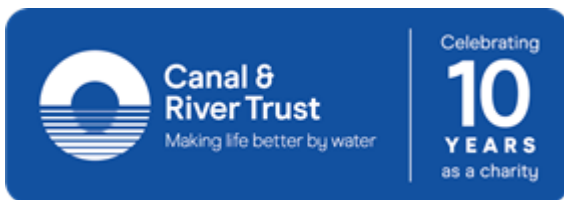
Andrea

I know Deborah has been working on this, but not sure where she is up to.
I would suggest you give her a call or email, as this falls outside my knowledge.

Deborah McCormick: 07768 447444

Gareth Taylor (BSc)

Infrastructure Services, Works Engineer (Northwest)
Northwest Region: Lancaster canal, Leeds to Liverpool canal (Yorkshire Boarder – Greenberfield Locks).
Manchester, Bury & Bolton Canal, Rochdale Canal & Ashton Canal.



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<https://canalrivertrust.org.uk/business-and-trade/undertaking-works-on-our-property-and-our-code-of-practice>

From: Andrea McGee <andrea.mcgee@civicingineers.com>
Sent: 21 October 2022 12:06
To: Gareth Taylor <Gareth.Taylor@canalrivertrust.org.uk>
Cc: Robert Webster <robert.webster@civicingineers.com>; Deborah McCormick <Deborah.McCormick@canalrivertrust.org.uk>; Dan Podesta <dan@civicingineers.com>; Jordan Rutter <jordanrutter@macconsultingltd.com>
Subject: FW: TPW-NOR-2223-008 - Electric Park, Pollard Street development (SWD Acceptance)

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Hi Gareth,

I hope you are well.

Please see responses to your comments in **green** below.

Following your earlier email on the 6th of Oct, you advised:

“As the flood modelling has identified, infrastructure improvements to the Etihad waste weir will be required to enable us to mitigate the risk and accept the SWD. Deborah McCormick is currently in discussions with our Asset and Water Management team to establish the cost to complete the works. In addition to this cost, commercial fees will also apply, Deborah will be in touch to discuss the proposed heads of terms for the required commercial agreement.”

Can you please advise where Deborah is up to on this?

I notice our regular series of catch ups appears to have come to an end – it may be useful to have a call to discuss the below.

Can you please advise of your availability next week.

Thanks in advance,

Kind regards

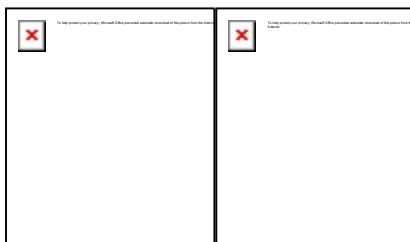
Andrea McGee

Civil Design Engineer

Direct Dial: 0161 393 4551

Mobile: 07398 414986

Office: 0161 228 6757



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From: Gareth Taylor <Gareth.Taylor@canalrivertrust.org.uk>

Sent: 19 October 2022 13:19

To: Andrea McGee <andrea.mcgee@civicengineers.com>

Cc: Robert Webster <robert.webster@civicengineers.com>; Deborah McCormick <Deborah.McCormick@canalrivertrust.org.uk>; Dan Podesta <dan@civicengineers.com>

Subject: TPW-NOR-2223-008 - Electric Park, Pollard Street development (SWD Acceptance)

Good day Andera

In relation to the Etihad works. Our Hydrology team who completed the assessment also undertook an inspection of the site and found no evidence of existing drainage to the canal, hence why the assessment was completed from zero run off rates. Although it is possible there may be some minor natural run off / seepage the proposed drainage will create a direct discharge to the canal, meaning the canal will receive the water more efficiently and much

quicker. Therefore, during times of flood will increase the risk to not just the local pound, but the wider canal including the lower pounds of the Rochdale Canal, where there is limited free board, and know over topping incidents. The highlighted risk is when the maximum discharge rate is received (during flood), along with the canal and other discharges to the network. Consequently, the possible impact of receiving any additional water needs to be managed, due to the canal(s) being at capacity. The acceptance of any surface water discharge (large or small) would be subject to the mitigation requirements. As we have been clear from the outset, in order to progress this scheme, we require your help with funding the necessary mitigation works.

Regardless of the above, a premium lump sum payment for the connection is applicable along with an annual charge, although the contribution to the weir will be included within the figure for the premium, in order to progress matters, please can you provide Deborah McCormick with the full cost of the next best feasible alternative for drainage, i.e., the full cost of connecting to the sewer and / or crossing the tramline. Without carrying out an additional design exercise, this is not information we would have readily available to provide. Can you please advise what you expect the premium lump sum for connection and annual charge is expected to be?

In addition to this, we will also need you to confirm the post development impermeable area. I recall from previous discussions that the outfall will remain private, we will therefore need to know who will be responsible for managing the payments and maintenance of the outfall long term. 0.6794HA Total impermeable area. Jordan, may be able to advise on future maintenance of the outfalls.

Once we have the information above, Deborah will draft the heads of terms for the proposed agreement.

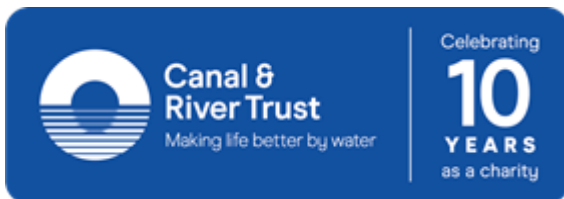
Regards

Gareth Taylor (BSc)

Infrastructure Services, Works Engineer (Northwest)

Northwest Region: Lancaster canal, Leeds to Liverpool canal (Yorkshire Boarder – Greenberfield Locks).

Manchester, Bury & Bolton Canal, Rochdale Canal & Ashton Canal.



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<https://canalrivertrust.org.uk/business-and-trade/undertaking-works-on-our-property-and-our-code-of-practice>

From: Andrea McGee <andrea.mcgee@civicingineers.com>

Sent: 17 October 2022 19:19

To: Gareth Taylor <Gareth.Taylor@canalrivertrust.org.uk>

Cc: Robert Webster <robert.webster@civicingineers.com>; Deborah McCormick

<Deborah.McCormick@canalrivertrust.org.uk>; Dan Podesta <dan@civicingineers.com>

Subject: RE: TPW-NOR-2223-008 - Electric Park, Pollard Street development (SWD Acceptance)

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Hi Gareth,

I hope you are well?

I wondered if you had time to review and consider my earlier email.

Kind regards

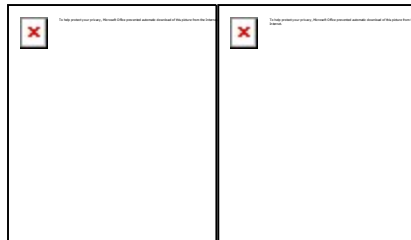
Andrea McGee

Civil Design Engineer

Direct Dial: 0161 393 4551

Mobile: 07398 414986

Office: 0161 228 6757



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From: Andrea McGee

Sent: 07 October 2022 17:20

To: Gareth Taylor <Gareth.Taylor@canalrivertrust.org.uk>

Cc: Robert Webster <robert.webster@civicengineers.com>; Deborah McCormick <Deborah.McCormick@canalrivertrust.org.uk>; Dan Podesta <dan@civicengineers.com>

Subject: FW: TPW-NOR-2223-008 - Electric Park, Pollard Street development (SWD Acceptance)

Hi Gareth,

Many thanks for getting this over to us.

I will double check the preferred address with the client and get back to you on that, if that is ok.

In relation to the required improvement works identified by your flood modelling, our thoughts on this are that we have used the existing rates of 3.4l/s discharge from the site, and so we are not increasing the rates into the canal. Therefore, if we are not increasing the rates in to the canal, would this scheme need to fund the improvements works to the Etihad waste weir?

I look forward to hearing from you soon,

Kind regards

From: Gareth Taylor <Gareth.Taylor@canalrivertrust.org.uk>
Sent: 06 October 2022 16:09
To: Andrea McGee <andrea.mcgee@civicengineers.com>; Deborah McCormick <Deborah.McCormick@canalrivertrust.org.uk>
Cc: Robert Webster <robert.webster@civicengineers.com>
Subject: TPW-NOR-2223-008 - Electric Park, Pollard Street development (SWD Acceptance)

Andrea

Subject: ELECTRIC PARK, POLLARD STREET DEVELOPMENT WATER DISCHARGE (SUBJECT TO CONTRACT)

The results of the assessment for the above SWD proposal is ACCEPTABLE on the information provided, to a maximum discharge rate of 3.4 l/s.

Considering this please find attached the SWD Acceptance Letter. If you could please review the address in the acceptance letter, I'm not certain I have used the right one.

More so please note the additional requirements and mitigations that would allow us to accept the SWD and ultimately make a connection to the canal. Without these additions (to be agreed with the Works Engineer and Utilities Surveyor) we would not be able to accept any SWD from the site to the Ashton Canal.

As we have confirmed in our previous discussions, due to the impact of accumulative risk identified with accepting the surface water from your scheme, this acceptance is conditional on the basis that the required mitigation measures to the canal are fully funded by yourselves.

As the flood modelling has identified, infrastructure improvements to the Etihad waste weir will be required to enable us to mitigate the risk and accept the SWD. Deborah McCormick is currently in discussions with our Asset and Water Management team to establish the cost to complete the works. In addition to this cost, commercial fees will also apply, Deborah will be in touch to discuss the proposed heads of terms for the required commercial agreement.

Additional to the SWD Assessment mitigation requirements, there remains the technical approval (Construction), for which I will need to review and approve the following.

- Works Information / Risk Assessment and Method Statements for the construction of the outfall(s) / headwall(s) along the boundary of the canal.
- Details of the Outfall(s) / Headwall(s) – to include a drawing showing the height and arrangement of discharge point in relation to the canal and the water levels
- Details of the routine maintenance schedule going forward – i.e. is this to stay private under a maintenance managing agent or is the drainage system to be adopted by the drainage authority?

Deborah McCormick will be in contact regarding the agreement, and discuss the mitigation required. However, it is important that no connection to the canal is made until this agreement is in place.

If you need anything further from me, please make contact, if not I will look forward to receiving the technical information but appreciate this may be with the site developers and not yourself.

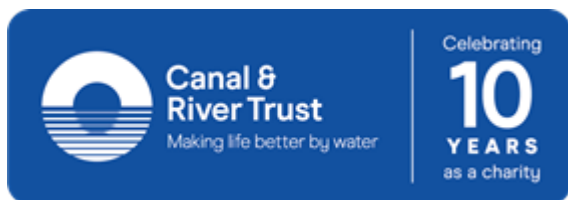
Regards

Gareth Taylor (BSc)

Infrastructure Services, Works Engineer (Northwest)

Northwest Region: Lancaster canal, Leeds to Liverpool canal (Yorkshire Boarder – Greenberfield Locks).

Manchester, Bury & Bolton Canal, Rochdale Canal & Ashton Canal.



Canal & River Trust | NW Waterway | Canal Cottage | Lowerhouse Lane | Rosegrove | Burnley | BB12 6HU | Mob: 07484 913064 |

For further information and a copy of the 3rd Party Code of Practice please follow the link below.

<https://canalrivertrust.org.uk/business-and-trade/undertaking-works-on-our-property-and-our-code-of-practice>

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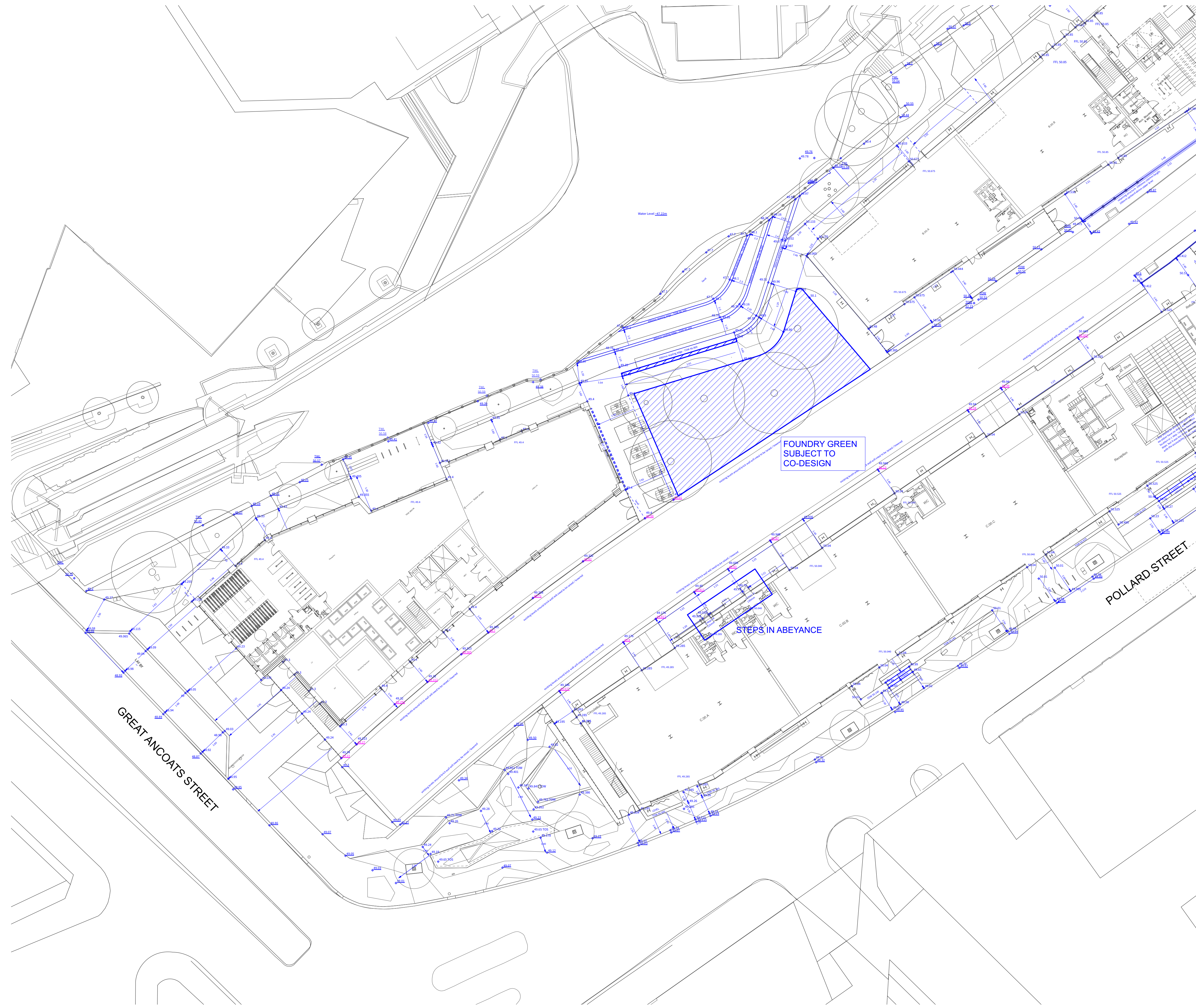
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Mae'r e-bost hwn a'i atodiadau ar gyfer defnydd y derbynnydd bwriedig yn unig. Os nad chi yw derbynnydd bwriedig yr e-bost hwn a'i atodiadau, ni ddylech gymryd unrhyw gamau ar sail y cynnwys, ond yn hytrach dylech eu dileu heb eu copïo na'u hanfon ymlaen a rhoi gwybod i'r anfonwr eich bod wedi eu derbyn ar ddamwain. Mae unrhyw farn neu safbwynt a fynegir yn eiddo i'r awdur yn unig ac nid ydynt o reidrwydd yn cynrychioli barn a safbwyntiau Glandŵr Cymru.

Mae Glandŵr Cymru yn gwmni cyfyngedig drwy warant a gofrestrwyd yng Nghymru a Lloegr gyda rhif cwmni 7807276 a rhif elusen gofrestredig 1146792. Swyddfa gofrestredig: National Waterways Museum Ellesmere Port, South Pier Road, Ellesmere Port, Cheshire CH65 4FW.

Appendix D – Planit-ie Proposed Site Levels

NOTE: co-design of foundry green - allow for provisional sum.



LOCATION PLAN

KEY

BOUNDARIES

Phase 1 Works Boundary

LEVELS & CONSTRAINTS

Spot Level - Existing
As Per Topographic Survey - Xx-xx-xx
Drawing: Survey Ref. Rnc N/a.
Originator: Survey Name

Spot Level - Existing
To be raised / lowered
As Per Topographic Survey - Xx-xx-xx
Drawing: Survey Ref. Rnc N/a.
Originator: Survey Name

Spot Level - Proposed

Gradients

Level area

Drainage Channel

Scale Bar (m)

0 5 10 20

D2-P03	14-06-22	Tender	JN	AM
D2-P02	01-06-22	Tender	TF	AM
S1-P01	10-05-22	For coordination	TF	AM

Revision	Date	Description	Drawn	Apprvd.

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LIVERPOOL
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Client General Projects

Project MXM Pollard Street

Drg Title External Levels - Sheet 1

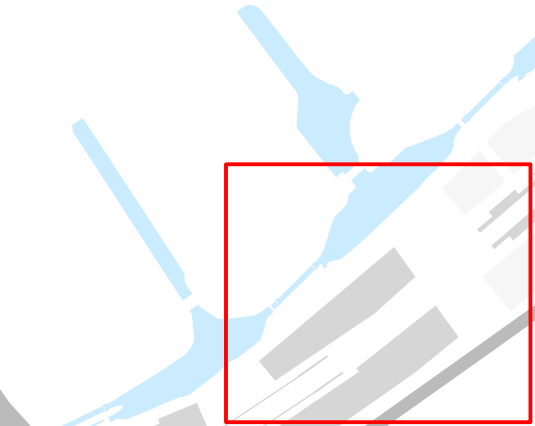
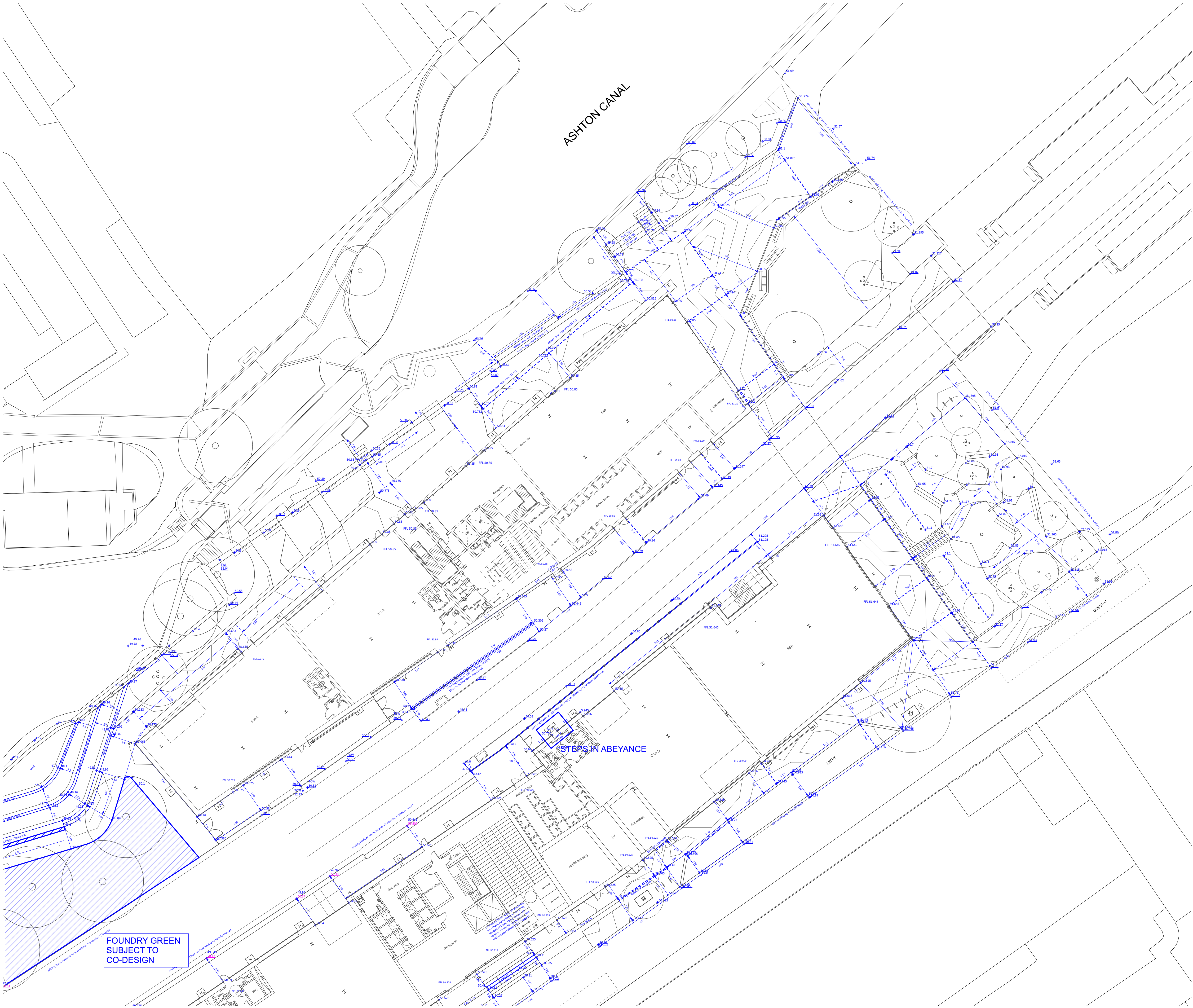
Created on	Created by	Approved by
11-02-22	TF	AM

Scale	Size	Workstage
1:250	A1	Stage 3/4

Drg No.	Suitability	Revision
PLS-PLA-ZZ-00-DR-L-3000	D2	P03

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NOTE: co-design of foundry green - allow for provisional sum.



LOCATION PLAN

KEY

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- NOTES:
1. Do not scale from this drawing.
 2. Always work to noted dimensions.
 3. All dimensions are in millimetres unless otherwise stated.
 4. All setting out, levels and dimensions to be agreed on site.
 5. The dimensions of all materials must be checked on site before being laid out.
 6. This drawing must be read with the relevant specification clauses and detail drawings.
 7. Order of construction and setting out to be agreed on site.

KEY

BOUNDARIES

Phase 1 Works Boundary

LEVELS & CONSTRAINTS

Spot Level - Existing
As Per Topographic Survey - Xx-xx-xx
Drawing: Survey Ref. Rnc N/a.
Originator: Survey Name

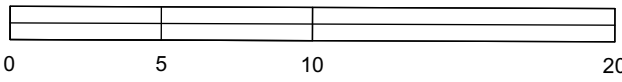
Spot Level - Existing
To be raised / lowered
As Per Topographic Survey - Xx-xx-xx
Drawing: Survey Ref. Rnc N/a.
Originator: Survey Name

Spot Level - Proposed

Gradients

Level area

Drainage Channel



D2-P03	14-06-22	Tender	JN	AM
D2-P01	01-06-22	Tender	TF	AM
S1-P01	10-05-22	For coordination	TF	AM
Revision	Date	Description	Drawn	Apprvd.

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Client General Projects

Project MXM Pollard Street

Drg Title External Levels - Sheet 2

Created on 11-02-22 Created by TF Approved by AM

Scale 1:250 Size A1 Workstage Stage 3/4

Drg No. PLS-PLA-ZZ-00-DR-L-3001 Suitability D2 Revision P03

Appendix E – United Utilities Correspondence

Andrea McGee

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 18 November 2022 14:23
To: Andrea McGee
Subject: RE: Repeat PDE 4200032473 Pollard Street new islington Manchester: new UU ref: 02949279

Good afternoon Andrea,

If the applicant provided written evidence to discard discharging the North part of the site to the adjacent Canal, then United Utilities will accept draining all the surface water from the proposed site to the public network at a maximum discharge rate total of 8l/s (3l/s from the north part and 5l/s from the south part).

Evidence related to cost viability will not be considered by United Utilities. The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining the cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Kind regards,



Mohammed Aljafarawi (He/Him)
Developer Engineer
Developer Services & Metering
Customer Services
M: 07950474499
unitedutilities.com

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----- Original Message -----

From: Andrea McGee [andrea.mcgee@civicengineers.com]
Sent: 07/11/2022 09:19
To: wastewaterdeveloperservices@uuplc.co.uk
Subject: RE: Repeat PDE 4200032473 Pollard Street new islington Manchester: new UU ref: 02949279

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Many thanks for your response.

As I mentioned in my previous email, discussions are still on going in relation to discharging surface water from the northern parcel of the site to the canal at 2 separate outfalls at a combined total rate of 3l/s, (1.5l/s per outfall).

If the CRT are unable to accept this, can UU accept surface water discharge for the entire site to the existing UU network at a total rate of 8l/s , as per current proposals?

I look forward to hearing from you.

Kind regards

Andrea McGee

Civil Design Engineer

Tel: 0161 393 4551

DDI: 07398 414986

Mobile: 0161 228 6757



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From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>

Sent: 27 October 2022 12:36

To: Andrea McGee <andrea.mcgee@civicengineers.com>

Subject: Repeat PDE 4200032473 Pollard Street new islington Manchester: new UU ref: 02949279

Good afternoon Andrea,

Thanks for your email, we can confirm the proposals are acceptable in principle to United Utilities (969-03-CIV-XX--XX-D-C-30001, Rev:P02, Dated: 15/06/2022), for the avoidance of doubt surface water for the south part of site must drain at the restricted rate of 5 l/s.

If we can be of any further assistance please don't hesitate to contact us further.

Kind regards,



Mohammed Aljafarawi (He/Him)

Developer Engineer
Developer Services & Metering
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