

Drainage Planning Conditions Supplementary Information

Subject: Land Off Elizabeth Street, Manchester

Ref: 080139

Date: 09/08//2023

The Planning Permission Ref: 133125FO/2022
Variation Application number: 136813/JO/2023

Manchester City Council Lead Local Flood Authority have provided comments in **red**. Curtins have provided comments in response in **purple**.

Condition 5

- Detailed drainage layout including labelled components, levels and connectivity; - **Cover levels and invert levels need to be accurately reflected within the Causeway modelling. Currently, there is a discrepancy between levels from drawing no. 080139 CUR XX XX D C 92500 P04 and modelling nodes. Route to outfall should also be clearly demonstrated within the drawing.**
The Causeway Flow Model has been updated to suit the current Drainage Layout. Please refer to Appendix A for:
 - Drainage Layout
 - Manhole Schedule
 - Drainage Details Sheet 1
 - Drainage Details Sheet 2
 - Drainage Details Sheet 3Please refer to Appendix B FOR:
 - Causeway Flow Surface Water Calculations Without Surcharged Outfall
 - Causeway Flow Surface Water Calculations Without Surcharged Outfall
- For sites where proposed development would cause unusual pollution risk to surface water, evidence of pollution control measures (preferably through SuDS) is required; - Hazard index, chapter 7 – **No evidence of the developer completing this assessment is available on MCC planning portal. Can the developer please submit this assessment for review.**
There are limited opportunities for SuDS on site. An assessment of SuDS has been provided in the FRA and Drainage Report submitted for planning and the treatment proposal is note din section 6.4.12.
The intention is to provide localised rain gardens which will accept run-off from adjacent paved areas however this will not be sufficient to treat the main areas of the site.
A petrol Interceptor has therefore been specified for the site.
Based on the Site Use Goods Vehicles, we have specified a Full Retention Class 1 Separator with alarm.
We have therefore specified a SPEL Puraceptor.product P015/1CSC which has a capability to treat up to 15 l/s.

- Construction details of flow control and SuDS elements – Level of cover within the attenuation tank must be listed within the standard details; Typical drainage details sheet 3, 080139-CUR-XX-XX-DR-C-92522-P02. Details should be submitted for all SuDS components and reflect site specific details.

Attenuation Tank Sections have been updated, however they are generic as they refer to the manufacturer design. The contractor has proposed to use an SDS Geocellular tank and therefore SDS Details to be referred to.

Please refer to Appendix A for:

- Drainage Details Sheet 3
- (b) The phase shall then be constructed in accordance with the approved details, within an agreed timescale. – No details have been submitted regarding current plan of construction. Contractor to provide programme.
- The proposed drainage drawing states the following; “CONDITION OF MANHOLE TO BE SURVEYED IF SUITABLE. ALLOWANCE FOR NEW MANHOLE TO BE ACCOUNTED FOR. SUBJECT TO S106 AGREEMENT”. The developer needs to undertake an assessment to deem if the outfall is suitable.
The manhole has been surveyed and appears to be in a suitable condition - we include a reference to a new manhole allowance for tender purposes in case United Utilities require a new manhole when they inspect the connection so as to not underestimate costings. Section 106 Application has been submitted to United Utilities for Approval.
- Where surface water is connected to the public sewer, agreement in principle from United Utilities is required. An email of acceptance of proposed flows and/or new connection will suffice.
United Utilities correspondence is included in Appendix C. Section 106 Application has been submitted to United Utilities for Approval.
- The proposed surface water sewer appears to clash with the existing foul public sewer, the developer will need to supply long-sections through the area in question for review.
Existing public sewer has been exposed at one location, upstream of the site crossing – grid reference E:384203, N: 400220.275. Drainage sections are provided in Appendix D.

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Appendix A

Drainage Layout

Manhole Schedule

Drainage Details Sheet 1

Drainage Details Sheet 2

Drainage Details Sheet 3



OUTFALL: 225Ø COMBINED CONNECTION TO EXISTING MANHOLE
S106 AGREEMENT REQUIRED WITH UNITED UTILITIES (DIRECT)
PART 1 BY CURTINS
PART 2 BY CONTRACTOR

BASED ON THE CURRENT DESIGN, PUMPING WILL NOT BE REQUIRED

DRAINAGE DESIGN FOR THE 30-YR & 100-YR (+40% CLIMATE CHANGE)
INCLUDES AN ALLOWANCE FOR A SURCHARGED OUTFALL LEVEL OF 54.5
(1M ABOVE SOFFIT LEVEL OF PUBLIC SEWER)

POLLUTION TREATMENT: OIL SEPARATOR

SUSTAINABLE DRAINAGE: RAIN GARDENS

INFILTRATION IS NOT CONSIDERED APPROPRIATE FOR THIS SCHEME

FOUL DRAINAGE DESIGN.

FOUL WATER DESIGN

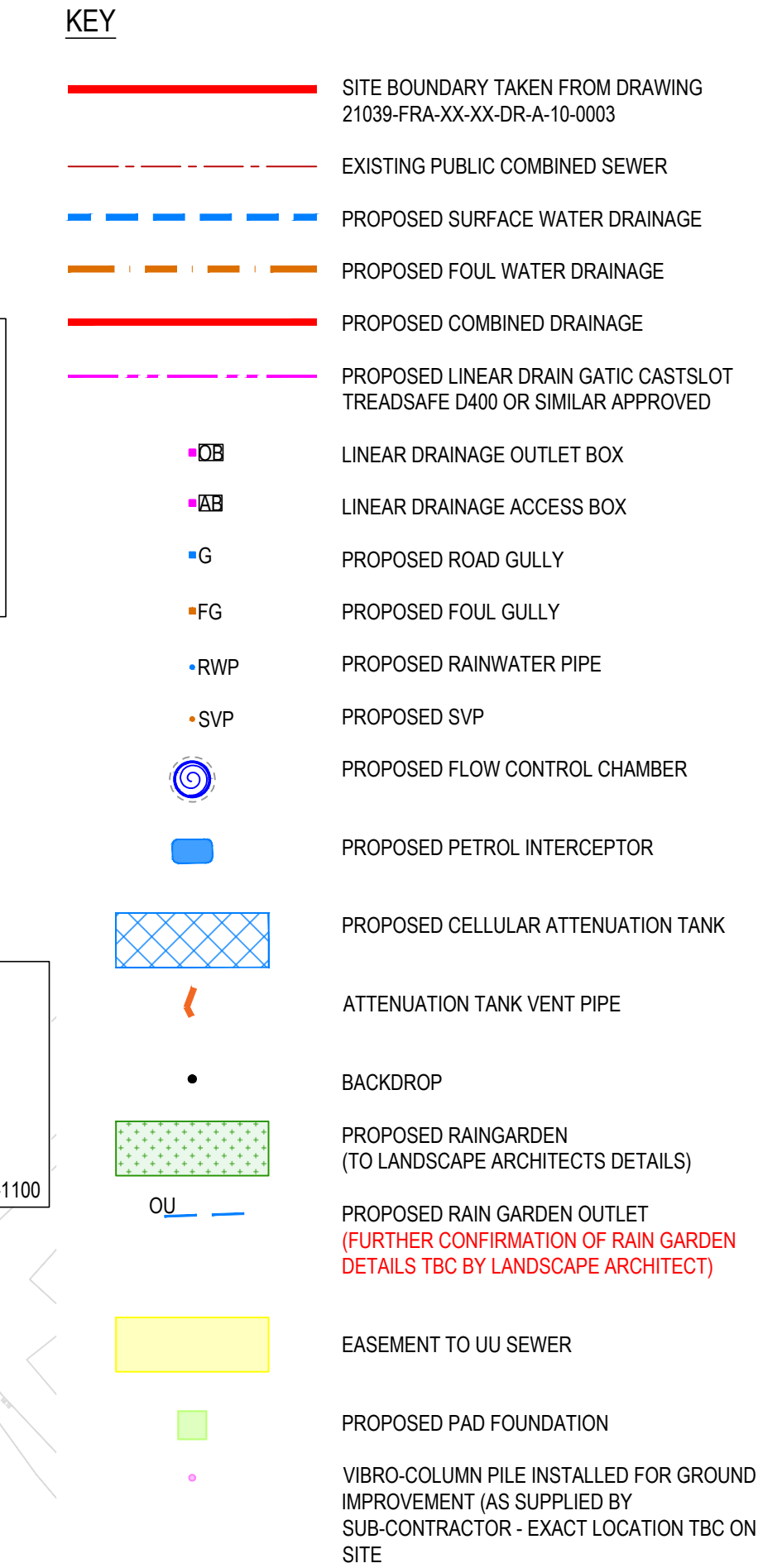
FW PEAK FLOW RATE: 4.7 l/s (BASED ON ESTIMATE OF 5 DUs PER UNIT).

OUTFALL: 225Ø COMBINED CONNECTION TO EXISTING MANHOLE
S106 AGREEMENT REQUIRED WITH UNITED UTILITIES (DIRECT)
PART 1 BY CURTINS
PART 2 BY CONTRACTOR

BASED ON THE CURRENT DESIGN, PUMPING WILL NOT BE REQUIRED.

"RESIDUAL HAZARD REGISTER (RELATES TO CIVIL/STRUCTURAL MATTERS ONLY)
MUST BE READ IN CONJUNCTION WITH CURTINS RESIDUAL HAZARD REGISTER 080139-CUR-XX-XX-HA-Z-00001.
HAZARDS THAT SHOULD BE OBVIOUS TO A COMPETENT CONTRACTOR HAVE NOT BEEN INDICATED ON THIS DRAWING.
SHOULD ANY ADDITIONAL HAZARDS BE IDENTIFIED, THE CONTRACTOR SHOULD NOTIFY ALL RELEVANT PROJECT TEAM
MEMBERS."

HAZARD REGISTER			
Hazard Ref.	Item (Feature, Element or Activity)	Potential Hazard Identified	Action (Information to Assist Control)
2.01	Construction activity next to an existing retaining feature around perimeter.	Collapse / failure of existing retaining feature due to condition / capacity under load.	Steer construction works away from the boundary condition and show clear zone on constraints plan.
2.02	Existing Buildings	Damage to existing buildings during construction	Liaison between contractor and neighbouring building owners and users. Contractor to agree working hours and method statements. Contractor to erect appropriate barriers and hoardings to protect occupants against interaction with works. Additional access routes to be considered to separate occupants and construction staff. The principal contractor must ensure that existing land /assets are not undermined during construction.
3.00 Existing Buried & Overhead Services			
3.01	Public combined sewer known to cross site. Location and depth known at one point only	Existing sewer could be damaged during construction activity.	Sewer to be located and marked out prior to construction works
5.00 Excavations & Foundations			
5.01	Excavation stability.	At 2.5 - 3.0m - excavation may be unstable in the temporary condition.	Note potential instability on drawings - draw attention to site investigation report. Avoid the need for working in the excavation where possible.
5.02	Contamination within Made Ground	Risk to end users and site operatives	Carry out detailed site investigation to determine remediation measures required. Inform contractor and design team as required.
8.00 Access & Maintenance			
8.01	Works in Public Highway	*Risk to operatives & Public off site from construction traffic. *	*Traffic Management plan to be developed *



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
3. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS OR DISCREPANCIES SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
4. ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.

FOR FULL DRAINAGE NOTES REFER
TO DRAWING CUR-XX-XX-DR-C-92530

DRAWING REFERENCES

THE DESIGN OF THIS SCHEME HAS BEEN DESIGNED IN ACCORDANCE WITH THE BELOW DRAWINGS AND INFORMATION.

SURVEYS

- TOPOGRAPHICAL SURVEY REF: TOPOGRAPHICAL SURVEY 'S22909-T_Rev -'. DATED APRIL 2021.
- CCTV SURVEY REF 000847 BY LAYER SURVEYS DATED MARCH 2022
- TRIAL PIT ON PUBLIC SEWER BY SEP 28/06/2022

ARCHITECT'S PLANS

- 21039-FRA-XX-XX-DR-A-90-0011 REV C3 ALL UNITS - SITE SETTING OUT PLAN
- 21039-FRA-XX-XX-DR-A-90-0013- REV C1 ALL UNITS - SITE DRAINAGE SETTING OUT

LANDSCAPE ARCHITECT'S PLANS

- 4018 101 REV B LANDSCAPE LAYOUT (FOR REFERENCE ONLY)

FOUNDATION PLANS

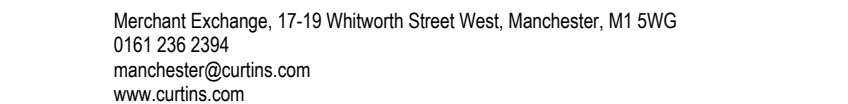
- 080139-CUR-01-FN-DR-S-16001 REV C01 UNIT 01 FOUNDATION GA
- 080139-CUR-02-FN-DR-S-16001 REV C02 UNIT 02 FOUNDATION GA
- 080139-CUR-04-FN-DR-S-16001 REV C02 UNIT 04 FOUNDATION GA
- 080139-CUR-09-FN-DR-S-16001 REV C02 UNIT 09 FOUNDATION GA
- 080139-CUR-ZZ-ZZ-DR-S-17001 REV C03 GA TO EXTERNAL

VIBRO-COLUMN GROUND IMPROVEMENT

- TCV-22310-2-3 REV A STONE COLUMN LAYOUT PLOT 2-3
- TCV-22310-4-8 REV - STONE COLUMN LAYOUT PLOT 4-8
- TCV-22310-9 REV - STONE COLUMN LAYOUT PLOT 9

RAIN GARDENS ALLOW FOR BACKFALL ON FOOTWAYS -
FINAL DETAILS TO BE REVIEWED AND CONFIRMED WITH
TRITON.

C01	CONSTRUCTION ISSUE	04/08/22	ATL	CG
P04	TENDER ISSUE	14/10/22	ATL	CG
P03	STAGE 3 UPDATE	23/06/22	LK	CG
P02	STAGE 3 ISSUE	15/06/22	LK	CG
P01	DRAFT ISSUE FOR COMMENT	13/05/22	CS	CG
Rev:	Description:	Date:	By:	Child



Status: **SUITABLE FOR STAGE**

SUITABLE FOR STAGE
APPROVAL

Project: ELIZABETH STREET,
CHEETHAM HILL

Drug Title: _____

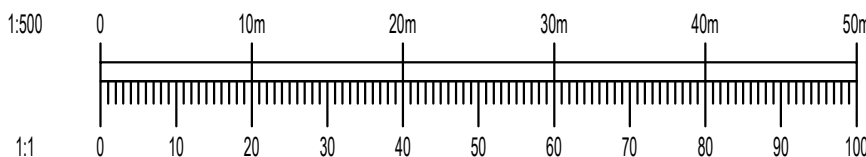
PROPOSED DRAINAGE LAYOUT

Drawn By	Designed By	Checked By	
LK	LK	CG	
	Date	Scales @ A1	
	12/05/22	1:500	
Project No - Originator - Function - Spatial - Form - Discipline - Number			Revision

080139 - CUR - XX - XX- D - C- 92500

Revision

C01



Manhole schedule																		
Surface Water Manholes																		
MH REF	CL (mAOD)	IL (mAOD)	DEPTH TO SOFFIT (m)	DS PIPE DIA (mm)	MH DIA (mm)	MH TYPE	CATCHPIT	CATCHPIT Depth (mm)	COVER SIZE (mm)	COVER CLASS	COVER TYPE	RECESSED	RESTRICTED ACCESS	BACK DROP	Back drop IL (m)	COMMENTS	EASTING	NORTHING
S1	55.730	54.830	0.60	300	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384220.965	400062.603
S2	55.730	54.580	0.85	300	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384236.864	400110.008
S3	55.800	54.261	1.16	375	1500	TYPE C	N	N/A	1200X675	B125	SINGLE SEALED	N	N	N	N/A		384252.244	400155.882
S4	55.860	54.900	0.66	300	1500	TYPE C	N	N/A	1200X675	D400	SINGLE SEALED	N	N	N	N/A		384186.319	400064.772
S5	55.870	54.454	1.12	300	1500	TYPE C	N	N/A	1200X675	D400	SINGLE SEALED	N	N	N	N/A		384207.152	400126.918
S6	55.880	54.002	1.43	450	1500	TYPE C	N	N/A	1200X675	D400	SINGLE SEALED	N	N	N	N/A		384220.436	400166.545
S7	55.590	54.310	0.83	450	1500	TYPE C	N	N/A	1200X675	D400	SINGLE SEALED	N	N	N	N/A		384165.457	400066.617
S8	55.590	54.148	0.99	450	1500	TYPE C	Y	500	1200X675	D400	SINGLE SEALED	N	N	N	N/A	CP DEPTH: 500mm	384177.825	400103.871
S9	55.880	54.900	0.76	225	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384130.333	400159.789
S10	55.880	54.658	1.00	225	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384159.093	400150.149
S11	55.590	53.990	1.15	450	1500	TYPE C	N	N/A	1200X675	D400	SINGLE SEALED	N	N	N	N/A		384189.774	400139.866
S12	56.180	53.846	1.88	450	1500	TYPE B	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384200.186	400171.23
S13	56.390	55.500	0.67	225	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384157.776	400247.123
S14	56.500	55.391	0.88	225	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384166.138	400244.437
S15	56.490	55.500	0.77	225	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384152.686	400214.112
S16	55.820	54.150	1.22	450	1500	TYPE C	N	N/A	1200X675	D400	SINGLE SEALED	N	N	N	N/A		384114.652	400216.731
S17	56.270	53.986	1.83	450	1500	TYPE B	Y	500	600X600	D400	SINGLE SEALED	N	N	N	N/A	CP DEPTH: 500mm	384152.590	400204.015
S18	56.030	54.600	1.21	225	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	Y	N	N/A	RESTRICTED ACCESS 350mm DIA MAX;	384130.509	400193.971
S19	56.030	54.227	1.58	225	1500	TYPE B	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384181.694	400176.726
S20	56.270	53.860	1.96	450	1500	TYPE B	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384187	400192.475
S21	56.750	53.690	2.61	450	1500	TYPE B	N	N/A	600X600	B125	SINGLE SEALED	N	N	N	N/A		384214.327	400204.953
S22	56.830	55.300	1.38	150	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	Y	N	N/A	RESTRICTED ACCESS 350mm DIA MAX;	384241.384	400222.245
S23	56.730	55.300	1.28	150	600	PPIC	N	N/A	600X600	D400	SINGLE SEALED	N	Y	N	N/A	RESTRICTED ACCESS 350mm DIA MAX;	384234.697	400192.502
S24	56.830	54.499	2.11	225	1500	TYPE B	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384222.871	400205.88
S25	56.720	53.665	2.83	225	1500	TYPE B	Y	*TBC	1200X675	D400	SINGLE SEALED	N	N	N	N/A	HYDROBRAKE MANHOLE 1500mm *SUMP DEPTH TBC BY HYDROBRAKE SUPPLIER	384227.071	400218.929
S26	57.000	53.506	3.27	225	1200	TYPE A1/2	N	N/A	600X600	B125	SINGLE SEALED	N	N	N	N/A	P TRAP ON OUTLET	384234.439	400225.535

Foul Water Manholes																		
MH REF	CL (mAOD)	IL (mAOD)	DEPTH TO SOFFIT (m)	DS PIPE DIA (mm)	MH DIA (mm)	MH TYPE	CATCHPIT	CATCHPIT Depth (mm)	COVER SIZE (mm)	COVER CLASS	COVER TYPE	RECESSED	RESTRICTED ACCESS	BACK DROP	Back drop IL (m)	COMMENTS	EASTING	NORTHING
F1	56.010	55.350	0.56	100	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	N	N	N/A		384123.742	400201.527
F2	56.010	55.202	0.71	100	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	N	N	N/A		384131.175	400199.023
F3	56.010	54.672	1.19	150	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	Y	N	N/A		384163.811	400188.027
F4	56.030	55.350	0.58	100	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	N	N	N/A		384192.892	400178.275
F5	56.030	55.001	0.93	100	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	N	N	N/A		384170.189	400185.879
F6	55.880	55.310	0.47	100	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	N	N	N/A		384205.366	400118.504
F7	55.870	54.680	1.04	150	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	N	N	N/A		384218.829	400158.67
F8	56.490	55.700	0.69	100	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	N	N	N/A		384164.903	400238.854
F9	56.840	54.198	2.49	150	1200	TYPE B	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384206.338	400210.216
F10	56.830	55.570	1.16	100	450	PPIC	N	N/A	450X450	D400	SINGLE SEALED	N	N	N	N/A		384231.299	400210.963
F11	56.940	54.010	2.78	150	1200	TYPE B	N	N/A	600X600	D400	SINGLE SEALED	N	N	Y	55.360	BD IL: 55.36m	384220.112	400223.008

Combined Water Manholes																		
MH REF	CL (mAOD)	IL (mAOD)	DEPTH TO SOFFIT (m)	DS PIPE DIA (mm)	MH DIA (mm)	MH TYPE	CATCHPIT	CATCHPIT Depth (mm)	COVER SIZE (mm)	COVER CLASS	COVER TYPE	RECESSED	RESTRICTED ACCESS	BACK DROP	Back drop IL (m)	COMMENTS	EASTING	NORTHING
C1	56.530	53.455	2.85	225	1500	TYPE B	N	N/A	600X600	D400	SINGLE SEALED	N	N	N	N/A		384231.515	400233.598

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. ALL ADOPTABLE DRAINAGE WORKS INCLUDING WORKS TO EXISTING PUBLIC SEWERS TO BE UNDERTAKEN IN ACCORDANCE WITH "SEWERS FOR ADOPTION 7th EDITION" AND "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION" AND CONSTRUCTED TO THE RELEVANT STATUTORY UNDERTAKERS DETAILS.
3. ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH CURTINS DRAINAGE SPECIFICATION, "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION", BS EN 752 2017 'DRAIN AND SEWER SYSTEMS OUTSIDE BUILDINGS' AND THE BUILDING REGULATIONS APPROVED 'DOCUMENT H'.
4. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
5. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
6. THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION MAY NEED TO BE INCREASED TO ACCOMMODATE THE CONNECTIONS AND BENDS.
7. COVER LEVELS BASED ON TENDER DESIGN LEVELS REDUCED BY 0.1m READ IN CONJUNCTION WITH TRITON LEVELS SKETCH.
8. COVER LEVELS, GULLY POSITIONS, AND BUILDING LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/LANDSCAPE ARCHITECT. CONTRACTOR TO ALLOW FOR ADJUSTMENT TO SUIT AGREED POSITIONS AND FINISHED LEVELS, AND CONFIRM ALL COVER LEVELS ON SITE.
9. ALL MANHOLE COVERS IN BLOCK/SLAB AND EXTERNAL PAVING AREAS MAY REQUIRE RECESSED COVERS OF THE APPROPRIATE GRADE TO ACCEPT THE LANDSCAPE ARCHITECT'S PAVING PROPOSAL UNLESS CONFIRMED OTHERWISE.
10. THE LANDSCAPE ARCHITECT MAY REQUIRE THE ORIENTATION OF CHAMBER COVERS TO BE CO-ORDINATED WITH THE PAVING PATTERN. THIS WILL BE SUBJECT TO REVIEW WITH THE MANHOLE INTERNAL BENCHING ARRANGEMENT, LANDING AND STEP LOCATION AND IF REQUIRED, SHOULD BE ADVISED TO US AS SOON AS POSSIBLE.
11. ALL MANHOLE, GULLY AND CHANNEL (ACCESS/OUTLET) COVERS (IRONWORK) SHOULD BE THE FOLLOWING SPECIFICATION:
 - B125 LOAD CLASS IN PEDESTRIAN AREAS
 - D400 LOAD CLASS IN VEHICULAR AREASANY AMBIGUITIES ON DRAWINGS/ACCESS AND MAINTENANCE STRATEGY SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY.
12. ALL SURFACE CHANNEL ACCESS BOXES/OUTLET BOXES IN BLOCK/SLAB AND EXTERNAL PAVING AREAS MAY REQUIRE RECESSED COVERS OF THE APPROPRIATE GRADE TO ACCEPT THE LANDSCAPE ARCHITECT'S PAVING PROPOSAL. TBC BY LANDSCAPE ARCHITECT AND SUBJECT TO AVAILABILITY FROM MANUFACTURER.
13. ALL SURFACE CHANNELS TO BE OF THE TREADSAFE TYPE, UNLESS OTHERWISE SPECIFIED.
14. ALL PROPRIETARY PRODUCTS TO BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS, INSTRUCTIONS AND RECOMMENDATIONS.

C01	CONSTRUCTION ISSUE	04/08/23	ATL	CG
P03	TENDER ISSUE	14/10/22	ATL	CG
P02	STAGE 3 UPDATE	23/06/22	LK	CG
P01	STAGE 3 ISSUE	15/06/22	LK	CG
Rev:	Description:	Date:	By:	Chkd:



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Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer
Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kenton • Leeds • Liverpool • London • Manchester • Nottingham

Status: SUITABLE FOR STAGE APPROVAL

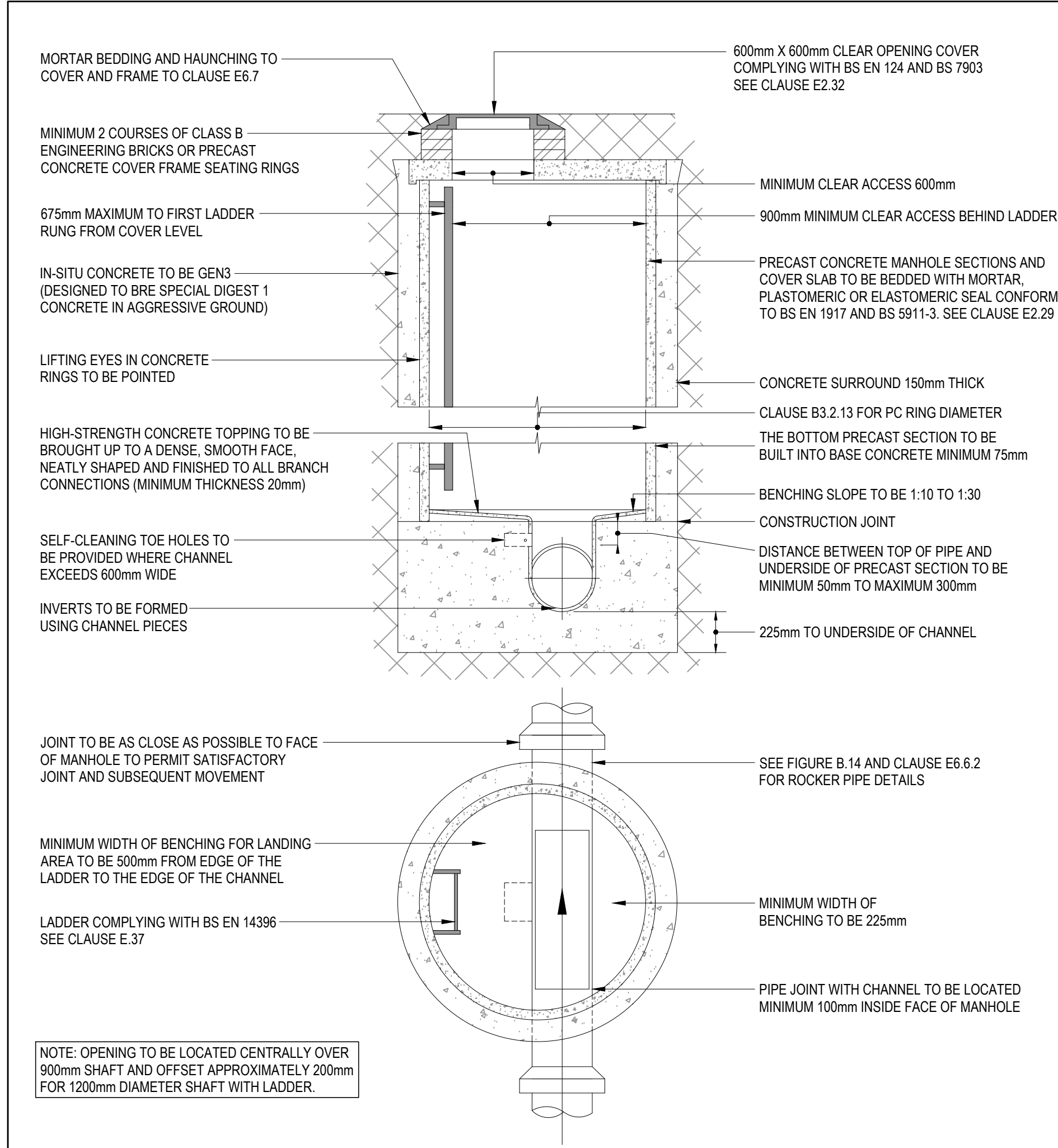
S4

Project: ELIZABETH STREET, CHEETHAM HILL

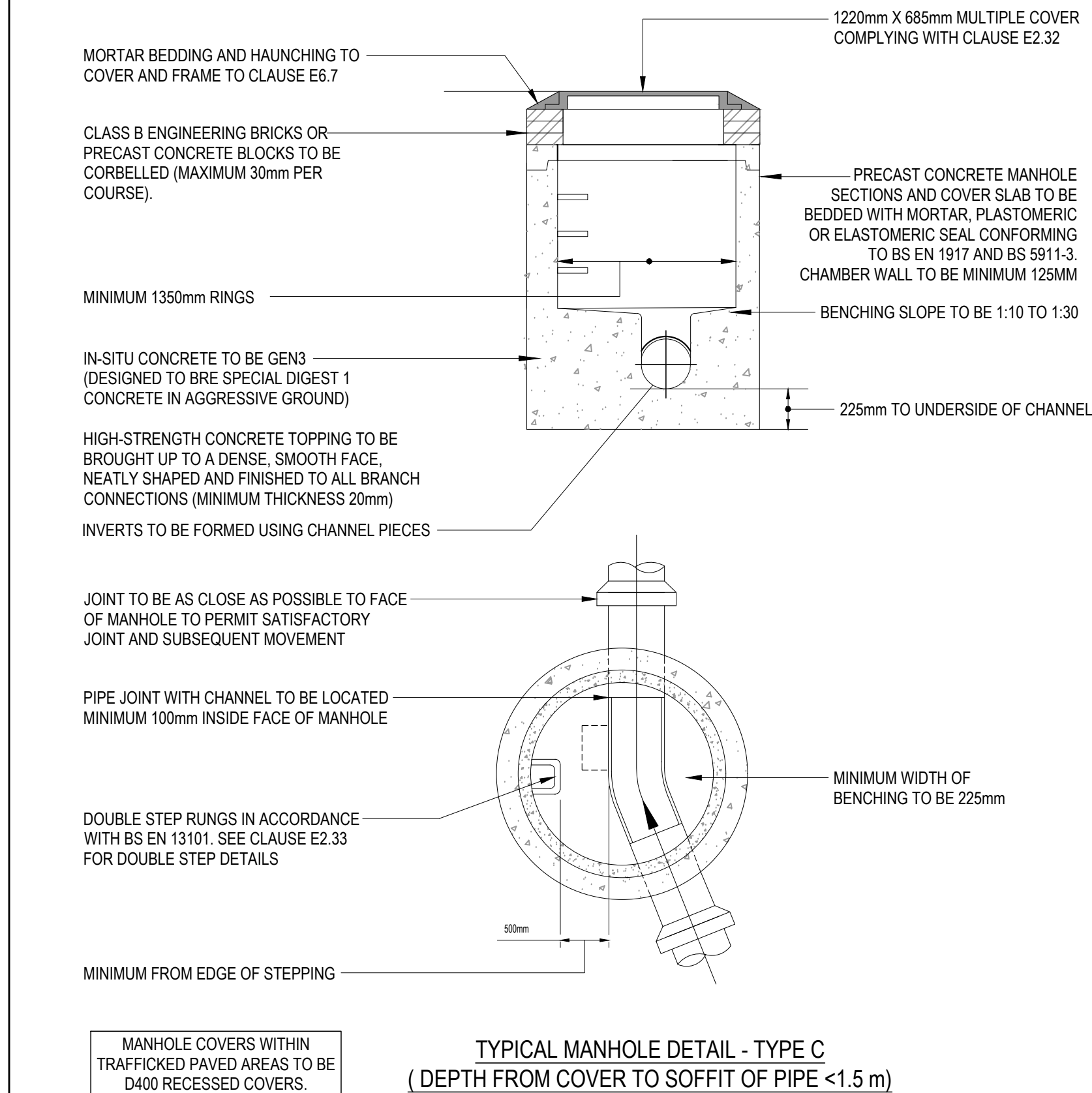
Orig Title: MANHOLE SCHEDULES SHEET 1

Size:	Date:	Drawn By:	Designed By:	Checked By:			
A1	27/05/22	LK	CG	CG			
Scale:	1:20						
Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
080139 - CUR - XX - XX - DR - C - 92510 - C01							

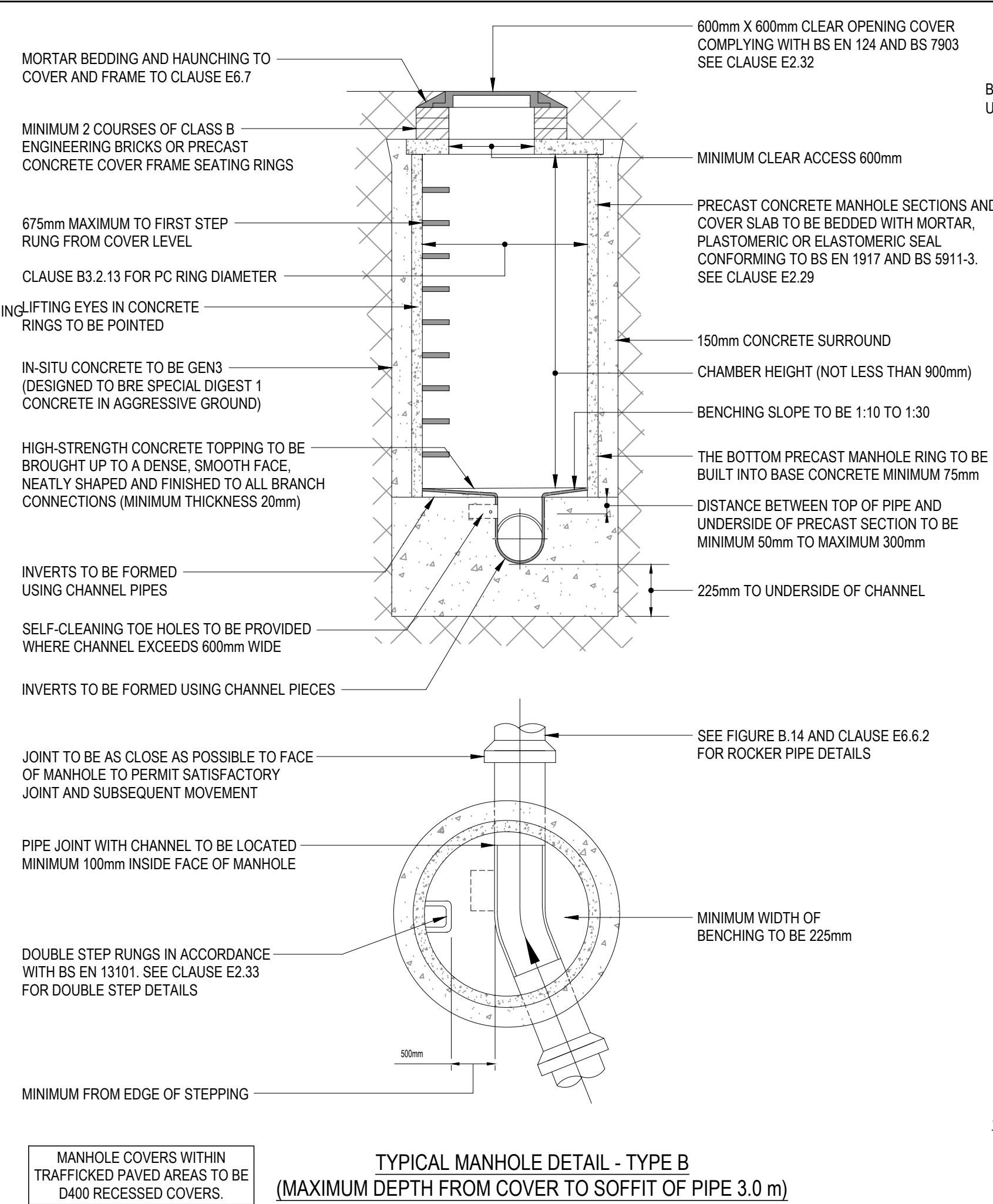
\\msd\p\Projects\080139 - Elizabeth Street, Cheetham Hill\04 Production\4x Models Drawings\CG\00292



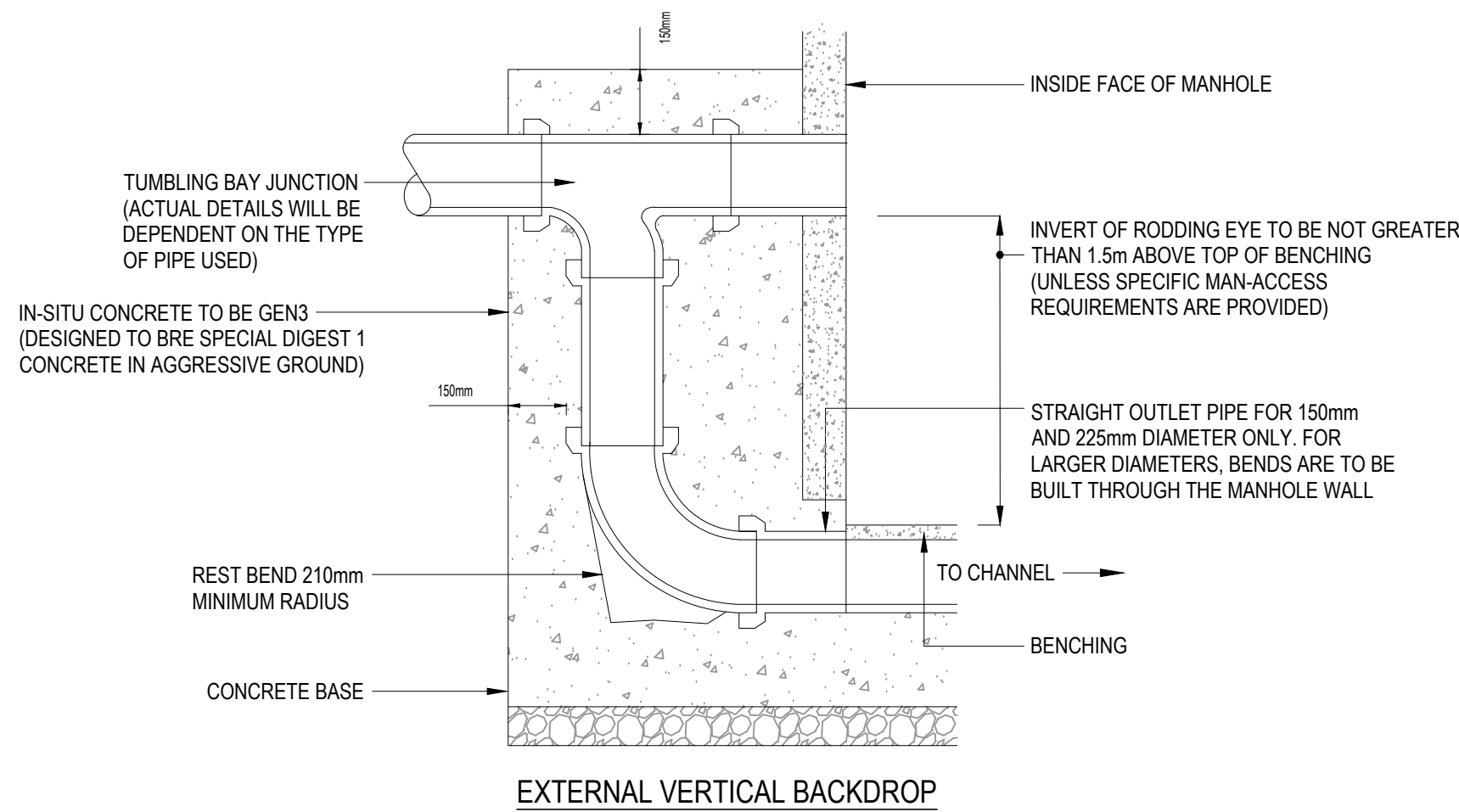
TYPICAL MANHOLE DETAIL - TYPE A1/2
(DEPTH FROM COVER TO SOFFIT OF PIPE 3m TO 6m)



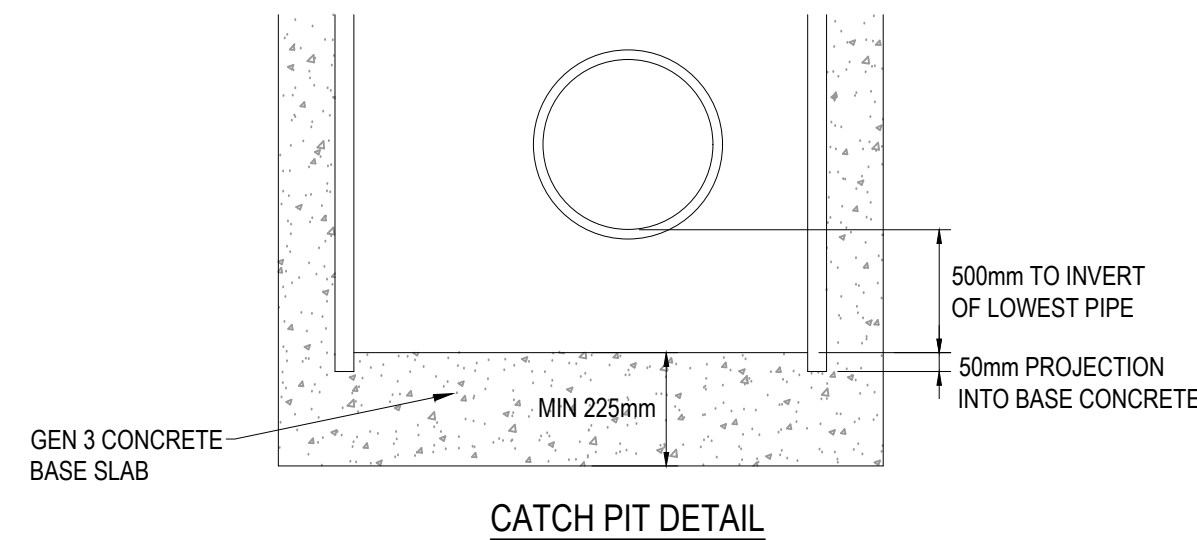
TYPICAL MANHOLE DETAIL - TYPE C
(DEPTH FROM COVER TO SOFFIT OF PIPE <1.5 m)



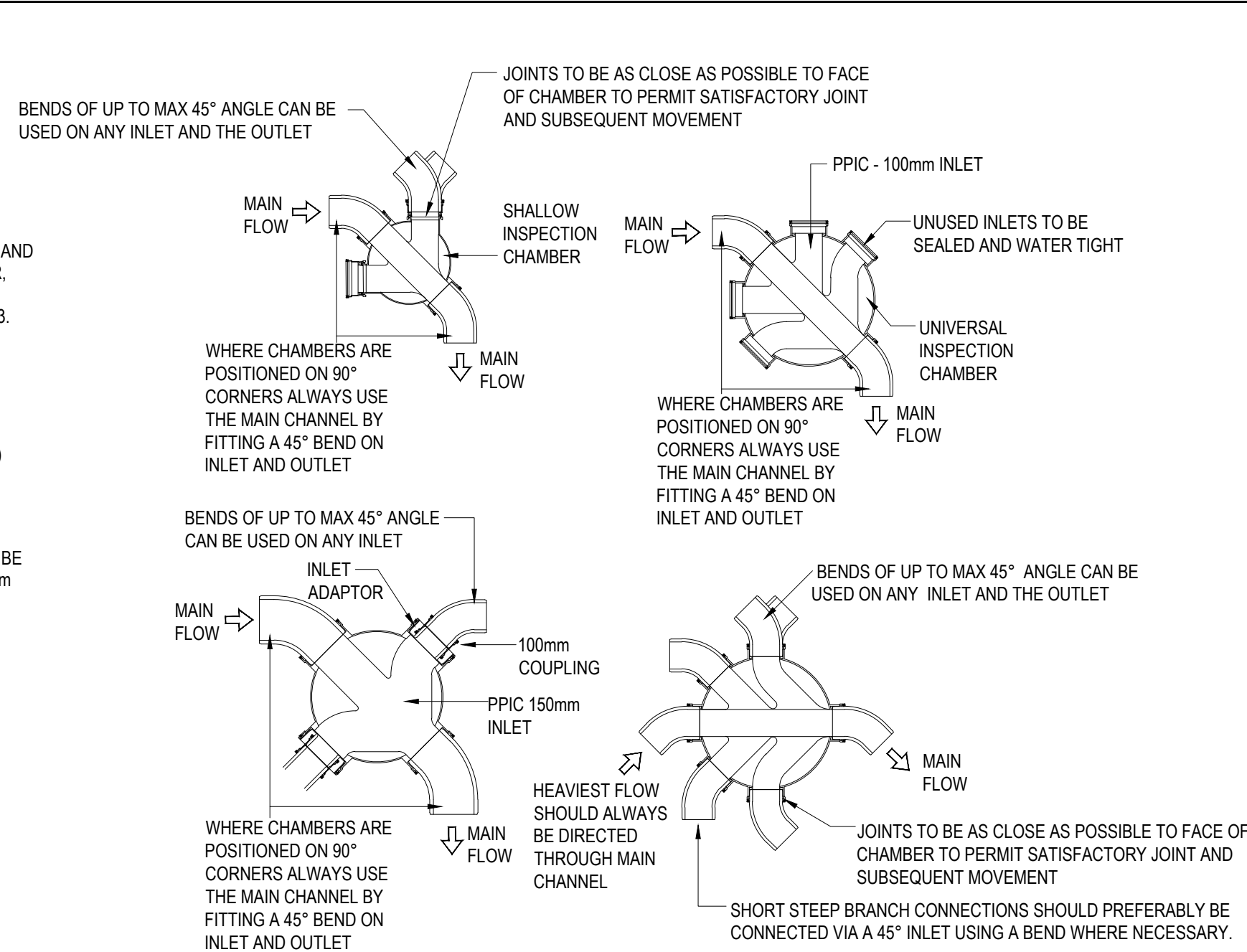
TYPICAL MANHOLE DETAIL - TYPE B
(MAXIMUM DEPTH FROM COVER TO SOFFIT OF PIPE 3.0 m)



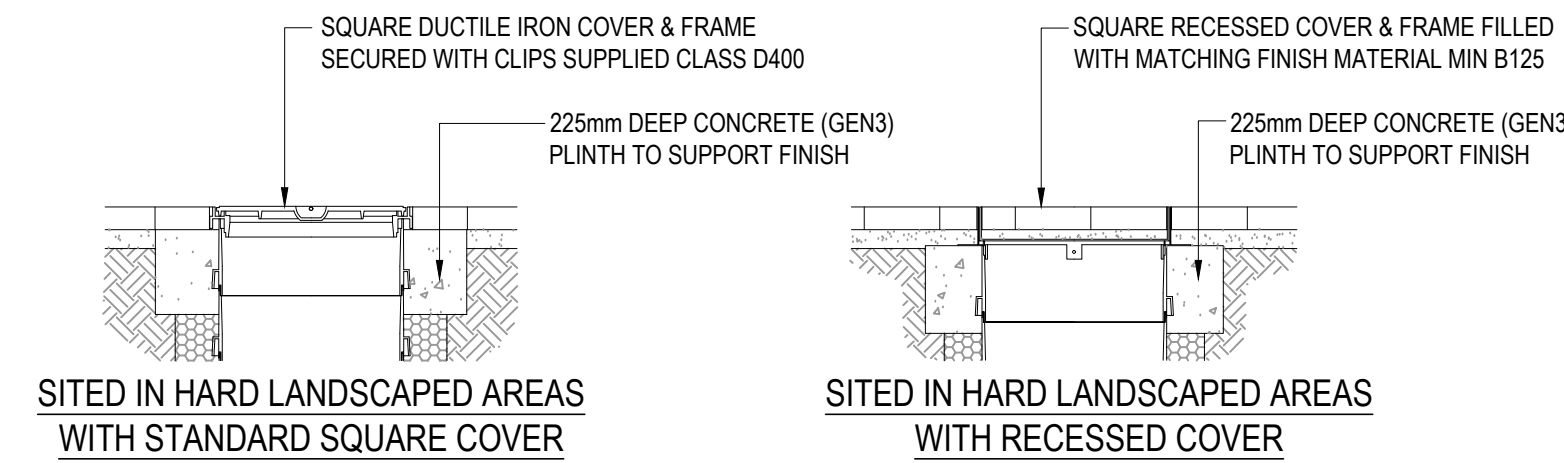
EXTERNAL VERTICAL BACKDROP



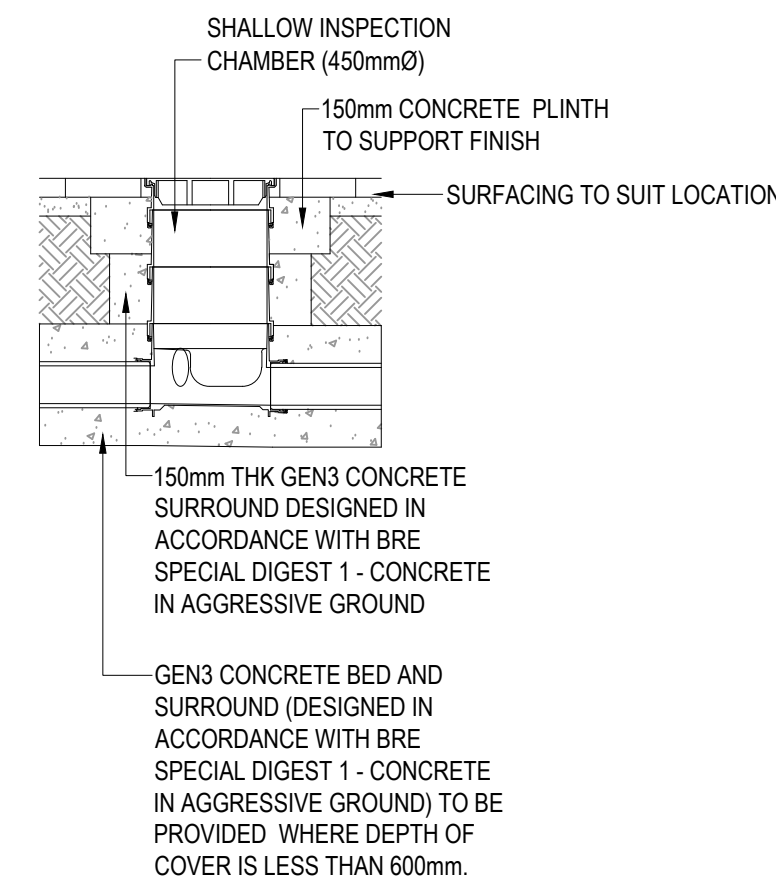
CATCH PIT DETAIL



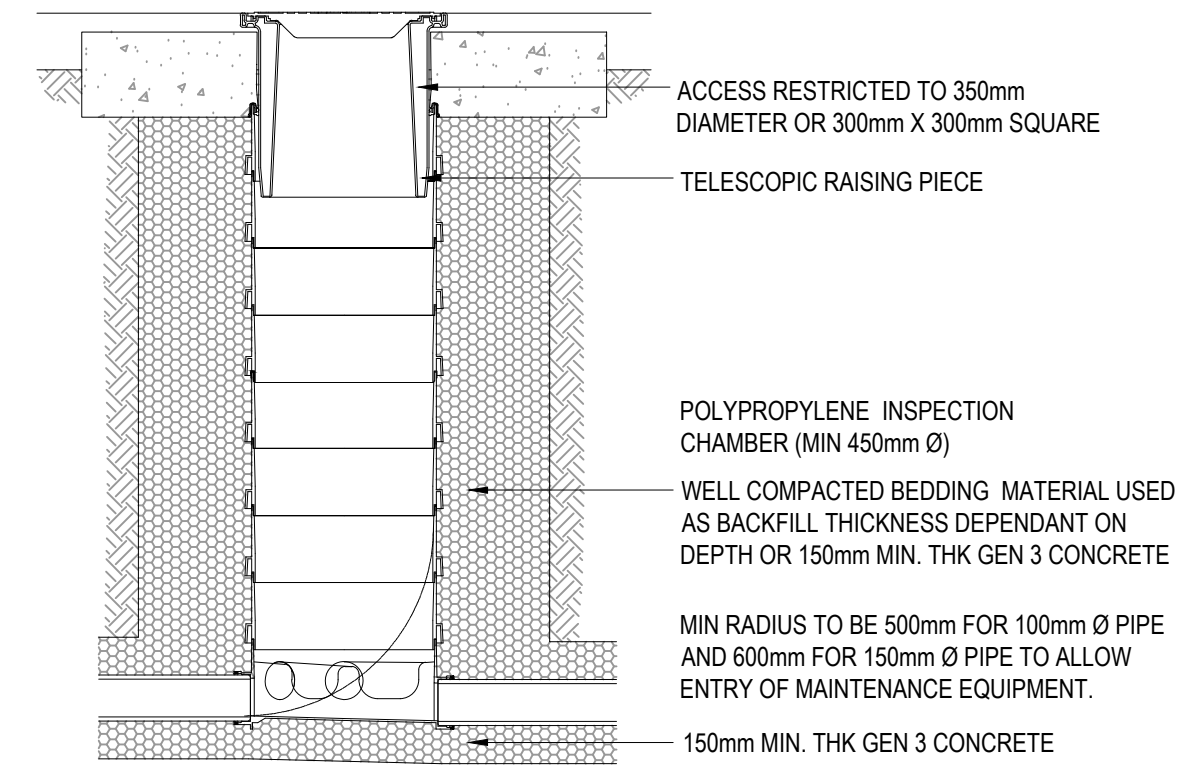
INSPECTION CHAMBER BASE DETAILS



TYPICAL INSPECTION CHAMBER COVER DETAILS



SHALLOW INSPECTION CHAMBER
MAX DEPTH 0.6m



DEEP INSPECTION CHAMBER
DEPTHS BETWEEN 1.2m AND 3.0m

GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- REFER TO DRAWING 080139-CUR-XX-XX-DR-C-92530_GENERAL DRAINAGE NOTES.

C01	CONSTRUCTION ISSUE	04/08/23	ATL	CG
P02	TENDER ISSUE	14/10/22	ATL	CG
P01	STAGE 3 ISSUE	15/06/22	LK	CG
Rev:	Description:	Date:	By:	Chkd:



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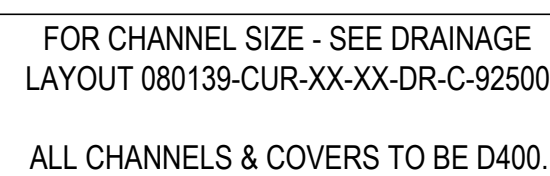
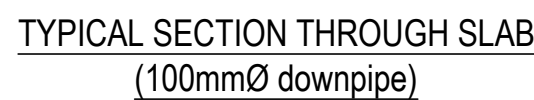
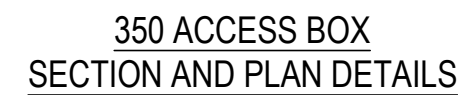
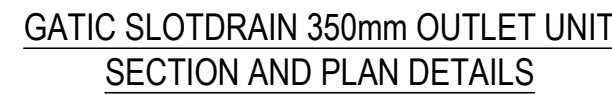
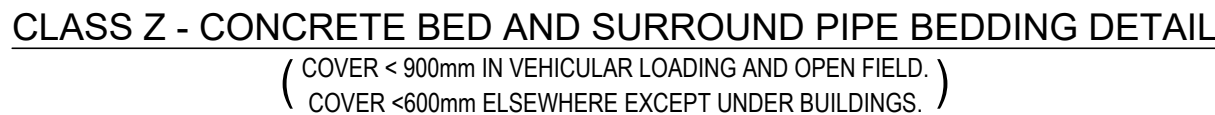
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Status: **SUITABLE FOR STAGE APPROVAL** **S4**

Project: **ELIZABETH STREET, CHEETHAM HILL**

Orig Title: **TYPICAL DRAINAGE DETAILS SHEET 1**

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	27/05/22	LK	CG	CG
Scale:	1:20			
Project No:	Originator:	Volume:	Level:	Type:
080139 - CUR - XX - XX - DR - C - 92520 - C01				

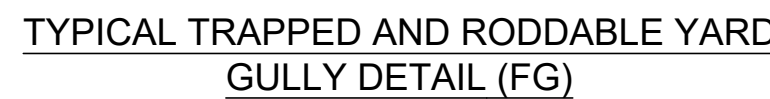


230 X 230 HINGED & LOCKING GRATING & FRAME, BEDDED ON CEMENT MORTAR.

375MM DIAMETER, 750MM DEEP SQUARE TOP SEMI-UNIVERSAL GULLY WITH FILTER BUCKET.

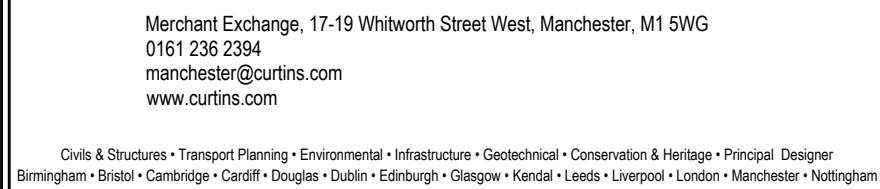
150MM CONCRETE BED AND SURROUND TO BS 5328, STANDARD MIX ST4 (SULPHATE RESISTING).

NOTE:
THE DEPTH OF THE GULLY CAN BE INCREASED BY UP TO 300MM BY FITTING A 225MM COUPLING AND A 300 MM HIGH RAISING PIECE BETWEEN THE FRAME AND THE GULLY BODY.



1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING 080139-CUR-XX-XX-DR-C-92530_GENERAL DRAINAGE NOTES.

C01	CONSTRUCTION ISSUE	04/08/23	ATL	CG
P02	TENDER ISSUE	14/10/22	ATL	CG
P01	STAGE 3 ISSUE	15/06/22	LK	CG
Rev:	Description:	Date:	By:	Chkd:



Status:	SUITABLE FOR STAGE	
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Status:	SUITABLE FOR STAGE APPROVAL	S4
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Project: ELIZABETH STREET,
CHEETHAM HILL

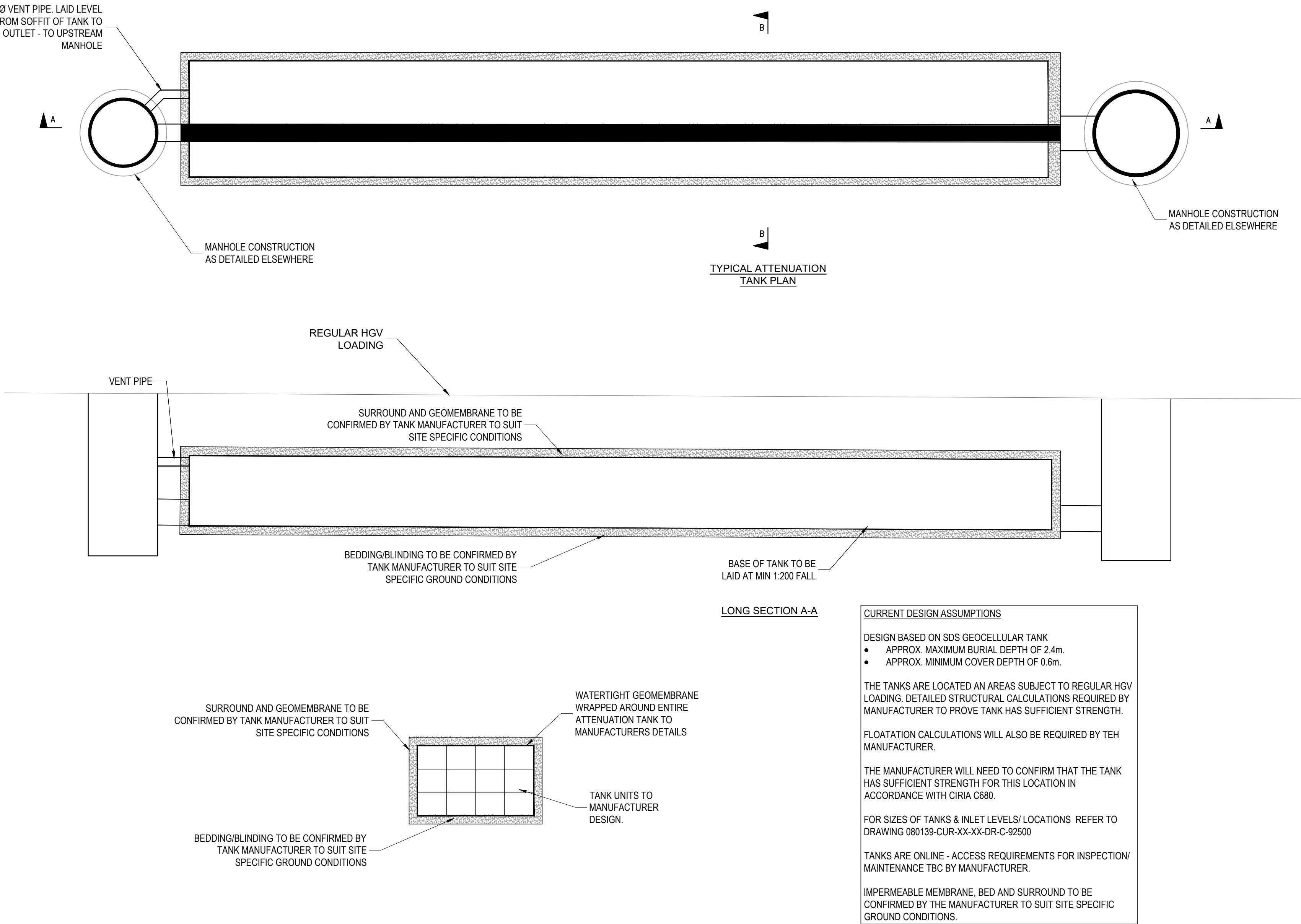
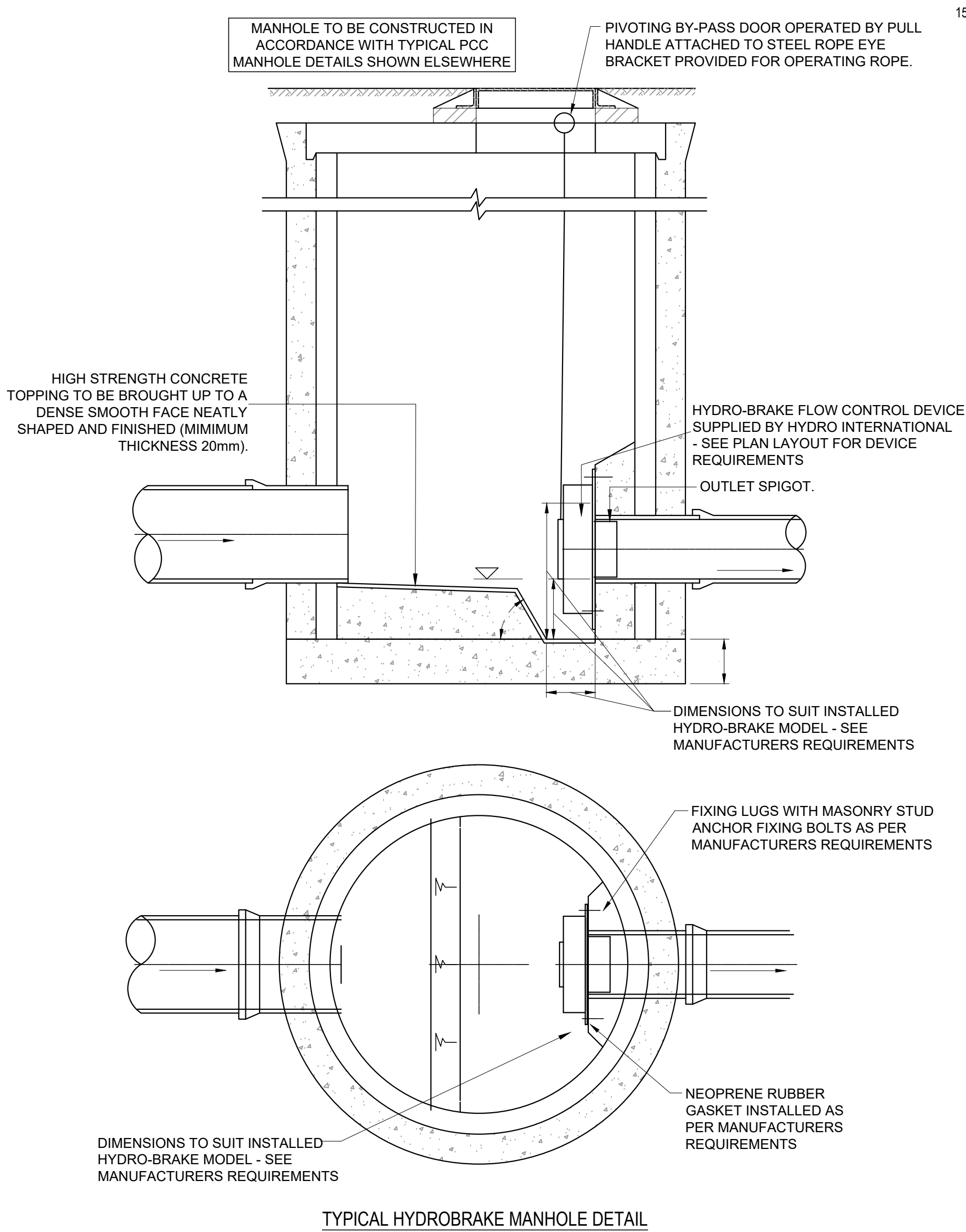
Org Title:

TYPICAL DRAINAGE DETAILS
SHEET 2

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	27/05/22			

Scale: 1:20	LR	CG	CG
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Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
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GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
- REFER TO DRAINAGE LAYOUT 080139-CUR-XX-XX-DR-C-92500 FOR THE LOCATION OF THE ATTENUATION TANK AND FLOW CONTROL MANHOLE.
- ATTENUATION TANK TO BE INSTALLED STRICTLY IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS.
- WHERE AN ALTERNATIVE ATTENUATION TANK DEVICE IS PREFERRED, IT WILL BE SUBJECT TO REDESIGN TO CONFIRM WHETHER THE SYSTEM HAS CAPACITY.
- THE DESIGN OF THE TANK SHOULD BE PROVIDED BY THE MANUFACTURER OR SUPPLIER TO ENSURE THE TANK IS SUFFICIENT FOR THE SITE SPECIFIC CRITERIA.
- THE TANK DESIGN SHOULD INCORPORATE:
 - CRATES SUBJECT TO REGULAR HEAVY VEHICLE LOADING.
 - SUITABLE MAINTENANCE ACCESS, AND
 - VENTING TO PREVENT TRAPPED AIR POCKETS.
- THE STRENGTH OF THE TANK SHOULD COMPLY WITH CIRIA C680 STRUCTURAL DESIGN OF MODULAR GEOCELLULAR DRAINAGE TANKS.
- ACCESS FOR MAINTENANCE SHOULD BE IN ACCORDANCE WITH CIRIA GUIDANCE.
- VENTING TO THE TANK SHOULD BE CONFIRMED BY THE TANK MANUFACTURER. VENTING CURRENTLY PROPOSED TO BE ROUTED BACK TO THE NEAREST MANHOLE ABOVE THE DESIGN WATER LEVEL.
- CONSTRUCTION AND INSTALLATION OF THE TANK SHOULD BE STRICTLY IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION REQUIREMENTS.
- THE CURRENT DESIGN OF THE TANK IS BASED ON USE OF SDS MODULES. HOWEVER, WHERE AN ALTERNATIVE SYSTEM IS PROPOSED, THE DIMENSIONS OF THE UNITS WILL NEED TO BE CHECKED WITHIN THE DESIGN AND MAY RESULT IN A REDESIGN.
- THE CONTRACTOR SHALL PROHIBIT THE MOVEMENT OF CONSTRUCTION PLANT ACROSS THE STORAGE TANK AND WHERE NECESSARY PROVIDE ADDITIONAL SUPPORT AND PROTECTION TO THE STRUCTURE. PARTICULARLY POST CONSTRUCTION. TEMPORARY FENCING CAN BE USED TO PROHIBIT TRADE STOCKS, PILLING MATERIALS, HEAVY PLANTS ETC.
- FLOW CONTROL TO BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS, INSTRUCTIONS AND RECOMMENDATIONS.
- WHERE ALTERNATIVE FLOW CONTROL DEVICE IS PREFERRED, IT WILL BE SUBJECT TO REDESIGN TO CONFIRM WHETHER THE SYSTEM HAS CAPACITY.
- SURFACE WATER DRAINAGE CONNECTION SUBJECT TO S106 AGREEMENT WITH UNITED UTILITIES.
- FOR FULL DRAINAGE NOTES REFER TO 080139-CUR-XX-XX-DR-C-92530.

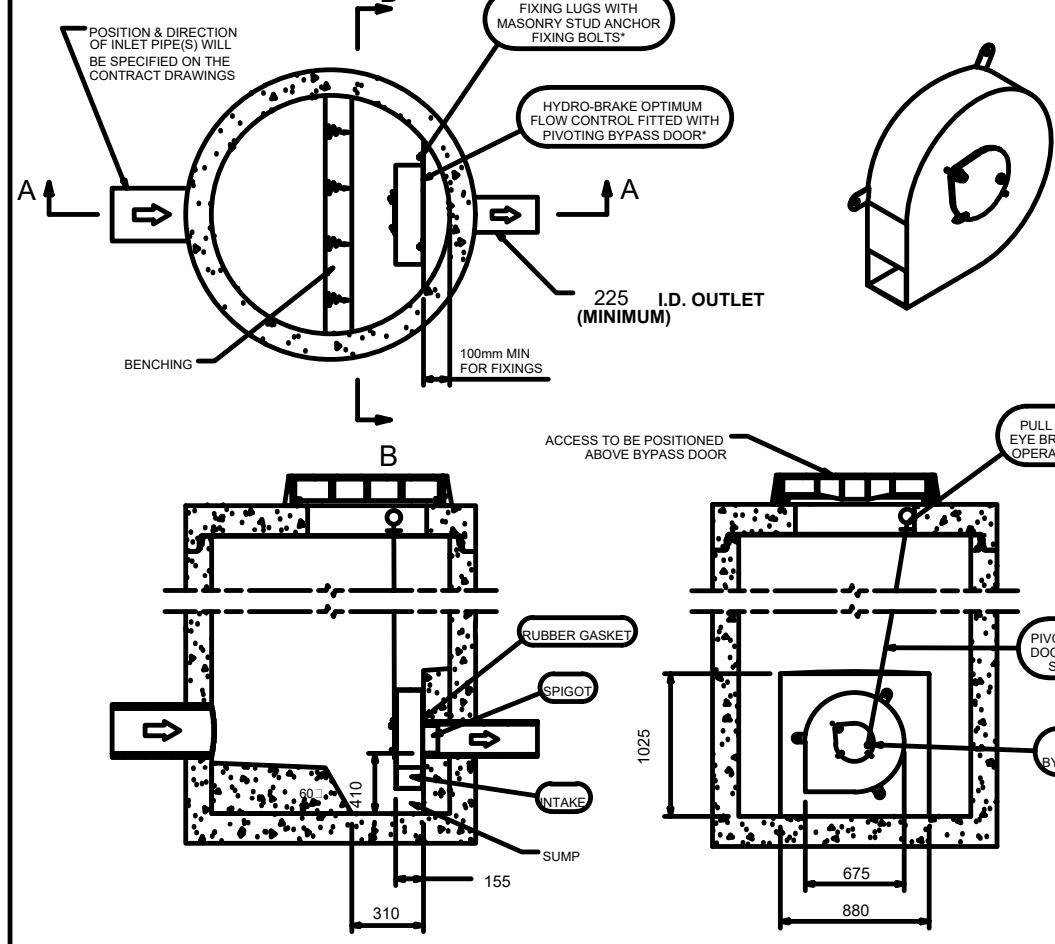
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.300	11.000
Flush-Flo™	0.386	10.998
Kick-Flo®	0.836	8.932
Mean Flow		9.537

Hydro-Brake Optimum Flow Control including:

- 3 mm grade 304L stainless steel integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel flange
- Rubber gasket to seal outlet
- Indicative Weight: 30 kg

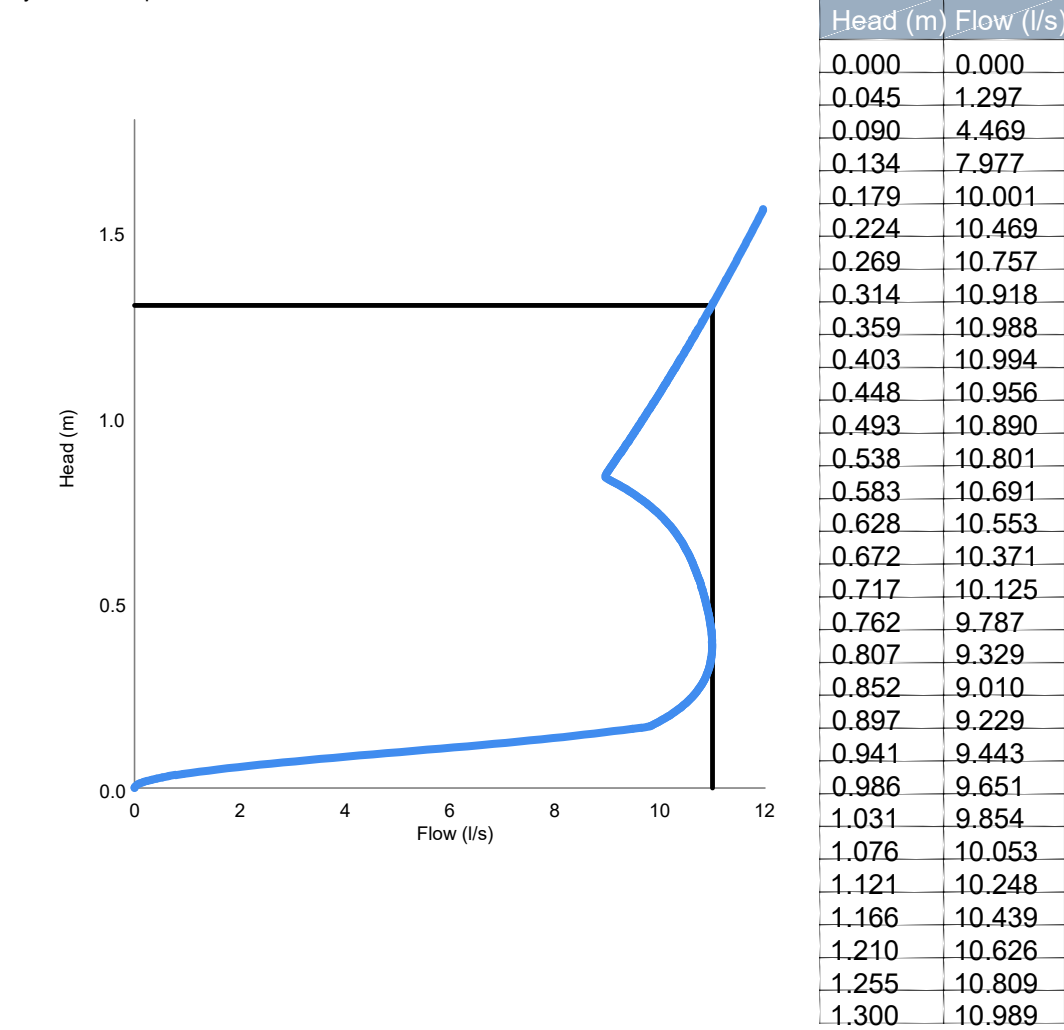
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Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.300	11.000
Flush-Flo	0.386	10.998
Kick-Flo®	0.836	8.932
Mean Flow		9.537

hydro-int.com/patents



DESIGN ADVICE: The head/flow characteristics of this SHE-0148-1100-1300-1100 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve. The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

DATE	03/08/2023 22:30	SHE-0148-1100-1300-1100
SITE	Elizabeth Street	
DESIGNER	Chloe Grimley	Hydro-Brake Optimum®
Ref.	080139	

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C01	CONSTRUCTION ISSUE	04/08/23	ATL	CG
P02	TENDER ISSUE	14/10/22	ATL	CG
P01	STAGE 3 ISSUE	15/06/22	LK	CG
Rev:	Description:	Date:	By:	Chkd:

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Status: **SUITABLE FOR STAGE APPROVAL**

Project: **ELIZABETH STREET, CHEETHAM HILL**

Orig Title: **TYPICAL DRAINAGE DETAILS SHEET 3**

Size: A1 Date: 27/05/22 Drawn By: LK Designed By: CG Checked By: CG

Scale: 1:20

Project No: 080139 - CUR - XX - XX - DR - C - 92522 - C01

Originator: Volume: Level: Type: Role: Category / Number: Rev:

080139 - CUR - XX - XX - DR - C - 92522 - C01

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Appendix B

Causeway Flow Surface Water Calculations Without Surcharged Outfall

Causeway Flow Surface Water Calculations Without Surcharged Outfall

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	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	0.100	5.00	55.730	600	384220.965	400062.603	0.900
2	0.083	5.00	55.730	600	384236.864	400110.008	1.150
3	0.016	5.00	55.800	1500	384252.244	400155.882	1.539
4	0.122	5.00	55.860	1500	384186.319	400064.772	0.960
5	0.043	5.00	55.870	1500	384207.152	400126.918	1.416
6			55.880	1500	384220.436	400166.545	1.878
7		5.00	55.590	1500	384165.457	400066.617	1.280
8	0.152	5.00	55.590	1500	384177.825	400103.871	1.442
9	0.095	5.00	55.880	600	384130.333	400159.789	0.980
10	0.026	5.00	55.880	600	384159.093	400150.149	1.222
11	0.142	5.00	55.590	1500	384189.774	400139.866	1.600
12	0.074	5.00	56.180	1500	384200.186	400171.230	2.334
13	0.066	5.00	56.390	600	384157.776	400247.123	0.890
14			56.500	600	384166.138	400244.437	1.109
15	0.056	5.00	56.490	600	384152.686	400214.112	0.990
Jun			56.560		384155.199	400211.799	1.398
16		5.00	55.820	1500	384114.652	400216.731	1.670
17	0.204	5.00	56.270	1500	384152.590	400204.015	2.284
18	0.110	5.00	56.030	600	384130.509	400193.971	1.430
19	0.030	5.00	56.030	1500	384181.694	400176.726	1.803
20	0.127	5.00	56.270	1500	384187.000	400192.475	2.438
21	0.036	5.00	56.750	1500	384214.327	400204.953	3.060
22	0.028	5.00	56.830	600	384241.384	400222.245	1.530
23	0.025	5.00	56.730	600	384234.697	400192.502	1.430
24			56.830	1500	384222.871	400205.880	2.331
Jun24			56.750		384220.220	400211.359	3.085
25	0.081	5.00	56.720	1500	384227.071	400218.929	3.084
26			56.750	1200	384234.439	400225.535	3.244
C1			56.530	1500	384231.515	400233.598	3.075
UU2203			56.520	1200	384236.491	400239.782	3.205

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	50.000	250.0	300	Circular	55.730	54.830	0.600	55.730	54.630	0.800
1.001	48.384	250.0	300	Circular	55.730	54.580	0.850	55.800	54.386	1.114
1.002	33.548	250.0	375	Circular	55.800	54.261	1.164	55.880	54.127	1.378
2.000	65.545	170.0	300	Circular	55.860	54.900	0.660	55.870	54.514	1.056
2.001	41.794	165.9	300	Circular	55.870	54.454	1.116	55.880	54.202	1.378
1.003	20.785	250.0	450	Circular	55.880	54.002	1.428	56.180	53.919	1.811
3.000	39.253	350.0	450	Circular	55.590	54.310	0.830	55.590	54.198	0.942
3.001	37.926	350.0	450	Circular	55.590	54.148	0.992	55.590	54.040	1.100
4.000	30.333	167.0	225	Circular	55.880	54.900	0.755	55.880	54.718	0.937
4.001	32.358	73.0	225	Circular	55.880	54.658	0.997	55.590	54.215	1.150
3.002	33.047	350.0	450	Circular	55.590	53.990	1.150	56.180	53.896	1.834
1.004	36.568	350.0	450	Circular	56.180	53.846	1.884	56.750	53.742	2.558
5.000	8.783	150.0	225	Circular	56.390	55.500	0.665	56.500	55.441	0.834
5.001	34.422	150.0	225	Circular	56.500	55.391	0.884	56.560	55.162	1.173
6.000	3.415	10.1	225	Circular	56.490	55.500	0.765	56.560	55.162	1.173
5.002	8.210	150.0	225	Circular	56.560	55.162	1.173	56.270	55.107	0.938
7.000	40.012	350.0	450	Circular	55.820	54.150	1.220	56.270	54.036	1.784
5.003	36.294	350.0	450	Circular	56.270	53.986	1.834	56.270	53.882	1.938
8.000	54.012	167.0	225	Circular	56.030	54.600	1.205	56.030	54.277	1.528
8.001	16.619	167.0	225	Circular	56.030	54.227	1.578	56.270	54.127	1.918
5.004	30.041	326.5	450	Circular	56.270	53.832	1.988	56.750	53.740	2.560
1.005	8.704	350.0	450	Circular	56.750	53.690	2.610	56.750	53.665	2.635
9.000	24.709	34.0	150	Circular	56.830	55.300	1.380	56.830	54.574	2.106
10.000	17.856	24.6	150	Circular	56.730	55.300	1.280	56.830	54.574	2.106
9.001	6.087	10.0	225	Circular	56.830	54.499	2.106	56.750	53.890	2.635

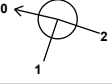
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1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	1500	Manhole	Adoptable
1.002	3	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
2.000	4	1500	Manhole	Adoptable	5	1500	Manhole	Adoptable
2.001	5	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
1.003	6	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
3.000	7	1500	Manhole	Adoptable	8	1500	Manhole	Adoptable
3.001	8	1500	Manhole	Adoptable	11	1500	Manhole	Adoptable
4.000	9	600	Manhole	Adoptable	10	600	Manhole	Adoptable
4.001	10	600	Manhole	Adoptable	11	1500	Manhole	Adoptable
3.002	11	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
1.004	12	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
5.000	13	600	Manhole	Adoptable	14	600	Manhole	Adoptable
5.001	14	600	Manhole	Adoptable	Jun		Junction	
6.000	15	600	Manhole	Adoptable	Jun		Junction	
5.002	Jun		Junction		17	1500	Manhole	Adoptable
7.000	16	1500	Manhole	Adoptable	17	1500	Manhole	Adoptable
5.003	17	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
8.000	18	600	Manhole	Adoptable	19	1500	Manhole	Adoptable
8.001	19	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
5.004	20	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
1.005	21	1500	Manhole	Adoptable	Jun24		Junction	
9.000	22	600	Manhole	Adoptable	24	1500	Manhole	Adoptable
10.000	23	600	Manhole	Adoptable	24	1500	Manhole	Adoptable
9.001	24	1500	Manhole	Adoptable	Jun24		Junction	

Pipeline Schedule

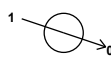
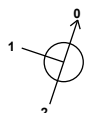
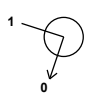
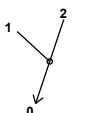
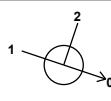
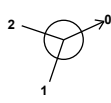
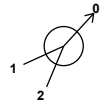
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.006	10.210	350.0	450	Circular	56.750	53.665	2.635	56.720	53.636	2.634
1.007	9.896	62.2	225	Circular	56.720	53.665	2.830	56.750	53.506	3.019
1.008	8.577	167.0	225	Circular	56.750	53.506	3.019	56.530	53.455	2.850
1.009	7.937	56.7	225	Circular	56.530	53.455	2.850	56.520	53.315	2.980

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	Jun24		Junction		25	1500	Manhole	Adoptable
1.007	25	1500	Manhole	Adoptable	26	1200	Manhole	Adoptable
1.008	26	1200	Manhole	Adoptable	C1	1500	Manhole	Adoptable
1.009	C1	1500	Manhole	Adoptable	UU2203	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	384220.965	400062.603	55.730	0.900	600				
						0	1.000	54.830	300
2	384236.864	400110.008	55.730	1.150	600		1	1.000	54.630
						0	1.001	54.580	300
3	384252.244	400155.882	55.800	1.539	1500		1	1.001	54.386
						0	1.002	54.261	375
4	384186.319	400064.772	55.860	0.960	1500		0	2.000	54.900
5	384207.152	400126.918	55.870	1.416	1500		1	2.000	54.514
						0	2.001	54.454	300
6	384220.436	400166.545	55.880	1.878	1500		1	2.001	54.202
						2	1.002	54.127	375
						0	1.003	54.002	450
7	384165.457	400066.617	55.590	1.280	1500		0	3.000	54.310
8	384177.825	400103.871	55.590	1.442	1500		1	3.000	54.198
						0	3.001	54.148	450
9	384130.333	400159.789	55.880	0.980	600		0	4.000	54.900
									225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
10	384159.093	400150.149	55.880	1.222	600		1	4.000	54.718	225
							0	4.001	54.658	225
11	384189.774	400139.866	55.590	1.600	1500		1	4.001	54.215	225
							2	3.001	54.040	450
							0	3.002	53.990	450
12	384200.186	400171.230	56.180	2.334	1500		1	3.002	53.896	450
							2	1.003	53.919	450
							0	1.004	53.846	450
13	384157.776	400247.123	56.390	0.890	600					
							0	5.000	55.500	225
14	384166.138	400244.437	56.500	1.109	600		1	5.000	55.441	225
							0	5.001	55.391	225
15	384152.686	400214.112	56.490	0.990	600					
							0	6.000	55.500	225
Jun	384155.199	400211.799	56.560	1.398			1	6.000	55.162	225
							2	5.001	55.162	225
							0	5.002	55.162	225
16	384114.652	400216.731	55.820	1.670	1500					
							0	7.000	54.150	450
17	384152.590	400204.015	56.270	2.284	1500		1	7.000	54.036	450
							2	5.002	55.107	225
							0	5.003	53.986	450
18	384130.509	400193.971	56.030	1.430	600					
							0	8.000	54.600	225
19	384181.694	400176.726	56.030	1.803	1500		1	8.000	54.277	225
							0	8.001	54.227	225
20	384187.000	400192.475	56.270	2.438	1500		1	8.001	54.127	225
							2	5.003	53.882	450
							0	5.004	53.832	450
21	384214.327	400204.953	56.750	3.060	1500		1	5.004	53.740	450
							2	1.004	53.742	450
							0	1.005	53.690	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
22	384241.384	400222.245	56.830	1.530	600	 0	0	9.000	55.300	150
23	384234.697	400192.502	56.730	1.430	600	 0	0	10.000	55.300	150
24	384222.871	400205.880	56.830	2.331	1500	 012	1 2	10.000 9.000	54.574 54.574	150 150
Jun24	384220.220	400211.359	56.750	3.085		 012	1 2	9.001 1.005	53.890 53.665	225 450
25	384227.071	400218.929	56.720	3.084	1500	 01	1 0	1.006 1.007	53.636 53.665	450 225
26	384234.439	400225.535	56.750	3.244	1200	 01	1 0	1.007 1.008	53.506 53.506	225 225
C1	384231.515	400233.598	56.530	3.075	1500	 01	1 0	1.008 1.009	53.455 53.455	225 225
UU2203	384236.491	400239.782	56.520	3.205	1200	 1	1	1.009	53.315	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 25 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	53.665	Product Number	CTL-SHE-0148-1100-1300-1100
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	11.0	Min Node Diameter (mm)	1200

Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	54.148
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	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	640.0	0.0	0.750	640.0	0.0	0.751	0.0	0.0

Node 17 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	53.986
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	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	390.0	0.0	1.125	390.0	0.0	1.126	0.0	0.0

Other (defaults)

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

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	54.912	0.082	11.9	0.2064	0.0000	OK
15 minute winter	2	11	54.693	0.113	20.6	0.1946	0.0000	OK
15 minute winter	3	12	54.369	0.108	22.1	0.2124	0.0000	OK
15 minute winter	4	11	54.982	0.082	14.5	0.3521	0.0000	OK
15 minute winter	5	11	54.549	0.095	18.4	0.2252	0.0000	OK
15 minute winter	6	13	54.283	0.281	40.1	0.4969	0.0000	OK
15 minute summer	7	1	54.310	0.000	0.0	0.0000	0.0000	OK
120 minute winter	8	116	54.176	0.028	5.8	17.3233	0.0000	OK
15 minute winter	9	10	54.982	0.082	11.3	0.1822	0.0000	OK
15 minute winter	10	11	54.733	0.075	13.9	0.0530	0.0000	OK
15 minute winter	11	14	54.272	0.282	36.1	0.9979	0.0000	OK
15 minute winter	12	13	54.269	0.423	70.0	1.0159	0.0000	OK
15 minute winter	13	10	55.569	0.069	7.9	0.1220	0.0000	OK
15 minute winter	14	11	55.455	0.064	7.8	0.0182	0.0000	OK
15 minute winter	15	10	55.531	0.031	6.7	0.0437	0.0000	OK
15 minute winter	Jun	11	55.255	0.093	14.2	0.0000	0.0000	OK
120 minute winter	16	98	54.178	0.028	0.4	0.0498	0.0000	OK
120 minute winter	17	96	54.178	0.192	42.2	71.8082	0.0000	OK
15 minute winter	18	11	54.687	0.087	13.1	0.1590	0.0000	OK
15 minute winter	19	11	54.331	0.104	16.0	0.2174	0.0000	OK
15 minute winter	20	13	54.253	0.421	68.8	1.1820	0.0000	OK
15 minute winter	21	13	54.276	0.586	50.6	1.1724	0.0000	SURCHARGED
15 minute winter	22	10	55.333	0.033	3.3	0.0217	0.0000	OK
15 minute winter	23	10	55.330	0.030	3.0	0.0187	0.0000	OK
15 minute winter	24	10	54.529	0.030	6.2	0.0523	0.0000	OK
Link Event (Outflow)	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	11.3	0.736	0.162	0.7705	
15 minute winter	2	1.001	3	20.3	0.864	0.290	1.1386	
15 minute winter	3	1.002	6	22.2	0.840	0.176	1.1147	
15 minute winter	4	2.000	5	13.6	0.889	0.160	1.0046	
15 minute winter	5	2.001	6	17.9	0.965	0.208	0.7807	
15 minute summer	6	1.003	12	39.2	0.758	0.192	2.2799	
15 minute summer	7	3.000	8	0.0	0.000	0.000	0.0000	
15 minute winter	8	3.001	11	-14.0	-0.399	-0.082	1.5891	
15 minute winter	9	4.000	10	11.0	0.857	0.274	0.3885	
15 minute winter	10	4.001	11	14.0	1.235	0.230	0.3670	
15 minute winter	11	3.002	12	28.8	0.687	0.167	4.0356	
15 minute winter	12	1.004	21	48.0	0.608	0.279	5.7244	
15 minute winter	13	5.000	14	7.8	0.787	0.183	0.0866	
15 minute winter	14	5.001	Jun	7.7	0.621	0.181	0.4270	
15 minute winter	15	6.000	Jun	6.7	1.159	0.041	0.0318	
15 minute winter	Jun	5.002	17	14.2	0.946	0.335	0.1232	
60 minute winter	16	7.000	17	-0.5	-0.033	-0.003	0.8464	
15 minute winter	17	5.003	20	-65.2	-0.859	-0.379	2.7829	
15 minute winter	18	8.000	19	12.6	0.894	0.313	0.7590	
15 minute winter	19	8.001	20	16.0	0.931	0.398	0.3069	
15 minute winter	20	5.004	21	-48.6	0.514	-0.273	4.6950	
15 minute winter	21	1.005	Jun24	16.7	0.393	0.097	1.3791	
15 minute winter	22	9.000	24	3.2	1.118	0.105	0.0713	
15 minute winter	23	10.000	24	2.9	1.219	0.082	0.0432	
15 minute winter	24	9.001	Jun24	6.1	1.594	0.037	0.1304	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Jun24	13	54.279	0.614	21.1	0.0000	0.0000	SURCHARGED
15 minute winter	25	13	54.280	0.644	18.3	1.4752	0.0000	SURCHARGED
30 minute summer	26	31	53.590	0.084	11.0	0.0952	0.0000	OK
15 minute winter	C1	21	53.520	0.065	11.0	0.1152	0.0000	OK
360 minute winter	UU2203	208	53.375	0.060	11.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Jun24	1.006	25	11.3	0.150	0.066	1.6177	
15 minute winter	25	1.007	26	11.0	0.963	0.167	0.1135	
15 minute winter	26	1.008	C1	11.0	0.957	0.274	0.0989	
360 minute winter	C1	1.009	UU2203	11.0	1.217	0.159	0.0717	232.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	54.967	0.137	29.1	0.3423	0.0000	OK
15 minute winter	2	11	54.771	0.191	52.7	0.3294	0.0000	OK
15 minute winter	3	11	54.673	0.412	55.3	0.8134	0.0000	SURCHARGED
15 minute winter	4	11	55.034	0.134	35.5	0.5769	0.0000	OK
15 minute winter	5	12	54.665	0.211	45.9	0.5018	0.0000	OK
15 minute summer	6	11	54.610	0.608	96.8	1.0744	0.0000	SURCHARGED
240 minute winter	7	236	54.410	0.100	0.6	0.1773	0.0000	OK
240 minute winter	8	236	54.410	0.262	50.3	160.5245	0.0000	OK
15 minute winter	9	10	55.041	0.141	27.7	0.3122	0.0000	OK
15 minute winter	10	11	54.777	0.119	34.3	0.0846	0.0000	OK
15 minute winter	11	11	54.582	0.592	99.4	2.0982	0.0000	SURCHARGED
15 minute winter	12	10	54.571	0.725	129.2	1.7418	0.0000	SURCHARGED
15 minute winter	13	10	55.615	0.115	19.2	0.2026	0.0000	OK
15 minute winter	14	10	55.495	0.104	19.0	0.0293	0.0000	OK
15 minute winter	15	10	55.548	0.048	16.3	0.0673	0.0000	OK
15 minute winter	Jun	11	55.325	0.163	34.9	0.0000	0.0000	OK
240 minute winter	16	236	54.410	0.260	1.1	0.4594	0.0000	OK
240 minute winter	17	236	54.410	0.424	46.9	158.5884	0.0000	OK
15 minute winter	18	10	54.752	0.152	32.0	0.2768	0.0000	OK
15 minute winter	19	11	54.588	0.361	40.9	0.7573	0.0000	SURCHARGED
15 minute winter	20	11	54.465	0.633	200.0	1.7767	0.0000	SURCHARGED
15 minute winter	21	11	54.533	0.843	128.7	1.6887	0.0000	SURCHARGED
15 minute winter	22	10	55.354	0.054	8.2	0.0350	0.0000	OK
15 minute winter	23	10	55.347	0.047	7.3	0.0297	0.0000	OK
15 minute winter	24	10	54.545	0.046	15.3	0.0812	0.0000	OK

Link Event (Outflow)	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	28.5	0.909	0.407	1.5705	
15 minute summer	2	1.001	3	51.1	1.055	0.731	2.6555	
15 minute winter	3	1.002	6	64.1	0.868	0.508	3.7002	
15 minute winter	4	2.000	5	34.1	1.134	0.401	2.0580	
15 minute winter	5	2.001	6	46.7	1.049	0.542	2.5804	
15 minute winter	6	1.003	12	116.8	0.791	0.573	3.2932	
120 minute winter	7	3.000	8	-0.9	-0.058	-0.005	1.7551	
15 minute winter	8	3.001	11	-102.5	-1.029	-0.596	3.2325	
15 minute winter	9	4.000	10	26.8	1.069	0.668	0.7647	
15 minute winter	10	4.001	11	34.1	1.370	0.560	0.9896	
120 minute winter	11	3.002	12	-45.3	0.493	-0.264	5.1068	
15 minute summer	12	1.004	21	100.7	0.636	0.586	5.7940	
15 minute winter	13	5.000	14	19.0	0.989	0.448	0.1683	
15 minute winter	14	5.001	Jun	18.6	0.769	0.440	0.8350	
15 minute winter	15	6.000	Jun	16.3	1.298	0.099	0.0625	
15 minute winter	Jun	5.002	17	34.6	1.166	0.817	0.2435	
30 minute winter	16	7.000	17	-8.2	-0.231	-0.048	3.8202	
15 minute winter	17	5.003	20	-202.2	-1.704	-1.177	4.7138	
15 minute winter	18	8.000	19	32.2	1.052	0.803	1.8185	
15 minute winter	19	8.001	20	39.4	1.006	0.982	0.6610	
15 minute winter	20	5.004	21	-132.9	-0.839	-0.747	4.7598	
15 minute winter	21	1.005	Jun24	-29.9	0.420	-0.174	1.3791	
15 minute winter	22	9.000	24	8.1	1.441	0.263	0.1383	
15 minute winter	23	10.000	24	7.2	1.566	0.200	0.0823	
15 minute winter	24	9.001	Jun24	15.2	1.656	0.092	0.1387	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Jun24	11	54.541	0.876	30.4	0.0000	0.0000	SURCHARGED
15 minute winter	25	11	54.546	0.910	23.6	2.0852	0.0000	SURCHARGED
30 minute summer	26	13	53.590	0.084	11.0	0.0952	0.0000	OK
60 minute winter	C1	21	53.520	0.065	11.0	0.1152	0.0000	OK
180 minute summer	UU2203	76	53.375	0.060	11.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Jun24	1.006	25	-17.2	0.131	-0.100	1.6177	
30 minute summer	25	1.007	26	11.0	0.962	0.167	0.1135	
120 minute winter	26	1.008	C1	11.0	0.957	0.274	0.0989	
180 minute summer	C1	1.009	UU2203	11.0	1.217	0.159	0.0717	257.5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	55.536	0.706	52.6	1.7676	0.0000	FLOOD RISK
15 minute winter	2	11	55.418	0.838	89.6	1.4472	0.0000	SURCHARGED
15 minute winter	3	11	55.072	0.811	93.5	1.6015	0.0000	SURCHARGED
15 minute winter	4	12	55.369	0.469	64.2	2.0204	0.0000	SURCHARGED
15 minute winter	5	12	55.179	0.725	78.1	1.7208	0.0000	SURCHARGED
15 minute winter	6	11	54.983	0.981	172.6	1.7326	0.0000	SURCHARGED
360 minute winter	7	352	54.832	0.522	1.2	0.9216	0.0000	SURCHARGED
360 minute winter	8	352	54.832	0.684	75.3	418.2391	0.0000	SURCHARGED
15 minute winter	9	11	55.597	0.697	50.0	1.5495	0.0000	FLOOD RISK
15 minute winter	10	11	55.326	0.668	57.6	0.4732	0.0000	SURCHARGED
15 minute winter	11	11	54.860	0.870	219.7	3.0817	0.0000	SURCHARGED
15 minute winter	12	11	54.903	1.057	205.6	2.5378	0.0000	SURCHARGED
15 minute winter	13	10	55.672	0.172	34.7	0.3034	0.0000	OK
15 minute winter	14	11	55.584	0.193	34.2	0.0546	0.0000	OK
15 minute winter	15	10	55.564	0.064	29.5	0.0907	0.0000	OK
15 minute winter	Jun	11	55.458	0.296	61.4	0.0000	0.0000	SURCHARGED
360 minute winter	16	352	54.831	0.681	1.0	1.2037	0.0000	SURCHARGED
360 minute winter	17	352	54.831	0.845	37.0	316.1448	0.0000	SURCHARGED
15 minute winter	18	11	55.711	1.111	57.8	2.0226	0.0000	SURCHARGED
15 minute winter	19	11	55.075	0.848	67.8	1.7816	0.0000	SURCHARGED
360 minute winter	20	352	54.831	0.999	23.2	2.8067	0.0000	SURCHARGED
15 minute winter	21	11	54.845	1.155	182.2	2.3122	0.0000	SURCHARGED
15 minute winter	22	10	55.373	0.073	14.7	0.0474	0.0000	OK
15 minute winter	23	10	55.362	0.062	13.1	0.0395	0.0000	OK
15 minute winter	24	11	54.874	0.375	27.6	0.6618	0.0000	SURCHARGED

Link Event (Outflow)	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	48.5	0.951	0.694	3.5210	
15 minute winter	2	1.001	3	86.1	1.222	1.230	3.4072	
15 minute winter	3	1.002	6	96.2	0.925	0.763	3.7002	
15 minute winter	4	2.000	5	56.8	1.146	0.668	4.6156	
15 minute winter	5	2.001	6	76.4	1.085	0.887	2.9431	
15 minute winter	6	1.003	12	175.2	1.106	0.860	3.2932	
30 minute winter	7	3.000	8	-4.3	-0.149	-0.025	3.8800	
15 minute winter	8	3.001	11	-232.2	-2.053	-1.351	4.4650	
15 minute winter	9	4.000	10	45.0	1.132	1.123	1.2064	
15 minute winter	10	4.001	11	58.0	1.459	0.953	1.2869	
60 minute winter	11	3.002	12	-114.4	-0.722	-0.665	5.2361	
15 minute winter	12	1.004	21	107.8	0.680	0.627	5.7940	
15 minute winter	13	5.000	14	34.2	1.123	0.808	0.2672	
15 minute winter	14	5.001	Jun	33.2	0.874	0.785	1.3087	
15 minute winter	15	6.000	Jun	29.4	1.374	0.179	0.0838	
15 minute winter	Jun	5.002	17	61.2	1.540	1.445	0.3171	
15 minute winter	16	7.000	17	-24.2	-0.334	-0.141	5.9205	
15 minute winter	17	5.003	20	-314.5	-2.243	-1.830	5.7505	
15 minute winter	18	8.000	19	52.9	1.330	1.319	2.1481	
15 minute winter	19	8.001	20	67.1	1.686	1.672	0.6610	
15 minute winter	20	5.004	21	-183.6	-1.159	-1.031	4.7598	
15 minute winter	21	1.005	Jun24	-56.6	0.470	-0.329	1.3791	
15 minute winter	22	9.000	24	14.6	1.544	0.477	0.3225	
15 minute winter	23	10.000	24	13.0	1.692	0.362	0.2191	
15 minute summer	24	9.001	Jun24	28.6	1.691	0.173	0.2421	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Jun24	11	54.849	1.184	56.2	0.0000	0.0000	SURCHARGED
15 minute winter	25	11	54.849	1.213	42.6	2.7798	0.0000	SURCHARGED
30 minute winter	26	9	53.590	0.084	11.0	0.0952	0.0000	OK
720 minute summer	C1	285	53.520	0.065	11.0	0.1152	0.0000	OK
720 minute summer	UU2203	285	53.375	0.060	11.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Jun24	1.006	25	-29.2	0.222	-0.170	1.6177	
15 minute winter	25	1.007	26	11.0	0.963	0.167	0.1134	
30 minute winter	26	1.008	C1	11.0	0.957	0.274	0.0989	
720 minute summer	C1	1.009	UU2203	11.0	1.217	0.159	0.0717	523.1

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	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	0.100	5.00	55.730	600	384220.965	400062.603	0.900
2	0.083	5.00	55.730	600	384236.864	400110.008	1.150
3	0.016	5.00	55.800	1500	384252.244	400155.882	1.539
4	0.122	5.00	55.860	1500	384186.319	400064.772	0.960
5	0.043	5.00	55.870	1500	384207.152	400126.918	1.416
6			55.880	1500	384220.436	400166.545	1.878
7		5.00	55.590	1500	384165.457	400066.617	1.280
8	0.152	5.00	55.590	1500	384177.825	400103.871	1.442
9	0.095	5.00	55.880	600	384130.333	400159.789	0.980
10	0.026	5.00	55.880	600	384159.093	400150.149	1.222
11	0.142	5.00	55.590	1500	384189.774	400139.866	1.600
12	0.074	5.00	56.180	1500	384200.186	400171.230	2.334
13	0.066	5.00	56.390	600	384157.776	400247.123	0.890
14			56.500	600	384166.138	400244.437	1.109
15	0.056	5.00	56.490	600	384152.686	400214.112	0.990
Jun			56.560		384155.199	400211.799	1.398
16		5.00	55.820	1500	384114.652	400216.731	1.670
17	0.204	5.00	56.270	1500	384152.590	400204.015	2.284
18	0.110	5.00	56.030	600	384130.509	400193.971	1.430
19	0.030	5.00	56.030	1500	384181.694	400176.726	1.803
20	0.127	5.00	56.270	1500	384187.000	400192.475	2.438
21	0.036	5.00	56.750	1500	384214.327	400204.953	3.060
22	0.028	5.00	56.830	600	384241.384	400222.245	1.530
23	0.025	5.00	56.730	600	384234.697	400192.502	1.430
24			56.830	1500	384222.871	400205.880	2.331
Jun24			56.750		384220.220	400211.359	3.085
25	0.081	5.00	56.720	1500	384227.071	400218.929	3.084
26			56.750	1200	384234.439	400225.535	3.244
C1			56.530	1500	384231.515	400233.598	3.075
UU2203			56.520	1200	384236.491	400239.782	3.205

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	50.000	250.0	300	Circular	55.730	54.830	0.600	55.730	54.630	0.800
1.001	48.384	250.0	300	Circular	55.730	54.580	0.850	55.800	54.386	1.114
1.002	33.548	250.0	375	Circular	55.800	54.261	1.164	55.880	54.127	1.378
2.000	65.545	170.0	300	Circular	55.860	54.900	0.660	55.870	54.514	1.056
2.001	41.794	165.9	300	Circular	55.870	54.454	1.116	55.880	54.202	1.378
1.003	20.785	250.0	450	Circular	55.880	54.002	1.428	56.180	53.919	1.811
3.000	39.253	350.0	450	Circular	55.590	54.310	0.830	55.590	54.198	0.942
3.001	37.926	350.0	450	Circular	55.590	54.148	0.992	55.590	54.040	1.100
4.000	30.333	167.0	225	Circular	55.880	54.900	0.755	55.880	54.718	0.937
4.001	32.358	73.0	225	Circular	55.880	54.658	0.997	55.590	54.215	1.150
3.002	33.047	350.0	450	Circular	55.590	53.990	1.150	56.180	53.896	1.834
1.004	36.568	350.0	450	Circular	56.180	53.846	1.884	56.750	53.742	2.558
5.000	8.783	150.0	225	Circular	56.390	55.500	0.665	56.500	55.441	0.834
5.001	34.422	150.0	225	Circular	56.500	55.391	0.884	56.560	55.162	1.173
6.000	3.415	10.1	225	Circular	56.490	55.500	0.765	56.560	55.162	1.173
5.002	8.210	150.0	225	Circular	56.560	55.162	1.173	56.270	55.107	0.938
7.000	40.012	350.0	450	Circular	55.820	54.150	1.220	56.270	54.036	1.784
5.003	36.294	350.0	450	Circular	56.270	53.986	1.834	56.270	53.882	1.938
8.000	54.012	167.0	225	Circular	56.030	54.600	1.205	56.030	54.277	1.528
8.001	16.619	167.0	225	Circular	56.030	54.227	1.578	56.270	54.127	1.918
5.004	30.041	326.5	450	Circular	56.270	53.832	1.988	56.750	53.740	2.560
1.005	8.704	350.0	450	Circular	56.750	53.690	2.610	56.750	53.665	2.635
9.000	24.709	34.0	150	Circular	56.830	55.300	1.380	56.830	54.574	2.106
10.000	17.856	24.6	150	Circular	56.730	55.300	1.280	56.830	54.574	2.106
9.001	6.087	10.0	225	Circular	56.830	54.499	2.106	56.750	53.890	2.635

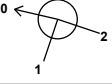
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1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	1500	Manhole	Adoptable
1.002	3	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
2.000	4	1500	Manhole	Adoptable	5	1500	Manhole	Adoptable
2.001	5	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
1.003	6	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
3.000	7	1500	Manhole	Adoptable	8	1500	Manhole	Adoptable
3.001	8	1500	Manhole	Adoptable	11	1500	Manhole	Adoptable
4.000	9	600	Manhole	Adoptable	10	600	Manhole	Adoptable
4.001	10	600	Manhole	Adoptable	11	1500	Manhole	Adoptable
3.002	11	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
1.004	12	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
5.000	13	600	Manhole	Adoptable	14	600	Manhole	Adoptable
5.001	14	600	Manhole	Adoptable	Jun		Junction	
6.000	15	600	Manhole	Adoptable	Jun		Junction	
5.002	Jun		Junction		17	1500	Manhole	Adoptable
7.000	16	1500	Manhole	Adoptable	17	1500	Manhole	Adoptable
5.003	17	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
8.000	18	600	Manhole	Adoptable	19	1500	Manhole	Adoptable
8.001	19	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
5.004	20	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
1.005	21	1500	Manhole	Adoptable	Jun24		Junction	
9.000	22	600	Manhole	Adoptable	24	1500	Manhole	Adoptable
10.000	23	600	Manhole	Adoptable	24	1500	Manhole	Adoptable
9.001	24	1500	Manhole	Adoptable	Jun24		Junction	

Pipeline Schedule

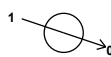
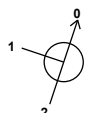
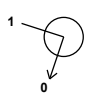
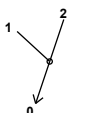
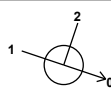
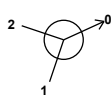
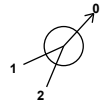
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.006	10.210	350.0	450	Circular	56.750	53.665	2.635	56.720	53.636	2.634
1.007	9.896	62.2	225	Circular	56.720	53.665	2.830	56.750	53.506	3.019
1.008	8.577	167.0	225	Circular	56.750	53.506	3.019	56.530	53.455	2.850
1.009	7.937	56.7	225	Circular	56.530	53.455	2.850	56.520	53.315	2.980

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	Jun24		Junction		25	1500	Manhole	Adoptable
1.007	25	1500	Manhole	Adoptable	26	1200	Manhole	Adoptable
1.008	26	1200	Manhole	Adoptable	C1	1500	Manhole	Adoptable
1.009	C1	1500	Manhole	Adoptable	UU2203	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	384220.965	400062.603	55.730	0.900	600				
						0	1.000	54.830	300
2	384236.864	400110.008	55.730	1.150	600		1	1.000	54.630
						0	1.001	54.580	300
3	384252.244	400155.882	55.800	1.539	1500		1	1.001	54.386
						0	1.002	54.261	375
4	384186.319	400064.772	55.860	0.960	1500		0	2.000	54.900
5	384207.152	400126.918	55.870	1.416	1500		1	2.000	54.514
						0	2.001	54.454	300
6	384220.436	400166.545	55.880	1.878	1500		1	2.001	54.202
						2	1.002	54.127	375
						0	1.003	54.002	450
7	384165.457	400066.617	55.590	1.280	1500		0	3.000	54.310
8	384177.825	400103.871	55.590	1.442	1500		1	3.000	54.198
						0	3.001	54.148	450
9	384130.333	400159.789	55.880	0.980	600		0	4.000	54.900
									225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
10	384159.093	400150.149	55.880	1.222	600		1	4.000	54.718	225
							0	4.001	54.658	225
11	384189.774	400139.866	55.590	1.600	1500		1	4.001	54.215	225
							2	3.001	54.040	450
							0	3.002	53.990	450
12	384200.186	400171.230	56.180	2.334	1500		1	3.002	53.896	450
							2	1.003	53.919	450
							0	1.004	53.846	450
13	384157.776	400247.123	56.390	0.890	600					
							0	5.000	55.500	225
14	384166.138	400244.437	56.500	1.109	600		1	5.000	55.441	225
							0	5.001	55.391	225
15	384152.686	400214.112	56.490	0.990	600					
							0	6.000	55.500	225
Jun	384155.199	400211.799	56.560	1.398			1	6.000	55.162	225
							2	5.001	55.162	225
							0	5.002	55.162	225
16	384114.652	400216.731	55.820	1.670	1500					
							0	7.000	54.150	450
17	384152.590	400204.015	56.270	2.284	1500		1	7.000	54.036	450
							2	5.002	55.107	225
							0	5.003	53.986	450
18	384130.509	400193.971	56.030	1.430	600					
							0	8.000	54.600	225
19	384181.694	400176.726	56.030	1.803	1500		1	8.000	54.277	225
							0	8.001	54.227	225
20	384187.000	400192.475	56.270	2.438	1500		1	8.001	54.127	225
							2	5.003	53.882	450
							0	5.004	53.832	450
21	384214.327	400204.953	56.750	3.060	1500		1	5.004	53.740	450
							2	1.004	53.742	450
							0	1.005	53.690	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
22	384241.384	400222.245	56.830	1.530	600	 0	0	9.000	55.300	150
23	384234.697	400192.502	56.730	1.430	600	 0	0	10.000	55.300	150
24	384222.871	400205.880	56.830	2.331	1500	 012	1 2	10.000 9.000	54.574 54.574	150 150
Jun24	384220.220	400211.359	56.750	3.085		 012	1 2	9.001 1.005	54.499 53.890	225 450
25	384227.071	400218.929	56.720	3.084	1500	 01	1 0	1.006 1.007	53.665 53.636	450 225
26	384234.439	400225.535	56.750	3.244	1200	 01	1 0	1.007 1.008	53.506 53.506	225 225
C1	384231.515	400233.598	56.530	3.075	1500	 01	1 0	1.008 1.009	53.455 53.455	225 225
UU2203	384236.491	400239.782	56.520	3.205	1200	 1	1	1.009	53.315	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 UU2203 Surcharged Outfall

Overrides Design Area x Depression Storage Area (m²) 0 Evapo-transpiration (mm/day) 0
 Overrides Design Additional Inflow x Depression Storage Depth (mm) 0
 Applies to 30yr, 100yr+40% CC 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 minute storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	1.225	300	1.225	600	1.225	900	1.225	1200	1.225
60	1.225	360	1.225	660	1.225	960	1.225	1260	1.225
120	1.225	420	1.225	720	1.225	1020	1.225	1320	1.225
180	1.225	480	1.225	780	1.225	1080	1.225	1380	1.225
240	1.225	540	1.225	840	1.225	1140	1.225	1440	1.225

Node 25 Online Hydro-Brake® Control

Flap Valve x Objective (HE) Minimise upstream storage
 Replaces Downstream Link x Sump Available ✓
 Invert Level (m) 53.665 Product Number CTL-SHE-0148-1100-1300-1100
 Design Depth (m) 1.300 Min Outlet Diameter (m) 0.225
 Design Flow (l/s) 11.0 Min Node Diameter (mm) 1200

Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 Safety Factor 2.0 Invert Level (m) 54.148
 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	640.0	0.0	0.750	640.0	0.0	0.751	0.0	0.0

Node 17 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 Safety Factor 2.0 Invert Level (m) 53.986
 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	390.0	0.0	1.125	390.0	0.0	1.126	0.0	0.0

Other (defaults)

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

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	54.912	0.082	11.9	0.2064	0.0000	OK
15 minute winter	2	11	54.693	0.113	20.6	0.1946	0.0000	OK
15 minute winter	3	12	54.369	0.108	22.1	0.2124	0.0000	OK
15 minute winter	4	11	54.982	0.082	14.5	0.3521	0.0000	OK
15 minute winter	5	11	54.549	0.095	18.4	0.2252	0.0000	OK
15 minute winter	6	13	54.283	0.281	40.1	0.4969	0.0000	OK
15 minute summer	7	1	54.310	0.000	0.0	0.0000	0.0000	OK
120 minute winter	8	116	54.176	0.028	5.8	17.3233	0.0000	OK
15 minute winter	9	10	54.982	0.082	11.3	0.1822	0.0000	OK
15 minute winter	10	11	54.733	0.075	13.9	0.0530	0.0000	OK
15 minute winter	11	14	54.272	0.282	36.1	0.9979	0.0000	OK
15 minute winter	12	13	54.269	0.423	70.0	1.0159	0.0000	OK
15 minute winter	13	10	55.569	0.069	7.9	0.1220	0.0000	OK
15 minute winter	14	11	55.455	0.064	7.8	0.0182	0.0000	OK
15 minute winter	15	10	55.531	0.031	6.7	0.0437	0.0000	OK
15 minute winter	Jun	11	55.255	0.093	14.2	0.0000	0.0000	OK
120 minute winter	16	98	54.178	0.028	0.4	0.0498	0.0000	OK
120 minute winter	17	96	54.178	0.192	42.2	71.8082	0.0000	OK
15 minute winter	18	11	54.687	0.087	13.1	0.1590	0.0000	OK
15 minute winter	19	11	54.331	0.104	16.0	0.2174	0.0000	OK
15 minute winter	20	13	54.253	0.421	68.8	1.1820	0.0000	OK
15 minute winter	21	13	54.276	0.586	50.6	1.1724	0.0000	SURCHARGED
15 minute winter	22	10	55.333	0.033	3.3	0.0217	0.0000	OK
15 minute winter	23	10	55.330	0.030	3.0	0.0187	0.0000	OK
15 minute winter	24	10	54.529	0.030	6.2	0.0523	0.0000	OK
Link Event (Outflow)	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	11.3	0.736	0.162	0.7705	
15 minute winter	2	1.001	3	20.3	0.864	0.290	1.1386	
15 minute winter	3	1.002	6	22.2	0.840	0.176	1.1147	
15 minute winter	4	2.000	5	13.6	0.889	0.160	1.0046	
15 minute winter	5	2.001	6	17.9	0.965	0.208	0.7807	
15 minute summer	6	1.003	12	39.2	0.758	0.192	2.2799	
15 minute summer	7	3.000	8	0.0	0.000	0.000	0.0000	
15 minute winter	8	3.001	11	-14.0	-0.399	-0.082	1.5891	
15 minute winter	9	4.000	10	11.0	0.857	0.274	0.3885	
15 minute winter	10	4.001	11	14.0	1.235	0.230	0.3670	
15 minute winter	11	3.002	12	28.8	0.687	0.167	4.0356	
15 minute winter	12	1.004	21	48.0	0.608	0.279	5.7244	
15 minute winter	13	5.000	14	7.8	0.787	0.183	0.0866	
15 minute winter	14	5.001	Jun	7.7	0.621	0.181	0.4270	
15 minute winter	15	6.000	Jun	6.7	1.159	0.041	0.0318	
15 minute winter	Jun	5.002	17	14.2	0.946	0.335	0.1232	
60 minute winter	16	7.000	17	-0.5	-0.033	-0.003	0.8464	
15 minute winter	17	5.003	20	-65.2	-0.859	-0.379	2.7829	
15 minute winter	18	8.000	19	12.6	0.894	0.313	0.7590	
15 minute winter	19	8.001	20	16.0	0.931	0.398	0.3069	
15 minute winter	20	5.004	21	-48.6	0.514	-0.273	4.6950	
15 minute winter	21	1.005	Jun24	16.7	0.393	0.097	1.3791	
15 minute winter	22	9.000	24	3.2	1.118	0.105	0.0713	
15 minute winter	23	10.000	24	2.9	1.219	0.082	0.0432	
15 minute winter	24	9.001	Jun24	6.1	1.594	0.037	0.1304	

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Jun24	13	54.279	0.614	21.1	0.0000	0.0000	SURCHARGED
15 minute winter	25	13	54.280	0.644	18.3	1.4752	0.0000	SURCHARGED
30 minute summer	26	31	53.590	0.084	11.0	0.0952	0.0000	OK
15 minute winter	C1	21	53.520	0.065	11.0	0.1152	0.0000	OK
360 minute winter	UU2203	208	53.375	0.060	11.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Jun24	1.006	25	11.3	0.150	0.066	1.6177	
15 minute winter	25	1.007	26	11.0	0.963	0.167	0.1135	
15 minute winter	26	1.008	C1	11.0	0.957	0.274	0.0989	
360 minute winter	C1	1.009	UU2203	11.0	1.217	0.159	0.0717	232.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	54.967	0.137	29.1	0.3423	0.0000	OK
15 minute winter	2	11	54.771	0.191	52.7	0.3294	0.0000	OK
15 minute winter	3	11	54.672	0.411	55.5	0.8115	0.0000	SURCHARGED
15 minute winter	4	11	55.034	0.134	35.5	0.5770	0.0000	OK
15 minute winter	5	12	54.665	0.211	45.9	0.4997	0.0000	OK
1440 minute winter	6	1110	54.649	0.647	4.8	1.1431	0.0000	SURCHARGED
1440 minute winter	7	1110	54.649	0.339	0.2	0.5988	0.0000	OK
1440 minute winter	8	1110	54.649	0.501	12.9	306.5072	0.0000	SURCHARGED
15 minute winter	9	10	55.041	0.141	27.7	0.3122	0.0000	OK
15 minute winter	10	11	54.777	0.119	34.3	0.0846	0.0000	OK
1440 minute winter	11	1110	54.649	0.659	11.3	2.3338	0.0000	SURCHARGED
1440 minute winter	12	1110	54.649	0.803	7.7	1.9279	0.0000	SURCHARGED
15 minute winter	13	10	55.615	0.115	19.2	0.2026	0.0000	OK
15 minute winter	14	10	55.495	0.104	19.0	0.0293	0.0000	OK
15 minute winter	15	10	55.548	0.048	16.3	0.0673	0.0000	OK
15 minute winter	Jun	11	55.325	0.163	34.9	0.0000	0.0000	OK
1440 minute winter	16	1110	54.649	0.499	0.4	0.8816	0.0000	SURCHARGED
1440 minute winter	17	1110	54.649	0.663	8.0	247.9555	0.0000	SURCHARGED
15 minute winter	18	10	54.752	0.152	32.0	0.2769	0.0000	OK
1440 minute winter	19	1110	54.648	0.421	1.9	0.8851	0.0000	SURCHARGED
1440 minute winter	20	1110	54.649	0.817	4.3	2.2948	0.0000	SURCHARGED
1440 minute winter	21	1110	54.650	0.960	5.3	1.9212	0.0000	SURCHARGED
15 minute winter	22	10	55.354	0.054	8.2	0.0350	0.0000	OK
15 minute winter	23	10	55.347	0.047	7.3	0.0297	0.0000	OK
1440 minute winter	24	1110	54.650	0.151	0.7	0.2664	0.0000	OK

Link Event (Outflow)	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	28.5	0.909	0.407	1.5705	
15 minute winter	2	1.001	3	51.1	1.071	0.730	2.8189	
15 minute winter	3	1.002	6	63.6	0.868	0.505	3.7002	
15 minute winter	4	2.000	5	34.1	1.136	0.401	2.0497	
15 minute winter	5	2.001	6	46.3	1.049	0.538	2.5753	
15 minute winter	6	1.003	12	114.6	0.790	0.562	3.2932	
120 minute winter	7	3.000	8	-1.0	-0.068	-0.006	2.7510	
15 minute winter	8	3.001	11	-102.7	-1.041	-0.597	3.2350	
15 minute winter	9	4.000	10	26.8	1.069	0.668	0.7647	
15 minute winter	10	4.001	11	34.1	1.370	0.560	0.9896	
120 minute winter	11	3.002	12	-57.4	0.490	-0.334	5.2361	
15 minute summer	12	1.004	21	98.0	0.630	0.570	5.7940	
15 minute winter	13	5.000	14	19.0	0.989	0.448	0.1683	
15 minute winter	14	5.001	Jun	18.6	0.769	0.440	0.8350	
15 minute winter	15	6.000	Jun	16.3	1.298	0.099	0.0625	
15 minute winter	Jun	5.002	17	34.6	1.166	0.817	0.2435	
30 minute summer	16	7.000	17	-9.0	-0.225	-0.052	3.4412	
15 minute winter	17	5.003	20	-203.6	-1.700	-1.185	4.8282	
15 minute winter	18	8.000	19	32.2	1.052	0.803	1.8171	
15 minute winter	19	8.001	20	39.4	1.006	0.983	0.6610	
15 minute winter	20	5.004	21	-135.5	-0.855	-0.761	4.7598	
15 minute winter	21	1.005	Jun24	-30.5	0.420	-0.178	1.3791	
15 minute winter	22	9.000	24	8.1	1.441	0.263	0.1383	
15 minute winter	23	10.000	24	7.2	1.566	0.200	0.0823	
15 minute winter	24	9.001	Jun24	15.2	1.656	0.092	0.1387	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Jun24	1080	54.648	0.983	5.6	0.0000	0.0000	SURCHARGED
1440 minute winter	25	1110	54.650	1.014	5.6	2.3234	0.0000	SURCHARGED
1440 minute winter	26	1110	54.543	1.037	5.6	1.1733	0.0000	SURCHARGED
1440 minute winter	C1	1110	54.542	1.087	5.6	1.9202	0.0000	SURCHARGED
15 minute summer	UU2203	1	54.540	1.225	0.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	Jun24	1.006	25	-17.7	0.144	-0.103	1.6177	
15 minute summer	25	1.007	26	10.8	0.898	0.164	0.3936	
15 minute winter	26	1.008	C1	9.5	0.718	0.236	0.3411	
1440 minute winter	C1	1.009	UU2203	5.6	0.142	0.082	0.3157	194.2

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	55.533	0.703	52.6	1.7620	0.0000	FLOOD RISK
15 minute winter	2	11	55.416	0.836	89.6	1.4438	0.0000	SURCHARGED
1440 minute winter	3	1080	55.105	0.844	4.8	1.6666	0.0000	SURCHARGED
15 minute winter	4	12	55.367	0.467	64.2	2.0112	0.0000	SURCHARGED
15 minute winter	5	12	55.177	0.723	77.9	1.7163	0.0000	SURCHARGED
1440 minute winter	6	1080	55.105	1.103	8.1	1.9485	0.0000	SURCHARGED
1440 minute winter	7	1080	55.105	0.795	0.4	1.4043	0.0000	SURCHARGED
1440 minute winter	8	1080	55.105	0.957	21.8	460.0109	0.0000	SURCHARGED
15 minute winter	9	11	55.596	0.696	50.0	1.5456	0.0000	FLOOD RISK
15 minute winter	10	11	55.325	0.667	57.6	0.4721	0.0000	SURCHARGED
1440 minute winter	11	1080	55.104	1.114	18.5	3.9474	0.0000	SURCHARGED
1440 minute winter	12	1080	55.105	1.259	12.7	3.0219	0.0000	SURCHARGED
15 minute winter	13	10	55.672	0.172	34.7	0.3034	0.0000	OK
15 minute winter	14	11	55.584	0.193	34.2	0.0546	0.0000	OK
15 minute winter	15	10	55.564	0.064	29.5	0.0907	0.0000	OK
15 minute winter	Jun	11	55.458	0.296	61.4	0.0000	0.0000	SURCHARGED
1440 minute winter	16	1080	55.105	0.955	0.3	1.6867	0.0000	SURCHARGED
1440 minute winter	17	1080	55.105	1.119	13.3	418.4346	0.0000	SURCHARGED
15 minute winter	18	11	55.709	1.109	57.8	2.0198	0.0000	SURCHARGED
1440 minute winter	19	1080	55.105	0.878	3.3	1.8430	0.0000	SURCHARGED
1440 minute winter	20	1080	55.105	1.273	8.7	3.5751	0.0000	SURCHARGED
1440 minute winter	21	1080	55.105	1.415	12.3	2.8319	0.0000	SURCHARGED
15 minute winter	22	10	55.373	0.073	14.7	0.0474	0.0000	OK
15 minute winter	23	10	55.362	0.062	13.1	0.0395	0.0000	OK
1440 minute winter	24	1080	55.105	0.606	1.3	1.0707	0.0000	SURCHARGED

Link Event (Outflow)	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	48.5	0.951	0.693	3.5210	
15 minute winter	2	1.001	3	86.0	1.222	1.230	3.4072	
15 minute winter	3	1.002	6	96.2	0.925	0.763	3.7002	
15 minute winter	4	2.000	5	56.6	1.146	0.666	4.6156	
15 minute winter	5	2.001	6	76.3	1.085	0.887	2.9431	
15 minute winter	6	1.003	12	175.1	1.105	0.860	3.2932	
30 minute winter	7	3.000	8	-4.4	-0.156	-0.026	4.1120	
15 minute winter	8	3.001	11	-231.8	-2.050	-1.349	4.6222	
15 minute winter	9	4.000	10	45.0	1.132	1.122	1.2064	
15 minute winter	10	4.001	11	58.0	1.458	0.952	1.2869	
60 minute winter	11	3.002	12	-117.9	-0.744	-0.686	5.2361	
15 minute winter	12	1.004	21	108.1	0.682	0.629	5.7940	
15 minute winter	13	5.000	14	34.2	1.123	0.808	0.2672	
15 minute winter	14	5.001	Jun	33.2	0.874	0.785	1.3087	
15 minute winter	15	6.000	Jun	29.4	1.374	0.179	0.0838	
15 minute winter	Jun	5.002	17	61.2	1.540	1.445	0.3171	
15 minute winter	16	7.000	17	-24.1	-0.334	-0.140	5.9458	
15 minute winter	17	5.003	20	-314.0	-2.240	-1.827	5.7505	
15 minute winter	18	8.000	19	52.9	1.330	1.319	2.1481	
15 minute winter	19	8.001	20	67.1	1.686	1.672	0.6610	
15 minute winter	20	5.004	21	-183.1	-1.156	-1.029	4.7598	
15 minute winter	21	1.005	Jun24	-55.9	0.470	-0.325	1.3791	
15 minute winter	22	9.000	24	14.6	1.544	0.477	0.3225	
15 minute winter	23	10.000	24	13.0	1.692	0.362	0.2191	
15 minute summer	24	9.001	Jun24	27.7	1.670	0.167	0.2421	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Jun24	1080	55.105	1.440	11.0	0.0000	0.0000	SURCHARGED
1440 minute winter	25	1080	55.104	1.468	11.3	3.3656	0.0000	SURCHARGED
30 minute summer	26	17	54.556	1.050	10.7	1.1872	0.0000	SURCHARGED
30 minute summer	C1	17	54.548	1.093	9.4	1.9319	0.0000	SURCHARGED
15 minute summer	UU2203	1	54.540	1.225	14.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	Jun24	1.006	25	-30.0	-0.189	-0.174	1.6177	
15 minute winter	25	1.007	26	11.3	0.943	0.171	0.3936	
15 minute summer	26	1.008	C1	12.6	0.866	0.313	0.3411	
15 minute summer	C1	1.009	UU2203	14.3	0.360	0.207	0.3157	1.4

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Appendix C

United Utilities Correspondence

Chloé Grimsley

From: Perry, Graham <Graham.Perry@uuplc.co.uk>
Sent: 15 November 2021 21:06
To: Chloé Grimsley
Cc: Wastewater Developer Services
Subject: Pre Development Enquiry for : Elizabeth Street, Cheetham Hill M8 8JJ UU
reference Number : UU Ref. 4200044839

Pre Development Enquiry for: Elizabeth Street, Cheetham Hill M8 8JJ UU reference Number : UU Ref. 4200044839

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

I response to your specific queries:

- There is an existing 225mm combined sewer shown on the sewer records. A GPR survey has been undertaken, however there were no accessible locations within the clients owned land or nearby public owned land.
Please could you advise how access can be made to locate the sewer to determine its position and depth? We are currently planned to undertake some drainage surveys in the coming weeks. – **You could either negotiate access into third party land or carry out slip trenches across the sewer as it crosses your site to confirm alignment and depth**
- The existing 225mm combined sewer crosses below the proposed site access, although the existing site appears to be an existing access it appears relatively informal. If the existing sewer is less than 1.2m cover to the pipe under the proposed access please advise if we need to concrete encase?
If the sewer has more than 1.2m cover, please advise if we need to do anything further. – **The available level information I have suggests that the sewer is lower than the minimum 1.2m. However the line may clash with any sewers crossing the site to enable a connection into Elizabeth Street. To avoid this you may want to consider incorporating the upstream sewer in your proposals and form a connection which will create a break to allow you to cross**
- Please advise of sewer easement for the 225mm combine public sewer. – **Minimum easement width is 6m**
- Please advise If new connections to the public sewer in Elizabeth Street is possible for both foul and surface water. The existing site may have some minor areas drained but the majority is generally unused and essentially greenfield.
Greenfield Rates are:
QBar – 11.1 l/s, 1 Year – 9.6 l/s, 30 Year -18.8 l/s, 100 Year – 23.1 l/s. **refer to response below**
- Please advise whether manholes can be proposed within the site with direct connection to the sewer (via saddle) in Elizabeth Street or if preference is for a new manhole on the sewer in Elizabeth Street. – **An offset**

manhole is possible when you cannot physically build a new manhole over the sewer due to the presence of other utilities but we look at schemes on a case by case basis

- Please advise of any historic flooding records for the site/locality. Modelling data suggests high surcharge levels in the 225mm combined sewer crossing your site

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 400mm x450 mm diameter public combined sewer within Elizabeth Street located to the north of your proposed development at an unrestricted rate.

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

- 1. into the ground (infiltration);**
- 2. to a surface waterbody;**
- 3. to a surface water sewer or highway drain;**
- 4. to a combined sewer.**

For guidance, The **North West SuDS Pro-Forma** provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

<https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs>

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

<https://www.gov.uk/government/publications/groundwater-protection-position-statements>

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 400mm x 450mm diameter public combined sewer within Elizabeth Street located north of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 11l/s. Variable flow rates will not be permitted

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the public sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site

According to our public sewer records there are public sewers located within your site boundary. We will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe unless there happens to be a formal easement agreement in place, in which case the specified easement width would apply. If you cannot achieve this then you may wish to consider diverting and or abandoning the public sewer.

Please refer to the link below to obtain full details of the processes involved with sewer diversions:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/>

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address:

DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/>

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/>

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

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

Kind regards,

Graham Perry



Graham Perry
Development Engineer
Developer Services
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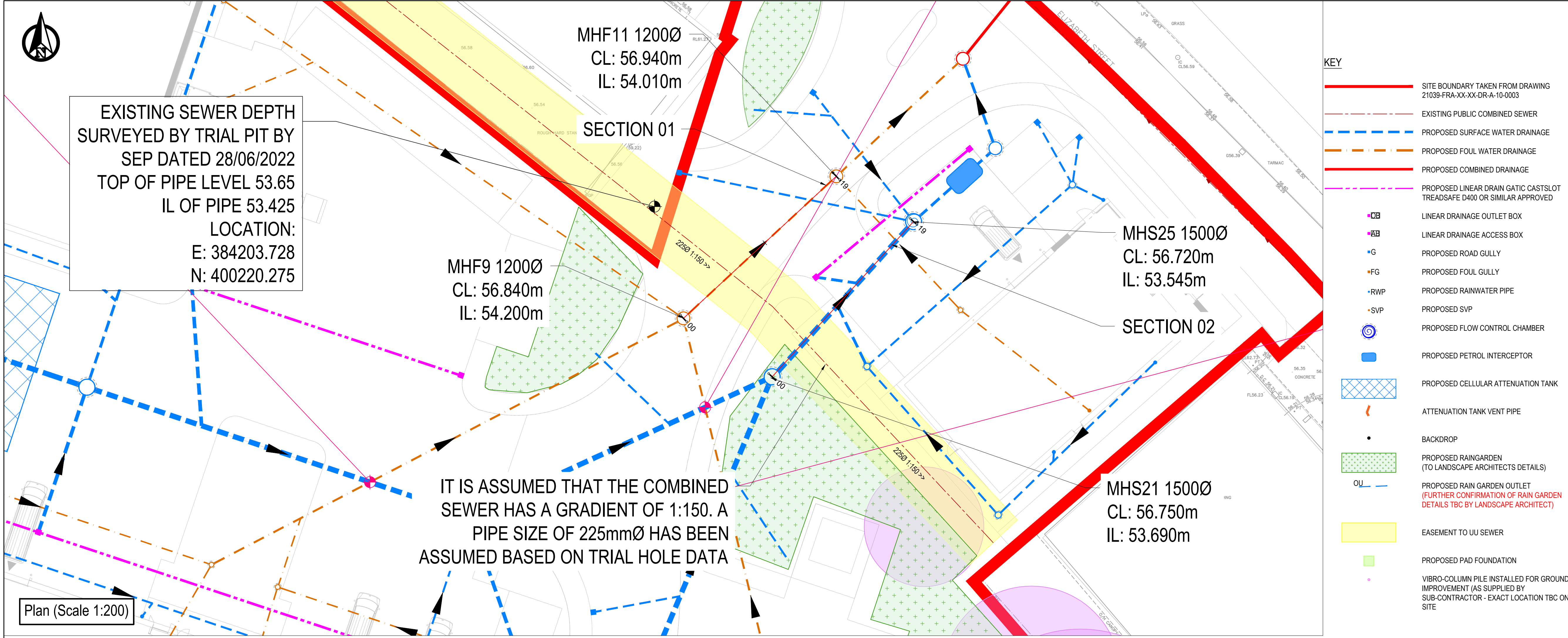
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Appendix D

Drainage Sections



GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
- FOR DRAINAGE LAYOUT, REFER TO CURTINS DRAWING 080139-CUR-XX-XX-DR-C-92500
- FOR GENERAL DRAINAGE NOTES, REFER TO CURTINS DRAWING 080139-CUR-XX-XX-DR-C-92530

DRAWING REFERENCES

THE DESIGN OF THIS SCHEME HAS BEEN DESIGNED IN ACCORDANCE WITH THE BELOW DRAWINGS AND INFORMATION.

SURVEYS

- TOPOGRAPHICAL SURVEY REF: TOPOGRAPHICAL SURVEY 'S22909-T_Rev -', DATED APRIL 2021.
- CCTV SURVEY REF 000847 BY LAYER SURVEYS DATED MARCH 2022
- TRIAL PIT ON PUBLIC SEWER BY SEP 28/06/2022

ARCHITECTS PLANS

- 21039-FRA-XX-XX-DR-A-90-0011 REV C3 ALL UNITS - SITE SETTING OUT PLAN
- 21039-FRA-XX-XX-DR-A-90-0013- REV C1 ALL UNITS - SITE DRAINAGE SETTING OUT

LANDSCAPE ARCHITECT'S PLANS

- 4018 101 REV B LANDSCAPE LAYOUT (FOR REFERENCE ONLY)

FOUNDATION PLANS

- 080139-CUR-01-FN-DR-S-16001 REV C01 UNIT 01 FOUNDATION GA
- 080139-CUR-02-FN-DR-S-16001 REV C02 UNIT 02 FOUNDATION GA
- 080139-CUR-04-FN-DR-S-16001 REV C02 UNIT 04 FOUNDATION GA
- 080139-CUR-09-FN-DR-S-16001 REV C02 UNIT 09 FOUNDATION GA
- 080139-CUR-ZZ-ZZ-DR-S-17001 REV C03 GA TO EXTERNAL RETAINING WALLS

VIBRO-COLUMN GROUND IMPROVEMENT

- TCV-22310-2-3 REV A STONE COLUMN LAYOUT PLOT 2-3
- TCV-22310-4-8 REV - STONE COLUMN LAYOUT PLOT 4-8
- TCV-22310-9 REV - STONE COLUMN LAYOUT PLOT 9

KEY

- SITE BOUNDARY TAKEN FROM DRAWING 21039-FRA-XX-XX-DR-A-10-0003
- EXISTING PUBLIC COMBINED SEWER
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED COMBINED DRAINAGE
- PROPOSED LINEAR DRAIN GATIC CASTSLOT TREADSAFE D400 OR SIMILAR APPROVED
- LINEAR DRAINAGE OUTLET BOX
- LINEAR DRAINAGE ACCESS BOX
- PROPOSED ROAD GULLY
- PROPOSED FOUL GULLY
- PROPOSED RAINWATER PIPE
- PROPOSED SVP
- PROPOSED FLOW CONTROL CHAMBER
- PROPOSED PETROL INTERCEPTOR
- PROPOSED CELLULAR ATTENUATION TANK
- ATTENUATION TANK VENT PIPE
- BACKDROP
- PROPOSED RAINGARDEN (TO LANDSCAPE ARCHITECTS DETAILS)
- PROPOSED RAIN GARDEN OUTLET (FURTHER CONFIRMATION OF RAIN GARDEN DETAILS TBC BY LANDSCAPE ARCHITECT)
- EASEMENT TO UU SEWER
- PROPOSED PAD FOUNDATION
- VIBRO-COLUMN PILE INSTALLED FOR GROUND IMPROVEMENT (AS SUPPLIED BY SUB-CONTRACTOR - EXACT LOCATION TBC ON SITE)

