

Sparkle St, Manchester

Drainage Planning Condition Discharge Report

Curtins Ref: SPS-CUR-XX-XX-RP-C-83-0002

Revision: P01

Issue Date: 12 December 2025

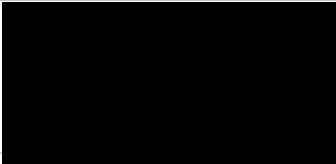
Client Name: Central and Urban

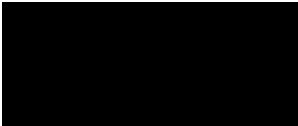
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Cheltenham GL 53 7TH

Control Sheet

Rev	Description	Checked	Issued	Date
P01	First Issue	MW	ATL	12/12/25

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1.0 Planning Condition Discharge

1.1 Introduction

Curtins has been appointed by Central & Urban to provide a report to facilitate the discharge of Planning Conditions for the proposed development located at Sparkle St, Manchester, M1 2NJ. Planning Approval Ref **139986/FO/2024**.

The Planning Condition to be discharged is Condition 11, which relates to the proposed surface water drainage design for the scheme.

1.2 Condition 11

The wording of Condition 11 is as follows:

Notwithstanding the Sparkle Street, Manchester Flood Risk Assessment and Drainage Strategy Curtins Ref: 082142-CUR-XX-XX-RP-C-92000 Revision: V04 Issue Date: 19 April 2024 and dwg 082142-CUR-XX-XX-DR-C-92500-P03, prior to the commencement of the development other than demolition as identified on plan 10413-SHP-Z0-A-B5D8-JC20-XP-XX-001, a surface water drainage scheme in accordance with Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacement national standards, shall be submitted for approval in writing by the City Council, as Local Planning Authority. This shall include:

- *Where surface water is connected to the public sewer, details of surface water attenuation to the flow rates proposed in 082142-CUR-XX-XX-RP-C-92000 Revision: V04 Issue Date: 19 April 2024.*
- *Maximised integration of green SuDS components (utilising infiltration or attenuation) if practicable.*
- *A finalised drainage layout showing all components, outfalls, levels and connectivity.*
- *An existing and proposed impermeable areas drawing to accompany all discharge rate calculations.*
- *Hydraulic calculations of the proposed drainage system, including all design parameters. Calculations must include Critical Storm Events for the 1 in 2, 1 in 30 and 1 in 100 + 45% Climate Change. Results must demonstrate no surcharge for the 1 in 2, no flooding in the 1 in 30 and no flooding of buildings for the 1 in 100 + 45% Climate Change.*
- *A plan indicating surface water overland flow routes for extreme events to ensure flows are diverted away from existing and proposed buildings (including basements).*
- *Construction details of flow control and SuDS elements.*

The development shall be constructed and completed in accordance with the approved details prior to the occupation of the residential accommodation hereby approved.

Reason: To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution. This condition is imposed in light of national policies within the NPPF and NPPG and Core Strategy Policies SP1, DM1 EN08 and EN14.

1.3 Surface Water Drainage Design

The Surface Water Drainage has been designed and progressed following the principals of the FRA & Drainage Strategy 082142-CUR-XX-XX-RP-C-92000, Rev V04.

The specific requirements of the Planning Condition, and how these are satisfied, are summarised below:

Where surface water is connected to the public sewer, details of surface water attenuation to the flow rates proposed in 082142-CUR-XX-XX-RP-C-92000 Revision: V04 Issue Date: 19 April 2024.

The proposed surface water drainage connects to the 900mm diameter United Utilities Public Surface Water Sewer in Store St. It is proposed to make the connection at Manhole Ref UU9006.

The proposed discharge rates are in line with those included within the Drainage Strategy:

- 1 year = 12.1 l/s (50% of 1 year existing)
- 30 Year = 29.6 l/s (50% of 30 year existing)
- 100 Year +45% climate change = 29.6 l/s (50% of 30 year existing/61% of 100 year existing)

As confirmed within the Drainage Strategy, United Utilities have accepted the proposed Flow Rates.

Surface Water Attenuation is provided by the following elements:

- Cellular Storage Tank
- Filter Drains

The attenuation has been designed to accommodate all storm events up to the 1 in 100-year (Including climate change) storm event without flooding. The attenuation tank has been sized to provide 54m³ of attenuation storage.

The Attenuation tank has been located so that the majority of the tank sits within an area of fill, and outside any potential zone of loading from the existing retaining walls.

Previous comments have been noted regarding easements around proposed tanks (2.5m from Public Highway, and 5m from Dwellings). The proposed tanks are located outside these easement zones.

A copy of the proposed drainage layouts is enclosed in *Appendix A*

Maximised integration of green SuDS components (utilising infiltration or attenuation) if practicable.

Systems such as infiltration trenches and soakaways were considered as part of the surface water management strategy however, the ground conditions and spatial constraints, therefore, infiltration systems are not considered suitable for the site

The development is proposing to include permeable paving/ filter drains and rain gardens/drained soft landscaping as sustainable drainage features at the podium level. The permeable paving has not been included within the drainage modelling but is in place as a treatment phase only.

The extent of permeable paving is shown on the Podium Level Drainage Layout, which is enclosed in *Appendix A*.

The access road at ground floor level was initially proposed as permeable paving, but due to the access requirements and the number of services required within this zone, it was not possible to include this as permeable paving.

A finalised drainage layout showing all components, outfalls, levels and connectivity.

A copy of the proposed drainage layouts is enclosed in *Appendix A*

An existing and proposed impermeable areas drawing to accompany all discharge rate calculations.

A copy of the existing/ proposed catchments plan and the existing discharge rate calculations are enclosed in *Appendix B*

Hydraulic calculations of the proposed drainage system, including all design parameters.

Calculations must include Critical Storm Events for the 1 in 2, 1 in 30 and 1 in 100 + 45%

Climate Change. Results must demonstrate no surcharge for the 1 in 2, no flooding in the 1 in 30 and no flooding of buildings for the 1 in 100 + 45% Climate Change.

A copy of the Drainage calculations for all storm events is enclosed in *Appendix C*. It should be noted that the 1 in 2 year-calculations include some surcharge. However, this is restricted to pipework immediately adjacent to flow control manholes and cannot be removed within the design.

A plan indicating surface water overland flow routes for extreme events to ensure flows are diverted away from existing and proposed buildings (including basements).

No flooding occurs in the 1:100+45% climate change event. Therefore, more extreme events have been modelled in order to identify where the network will initially flood at both ground floor and podium level.

- The first flood at podium level occurs in the 1:100 + 50% cc event.
- The first flood at ground floor occurs in the 1:300 + 100% cc event.

A copy of the proposed drainage layouts are enclosed in *Appendix D*

Construction details of flow control and SuDS elements.

A copy of all drainage details, including the flow controls and SuDS elements are included in *Appendix E*.

Appendix

Appendix A

Proposed Drainage Layout - Ground Floor

Proposed Drainage Layout - Podium Level

NOT ALL HAZARDS ARE IDENTIFIED ON THIS DRAWING: REFER TO
082142-CUR-XX-XX-DR-C-92501 PODIUM LEVEL DRAINAGE LAYOUT



SVP • FOUL POP-UP
FG - FOUL GULLY
SS - STUB STACK
SVP - SOIL VENT PIPES

 PROPOSED FOUNDATION

 DRAINAGE CROSSING GROUND BEAM
PUT - PASSES UNDER GROUND BEAM
PTF - PASSES THROUGH GROUND BEAM
PAF - PASSES ABOVE GROUND BEAM
INVERT LEVEL SHOWN AT CENTRE OF GROUND BEAM

 CHANGE IN SLAB LEVEL

1. FURTHER CO-ORDINATION WITH FOUNDATION LAYOUT REQUIRED TO AVOID CLASHES WITH SOME POP-UP LOCATIONS

P06	UPDATED IN LINE WITH RWP SETTING OUT	12/12/25	ATL	MW
P05	PRELIMINARY STAGE 4 ISSUE	05/12/25	ATL	MW
P04	STAGE 3 ISSUE	27/09/24	ATL	ATL
P03	STAGE 2 UPDATE	19/04/24	CS	CG
P02	ISSUED FOR STAGE 2	07/07/23	ATL	CG
P01	ISSUED FOR DRAFT FRA	07/07/23	ATL	CG
Rev:	Description:	Date:	By:	Chkd:

Project No - Originator - Function - Spatial - Form - Discipline - Number	Revision
SPS - CUR - ZZ - L00- DR- C -50-1900	P06

NOT ALL HAZARDS ARE IDENTIFIED ON THIS DRAWING: REFER TO
082142-CUR-XX-XX-DR-C-92500 GROUND FLOOR DRAINAGE LAYOUT

 PERMEABLE PAVING OFF SLAB

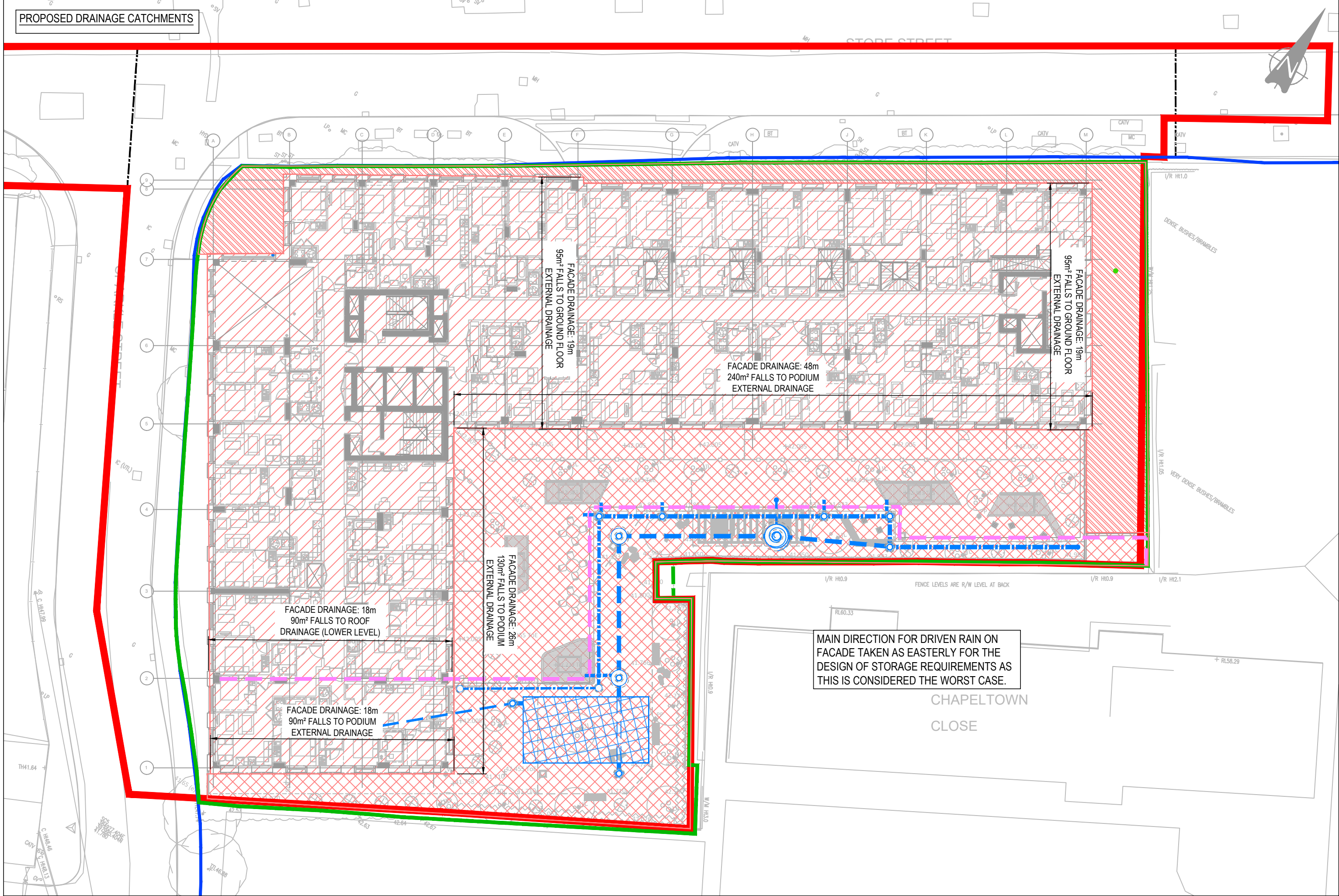
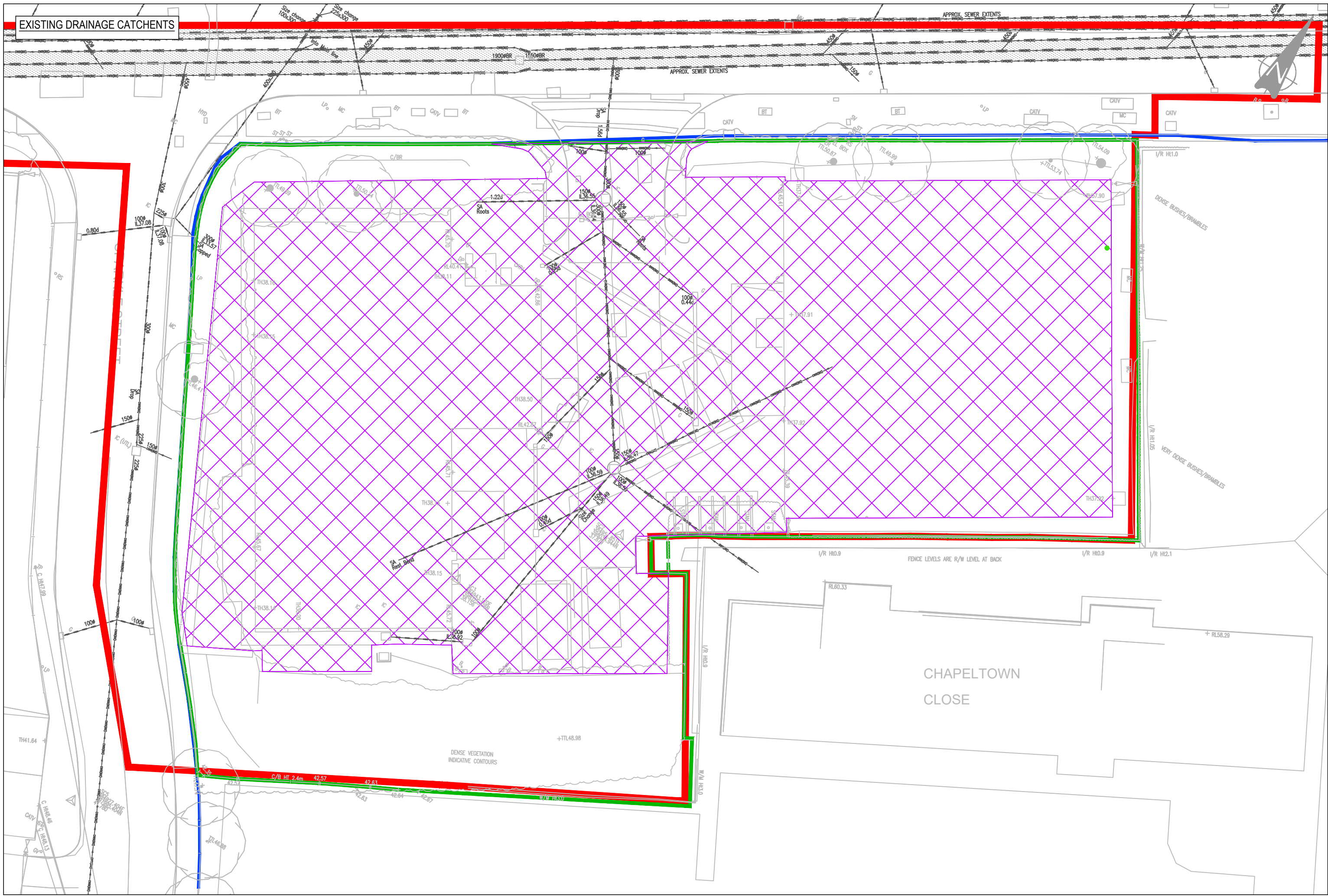
1. FURTHER CO-ORDINATION WITH FOUNDATION LAYOUT REQUIRED TO AVOID CLASHES WITH SOME POP-UP LOCATIONS

250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355	360	365	370	375	380	385	390	395	400	405	410	415	420	425	430	435	440	445	450	455	460	465	470	475	480	485	490	495	500	505	510	515	520	525	530	535	540	545	550	555	560	565	570	575	580	585	590	595	600	605	610	615	620	625	630	635	640	645	650	655	660	665	670	675	680	685	690	695	700	705	710	715	720	725	730	735	740	745	750	755	760	765	770	775	780	785	790	795	800	805	810	815	820	825	830	835	840	845	850	855	860	865	870	875	880	885	890	895	900	905	910	915	920	925	930	935	940	945	950	955	960	965	970	975	980	985	990	995	1000
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Appendix B

Existing/ Proposed Catchment Plan

Existing Surface Water Drainage Model Details and Results



EXISTING CATCHMENTS

TOTAL EXISTING HARDSTANDING CATCHMENT: 0.22 Ha.

MODELLING OF THE EXISTING DRAINAGE NETWORK INDICATES THE PRE-DEVELOPMENT BROWNFIELD FLOWS ARE:

- 1 YEAR - 24.2/s
- 30 YEAR - 59.1/s
- 100 YEAR - 75.6/s

PROPOSED CATCHMENTS

TOTAL PROPOSED DRAINAGE CATCHMENT: 0.373Ha*

THE PROPOSED DRAINAGE HAS BEEN DESIGNED TO PROVIDE A 50% BETTERMENT TO THE PRE-DEVELOPMENT BROWNFIELD FLOWS:

- 1 YEAR - 12.1/s
- 30 YEAR - 29.6/s
- 100 YEAR +45% CLIMATE CHANGE - 29.6/s

*TOTAL AREA INCLUDES ALLOWANCE FOR FACADE DRAINAGE AS BUILDING IS OVER 5 STOREYS TALL; REFER TO TABLE 1

TABLE 1: PROPOSED DRAINAGE CATCHMENTS			
CATCHMENT AREA	PLAN AREA	ADDITIONAL FACADE AREA	TOTAL CATCHMENT AREA
ROOF	0.171 Ha	0.019 Ha	0.190 Ha
GROUND FLOOR EXTERNALS	0.023 Ha	0.010 Ha	0.033 Ha
PODIUM EXTERNALS	0.089 Ha	0.046 Ha	0.135 Ha
TOTAL	0.283 Ha	0.075 Ha	0.373 Ha

DRAWING BASED ON:

SURVEY INFORMATION

- 60159-1 TOPOGRAPHICAL SURVEY BY MALCOLM HUGHES DATED MAY 2023
- TOPOGRAPHICAL SURVEY BY SEP S15724-T
- 60159-UG1 & UG2 GPR SURVEY BY MALCOLM HUGHES DATED MAY 2023
- PJ00478370 CCTV SURVEY BY LANES GROUP (FOR MALCOLM HUGHES) DATED MAY 2023

HIGHWAY BOUNDARY INFORMATION

- INFORMATION RECEIVED FROM MANCHESTER CC HIGHWAYS MAY 2023

ARCHITECT'S PLANS

- SPS-SHA-ZZ-L00-DR-A-03-1001 REV P06 GA GROUND FLOOR
- SPS-SHA-ZZ-L01-DR-A-03-1001 REV P06 GA FIRST FLOOR

LANDSCAPE ARCHITECT'S PLANS

- SPS-RFM-XX-L00-M2-L-19-0001 REV P03 LANDSCAPE GA GROUND LEVEL
- SPS-RFM-XX-L01-M2-L-19-0002 REV P05 LANDSCAPE GA PODIUM

ABOVE GROUND DRAINAGE LAYOUTS

- FOUL POP-UP DRAWINGS RECEIVED 14.11.25 & 27.11.25 (WIP ISSUE)
- RWP CONNECTION SKETCHES RECEIVED 27.11.25 (WIP ISSUE)

FOUNDATIONS/ SLAB DETAILS

- SPS-CUR-ZZ-FN-DR-S-03-1090 WIP ISSUE 11.11.25 FOUNDATION LAYOUT
- SPS-CUR-ZZ-L00-DR-S-03-1100 WIP ISSUE 11.11.25 LEVEL 00 GA
- SPS-CUR-ZZ-L01-DR-S-03-1101 WIP ISSUE 11.11.25 LEVEL 01 GA

- KEY:**
- PLANNING APPLICATION BOUNDARY TAKEN FROM DRAWING 10413-SHP-Z1-A-G200-PL-00-001.
 - SITE OWNERSHIP BOUNDARY TAKEN FROM DRAWING 10413-SHP-Z1-A-G200-PL-00-001.
 - HIGHWAY BOUNDARY, BASED ON INFORMATION RECEIVED FROM MANCHESTER CC HIGHWAYS.
- EXISTING CATCHMENT PLAN**
- EXISTING ROOF/ HARDSTANDING AREA
 - EXISTING COMBINED DRAINAGE
 - EXISTING FOUL DRAINAGE
 - EXISTING SURFACE WATER DRAINAGE
- PROPOSED CATCHMENT PLAN**
- PROPOSED ROOF AREA
 - PROPOSED EXTERNAL AREA (GROUND FLOOR LEVEL)
 - PROPOSED EXTERNAL AREA (PODIUM LEVEL)
 - PROPOSED SW DRAINAGE
 - EXTENT OF PROPOSED RETAINING WALL

- GENERAL NOTES:**
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
 - DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
 - DO NOT SCALE THIS DRAWING. ALL DETAILS AND DIMENSIONS ARE TO BE CHECKED BY THE CONTRACTOR. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
 - ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDANCE DATUM UNLESS OTHERWISE NOTED.
 - FOR FULL DRAINAGE NOTES REFER TO DRAWING SPS-CUR-ZZ-ZZ-DR-C-03-1910

P01

ISSUED FOR PLANNING CONDITION DISCHARGE

12.12.25

ATL

MW

Rev:

Description:

Date:

By:

Chkd:

Curtins

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STAGE 4

Project:

SPARKLE STREET, MANCHESTER

Orig Title:

EXISTING AND PROPOSED DRAINAGE CATCHMENTS

Drawn By

ATL

Designed By

ATL

Checked By

MW

Project No.

0824142

Date

12/12/25

Scales @ A1

1:200

Project No • Originator • Function • Spatial • Form • Discipline • Number

SPS - CUR - ZZ - ZZ - DR - C - 83-1903

Revision

P01

File: s:\Projects\08201 - 0830000824142 - Central & Urban BTRQ4-Production\4-Model Drawings\CC401921

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

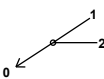
Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
EX06	0.022	5.00	37.990	1200	384946.413	398021.754	1.070
EX05	0.173	5.00	37.870	1200	384948.723	398038.990	1.280
EX04	0.024	5.00	37.660	1200	384937.021	398055.843	1.130
UU9101		5.00	36.860	2450	384987.662	398102.251	4.210
OF			37.350		384931.965	398065.316	5.025
UU9005			37.410	2450	384925.957	398061.398	5.120

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	EX06	EX05	17.390	0.600	36.920	36.790	0.130	133.8	100	5.39	45.1
1.001	EX05	EX04	20.517	0.600	36.590	36.530	0.060	342.0	300	5.74	43.9
1.002	EX04	OF	10.740	0.600	36.530	33.525	3.005	3.6	300	5.91	43.3
2.000	UU9101	OF	66.831	0.600	32.650	32.325	0.325	205.6	1550	5.37	45.2
1.003	OF	UU9005	7.173	0.600	32.325	32.290	0.035	205.6	1550	5.95	43.2

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
EX06	384946.413	398021.754	37.990	1.070	1200				
						0	1.000	36.920	100
EX05	384948.723	398038.990	37.870	1.280	1200		1	1.000	36.790
						0	1.001	36.590	300
EX04	384937.021	398055.843	37.660	1.130	1200		1	1.001	36.530
						0	1.002	36.530	300
UU9101	384987.662	398102.251	36.860	4.210	2450		0	2.000	32.650
						0	2.000	32.325	1550
OF	384931.965	398065.316	37.350	5.025			1	2.000	32.325
						2	1.002	33.525	300
						0	1.003	32.325	1550

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
UU9005	384925.957	398061.398	37.410	5.120	2450	1	1.003	32.290	1550



Simulation Settings

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

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0

Node UU9005 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 All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	2.550	300	2.550	600	2.550	900	2.550	1200	2.550
60	2.550	360	2.550	660	2.550	960	2.550	1260	2.550
120	2.550	420	2.550	720	2.550	1020	2.550	1320	2.550
180	2.550	480	2.550	780	2.550	1080	2.550	1380	2.550
240	2.550	540	2.550	840	2.550	1140	2.550	1440	2.550

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	92.521	26.180	1 year 1440 minute summer	4.127	1.106
1 year 30 minute summer	60.022	16.984	30 year 15 minute summer	226.195	64.005
1 year 60 minute summer	40.398	10.676	30 year 30 minute summer	147.452	41.724
1 year 120 minute summer	24.980	6.602	30 year 60 minute summer	98.615	26.061
1 year 180 minute summer	19.271	4.959	30 year 120 minute summer	59.946	15.842
1 year 240 minute summer	15.301	4.043	30 year 180 minute summer	45.598	11.734
1 year 360 minute summer	11.775	3.030	30 year 240 minute summer	35.759	9.450
1 year 480 minute summer	9.342	2.469	30 year 360 minute summer	26.939	6.932
1 year 600 minute summer	7.682	2.101	30 year 480 minute summer	20.981	5.545
1 year 720 minute summer	6.859	1.838	30 year 600 minute summer	17.039	4.661
1 year 960 minute summer	5.653	1.489	30 year 720 minute summer	15.093	4.045

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 960 minute summer	12.278	3.233	100 year 240 minute summer	46.975	12.414
30 year 1440 minute summer	8.788	2.355	100 year 360 minute summer	35.264	9.075
100 year 15 minute summer	291.766	82.560	100 year 480 minute summer	27.350	7.228
100 year 30 minute summer	191.982	54.324	100 year 600 minute summer	22.137	6.055
100 year 60 minute summer	129.253	34.158	100 year 720 minute summer	19.562	5.243
100 year 120 minute summer	78.836	20.834	100 year 960 minute summer	15.851	4.174
100 year 180 minute summer	59.966	15.431	100 year 1440 minute summer	11.278	3.023

Results for 1 year Critical Storm Duration. Lowest mass balance: 96.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	EX06	11	36.969	0.049	2.5	0.0758	0.0000	OK
15 minute summer	EX05	10	36.715	0.125	22.0	0.4792	0.0000	OK
15 minute summer	EX04	10	36.572	0.042	24.3	0.0655	0.0000	OK
1440 minute summer	UU9101	1680	32.984	0.334	0.9	1.5752	0.0000	OK
1440 minute summer	OF	1650	32.984	0.659	1.9	0.0000	0.0000	OK
15 minute summer	UU9005	1	34.840	2.550	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	EX06	1.000	EX05	2.4	0.646	0.468	0.0655	
15 minute summer	EX05	1.001	EX04	21.6	1.353	0.362	0.3471	
15 minute summer	EX04	1.002	OF	24.2	4.124	0.041	0.0631	
1440 minute summer	UU9101	2.000	OF	-0.9	-0.004	0.000	35.3835	
1440 minute summer	OF	1.003	UU9005	0.0	0.000	0.000	9.4737	0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 96.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	EX06	11	37.030	0.110	6.1	0.1694	0.0000	SURCHARGED
15 minute summer	EX05	10	36.791	0.201	53.3	0.7693	0.0000	OK
15 minute summer	EX04	10	36.596	0.066	59.3	0.1026	0.0000	OK
1440 minute summer	UU9101	1680	33.447	0.797	1.9	3.7584	0.0000	OK
1440 minute summer	OF	1680	33.447	1.122	4.0	0.0000	0.0000	OK
15 minute summer	UU9005	1	34.840	2.550	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	EX06	1.000	EX05	5.7	0.759	1.093	0.1245	
15 minute summer	EX05	1.001	EX04	52.7	1.740	0.882	0.6325	
15 minute summer	EX04	1.002	OF	59.1	5.314	0.100	0.1194	
1440 minute summer	UU9101	2.000	OF	-1.9	-0.004	0.000	81.2980	
1440 minute summer	OF	1.003	UU9005	0.0	0.000	0.000	11.9726	0.0

Results for 100 year Critical Storm Duration. Lowest mass balance: 96.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	EX06	11	37.113	0.193	7.8	0.2971	0.0000	SURCHARGED
15 minute summer	EX05	10	36.824	0.234	68.2	0.8953	0.0000	OK
15 minute summer	EX04	10	36.605	0.075	75.9	0.1167	0.0000	OK
1440 minute summer	UU9101	1680	33.748	1.098	2.6	5.1770	0.0000	OK
1440 minute summer	OF	1680	33.748	1.423	5.2	0.0000	0.0000	OK
15 minute summer	UU9005	1	34.840	2.550	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	EX06	1.000	EX05	6.9	0.895	1.334	0.1294	
15 minute summer	EX05	1.001	EX04	67.4	1.848	1.128	0.7462	
15 minute summer	EX04	1.002	OF	75.6	5.686	0.128	0.1429	
1440 minute summer	UU9101	2.000	OF	-2.6	-0.003	0.000	108.0204	
1440 minute summer	OF	1.003	UU9005	0.0	0.000	0.000	13.2255	0.0

Appendix E

Drainage Details

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
FD01	0.039	5.00	41.842	450		384946.543	398020.024	1.242
FD02	0.017	5.00	41.842	450		384955.371	398025.702	1.422
FD03	0.036	5.00	41.842	600		384948.434	398036.677	1.942
FD05	0.034	5.00	41.842	600		384952.469	398039.236	1.974
FD07	0.047	5.00	41.842	600		384962.800	398045.803	2.056
FD04	0.039	5.00	41.842	600		384967.003	398048.473	2.089
RE 06A	0.010	5.00	41.842	150		384983.870	398056.433	1.242
FD06	0.010	5.00	41.842	600		384968.250	398046.510	2.105
S01	0.018	5.00	41.850	600		384951.156	398021.704	1.620
S02		5.00	41.700	600		384960.243	398020.885	2.100
TANK	0.000	5.00	41.850			384957.483	398025.231	2.271
S03A	0.090	5.00	41.850	1200		384956.255	398027.162	2.280
S03	0.000	5.00	41.850	1200		384950.505	398036.215	2.323
S05	0.000		41.850	1800		384960.560	398042.603	2.371
DP05	0.000		41.833	300		384959.090	398044.912	5.233
OU	0.017	5.00	37.110	350	350	384968.956	398081.282	1.000
S07	0.016	5.00	37.150	600		384976.326	398068.026	1.830
S08	0.000		37.150	2100		384954.866	398054.187	1.958
OF	0.000		37.200	1500		384941.958	398074.613	2.169

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	FD01	FD02	10.496	0.600	40.600	40.495	0.105	100.0	150	5.17	46.0
1.001	FD02	FD03	12.984	0.600	40.420	40.333	0.087	150.0	225	5.38	45.2
1.002	FD03	FD05	4.778	0.600	39.900	39.868	0.032	150.0	300	5.44	45.0
1.003	FD05	FD07	12.242	0.600	39.868	39.786	0.082	150.0	300	5.60	44.4
1.004	FD07	FD04	4.979	0.600	39.786	39.753	0.033	150.0	300	5.66	44.1
1.005	FD04	FD06	2.326	0.600	39.753	39.737	0.016	150.0	300	5.69	44.0
2.000	RE 06A	FD06	18.505	0.600	40.600	40.415	0.185	100.0	150	5.31	45.5
1.006_1	FD06	S05	8.626	0.600	39.737	39.679	0.058	150.0	300	5.81	43.6
3.000	S01	TANK	7.244	0.600	40.230	40.158	0.072	100.0	150	5.12	46.2
4.000	S02	TANK	5.148	0.600	39.600	39.579	0.021	250.0	300	5.09	46.3
3.001	TANK	S03A	2.288	0.600	39.579	39.570	0.009	250.0	300	5.16	46.0
3.002	S03A	S03	10.725	0.600	39.570	39.527	0.043	250.0	300	5.34	45.3
3.003	S03	S05	11.913	0.600	39.527	39.479	0.048	250.0	300	5.54	44.6
1.007	S05	DP05	2.737	0.600	39.479	39.461	0.018	150.0	300	5.84	43.5
1.009	DP05	S08	10.192	0.600	36.600	36.498	0.102	99.9	225	5.97	43.2
5.000	OU	S07	15.167	0.600	36.110	35.395	0.715	21.2	225	5.09	46.3
5.001	S07	S08	25.535	0.600	35.320	35.192	0.128	200.0	300	5.47	44.8

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.006	S08	OF	24.163	0.600	35.192	35.031	0.161	150.1	225	6.35	32.3

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	17.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	Starting Level (m)	
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
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
100	45	0	0

Node OF 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 100yr, 100yr+45% 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	-0.190	300	-0.190	600	-0.190	900	-0.190	1200	-0.190
60	-0.190	360	-0.190	660	-0.190	960	-0.190	1260	-0.190
120	-0.190	420	-0.190	720	-0.190	1020	-0.190	1320	-0.190
180	-0.190	480	-0.190	780	-0.190	1080	-0.190	1380	-0.190
240	-0.190	540	-0.190	840	-0.190	1140	-0.190	1440	-0.190

Node S05 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	39.479	Product Number	CTL-SHE-0163-1550-2000-1550
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	15.5	Min Node Diameter (mm)	1800

Node S08 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	35.192	Product Number	CTL-SHE-0162-1210-0800-1210
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	12.1	Min Node Diameter (mm)	1200

Node S08 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.600	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	17.5		
Invert Level (m)	36.350	Diameter (m)	0.100		

Node FD06 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.005
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	39.737	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	77	Diameter (mm)	525

Node FD06 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	2.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.415	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	45	Diameter (mm)	525

Node TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	39.579
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	45

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	47.5	47.5	1.200	47.5	76.8	1.201	0.0	76.8

Node FD03 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.333	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	46	Diameter (mm)	525

Node FD02 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.495	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	40	Diameter (mm)	450

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	92.521	26.180	1 year 360 minute winter	7.654	3.030
1 year 15 minute winter	64.927	26.180	1 year 480 minute summer	9.342	2.469
1 year 30 minute summer	60.022	16.984	1 year 480 minute winter	6.207	2.469
1 year 30 minute winter	42.121	16.984	1 year 600 minute summer	7.682	2.101
1 year 60 minute summer	40.398	10.676	1 year 600 minute winter	5.249	2.101
1 year 60 minute winter	26.839	10.676	1 year 720 minute summer	6.859	1.838
1 year 120 minute summer	24.980	6.602	1 year 720 minute winter	4.609	1.838
1 year 120 minute winter	16.596	6.602	1 year 960 minute summer	5.653	1.489
1 year 180 minute summer	19.271	4.959	1 year 960 minute winter	3.745	1.489
1 year 180 minute winter	12.527	4.959	1 year 1440 minute summer	4.127	1.106
1 year 240 minute summer	15.301	4.043	1 year 1440 minute winter	2.773	1.106
1 year 240 minute winter	10.165	4.043	2 year 15 minute summer	119.760	33.888
1 year 360 minute summer	11.775	3.030	2 year 15 minute winter	84.042	33.888

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 30 minute summer	77.518	21.935	30 year 360 minute winter	17.511	6.932
2 year 30 minute winter	54.399	21.935	30 year 480 minute summer	20.981	5.545
2 year 60 minute summer	51.720	13.668	30 year 480 minute winter	13.940	5.545
2 year 60 minute winter	34.361	13.668	30 year 600 minute summer	17.039	4.661
2 year 120 minute summer	31.549	8.338	30 year 600 minute winter	11.642	4.661
2 year 120 minute winter	20.961	8.338	30 year 720 minute summer	15.093	4.045
2 year 180 minute summer	24.133	6.210	30 year 720 minute winter	10.143	4.045
2 year 180 minute winter	15.687	6.210	30 year 960 minute summer	12.278	3.233
2 year 240 minute summer	19.039	5.032	30 year 960 minute winter	8.133	3.233
2 year 240 minute winter	12.649	5.032	30 year 1440 minute summer	8.788	2.355
2 year 360 minute summer	14.516	3.735	30 year 1440 minute winter	5.906	2.355
2 year 360 minute winter	9.436	3.735	100 year +45% CC 15 minute summer	423.061	119.712
2 year 480 minute summer	11.436	3.022	100 year +45% CC 15 minute winter	296.885	119.712
2 year 480 minute winter	7.598	3.022	100 year +45% CC 30 minute summer	278.374	78.770
2 year 600 minute summer	9.363	2.561	100 year +45% CC 30 minute winter	195.350	78.770
2 year 600 minute winter	6.398	2.561	100 year +45% CC 60 minute summer	187.417	49.529
2 year 720 minute summer	8.339	2.235	100 year +45% CC 60 minute winter	124.515	49.529
2 year 720 minute winter	5.605	2.235	100 year +45% CC 120 minute summer	114.312	30.209
2 year 960 minute summer	6.846	1.803	100 year +45% CC 120 minute winter	75.946	30.209
2 year 960 minute winter	4.535	1.803	100 year +45% CC 180 minute summer	86.951	22.375
2 year 1440 minute summer	4.967	1.331	100 year +45% CC 180 minute winter	56.520	22.375
2 year 1440 minute winter	3.338	1.331	100 year +45% CC 240 minute summer	68.114	18.001
30 year 15 minute summer	226.195	64.005	100 year +45% CC 240 minute winter	45.253	18.001
30 year 15 minute winter	158.733	64.005	100 year +45% CC 360 minute summer	51.133	13.158
30 year 30 minute summer	147.452	41.724	100 year +45% CC 360 minute winter	33.238	13.158
30 year 30 minute winter	103.475	41.724	100 year +45% CC 480 minute summer	39.658	10.480
30 year 60 minute summer	98.615	26.061	100 year +45% CC 480 minute winter	26.348	10.480
30 year 60 minute winter	65.517	26.061	100 year +45% CC 600 minute summer	32.099	8.780
30 year 120 minute summer	59.946	15.842	100 year +45% CC 600 minute winter	21.932	8.780
30 year 120 minute winter	39.827	15.842	100 year +45% CC 720 minute summer	28.365	7.602
30 year 180 minute summer	45.598	11.734	100 year +45% CC 720 minute winter	19.063	7.602
30 year 180 minute winter	29.640	11.734	100 year +45% CC 960 minute summer	22.984	6.052
30 year 240 minute summer	35.759	9.450	100 year +45% CC 960 minute winter	15.225	6.052
30 year 240 minute winter	23.758	9.450	100 year +45% CC 1440 minute summer	16.353	4.383
30 year 360 minute summer	26.939	6.932	100 year +45% CC 1440 minute winter	10.990	4.383

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	FD01	10	40.654	0.054	4.6	0.0427	0.0000	OK
15 minute winter	FD02	10	40.482	0.062	6.5	0.0246	0.0000	OK
15 minute winter	FD03	10	39.981	0.081	10.8	0.0527	0.0000	OK
15 minute winter	FD05	10	39.953	0.085	14.8	0.0534	0.0000	OK
15 minute winter	FD07	10	39.907	0.121	20.2	0.0897	0.0000	OK
15 minute winter	FD04	11	39.886	0.133	24.5	0.0873	0.0000	OK
15 minute winter	RE 06A	10	40.626	0.026	1.2	0.0047	0.0000	OK
15 minute winter	FD06	11	39.859	0.122	26.7	0.0708	0.0000	OK
15 minute winter	S01	10	40.265	0.035	2.1	0.0179	0.0000	OK
15 minute winter	S02	16	39.730	0.130	0.9	0.0369	0.0000	OK
15 minute winter	TANK	15	39.731	0.152	24.0	6.8379	0.0000	OK
15 minute winter	S03A	15	39.730	0.160	22.8	0.3079	0.0000	OK
15 minute winter	S03	15	39.728	0.201	13.1	0.2278	0.0000	OK
15 minute winter	S05	15	39.727	0.248	26.9	0.6315	0.0000	OK
15 minute winter	DP05	15	36.685	0.085	13.8	0.0060	0.0000	OK
15 minute winter	OU	10	36.131	0.021	2.0	0.0097	0.0000	OK
30 minute winter	S07	34	35.800	0.480	3.1	0.2196	0.0000	SURCHARGED
30 minute winter	S08	35	35.803	0.611	15.1	2.1171	0.0000	SURCHARGED
15 minute summer	OF	1	35.031	0.000	12.1	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	FD01	1.000	FD02	4.5	0.819	0.256	0.0583	
15 minute winter	FD02	1.001	FD03	6.5	0.758	0.153	0.1110	
15 minute winter	FD03	1.002	FD05	10.7	0.678	0.118	0.0757	
15 minute winter	FD05	1.003	FD07	14.7	0.684	0.162	0.2636	
15 minute winter	FD07	1.004	FD04	20.0	0.704	0.220	0.1413	
15 minute winter	FD04	1.005	FD06	24.5	0.858	0.270	0.0664	
15 minute winter	RE 06A	2.000	FD06	1.2	0.563	0.065	0.0378	
15 minute winter	FD06	1.006_1	S05	26.9	1.067	0.297	0.2177	
15 minute winter	S01	3.000	TANK	2.1	0.666	0.117	0.0226	
15 minute winter	S02	4.000	TANK	-0.9	-0.117	-0.013	0.1673	
15 minute winter	TANK	3.001	S03A	-22.0	-1.365	-0.314	0.0846	
15 minute winter	S03A	3.002	S03	-12.7	0.496	-0.182	0.4750	
15 minute winter	S03	3.003	S05	-13.1	0.334	-0.188	0.6707	
15 minute winter	S05	Hydro-Brake®	DP05	13.8				
15 minute winter	DP05	1.009	S08	13.8	1.062	0.265	0.1322	
15 minute winter	OU	5.000	S07	2.0	1.082	0.017	0.2800	
30 minute winter	S07	5.001	S08	5.1	0.410	0.066	1.7982	
60 minute winter	S08	Hydro-Brake®	OF	12.1				33.2
15 minute summer	S08	Orifice	OF	0.0				0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	FD01	10	40.663	0.063	6.0	0.0495	0.0000	OK
15 minute winter	FD02	10	40.491	0.071	8.5	0.0283	0.0000	OK
15 minute winter	FD03	10	39.995	0.095	14.0	0.0618	0.0000	OK
15 minute winter	FD05	10	39.968	0.100	19.1	0.0624	0.0000	OK
15 minute winter	FD07	10	39.930	0.144	26.2	0.1066	0.0000	OK
15 minute winter	FD04	11	39.909	0.156	31.8	0.1022	0.0000	OK
15 minute winter	RE 06A	11	40.630	0.030	1.5	0.0053	0.0000	OK
15 minute winter	FD06	11	39.879	0.142	34.6	0.0814	0.0000	OK
15 minute winter	S01	10	40.271	0.041	2.8	0.0207	0.0000	OK
30 minute winter	S02	25	39.808	0.208	0.6	0.0588	0.0000	OK
30 minute winter	TANK	25	39.808	0.229	22.0	10.3253	0.0000	OK
30 minute winter	S03A	25	39.808	0.238	21.4	0.4563	0.0000	OK
30 minute winter	S03	25	39.807	0.280	12.2	0.3168	0.0000	OK
30 minute winter	S05	25	39.807	0.328	27.2	0.8338	0.0000	SURCHARGED
30 minute winter	DP05	25	36.688	0.088	14.6	0.0062	0.0000	OK
60 minute winter	OU	57	36.144	0.034	1.3	0.0160	0.0000	OK
60 minute winter	S07	57	36.142	0.822	2.7	0.3764	0.0000	SURCHARGED
60 minute winter	S08	57	36.142	0.950	15.1	3.2914	0.0000	SURCHARGED
15 minute summer	OF	1	35.031	0.000	12.1	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	FD01	1.000	FD02	5.9	0.877	0.334	0.0709	
15 minute winter	FD02	1.001	FD03	8.4	0.815	0.199	0.1347	
15 minute winter	FD03	1.002	FD05	14.0	0.708	0.154	0.0942	
15 minute winter	FD05	1.003	FD07	19.0	0.707	0.209	0.3294	
15 minute winter	FD07	1.004	FD04	25.8	0.734	0.285	0.1751	
15 minute winter	FD04	1.005	FD06	31.6	0.909	0.349	0.0811	
15 minute winter	RE 06A	2.000	FD06	1.5	0.610	0.084	0.0455	
15 minute winter	FD06	1.006_1	S05	34.8	1.138	0.384	0.2640	
15 minute winter	S01	3.000	TANK	2.8	0.720	0.155	0.0278	
15 minute summer	S02	4.000	TANK	-1.4	-0.142	-0.020	0.2317	
15 minute winter	TANK	3.001	S03A	-30.4	-1.462	-0.434	0.1320	
15 minute summer	S03A	3.002	S03	-18.3	0.497	-0.262	0.5982	
15 minute winter	S03	3.003	S05	-19.9	0.339	-0.284	0.8225	
30 minute winter	S05	Hydro-Brake®	DP05	14.6				
30 minute winter	DP05	1.009	S08	14.6	1.078	0.282	0.1385	
15 minute winter	OU	5.000	S07	2.6	1.142	0.023	0.3073	
30 minute winter	S07	5.001	S08	4.9	0.435	0.063	1.7982	
60 minute winter	S08	Hydro-Brake®	OF	13.1				42.7
15 minute summer	S08	Orifice	OF	0.0				0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	FD01	10	40.694	0.094	11.4	0.0737	0.0000	OK
15 minute winter	FD02	10	40.522	0.102	16.2	0.0447	0.0000	OK
30 minute winter	FD03	28	40.188	0.288	20.6	0.1884	0.0000	OK
30 minute winter	FD05	28	40.188	0.320	28.1	0.2009	0.0000	SURCHARGED
30 minute winter	FD07	28	40.188	0.402	38.2	0.2975	0.0000	SURCHARGED
30 minute winter	FD04	28	40.187	0.434	45.8	0.2850	0.0000	SURCHARGED
15 minute winter	RE 06A	10	40.641	0.041	2.9	0.0074	0.0000	OK
30 minute winter	FD06	28	40.187	0.450	49.6	0.2825	0.0000	SURCHARGED
15 minute winter	S01	10	40.287	0.057	5.2	0.0289	0.0000	OK
30 minute winter	S02	28	40.187	0.587	1.2	0.1661	0.0000	SURCHARGED
30 minute winter	TANK	28	40.187	0.608	50.1	27.4304	0.0000	SURCHARGED
30 minute winter	S03A	28	40.187	0.617	48.2	1.1843	0.0000	SURCHARGED
30 minute winter	S03	28	40.186	0.659	29.2	0.7457	0.0000	SURCHARGED
30 minute winter	S05	28	40.186	0.707	48.6	1.7985	0.0000	SURCHARGED
30 minute summer	DP05	33	36.690	0.090	15.5	0.0064	0.0000	OK
60 minute winter	OU	44	36.422	0.312	3.4	0.1444	0.0000	SURCHARGED
60 minute winter	S07	44	36.422	1.102	4.9	0.5048	0.0000	SURCHARGED
60 minute winter	S08	43	36.422	1.230	18.9	4.2596	0.0000	SURCHARGED
15 minute summer	OF	1	35.031	0.000	14.5	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	FD01	1.000	FD02	11.2	1.020	0.633	0.1157	
15 minute winter	FD02	1.001	FD03	16.0	0.961	0.378	0.2168	
15 minute winter	FD03	1.002	FD05	26.3	0.729	0.290	0.2786	
15 minute winter	FD05	1.003	FD07	35.2	0.727	0.389	0.8124	
15 minute winter	FD07	1.004	FD04	47.6	0.800	0.525	0.3506	
15 minute winter	FD04	1.005	FD06	58.2	1.023	0.643	0.1638	
15 minute winter	RE 06A	2.000	FD06	2.8	0.728	0.159	0.0719	
15 minute winter	FD06	1.006_1	S05	62.6	1.271	0.692	0.6074	
15 minute winter	S01	3.000	TANK	5.1	0.854	0.290	0.0437	
15 minute summer	S02	4.000	TANK	-3.4	-0.216	-0.048	0.3625	
15 minute winter	TANK	3.001	S03A	-63.9	-1.606	-0.914	0.1611	
15 minute summer	S03A	3.002	S03	-41.4	-0.616	-0.592	0.7552	
15 minute summer	S03	3.003	S05	-43.2	-0.614	-0.618	0.8389	
15 minute winter	S05	Hydro-Brake®	DP05	15.5				
15 minute winter	DP05	1.009	S08	15.5	1.094	0.298	0.1443	
15 minute winter	OU	5.000	S07	5.0	1.219	0.044	0.6032	
15 minute winter	S07	5.001	S08	8.5	0.542	0.109	1.7982	
60 minute winter	S08	Hydro-Brake®	OF	14.8				78.2
60 minute winter	S08	Orifice	OF	2.8				3.5

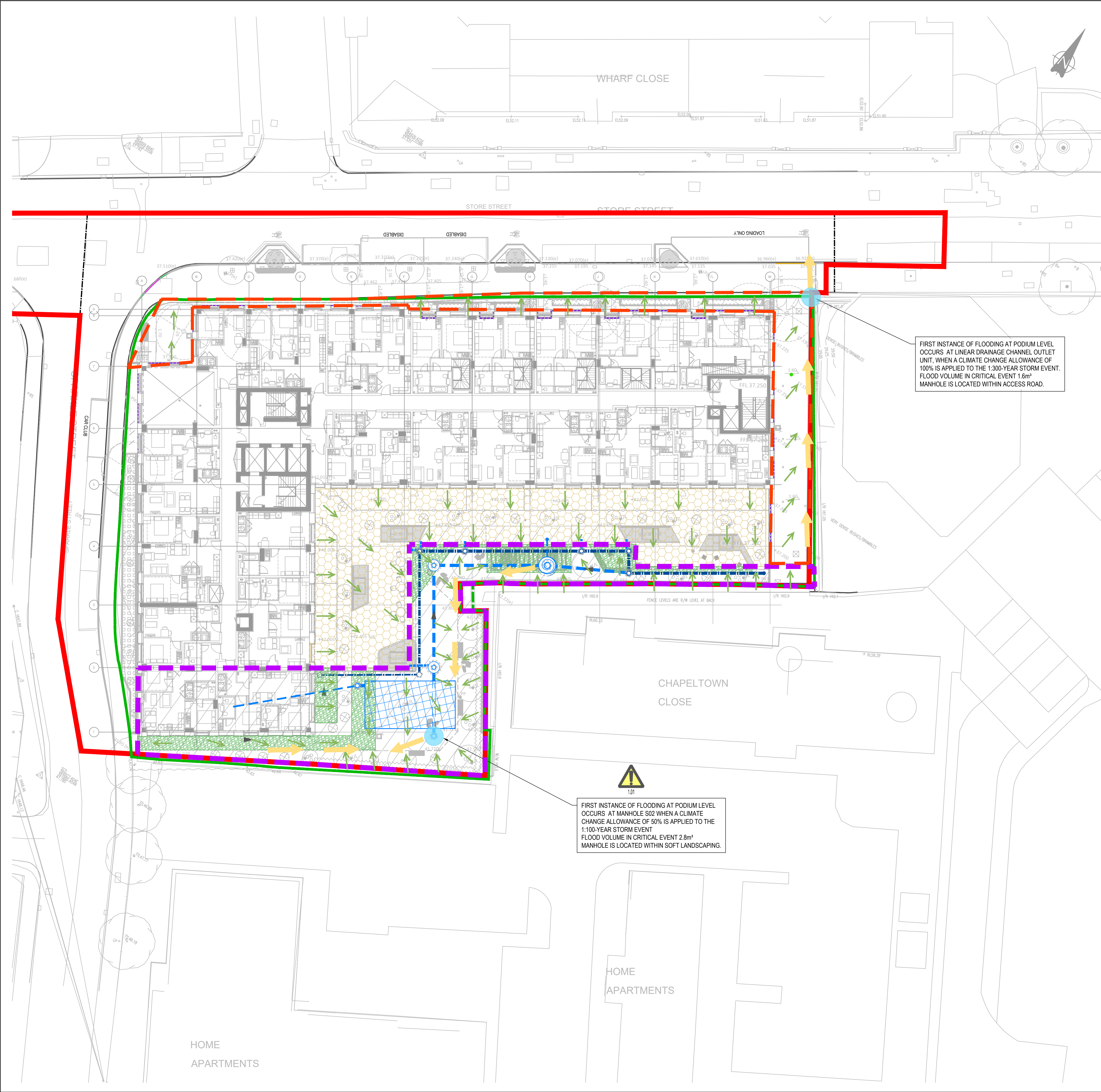
Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	FD01	57	41.700	1.100	11.1	0.8660	0.0000	FLOOD RISK
60 minute winter	FD02	57	41.699	1.279	15.9	2.0850	0.0000	FLOOD RISK
60 minute winter	FD03	57	41.699	1.799	26.3	3.7240	0.0000	FLOOD RISK
60 minute winter	FD05	57	41.698	1.830	32.4	1.1477	0.0000	FLOOD RISK
60 minute winter	FD07	57	41.698	1.912	44.0	1.4148	0.0000	FLOOD RISK
60 minute winter	FD04	57	41.697	1.944	53.4	1.2755	0.0000	FLOOD RISK
60 minute winter	RE 06A	57	41.697	1.097	6.1	0.1963	0.0000	FLOOD RISK
60 minute winter	FD06	57	41.697	1.960	57.5	4.7734	0.0000	FLOOD RISK
60 minute winter	S01	57	41.696	1.466	5.1	0.7405	0.0000	FLOOD RISK
60 minute winter	S02	57	41.696	2.096	3.7	0.5932	0.0000	FLOOD RISK
60 minute winter	TANK	57	41.696	2.117	63.5	54.1726	0.0000	FLOOD RISK
60 minute winter	S03A	57	41.696	2.126	61.5	4.0820	0.0000	FLOOD RISK
60 minute winter	S03	57	41.696	2.169	37.5	2.4526	0.0000	FLOOD RISK
60 minute winter	S05	57	41.695	2.216	56.1	5.6399	0.0000	FLOOD RISK
60 minute winter	DP05	57	36.693	0.093	16.3	0.0066	0.0000	OK
30 minute winter	OU	21	36.536	0.426	7.2	0.1975	0.0000	SURCHARGED
30 minute winter	S07	21	36.536	1.216	13.1	0.5568	0.0000	SURCHARGED
30 minute winter	S08	21	36.535	1.343	26.4	4.6537	0.0000	SURCHARGED
15 minute summer	OF	1	35.031	0.000	14.9	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	FD01	1.000	FD02	20.8	1.184	1.171	0.1848	
15 minute summer	FD02	1.001	FD03	28.0	1.067	0.661	0.5164	
15 minute winter	FD03	1.002	FD05	38.3	0.725	0.423	0.3365	
15 minute winter	FD05	1.003	FD07	52.0	0.739	0.575	0.8621	
15 minute winter	FD07	1.004	FD04	74.1	1.052	0.818	0.3506	
15 minute winter	FD04	1.005	FD06	92.0	1.307	1.016	0.1638	
15 minute winter	RE 06A	2.000	FD06	5.3	0.864	0.299	0.3258	
15 minute winter	FD06	1.006_1	S05	98.9	1.405	1.092	0.6074	
15 minute winter	S01	3.000	TANK	9.7	1.001	0.547	0.1275	
30 minute winter	S02	4.000	TANK	-5.7	-0.156	-0.081	0.3625	
15 minute winter	TANK	3.001	S03A	-115.7	-1.766	-1.654	0.1611	
15 minute winter	S03A	3.002	S03	-72.3	-1.027	-1.034	0.7552	
15 minute winter	S03	3.003	S05	-75.7	-1.075	-1.082	0.8389	
60 minute winter	S05	Hydro-Brake®	DP05	16.3				
60 minute winter	DP05	1.009	S08	16.3	1.107	0.313	0.1499	
15 minute winter	OU	5.000	S07	9.2	1.273	0.082	0.6032	
15 minute winter	S07	5.001	S08	13.2	0.572	0.169	1.7982	
30 minute winter	S08	Hydro-Brake®	OF	15.5				117.4
30 minute winter	S08	Orifice	OF	7.7				5.8

Appendix D

Overland Flow Routes Plan



OVERLAND FLOW ROUTES

SURFACE WATER DESIGN
THE DESIGN PROVIDES CAPACITY UP TO THE 100 YEAR 45% CLIMATE CHANGE EVENT.

SW FLOW RATES:

- 1 YEAR - 12.1l/s
- 30 YEAR - 29.6 l/s
- 100 YEAR +45% CLIMATE CHANGE - 29.6l/s

NO FLOODING OCCURS IN THE 1:100+45% CLIMATE CHANGE EVENT.
THEREFORE, MORE EXTREME EVENTS HAVE BEEN MODELLED IN ORDER TO IDENTIFY WHERE THE NETWORK WILL INITIALLY FLOOD AT BOTH GROUND FLOOR AND PODIUM LEVEL.

FIRST FLOOD AT PODIUM LEVEL OCCURS IN THE 1:100 + 50% CC EVENT.
FIRST FLOOD AT GROUND FLOOR OCCURS IN THE 1:300 + 100% CC EVENT.

DRAWING BASED ON:

SURVEY INFORMATION

- 60159-1 TOPOGRAPHICAL SURVEY BY MALCOLM HUGHES DATED MAY 2023
- TOPOGRAPHICAL SURVEY BY SEP S15724-T
- 60159-UG1 & UG2 GPR SURVEY BY MALCOLM HUGHES DATED MAY 2023
- PJ00478370 CCTV SURVEY BY LANES GROUP (FOR MALCOLM HUGHES) DATED MAY 2023

HIGHWAY BOUNDARY INFORMATION

- INFORMATION RECEIVED FROM MANCHESTER CC HIGHWAYS MAY 2023

ARCHITECT'S PLANS

- SPS-SHA-ZZ-L00-DR-A-03-1001 REV P06 GA GROUND FLOOR
- SPS-SHA-ZZ-L01-DR-A-03-1001 REV P06 GA FIRST FLOOR

LANDSCAPE ARCHITECT'S PLANS

- SPS-RFM-XX-L00-M2-L-19-0001 REV P03 LANDSCAPE GA GROUND LEVEL
- SPS-RFM-XX-L01-M2-L-19-0002 REV P05 LANDSCAPE GA PODIUM

ABOVE GROUND DRAINAGE LAYOUTS

- FOUL POP-UP DRAWINGS RECEIVED 14.11.25 & 27.11.25 (WIP ISSUE)
- RWP CONNECTION SKETCHES RECEIVED 27.11.25 (WIP ISSUE)

FOUNDATIONS/ SLAB DETAILS

- SPS-CUR-ZZ-FN-DR-S-03-1090 WIP ISSUE 11.11.25 FOUNDATION LAYOUT
- SPS-CUR-ZZ-L00-DR-S-03-1100 WIP ISSUE 11.11.25 LEVEL 00 GA
- SPS-CUR-ZZ-L01-DR-S-03-1101 WIP ISSUE 11.11.25 LEVEL 01 GA

- KEY:**
- PLANNING APPLICATION BOUNDARY TAKEN FROM DRAWING 10413-SHP-Z1-A-G200-PL-00-001.
 - SITE OWNERSHIP BOUNDARY TAKEN FROM DRAWING 10413-SHP-Z1-A-G200-PL-00-001.
 - PROPOSED SURFACE WATER DRAINAGE
 - PROPOSED LINEAR DRAINAGE CHANNEL
 - EXTENT OF EXTERNAL AREA - GROUND FLOOR
 - EXTENT OF EXTERNAL AREA - PODIUM LEVEL
 - LOCATION OF FLOODING WITHIN DRAINAGE NETWORK (>1:100 + 45% CLIMATE CHANGE EVENT)
 - ROUTE OF OVERLAND FLOW
 - GENERAL FALLS

GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
- DO NOT SCALE THIS DRAWING. ALL DETAILS AND DIMENSIONS ARE TO BE CHECKED BY THE CONTRACTOR. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
- ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
- FOR FULL DRAINAGE NOTES REFER TO DRAWING SPS-CUR-ZZ-ZZ-DR-C-03-1910

P01	ISSUED FOR PLANNING CONDITION DISCHARGE	12.12.25	ATL	MW
Rev:	Description:	Date:	By:	Chkd:

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Status: **STAGE 4**

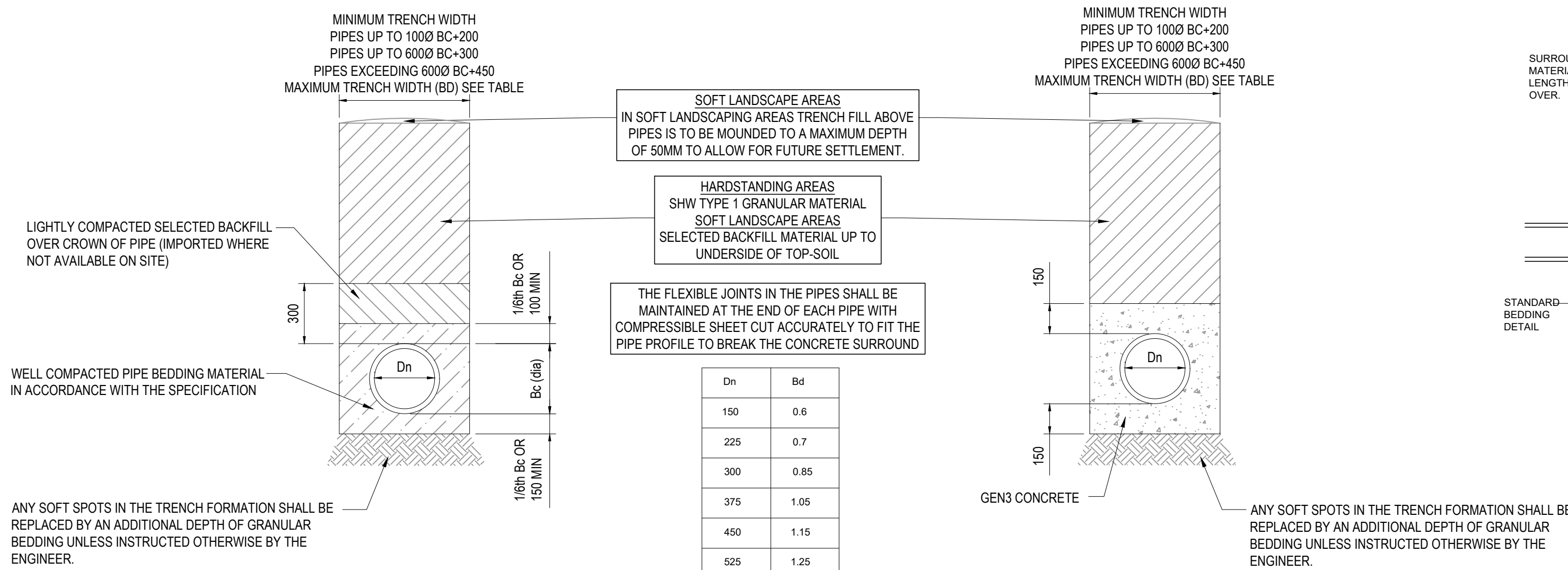
Project: **SPARKLE STREET, MANCHESTER**

Orig Title: **OVERLAND FLOW ROUTES**

Drawn By	Designed By	Checked By
ATL	ATL	MW
Project No.	Date	Scales @ A1
0824142	12/12/25	1:200
Project No • Originator • Function • Spatial • Form • Discipline • Number		
Revision		
SPS - CUR - ZZ - L01- DR - C - 83-1904		
P01		

Appendix C

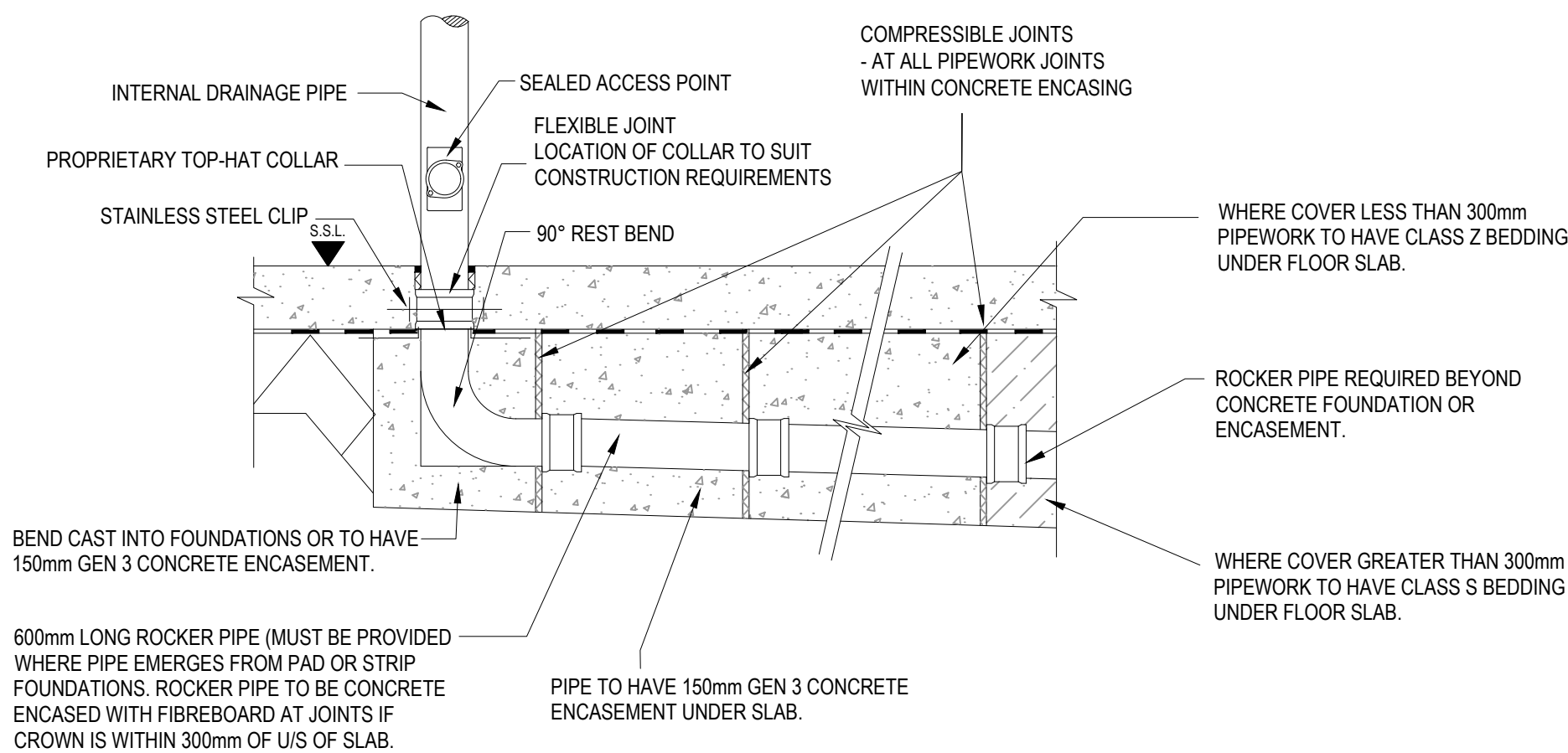
Proposed Drainage Calculations



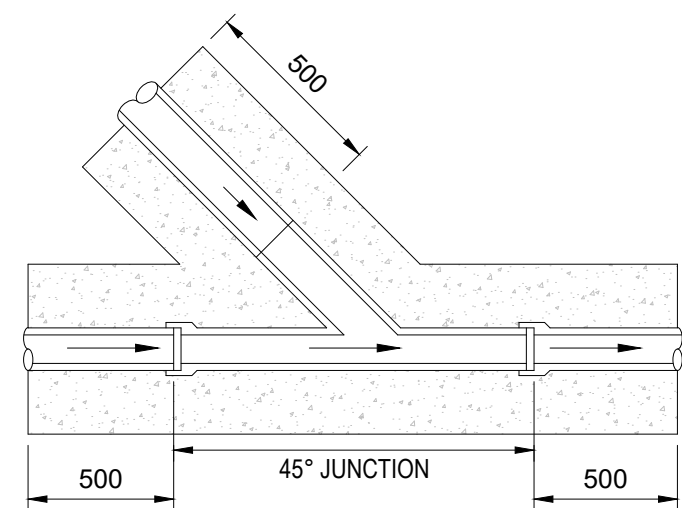
CLASS S - 360° GRANULAR SURROUND PIPE BEDDING DETAIL

CLASS Z - CONCRETE BED AND SURROUND PIPE BEDDING DETAIL
(COVER < 900mm IN VEHICULAR LOADING AND OPEN FIELD.)
(COVER < 600mm ELSEWHERE EXCEPT UNDER BUILDINGS.)

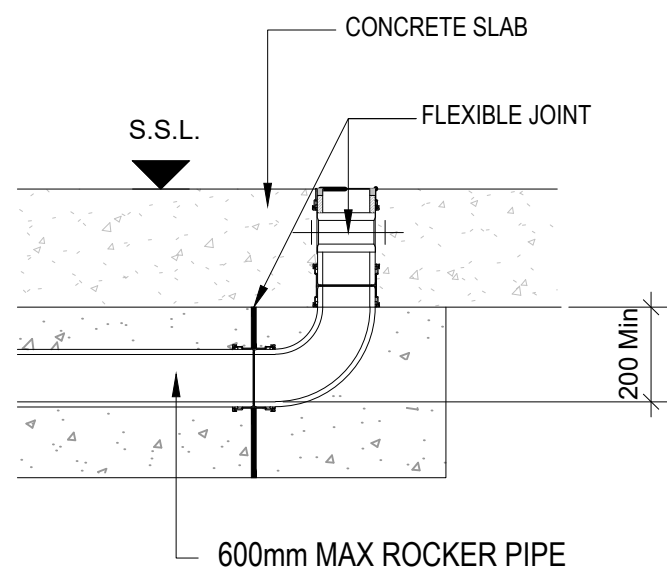
MAXIMUM TRENCH WIDTH



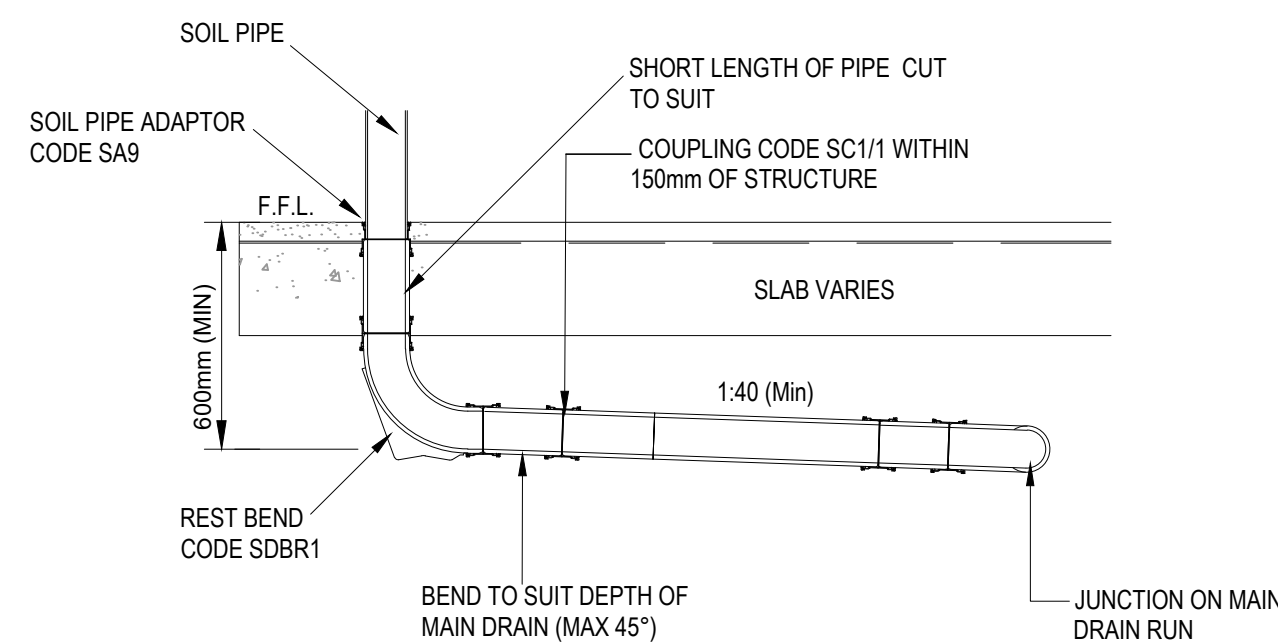
DRAINAGE UNDER BUILDINGS



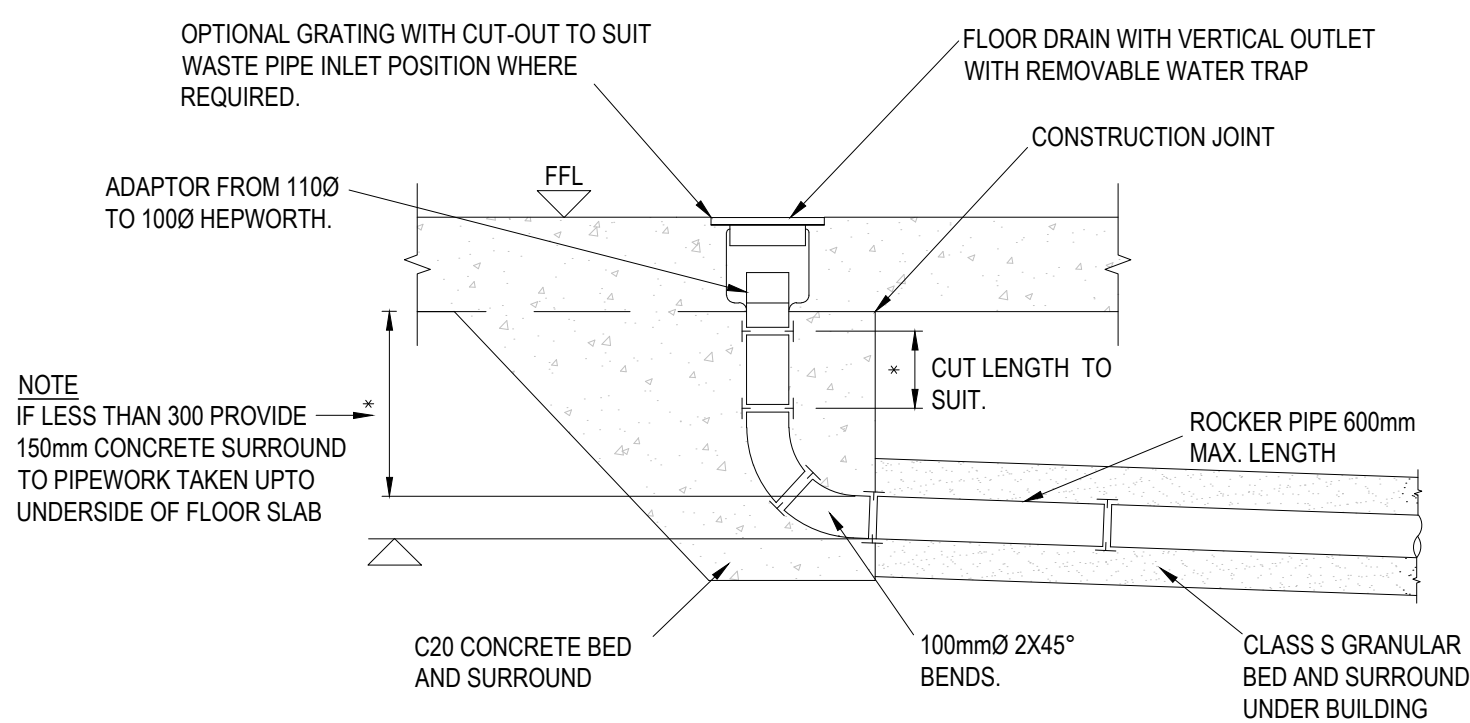
TYPICAL SADDLE CONNECTION



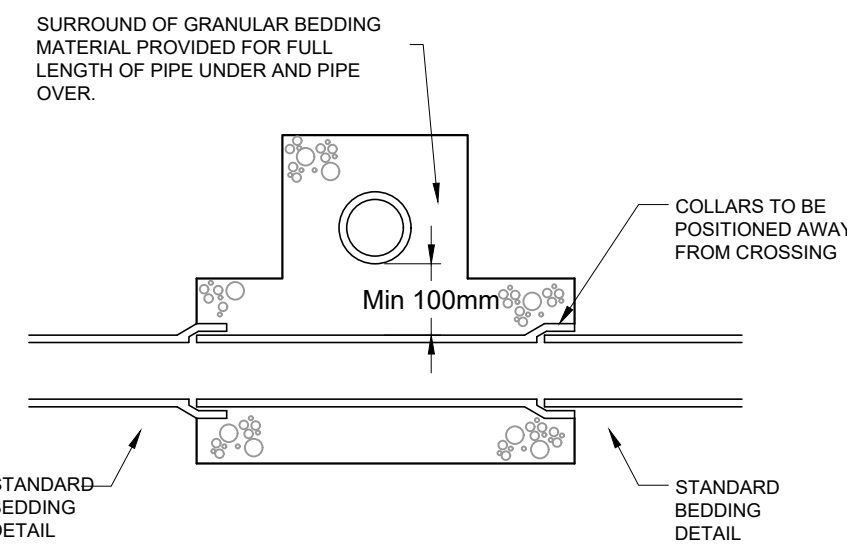
TYPICAL SECTION THROUGH SLAB
(100mmØ downpipe)



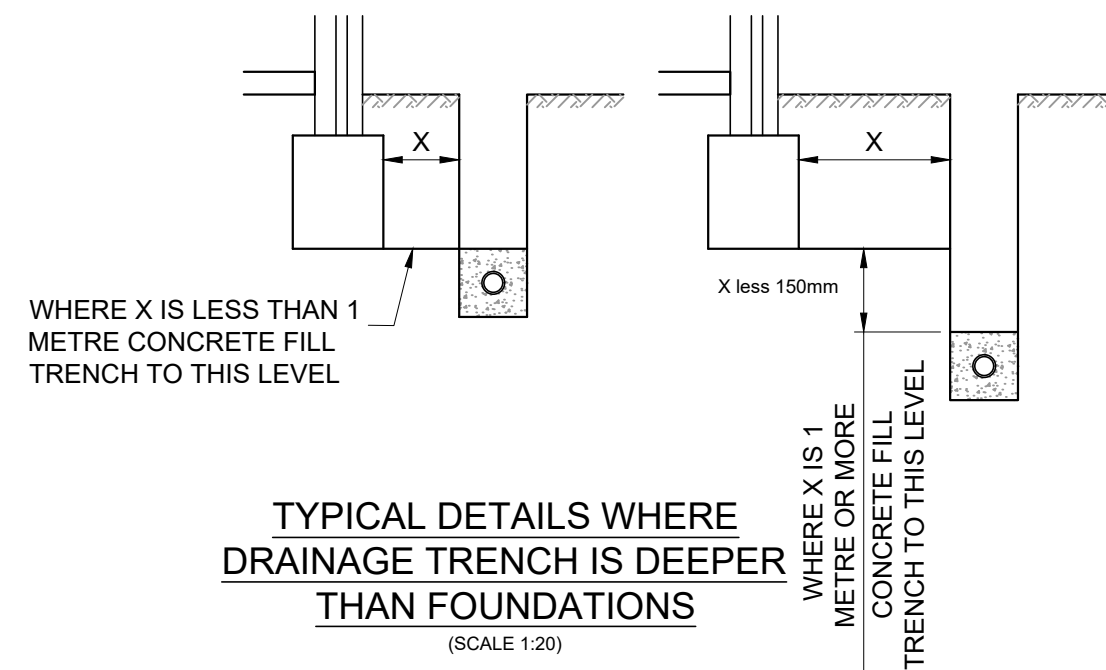
TYPICAL SVP CONNECTION
TO MAIN RUN



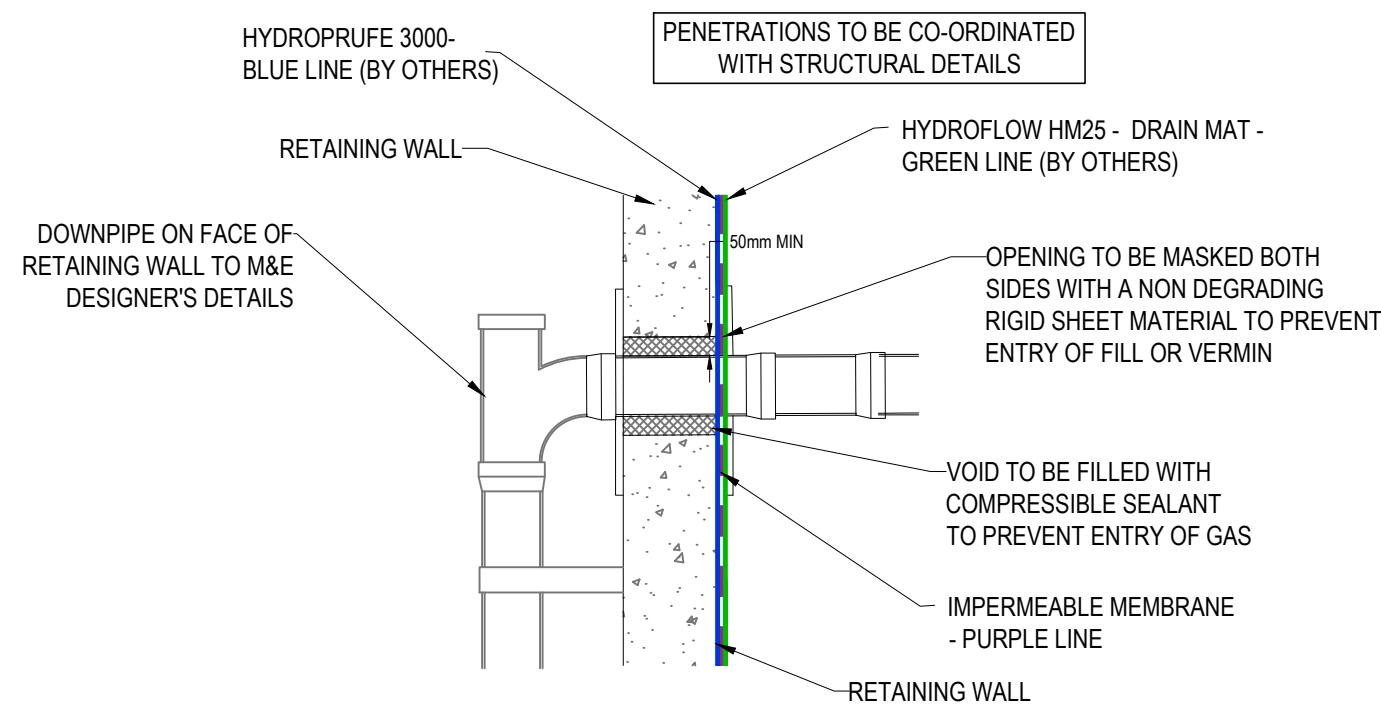
INTERNAL FLOOR DRAIN



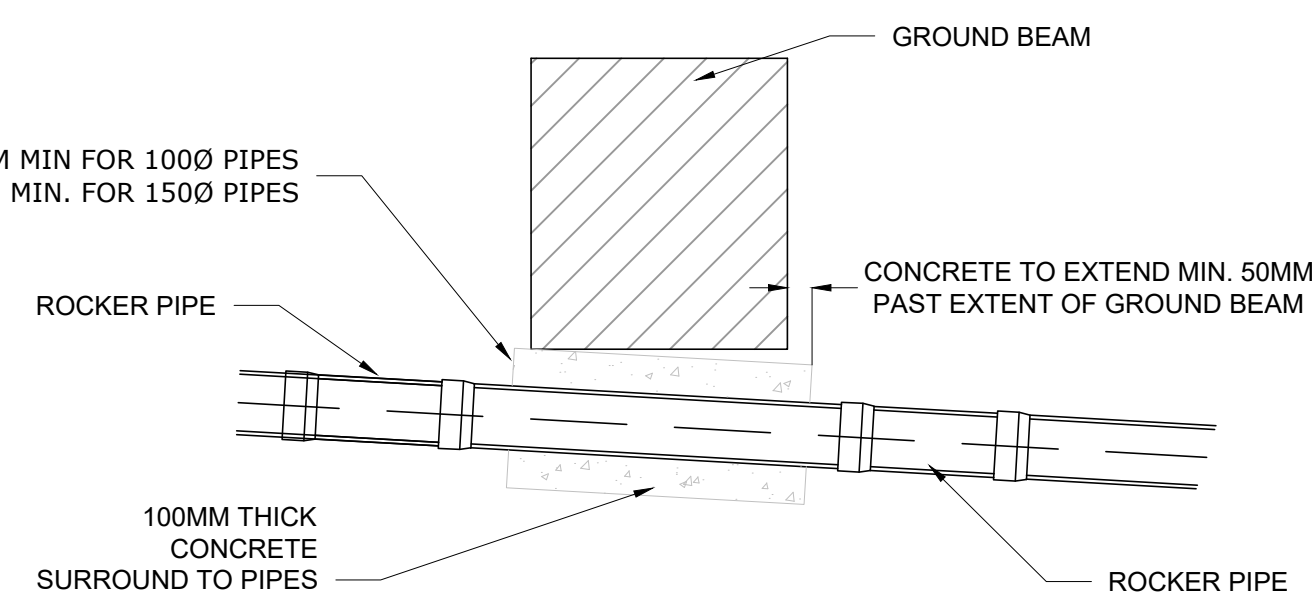
PIPE CROSSINGS DETAIL
(SCALE 1:20)



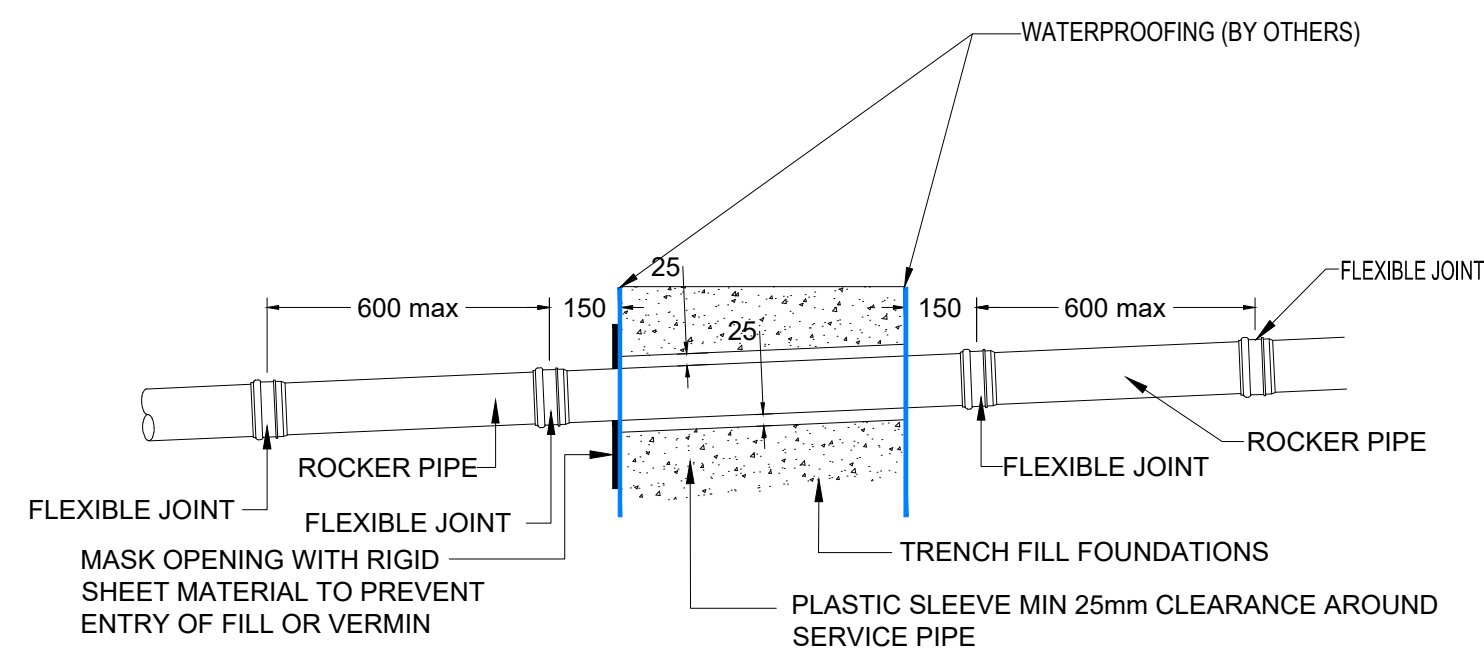
TYPICAL DETAILS WHERE
DRAINAGE TRENCH IS DEEPER
THAN FOUNDATIONS
(SCALE 1:20)



PENETRATION DETAIL THROUGH RETAINING WALL



TYPICAL PIPE DETAIL UNDER
GROUND BEAMS



PIPES PASSING THROUGH
GROUND BEAM

GENERAL NOTES:

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- FOR GENERAL NOTES REFER TO DRAWING 082142-CUR-XX-XX-D-C-92500

P03	PRELIMINARY STAGE 4 ISSUE	05.12.25	ATL	MW
P02	ISSUED FOR STAGE 3	27.09.24	ATL	ATL
P01	ISSUED FOR STAGE 2	14.07.23	ATL	CG
Rev:	Description:	Date:	By:	Chkd:

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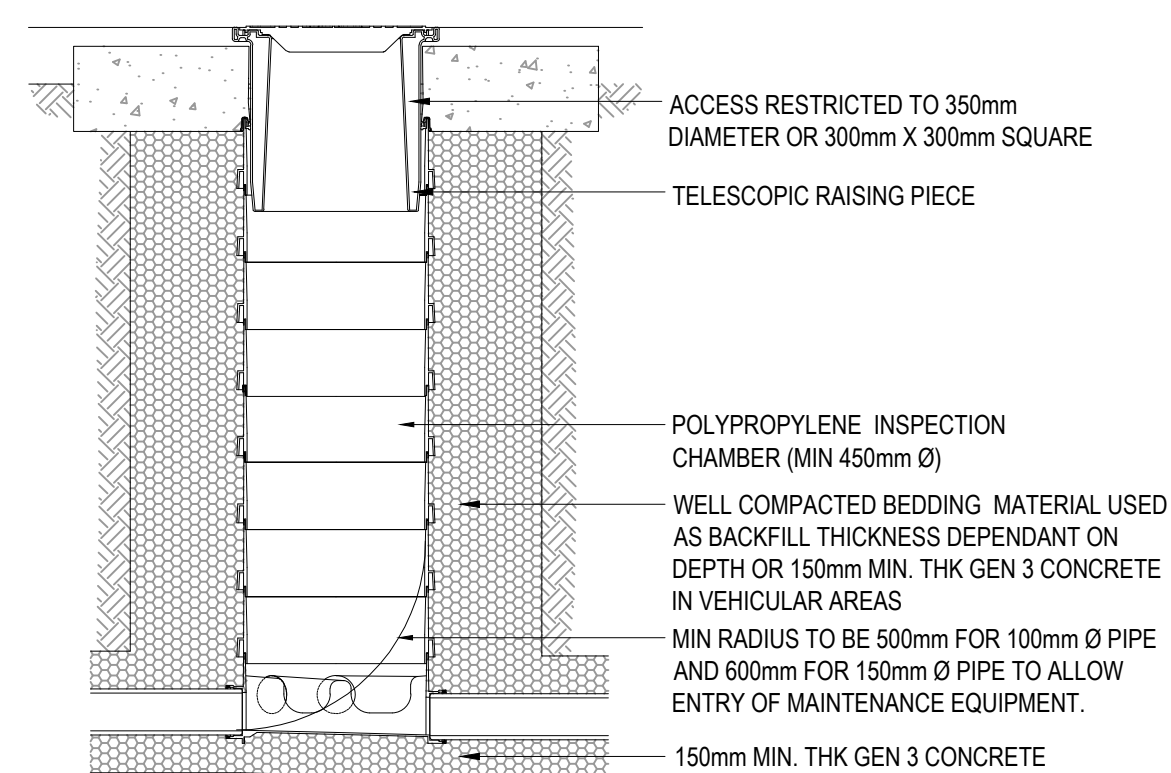
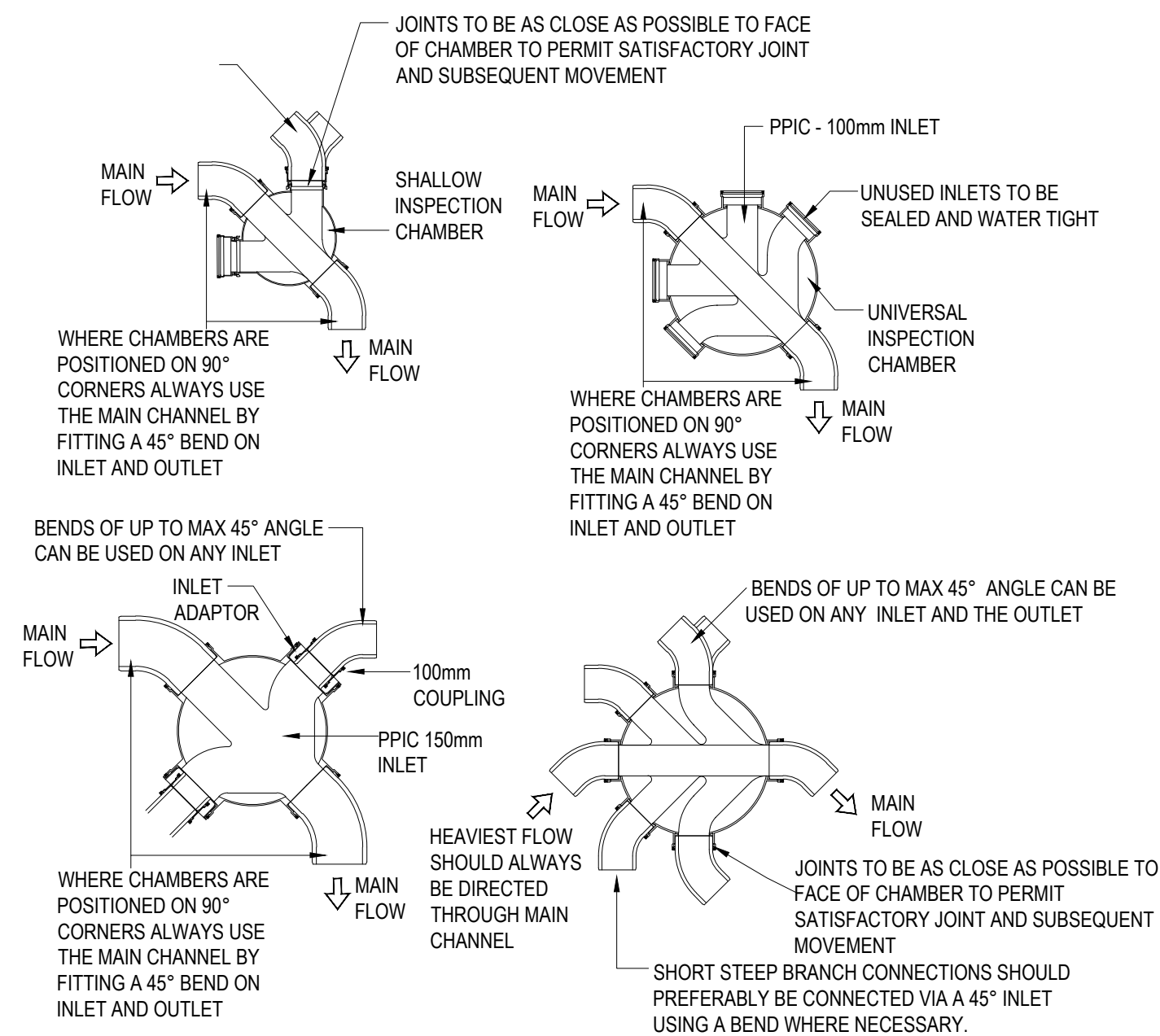
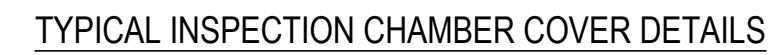
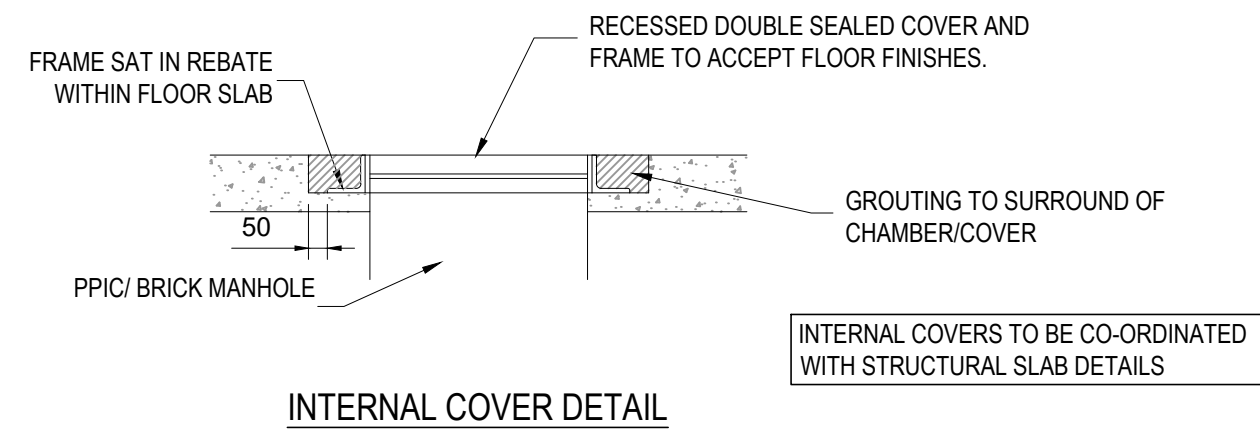
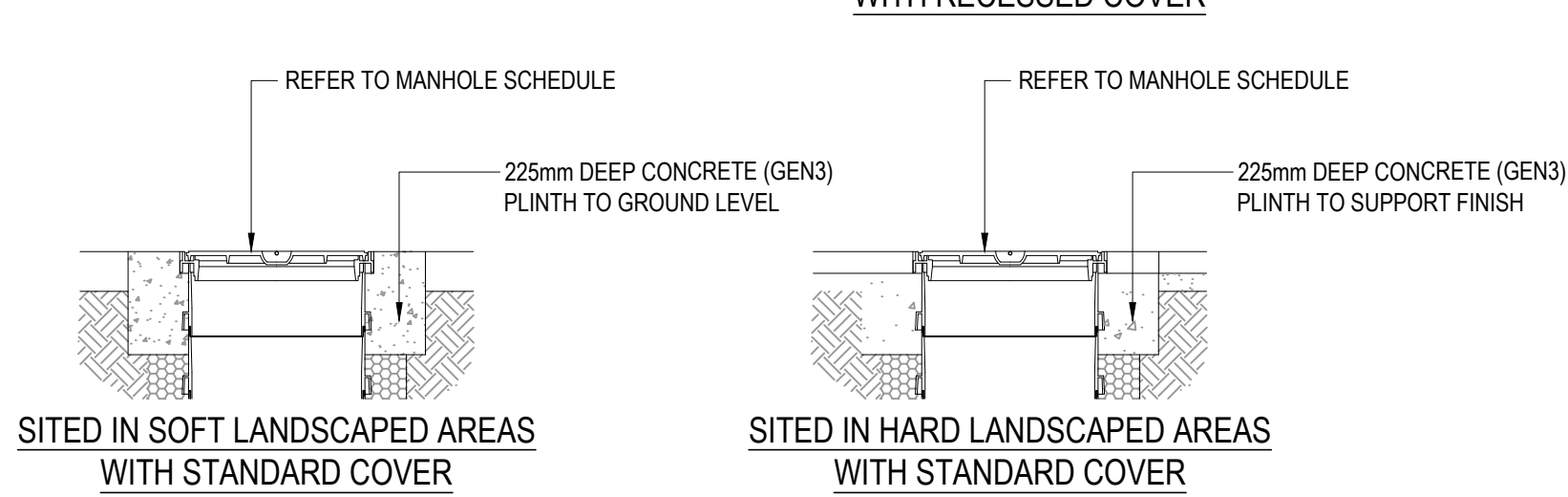
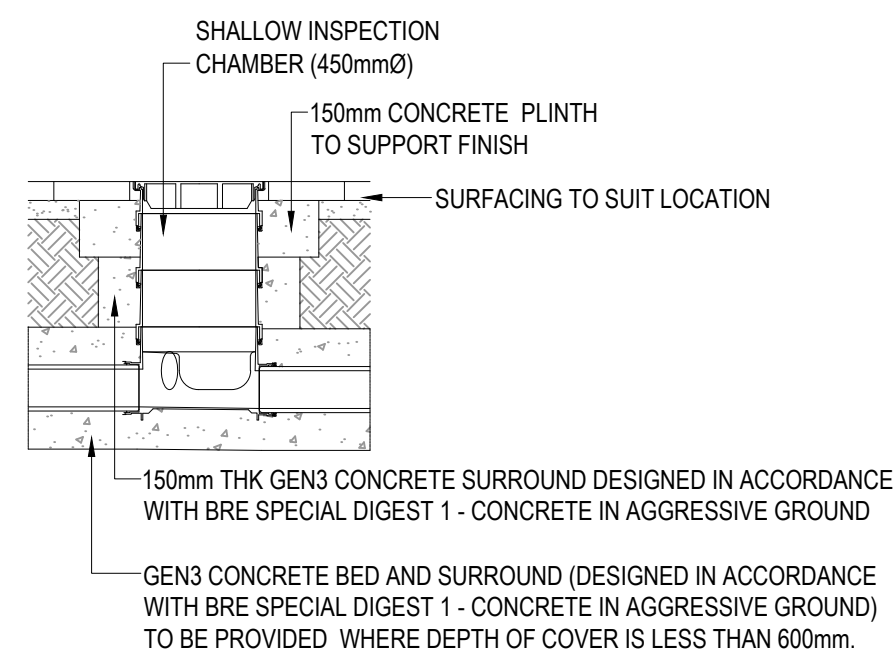
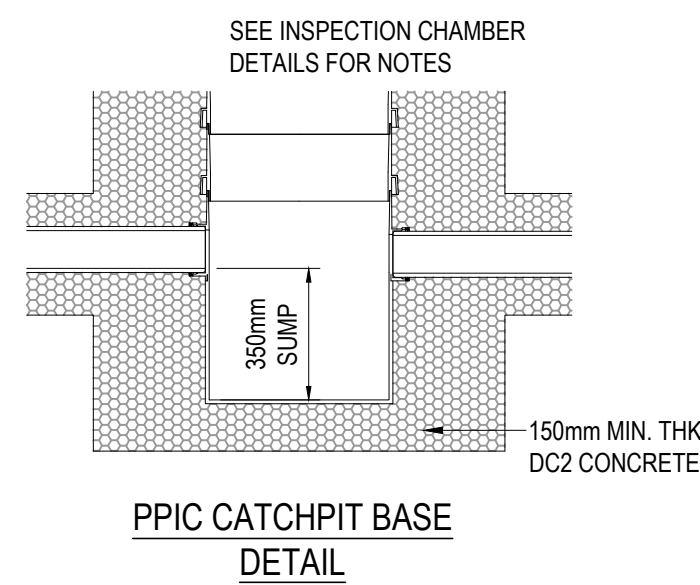
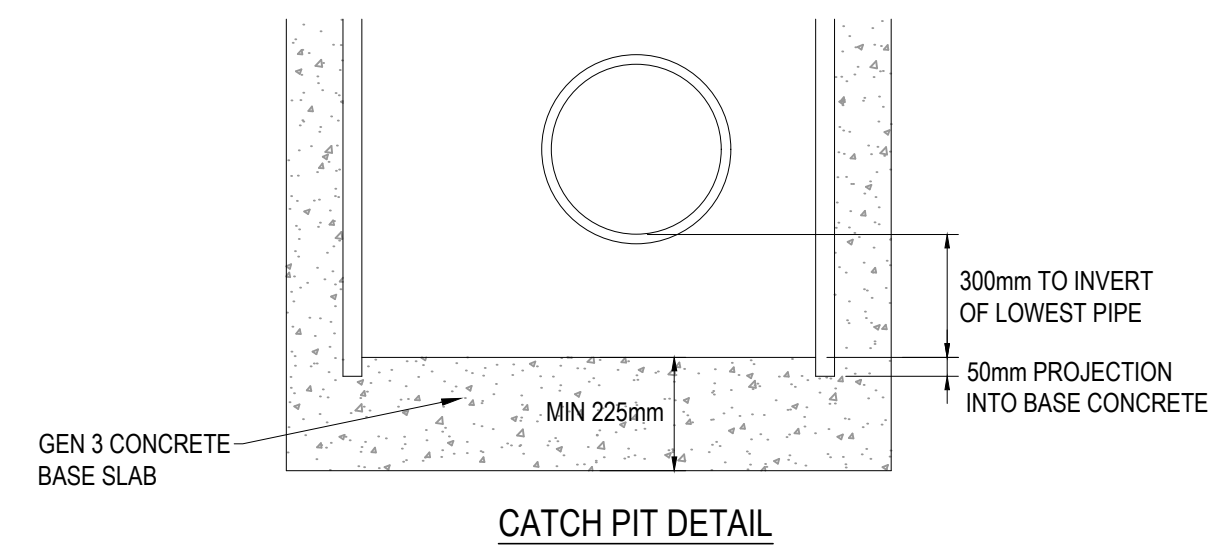
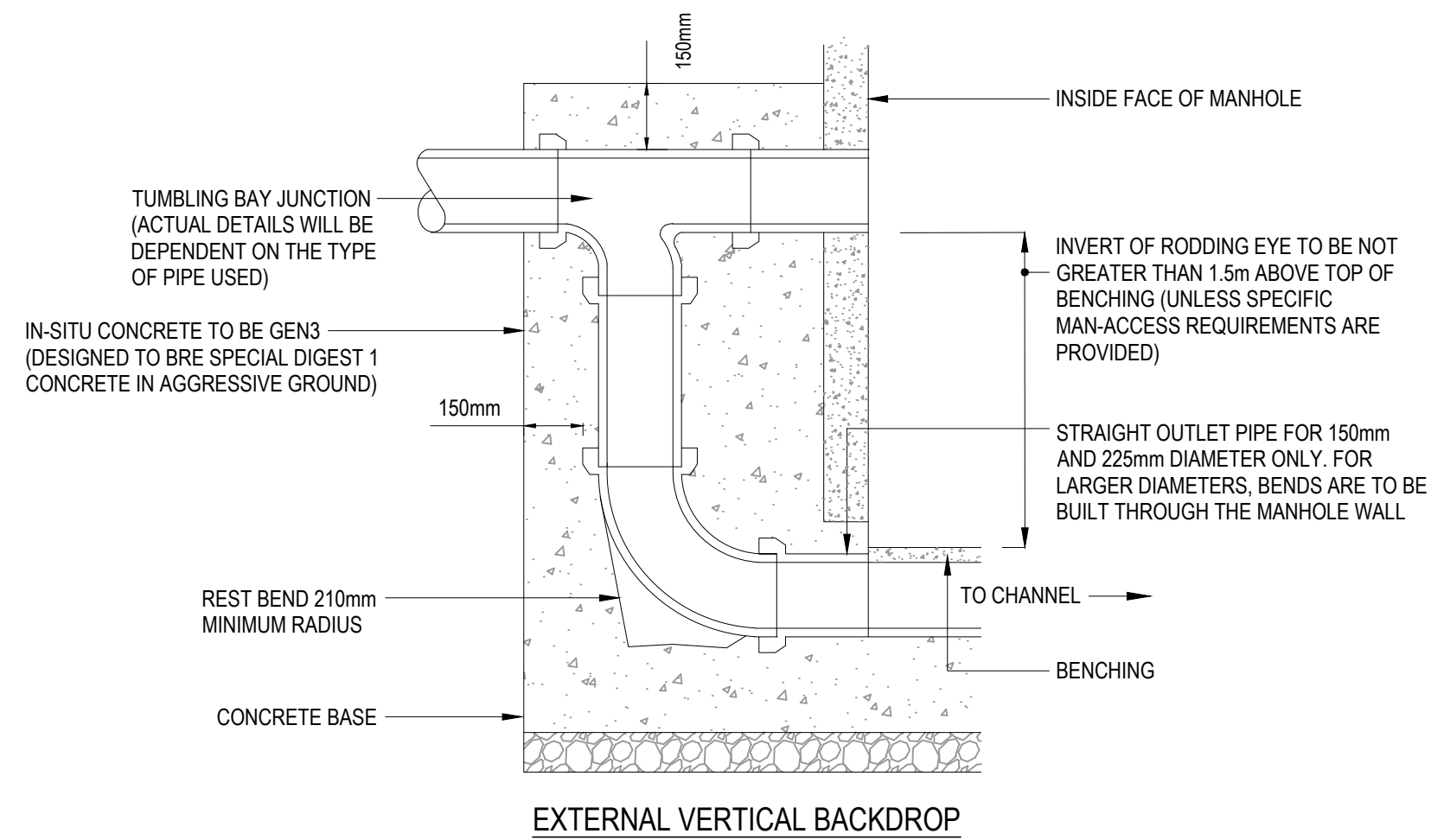
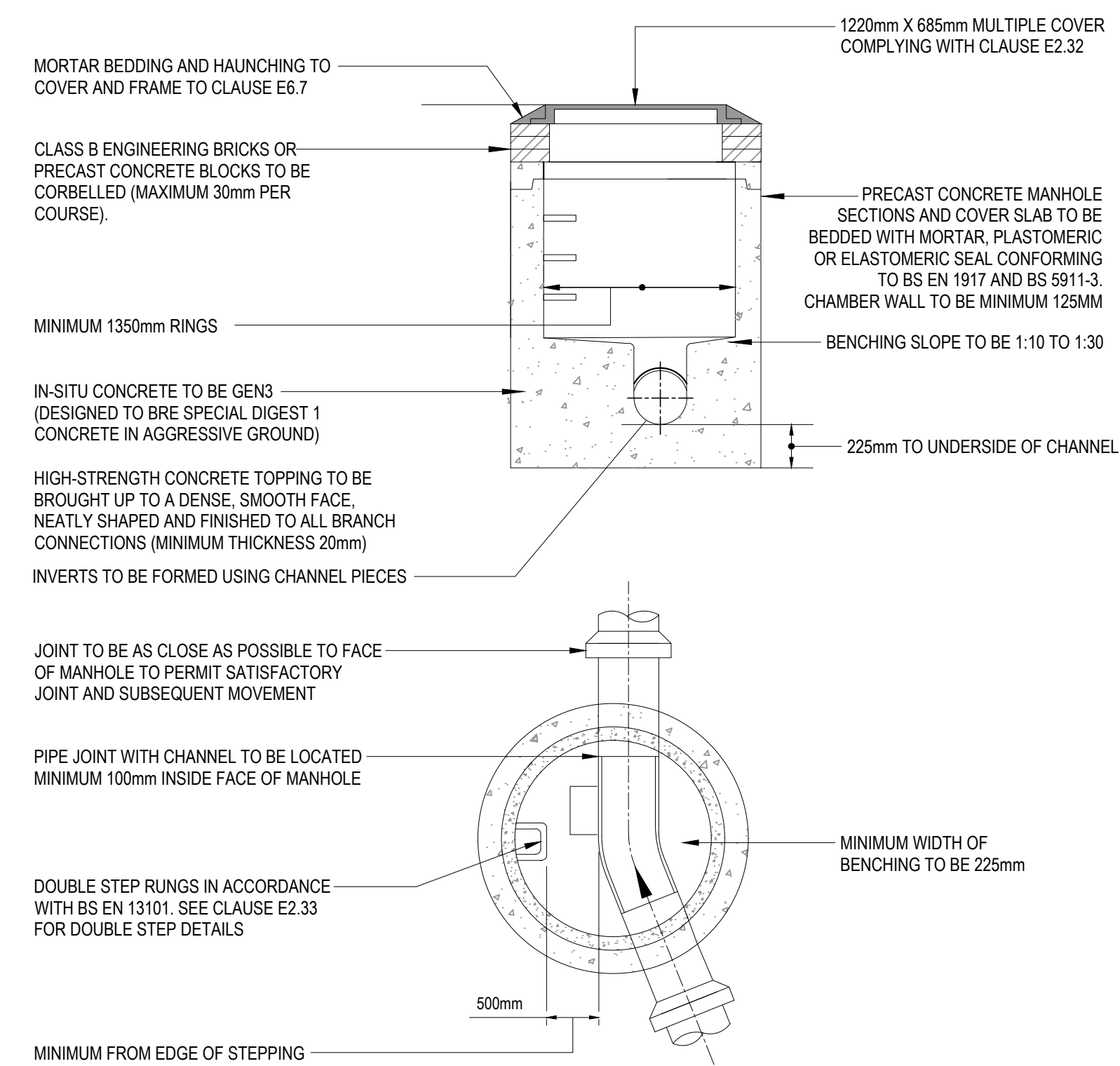
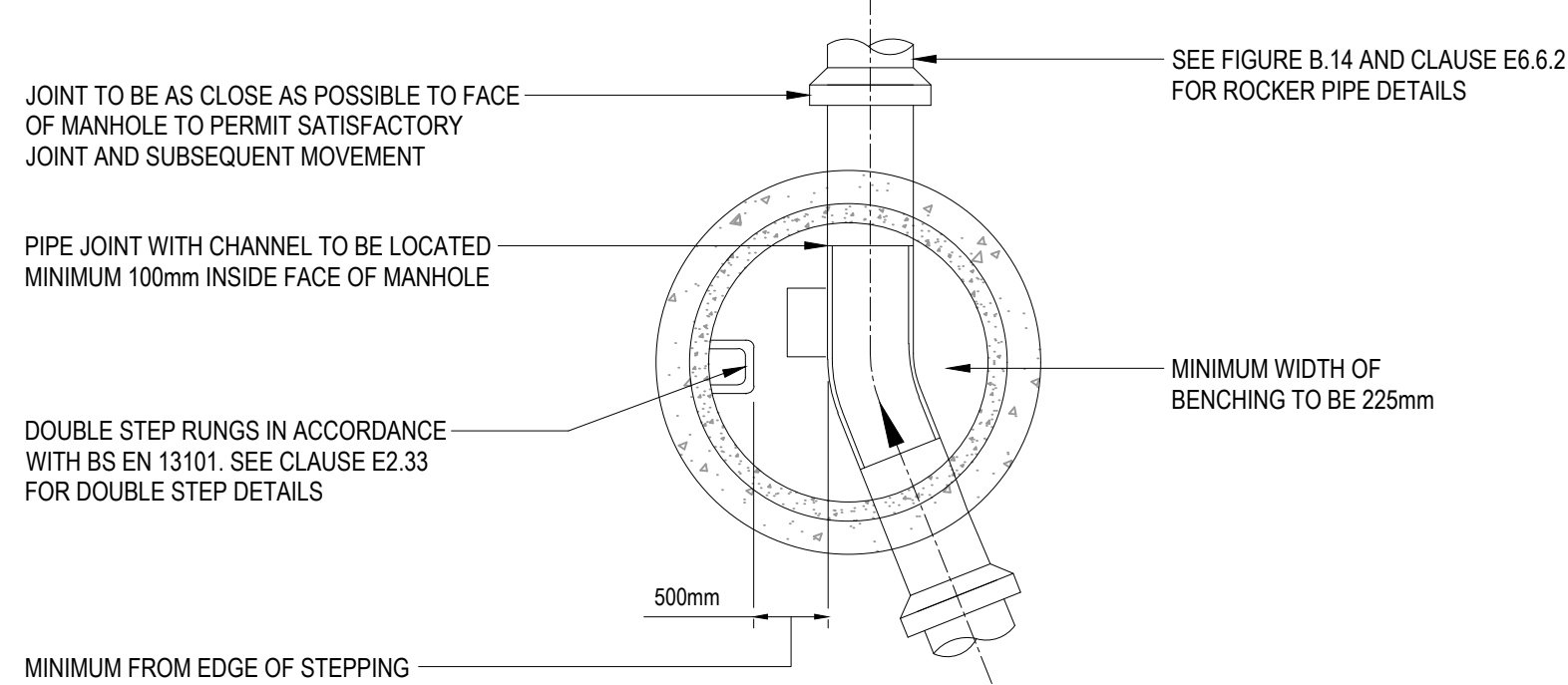
Status:

STAGE 4

Project:
SPARKLE STREET, MANCHESTER

Orig Title:
TYPICAL DRAINAGE DETAILS
SHEET 1

Drawn By	Designed By	Checked By
ATL	ATL	CD
Project No.	Date	Scales @ A1
0824142	14/07/23	NTS
Project No • Originator • Function • Spatial • Form • Discipline • Number		
Revision		
SPS - CUR - ZZ - ZZ - DR - C - 83-4920		
P03		



- | GENERAL NOTES: | |
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| 3. | ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. |
| 4. | FOR GENERAL NOTES REFER TO DRAWING 082142-CUR-XX-XX-D-92500 |

P03	PRELIMINARY STAGE 4 ISSUE	05.12.25	ATL	MW
P02	ISSUED FOR STAGE 3	27.09.24	ATL	ATL
P01	ISSUED FOR STAGE 2	14.07.23	ATL	CG
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Status:

Project: **SPARKLE STREET, MANCHESTER**

Dwg Title:

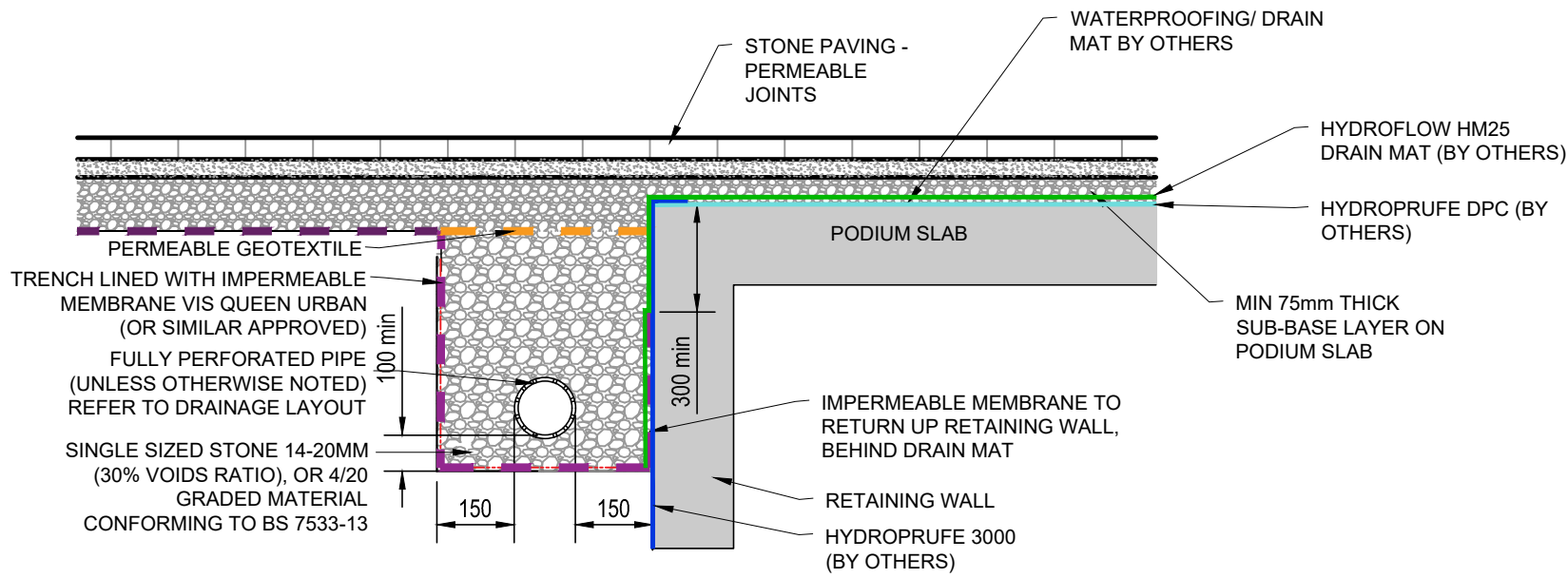
TYPICAL DRAINAGE DETAILS
SHEET 2

Drawn By ATL	Designed By ATL	Checked By CD
Project No. 0824142	Date 14/07/23	Scales @ A1 NTS
Project No - Originator - Function - Spatial - Form - Discipline - Number		Revision
SPS - CUR - ZZ - ZZ - DR- C-83-4921		P03

GENERAL NOTES:

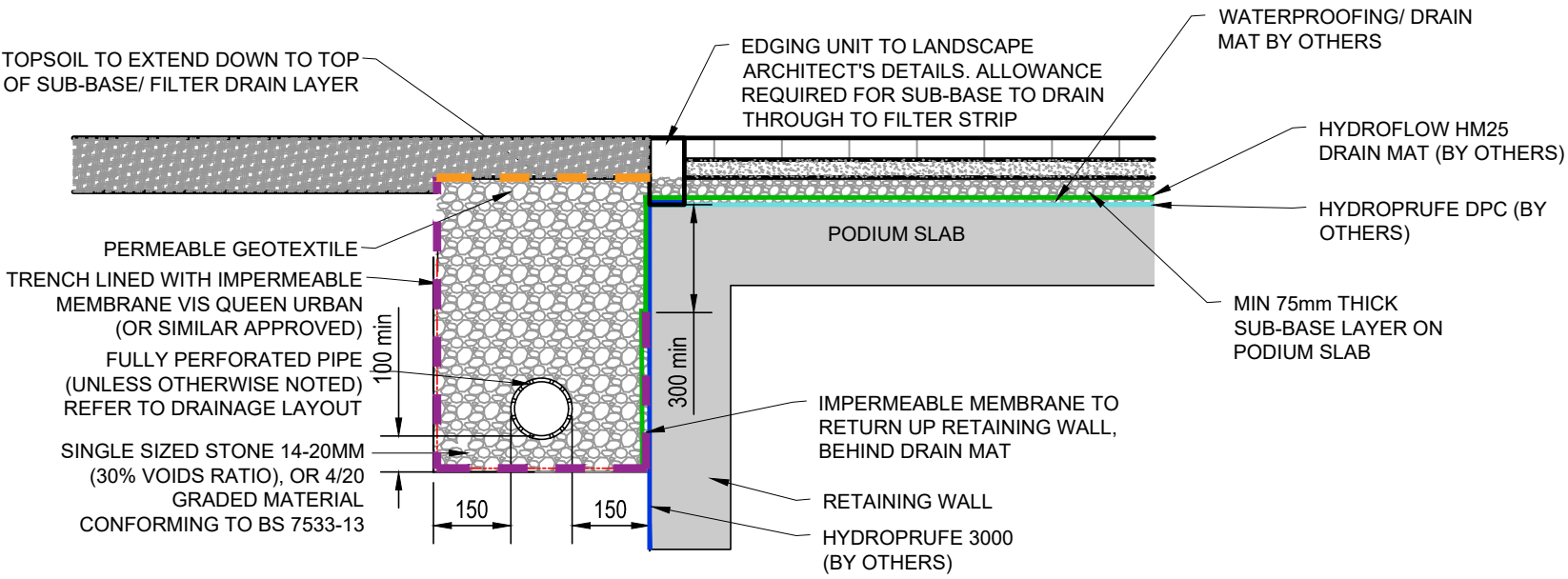
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FOR PIPE SIZES, INVERT LEVELS & LOCATIONS - SEE
DRAINAGE LAYOUT SPS-CUR-ZZ-L01-DR-C-50-1901

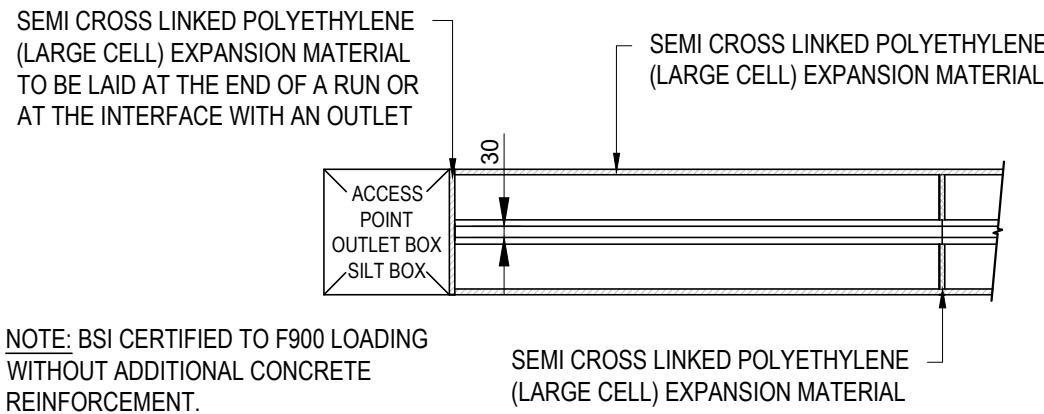


PERFORATED PIPE DETAIL UNDER POROUS ASPHALT
& INTERFACE WITH PAVING ON PODIUM DECK

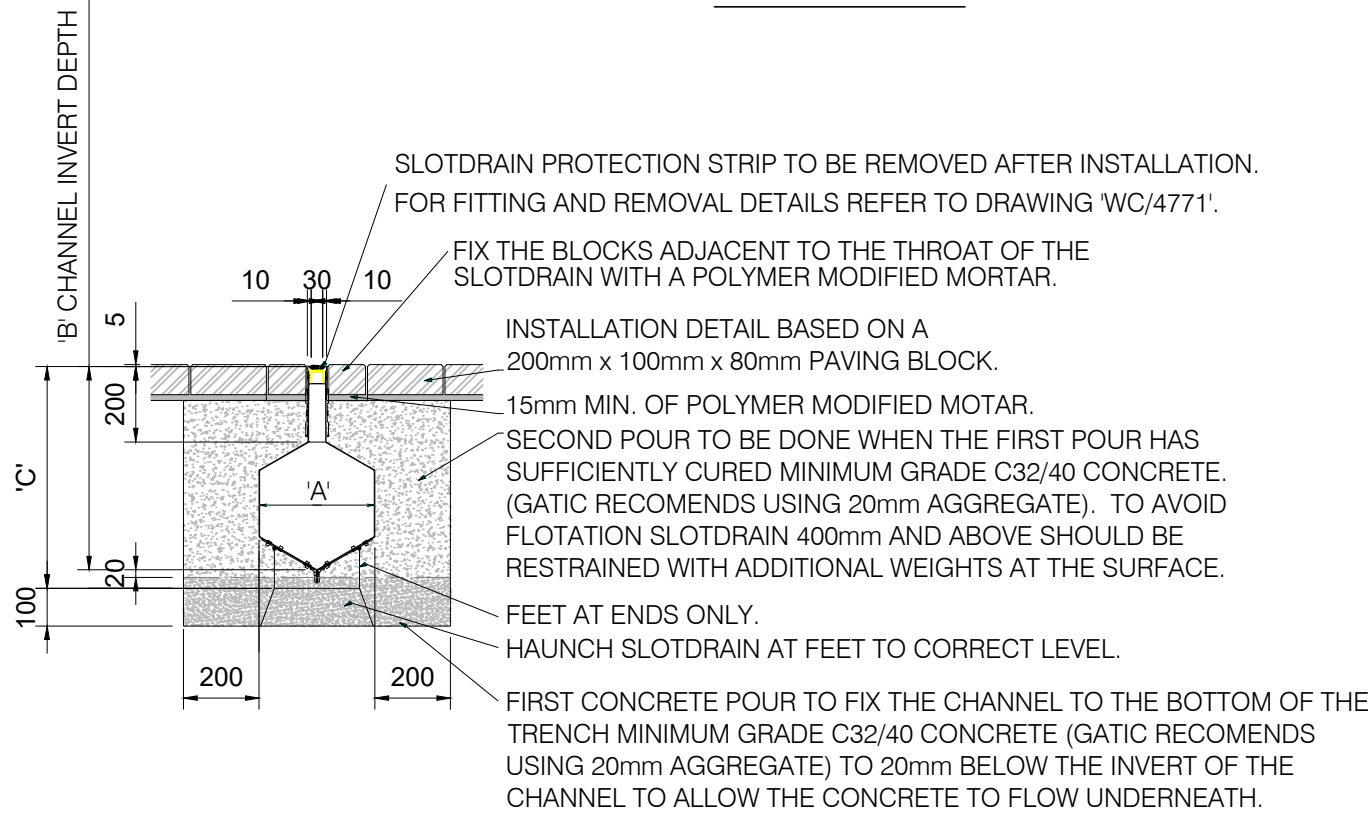
FOR PIPE SIZES, INVERT LEVELS & LOCATIONS - SEE
DRAINAGE LAYOUT SPS-CUR-ZZ-L01-DR-C-50-1901



PERFORATED PIPE DETAIL UNDER SOFT LANDSCAPING
& INTERFACE WITH PAVING ON PODIUM DECK

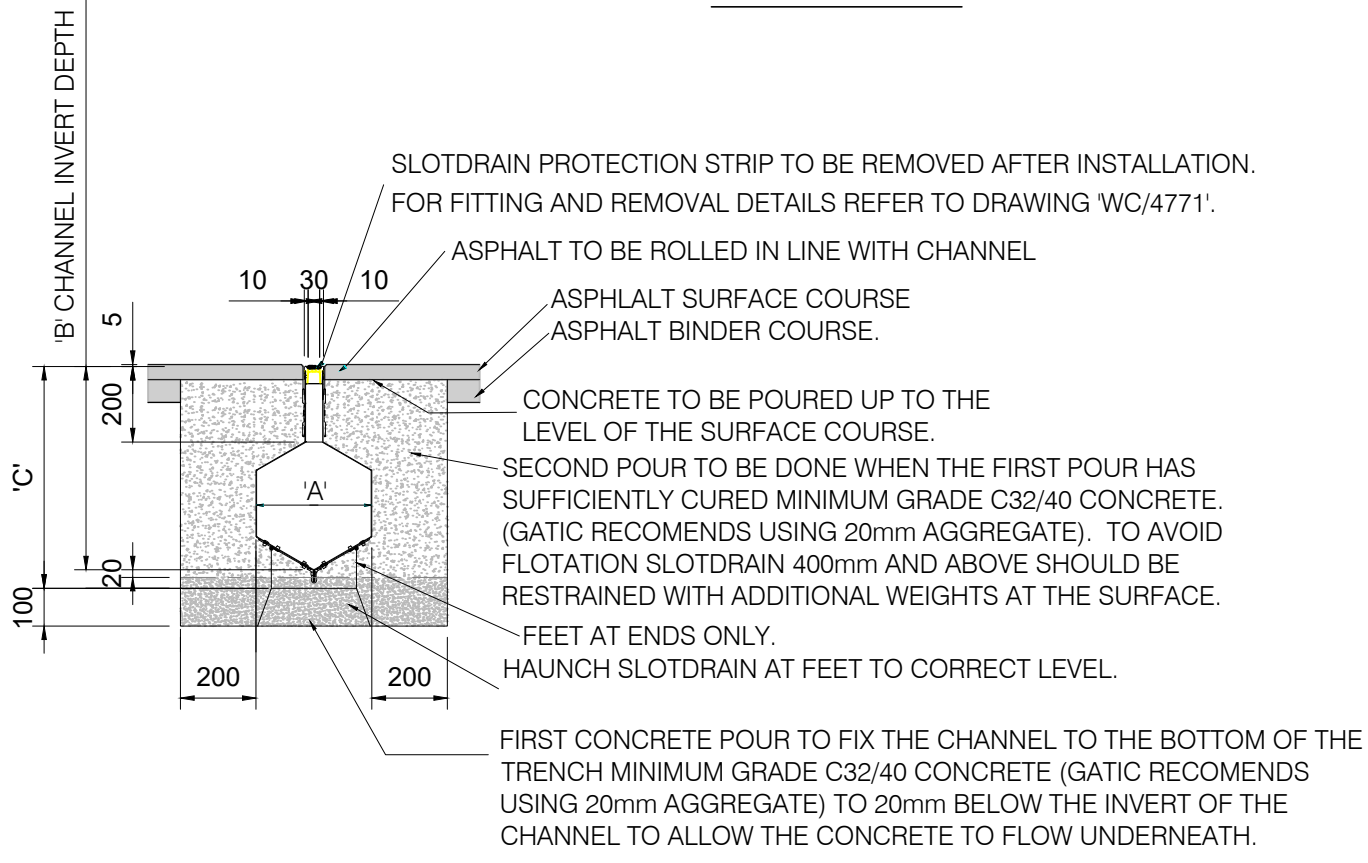


GATIC PLAN DETAIL



GATIC CASTSLOT TREADSAFE
BLOCK PAVING INSTALLATION

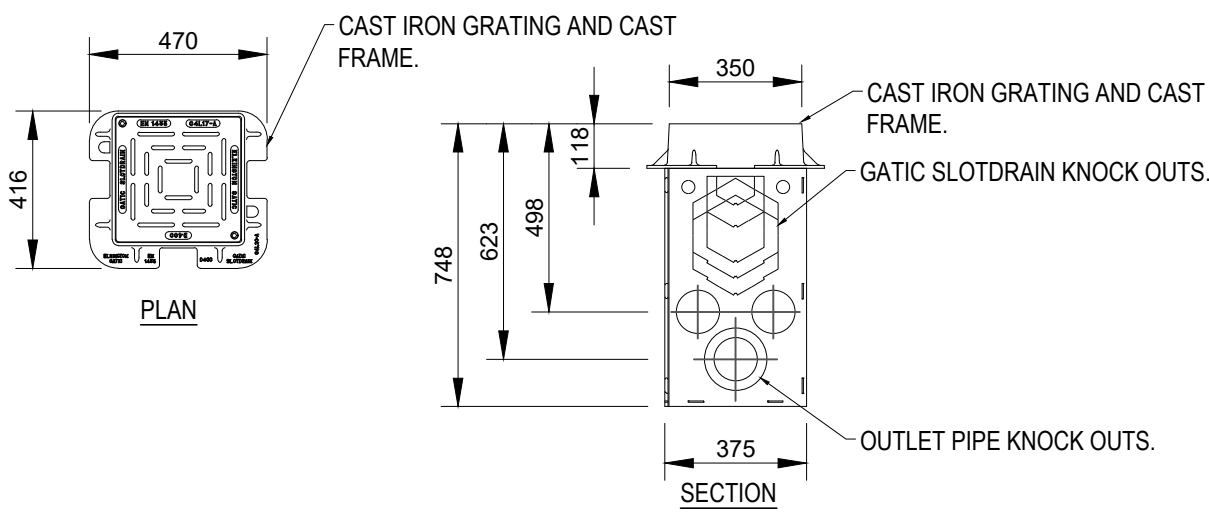
GATIC PLAN DETAIL



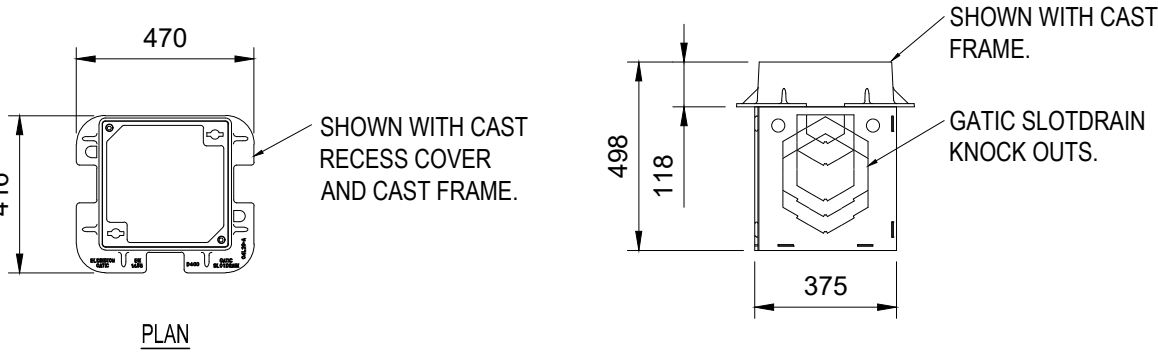
GATIC CASTSLOT TREADSAFE
ASPHALT INSTALLATION

CASTSLOT TREADSAFE SLOT DRAIN						
WIDTH 'A'	INVERT 'B'	DEPTH 'C'	C.S.A.	3m PART No.	1m PART No.	500mm PART No.
100	308	357	9098	CAT00001	CAT00009	CAT00017
150	366	415	20325	CAT00002	CAT00010	CAT00018
225	452	501	45014	CAT00003	CAT00011	CAT00019

FOR CHANNEL SIZES AND LOADINGS - SEE DRAINAGE
LAYOUT SPS-CUR-ZZ-L00-DR-C-50-1900



GATIC SLOT DRAIN 350mm OUTLET UNIT
SECTION AND PLAN DETAILS
NTS



350 ACCESS BOX
SECTION AND PLAN DETAILS
NTS

P03	PRELIMINARY STAGE 4 ISSUE	05.12.25	ATL	MW
P02	ISSUED FOR STAGE 3	27.09.24	ATL	ATL
P01	ISSUED FOR STAGE 2	14.07.23	ATL	CG

Rev: Description: Date: By: Chkd:

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Status: **STAGE 4**

Project: **SPARKLE STREET, MANCHESTER**

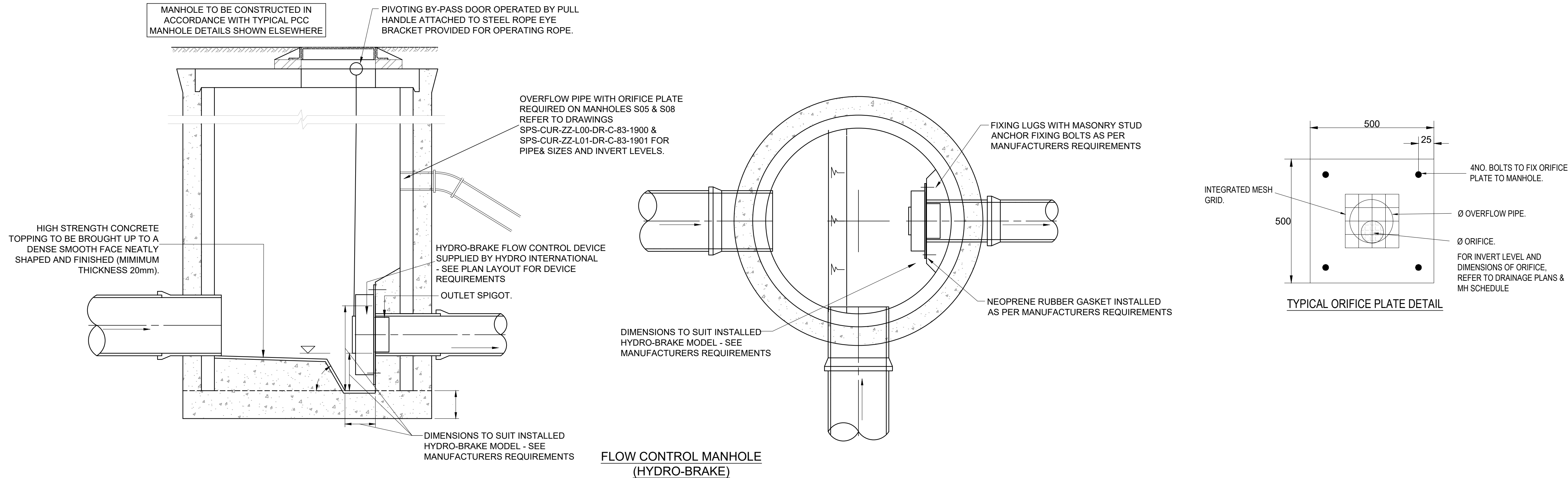
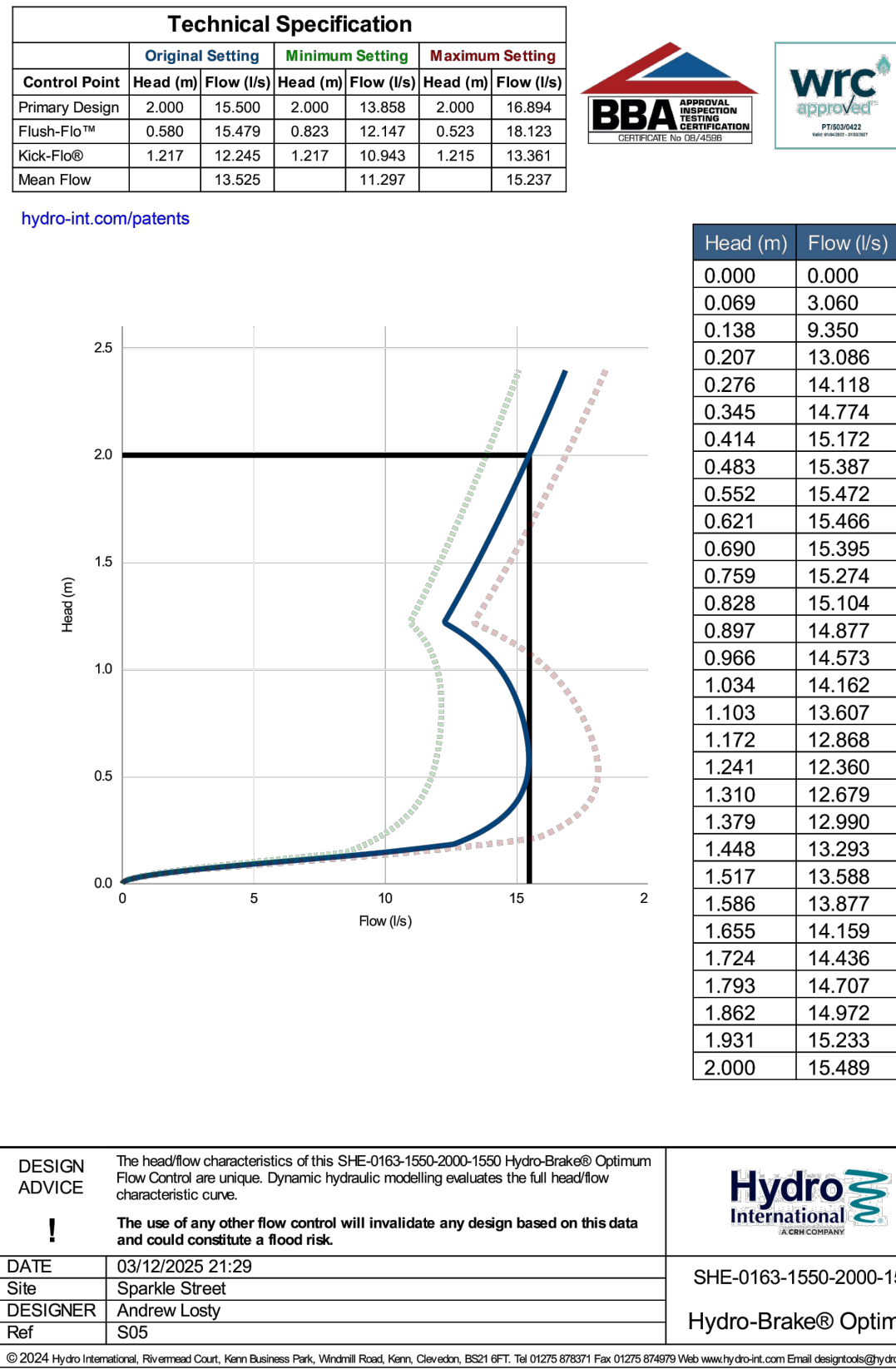
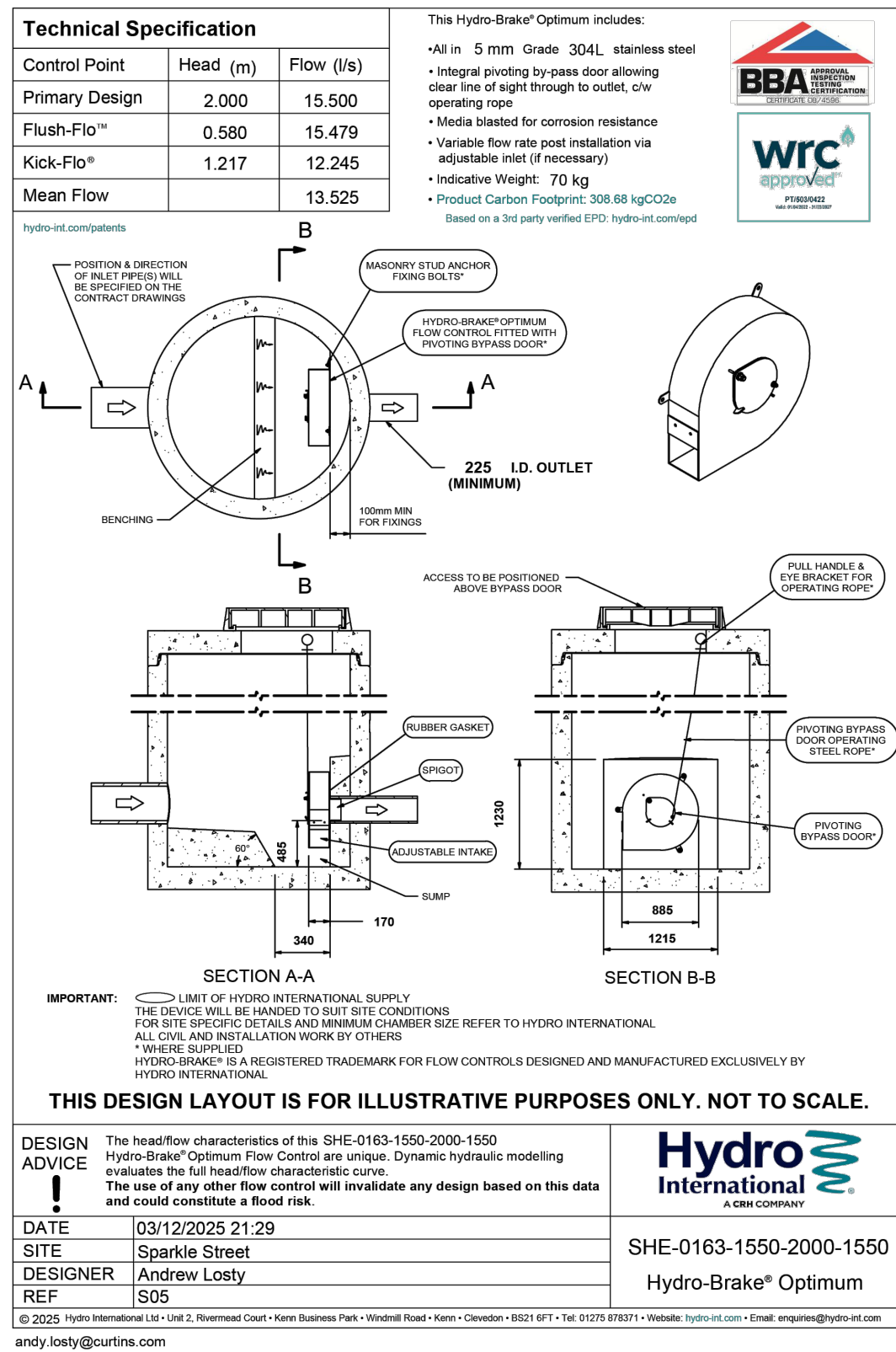
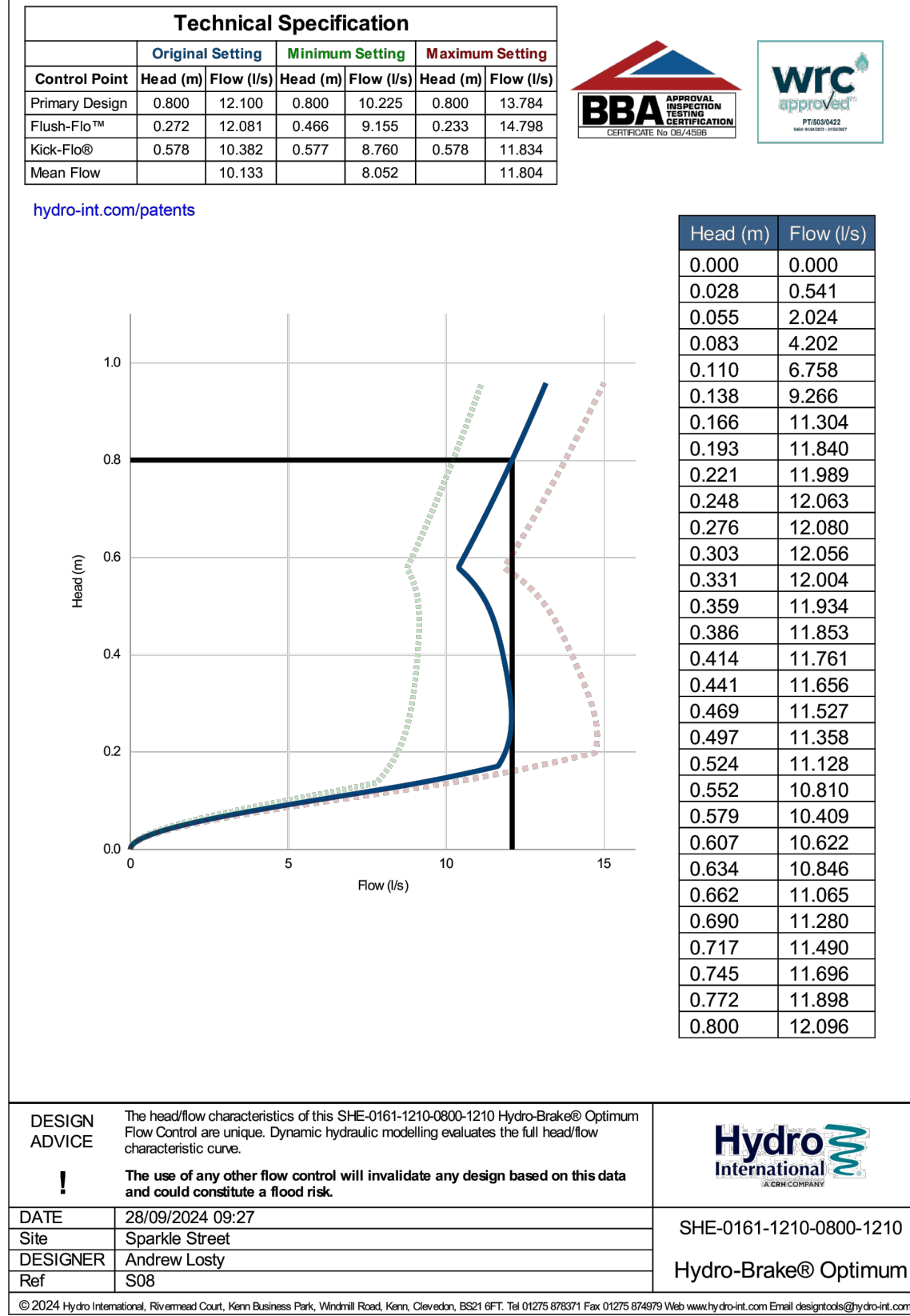
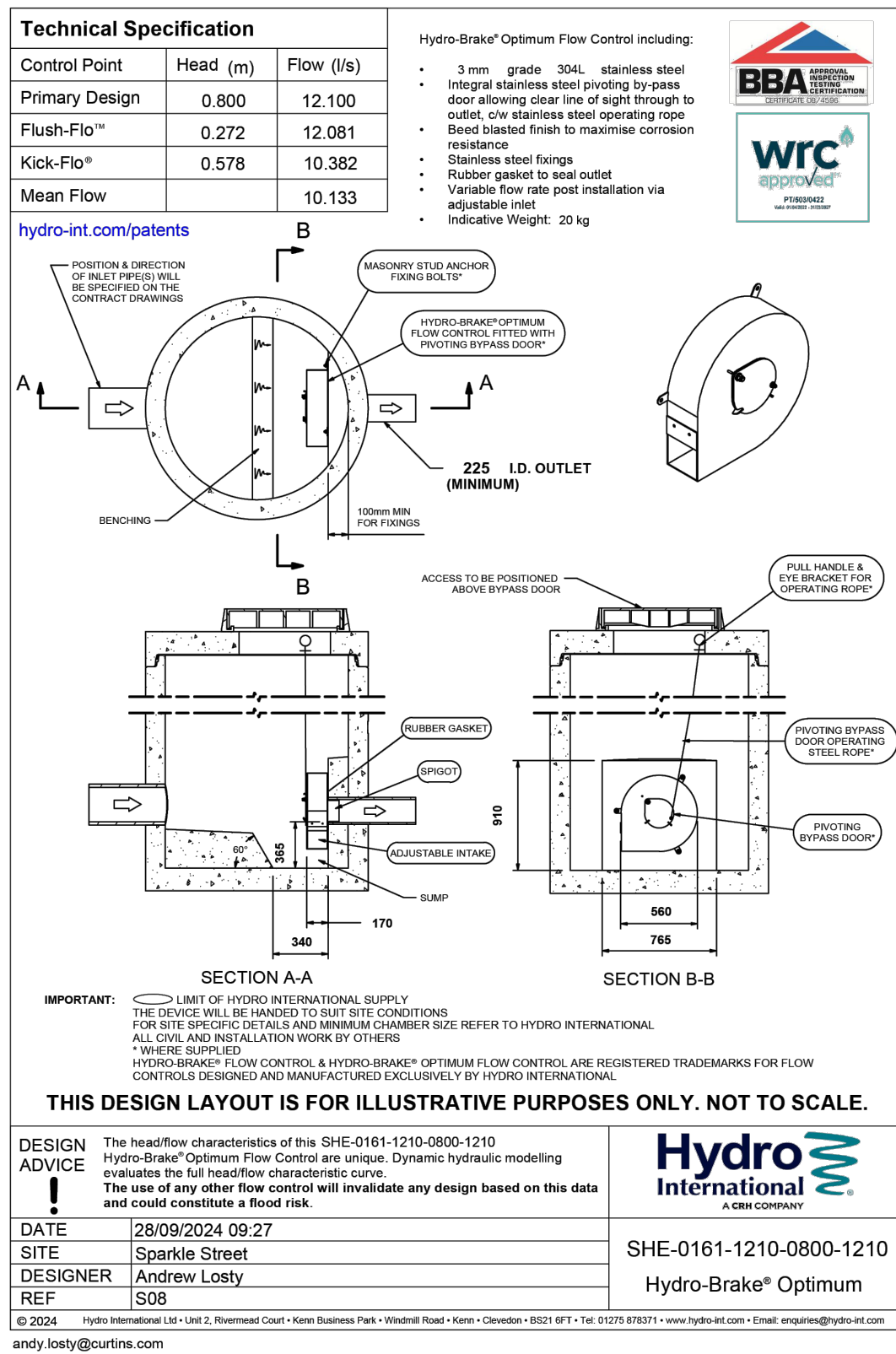
Orig Title:

**TYPICAL DRAINAGE DETAILS
SHEET 3**

Drawn By ATL	Designed By ATL	Checked By CD
Project No. 0824142	Date 14/07/23	Scales @ A1 NTS
Project No - Originator - Function - Spatial - Form - Discipline - Number		
SPS - CUR - ZZ - ZZ - DR - C - 83-4922		
Revision		
P03		

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- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- FOR GENERAL NOTES REFER TO DRAWING 082142-CUR-XX-XX-D-C-92500

HYDROBRAKE DETAILS
MANHOLE S05HYDROBRAKE DETAILS
MANHOLE S08

P03	PRELIMINARY STAGE 4 ISSUE	05.12.25	ATL	MW
P02	ISSUED FOR STAGE 3	27.09.24	ATL	ATL
P01	ISSUED FOR STAGE 2	14.07.23	ATL	CG

Rev:	Description:	Date:	By:	Chkd:
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Status:

STAGE 4

Project:
SPARKLE STREET, MANCHESTER

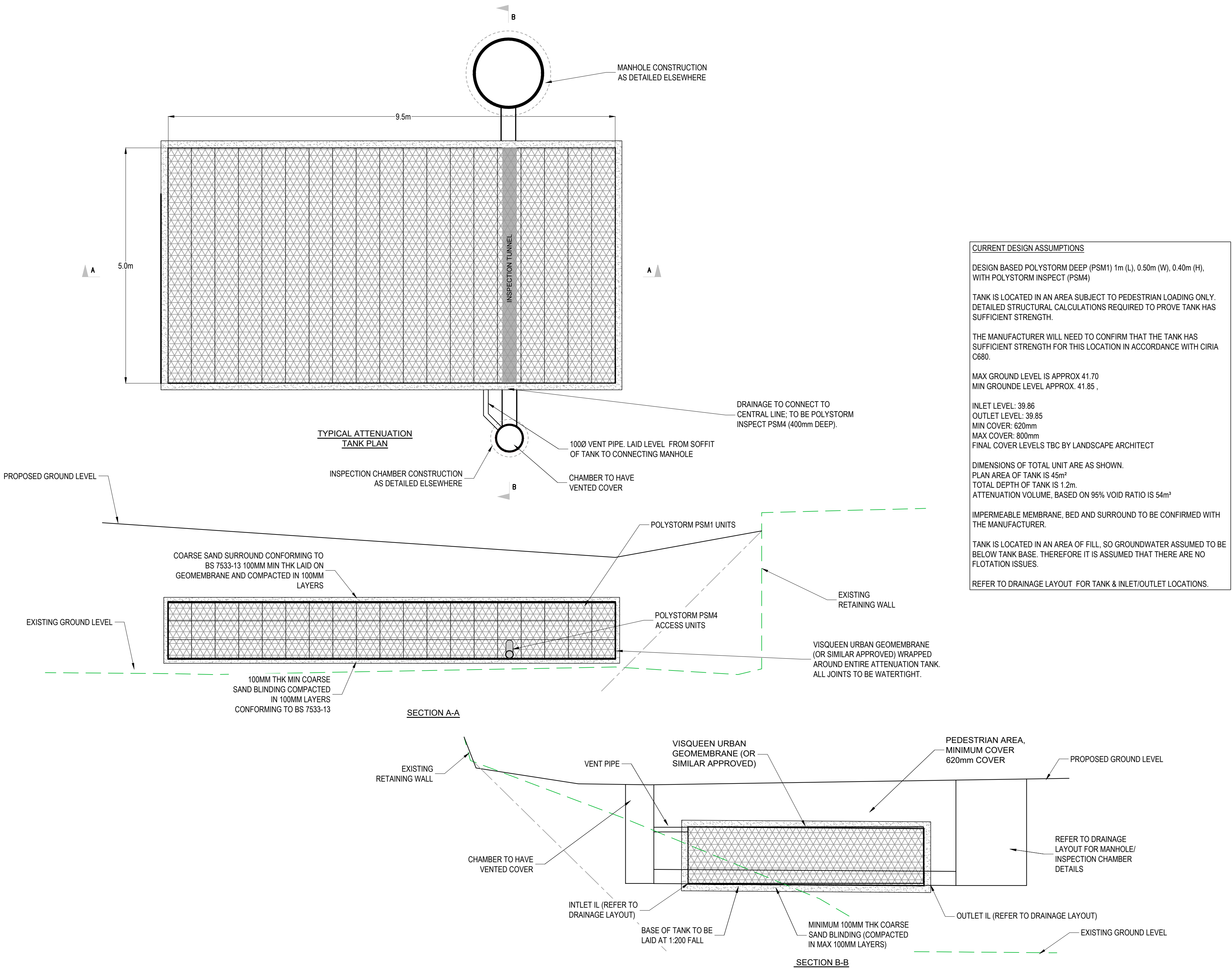
Dwg Title:
**TYPICAL DRAINAGE DETAILS
SHEET 4**

Drawn By: ATL
Designed By: ATL
Checked By: CD

Project No: 0824142
Date: 14/07/23
Scales: @ A1
NTS

Project No - Originator - Function - Spatial - Form - Discipline - Number
Revision

SPS - CUR - ZZ - ZZ - DR - C - 83-4923
P03



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- ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
- REFER TO DRAINAGE LAYOUT SPS-CUR-ZZ-L01-DR-C-83-1901 FOR THE LOCATION OF THE ATTENUATION TANK.
- 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 SHOULD BE LOCATED WITHIN LANDSCAPED AREAS, OR 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 POLYSTORM PSM1/ PSM4 MODULES, TO ALLOW AN ASSUMPTION OF UNIT SIZES WITHIN THE OVERALL DESIGN. 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.
- FOR FULL DRAINAGE NOTES REFER TO DWG SPS-CUR-ZZ-ZZ-DR-C-83-4910

P02	TANK SIZE AMENDED, GROUND LEVELS ADDED TO SECTIONS	12.12.25	ATL	MW
P01	PRELIMINARY STAGE 4 ISSUE	05.12.25	ATL	MW
Rev:	Description:	Date:	By:	Chkd:

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Status:

STAGE 4

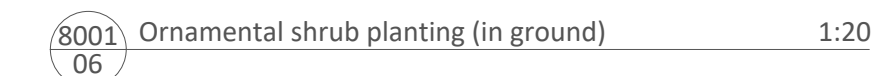
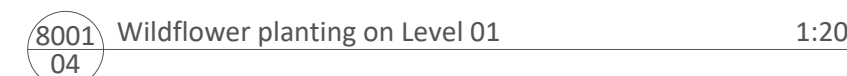
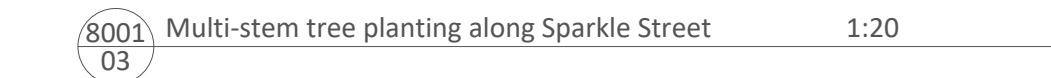
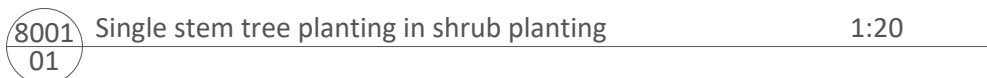
Project:

SPARKLE STREET, MANCHESTER

Orig Title:

TYPICAL DRAINAGE DETAILS
SHEET 5

Drawn By	Designed By	Checked By
ATL	ATL	MW
Project No.	Date	Scales @ A1
0824142	05/12/25	NTS
Project No - Originator - Function - Spatial - Form - Discipline - Number		
Revision		
SPS - CUR - ZZ - ZZ - DR- C - 83-4924		
P02		



8001 Roof terrace raised planter detail 1:20

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