

DRAINAGE STATEMENT

**Wood Vale,
Billinghurst**

**Prepared for
Bellway Homes Ltd
(South London)**

by

**Stuart Michael
Associates Limited**

January 2025



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Document Issue	Description / Changes	Revised by	Date
Issue 01	Issued for approval	-	29/01/2025
Issue 02	Appendix 3 / Drawings updated	MSR	24/06/2025
Issue 03	Paragraph 3.17 removed	MSR	19/05/2026



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1.0 INTRODUCTION

- 1.1 Stuart Michael Associates Limited, consulting engineers, has been commissioned by Bellway Homes Ltd (hereafter referred to as the 'Client') to prepare this Drainage Statement for land located at Wood Vale, Billingham.
- 1.2 This statement has been prepared in order to provide foul and surface water drainage proposals for a residential development comprising of 83 residential dwellings on land hereafter referred to as the 'Site'.
- 1.3 Rainfall-runoff management for the Site will follow the procedure laid down by the Non-statutory Technical Standards (NTS) for Sustainable Drainage Systems (SuDS), which were published by the Department for Environment, Food and Rural Affairs (DEFRA) in March 2015.
- 1.4 The purposes of the statement are, as follows:
 - To demonstrate the development of the proposed Site will not increase risk of flooding elsewhere;
 - To confirm that satisfactory strategies, incorporating Sustainable Drainage Systems (SuDS), are achievable for disposal of surface water runoff from the proposed development;
 - To provide details on foul water disposal for the development.



2.0 THE SITE

- 2.1 The Site is located to the east of Billingham, in the district of Horsham.
- 2.2 The development is located approximately 800 metres east from the settlement of Billingham, and to the west of Wooddale Lane. The approximate Site area is 6.17 hectares and is comprised of agricultural land.
- 2.3 The Site is made up of three agricultural fields bound by hedgerows and trees. The topography gently slopes from the east to the southwest corner of the Site. The current access for the Site is within Wooddale Lane via a farm gate. Public Right of Way 1941 runs west-east adjacent to the north site boundary, linking Wooddale Lane to the eastern edge of Billingham. This is also linked eastward into the wider countryside. The village of Billingham is located immediately west from the development Site and includes existing residential properties and community facilities.
- 2.4 The Site is bound by Wooddale Lane and to the west, by land currently under development for up to 475 dwellings and associated infrastructure, including a new primary school (DC/15/0059). Of the 475 dwellings, 162 have already been built (reserved matters consents ref: DC/16/1422, ref: DC/16/2610 and ref:DC/17/0079). The remaining 313 dwellings are currently under construction.



3.0 SURFACE WATER DRAINAGE

Guidance and Standards

- 3.1 The proposed development will incorporate SuDS to dispose surface water runoff for all impermeable areas. The guidance given in the CIRIA report C753 'The SuDS Manual' will be followed during the design of the proposed SuDS solutions.
- 3.2 The NTS for SuDS sets out the recommended procedures for rainfall runoff management for developments in various terms, including peak flow control, volume control and flood risk within the development.
- 3.3 Requirement H3 Part 3 of the Building Regulations Approved Document H (2002 Edition) states that rainwater from a system should discharge to one of the following listed in order of priority:
- an adequate soakaway or some adequate infiltration system; or, where this is not reasonably practicable,
 - a watercourse; or, where that is not reasonably practicable,
 - a sewer
- 3.4 Ground investigations confirmed presence of cohesive soils on Site. Soakage tests undertaken were insufficient for soil infiltration and achieved virtually no soakage being recorded, therefore infiltration has been discounted in line with the outline application FRA ((Ref: 882179-R1(01)-FRA).
- 3.5 The topographical survey indicates that there is an existing ditch network within the Site boundary and within its vicinity. Therefore, SuDS measures will focus on discharging surface water to an existing ditch network at a restricted flow rate.
- 3.6 NTS states that the proposed drainage system must be designed so that flooding does not occur on any part of the Site for a 1 in 30 rainfall event.
- 3.7 The drainage system must be designed so that flooding does not occur to any building or utility plant susceptible to water during a 1 in 100-year rainfall event.
- 3.8 Calculations for the proposed SuDS system will include a 45% allowance for climate change in accordance with the latest Environment Agency (EA) climate change guidance and 5% allowance for urban creep.
- 3.9 An overall 5% urban creep was included within the surface water calculations because there are areas of the site where urban creep cannot be attributed. For example, the flats and the maisonettes within the northwest.

Surface Water Drainage Proposals

- 3.10 All surface water runoff from proposed impermeable areas which include roofs, roads, parking areas and driveways will drain to a standard sewer network via rainwater pipes, gullies and porous parking.
- 3.11 The Site has a total impermeable area of circa 1.64ha. These areas are provided in an impermeable catchment areas plan in **Appendix 1**.
- 3.12 All new sewer networks have been designed to contain storm events up to and including the 1 in 30-year return period within the network, with no flooding. For the 1 in 100 with 45% climate change storm event some minor flooding occurs. See overland flood routing section for further details.



- 3.13 The surface water drainage system has also allowed for 5% additional flow for future urban creep.
- 3.14 The development has been split into three drainage catchments; Network 1, Network 2 and Attenuation Basin 3. Refer to **Appendix 1** impermeable catchment areas plan for further details.
- 3.15 The surface water from the whole Site will be discharged into the existing ditch network, which is proposed to be re-graded where necessary. See **Appendix 2** for the Sites planning surface water drainage strategy.
- 3.16 Raingardens are proposed adjacent to the main roads within the development parcels. These will help slow the conveyance of surface water runoff and treat surface water runoff from the roads. See **Appendix 2** for the Sites planning surface water drainage strategy.

Network 1

- 3.17 Network 1 is the main network for the Site which drains the majority of the development. It serves an impermeable catchment area of 1.029ha. The attenuation basin has been designed with 1:3 side slopes, refer to **Appendix 5** for detailed drainage drawings.
- 3.18 All surface water sewers drain to an attenuation basin located adjacent to the western boundary of the southern development parcel, where it will discharge off Site to an existing ditch network at a restricted flow rate of 7.5l/s via the use of a hydro brake. Refer to **Appendix 3** for detailed drainage drawings.
- 3.19 There is also a cellular attenuation tank with downstream hydrobrake control provided between the two development parcels, with a further cellular attenuation tank provided for additional storage, linked to the pond. These provide further storage and hold storm water at source to prevent overwhelming the network further downstream and at the attenuation basin. Refer to **Appendix 3** for detailed drainage drawings where tanks and control devices are provided.
- 3.20 The discharge rate off Site will be restricted to the mean annual greenfield runoff rate which has been calculated in the FRA carried out by Reside Developments Ltd (Ref: 882179-R1(01)-FRA) as 7.5 l/s.
- 3.21 The attenuation basin and both cellular tanks have been sized with sufficient capacity to store and restrict the discharge rate off Site for up to and including the 1 in 100 year with 45% climate change return period with a very small amount of flooding. Any flooding that occurs will re-enter the network at the next available point. Refer to the flood exceedance route drawing in **Appendix 4**. Also refer to **Appendix 3** for detailed drainage drawings and **Appendix 5** surface water Flow calculations.

Network 2

- 3.22 Network 2 serves a small portion the Site in the northeast and serves an impermeable catchment area of 0.465ha. The attenuation basin has been designed with 1:3 side slopes, refer to **Appendix 3** for detailed drainage drawings.
- 3.23 The surface water sewers from throughout the development parcel will drain to an attenuation basin located adjacent to the southeastern boundary of the northern development parcel, which will discharge storm water into the existing ditch located to the east of the Site at a restricted greenfield runoff rate at 3.8l/s, via a hydrobrake control chamber. Refer to **Appendix 3** for detailed drainage drawings.



- 3.24 The attenuation basin has been sized with sufficient capacity to store for up to and including the 1 in 100 year with 45% climate change return period with no flooding. Refer to **Appendix 6** surface water Flow calculations.

Pond Network

- 3.25 Attenuation basin 3, located on the northwestern corner of the southern development parcel, serves a small portion the southern development parcel and serves an impermeable catchment area of 0.147ha.
- 3.26 The attenuation basin has been designed with 1:3 side slopes. This designed as a permanent wet pond, with provision for additional storage above the permanent water level. Refer to **Appendix 3** for detailed drainage drawings.
- 3.27 A downstream orifice control chamber restricts the flow rate off Site to the existing ditch to the east at 2 l/s.
- 3.28 Attenuation basin 3 has been sized with sufficient capacity to store up to and including the 1 in 100 year with 45% climate change return period with no flooding. Refer to **Appendix 7** surface water Flow calculations.

Overland Flood Routing

- 3.29 For 1 in 100 year with 45% climate change return period some minor flooding will occur. Any flooding that occurs will re-enter the network at the next available point and not leave the Site, this is shown on the flood exceedance route drawing in **Appendix 4**.
- 3.30 For rainfall events above the 1 in 100 year with 45% climate change return period flooding will occur. Any overland flood routing will be directed along roads away from dwellings and ground levels suitably adjusted to allow appropriate flow routes. A drawing illustrating the flood exceedance routes is provided in **Appendix 4**.

Water Quality Management

- 3.31 **Table 1** details the pollution hazard indices for the Site as stated by CIRIA C753. The indices range from 0 (no pollution hazard for this contaminant type) to 1 (high pollution hazard for this contaminant type).

Table 1: Pollution Hazard indices for different land use classifications

Land Use	Pollution Hazard	Total Suspended solids (TSS)	Metals	Hydro-carbons
Residential Roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change	Low	0.5	0.4	0.4
Total	Low	0.7	0.6	0.45

- 3.32 To deliver adequate treatment, selected SuDS components must have a total pollution index (for each contaminant type) that equals or exceeds the pollution hazard index.
- 3.33 Pollution mitigating indices for individual treatment SuDS components implemented across the development are provided in **Table 2**.

Table 2 – Individual Component Pollution Mitigation Indices



	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Pond	0.7	0.7	0.5
Bioretention system	0.8	0.8	0.8

- 3.34 Following the guidance in the CIRIA C753 SuDS manual, a factor of 0.5 is used to account for the reduced performance of secondary or tertiary components associated with already reduced inflow concentrations.
- 3.35 All runoff from each phase will go through at least one SuDS treatment device. **Table 3** details how treatment is achieved for each network across the Site.

Table 3 – Treatment Pollution Mitigation Indices for Individual Networks

Infiltration Location	Device/Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Network 1	Pond	0.7	0.7	0.5
	Bioretention system	0.8	0.8	0.8
Network 2	Pond	0.7	0.7	0.5
	Bioretention system	0.8	0.8	0.8
Attenuation Basin 3	Pond	0.7	0.7	0.5
	Total Pollution Hazard	0.7	0.6	0.45
	Acceptability of pollution mitigation	Sufficient	Sufficient	Sufficient

- 3.36 All surface water runoff will have sufficient treatment before discharging to the existing ditch network.



4.0 FOUL WATER DRAINAGE

- 4.1 Both development parcels will discharge foul water via a network of gravity sewers to an existing adopted ICOSA foul pump station located approximately 73m west from the Site boundary, on the western side of Hilland Road.
- 4.2 The proposal is to offer the main spine foul sewers throughout the development parcels to an independent water authority under a Section 104 agreement.
- 4.3 ICOSA have confirmed that there is capacity to serve the development and proposed discharge rates.
- 4.4 The foul water drainage will comply with Building Regulations Part H where private and with Water UK code for adoption in roads where it will be offered to a water authority.
- 4.5 The FW drainage proposal is provided in **Appendix 2**.



5.0 CONCLUSION

- 5.1 Surface water sewers have been designed to contain storm events up to and including the 1 in 30 year return period within the network with no flooding.
- 5.2 SuDS storage structures have been sized to store storm events up to and including the 1 in 100 year with 45% climate change return period with no flooding whilst restricting the discharge rate off Site to the mean annual greenfield runoff rate.
- 5.3 It has been demonstrated that for any storm event above and including the 1 in 100 year with 45% climate change return period flooding will be directed along roads away from dwellings to a point where it can re-enter the sewer network. A drawing illustrating the flood exceedance routes is provided in **Appendix 4**.
- 5.4 It has been demonstrated the SuDS components will have sufficient treatment before discharging into an existing ditch.
- 5.5 Both development parcels will discharge foul water via a network of gravity sewers to an existing adopted ICOSA foul pump station located to the west of the Site, alongside Hilland Road.
- 5.6 ICOSA have confirmed that there is capacity to serve the development and the associated discharge rates.



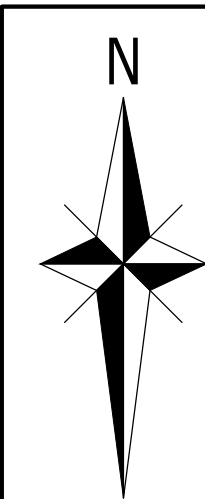
APPENDIX 1

Impermeable Areas



APPENDIX 2

Concept Drainage Strategy



SURFACE WATER STRATEGY PROPERTIES

GREENFIELD RUNOFF RATES (AGREED AT OUTLINE)

CATCHMENT 1 - 7.5/s
CATCHMENT 2 - 3.8/s
CATCHMENT 3 - 2.0/s

TOTAL DISCHARGE RATE = 7.5+3.8+2.0=13.3/s

TOTAL APPLICATION AREA = 2.60ha
MEASURED IMPERMEABLE AREA OF DEVELOPMENT INCLUDING 10% URBAN CREEP = 1.88ha (APPROX 70% OF TOTAL AREA)

STORAGE SUMMARY:

BASIN 1:
AREA PROVIDED = 383m²
DEPTH = 1.28m
VOLUME = 187m³

BASIN 2:
AREA PROVIDED = 649m²
DEPTH = 1.47m
VOLUME = 409m³

BASIN 3:
AREA PROVIDED = 350m²
DEPTH = 1.06m
VOLUME = 165m³

TANK 1:
AREA PROVIDED = 180m²
DEPTH = 1.20m
VOLUME = 205m³

TANK 2:
AREA PROVIDED = 260m²
DEPTH = 0.80m
VOLUME = 198m³

TOTAL STORAGE IN SYSTEM = 187+409+165+205+198 = 1164m³ (PLUS MANHOLES AND PIPEWORK)

Catchment 1.0 impermeable area = 1.022ha. (Includes urban creep)

Catchment 2.0 impermeable area = 0.591ha. (Includes urban creep)

Catchment 3.0 impermeable area = 0.270ha. (Includes urban creep)

NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
- DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
- ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
- ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
- NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
- THE AVOIDANCE AND PROTECTION OF SERVICES DURING THE WORKS IS THE RESPONSIBILITY OF THE CONTRACTOR.
- THE CONTRACTOR IS REMINDED OF HIS OBLIGATION TO VERIFY THE ROUTE OF ALL SERVICES ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
- THE CONTRACTOR SHOULD ALLOW FOR ANY NECESSARY LIAISON WITH THE STATUTORY UTILITIES DURING THE COURSE OF THE WORKS TO AVOID ANY DISRUPTION TO RETAINED SERVICES.
- THE CONTRACTOR SHOULD NOTE THAT THE SERVICES SHOWN ARE NOT TO BE CONSIDERED EXHAUSTIVE. PRIVATE SERVICES MAY BE PRESENT WITHIN THE LIMIT OF WORKS AND CARE SHOULD BE TAKEN TO LOCATE AND AVOID THESE DURING CONSTRUCTION.
- ALL INFORMATION IS INDICATIVE AND IS FOR INFORMATION ONLY.

KEY

- SITE BOUNDARY
- PROPOSED ATTENUATION BASIN
- PROPOSED ATTENUATION TANK
- PROPOSED SW DRAINS/SEWER & MANHOLE / INSPECTION CHAMBER
- PROPOSED FW DRAINS/SEWERS & MANHOLE / INSPECTION CHAMBER
- PROPOSED HEADWALL
- ROOT PROTECTION AREA
- PROPOSED FOUL WATER EASEMENT
- PROPOSED GRADIENT
- PROPOSED CONTOURS (50mm AND 250mm)
- BASIN CONTOURS (100mm AND 1000mm)
- EXISTING SPOT LEVEL
- EXISTING DITCH
- EXISTING SURFACE WATER SEWER
- PROPOSED INDICATIVE FINISHED LEVEL (+/- 300mm)
- DIRECTIONAL FLOW ARROWS

DRAFT

DRAWINGS:

PLEASE REFER TO THE FOLLOW DRAWINGS:

SITE LAYOUT
DHA ARCHITECTURE'S DRAWING REF.
022207-BEL-SL-AP05_APPRAISAL LAYOUT
DATE: 08.04.24

STRATEGIC DRAINAGE PLAN
RSK'S DRAWING REF.
882179-10-01_INDICATIVE SURFACE WATER DRAINAGE STRATEGY
DATE: 12.20

OMEGA ARCHITECT'S DRAWING REF.
2989-C-1005-SK-3.2
DATE: 08.12.20

TREE CONSTRAINTS PLAN
SIA TREE'S DRAWING REF.
SIA TPP 20518-041 REV. A
DATE: 08.12.20

TOPOLOGICAL SURVEY
MK SURVEYS DRAWING REF.
27563_TOPOLOGICAL SURVEY
DATE: 07.21

MALTBY SURVEYS LTD
23/139/100/A TOPOLOGICAL SURVEY
DATE: 06.23

EXISTING SEWER DRAWINGS
ROBERT WEST'S DRAWING REF.
4120-001-C-SK-237_STRATEGIC SURFACE WATER POND & DRAINAGE LAYOUT
DATE: 30.04.18

ROBERT WEST'S DRAWING REF.
4120-001-C-2524_SECTION 104 FOUL DRAINAGE PLAN
SHEET 5 OF 7
DATE: 03.08.18

K	PERMANENT WATER WITHIN BASIN 3	TR	TR	BB	09.05.24
J	FLOW ARROWS ADDED	TR	JM	BB	02.05.24
H	F2 AND S33 ADJUSTED TO NEW LAYOUT	TR	JM	BB	17.04.24
G	UPDATED IN LINE WITH NEW MASTERPLAN	TR	JM	BB	26.03.24
F	UPDATED IN LINE WITH NEW MASTERPLAN	TR	JM	BB	05.03.24
E	UPDATED TO LAYOUT REVISION AP05	HS	JM	BB	20.10.23
D	UPDATED TO SUIT REVISED SITE LAYOUT	HS	JM	BB	05.10.23
C	SW CATCHMENT AREAS UPDATED	DC	JM	BB	23.08.23
B	UPDATED ROAD CONTOURS	WA	EF	BB	25.07.23
A	PRELIMINARY ISSUE	DC	JM	BB	13.07.23
Rev	Description	Drm	Chk	App	Date

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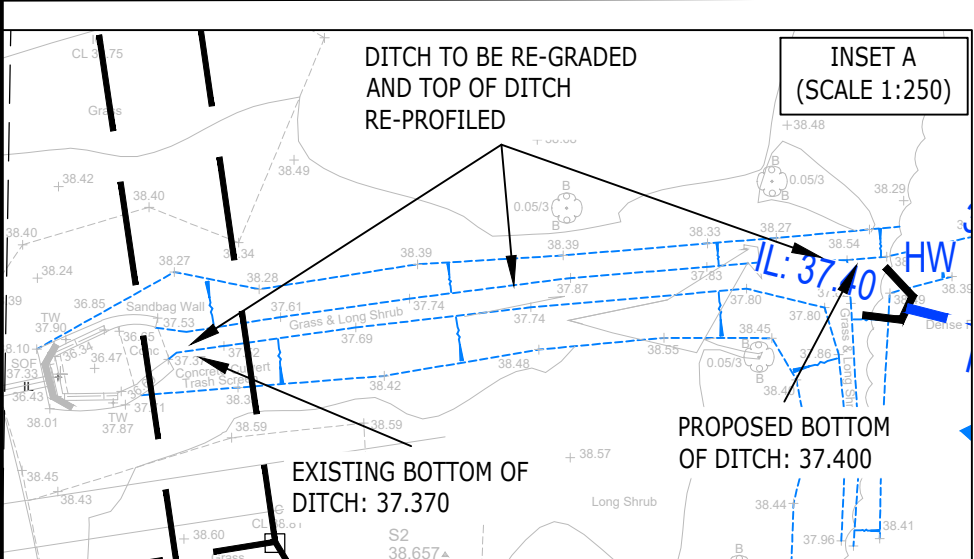
Project Title:
**LAND AT DUCKMOOR,
EAST BILLINGSHURST**

Drawing Title:
CONCEPT DRAINAGE STRATEGY

A1 Scale	Date	Designed by
1:500	JUNE 23	DC
Drawn by	Checked by	Approved by
DC	JM	BB

Drawing Number
2303710-002

Rev
K

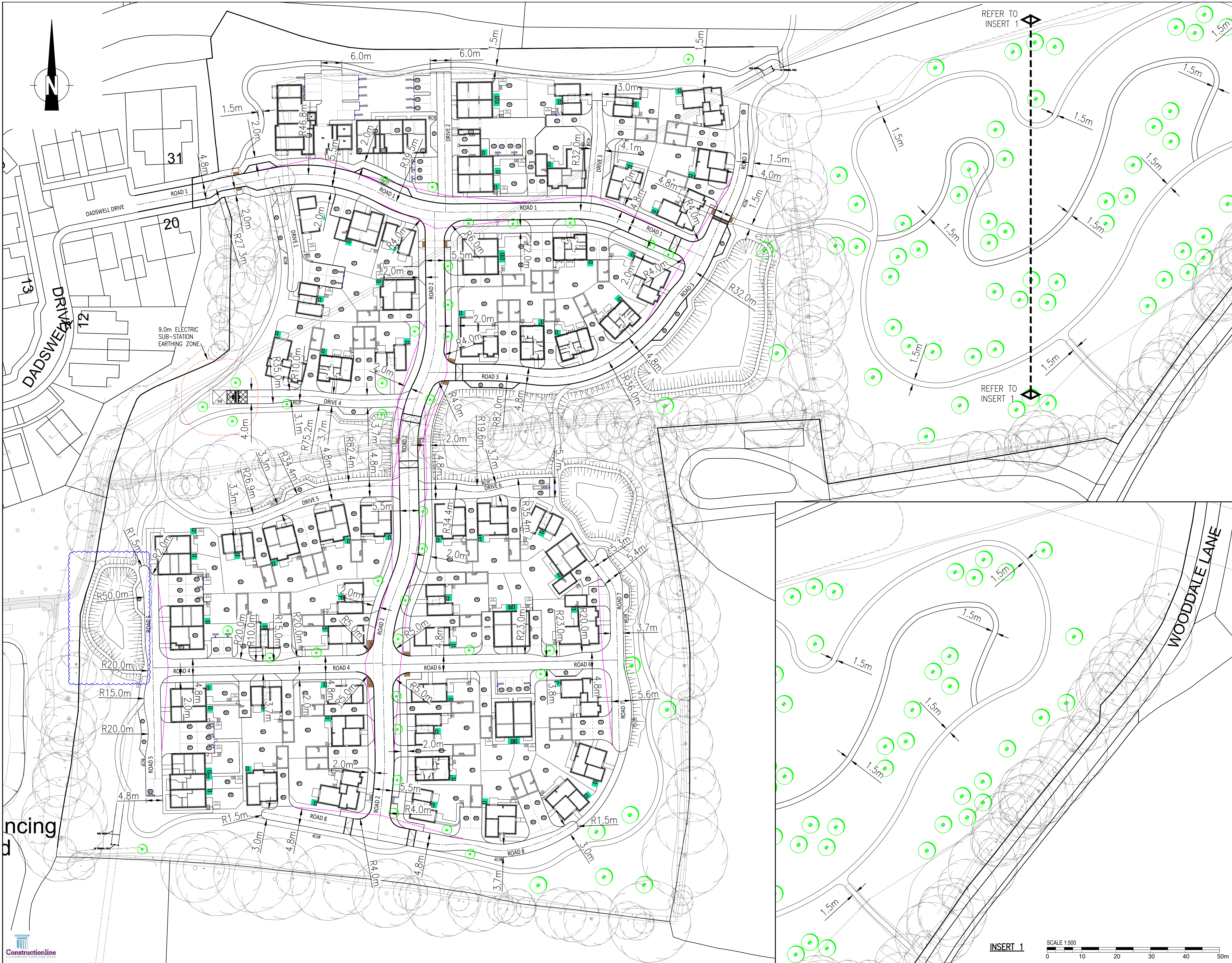


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APPENDIX 3

Detail Drainage Drawings



- NOTES: GENERAL
- DO NOT SCALE FROM THIS DRAWING
 - ALL DIMENSIONS SHOWN ARE IN METRES UNLESS STATED OTHERWISE.
 - THIS DRAWING IS BASED ON TOPOGRAPHICAL SURVEY COMPILED BY:
MKSURVEYS
HORSHAM
TEL: 01403243162
HORSHAM@MKSURVEYS.CO.UK
 - GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99975 APPLIED.
 - THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT SCHEME DRAWINGS AND SPECIFICATIONS.
 - ALL WORKS TO BE CARRIED OUT IN STRICT ACCORDANCE WITH "THE SPECIFICATION FOR HIGHWAY WORKS - MODIFIED AND EXTENDED", INCLUDING WEST SUSSEX COUNTY COUNCIL'S SUPPLEMENTARY CLAUSES.
 - ALL WORKS WITHIN THE PUBLIC HIGHWAY SHALL BE CARRIED OUT AND COMPLY WITH THE REQUIREMENTS OF THE DTP "TRAFFIC SIGNS MANUAL CHAPTER 8 - TRAFFIC SAFETY MEASURES AND SIGNS FOR ROAD WORKS AND TEMPORARY SITUATION".
 - ALL ROAD MARKINGS AND TRAFFIC SIGNS SHALL COMPLY WITH "THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016".
 - ALL EXISTING LEVELS TO BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF ANY WORKS.
 - BEFORE ANY WORKS ARE COMMENCED THE WEST SUSSEX COUNTY COUNCIL AREA HIGHWAY MANAGER MUST BE CONTACTED.

- KEY
- 2.4mX25m VISIBILITY SPLAY
 - RCP BIN COLLECTION POINT
 - BIN STORE
 - 2 X CYCLES CYCLE STORE
 - ELECTRIC VEHICLE CHARGING POINT DUCTING - SOLO
 - EVCIP ELECTRIC VEHICLE CHARGING POINT - SOLO

CONSTRUCTION ISSUE				
CIO	DESCRIPTION	MSR	DATE	
C09	BASIN 1 SHAPE/SIZE REVISED	MSR	05.03.28	
C08	PLOTS 79, 82 & 83 SHED POSITION REVISED	FP	MSR 30.01.26	
C08	PLOT 38 DRIVE/PATH REVISED. PLOTS 15,16,19,21,35,36,52,53,54,56,57,58,59,73 & 74 CYCLE SHEDS/PATHS REVISED	MSR	27.01.26	
C07	PLOT 53/54 & 79/80 FENCE REVISED. PLOT 45 ROTATED. PLOTS 1-8 BLOCK REVISED	MSR	11.11.25	
C06	ELECTRIC SUB-STATION LOCATION REVISED AND EARTHING ZONE ADDED	MSR	28.10.25	
C05	PATHS TO CYCLE STORE ADDED	FP	MSR 03.10.25	
C04	PATHS NEAR NORTHERN TERMINAL POLES REVISED	MSR	20.08.25	
C03	PATH REVISED. AREA SHOWN IN ABYSSANCE LAYOUT REVISED	MSR	29.05.25	
C02	LAYOUT REVISED	FP	MSR 29.01.25	
C01	BUILDINGS UPDATED & LAYOUT REVISED	FP	MSR 16.01.25	
P01	CONSTRUCTION ISSUE			
ST	Rev	Description	Drm	Chk Date
REVISIONS				
Preliminary Issue		Submitted for S104		
Planning Issue		Issued for Tender		
Submitted for S38		Issued for Construction	✓	
Submitted for S278		As Built		
DRAWING STATUS				

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Bellway

JOB TITLE
**WOOD VALE
EAST BILLINGHURST**

DRAWING TITLE
**GENERAL ARRANGEMENT
LAYOUT**

DATE
OCT. 2024

DESIGN
JS

CHECKED
CL

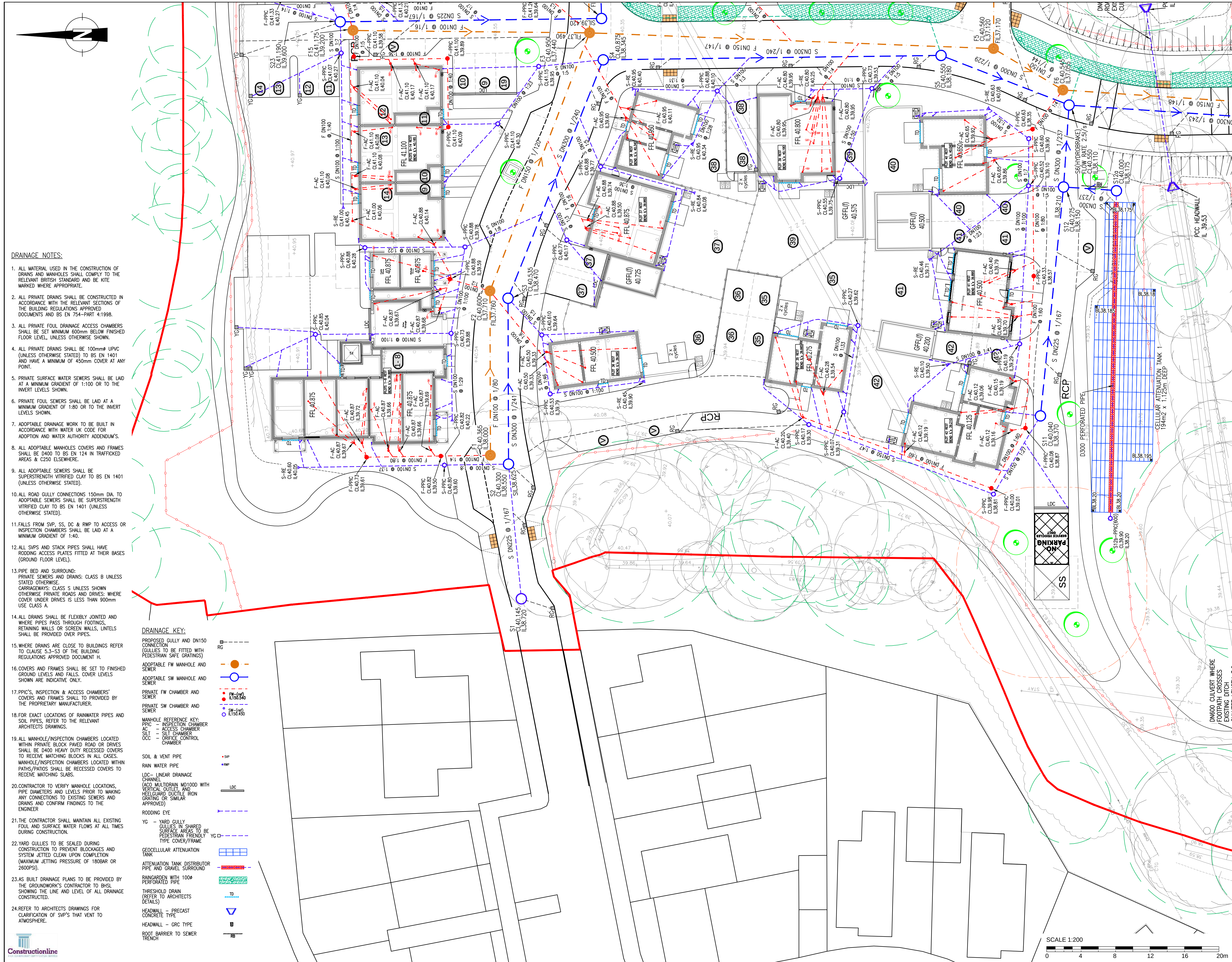
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Drainage Notes:

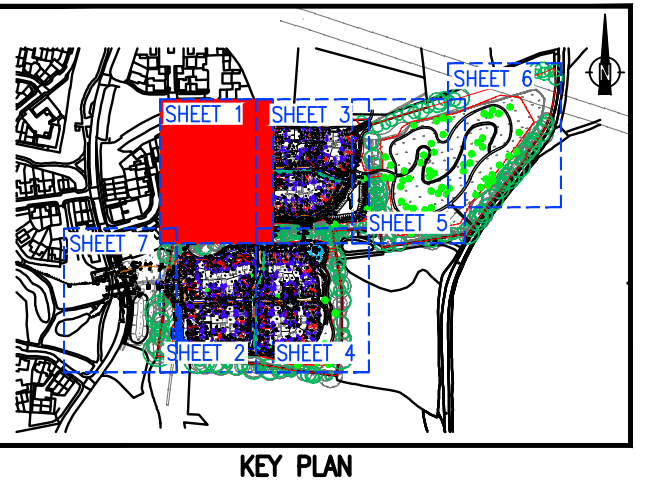
1. ALL MATERIAL USED IN THE CONSTRUCTION OF DRAINS AND MANHOLES SHALL COMPLY TO THE RELEVANT BRITISH STANDARD AND BE KITE MARKED WHERE APPROPRIATE.
2. ALL PRIVATE DRAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE RELEVANT SECTIONS OF THE BUILDING REGULATIONS APPROVED DOCUMENTS AND BS EN 754-PART 4:1998.
3. ALL PRIVATE FOUL DRAINAGE ACCESS CHAMBERS SHALL BE SET MINIMUM 600mm BELOW FINISHED FLOOR LEVEL, UNLESS OTHERWISE SHOWN.
4. ALL PRIVATE DRAINS SHALL BE 100mm Ø UPVC (UNLESS OTHERWISE STATED) TO BS EN 1401 AND HAVE A MINIMUM OF 450mm COVER AT ANY POINT.
5. PRIVATE SURFACE WATER SEWERS SHALL BE LAID AT A MINIMUM GRADIENT OF 1:100 OR TO THE INVERT LEVELS SHOWN.
6. PRIVATE FOUL SEWERS SHALL BE LAID AT A MINIMUM GRADIENT OF 1:80 OR TO THE INVERT LEVELS SHOWN.
7. ADAPTABLE DRAINAGE WORK TO BE BUILT IN ACCORDANCE WITH WATER UK CODE FOR ADOPTION AND WATER AUTHORITY ADDENDUM'S.
8. ALL ADAPTABLE MANHOLES COVERS AND FRAMES SHALL BE D400 TO BS EN 124 IN TRAFFICKED AREAS & C250 ELSEWHERE.
9. ALL ADAPTABLE SEWERS SHALL BE SUPERSTRENGTH VITRIFIED CLAY TO BS EN 1401 (UNLESS OTHERWISE STATED).
10. ALL ROAD GULLY CONNECTIONS 150mm DIA. TO ADAPTABLE SEWERS SHALL BE SUPERSTRENGTH VITRIFIED CLAY TO BS EN 1401 (UNLESS OTHERWISE STATED).
11. FALLS FROM SVP, SS, DC & RWP TO ACCESS OR INSPECTION CHAMBERS SHALL BE LAID AT A MINIMUM GRADIENT OF 1:40.
12. ALL SVPS AND STACK PIPES SHALL HAVE RODDING ACCESS PLATES FITTED AT THEIR BASES (GROUND FLOOR LEVEL).
13. PIPE BED AND SURROUND: PRIVATE SEWERS AND DRAINS: CLASS B UNLESS STATED OTHERWISE. CARRIAGEWAYS: CLASS S UNLESS SHOWN OTHERWISE. PRIVATE ROADS AND DRIVES: WHERE COVER UNDER DRIVES IS LESS THAN 900mm USE CLASS A.
14. ALL DRAINS SHALL BE FLEXIBLY JOINTED AND WHERE PIPES PASS THROUGH FOOTINGS, RETAINING WALLS OR SCREEN WALLS, UNTELS SHALL BE PROVIDED OVER PIPES.
15. WHERE DRAINS ARE CLOSE TO BUILDINGS REFER TO CLAUSE 5.3-S3 OF THE BUILDING REGULATIONS APPROVED DOCUMENT H.
16. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS. COVER LEVELS SHOWN ARE INDICATIVE ONLY.
17. PPIC'S, INSPECTION & ACCESS CHAMBERS' COVERS AND FRAMES SHALL TO PROVIDED BY THE PROPRIETARY MANUFACTURER.
18. FOR EXACT LOCATIONS OF RAINWATER PIPES AND SOIL PIPES, REFER TO THE RELEVANT ARCHITECTS DRAWINGS.
19. ALL MANHOLE/INSPECTION CHAMBERS LOCATED WITHIN PRIVATE BLOCK PAVED ROAD OR DRIVES SHALL BE D400 HEAVY DUTY RECESSED COVERS TO RECEIVE MATCHING BLOCKS IN ALL CASES. MANHOLE/INSPECTION CHAMBERS LOCATED WITHIN PATHS/PATIOS SHALL BE RECESSED COVERS TO RECEIVE MATCHING SLABS.
20. CONTRACTOR TO VERIFY MANHOLE LOCATIONS, PIPE DIAMETERS AND LEVELS PRIOR TO MAKING ANY CONNECTIONS TO EXISTING SEWERS AND DRAINS AND CONFIRM FINDINGS TO THE ENGINEER.
21. THE CONTRACTOR SHALL MAINTAIN ALL EXISTING FOUL AND SURFACE WATER FLOWS AT ALL TIMES DURING CONSTRUCTION.
22. YARD GULLIES TO BE SEALED DURING CONSTRUCTION TO PREVENT BLOCKAGES AND SYSTEM JETTED CLEAN UPON COMPLETION (MAXIMUM JETTING PRESSURE OF 180BAR OR 2600PSI).
23. AS BUILT DRAINAGE PLANS TO BE PROVIDED BY THE GROUNDWORK'S CONTRACTOR TO BS11 SHOWING THE LINE AND LEVEL OF ALL DRAINAGE CONSTRUCTED.
24. REFER TO ARCHITECTS DRAWINGS FOR CLARIFICATION OF SVPS THAT VENT TO ATMOSPHERE.

Drainage Key:

- PROPOSED GULLY AND DN150 CONNECTION (GULLIES TO BE FITTED WITH PEDESTAL SAFE GRATINGS)
- ADAPTABLE FW MANHOLE AND SEWER
- ADAPTABLE SW MANHOLE AND SEWER
- PRIVATE FW CHAMBER AND SEWER
- PRIVATE SW CHAMBER AND SEWER
- MANHOLE REFERENCE KEY: PPIC - INSPECTION CHAMBER AC - ACCESS CHAMBER SILT - SILT CHAMBER OCC - OFFICE CONTROL CHAMBER
- SOIL & VENT PIPE
- RAIN WATER PIPE
- LDC - LINEAR DRAINAGE CHANNEL (ACO MULTIDRAIN M1000 WITH VERTICAL OUTLET AND HERICULAR DUCTILE IRON GRATING OR SIMILAR APPROVED)
- RODDING EYE
- YG - YARD GULLY GULLIES IN SHARED SURFACE AREAS TO BE PEDESTAL FRIENDLY YG C- TYPE COVER/FRAME
- GEOCELLULAR ATTENUATION TANK
- ATTENUATION TANK DISTRIBUTOR PIPE AND GRAVEL SURROUND
- RAINGARDEN WITH 100Ø PERFORATED PIPE
- THRESHOLD DRAIN (REFER TO ARCHITECTS DETAILS)
- HEADWALL - PRECAST CONCRETE TYPE
- HEADWALL - GRC TYPE
- ROOT BARRIER TO SEWER TRENCH

NOTES: GENERAL

- G1. DO NOT SCALE FROM THIS DRAWING
- G2. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS STATED OTHERWISE.
- G3. THIS DRAWING IS BASED ON TOPOGRAPHICAL SURVEY COMPLIED BY: MKSURVEYS HORSHAM TEL: 01403243162 HORSHAM@MKSURVEYS.CO.UK
- G4. GRID AND LEVELS BASED ON ORDNANCE DATUM. DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99975 APPLIED.
- G5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT SCHEME DRAWINGS AND SPECIFICATIONS.
- G6. ALL WORKS TO BE CARRIED OUT IN STRICT ACCORDANCE WITH "THE SPECIFICATION FOR HIGHWAY WORKS - MODIFIED AND EXTENDED", INCLUDING WEST SUSSEX COUNTY COUNCIL'S SUPPLEMENTARY CLAUSES.
- G7. ALL WORKS WITHIN THE PUBLIC HIGHWAY SHALL BE CARRIED OUT AND COMPLY WITH THE REQUIREMENTS OF THE DTP "TRAFFIC SIGNS MANUAL CHAPTER 8 - TRAFFIC SAFETY MEASURES AND SIGNS FOR ROAD WORKS AND TEMPORARY SITUATION".
- G8. ALL ROAD MARKINGS AND TRAFFIC SIGNS SHALL COMPLY WITH "THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016".
- G9. ALL EXISTING LEVELS TO BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF ANY WORKS.
- G10. BEFORE ANY WORKS ARE COMMENCED THE WEST SUSSEX COUNTY COUNCIL AREA HIGHWAY MANAGER MUST BE CONTACTED.



CONSTRUCTION ISSUE

Rev	Description	Drn	Chk	Date
C10	FW LATERALS REVISED - PLOTS 1-8, 9-14, 15-19, 42, 71, & 77	MSR		12.05.26
C09	FW LATERALS IL's REVISED - PLOTS 1-8, 9-14, 15-19, 21, 22, 24, 25, 27, 28, 29, 30, 31, 36, 37, 42, 71, 72, 77, 78, 79, 80 & 81	MSR		27.04.26
C08	GARAGE RWP'S REVISED - PLOTS 26,28,29, 30,33,34,29,42,60,62,63,64,65,66,67,75,76,77 & 78	MSR		11.02.26
C07	RAINWATER HARVEST TANKS REMOVED.	MSR		29.01.26
C06	PRIVATE DRAINAGE REVISED	MSR		11.11.25
C05	ELECTRIC SUB-STATION LOCATION REVISED	MSR		28.10.25
C04	DRAINAGE REVISED	FP	MSR	09.10.25
C03	DRAINAGE REVISED	FP	MSR	14.04.25
C02	LAYOUT REVISED	FP	MSR	29.01.25
C01	DRAINAGE REVISED	FP	MSR	17.01.25
P01	CONSTRUCTION ISSUE			
ST	INITIAL ISSUE			04.10.24

Rev	Description	Drn	Chk	Date
Preliminary Issue	Submitted for S104			
Planning Issue	Issued for Tender			
Submitted for S38	Issued for Construction			
Submitted for S278	As Built			

DRAWING STATUS

STUART MICHAEL ASSOCIATES
CONSULTING ENGINEERS

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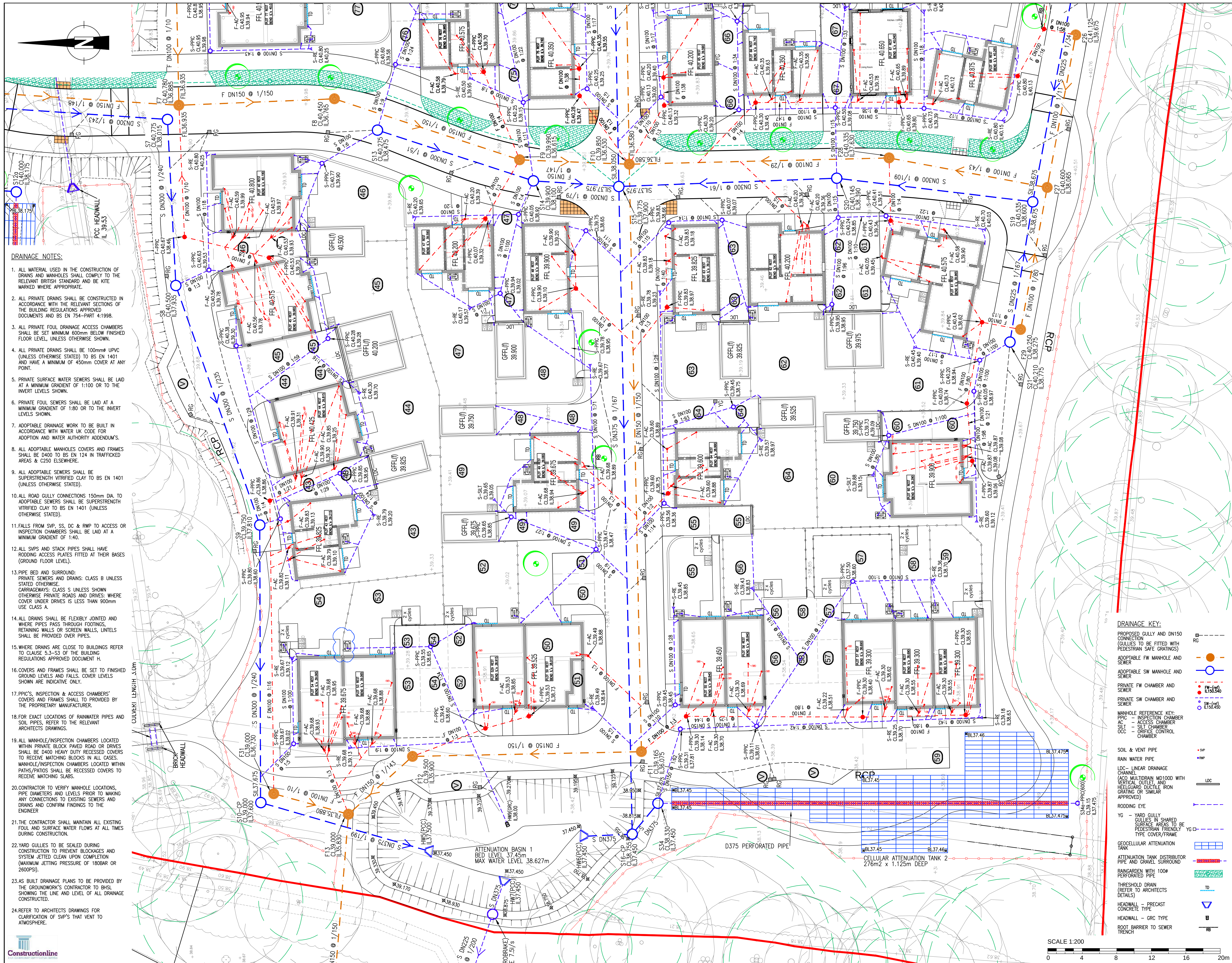


WOOD VALE,
EAST BILLINGHAMURST

DRAINAGE LAYOUT
SHEET 1

DATE	DESIGN	CHECKED	SCALE	BY
OCT. 2024	CL	MSR	1:200	0A1
7276-SMA-XX-XX-DR-C-0515				C10 SO

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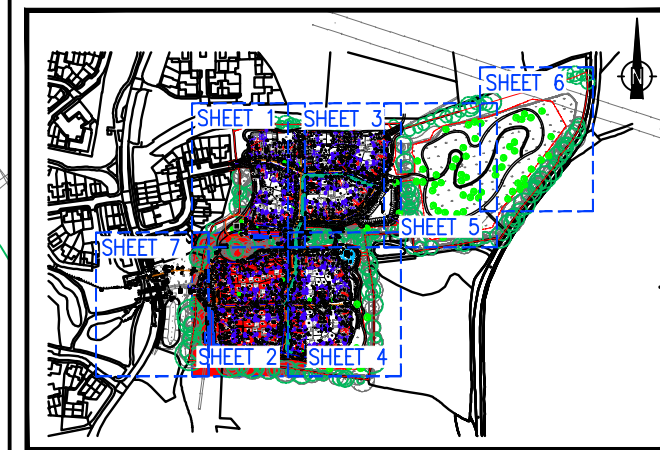


DRAINAGE NOTES:

1. ALL MATERIAL USED IN THE CONSTRUCTION OF DRAINS AND MANHOLES SHALL COMPLY TO THE RELEVANT BRITISH STANDARD AND BE KITE MARKED WHERE APPROPRIATE.
2. ALL PRIVATE DRAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE RELEVANT SECTIONS OF THE BUILDING REGULATIONS APPROVED DOCUMENTS AND BS EN 754-PART 4:1998.
3. ALL PRIVATE FOUL DRAINAGE ACCESS CHAMBERS SHALL BE SET MINIMUM 600mm BELOW FINISHED FLOOR LEVEL, UNLESS OTHERWISE SHOWN.
4. ALL PRIVATE DRAINS SHALL BE 100mm Ø UPVC (UNLESS OTHERWISE STATED) TO BS EN 1401 AND HAVE A MINIMUM OF 450mm COVER AT ANY POINT.
5. PRIVATE SURFACE WATER SEWERS SHALL BE LAID AT A MINIMUM GRADIENT OF 1:100 OR TO THE INVERT LEVELS SHOWN.
6. PRIVATE FOUL SEWERS SHALL BE LAID AT A MINIMUM GRADIENT OF 1:80 OR TO THE INVERT LEVELS SHOWN.
7. ADOPTABLE DRAINAGE WORK TO BE BUILT IN ACCORDANCE WITH WATER UK CODE FOR ADOPTION AND WATER AUTHORITY ADDENDUM'S.
8. ALL ADOPTABLE MANHOLES COVERS AND FRAMES SHALL BE D400 TO BS EN 124 IN TRAFFICKED AREAS & C250 ELSEWHERE.
9. ALL ADOPTABLE SEWERS SHALL BE SUPERSTRENGTH VITRIFIED CLAY TO BS EN 1401 (UNLESS OTHERWISE STATED).
10. ALL ROAD GULLY CONNECTIONS 150mm DIA. TO ADOPTABLE SEWERS SHALL BE SUPERSTRENGTH VITRIFIED CLAY TO BS EN 1401 (UNLESS OTHERWISE STATED).
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24. REFER TO ARCHITECTS DRAWINGS FOR CLARIFICATION OF SVP'S THAT WENT TO ATMOSPHERE.

NOTES: GENERAL

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CONSTRUCTION ISSUE

C10	FW LATERALS REVISED – PLOTS 1-8, 9-14, 15-19, 42, 71, 77 & 81	MSR	12.05.20
C09	FW LATERALS 1-8 REVISED – PLOTS 1-8, 9-14, 15-19, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 36, 37, 41, 71, 72, 77, 78, 79, 80 & 81	MSR	27.04.20
C08	BASIN 1 SIZE REVISED, ATTENUATION TANK 2 SIZE REVISED, SW DRAINAGE REVISED TO SUIT	MSR	04.03.20
C07	GARAGE RWP'S REVISED – PLOTS 26,28,29, 30,33,34,29,42,60,62,63,64,65,66,67,75,77 & 78	MSR	11.02.20
C06	RAINWATER HARVEST TANKS REMOVED, PRIVATE DRAINAGE REVISED, MANHOLES S19 & S20 RELOCATED	MSR	29.01.20
C05	PLOT 53/54 FENCE REVISED, PLOT 45 NOTED	MSR	11.11.20
- 004	DRAINAGE REVISED	FP	MSR 09.10.20
- 003	DRAINAGE REVISED	FP	MSR 14.04.20
- 002	LAYOUT REVISED	FP	MSR 29.01.20
- 001	DRAINAGE REVISED	FP	MSR 17.01.20
- P01	INITIAL ISSUE		04.10.24
ST	Rev Description	Drm	Chk Date

REVISIONS			
Preliminary Issue		Submitted for S104	
Planning Issue		Issued for Tender	
Submitted for S38		Issued for Construction	✓
Submitted for S278		As Built	
DRAWING STATUS			

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www: www.stuartmichael.co.uk

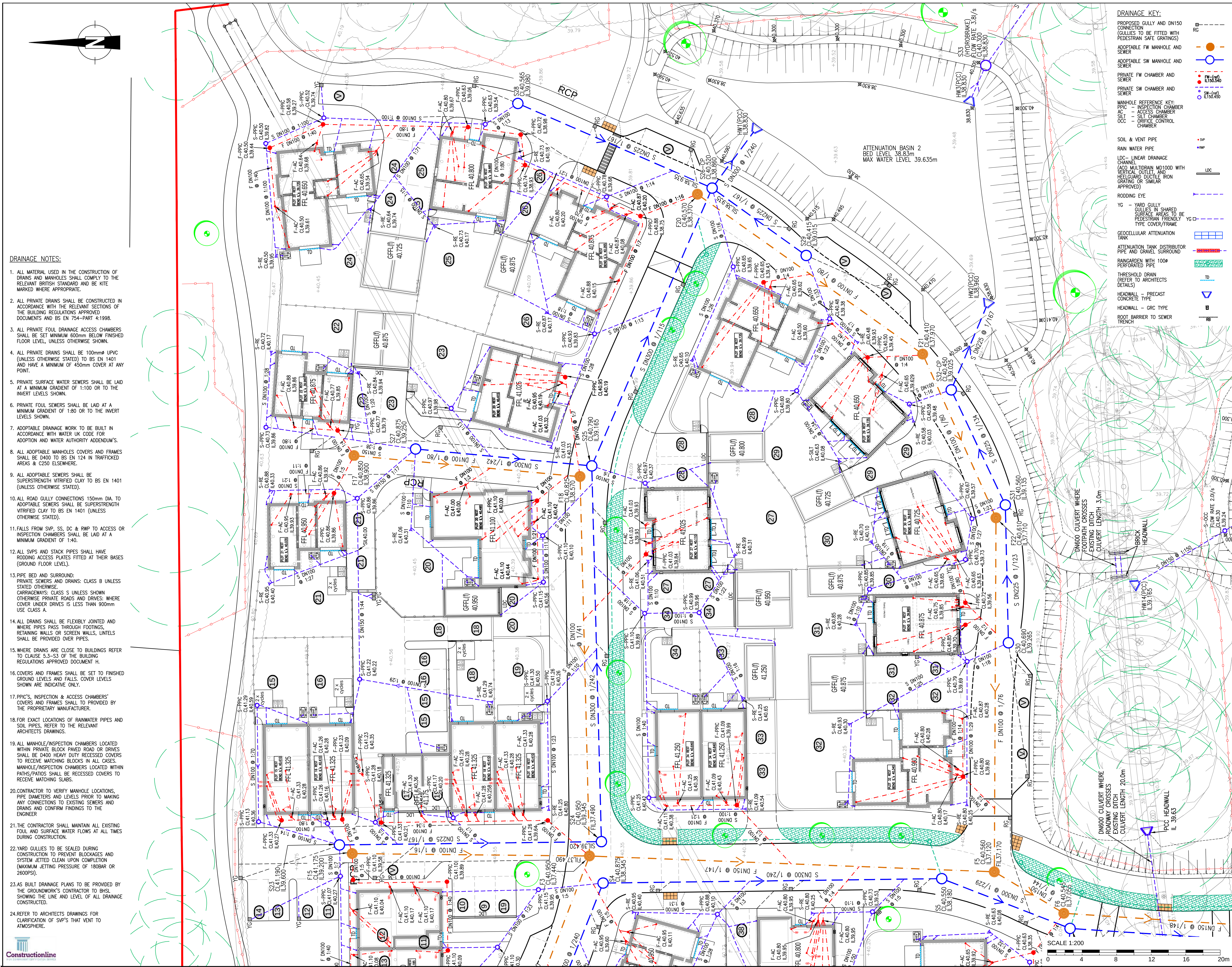
Bellway

WOOD VALE,
EAST BILLINGHAMURST

DRAINAGE LAYOUT
SHEET 2

DATE: OCT. 2024
DRAWN: CL
CHECKED: MSR
SCALE: 1:200
PROJECT: 7276-SMA-XX-XX-DR-C-0516
SHEET: C10 SO

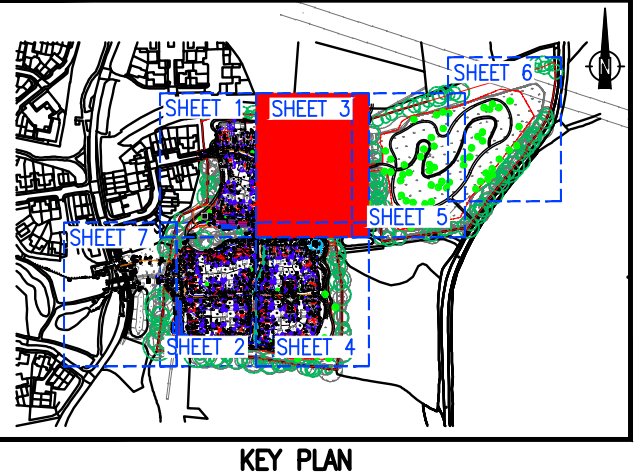
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 8. ALL ADAPTABLE MANHOLES COVERS AND FRAMES SHALL BE D400 TO BS EN 124 IN TRAFFICKED AREAS & C250 ELSEWHERE.
 9. ALL ADAPTABLE SEWERS SHALL BE SUPERSTRENGTH VITRIFIED CLAY TO BS EN 1401 (UNLESS OTHERWISE STATED).
 10. ALL ROAD GULLY CONNECTIONS 150mm DIA. TO ADAPTABLE SEWERS SHALL BE SUPERSTRENGTH VITRIFIED CLAY TO BS EN 1401 (UNLESS OTHERWISE STATED).
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- DRAINAGE KEY:**
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CONSTRUCTION ISSUE

ST	Rev	Description	Drm	Chk	Date
007	FW LATERALS REVISED - PLOTS 1-8, 9-14, MSR 15-19, 42, 71, & 77				12.05.26
008	FW LATERALS REVISED - PLOTS 1-8, 9-14, 15-19, 21, 22, 24, 25, 27, 28, 29, 30, 31, 36, 37, 42, 71, 72, 77, 78, 80 & 81				27.04.26
009	GARAGE RWP'S REVISED - PLOTS 26,28,29, 30,33,34,29,42,60,62,63,64,65,66,67,75,76,77 & 78				11.02.26
010	RAINWATER HARVEST TANKS REMOVED.				29.01.26
011	PRIVATE DRAINAGE REVISED				09.10.25
012	DRAINAGE REVISED				09.10.25
013	LAYOUT REVISED				29.01.25
014	DRAINAGE REVISED				17.01.25
015	CONSTRUCTION ISSUE				04.10.24
016	INTIAL ISSUE				04.10.24

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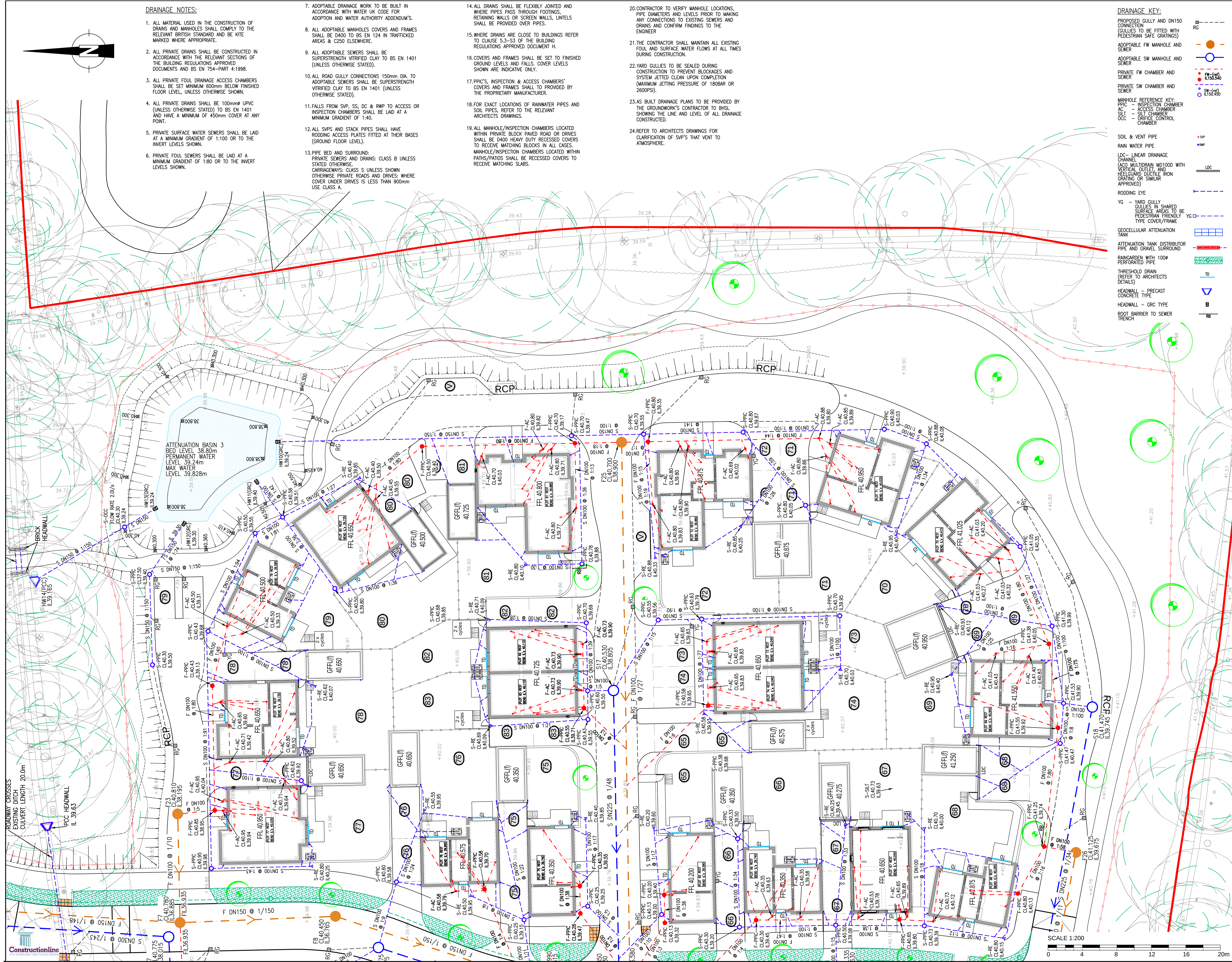


WOOD VALE,
EAST BILLINGHURST

DRAINAGE LAYOUT
SHEET 3

DATE	DESIGN	CHECKED	SCALE	BY
OCT. 2024	CL	MSR	1:200	0A1
7276-SMA-XX-XX-DR-C-0517				C08 SO

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DRAINAGE NOTES:

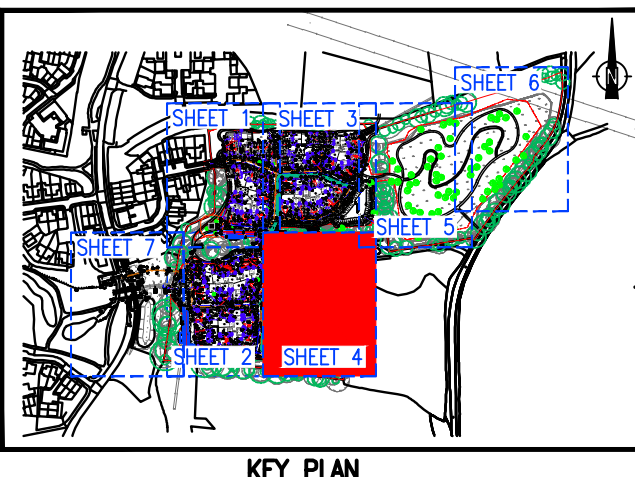
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13. PIPE BED AND SURROUND: PRIVATE SEWERS AND DRAINS: CLASS B UNLESS STATED OTHERWISE. CARRIAGEWAYS: CLASS S UNLESS SHOWN OTHERWISE. PRIVATE ROADS AND DRIVES: WHERE COVER UNDER DRIVES IS LESS THAN 900mm USE CLASS A.
14. ALL DRAINS SHALL BE FLEXIBLY JOINTED AND WHERE PIPES PASS THROUGH FOOTINGS, RETAINING WALLS OR SCREEN WALLS, UNITS SHALL BE PROVIDED OVER PIPES.
15. WHERE DRAINS ARE CLOSE TO BUILDINGS REFER TO CLAUSE 5.3-5.3 OF THE BUILDING REGULATIONS APPROVED DOCUMENT H.
16. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS, COVER LEVELS SHOWN ARE INDICATIVE ONLY.
17. PPIC'S, INSPECTION & ACCESS CHAMBERS' COVERS AND FRAMES SHALL TO PROVIDED BY THE PROPRIETARY MANUFACTURER.
18. FOR EXACT LOCATIONS OF RAINWATER PIPES AND SOIL PIPES, REFER TO THE RELEVANT ARCHITECTS DRAWINGS.
19. ALL MANHOLE/INSPECTION CHAMBERS LOCATED WITHIN PRIVATE BLOCK PAVED ROAD OR DRIVES SHALL BE D400 HEAVY DUTY RECESSED COVERS TO RECEIVE MATCHING BLOCKS IN ALL CASES. MANHOLE/INSPECTION CHAMBERS LOCATED WITHIN PATHS/PATIOS SHALL BE RECESSED COVERS TO RECEIVE MATCHING SLABS.
20. CONTRACTOR TO VERIFY MANHOLE LOCATIONS, PIPE DIAMETERS AND LEVELS PRIOR TO MAKING ANY CONNECTIONS TO EXISTING SEWERS AND DRAINS AND CONFIRM FINDINGS TO THE ENGINEER.
21. THE CONTRACTOR SHALL MAINTAIN ALL EXISTING FOUL AND SURFACE WATER FLOWS AT ALL TIMES DURING CONSTRUCTION.
22. YARD GULLIES TO BE SEALED DURING CONSTRUCTION TO PREVENT BLOCKAGES AND SYSTEM LETTED CLEAN UPON COMPLETION (MAXIMUM JETTING PRESSURE OF 180BAR OR 2600PSI).
23. AS BUILT DRAINAGE PLANS TO BE PROVIDED BY THE GROUNDWORKS' CONTRACTOR TO BSHL SHOWING THE LINE AND LEVEL OF ALL DRAINAGE CONSTRUCTED.
24. REFER TO ARCHITECTS DRAWINGS FOR CLARIFICATION OF SVPS THAT VENT TO ATMOSPHERE.

DRAINAGE KEY:

- PROPOSED GULLY AND DN150 CONNECTION (GULLIES TO BE FITTED WITH PEDESTALIAN SAFE GRATINGS)
- ADAPTABLE SW MANHOLE AND SEWER
- PRIVATE FW CHAMBER AND SEWER
- PRIVATE SW CHAMBER AND SEWER
- MANHOLE REFERENCE KEY:
PPIC - INSPECTION CHAMBER
AC - ACCESS CHAMBER
SILT - SILT CHAMBER
OCC - OFFICE CONTROL CHAMBER
- SOIL & VENT PIPE
- RAIN WATER PIPE
- LDC - LINEAR DRAINAGE CHANNEL (ACO MULTIDRAIN MD1000 WITH VERTICAL OUTLET AND HEELGUARD DUCTILE IRON GRATING OR SIMILAR APPROVED)
- RODDING EYE
- YG - YARD GULLY
GULLIES IN SHARED SURFACE AREAS TO BE PEDESTALIAN FREETRY TYPE COVER/FRAME
- GEODELLULAR ATTENUATION TANK
- ATTENUATION TANK DISTRIBUTOR PIPE AND GRAVEL SURROUND
- RANGING WITH 100 $\varnothing$
- THRESHOLD DRAIN (REFER TO ARCHITECTS DETAILS)
- HEADWALL - PRECAST CONCRETE TYPE
- HEADWALL - GRC TYPE
- ROOT BARRIER TO SEWER TRENCH

NOTES: GENERAL

- G1. DO NOT SCALE FROM THIS DRAWING
- G2. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS STATED OTHERWISE.
- G3. THIS DRAWING IS BASED ON TOPOGRAPHICAL SURVEY COMPILED BY: MKSURVEYS
TEL: 01403243162
HORSHAM@MKSURVEYS.CO.UK
- G4. GRID AND LEVELS BASED ON ORDNANCE DATUM. DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99975 APPLIED.
- G5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT SCHEME DRAWINGS AND SPECIFICATIONS.
- G6. ALL WORKS TO BE CARRIED OUT IN STRICT ACCORDANCE WITH "THE SPECIFICATION FOR HIGHWAY WORKS - MODIFIED AND EXTENDED", INCLUDING WEST SUSSEX COUNTY COUNCIL'S SUPPLEMENTARY CLAUSES.
- G7. ALL WORKS WITHIN THE PUBLIC HIGHWAY SHALL COMPLY WITH THE REQUIREMENTS OF THE DTP "TRAFFIC SIGNS MANUAL CHAPTER 8 - TRAFFIC SAFETY MEASURES AND SIGNS FOR ROAD WORKS AND TEMPORARY SITUATION".
- G8. ALL ROAD MARKINGS AND TRAFFIC SIGNS SHALL COMPLY WITH "THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016".
- G9. ALL EXISTING LEVELS TO BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF ANY WORKS.
- G10. BEFORE ANY WORKS ARE COMMENCED THE WEST SUSSEX COUNTY COUNCIL AREA HIGHWAY MANAGER MUST BE CONTACTED.



CONSTRUCTION ISSUE

ST	Rev	Description	Drn	Chk	Date
001	1	FW LATERALS REVISED - PLOTS 1-8, 9-14, 15-19, 42, 71, & 77	MSR		12.05.26
002	1	FW LATERALS REVISED - PLOTS 1-8, 9-14, 15-19, 21, 22, 24, 25, 27, 28, 29, 30, 31, 36, 37, 42, 71, 72, 77, 78, 79, 80 & 81	MSR		27.04.26
003	1	GARAGE RWP'S REVISED - PLOTS 26,28,29, 30,33,34,29,42,60,62,63,64,65,66,67,75,76,77 & 78	MSR		11.02.26
004	1	RAINWATER HARVEST TANKS REMOVED.	MSR		29.01.26
005	1	PRIVATE DRAINAGE REVISED	MSR		11.11.25
006	1	PLOT 79/80 FENCE REVISED	FP	MSR	09.10.25
007	1	DRAINAGE REVISED	FP	MSR	14.04.25
008	1	LAYOUT REVISED	FP	MSR	29.01.25
009	1	DRAINAGE REVISED	FP	MSR	17.01.25
010	1	CONSTRUCTION ISSUE	FP	MSR	04.10.24
011	1	INITIAL ISSUE	FP	MSR	04.10.24

REVISIONS	
Preliminary Issue	Submitted for S104
Planning Issue	Issued for Tender
Submitted for S38	Issued for Construction
Submitted for S278	As Built

DRAWING STATUS	
Submitted for S104	Submitted for S38
Submitted for S278	As Built

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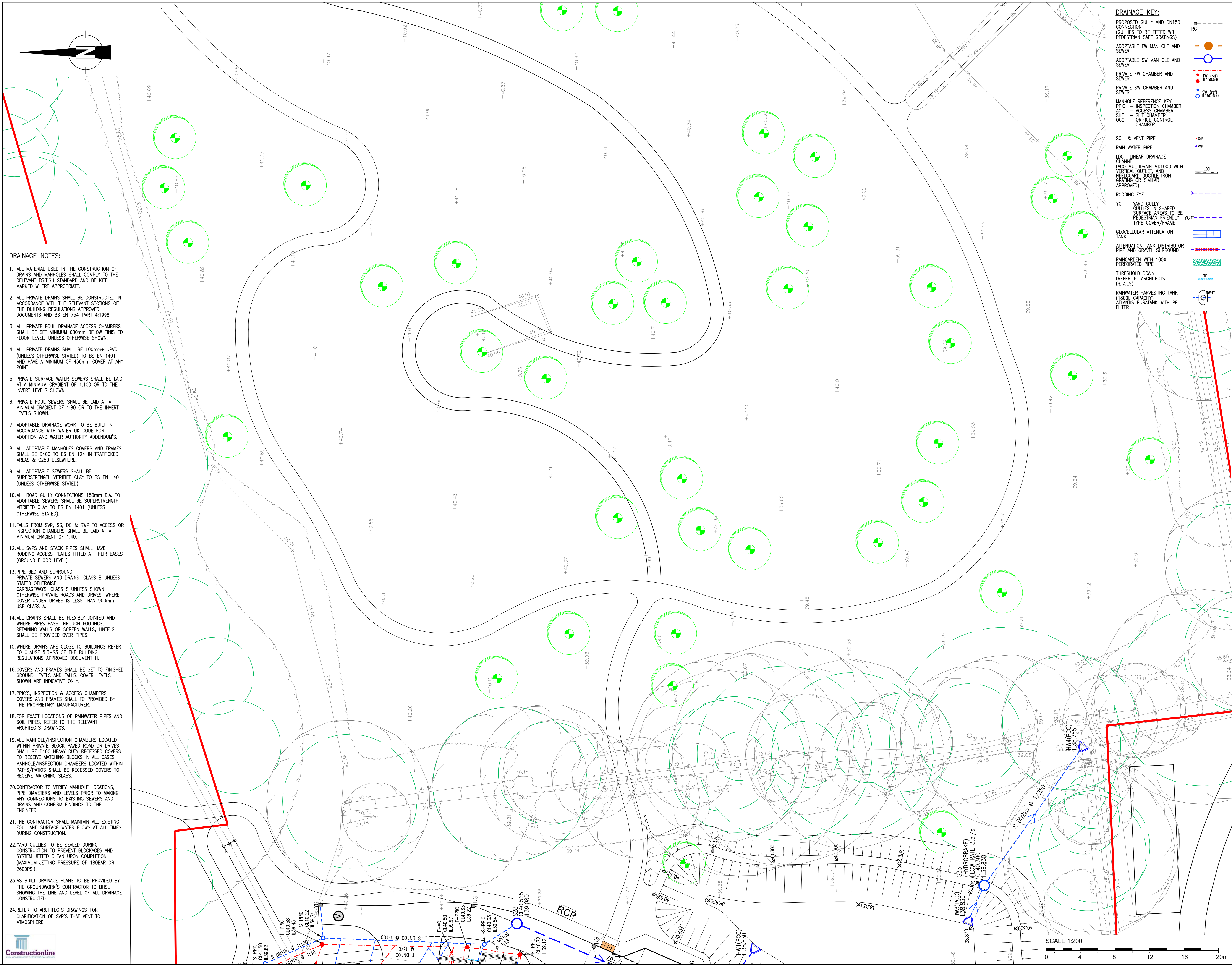


WOOD VALE,
EAST BILLINGHURST

DRAINAGE LAYOUT
SHEET 4

DATE	CL	MSR	SCALE	BY
OCT. 2024	CL	MSR	1:200	0A1
7276-SMA-XX-XX-DR-C-0518	C09	SO		

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DRAINAGE NOTES:

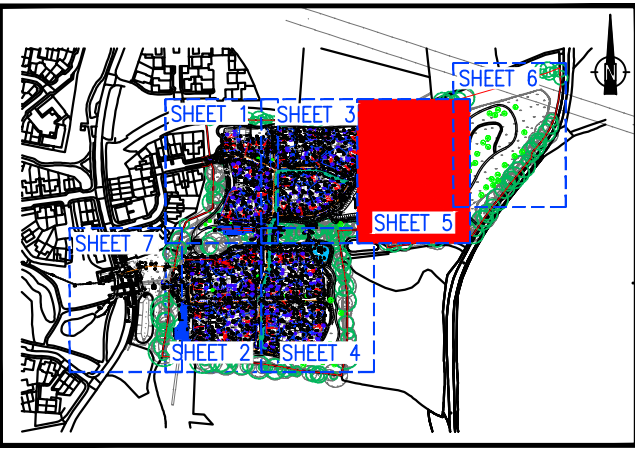
1. ALL MATERIAL USED IN THE CONSTRUCTION OF DRAINS AND MANHOLES SHALL COMPLY TO THE RELEVANT BRITISH STANDARD AND BE KITE MARKED WHERE APPROPRIATE.
2. ALL PRIVATE DRAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE RELEVANT SECTIONS OF THE BUILDING REGULATIONS APPROVED DOCUMENTS AND BS EN 754-PART 4:1998.
3. ALL PRIVATE FOUL DRAINAGE ACCESS CHAMBERS SHALL BE SET MINIMUM 600mm BELOW FINISHED FLOOR LEVEL, UNLESS OTHERWISE SHOWN.
4. ALL PRIVATE DRAINS SHALL BE 100mmØ UPVC (UNLESS OTHERWISE STATED) TO BS EN 1401 AND HAVE A MINIMUM OF 450mm COVER AT ANY POINT.
5. PRIVATE SURFACE WATER SEWERS SHALL BE LAID AT A MINIMUM GRADIENT OF 1:100 OR TO THE INVERT LEVELS SHOWN.
6. PRIVATE FOUL SEWERS SHALL BE LAID AT A MINIMUM GRADIENT OF 1:80 OR TO THE INVERT LEVELS SHOWN.
7. ADOPTABLE DRAINAGE WORK TO BE BUILT IN ACCORDANCE WITH WATER UK CODE FOR ADOPTION AND WATER AUTHORITY ADDENDUM'S.
8. ALL ADOPTABLE MANHOLES COVERS AND FRAMES SHALL BE D400 TO BS EN 124 IN TRAFFICKED AREAS & C250 ELSEWHERE.
9. ALL ADOPTABLE SEWERS SHALL BE SUPERSTRENGTH VIRRIFIED CLAY TO BS EN 1401 (UNLESS OTHERWISE STATED).
10. ALL ROAD GULLY CONNECTIONS 150mm DIA. TO ADOPTABLE SEWERS SHALL BE SUPERSTRENGTH VIRRIFIED CLAY TO BS EN 1401 (UNLESS OTHERWISE STATED).
11. FALLS FROM SVP, SS, DC & RWP TO ACCESS OR INSPECTION CHAMBERS SHALL BE LAID AT A MINIMUM GRADIENT OF 1:40.
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DRAINAGE KEY:

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- ADOPTABLE SW MANHOLE AND SEWER
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- RIDDING EYE
- YG - YARD GULLY GULLIES IN SHARED SURFACE AREAS TO BE PEDESTRIAN FRIENDLY YG CO TYPE COVER/FRAME
- GEOCELLULAR ATTENUATION TANK
- ATTENUATION TANK DISTRIBUTOR PIPE AND GRAVEL SURROUND
- RAINGARDEN WITH 100# PERFORATED PIPE
- THRESHOLD DRAIN (REFER TO ARCHITECTS DETAILS)
- RAINWATER HARVESTING TANK (1800L CAPACITY) ATLANTIS FURTANK WITH PF FILTER

NOTES: GENERAL

- G1. DO NOT SCALE FROM THIS DRAWING
- G2. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS STATED OTHERWISE.
- G3. THIS DRAWING IS BASED ON TOPOGRAPHICAL SURVEY COMPILED BY: MKSURVEYS HORSHAM TEL: 01403243162 HORSHAM@MKSURVEYS.CO.UK
- G4. GRID AND LEVELS BASED ON ORDNANCE DATUM. DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99975 APPLIED.
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KEY PLAN

CONSTRUCTION ISSUE

Rev	Description	Drn	Chk	Date
001	DRAINAGE REVISED	FP	MSR	09.10.25
002	DRAINAGE REVISED	FP	MSR	14.04.25
003	CONSTRUCTION ISSUE	FP	MSR	17.01.25
001	INITIAL ISSUE			04.10.24
ST	Rev			
REVISIONS				
DRAWING STATUS				
Preliminary Issue				
Submitted for S104				
Planning Issue				
Issued for Tender				
Submitted for S38				
Issued for Construction				
Submitted for S278				
As Built				

STUART MICHAEL ASSOCIATES
CONSULTING ENGINEERS

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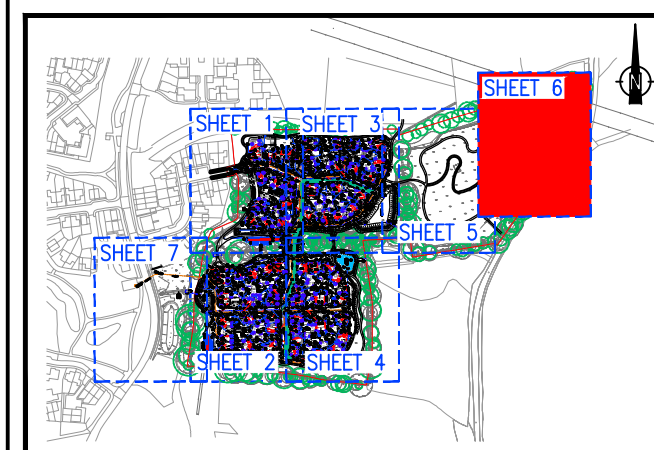
WOOD VALE,
EAST BILLINGHURST

DRAINAGE LAYOUT
SHEET 5

DATE	DRAWN	CHECKED	SCALE	BY
OCT. 2024	CL	MSR	1:200	@A1
7276-SMA-XX-XX-DR-C-0519 C03 SO				
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- NOTES: GENERAL**
- G1. NOT SCALE FROM THIS DRAWING.
 - G2. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS STATED OTHERWISE.
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MKSURVEYS
HORSHAM
TEL: 01403243162
HORSHAM@MKSURVEYS.CO.UK
 - G4. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99975 APPLIED.
 - G5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT SCHEME DRAWINGS AND SPECIFICATION.
 - G6. ALL WORKS TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE SPECIFICATION FOR HIGHWAY WORKS – MODIFIED AND EXTENDED”, PART 8 WEST SUSSEX COUNTY COUNCIL’S SUPPLEMENTARY CLAUSES.
 - G7. ALL WORKS WITHIN THE PUBLIC HIGHWAY SHALL BE CARRIED OUT AND COMPLY WITH THE REQUIREMENTS OF THE DTP TRAFFIC SIGNS MANUAL CHAPTER 8 – TRAFFIC SAFETY MEASURES AND SIGNS FOR ROAD WORKS AND TEMPORARY SITUATION.
 - G8. ALL ROAD MARKINGS AND TRAFFIC SIGNS SHALL COMPLY WITH THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016’.
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 - G10. BEFORE ANY WORKS ARE COMMENCED THE ADJACENT LOCAL AUTHORITY AREA HIGHWAY MANAGER MUST BE CONTACTED.



CONSTRUCTION ISSUE

-	C01	CONSTRUCTION ISSUE		FP	MSR	17.01.2
-	P01	INITIAL ISSUE				04.10.2
ST	Rev	Description		Drn	Chk	Date
REVISIONS						
Preliminary Issue				Submitted for S104		
Planning Issue				Issued for Tender		
Submitted for S38				Issued for Construction		✓
Submitted for S278				As Built		
DRAWING STATUS						



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Coombe House, Coombe Square, Thatcham, Berkshire RG19 4JF

T: 01635 867 711 **e:** mail@stuartmichael.co.uk
F: 01635 861 715 **w:** www.stuartmichael.co.uk

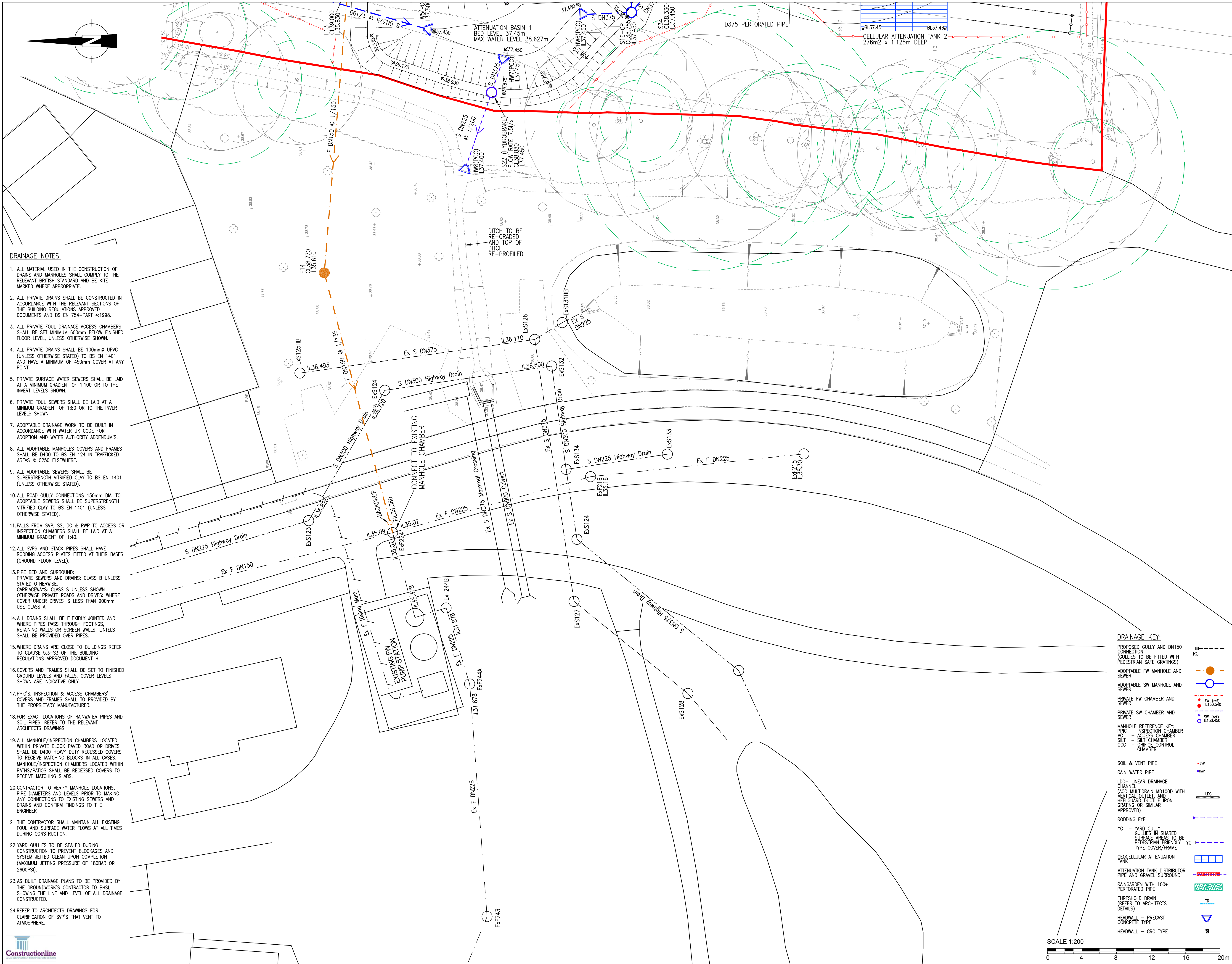


WOOD VALE,
EAST BILLINGHURST

DRAINAGE LAYOUT
SHEET 6

DATE	DRAWN	CHECKED	SCALE
OCT. 2024	CL	MSR	1:200 @A1
DRAWING No.	REV	STATUS	
7276-SMA-XX-XX-DR-C-0520	C01	S0	

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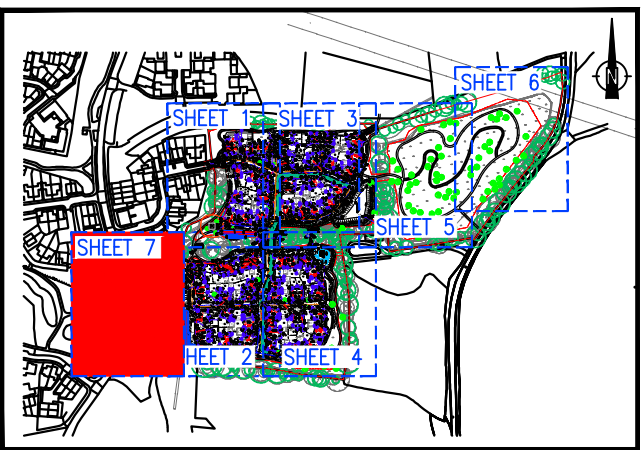
DRAINAGE NOTES:

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NOTES: GENERAL

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- G3. THIS DRAWING IS BASED ON TOPOGRAPHICAL SURVEY COMPLIED BY: MKSURVEYS HORSHAM TEL: 01403243162 HORSHAM@MKSURVEYS.CO.UK
- G4. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99975 APPLIED.
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KEY PLAN

CONSTRUCTION ISSUE

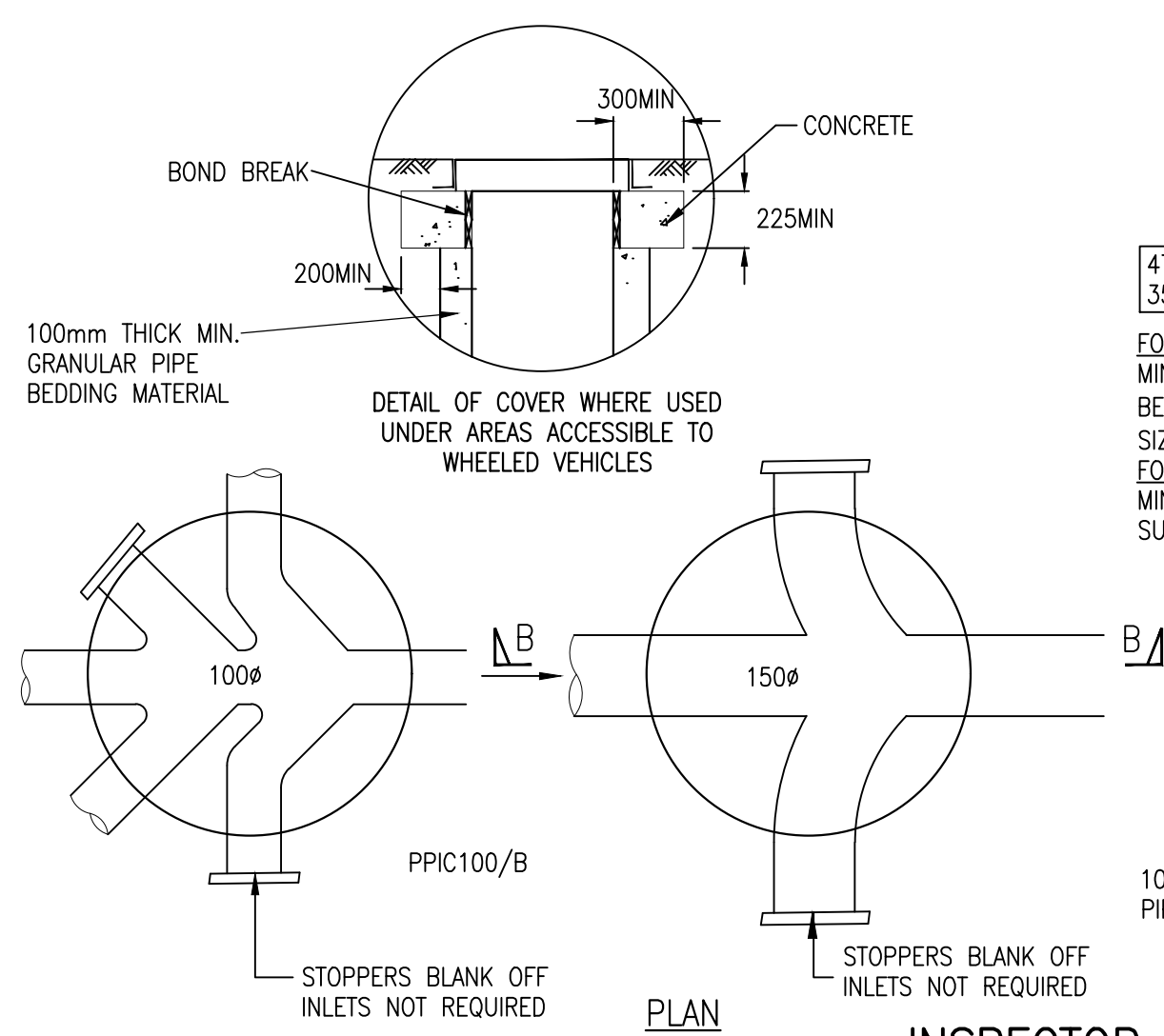
004	BASIN 1 SIZE REVISED, ATTENUATION TANK 2 SIZE REVISED, SW DRAINAGE REVISED TO SUIT	MSR	04.03.26		
003	DRAINAGE REVISED	FP	MSR 09.10.25		
002	DRAINAGE REVISED	FP	MSR 14.04.25		
001	CONSTRUCTION ISSUE	FP	MSR 17.01.25		
000	INITIAL ISSUE	FP	MSR 04.10.24		
ST	Rev	Description	Dwn	Chk	Date
REVISIONS					
Preliminary Issue					
Submitted for S104					
Planning Issue					
Submitted for S38					
Submitted for S278					
DRAWING STATUS					



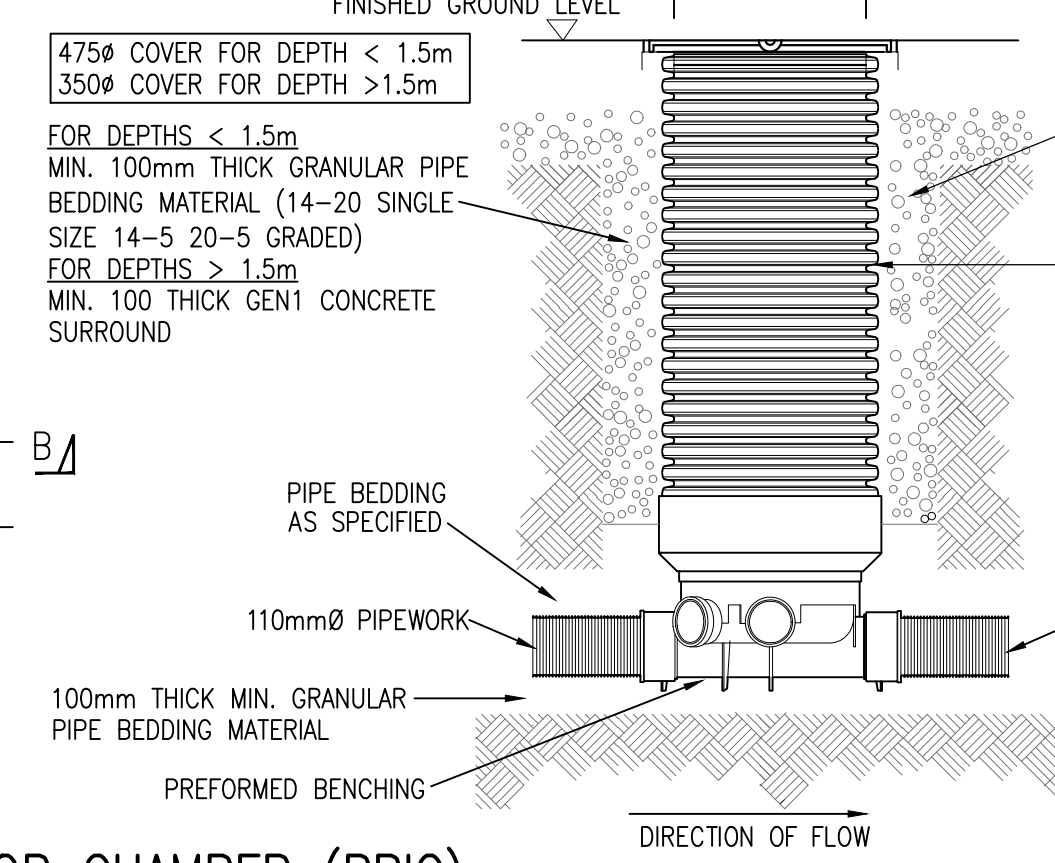
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JOB TITLE					
WOOD VALE, EAST BILLINGHURST					
DRAWING TITLE					
DRAINAGE LAYOUT SHEET 7					
DATE	DESIGN	CHECKED	SCALE	BY	
OCT. 2024	CL	MSR	1:200	0A1	
7276-SMA-XX-XX-DR-C-0521			REV	DRAWN	
			C04	SO	
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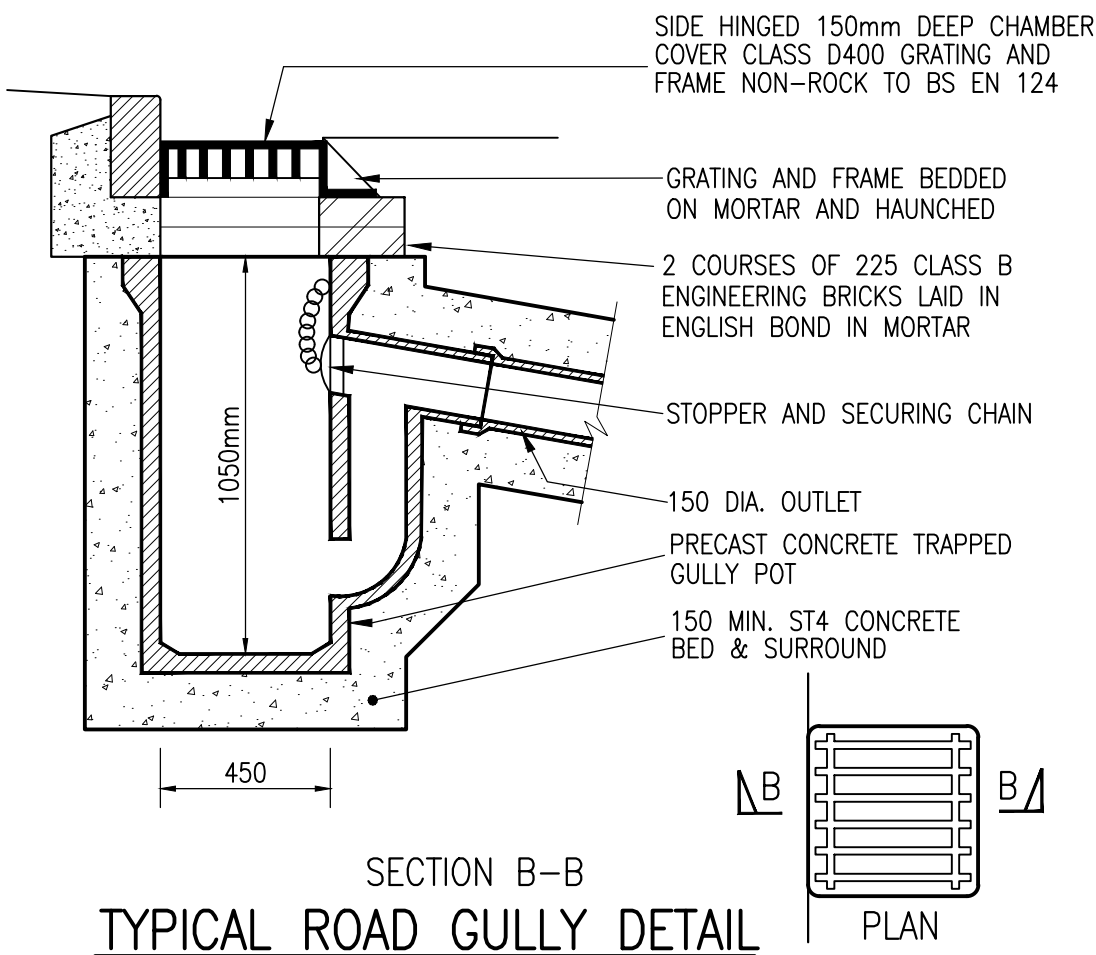
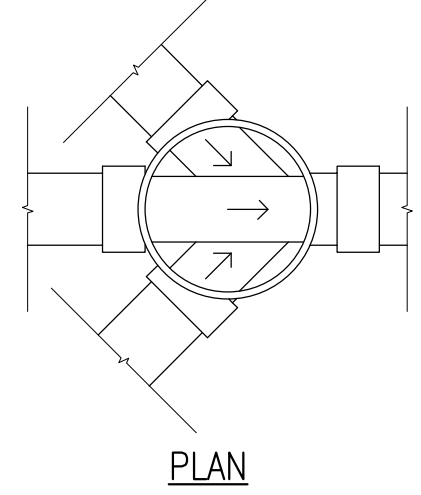
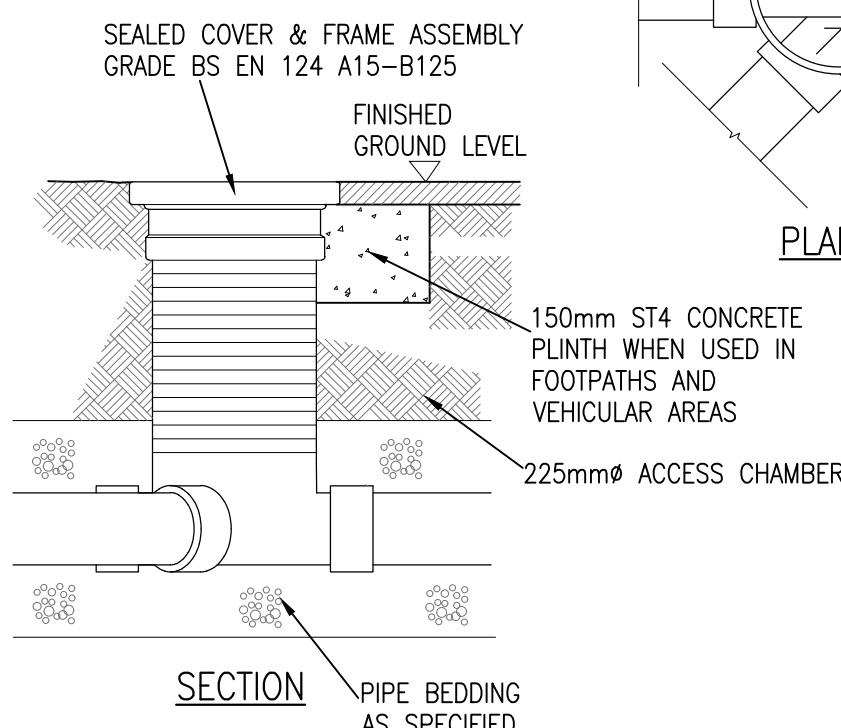
NOTE:
ALL COVERS AND FRAMES FOR
MANHOLES IN TRAFFICKED AREAS
SHALL BE C250 TO BS EN 124. ALL
OTHER MANHOLE COVERS AND FRAMES
SHALL BE B125.



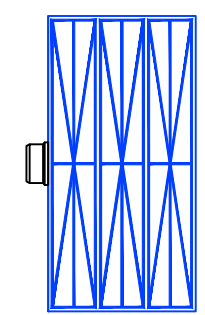
INSPECTOR CHAMBER (PPIC)
[MINI PPIC CHAMBER (mPPIC) SIMILAR
EXCEPT UNITS ARE 300mmØ SIZE]

COVERS LOCATED WITHIN PRIVATE
BLOCK PAVED ROAD, DRIVES AND
PATHS SHALL BE RECESSED TO
RECEIVE MATCHING BLOCKS

COVERS LOCATED WITHIN PRIVATE
BLOCK PAVED ROAD, DRIVES AND
PATHS SHALL BE RECESSED TO
RECEIVE MATCHING BLOCKS

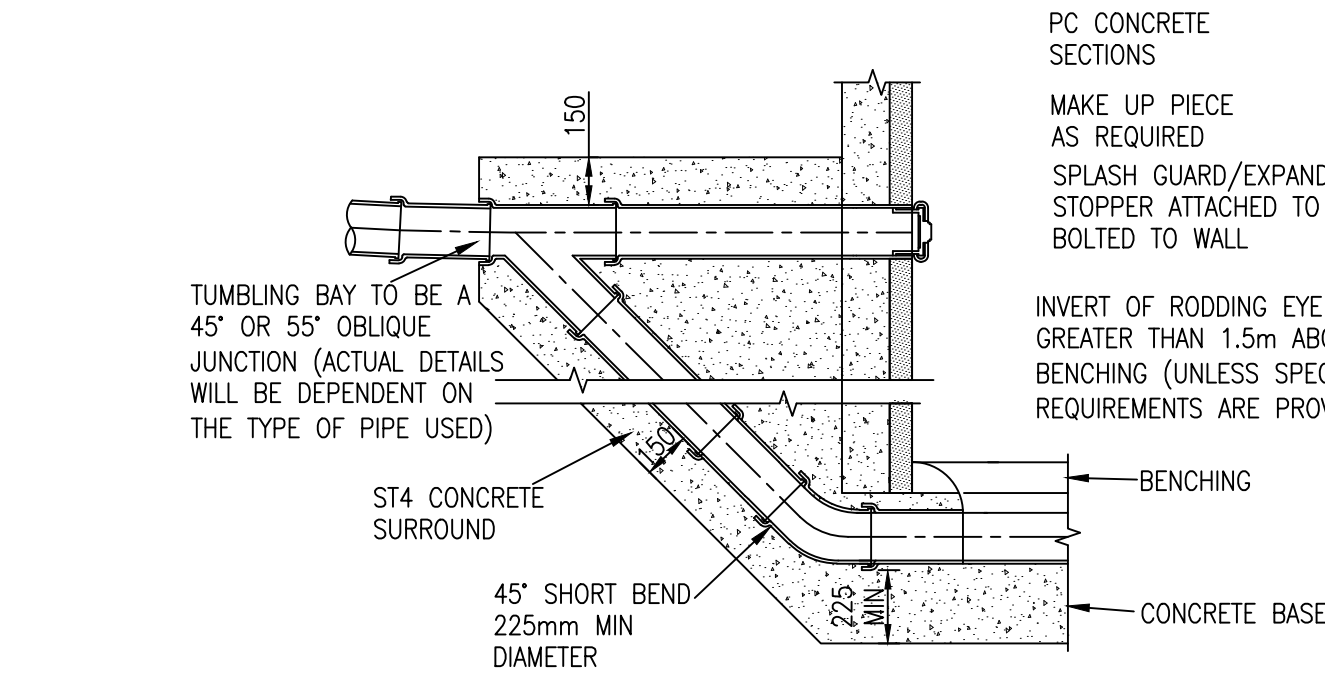


SECTION B-B
TYPICAL ROAD GULLY DETAIL

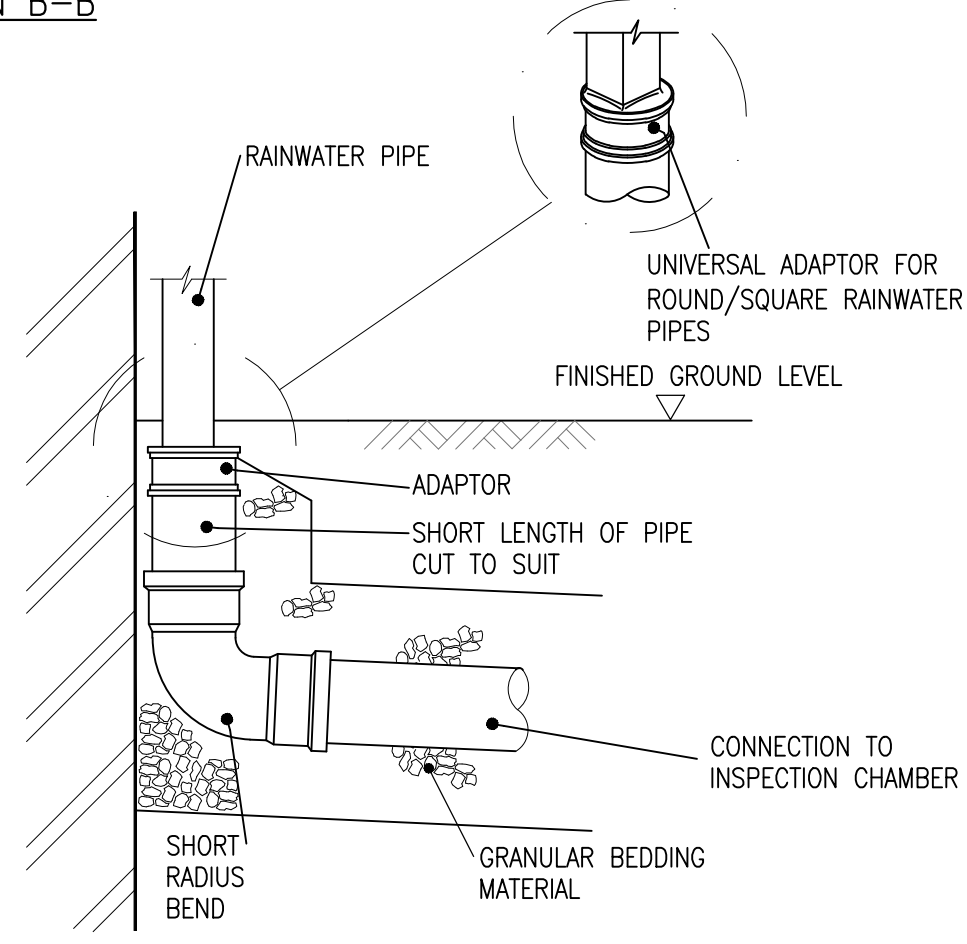


DISTRIBUTION TANK WITH
GEOTEXTILE SURROUND.
BY TCS GEOTECHNICS
OR SIMILAR APPROVED.
UNIT SIZE L354xW708xD150mm.

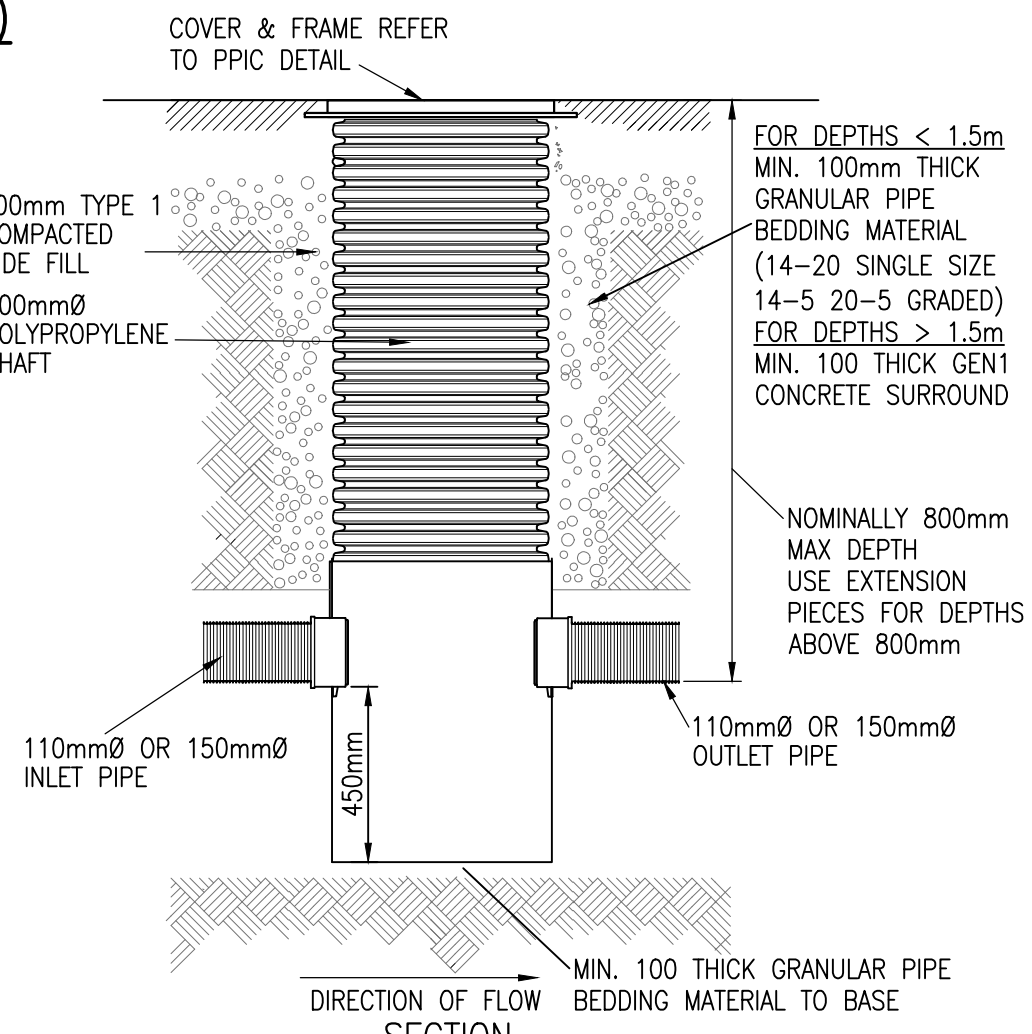
PLAN VIEW
SIDE VIEW
DISTRIBUTION TANK



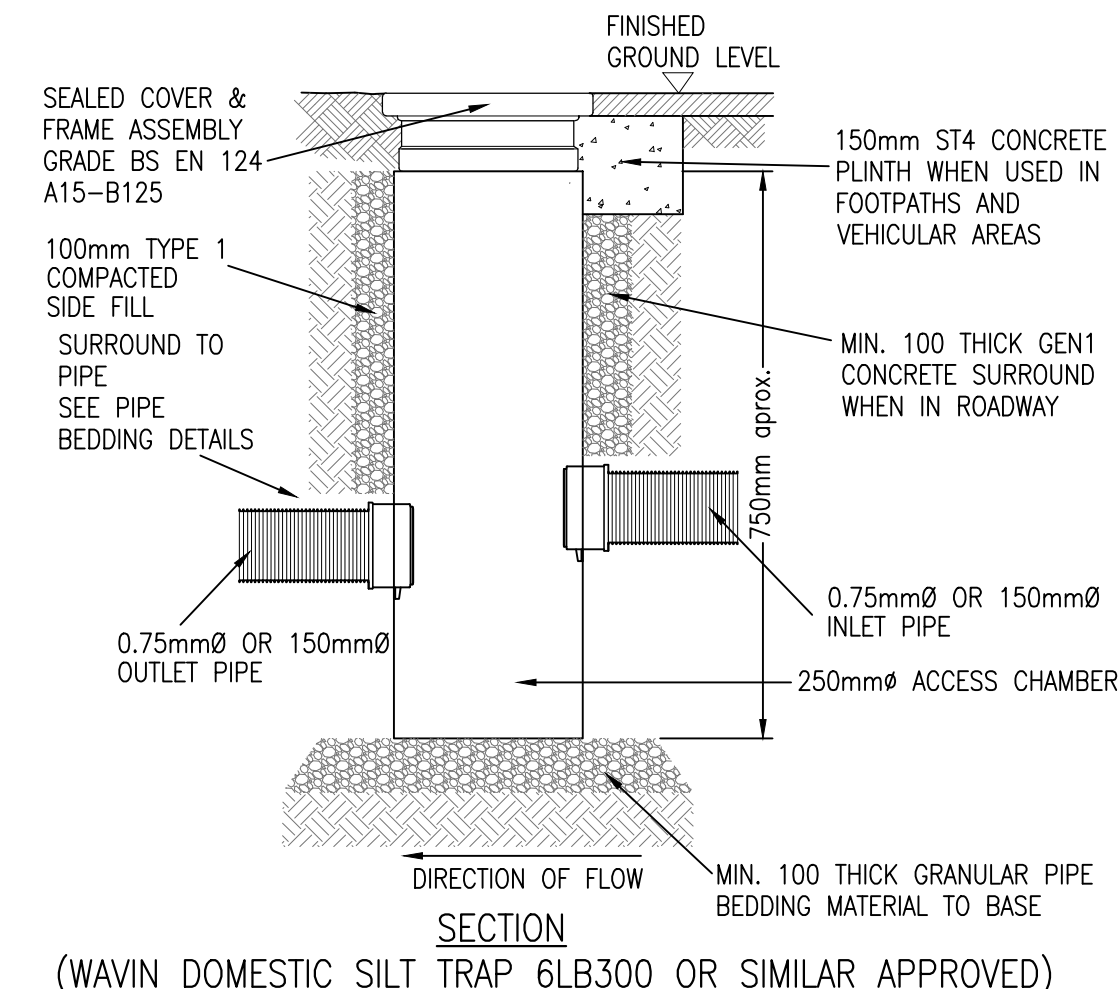
EXTERNAL RAMPED BACKDROP



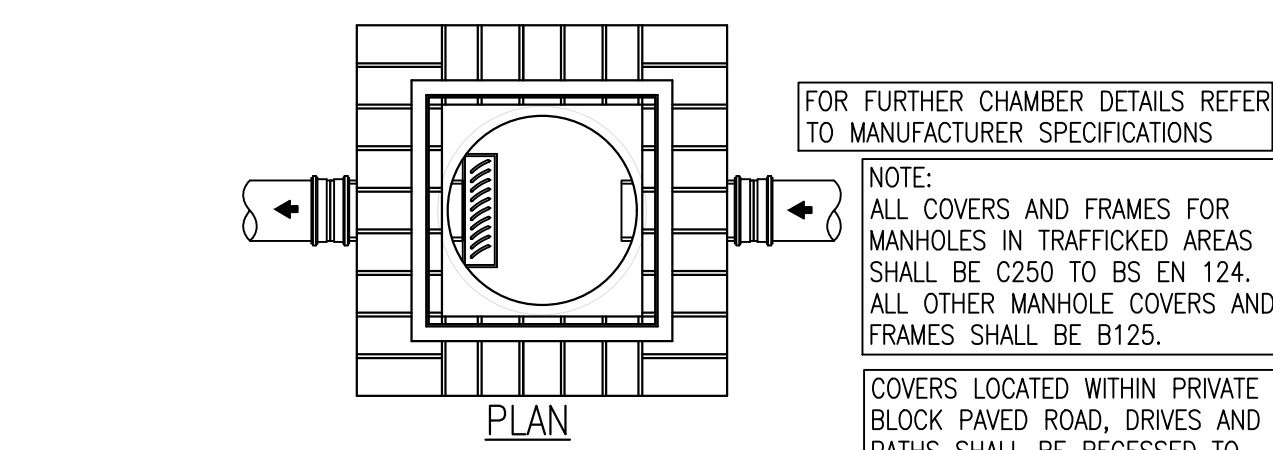
RAIN WATER PIPE CONNECTION



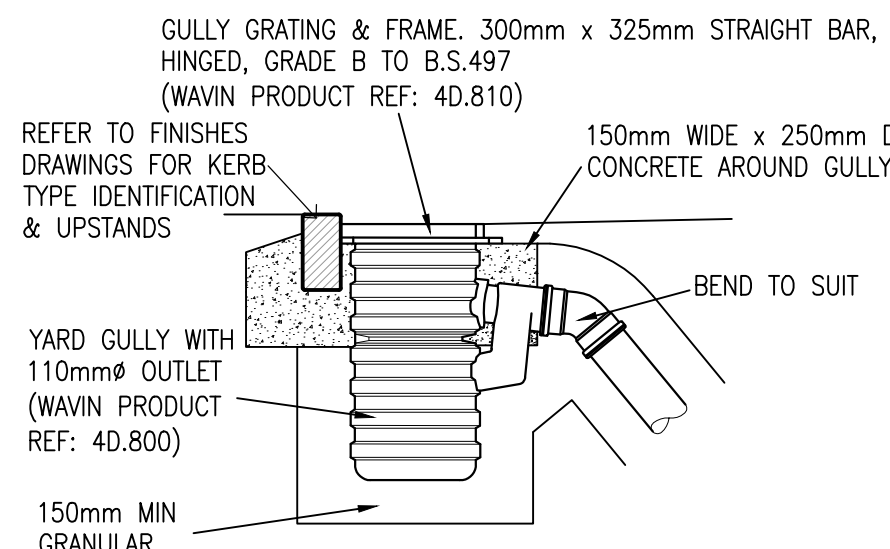
PREFORMED SILT TRAP
CHAMBER DETAIL (SILT)
(WAVIN OSMA SILT TRAP 6LB600 OR
SIMILAR APPROVED)



MINI SILT TRAP CHAMBER DETAIL (mSILT)

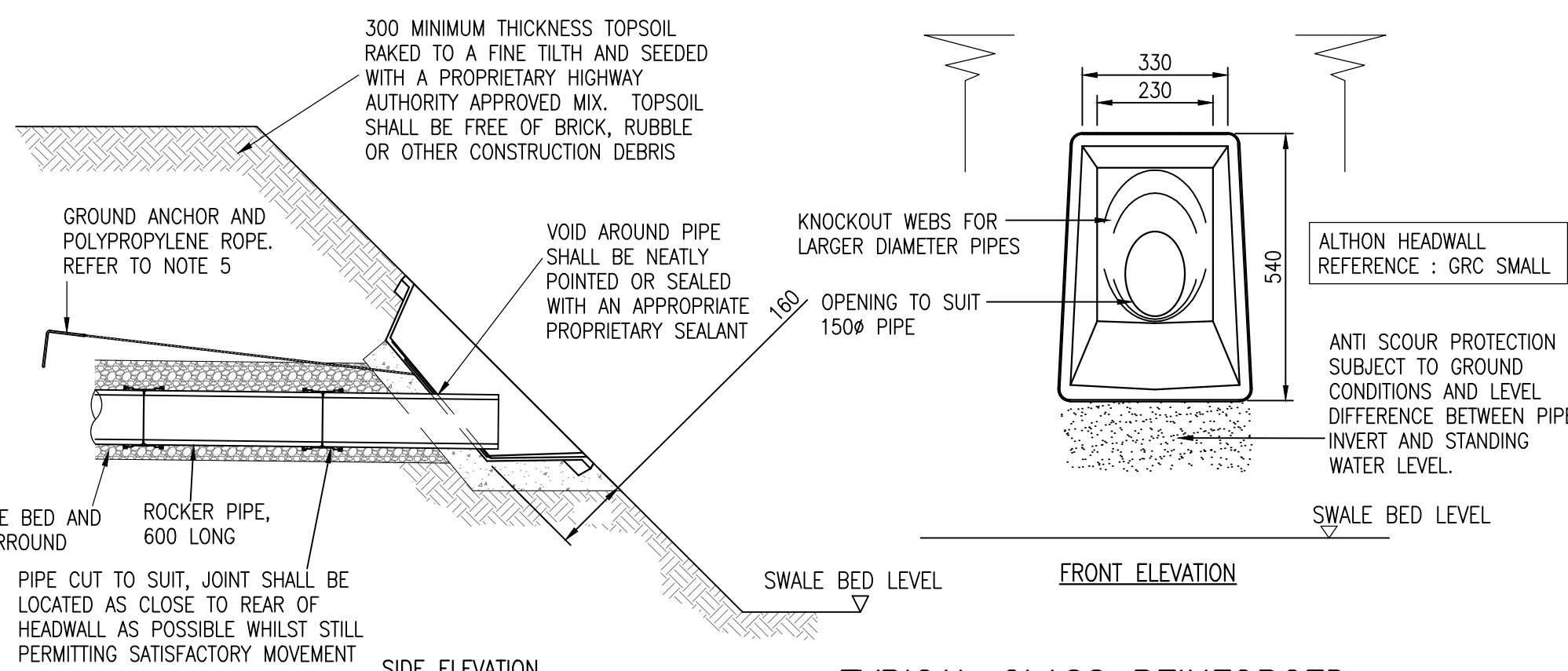


ORIFICE CONTROL CHAMBER (OCC)
(BY- SEL ENVIRONMENTAL LTD)

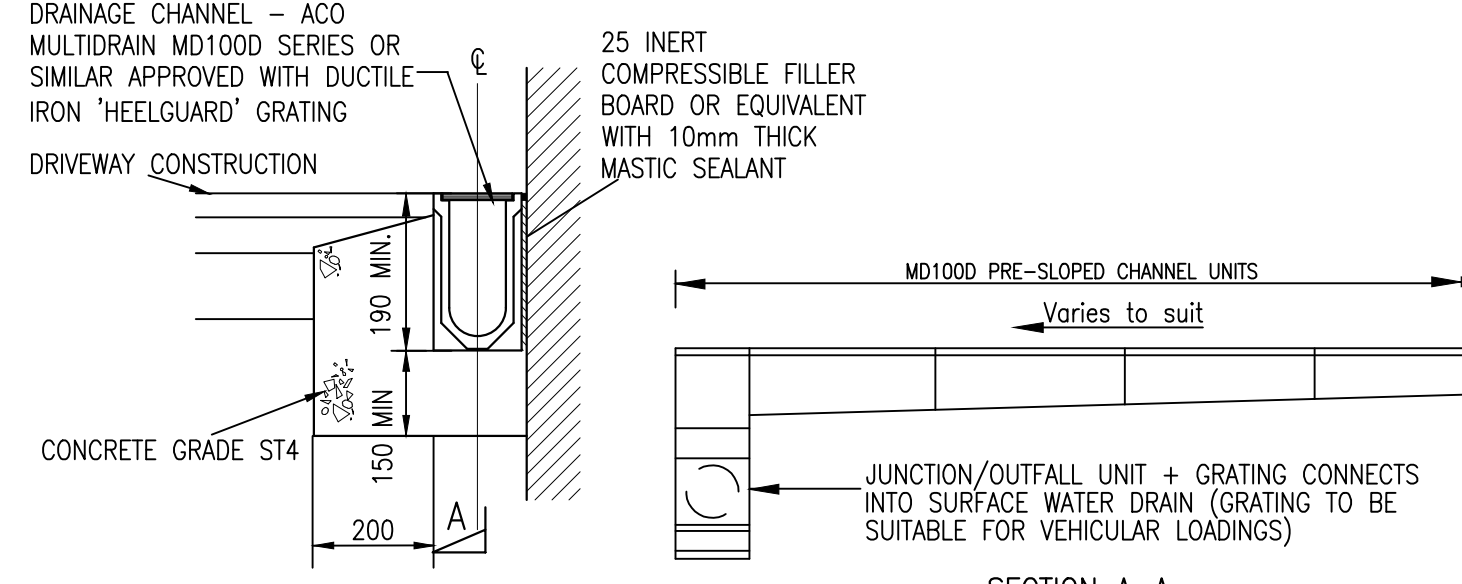


TYPICAL YARD GULLY DETAIL

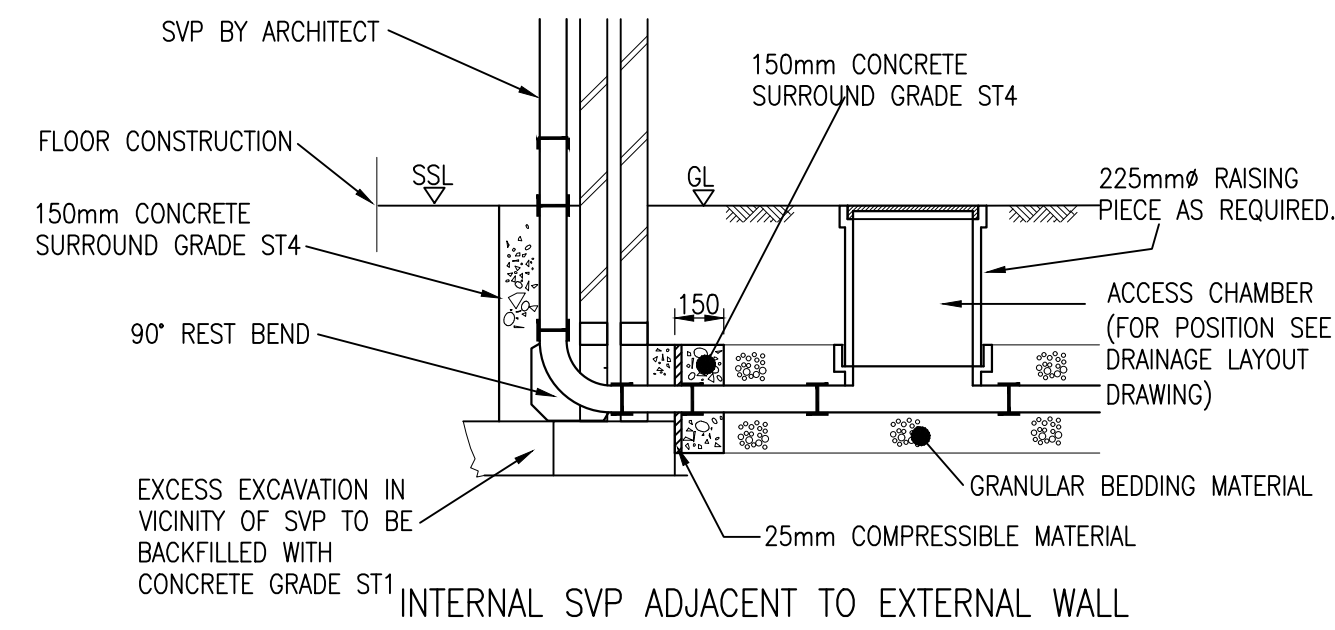
- NOTES: GLASS REINFORCED CONCRETE HEADWALL
- GLASS REINFORCED CONCRETE HEADWALL SHOWN IS SUPPLIED BY ALTHON LIMITED, REFER BELOW FOR CONTACT DETAILS. ALTERNATIVE MANUFACTURERS HEADWALL UNITS MAY BE USED SUBJECT TO APPROVAL.
 - IF THE PIPE RUN CONNECTING TO THE HEADWALL HAS LESS THAN 0.9m COVER IN OPEN GROUND (MEASURED FROM PIPE BARREL TO FINISHED GROUND LEVEL), THEN IT SHALL BE LAID WITH CLASS A BED AND SURROUND.
 - THE HEADWALL SHALL BE POSITIONED SO THAT IT IS RECESSED INTO THE BANK AND DOES NOT ENCR OACH INTO THE FLOW OF THE WATERCOURSE.
 - HEADWALLS SHALL BE LIFTED IN ACCORDANCE WITH THE MANUFACTURERS INSTALLATION GUIDELINES.
 - GROUND ANCHOR SHALL BE INSTALLED DURING BACKFILLING OF TRENCH. TO PREVENT DAMAGE TO THE PIPE THE ANCHOR SHALL BE POSITIONED SO THAT IT DOES NOT IMPACT AGAINST THE PIPE DURING COMPACTION OF BACKFILL. THE POLYPROPYLENE ROPE CONNECTING THE ANCHOR TO THE HEADWALL SHALL BE KEPT TAUT DURING THE BACKFILLING OPERATION.
 - WHERE THE USE OF SCOUR PROTECTION IS REQUIRED BENEATH THE HEADWALL, EITHER STONE PITCHING SET INTO GRADE C20 CONCRETE OR A TURF REINFORCEMENT MAT SHALL BE USED.



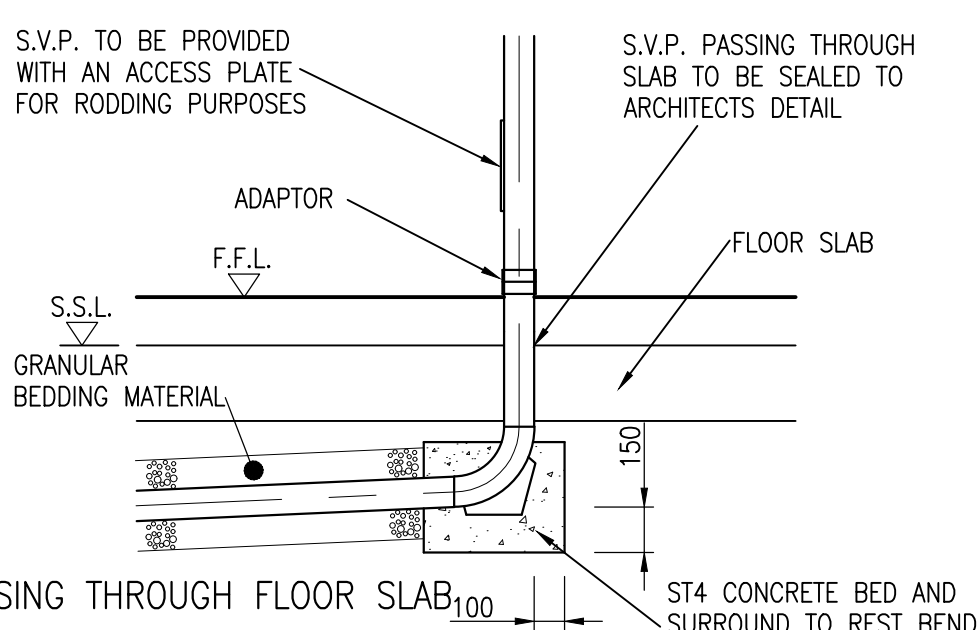
TYPICAL GLASS REINFORCED
CONCRETE (GRC) TYPE 2
HEADWALL
NOT TO SCALE



TYPICAL LINEAR DRAINAGE
CHANNEL DETAIL



TYPICAL SVP DETAILS



SVP PASSING THROUGH FLOOR SLAB

- NOTES:
- DO NOT SCALE FROM THIS DRAWING.
 - ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS STATED OTHERWISE.
 - THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT SCHEME DRAWINGS AND SPECIFICATIONS.
 - ALL WORKS WITHIN THE PUBLIC HIGHWAY SHALL BE CARRIED OUT AND COMPLY WITH THE REQUIREMENTS OF THE DTP "TRAFFIC SIGNS MANUAL CHAPTER 8 - TRAFFIC SAFETY MEASURES AND SIGNS FOR ROAD WORKS AND TEMPORARY SITUATION".
 - ALL EXISTING LEVELS TO BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF ANY WORKS.
 - THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY OCCURRENCES OF SOFT SPOTS IN THE SUBGRADE MATERIAL WITHIN THE CARRIAGEWAY NOTIONAL LOAD LINE. SOFT SPOTS SHALL BE REMOVED AND REPLACED WITH COMPACTED CAPPING MATERIAL AS AGREED WITH THE ENGINEER.
 - HANDLING OF KERBS, EDGINGS AND PAVORS (I.E. LIFTING, PLACING, MANOEUVRING) SHALL BE BY MECHANICAL OR SIMILAR PLANT APPARATUS.
 - ALL PROPRIETARY PRODUCTS TO BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

CONSTRUCTION ISSUE

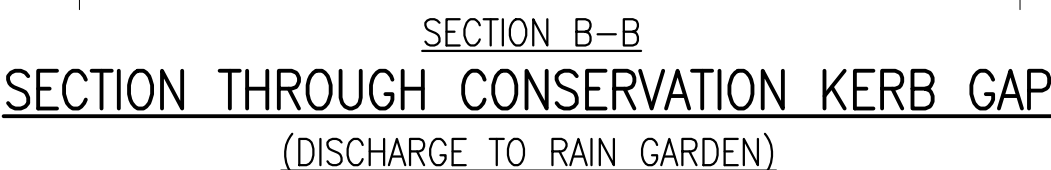
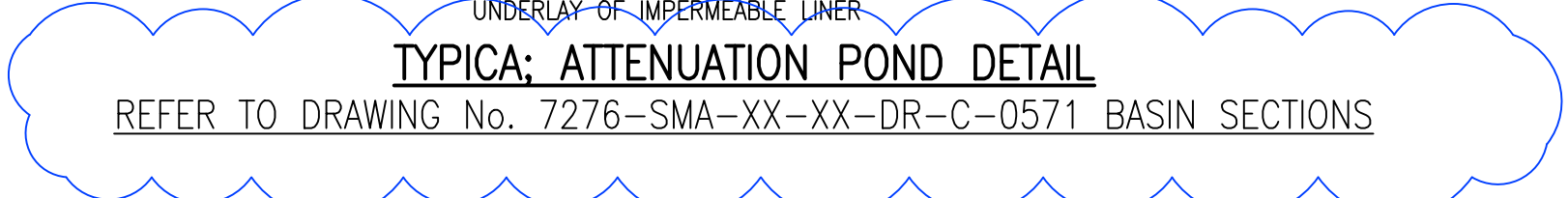
—	C01	CONSTRUCTION ISSUE	FP	MSR	17.01.25
—	P01	INITIAL ISSUE			04.10.24
ST	Rev	Description	Drn	Chk	Date
REVISIONS					
Preliminary Issue			Submitted for S104		
Planning Issue			Issued for Tender		
Submitted for S38			Issued for Construction		✓
Submitted for S278			As Built		
DRAWING STATUS					

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Bellway

WOOD VALE,
EAST BILLINGHURST
CONSTRUCTION DETAILS
SHEET 2

DATE: OCT. 2024
DRAWN: HF
CHECKED: CL
SCALE: 1:200
SHEET: 01
7276-SMA-XX-XX-DR-C-0530
C01 SO
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- CONSTRUCTION ISSUE

 **STUART MICHAEL ASSOCIATES**
CONSULTING ENGINEERS

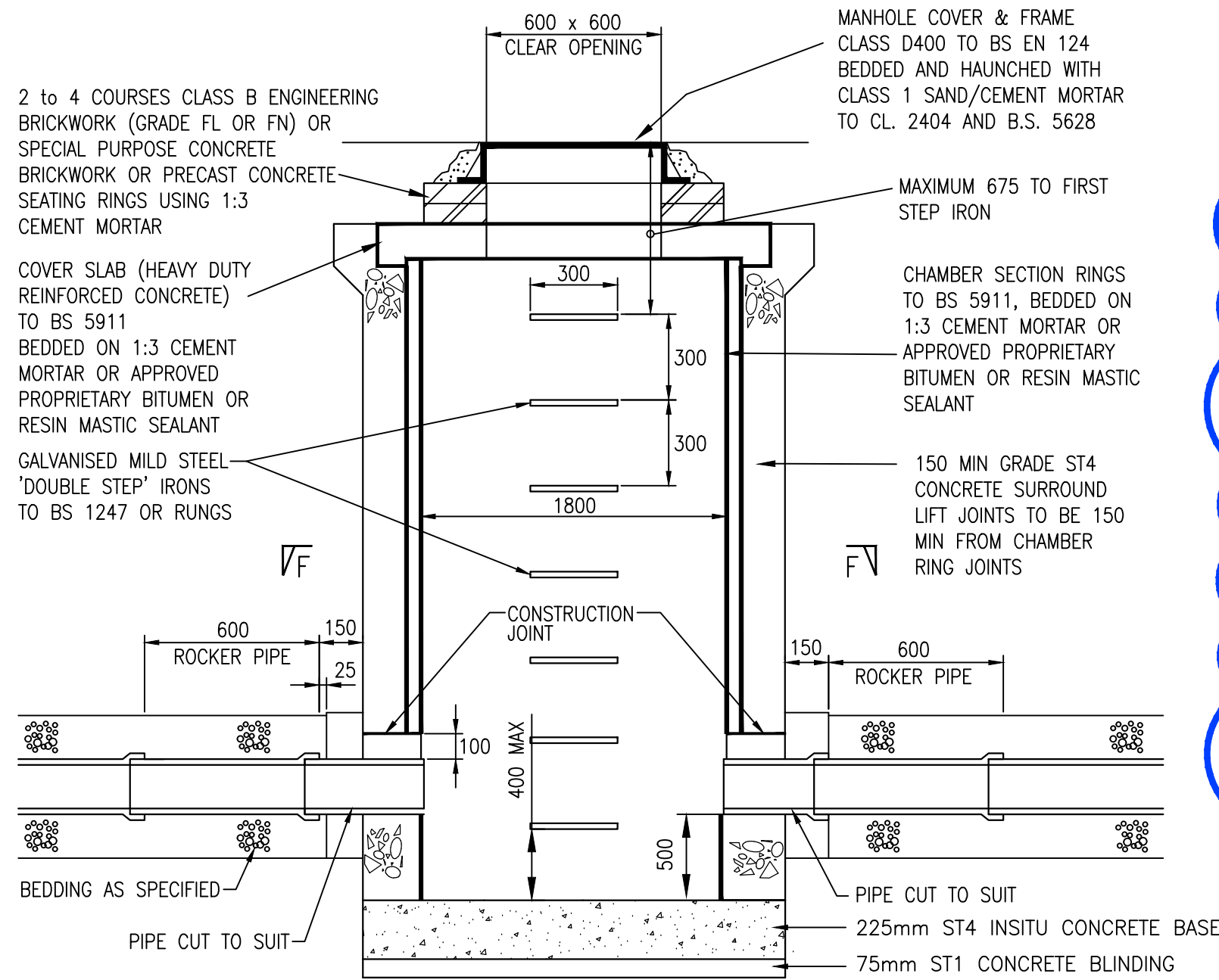
Stuart Michael Associates Ltd
Coombe House, Coombe Square, Thatcham, Berkshire RG19 4JF

T: 01635 867 711 **e:** mail@stuartmichael.co.uk
F: 01635 861 715 **w:** www.stuartmichael.co.uk

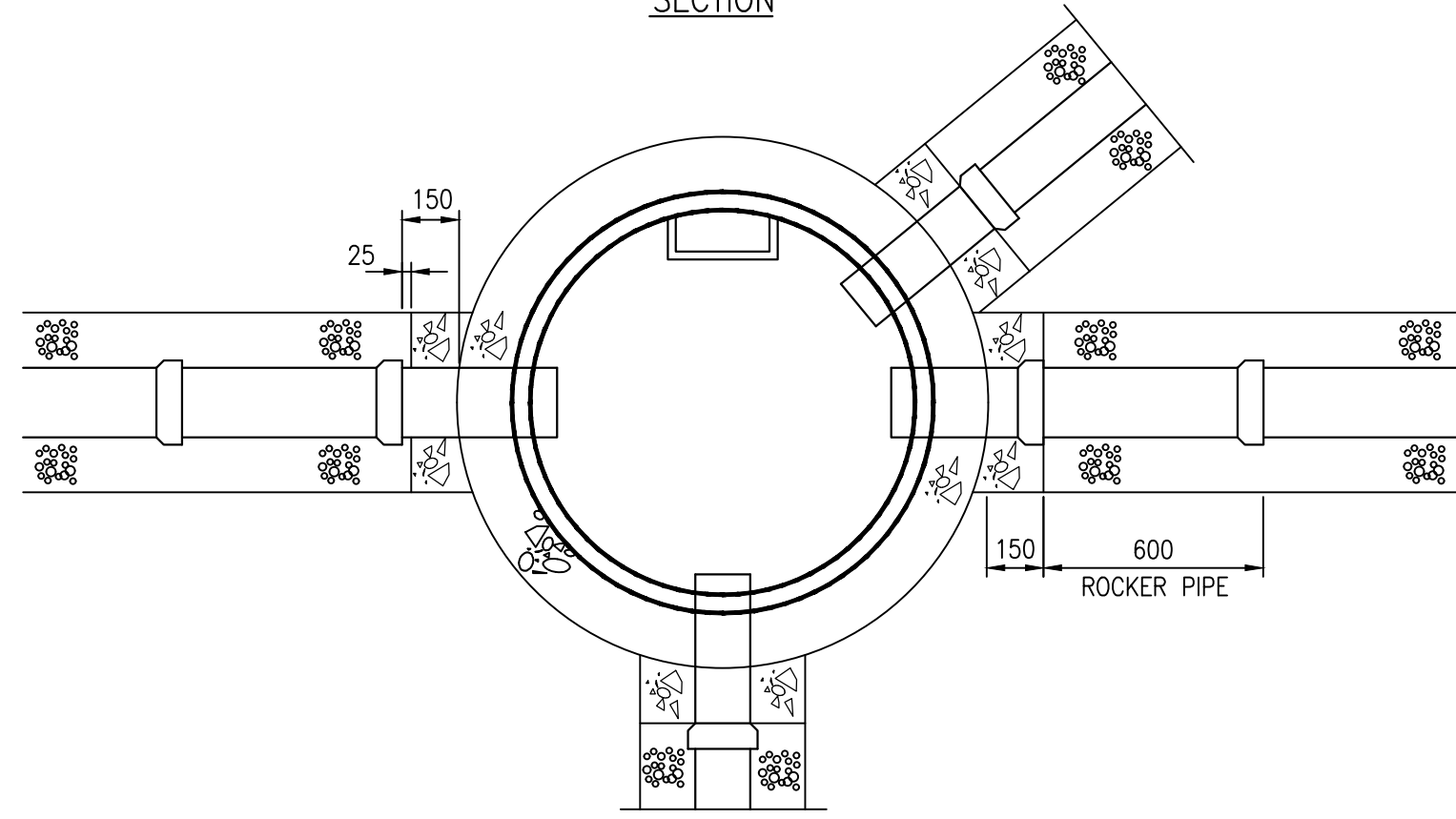
WOOD VALE,
EAST BILLINGHURST

DATE	DENOM	CHECKED	SCALE	
OCT. 2024	HF	CL	1:200	@A1
DRAWING NO.			REV	STATUS
7276-SMA-XX-XX-DR-C-0531			C03	S0

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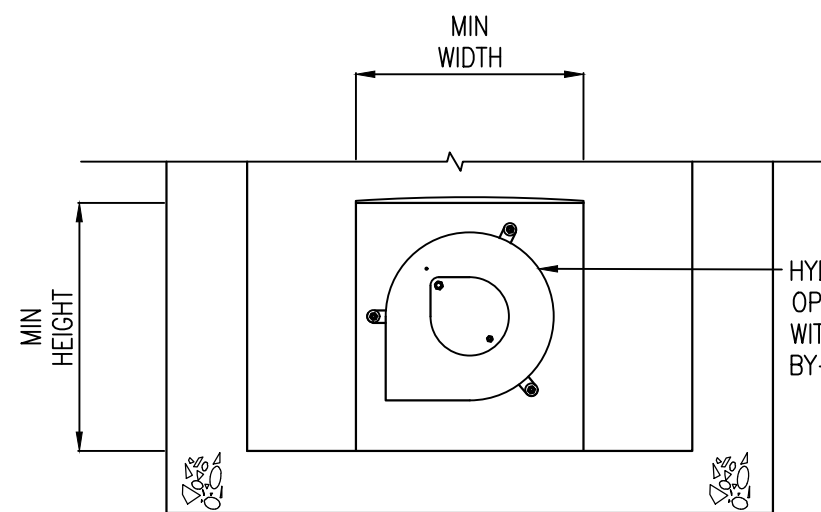
SECTION



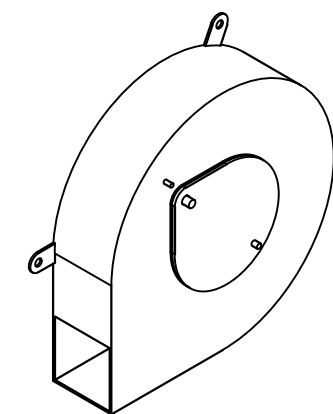
SECTION F-F

PCC CATCHPIT MANHOLE

MAXIMUM DEPTH OF COVER LEVEL TO SOFFIT OF PIPE 3.0m

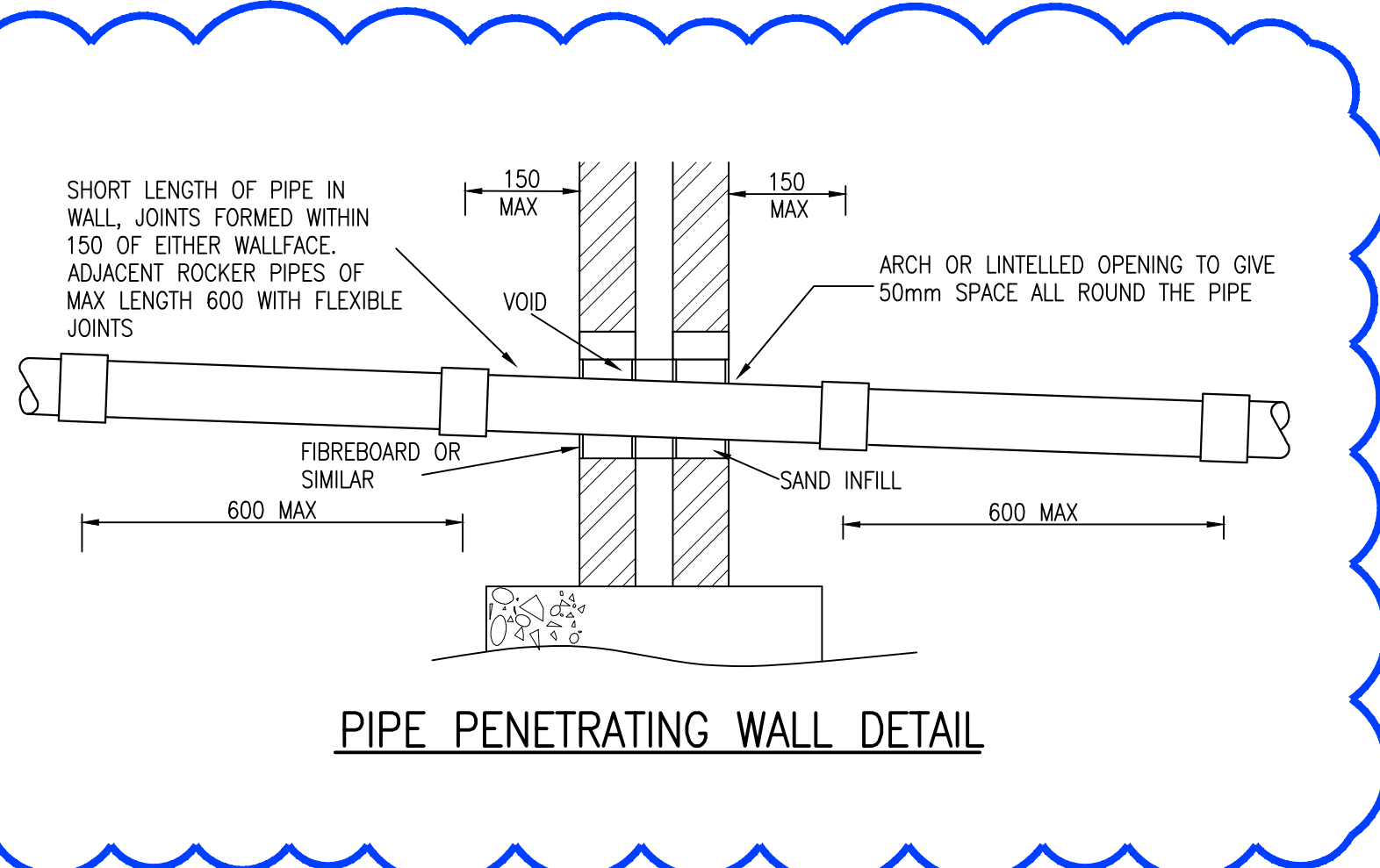


SECTION B-B
(VIEW ON MOUNTING BLOCK)

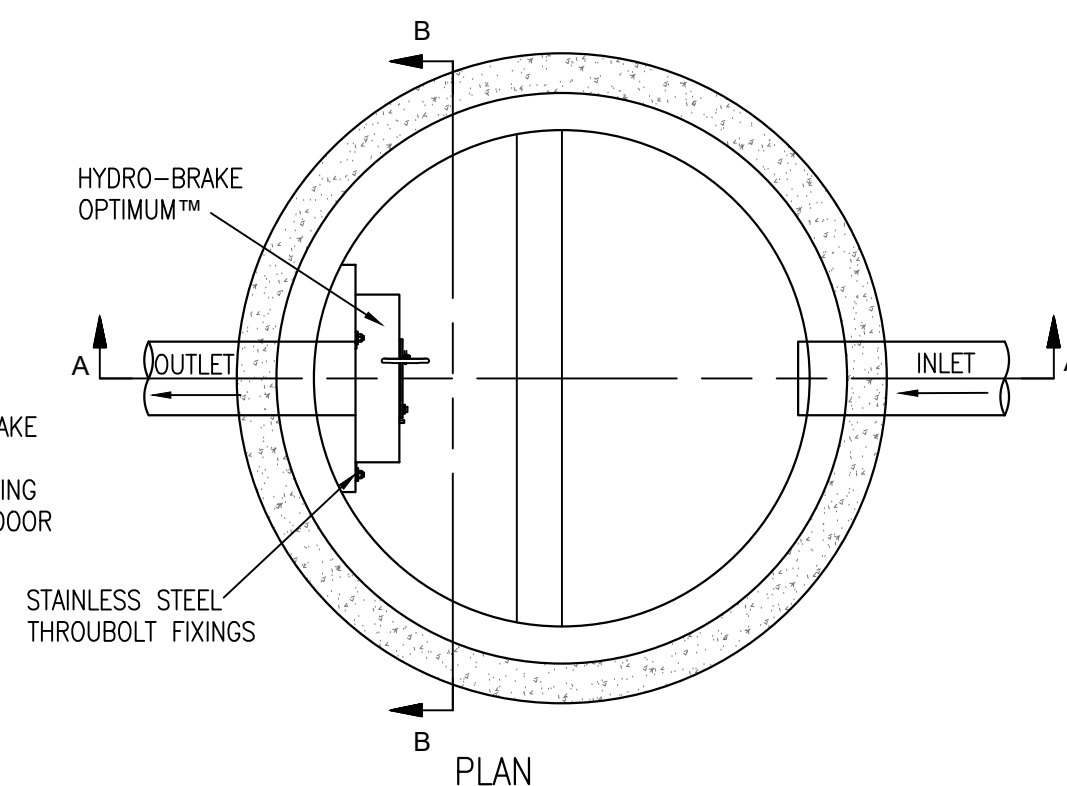


HYDRO-BRAKE OPTIMUM™ UNIT
(REFER TO SURFACE WATER DRAINAGE LAYOUTS FOR SPECIFIC UNIT DETAILS FOR EACH CONTROL CHAMBER)

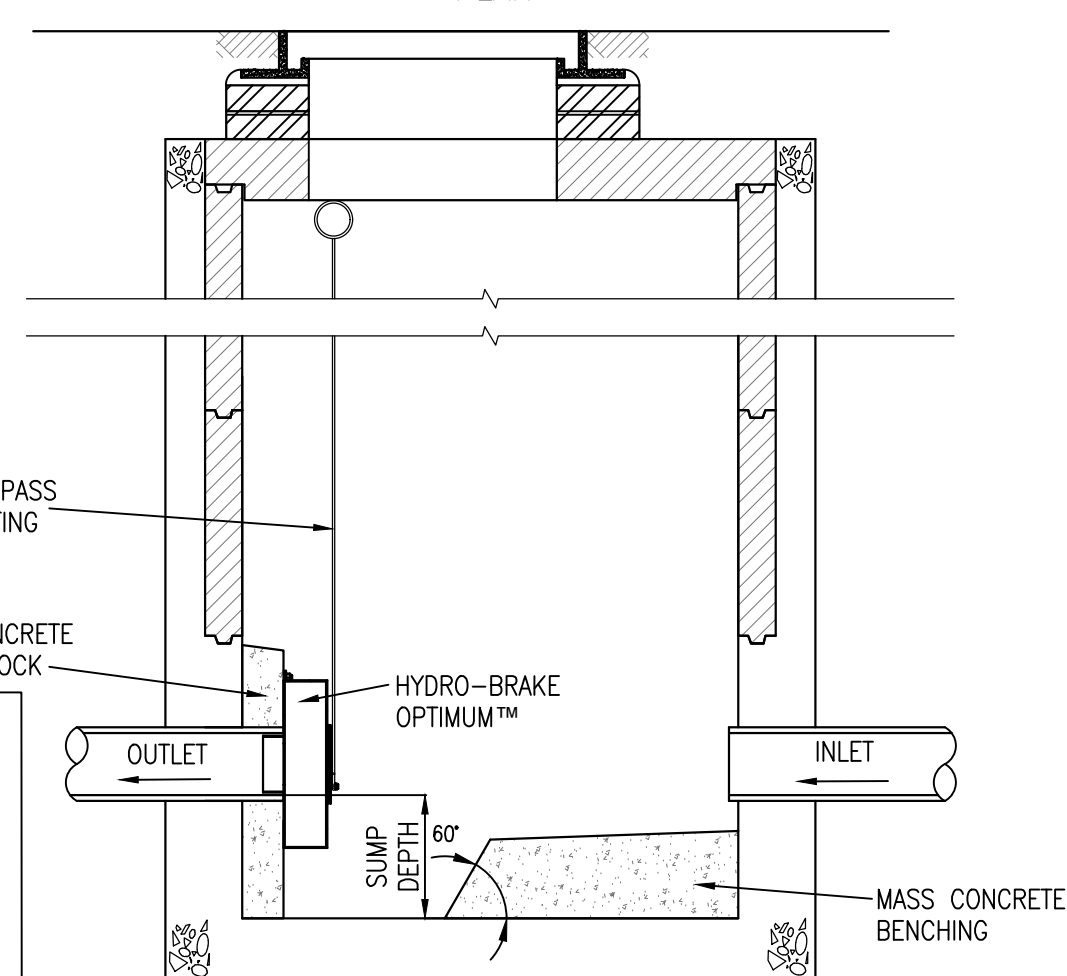
- NOTES:**
- UNIT REFERENCE:
S6: CTL-SHE-0072-2500-1200-2500
S22: CTL-SHE-0128-7500-1000-7500
S33: CTL-SHE-0090-3800-1200-3800
 - DISCHARGE RATE:
S6: 2.5 l/s
S22: 7.5 l/s
S33: 3.8 l/s
 - HYDRO-BRAKE OPTIMUM™ IS ALSO AVAILABLE WITH ALTERNATIVE FIXING MOUNTS.
 - HYDRO-BRAKE UNITS ARE TO BE INSTALLED AS PER THE MANUFACTURERS RECOMMENDATIONS.
 - SUMP DIMENSIONS:
S6: 160mm(WIDTH)x320mm(DEPTH)
S22: 270mm(WIDTH)x360mm(DEPTH)
S33: 190mm(WIDTH)x350mm(DEPTH)



PIPE PENETRATING WALL DETAIL

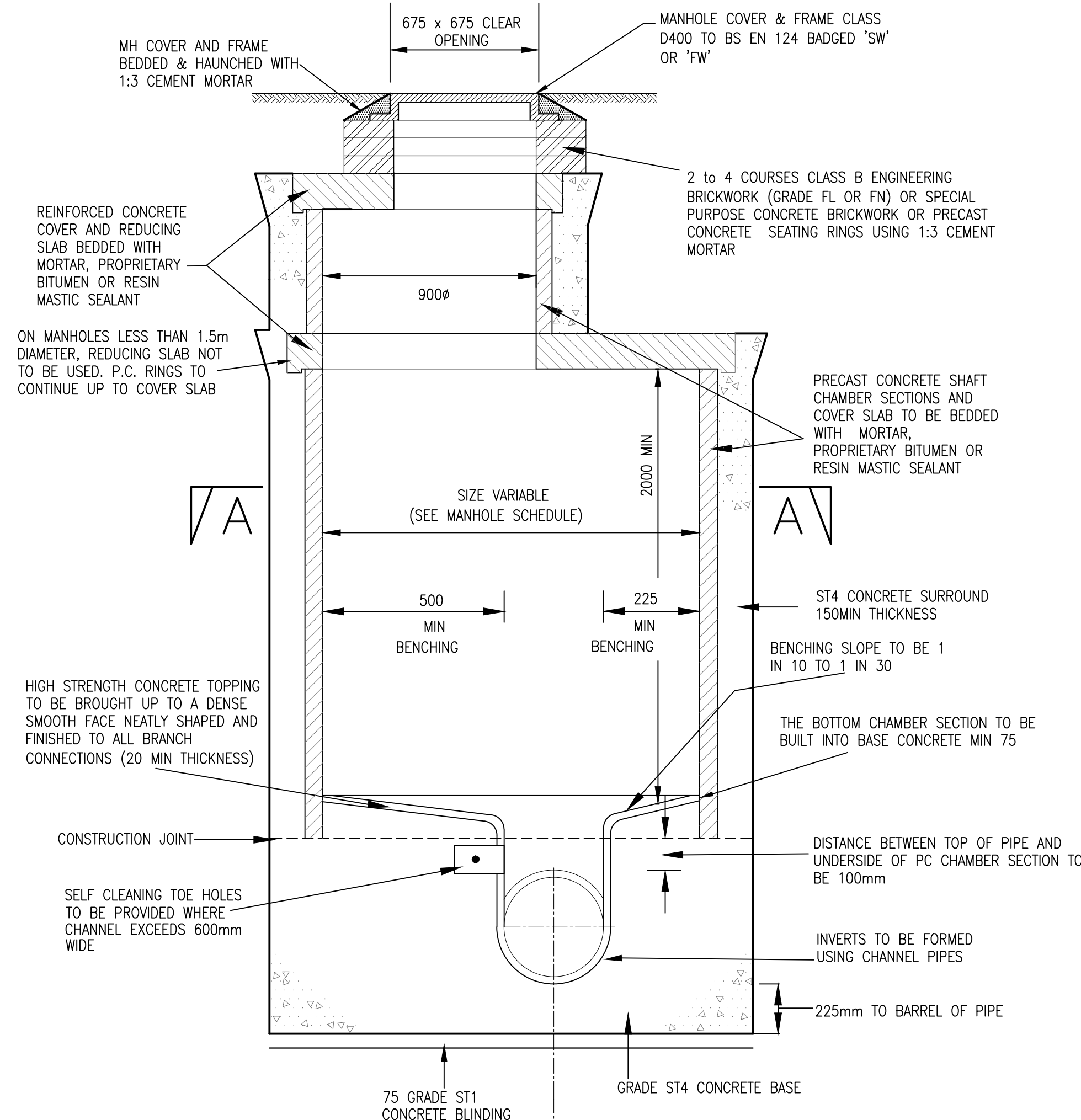


PLAN



SECTION A-A

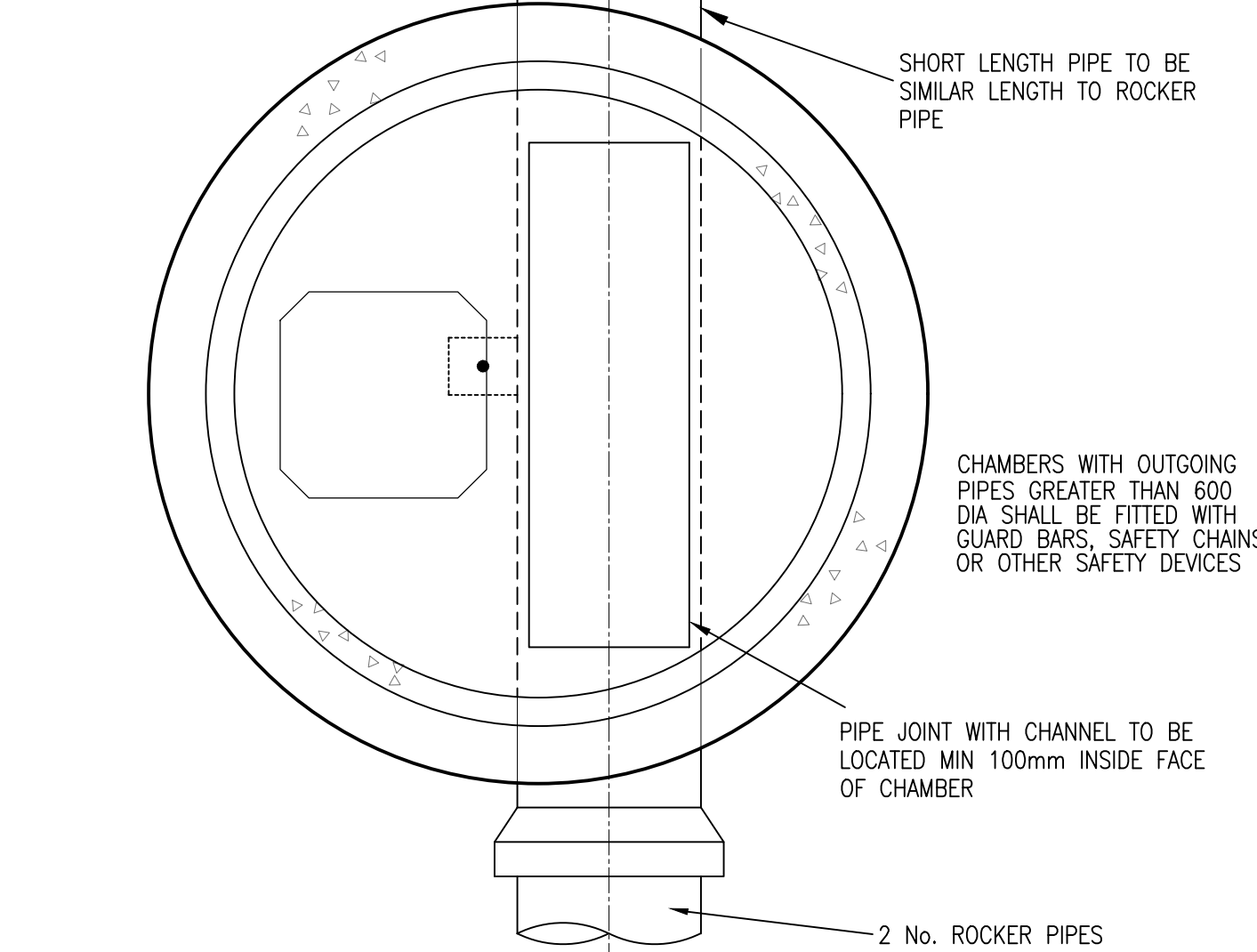
TYPICAL FLOW CONTROL DEVICE (HYDRO-BRAKE) MANHOLE



SECTION A-A

NOMINAL PIPE DIA(mm)	ROCKER EFFECTIVE PIPE LENGTH(mm)
150-600	0.6
OVER 600-750	1.0
OVER 750	1.25

2 No. ROCKER PIPES
JOINT TO BE AS CLOSE AS PRACTICABLE TO FACE OF MANHOLE TO PERMIT SATISFACTORY JOINT AND SUBSEQUENT MOVEMENT



SECTION A-A

ADOPTABLE CONCRETE MANHOLE TYPE A

DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 3.0m - 6.0m

- NOTES:**
- DO NOT SCALE FROM THIS DRAWING.
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CONSTRUCTION ISSUE

Rev	Description	Drn	Chk	Date
ST	Rev			
1	Initial Issue			04.10.24
2	Submitted for S38			
3	Submitted for S278			

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W: www.stuartmichael.co.uk

Bellway

WOOD VALE,
EAST BILLINGHURST

CONSTRUCTION DETAILS SHEET 5

DATE	DESIGN	CHECKED	SCALE	BY
OCT. 2024	HF	CL	1:200	QA1
7276-SMA-XX-XX-DR-C-0533				SO

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APPENDIX 4

Exceedance Flow Routes Drawing



APPENDIX 5

Surface Water Calculations – Network 1

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.022	5.00	40.145	1200	509545.713	126176.460	1.425
2	0.033	5.00	40.300	1200	509561.352	126177.944	1.750
3	0.075	5.00	40.535	1200	509580.608	126178.003	2.065
4	0.061	5.00	40.875	1200	509608.288	126166.957	2.530
5	0.037	5.00	40.550	1200	509608.799	126127.740	2.370
11	0.051	5.00	40.040	1200	509566.947	126116.201	1.670
12	0.035	5.00	40.275	1200	509585.282	126112.818	2.090
6	0.031	5.00	40.550	1200	509603.033	126112.881	2.440
7	0.025	5.00	40.775	1200	509601.488	126089.847	2.760
8	0.024	5.00	40.500	1200	509582.227	126088.877	2.565
9	0.045	5.00	39.750	1200	509554.448	126079.148	1.940
10			39.000	1350	509522.254	126079.023	1.400
18	0.061	5.00	41.470	1200	509628.175	125982.627	1.725
21	0.025	5.00	40.200	1200	509575.470	125992.490	1.425
19			40.585	1200	509591.957	125989.404	1.985
20	0.084	5.00	40.375	1200	509594.429	126002.615	1.830
17	0.061	5.00	40.530	1200	509630.098	126038.211	1.725
13	0.047	5.00	40.350	1200	509601.454	126069.085	1.800
14	0.053	5.00	39.900	1200	509594.362	126047.420	1.800
15	0.087	5.00	39.775	1350	509593.706	126037.511	1.875
16	0.122	5.00	38.750	1350	509518.596	126035.957	1.300
22	0.082	5.00	38.750	1350	509509.527	126052.889	1.301
OUTFALL			38.500	1200	509499.736	126055.401	1.100

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	15.709	0.600	38.720	38.625	0.095	165.4	225	5.26	50.0
1.001	2	3	19.256	0.600	38.550	38.470	0.080	240.7	300	5.58	50.0
1.002	3	4	29.803	0.600	38.470	38.345	0.125	238.4	300	6.07	50.0
1.003	4	5	39.220	0.600	38.345	38.180	0.165	237.7	300	6.71	48.8
1.004	5	6	15.939	0.600	38.180	38.110	0.070	227.7	300	6.97	47.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.014	40.3	3.0	1.200	1.450	0.022	0.0	41	0.593
1.001	1.009	71.3	7.5	1.450	1.765	0.055	0.0	65	0.660
1.002	1.014	71.7	17.6	1.765	2.230	0.130	0.0	101	0.843
1.003	1.015	71.8	25.2	2.230	2.070	0.191	0.0	123	0.929
1.004	1.038	73.3	29.6	2.070	2.140	0.228	0.0	133	0.984

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	11	12	18.644	0.600	38.370	38.260	0.110	169.5	225	5.31	50.0
2.001	12	6	17.751	0.600	38.185	38.110	0.075	236.7	300	5.60	50.0
1.005	6	7	23.086	0.600	38.110	38.015	0.095	243.0	300	7.35	46.8
1.006	7	8	19.285	0.600	38.015	37.935	0.080	241.1	300	7.67	45.8
1.007	8	9	29.433	0.600	37.935	37.810	0.125	235.5	300	8.15	44.4
1.008	9	10	32.194	0.600	37.810	37.675	0.135	238.5	300	8.68	43.1
1.009	10	22	29.068	0.600	37.600	37.450	0.150	193.8	375	9.05	42.1
3.000	18	19	36.847	0.600	39.745	38.675	1.070	34.4	225	5.27	50.0
4.000	21	19	16.773	0.600	38.775	38.675	0.100	167.7	225	5.28	50.0
3.001	19	20	13.440	0.600	38.600	38.545	0.055	244.4	300	5.50	50.0
3.002	20	15	34.903	0.600	38.545	37.975	0.570	61.2	300	5.79	50.0
5.000	17	15	36.399	0.600	38.805	38.050	0.755	48.2	225	5.32	50.0
6.000	13	14	22.796	0.600	38.550	38.100	0.450	50.7	300	5.17	50.0
6.001	14	15	9.931	0.600	38.100	37.975	0.125	79.4	300	5.27	50.0
3.003	15	16	75.126	0.600	37.900	37.450	0.450	166.9	375	6.69	48.9
3.004	16	22	19.208	0.600	37.450	37.449	0.001	19207.8	375	9.32	41.5
1.010	22	OUTFALL	10.108	0.600	37.450	37.400	0.050	202.2	225	9.50	41.1

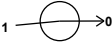
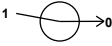
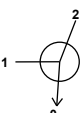
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.001	39.8	6.9	1.445	1.790	0.051	0.0	63	0.752
2.001	1.017	71.9	11.7	1.790	2.140	0.086	0.0	81	0.753
1.005	1.004	71.0	43.7	2.140	2.460	0.345	0.0	171	1.055
1.006	1.008	71.3	46.0	2.460	2.265	0.370	0.0	175	1.069
1.007	1.020	72.1	47.5	2.265	1.640	0.394	0.0	178	1.087
1.008	1.014	71.6	51.2	1.640	1.025	0.439	0.0	188	1.098
1.009	1.298	143.3	50.1	1.025	0.925	0.439	0.0	153	1.186
3.000	2.237	88.9	8.3	1.500	1.685	0.061	0.0	46	1.413
4.000	1.006	40.0	3.4	1.200	1.685	0.025	0.0	44	0.619
3.001	1.001	70.8	11.7	1.685	1.530	0.086	0.0	82	0.743
3.002	2.012	142.2	23.0	1.530	1.500	0.170	0.0	81	1.492
5.000	1.888	75.1	8.3	1.500	1.500	0.061	0.0	51	1.257
6.000	2.214	156.5	6.4	1.500	1.500	0.047	0.0	41	1.097
6.001	1.765	124.8	13.6	1.500	1.500	0.100	0.0	67	1.170
3.003	1.399	154.5	55.4	1.500	0.925	0.418	0.0	155	1.287
3.004	0.122	13.4	60.7	0.925	0.926	0.540	0.0	375	0.123
1.010	0.916	36.4	118.1	1.075	0.875	1.061	0.0	225	0.933

Pipeline Schedule

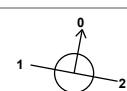
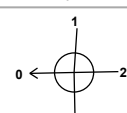
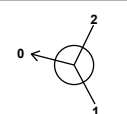
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.709	165.4	225	Circular	40.145	38.720	1.200	40.300	38.625	1.450
1.001	19.256	240.7	300	Circular	40.300	38.550	1.450	40.535	38.470	1.765
1.002	29.803	238.4	300	Circular	40.535	38.470	1.765	40.875	38.345	2.230
1.003	39.220	237.7	300	Circular	40.875	38.345	2.230	40.550	38.180	2.070
1.004	15.939	227.7	300	Circular	40.550	38.180	2.070	40.550	38.110	2.140
2.000	18.644	169.5	225	Circular	40.040	38.370	1.445	40.275	38.260	1.790
2.001	17.751	236.7	300	Circular	40.275	38.185	1.790	40.550	38.110	2.140
1.005	23.086	243.0	300	Circular	40.550	38.110	2.140	40.775	38.015	2.460
1.006	19.285	241.1	300	Circular	40.775	38.015	2.460	40.500	37.935	2.265
1.007	29.433	235.5	300	Circular	40.500	37.935	2.265	39.750	37.810	1.640
1.008	32.194	238.5	300	Circular	39.750	37.810	1.640	39.000	37.675	1.025
1.009	29.068	193.8	375	Circular	39.000	37.600	1.025	38.750	37.450	0.925
3.000	36.847	34.4	225	Circular	41.470	39.745	1.500	40.585	38.675	1.685
4.000	16.773	167.7	225	Circular	40.200	38.775	1.200	40.585	38.675	1.685
3.001	13.440	244.4	300	Circular	40.585	38.600	1.685	40.375	38.545	1.530
3.002	34.903	61.2	300	Circular	40.375	38.545	1.530	39.775	37.975	1.500
5.000	36.399	48.2	225	Circular	40.530	38.805	1.500	39.775	38.050	1.500
6.000	22.796	50.7	300	Circular	40.350	38.550	1.500	39.900	38.100	1.500
6.001	9.931	79.4	300	Circular	39.900	38.100	1.500	39.775	37.975	1.500
3.003	75.126	166.9	375	Circular	39.775	37.900	1.500	38.750	37.450	0.925
3.004	19.208	19207.8	375	Circular	38.750	37.450	0.925	38.750	37.449	0.926
1.010	10.108	202.2	225	Circular	38.750	37.450	1.075	38.500	37.400	0.875

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.003	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
1.004	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
2.000	11	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
2.001	12	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.005	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.006	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.007	8	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.008	9	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
1.009	10	1350	Manhole	Adoptable	22	1350	Manhole	Adoptable
3.000	18	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
4.000	21	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
3.001	19	1200	Manhole	Adoptable	20	1200	Manhole	Adoptable
3.002	20	1200	Manhole	Adoptable	15	1350	Manhole	Adoptable
5.000	17	1200	Manhole	Adoptable	15	1350	Manhole	Adoptable
6.000	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
6.001	14	1200	Manhole	Adoptable	15	1350	Manhole	Adoptable
3.003	15	1350	Manhole	Adoptable	16	1350	Manhole	Adoptable
3.004	16	1350	Manhole	Adoptable	22	1350	Manhole	Adoptable
1.010	22	1350	Manhole	Adoptable	OUTFALL	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	509545.713	126176.460	40.145	1.425	1200		0	1.000	38.720	225
2	509561.352	126177.944	40.300	1.750	1200		1	1.000	38.625	225
						0	1.001	38.550	300	
3	509580.608	126178.003	40.535	2.065	1200		1	1.001	38.470	300
						0	1.002	38.470	300	
4	509608.288	126166.957	40.875	2.530	1200		1	1.002	38.345	300
						0	1.003	38.345	300	
5	509608.799	126127.740	40.550	2.370	1200		1	1.003	38.180	300
						0	1.004	38.180	300	
11	509566.947	126116.201	40.040	1.670	1200		0	2.000	38.370	225
12	509585.282	126112.818	40.275	2.090	1200		1	2.000	38.260	225
						0	2.001	38.185	300	
6	509603.033	126112.881	40.550	2.440	1200		1	2.001	38.110	300
						2	1.004	38.110	300	
						0	1.005	38.110	300	
7	509601.488	126089.847	40.775	2.760	1200		1	1.005	38.015	300
						0	1.006	38.015	300	
8	509582.227	126088.877	40.500	2.565	1200		1	1.006	37.935	300
						0	1.007	37.935	300	
9	509554.448	126079.148	39.750	1.940	1200		1	1.007	37.810	300
						0	1.008	37.810	300	
10	509522.254	126079.023	39.000	1.400	1350		1	1.008	37.675	300
						0	1.009	37.600	375	
18	509628.175	125982.627	41.470	1.725	1200		0	3.000	39.745	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
21	509575.470	125992.490	40.200	1.425	1200		0	4.000	38.775	225
19	509591.957	125989.404	40.585	1.985	1200		1 2 0	4.000 3.000 3.001	38.675 38.675 38.600	225 225 300
20	509594.429	126002.615	40.375	1.830	1200		1 0	3.001 3.002	38.545 38.545	300 300
17	509630.098	126038.211	40.530	1.725	1200		0	5.000	38.805	225
13	509601.454	126069.085	40.350	1.800	1200		0	6.000	38.550	300
14	509594.362	126047.420	39.900	1.800	1200		1 0	6.000 6.001	38.100 38.100	300 300
15	509593.706	126037.511	39.775	1.875	1350		1 2 3 0	6.001 5.000 3.002 3.003	37.975 38.050 37.975 37.900	300 225 300 375
16	509518.596	126035.957	38.750	1.300	1350		1 0	3.003 3.004	37.450 37.450	375 375
22	509509.527	126052.889	38.750	1.301	1350		1 2 0	3.004 1.009 1.010	37.449 37.450 37.450	375 375 225
OUTFALL	509499.736	126055.401	38.500	1.100	1200		1	1.010	37.400	225

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	45	5	0

Node 22 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	37.450	Product Number	CTL-SHE-0128-7500-1000-7500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	7.5	Min Node Diameter (mm)	1200

Node 6 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	38.110	Product Number	CTL-SHE-0072-2500-1200-2500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node 22 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.449
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	58.0	0.0	1.300	256.0	0.0

Node 16 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	37.450
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	258.0	0.0	1.200	258.0	0.0	1.201	0.0	0.0

Node 12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.185
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	182.5	0.0	1.200	182.5	0.0	1.201	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.25%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	38.763	0.043	3.2	0.0621	0.0000	OK
15 minute winter	2	10	38.616	0.066	7.8	0.0991	0.0000	OK
15 minute winter	3	10	38.574	0.104	18.4	0.1924	0.0000	OK
15 minute winter	4	11	38.470	0.125	26.7	0.2013	0.0000	OK
15 minute winter	5	11	38.418	0.238	31.6	0.3435	0.0000	OK
15 minute winter	11	10	38.436	0.066	7.3	0.1157	0.0000	OK
240 minute winter	12	192	38.388	0.203	8.5	35.4677	0.0000	OK
15 minute winter	6	11	38.402	0.292	35.9	0.4047	0.0000	OK
15 minute winter	7	10	38.073	0.058	5.9	0.0756	0.0000	OK
15 minute winter	8	11	38.006	0.071	9.4	0.0940	0.0000	OK
15 minute winter	9	11	37.906	0.096	15.5	0.1531	0.0000	OK
360 minute winter	10	272	37.730	0.130	4.6	0.1865	0.0000	OK
15 minute winter	18	10	39.793	0.048	8.8	0.0879	0.0000	OK
15 minute winter	21	10	38.821	0.046	3.6	0.0681	0.0000	OK
15 minute winter	19	10	38.688	0.088	12.1	0.0990	0.0000	OK
15 minute winter	20	11	38.627	0.082	24.0	0.1683	0.0000	OK
15 minute winter	17	10	38.857	0.052	8.8	0.0956	0.0000	OK
15 minute winter	13	10	38.592	0.042	6.8	0.0697	0.0000	OK
15 minute winter	14	10	38.173	0.073	14.3	0.1256	0.0000	OK
15 minute winter	15	10	38.083	0.183	58.7	0.4312	0.0000	OK
360 minute winter	16	272	37.730	0.280	13.8	69.6619	0.0000	OK
360 minute winter	22	272	37.730	0.281	10.8	23.0990	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	37.400	0.000	5.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	3.1	0.598	0.077	0.0816	
15 minute winter	2	1.001	3	7.7	0.471	0.108	0.3174	
15 minute winter	3	1.002	4	18.3	0.743	0.255	0.7335	
15 minute winter	4	1.003	5	26.6	0.685	0.371	1.7191	
15 minute winter	5	1.004	6	32.5	0.513	0.443	1.0351	
15 minute winter	11	2.000	12	7.1	0.750	0.178	0.1773	
240 minute winter	12	2.001	6	-5.6	-0.209	-0.078	1.0543	
15 minute winter	6	Hydro-Brake®	7	2.3				
15 minute winter	7	1.006	8	5.9	0.530	0.082	0.2138	
15 minute winter	8	1.007	9	9.1	0.578	0.127	0.4740	
15 minute winter	9	1.008	10	15.2	0.802	0.212	0.6104	
360 minute winter	10	1.009	22	4.6	0.433	0.032	1.7786	
15 minute winter	18	3.000	19	8.6	1.413	0.097	0.2238	
15 minute winter	21	4.000	19	3.5	0.617	0.087	0.0952	
15 minute winter	19	3.001	20	12.1	0.741	0.171	0.2196	
15 minute winter	20	3.002	15	23.7	1.340	0.167	0.6695	
15 minute winter	17	5.000	15	8.5	1.252	0.114	0.2488	
15 minute winter	13	6.000	14	6.7	0.712	0.043	0.2194	
15 minute winter	14	6.001	15	14.1	0.932	0.113	0.1787	
15 minute winter	15	3.003	16	60.4	1.951	0.391	2.5131	
360 minute winter	16	3.004	22	4.5	-0.149	0.332	1.7009	
360 minute winter	22	Hydro-Brake®	OUTFALL	7.5				198.3

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.25%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	38.793	0.073	8.1	0.1044	0.0000	OK
15 minute winter	2	12	38.785	0.235	20.4	0.3551	0.0000	OK
15 minute winter	3	12	38.778	0.308	43.4	0.5720	0.0000	SURCHARGED
240 minute winter	4	236	38.732	0.387	13.2	0.6243	0.0000	SURCHARGED
240 minute winter	5	236	38.732	0.552	15.0	0.7967	0.0000	SURCHARGED
240 minute winter	11	236	38.732	0.362	3.5	0.6309	0.0000	SURCHARGED
240 minute winter	12	236	38.732	0.547	19.2	95.6660	0.0000	SURCHARGED
240 minute winter	6	236	38.732	0.622	16.2	0.8616	0.0000	SURCHARGED
15 minute winter	7	10	38.096	0.081	11.5	0.1066	0.0000	OK
360 minute winter	8	344	38.063	0.128	4.8	0.1692	0.0000	OK
360 minute winter	9	344	38.063	0.253	7.1	0.4039	0.0000	OK
360 minute winter	10	344	38.063	0.463	7.1	0.6626	0.0000	SURCHARGED
15 minute winter	18	10	39.823	0.078	22.4	0.1434	0.0000	OK
15 minute winter	21	10	38.851	0.076	9.2	0.1122	0.0000	OK
15 minute winter	19	10	38.749	0.149	31.0	0.1681	0.0000	OK
15 minute winter	20	10	38.680	0.135	61.3	0.2775	0.0000	OK
15 minute winter	17	10	38.888	0.083	22.4	0.1531	0.0000	OK
15 minute winter	13	10	38.616	0.066	17.2	0.1098	0.0000	OK
15 minute winter	14	10	38.224	0.124	36.4	0.2127	0.0000	OK
15 minute winter	15	11	38.214	0.314	150.1	0.7414	0.0000	OK
360 minute winter	16	344	38.063	0.613	27.4	152.2973	0.0000	SURCHARGED
360 minute winter	22	344	38.063	0.614	17.2	65.9759	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	37.400	0.000	7.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	8.3	0.747	0.207	0.3246	
15 minute winter	2	1.001	3	18.4	0.559	0.258	1.2491	
15 minute winter	3	1.002	4	41.3	0.832	0.577	2.0987	
240 minute winter	4	1.003	5	12.5	0.470	0.174	2.7618	
240 minute winter	5	1.004	6	14.1	0.254	0.192	1.1224	
240 minute winter	11	2.000	12	3.4	0.528	0.085	0.7415	
240 minute winter	12	2.001	6	-13.6	-0.220	-0.189	1.2500	
240 minute winter	6	Hydro-Brake®	7	2.3				
15 minute winter	7	1.006	8	11.4	0.608	0.160	0.3626	
360 minute winter	8	1.007	9	4.8	0.511	0.067	1.3570	
360 minute winter	9	1.008	10	7.1	0.639	0.099	2.1548	
360 minute winter	10	1.009	22	6.3	0.492	0.044	3.2061	
15 minute winter	18	3.000	19	22.0	1.835	0.247	0.4412	
15 minute winter	21	4.000	19	9.1	0.789	0.226	0.1929	
15 minute winter	19	3.001	20	30.6	0.942	0.433	0.4413	
15 minute winter	20	3.002	15	60.6	1.412	0.426	1.5868	
15 minute winter	17	5.000	15	22.1	1.320	0.295	0.8008	
15 minute winter	13	6.000	14	17.1	0.900	0.109	0.4440	
15 minute winter	14	6.001	15	35.5	0.935	0.285	0.4351	
15 minute winter	15	3.003	16	151.3	2.144	0.979	5.9882	
360 minute winter	16	3.004	22	7.7	-0.179	0.571	2.1186	
360 minute winter	22	Hydro-Brake®	OUTFALL	7.5				217.1

Results for 100 year +45% CC +5% A Critical Storm Duration. Lowest mass balance: 99.25%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	1	440	40.043	1.323	1.7	1.9247	0.0000	FLOOD RISK
480 minute winter	2	440	40.043	1.493	4.1	2.2797	0.0000	FLOOD RISK
480 minute winter	3	440	40.043	1.573	9.2	2.9791	0.0000	SURCHARGED
480 minute winter	4	440	40.043	1.698	13.6	2.7791	0.0000	SURCHARGED
480 minute winter	5	440	40.042	1.862	16.2	2.7166	0.0000	SURCHARGED
480 minute winter	11	440	40.040	1.670	3.9	2.9592	3.2468	FLOOD
480 minute winter	12	440	40.041	1.856	22.6	210.8892	0.0000	FLOOD RISK
480 minute winter	6	440	40.041	1.931	18.4	2.7002	0.0000	SURCHARGED
600 minute winter	7	585	38.628	0.613	3.7	0.8095	0.0000	SURCHARGED
600 minute winter	8	585	38.628	0.693	5.1	0.9191	0.0000	SURCHARGED
600 minute winter	9	585	38.627	0.817	7.4	1.3225	0.0000	SURCHARGED
600 minute winter	10	585	38.627	1.027	7.1	1.4696	0.0000	SURCHARGED
15 minute winter	18	10	39.855	0.110	43.2	0.2055	0.0000	OK
15 minute winter	21	12	39.369	0.594	21.2	0.8907	0.0000	SURCHARGED
15 minute winter	19	12	39.352	0.752	56.1	0.8509	0.0000	SURCHARGED
15 minute winter	20	12	39.311	0.766	106.8	1.6038	0.0000	SURCHARGED
15 minute winter	17	12	39.172	0.367	43.2	0.6872	0.0000	SURCHARGED
15 minute winter	13	12	39.044	0.494	33.4	0.8297	0.0000	SURCHARGED
15 minute winter	14	12	39.027	0.927	66.1	1.6208	0.0000	SURCHARGED
15 minute winter	15	12	38.984	1.084	245.1	2.6074	0.0000	SURCHARGED
600 minute winter	16	585	38.627	1.177	32.5	292.4823	0.0000	FLOOD RISK
600 minute winter	22	585	38.627	1.178	22.1	177.2186	0.0000	FLOOD RISK
15 minute summer	OUTFALL	1	37.400	0.000	7.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	1	1.000	2	1.6	0.484	0.040	0.6248	
480 minute winter	2	1.001	3	3.6	0.371	0.051	1.3560	
480 minute winter	3	1.002	4	8.9	0.537	0.125	2.0987	
480 minute winter	4	1.003	5	13.4	0.458	0.187	2.7618	
480 minute winter	5	1.004	6	16.0	0.234	0.218	1.1224	
480 minute winter	11	2.000	12	3.7	0.425	0.092	0.7415	
480 minute winter	12	2.001	6	-16.3	-0.231	-0.226	1.2500	
480 minute winter	6	Hydro-Brake®	7	2.7				
600 minute winter	7	1.006	8	3.6	0.485	0.051	1.3580	
600 minute winter	8	1.007	9	4.9	0.508	0.068	2.0727	
600 minute winter	9	1.008	10	7.1	0.594	0.099	2.2671	
600 minute winter	10	1.009	22	6.9	0.455	0.048	3.2061	
15 minute winter	18	3.000	19	43.0	1.879	0.483	1.0864	
15 minute winter	21	4.000	19	16.3	0.774	0.408	0.6671	
15 minute winter	19	3.001	20	52.1	0.966	0.737	0.9464	
15 minute winter	20	3.002	15	97.5	1.385	0.686	2.4578	
15 minute winter	17	5.000	15	39.7	1.291	0.528	1.4476	
15 minute winter	13	6.000	14	30.8	0.923	0.197	1.6053	
15 minute winter	14	6.001	15	60.4	0.886	0.484	0.6993	
15 minute winter	15	3.003	16	239.0	2.187	1.546	8.2862	
600 minute winter	16	3.004	22	10.3	-0.169	0.768	2.1186	
600 minute winter	22	Hydro-Brake®	OUTFALL	8.1				341.1



APPENDIX 6

Surface Water Calculations - Network 2

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
23	0.080	5.00	41.190	1200	509612.701	126197.486	1.590
24	0.021	5.00	40.950	1200	509613.086	126167.149	1.605
25	0.082	5.00	40.790	1200	509656.596	126168.264	1.625
26	0.058	5.00	40.520	1200	509688.769	126154.328	1.660
33	0.090	5.00	40.300	1200	509702.973	126122.642	1.470
OUTFALL			39.000	1200	509720.064	126110.521	0.300
27	0.073	5.00	40.875	1200	509658.554	126188.670	1.625
28	0.047	5.00	40.565	1200	509698.568	126176.825	1.485
29	0.019	5.00	40.415	1200	509680.964	126143.436	1.400
30	0.045	5.00	40.690	1200	509636.115	126120.019	1.425
31	0.022	5.00	40.560	1200	509652.075	126120.375	1.425
32	0.019	5.00	40.450	1200	509665.402	126126.642	1.425

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	23	24	30.339	0.600	39.600	39.420	0.180	168.6	225	5.50	50.0
1.001	24	25	43.524	0.600	39.345	39.165	0.180	241.8	300	6.22	50.0
1.002	25	26	35.062	0.600	39.165	38.860	0.305	115.0	300	6.62	49.1
1.003	26	33	7.700	0.600	38.860	38.830	0.030	256.7	300	6.75	48.6
1.004	33	OUTFALL	20.953	0.600	38.830	38.700	0.130	161.2	225	7.09	47.5

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.004	39.9	10.8	1.365	1.305	0.080	0.0	80	0.854
1.001	1.006	71.1	13.7	1.305	1.325	0.101	0.0	89	0.782
1.002	1.465	103.6	34.0	1.325	1.360	0.256	0.0	118	1.317
1.003	0.977	69.0	50.1	1.360	1.170	0.380	0.0	190	1.062
1.004	1.027	40.8	71.6	1.245	0.075	0.556	0.0	225	1.046

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	27	25	20.500	0.600	39.250	39.165	0.085	241.2	300	5.34	50.0
3.000	28	26	24.538	0.600	39.080	38.935	0.145	169.2	225	5.41	50.0
4.000	29	26	13.400	0.600	39.015	38.935	0.080	167.5	225	5.22	50.0
5.000	30	31	15.964	0.600	39.265	39.135	0.130	122.8	225	5.23	50.0
5.001	31	32	14.727	0.600	39.135	39.025	0.110	133.9	225	5.44	50.0
5.002	32	33	37.783	0.600	39.025	38.830	0.195	193.8	225	6.12	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.008	71.2	9.9	1.325	1.325	0.073	0.0	75	0.715
3.000	1.002	39.8	6.4	1.260	1.360	0.047	0.0	60	0.735
4.000	1.007	40.0	2.6	1.175	1.360	0.019	0.0	38	0.566
5.000	1.178	46.9	6.1	1.200	1.200	0.045	0.0	55	0.821
5.001	1.128	44.9	9.1	1.200	1.200	0.067	0.0	68	0.885
5.002	0.936	37.2	11.7	1.200	1.245	0.086	0.0	87	0.831

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	30.339	168.6	225	Circular	41.190	39.600	1.365	40.950	39.420	1.305
1.001	43.524	241.8	300	Circular	40.950	39.345	1.305	40.790	39.165	1.325
1.002	35.062	115.0	300	Circular	40.790	39.165	1.325	40.520	38.860	1.360
1.003	7.700	256.7	300	Circular	40.520	38.860	1.360	40.300	38.830	1.170
1.004	20.953	161.2	225	Circular	40.300	38.830	1.245	39.000	38.700	0.075
2.000	20.500	241.2	300	Circular	40.875	39.250	1.325	40.790	39.165	1.325
3.000	24.538	169.2	225	Circular	40.565	39.080	1.260	40.520	38.935	1.360
4.000	13.400	167.5	225	Circular	40.415	39.015	1.175	40.520	38.935	1.360

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	23	1200	Manhole	Adoptable	24	1200	Manhole	Adoptable
1.001	24	1200	Manhole	Adoptable	25	1200	Manhole	Adoptable
1.002	25	1200	Manhole	Adoptable	26	1200	Manhole	Adoptable
1.003	26	1200	Manhole	Adoptable	33	1200	Manhole	Adoptable
1.004	33	1200	Manhole	Adoptable	OUTFALL	1200	Manhole	Adoptable
2.000	27	1200	Manhole	Adoptable	25	1200	Manhole	Adoptable
3.000	28	1200	Manhole	Adoptable	26	1200	Manhole	Adoptable
4.000	29	1200	Manhole	Adoptable	26	1200	Manhole	Adoptable

Pipeline Schedule

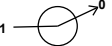
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.000	15.964	122.8	225	Circular	40.690	39.265	1.200	40.560	39.135	1.200
5.001	14.727	133.9	225	Circular	40.560	39.135	1.200	40.450	39.025	1.200
5.002	37.783	193.8	225	Circular	40.450	39.025	1.200	40.300	38.830	1.245

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.000	30	1200	Manhole	Adoptable	31	1200	Manhole	Adoptable
5.001	31	1200	Manhole	Adoptable	32	1200	Manhole	Adoptable
5.002	32	1200	Manhole	Adoptable	33	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
23	509612.701	126197.486	41.190	1.590	1200		0	1.000	39.600	225
24	509613.086	126167.149	40.950	1.605	1200		1	1.000	39.420	225
25	509656.596	126168.264	40.790	1.625	1200		0	1.001	39.345	300
							1	2.000	39.165	300
							2	1.001	39.165	300
26	509688.769	126154.328	40.520	1.660	1200		0	1.002	39.165	300
							1	4.000	38.935	225
							2	3.000	38.935	225
							3	1.002	38.860	300
33	509702.973	126122.642	40.300	1.470	1200		0	1.003	38.860	300
							1	5.002	38.830	225
							2	1.003	38.830	300
OUTFALL	509720.064	126110.521	39.000	0.300	1200		0	1.004	38.830	225
							1	1.004	38.700	225
27	509658.554	126188.670	40.875	1.625	1200		0	2.000	39.250	300
28	509698.568	126176.825	40.565	1.485	1200		0	3.000	39.080	225
29	509680.964	126143.436	40.415	1.400	1200		0	4.000	39.015	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
30	509636.115	126120.019	40.690	1.425	1200				
						0	5.000	39.265	225
31	509652.075	126120.375	40.560	1.425	1200		1	5.000	39.135
						0	5.001	39.135	225
32	509665.402	126126.642	40.450	1.425	1200		1	5.001	39.025
						0	5.002	39.025	225

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	45	5	0

Node 33 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	38.830	Product Number	CTL-SHE-0090-3800-1200-3800
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	3.8	Min Node Diameter (mm)	1200

Node 33 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.830
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	350.0	0.0	1.470	840.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	23	10	39.683	0.083	11.5	0.1772	0.0000	OK
15 minute winter	24	11	39.434	0.089	14.0	0.1242	0.0000	OK
15 minute winter	25	11	39.284	0.119	35.5	0.2553	0.0000	OK
15 minute summer	26	9	39.109	0.249	51.6	0.4561	0.0000	OK
480 minute winter	33	352	39.031	0.201	11.4	77.6339	0.0000	OK
15 minute summer	OUTFALL	1	38.700	0.000	2.3	0.0000	0.0000	OK
15 minute winter	27	10	39.326	0.076	10.5	0.1549	0.0000	OK
15 minute winter	28	10	39.142	0.062	6.8	0.1089	0.0000	OK
15 minute winter	29	8	39.119	0.104	2.7	0.1452	0.0000	OK
15 minute winter	30	10	39.322	0.057	6.5	0.1009	0.0000	OK
15 minute winter	31	11	39.206	0.071	9.6	0.1017	0.0000	OK
15 minute winter	32	10	39.123	0.098	12.0	0.1365	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	23	1.000	24	11.1	0.857	0.279	0.3938	
15 minute winter	24	1.001	25	14.0	0.644	0.197	0.9493	
15 minute winter	25	1.002	26	35.2	0.948	0.340	1.4669	
15 minute summer	26	1.003	33	56.2	2.016	0.815	0.2465	
480 minute winter	33	Hydro-Brake®	OUTFALL	3.6				107.5
15 minute winter	27	2.000	25	10.3	0.534	0.145	0.4092	
15 minute winter	28	3.000	26	6.7	0.492	0.167	0.4949	
15 minute winter	29	4.000	26	3.9	0.331	0.097	0.3346	
15 minute winter	30	5.000	31	6.4	0.691	0.137	0.1481	
15 minute winter	31	5.001	32	9.4	0.701	0.209	0.1997	
15 minute winter	32	5.002	33	12.4	1.268	0.334	0.4334	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	23	10	39.747	0.147	29.3	0.3139	0.0000	OK
15 minute winter	24	11	39.494	0.149	36.0	0.2071	0.0000	OK
15 minute winter	25	11	39.453	0.288	87.6	0.6173	0.0000	OK
360 minute winter	26	344	39.247	0.387	19.3	0.7079	0.0000	SURCHARGED
360 minute winter	33	344	39.247	0.417	27.2	175.7864	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	38.700	0.000	3.6	0.0000	0.0000	OK
15 minute winter	27	12	39.461	0.211	26.8	0.4273	0.0000	OK
15 minute winter	28	10	39.272	0.192	17.2	0.3383	0.0000	OK
15 minute winter	29	10	39.249	0.234	7.0	0.3280	0.0000	SURCHARGED
15 minute winter	30	10	39.361	0.096	16.5	0.1686	0.0000	OK
15 minute winter	31	10	39.263	0.128	24.4	0.1845	0.0000	OK
360 minute winter	32	344	39.247	0.222	4.4	0.3100	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	23	1.000	24	28.4	1.076	0.711	0.8043	
15 minute winter	24	1.001	25	35.9	0.745	0.505	2.2713	
15 minute winter	25	1.002	26	85.8	1.262	0.828	2.4537	
360 minute winter	26	1.003	33	18.7	0.906	0.270	0.5422	
360 minute winter	33	Hydro-Brake®	OUTFALL	3.8				112.5
15 minute winter	27	2.000	25	23.5	0.631	0.330	1.2518	
15 minute winter	28	3.000	26	17.8	0.459	0.448	0.9305	
15 minute winter	29	4.000	26	8.2	0.338	0.205	0.5329	
15 minute winter	30	5.000	31	16.3	0.828	0.348	0.3144	
15 minute winter	31	5.001	32	24.0	0.889	0.534	0.3964	
360 minute winter	32	5.002	33	4.2	0.560	0.112	1.4999	

Results for 100 year +45% CC +5% A Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	23	12	41.024	1.424	56.8	3.1162	0.0000	FLOOD RISK
15 minute winter	24	12	40.714	1.369	60.8	1.9254	0.0000	FLOOD RISK
15 minute winter	25	12	40.551	1.386	156.6	3.0372	0.0000	FLOOD RISK
15 minute winter	26	11	39.736	0.876	233.5	1.6333	0.0000	SURCHARGED
720 minute winter	33	705	39.635	0.805	29.4	391.4900	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	38.700	0.000	3.8	0.0000	0.0000	OK
15 minute winter	27	11	40.595	1.345	51.8	2.7888	0.0000	FLOOD RISK
15 minute winter	28	11	39.840	0.760	33.4	1.3644	0.0000	SURCHARGED
15 minute winter	29	11	39.746	0.731	13.5	1.0349	0.0000	SURCHARGED
15 minute winter	30	11	39.663	0.398	32.0	0.7133	0.0000	SURCHARGED
720 minute winter	31	705	39.635	0.500	3.7	0.7270	0.0000	SURCHARGED
720 minute winter	32	705	39.635	0.610	4.6	0.8602	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	23	1.000	24	48.1	1.211	1.206	1.2066	
15 minute winter	24	1.001	25	62.0	0.880	0.871	3.0649	
15 minute winter	25	1.002	26	155.3	2.205	1.499	2.4690	
15 minute winter	26	1.003	33	232.4	3.470	3.367	0.5422	
720 minute winter	33	Hydro-Brake®	OUTFALL	3.8				165.0
15 minute winter	27	2.000	25	44.5	0.635	0.625	1.4436	
15 minute winter	28	3.000	26	30.6	0.769	0.768	0.9759	
15 minute winter	29	4.000	26	12.0	0.372	0.299	0.5329	
15 minute winter	30	5.000	31	28.9	0.883	0.617	0.6349	
720 minute winter	31	5.001	32	3.5	0.506	0.077	0.5857	
720 minute winter	32	5.002	33	4.5	0.511	0.120	1.5027	



APPENDIX 7

Surface Water Calculations – Pond Network

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Attenuation Basin 3	0.173	40.300	1200	509657.487	126084.457	1.060

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	45	5	0

Node Attenuation Basin 3 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.750	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	2.0		
Invert Level (m)	39.240	Diameter (m)	0.033		

Node Attenuation Basin 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	39.240
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	148.0	0.0	1.060	338.0	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
480 minute winter	Attenuation Basin 3	368	39.407	0.167	3.6	27.7525	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)				
480 minute winter	Attenuation Basin 3	Orifice	0.9	26.2				

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

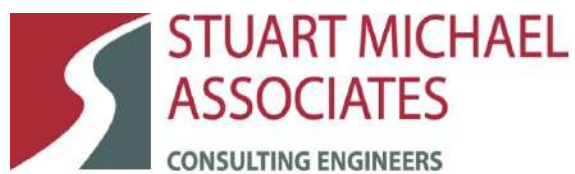
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Attenuation Basin 3	344	39.565	0.325	8.8	58.7305	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Attenuation Basin 3	Orifice	1.3	33.9

Results for 100 year +45% CC +5% A 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
480 minute winter	Attenuation Basin 3	464	39.828	0.588	13.2	120.1197	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Attenuation Basin 3	Orifice	1.7	55.8



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