

Foul & SuDS Drainage Statement Gatehouse Lane Development



Project	Gatehouse Lane Development
Project No.	1837
Client	Bedford Park Developments
Date	12 April 2024
Prepared by	Haworth McCall Consulting

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1 Introduction & Planning Background

This Statement has been prepared for Bedford Park Developments in relation to build a mixed-use commercial park including a wellness centre E(d) and 19 units for Class E(g), B2 or B8 uses, at the existing Farmers Stores site, Gatehouse Lane, Goddards Green, Hassocks, West Sussex BN6 9LE.

This statement is prepared to support the discharge of planning condition #3 of the Decision Notice relating to planning ref DM/23/1051, which reads as follows:

The development hereby permitted shall not commence unless and until details of the proposed foul and surface water drainage and means of disposal have been submitted to and approved in writing by the local planning authority. No building shall be occupied until all the approved drainage works have been carried out in accordance with the approved details. The details shall include a timetable for its implementation and a management and maintenance plan for the lifetime of the development which shall include arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime. Maintenance and management during the lifetime of the development should be in accordance with the approved details.

Reason: To ensure that the proposal is satisfactorily drained and to accord with the NPPF requirements, and Policy DP41 of the Mid Sussex District Plan (2014 - 2031).

Haworth McCall was appointed by Bedford Park Developments to provide a Foul & Surface Water (SuDS) Drainage Statement to assist with the discharge of the above condition. No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

2 Existing Site

The application site lies in Goddards Green, approximately 2.5km west of Burgess Hill town centre. The area is administered by Mid Sussex District Council (MSDC).

The site comprises a shingle/concrete parking area with agricultural/industrial storage units, skips and sheds. Access is from Gatehouse Lane to the north. A site location map and aerial view of the site are shown in Appendix A.

Topography: a topographic survey is shown in Appendix B. Topographical levels broadly slope from northwest to southeast, with site levels measuring between 30.74m AOD in the Gatehouse Lane entrance and 24.58m AOD in the southeast corner. A site survey is included in Appendix B.

Hydrology: two ditch watercourses from northeast and southeast of the site converge approximately 140m to the south to form the westbound Pook Bourne, a tributary of Herrings Stream. A pond (formerly known as Jackson's pit) lies 80m east of the site.

Geology: The BGS's online geology map shows the soil type is Weald Clay Formation (mudstone), with no superficial deposits overlying this solid bedrock.

Public Sewers: Southern Water confirms that there are no public assets in this vicinity.

3 Proposed Development Drainage Design

The proposal is to build a mixed-use commercial park including a Wellness Centre and 19 industrial units.

3.1 Surface Water Design

The NPPF states that SuDS should be utilised unless there are practical reasons for not doing so. The SuDS hierarchy has been applied, with infiltration features at the top of this list.

The Drainage Strategy that supported the Planning Application (prepared by Herringtons) stated that the Weald Clay is unlikely to be suitable for infiltration. This was accepted by the LLFA with Planning Permission granted subsequently. BRE365 testing was conducted at one location on site, with the tests abandoned after 24 hours as the water level failed to drop. Percolation tests have also been conducted at two other locations on site, confirming a low rate (10^{-6} m/s). The test results are included in Appendix B.

Rainwater will be routed to and discharged into the adjacent watercourse to the south via gravity. The offsite flow rate of 44l/s was set out by Herringtons in the FRA; and agreed with the LLFA.

The hard standing parking bays will have porous paved surfaces, with sub-bases of coarse granular fill (0.3 voids ratio). Those at higher elevations will have orifice plates to restrict the flow rate into the main network. The orifices diameters vary between 50 and 100mm. The drainage layout is shown in Appendix C. The roads and circulation areas will be impermeable (tarmac); these have been designed such that flows are directed to the porous pavings – or to trapped gullies/channels.

In addition to the porous pavings there is an SDS (or similar) attenuation tank. This is fitted with a 300mm dia perforated pipe along its length. This augments the porous pavings' treatment strategy.

CIRA's tables 26.2 and 26.3 set out the pollution and mitigation indices for discharge to surface waters. The pollution indices for a commercial yard (medium) are 0.7, 0.6 and 0.7 respectively. The corresponding mitigation indices for permeable pavings are the same, ie 0.7, 0.6 and 0.7.

It must be stressed that this level of treatment provides a significant betterment compared to the existing brownfield setup: the runoff currently has no treatment before it is discharged into the watercourse.

Causeway Flow calculations in Appendix D show the network calculation sheets for this design. These show all the storage nodes and controls throughout the network. The impermeable catchments are illustrated in Appendix C.

Exceedance flows: if the surface water system were to 'fail', ie get silted up – or in an extreme storm event, the resulting flow would go south - southeast into the watercourse. See the exceedance flows layout drawing in Appendix C.

Phasing of Construction Works: the network shall be formed upstream, with outfall and control manholes in place first. The pavings shall be built last and the roofs' drainage connected to the network only at the end. In this way there shall be minimal impact on the watercourse. The drainage network will be flushed of construction silts into a silt bag prior to first operation. Silt fences / straw bales will be set up to protect the watercourse during the works.

Ordinary Watercourse Consent will be sought for the proposed outfall headwall. Drainage details are set out in Appendix C.

3.2 Foul Water Design

As part of the approved planning consent, it was determined that foul drainage will be by means of a packaged sewerage treatment plant, the principle of which was accepted by the Council's Flood Risk and Drainage Team.

The packaged sewerage treatment plant has been specifically designed to deal with the loadings of the proposals adopting a robust position. It is intended that an application seeking a variation to a historical consent to discharge or an application for a new Environmental Permit from the EA will be submitted.

Given the strategy is to improve the existing site conditions generally there is not anticipated to be any issue for the Environment Agency to Grant a volume increase even if it means treating to a higher final effluent quality. Should it be the case that no record of an old consent to discharge exists then it has been confirmed by the chosen supplier of the packaged treatment plant (BioBubble) that there should be no issue securing a new permit as the proposed plant will be capable of exceeding any legal final effluent quality likely to be set within a New Environmental Permit. This accords with EA Guidelines and addresses the guidance note criteria.

The proposed foul drainage network is shown on the drainage layout in Appendix C. The specified package sewage treatment plant is a BioBubble unit capable of processing at least 11.1cu.m./day. This provides the following effluent quality: BOD 10mg/l, SS 20mg/l, Ammonia <1mg/l. The BioBubble design information are included in Appendix F.

3.3 Maintenance

The Applicant (developer) shall be responsible for the drainage networks. They are likely to contract out the responsibility for the ongoing maintenance of the drainage components, i.e. pipes, manholes, pavings and soakaways to an Estate Management Company. A Drainage Maintenance Plan has been set up in line with industry best practice – as set out in The SuDS Manual (CIRIA C753, 2015) - and the susdrain website (www.susdrain.org). Refer to Appendix E.

It is contended that this development's SuDS design is fully compliant with the PPG/NPPF. All the items listed in the relevant drainage condition have been addressed in full.

- End of Statement -

Appendix A - Site Location Map & Aerial View





Appendix B - Topographic Survey & Infiltration Tests



EXISTING SITE PLAN

1:500



SeSurveying

Line types and Symbols

Building Lines	_____	Garden Line	_____	Road Markings	_____
Rooflines	_____	Scrub Line	~~~~~	Hedge Line	~~~~~
Top & Back of Kerb	_____	Gullies / Waste Water	 Gully 100.19	Walls	 tw 100.40
Edge of Surface / Footpath	_____	Man holes & Flow	 MH 100.40	Steps	 100.20
Edge of Road	_____	Trees	 100.40	Plant	 Plant
Edge of Concrete	_____	Spot Levels	 100.40	Gates	 Gate
Top of bank	_____				
Bottom of bank	_____				
Fence / Handrail	_____				
Overhead Cables	_____				

Bedford Park III

Client Bedford Park Developments

Project The Gatehouse, Gatehouse Lane, Goddards Green, Hassocks, BN6 9LE

Drawing Title EXISTING SITE PLAN

Drawing Scale(s) 1:500, @ A1 Status PLANNING

Drawing Number PROJECT - STAGE - DRAWING - REVISION

2210-P-002 A



TCT Construction Limited

4th April 2024

To: Bedford Developments Limited

Please see the results and pictures of the percolation test undertaken in accordance with BRE 365 regulations.

Test carried out at site: Farmer stores, Gate house lane, Goddards Green.

Please see attached; -

- Block & Location Plan
- Percolation Test Recording Sheet for Pits 1 & 2
- Photos Pit 1
- Photos Pit 2
- Results of Pit 3 in line with BRE 365 Regulations
- Photos Pit 3

Conclusion

To conclude the ground is made up in the main of dense clay. Therefore, deemed not suitable for infiltration as per the attached test results.

Regards Luke Malins Director
TCT Construction Limited

07833478786 

Luke@tct-construction.co.uk 

TCT Construction 

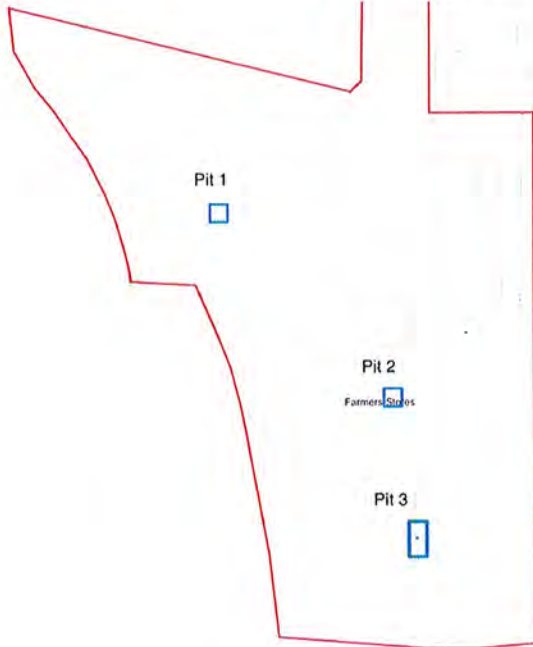
Office No 07811441126 

TCT

TCT Construction Limited

17:59 Wed 20 Mar

2210-P-001 BLOCK & LOCATION PLAN
PDF - 513 KB



LOCATION PLAN

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TCT Construction 🌐

Office No 07811441126 🖨️

TCT Construction Limited

Percolation Test Recording Sheet						
1	These tests should be carried out within and be representative of the proposed infiltration area which should be at least 5m from the intended building and any boundary					
2	Excavate 2 percolation holes: not less than 5m apart, 300mm square to a depth of 300mm below the proposed invert level of the effluent distribution pipe. Where deep holes are necessary, the hole should conform to this shape at the bottom but may be enlarged above the 300mm level to enable safe excavation to be carried out					
3	Fill the 300mm square section of the holes to a depth of at least 300mm with water and allow it to seep away overnight. It is important to saturate the soil surrounding the test hole to simulate day to day conditions in an operational drainage field					
4	Next day, refill the test sections with water to a depth of at least 300mm and observe the time (T) in seconds for the water to seep away from 75% to 25% full level					
5	Extreme weather conditions should be avoided when testing					
6	In evaluating your test results please note that where the Vp value does not fall between 15 secs:mm and 100secs:mm then infiltration trench or bed systems may not be possible					
Trial Hole	Depth below ground level	Depth of Water (minimum 300mm)	Time taken between 75% & 25% full (seconds) (T)	Percolation Value $Vp = T/150$ (Vp)	Occupant Capacity (P)	Minimum Area $A = P \times Vp \times 0.25$ (A)
1	(Test 1)	600 mm	4 hrs 30 mins			
	(Test 2)	600 mm	5 hrs 25 mins			
	(Test 3)	600 mm	5 hrs 30 mins			
2	(Test 1)	600 mm	4 hrs 35 mins			
	(Test 2)	600 mm	4 hrs 50 mins			
	(Test 3)	600 mm	5 hrs 30 mins			
			Average Vp	Average A m ²		
NB For wastewater that has received secondary treatment followed by settlement, the area may be reduced by 20% i.e. $A = P \times Vp \times 0.2$						
Site Location: <u>Former Store's Gate House Lane</u>						
Description of ground strata: <u>CLAY</u>						
Warrant Ref. Number if known: _____ Date test carried out: <u>12/12/23</u>						
Name of person carrying out the test: <u>LUKE MALINS</u>						
The water table is more than 1m below the bottom of the distribution pipes and I further confirm that there are no wells, springs or water abstraction points within 100m of the proposed infiltration area.						
Signed: _____ Date: <u>12/12/23</u>						
© Hafford & Son (Preston) Ltd recording sheet dec 14/08/2023						

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600mm)

PIT 2 (Pic 4 filled to



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PIT 1 (Pic 4 filled to 600mm)



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Percolation Test statistics Pit 3

Results and Pictures of Pit 3				
Pit (W)	Pit (L)	Pit (D)	Depth of Water	
600mm	2500mm	1500mm	1000mm	
Test Start Date		25/03/2024		
Test Start Time:		14.40		
Check Time Hours				
Results				
Check 1	15.00	No Change		
Check 2	15.20	No Change		
Check 3	15.40	10mm drop to 990mm		
Check 4	16.00	No Change		
Check 5	16.20	No Change		
Check 6	16.40	No Change		
Check 7	17.00	10mm drop to 980mm		
Check 8	17.20	No Change		
Check 9	17.40	No Change		
Check 10	18.00	No Change		
Check 11	18.20	No Change		
Check 12	18.40	No Change		
Test Start Date		26/03/2023		
Test Start Time:		07.00		
Check Time Hours				
Check 1	07.15	20mm drop to 960mm		
Check 2	07.45	No Change		
Check 3	08.15	No Change		
Check 4	08.45	No Change		
Check 5	09.15	No Change		

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**Pit 3 filled to 1000mm deep water level was still at 960mm
3 days later.**

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Job: 1837 Gatehouse Lane

Infiltration Calculator

$$f = \frac{Vp75-25}{ap50 \times tp75-25}$$

Vp 75-25 = Effective storage volume between 75% and 25% effective depth

ap50 = Internal surface area of the trial pit up to 50% effective depth and including the base area

tp75-25 = The time for the water level to fall from 75% to 25% effective depth

f = Infiltration rate

Trial pit width	=	0.3
Trial pit depth	=	0.6
Trial pit length	=	0.3

ap50 = 0.45 m/squared

tp75-25 = 18000 seconds

Vp 75-25 = 0.027 m/cubed

F = 3.33E-06

Appendix C – Drainage Design Drawings

- DESIGN NOTES**
1. STORAGE DESIGN BASED ON 1 IN 100 YR STORM + 45%.
 2. BUILDING DRAIN POINTS AND LOCATIONS TO BE CONFIRMED BY ARCHITECT.
 3. CONTRACTOR TO ESTABLISH LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCING.
 4. EXISTING TREES TO BE PROTECTED WHERE EXCAVATIONS RUN CLOSE.
 5. ORDINARY WATERCOURSE CONSENT (OWC) REQUIRED FOR NEW HEADWALL TO EXISTING DITCH.
 6. EFFLUENT DISCHARGE SUBJECT TO ENVIRONMENTAL PERMIT WITH THE EA (>5m³).
 7. PARKING AREAS: PARKING BAYS TO BE PERMEABLE WITH IMPERMEABLE CIRCULATION AREAS. IMPERMEABLE AREAS TO DRAIN TOWARDS PARKING BAYS, OR WHERE NOT POSSIBLE, TO DRAIN TO TRAPPED GULLY/CHANNEL WITH OUTFALL TO THE SUBBASE.
 8. EXISTING OUTFALL FROM SITE IS UNRESTRICTED AND WITHOUT TREATMENT. PROPOSED CONFIGURATION THEREFORE IMPROVES UPON EXISTING.

- ABBREVIATIONS**
- | | |
|---------|---|
| BO | BACKSTOP |
| BS | BASE LEVEL |
| CL | CONCRETE BED & SURROUND |
| CS | CAST IRON |
| CL | COVER LEVEL |
| CLASS B | CLASS B |
| CONC | CONCRETE |
| CPC | CAR PARK GULLY - D202.2 |
| CP | OFFICIAL NUMBER - SEE DRAINAGE DETAIL SHEET |
| DP | SURFACE WATER DISTRIBUTION TANK |
| FAC | 300mm DIA. FOUL INSPECTION CHAMBER - D202.18 |
| FIC | 450mm DIA. FOUL INSPECTION CHAMBER - D202.18 |
| FIC | FINISHED FLOOR LEVEL |
| FIC | ADAPTABLE FOUL WATER SEWER |
| G | GROUND LEVEL |
| HL | HIGH LEVEL |
| IL | INVERT LEVEL |
| INS | INSULATION |
| INCU | POLY(VINYL CHLORIDE) - UNRAISED |
| IR | ROAD GULLY - D202.1 |
| IR | EXTERNAL RIDDING POINT - D202.1 |
| IR | SUMMARY |
| IR | 300mm DIA. SURFACE WATER ACCESS CHAMBER - D202.18 |
| IR | 450mm DIA. SURFACE WATER INSPECTION CHAMBER - D202.18 |
| IR | SUMP LEVEL |
| IR | STUB TRACK OR DIRECT DRAIN CONNECTION |
| IR | STRUCTURAL SLAB LEVEL |
| IR | SOIL VENT PIPE (SWP) |
| IR | SURFACE WATER DRAIN |
| IR | ADAPTABLE SURFACE WATER SEWER |
| IR | VITRIFIED CLAY |
| IR | YARD GULLY - D202.2 |

- SPECIFICATION NOTES**
1. ALL DRAINAGE SHALL BE CONSTRUCTED AND COMMISSIONED IN ACCORDANCE WITH BS EN 256 & BS EN 752, BUILDING REGULATIONS DOC. H AND ANY PARTICULAR REQUIREMENTS OF THE BUILDING CONTROL OFFICE.
 2. DRAIN BEDDING IS TO BE PROVIDED AS D202.0, D202.1 AND D202.2 AS SHOWN ON THE DRAINAGE DETAILS SHEETS.
 3. EFFECTIVE COVER IS THE MINIMUM DEPTH OF COVER OVER THE PIPE CROWN AT ANY TIME DURING THE CONSTRUCTION PHASES.
 4. ALL CONCRETE PIPEWORK, MANHOLES AND FITTINGS SHALL BE TO BS 5911 (ALL RELEVANT PARTS). ALL CONCRETE PIPEWORK TO BE TO HIGH STRENGTH.
 5. WHERE CONNECTIONS ARE TO BE MADE TO EXISTING MANHOLES/SEWERS, INVERT LEVELS, PIPE SIZES & ORIENTATION SHALL BE CHECKED PRIOR TO THE COMMENCEMENT OF THE WORKS AND ANY VARIANCE REPORTED TO THE ENGINEER IMMEDIATELY - WORK TO COMMENCE AT DOWNSTREAM END WHEREVER POSSIBLE.
 6. WHERE PIPELINES CROSS, EACH IS TO BE SURROUNDED WITH GRADE 54 MASS CONCRETE FOR A DISTANCE NOT LESS THAN 1m CENTRED ON THE CROSSING POINT. LENGTH OF SURROUNDING TO BE EXTENDED AS NECESSARY TO WITHIN 150mm OF THE NEXT NEAREST FLEXIBLE JOINTS.
 7. THE CONTRACTOR IS TO ENSURE THAT PROTECTIVE MEASURES ARE TAKEN TO ENSURE THAT DRAINAGE PIPEWORK AND FITTINGS ARE NOT DAMAGED BY SITE TRAFFIC PRIOR TO OVERSIGHT FILLING OPERATIONS BEING COMPLETED AROUND BUILDINGS.
 8. ALL EXISTING DRAINAGE PIPEWORK SHALL BE RELOCATED AND ADAPTED DRAINAGE TO BE VC. ALL UNDERGROUND DRAINS TO BE LAID AT A GRADIENT OF 1:50.
 9. WHERE DRAINS PASS THROUGH FOUNDATIONS OR CONNECT TO MANHOLES, FLEXIBLE PIPE JOINTS ARE TO BE PROVIDED WITHIN 150mm OF THE FACE OF THE STRUCTURE AND WITHIN A FURTHER 500mm TO FORM A FLEXIBLE JOINT.
 10. WHERE PIPES PASS THROUGH SCREEN WALLS, FOOTINGS OR RETAINING WALLS, LIMITS ARE TO BE PROVIDED.
 11. WHERE PIPES PASS WITHIN 1m OF BUILDINGS OR WALLS THE FOUNDATIONS ARE TO BE REINFORCED DOWN BELOW THE BOTTOM OF THE TRENCH.
 12. 450mm DIA. INSPECTION CHAMBERS (FIC/SIC) MAY BE USED:
- WITH 350mm REDUCED OPENING WHERE THE DEPTH FROM COVER TO INVERT EXCEEDS 1000mm.
- 300mm DIA. POLYPROPYLENE ACCESS CHAMBERS (FAC/SAC) MAY BE USED:
- WHERE THE DEPTH FROM COVER TO INVERT DOES NOT EXCEED 600mm AND WHERE THE PIPE SIZE DOES NOT EXCEED 100mm DIA.
 13. STEEL COVERS WITH PROPERTY BOUNDARIES SHALL BE:
(UNLESS NOTED ON DRAWING OR MANHOLE SCHEDULE)
- ON PRIVATE DRIVEWAYS: FACTA GRADE 8 (BS EN ISO 1461:1999)
- ON PRIVATE PATHWAYS, VERGES OR ON GRASSES: FACTA GRADE 4 (BS EN ISO 1461:1999)
DUCTILE IRON COVERS OUTSIDE PROPERTY BOUNDARIES SHALL BE:
(UNLESS NOTED ON DRAWING OR MANHOLE SCHEDULE)
- ON ACCESS ROADS AND ON PAVES: GRADE 400 (BS EN 124:1994)
- ON SHARED PATHWAYS, VERGES: GRADE 435 (BS EN 124:1994)
 14. COVER LEVELS SHOWN 'CL' AND INVERT LEVELS SHOWN 'IL' ARE IN METRES ABOVE ORDNANCE DATUM.
 15. ALL DRAINS TO BE 100mm DIAMETER UNLESS NOTED OTHERWISE.
 16. ALL DRAIN PIPES 'Y' OR 'W' ARE PROPOSED ADAPTED SEWERS AND ARE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE (SSG)

SEE INSET BELOW FOR CONTINUATION

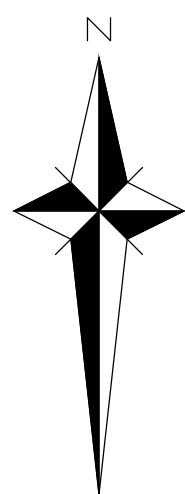
- GENERAL NOTES**
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- KEY**
- Existing surface water drain
 - Existing foul water drain
 - Private surface water drain
 - Private foul drain
 - Private treated effluent drain
 - Private Foul Water Manhole
 - Private Surface Water Manhole
 - Foul drain point D207.0
 - SW Drain point for RAMP D202.5
 - Drainage channel
 - FIC Foul Plastic Inspection Chamber - D202.6
 - SIC Surface Water Plastic Inspection Chamber - D202.6
 - SAC 300mm diameter Surface Water Access Chamber - D202.18
 - FAC 300mm diameter Foul Water Access Chamber - D202.18
 - YG Private Yard gully
 - RG Private Road gully
 - RP+ Roadway point
 - Impermeable surfacing with voided stone sub-base below, unless
 - Permeable parking bays with voided stone sub-base below, unless
 - Attenuation Tank

INSET SHOWING ACCESS ROAD AND JUNCTION TO GATEHOUSE LANE SCALE 1:200

ISSUE/REVISION	
P3	22.08.24 Updated to client's comments
P2	22.08.24 Updated to CV
P1	18.02.24 Final Issue For Condition Discharge
Client: BEDFORD PARK DEVELOPMENTS	
Project: Gatehouse Lane, Goddards Green, Hassocks, BN6 9 LE	
Drawing Title: PROPOSED SITE DRAINAGE LAYOUT	
Status: PRELIMINARY	
HaworthMcCall CONSULTING	
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Belfast Office: 88-72 Newtownards Road, Belfast, BT4 5DB Tel: +44 (0)1234 323300	
Scale: 1:200 @ A0	Date: February 2024
Drawing No: 1837-500	Rev: P3

SEE INSET BELOW FOR
CONTINUATION



GENERAL NOTES

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REFER TO DRAWING 1836-500 FOR FULL
DRAINAGE DESIGN.

KEY

- Existing surface water drain
- Existing foul water drain
- Private surface water drain
- Private foul drain
- Private treated effluent drain
- Drainage channel
- Impermeable surfacing with rodded stone sub-base below, unlit.
- Permeable parking bays with rodded stone sub-base below, unlit.
- Attenuation Tank
- Overland Flow Direction

INSET SHOWING
ACCESS ROAD AND
JUNCTION TO
GATEHOUSE LANE
SCALE 1:200

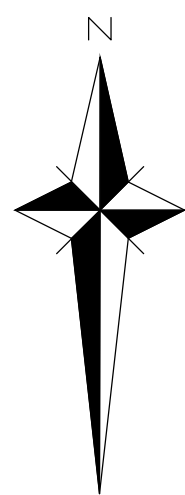
ISSUE/REVISION

P1	09.02.24	First Issue For Condition Discharge
Client:	BEDFORD PARK DEVELOPMENTS	
Project:	Gatehouse Lane, Goddards Green, Hassocks, BN9 9 LE	
Drawing Title:	EXCEEDANCE FLOW PLAN	
Status:	PRELIMINARY	

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CONSULTING

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Scale: 1:200 @ A0	Date: February 2024	HWS Project No: 1837-501
Drawing No: 1837-501	Rev: P1	

SEE INSET BELOW FOR
CONTINUATION



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1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non-intrusive observations, record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. Any discrepancies shall be notified to Haworth McCall prior to works commencing.
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 3. Do not scale. All dimensions and levels to be site confirmed.
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LEGEND

IMPERMEABLE CATCHMENT AREA

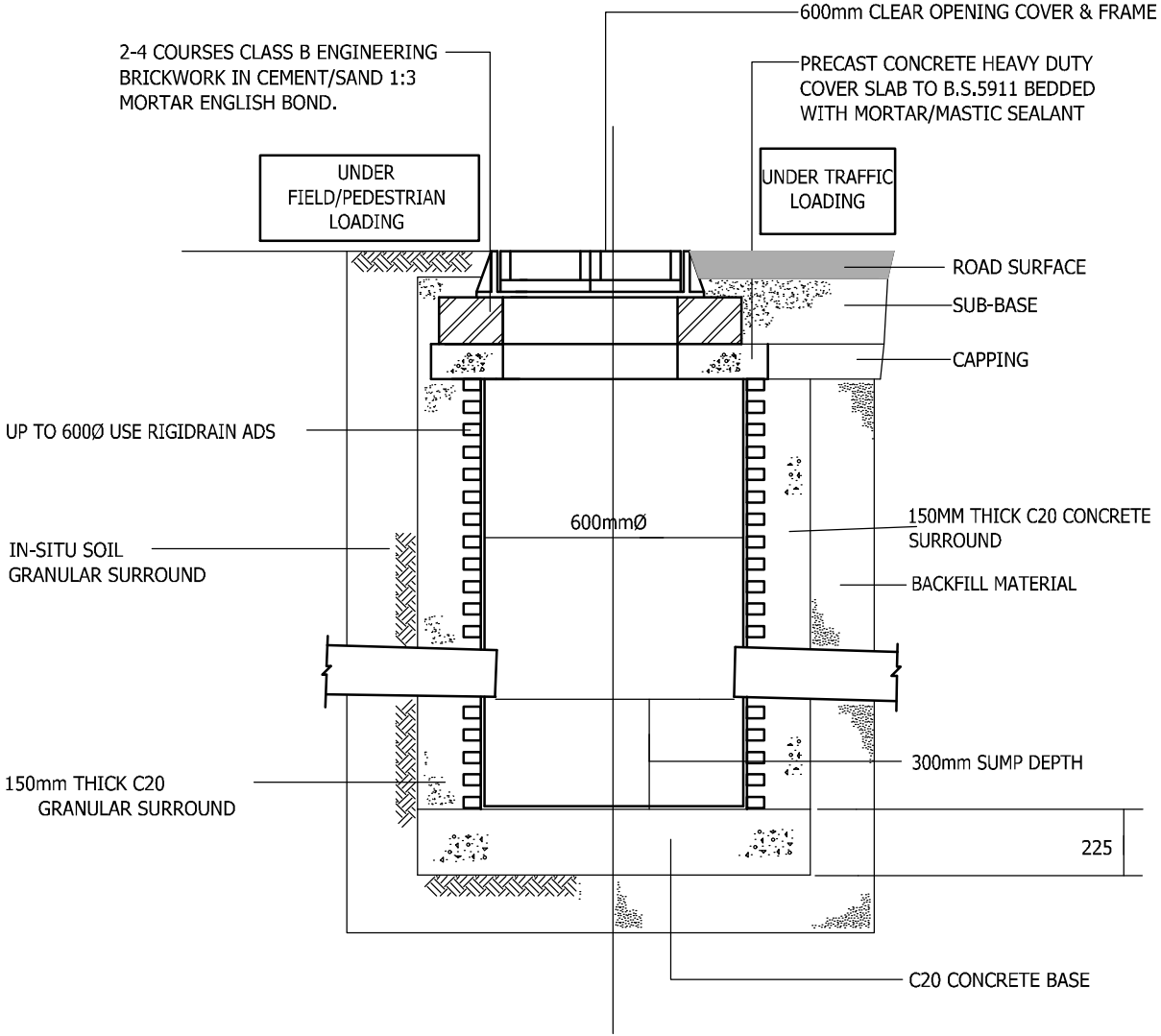
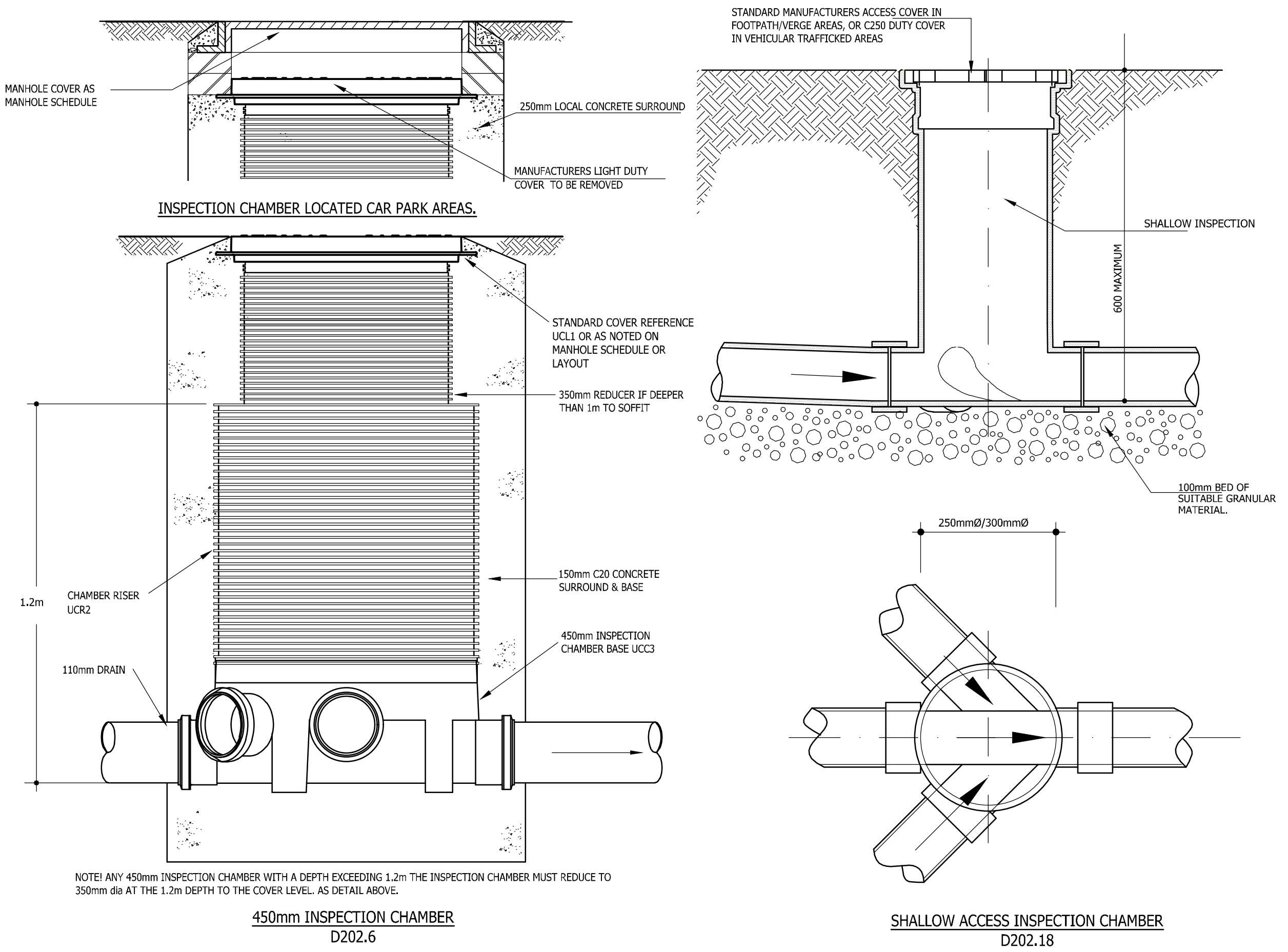
6,000 - 53.54m²

INDICATES SUB-CATCHMENT AREA

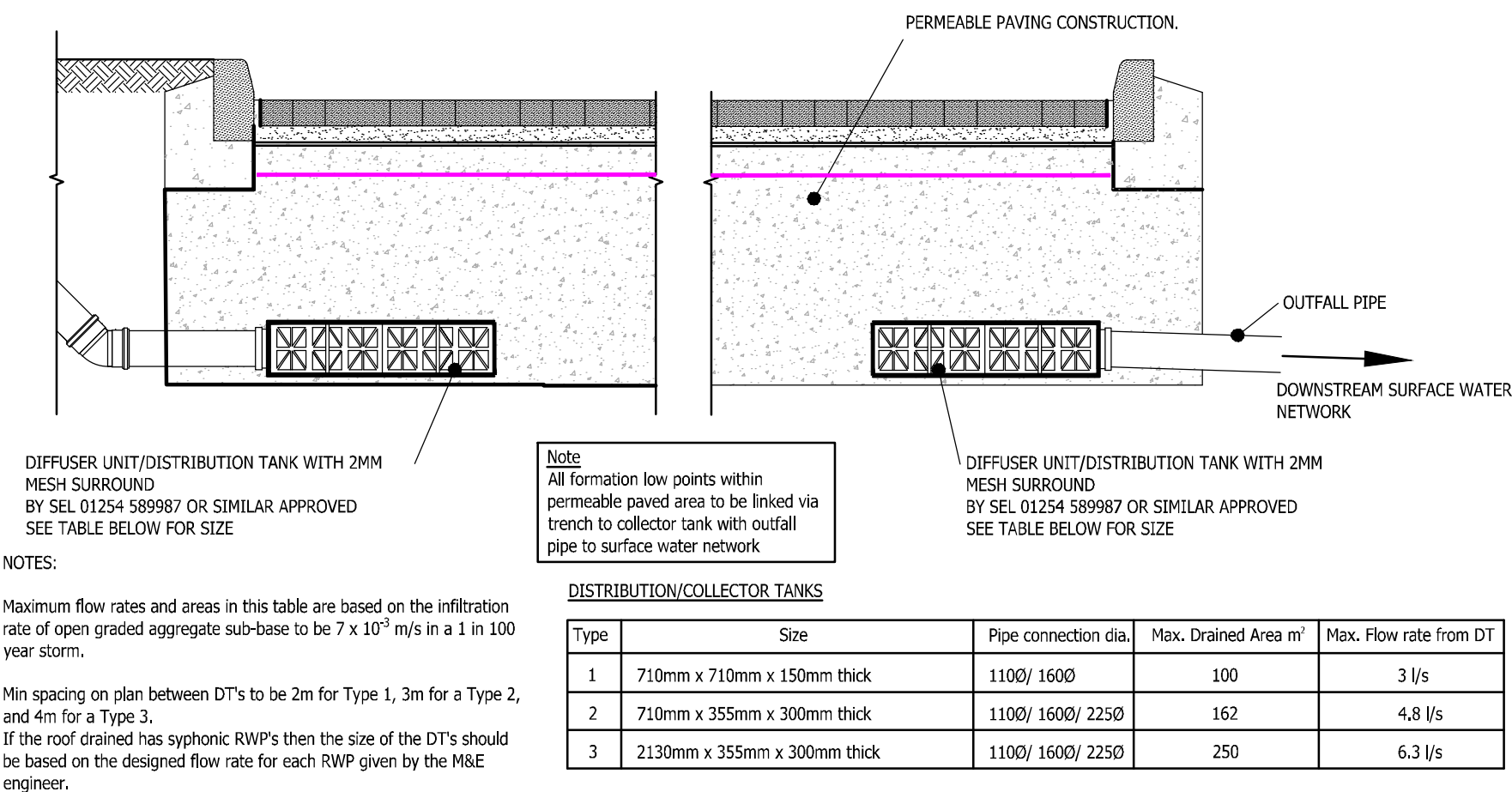
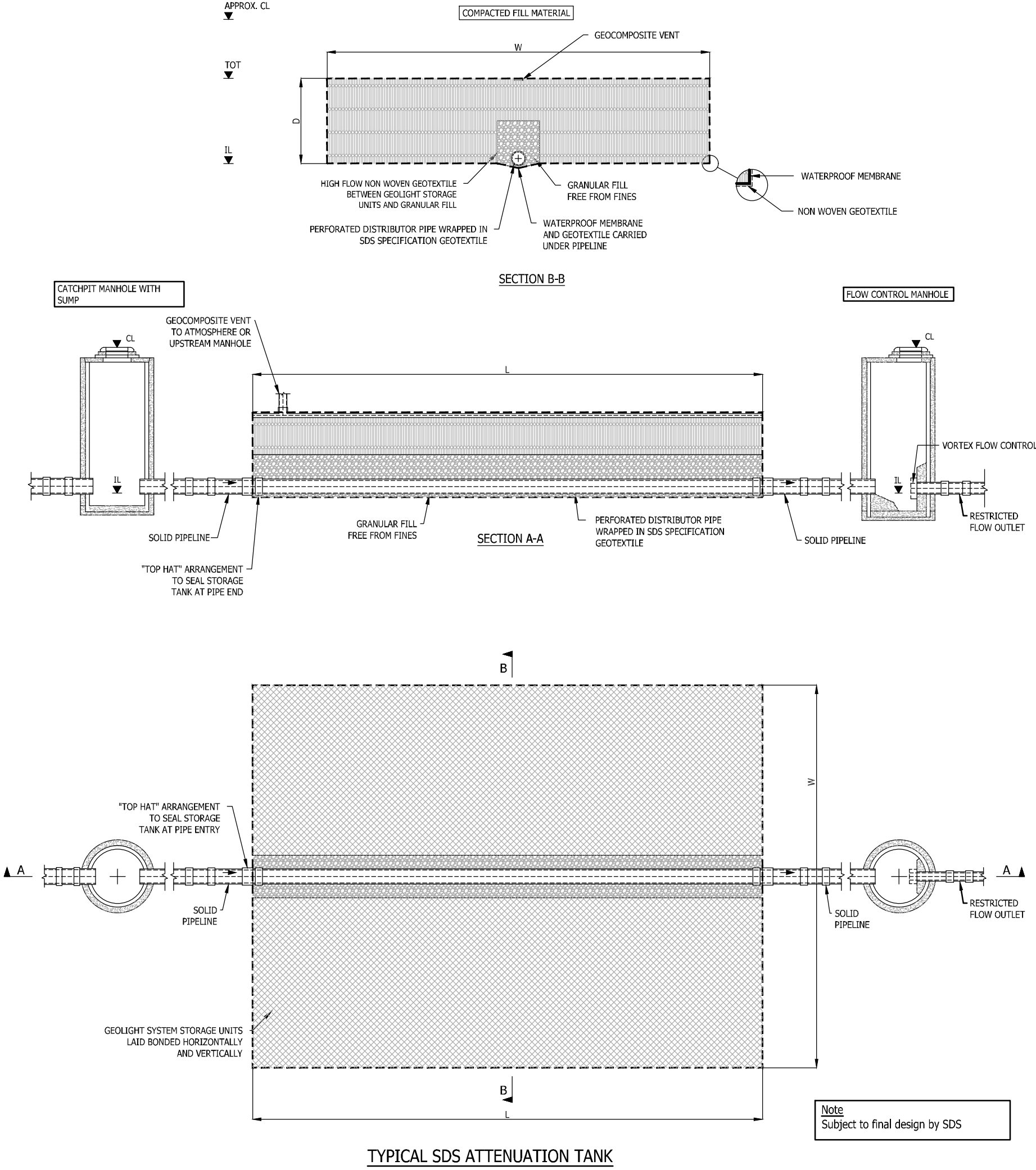
INDICATES SUB-CATCHMENT NUMBER

INSET SHOWING
ACCESS ROAD AND
JUNCTION TO
GATEHOUSE LANE
SCALE 1:200

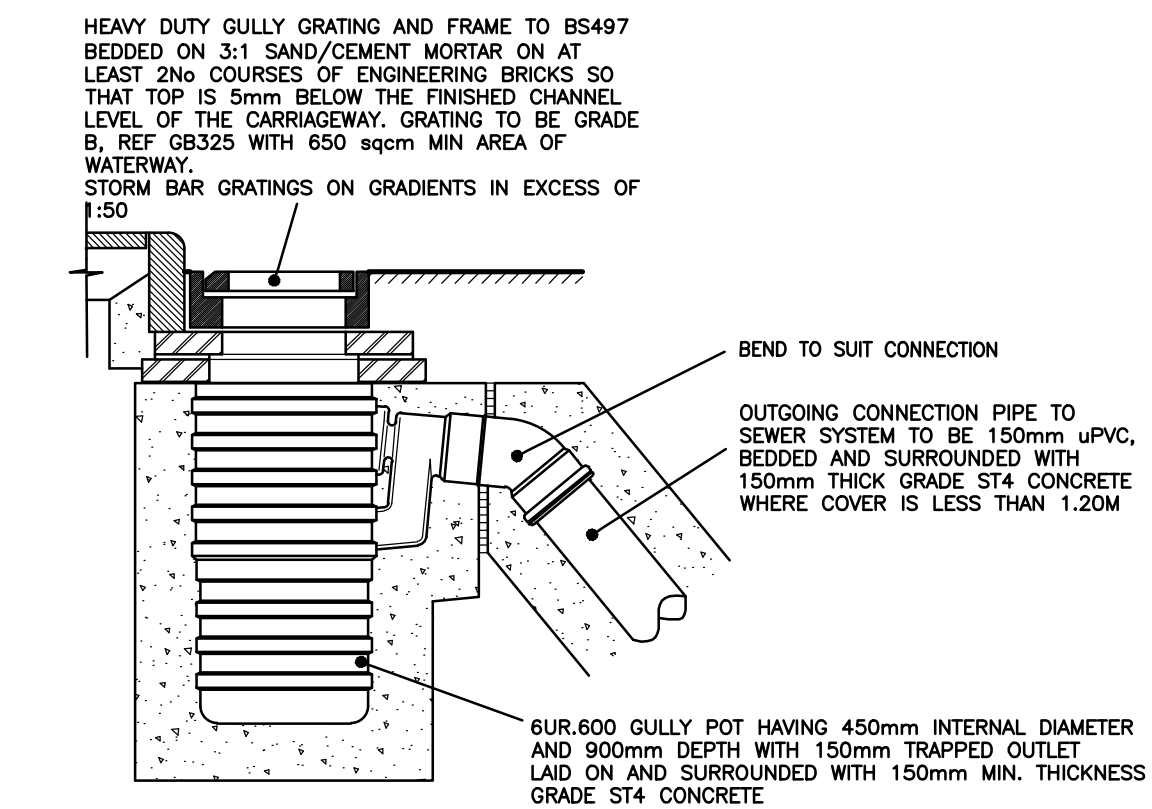
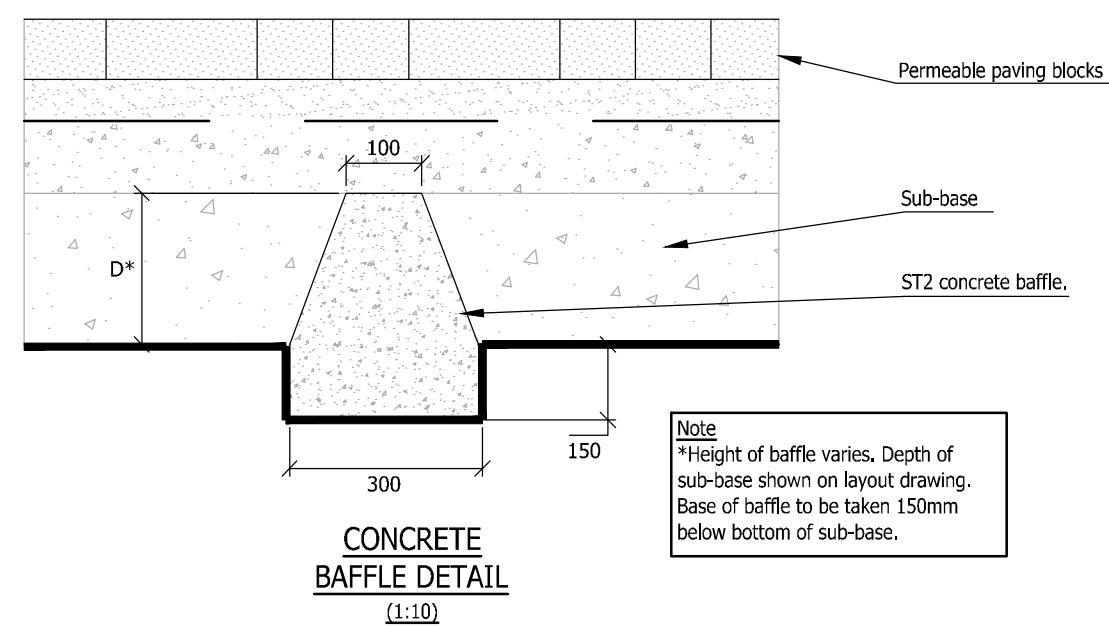
ISSUE/REVISION			
P1	22.03.24	Initial Issue	
Client: BEDFORD PARK DEVELOPMENTS			
Project: Gatehouse Lane, Goddards Green, Hassocks, BN6 9 LE			
Drawing Title: IMPERMEABLE CATCHMENT LAYOUT			
Status: PRELIMINARY			
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Scale: 1:200 @ A0	Date: March 2024	HW Project No:	
Drawing No: 1837/510		Rev: P1	



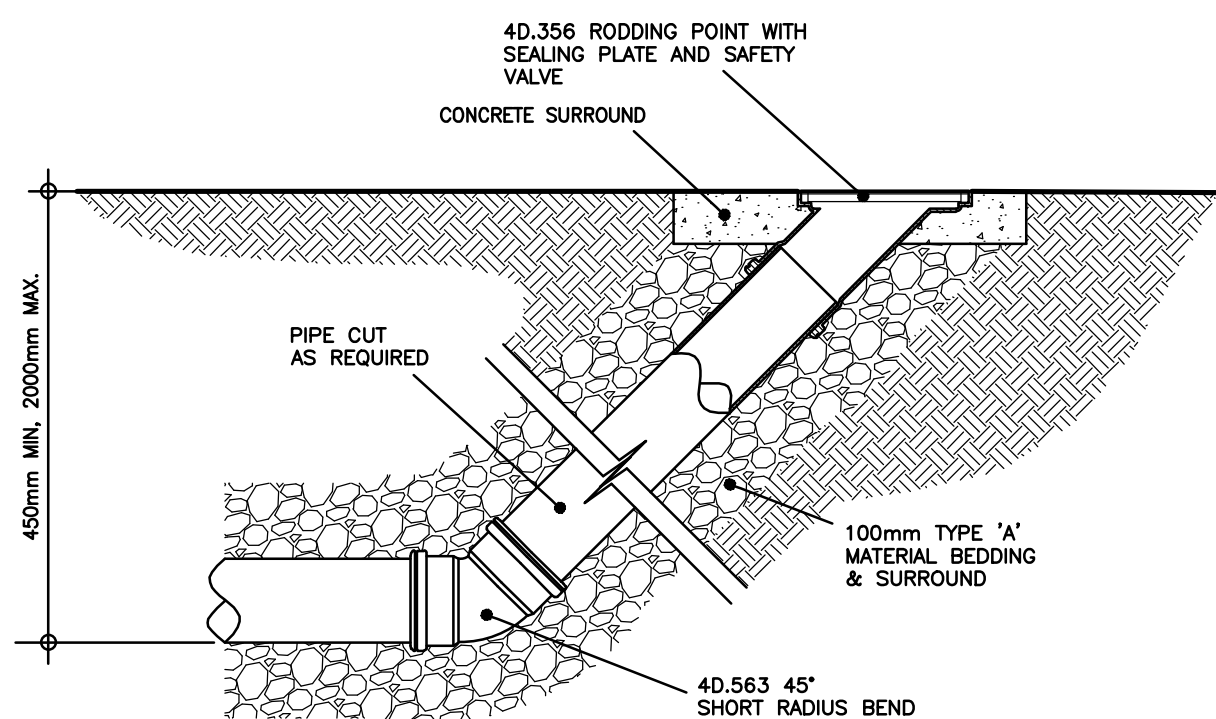
TYPICAL POLYPROPYLENE CATCHPIT (1:20 typical)



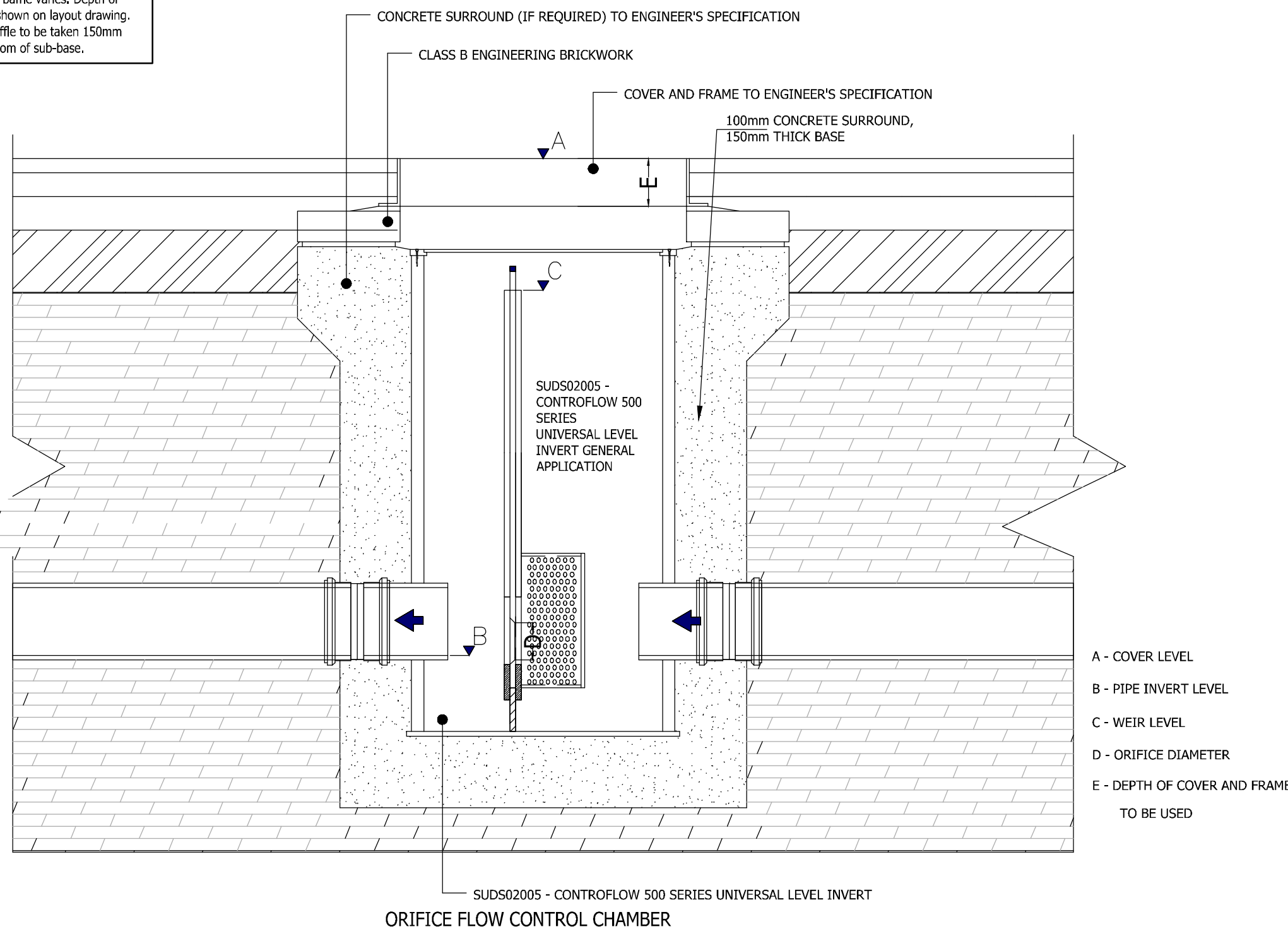
DISTRIBUTION/COLLECTOR TANK DETAIL WITHIN PERMEABLE PAVING (MARKED DT ON LAYOUT)



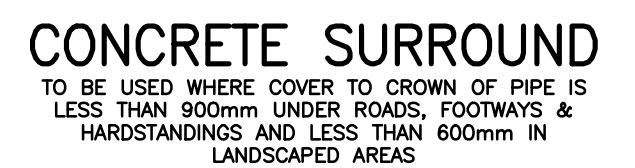
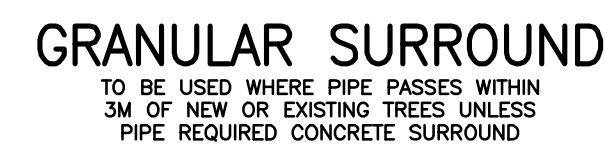
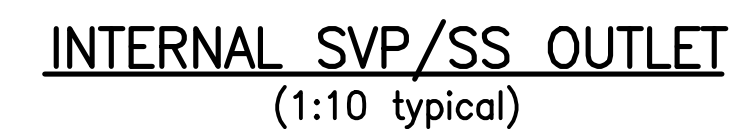
ROAD GULLY DETAIL (1:20 Typical)



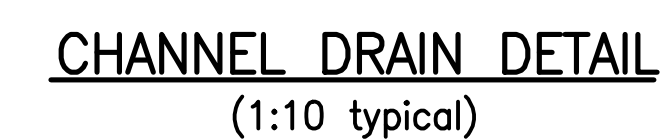
TYPICAL RODDING POINT DETAIL (1:10 typical)



ISSUE/REVISION					
P1	09.02.24	First Issue For Review / Comment			
Rev	Date	Description			
Client					
BEDFORD PARK DEVELOPMENTS					
Project					
Gatehouse Lane, Goddards Green, Hassocks, BN6 9 LE					
Drawing Title					
Drainage Details Sheet 1 of 2					
Issued for					
PRELIMINARY					
Dighton: 01273 617117 Belfast: 028 9028 3060 solutions@haworthmccall.co.uk www.haworthmccall.co.uk					
Scale	As Shown	Designer	BH	Date	
Original paper size	A1	Drawn	TC	February 2024	
				Dwg No	Rev
				1837 /502	P1



PIPE BEDDING DETAILS (Scale 1:20)



HYDROBRAKE FLOW
CONTROL CHAMBER

Scale As Shown	Designer BH	Date	Drg No	Rev
Original paper size A1	Drawn TC	February 2024	1837 /503	P2

Appendix D - Causeway Flow Calculation Sheets

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	60.00	Preferred Cover Depth (m)	0.900
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	1.000		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Depth (m)
S1	0.027	5.00	30.195	Manhole	1.173
S2	0.083	5.00	29.445	Manhole	1.760
PP1	0.119	5.00	28.744	Junction	0.854
SIC5			28.865	Manhole	1.415
PP5	0.043	5.00	28.454	Junction	0.804
SIC7			28.741	Manhole	1.241
S12	0.051	5.00	28.758	Manhole	1.713
PP6	0.042	5.00	27.848	Junction	0.808
SIC11			28.188	Manhole	1.288
PP2	0.141	5.00	28.158	Junction	0.800
SIC9	0.006	5.00	28.140	Manhole	0.825
S3			28.121	Manhole	1.711
PP7	0.047	5.00	27.488	Junction	0.750
SIC13			27.673	Manhole	1.073
Dummy MH	0.032	5.00	27.723	Manhole	1.659
PP3	0.129	5.00	27.411	Junction	0.901
SIC15			27.377	Manhole	1.227
PP8	0.139	5.00	27.245	Junction	0.945
SIC17			27.266	Manhole	1.116
S9	0.070	5.00	27.406	Manhole	2.061
PP4	0.053	5.00	27.347	Junction	0.750
SIC19			27.330	Manhole	0.930
S4	0.084	5.00	27.390	Manhole	2.281
S5	0.062	5.00	27.199	Manhole	2.179

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Depth (m)
S11			27.300	Junction	2.400
S6			25.590	Junction	0.745

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	S1	S2	89.898	0.600	29.022	27.760	1.262	71.2	150
1.001	S2	S12	29.553	0.600	27.685	27.045	0.640	46.2	225
2.000	PP1	SIC5	13.148	0.600	27.890	27.450	0.440	29.9	150
2.001	SIC5	S12	10.912	0.600	27.450	27.120	0.330	33.1	150
3.000	PP5	SIC7	12.812	0.600	27.650	27.500	0.150	85.4	100
3.001	SIC7	S12	2.840	0.600	27.500	27.170	0.330	8.6	100
1.002	S12	S3	19.622	0.600	27.045	26.485	0.560	35.0	225
4.000	PP6	SIC11	5.856	0.600	27.040	26.900	0.140	41.8	100
4.001	SIC11	S3	3.682	0.600	26.900	26.610	0.290	12.7	100
5.000	PP2	SIC9	3.338	0.600	27.358	27.315	0.043	77.6	225
5.001	SIC9	S3	6.008	0.600	27.315	27.220	0.095	63.2	150

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	Σ Area (ha)
1.000	1.193	21.1	4.9	0.027
1.001	1.930	76.7	19.9	0.110
2.000	1.848	32.7	21.5	0.119
2.001	1.756	31.0	21.5	0.119
3.000	0.833	6.5	7.8	0.043
3.001	2.651	20.8	7.8	0.043
1.002	2.217	88.2	58.4	0.323
4.000	1.195	9.4	7.6	0.042
4.001	2.180	17.1	7.6	0.042
5.000	1.485	59.1	25.5	0.141
5.001	1.266	22.4	26.6	0.147



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SW NETWORK CALCULATIONS
ALL EVENTS

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.003	S3	Dummy MH	15.644	0.600	26.410	26.064	0.346	45.2	300
6.000	PP7	SIC13	7.524	0.600	26.738	26.600	0.138	54.5	100
6.001	SIC13	Dummy MH	3.712	0.600	26.600	26.264	0.336	11.0	100
1.004	Dummy MH	S9	29.074	0.600	26.064	25.420	0.644	45.1	300
7.000	PP3	SIC15	33.980	0.600	26.510	26.150	0.360	94.4	225
7.001	SIC15	S9	6.131	0.600	26.150	25.370	0.780	7.9	150
8.000	PP8	SIC17	12.178	0.600	26.300	26.150	0.150	81.2	225
8.001	SIC17	S9	3.377	0.600	26.150	25.370	0.780	4.3	150
1.005	S9	S4	34.638	0.600	25.345	25.109	0.236	146.8	375
9.000	PP4	SIC19	2.258	0.600	26.597	26.400	0.197	11.5	100
9.001	SIC19	S4	5.963	0.600	26.400	26.300	0.100	59.6	100
1.006	S4	S5	18.380	0.600	25.109	25.020	0.089	206.5	375
1.007	S5	S11	25.625	0.600	25.020	24.900	0.120	213.5	375
1.008	S11	S6	8.913	0.600	24.900	24.845	0.055	162.1	375

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	Σ Area (ha)
1.003	2.344	165.7	92.5	0.512
6.000	1.045	8.2	8.5	0.047
6.001	2.338	18.4	8.5	0.047
1.004	2.346	165.8	106.8	0.591
7.000	1.346	53.5	23.3	0.129
7.001	3.616	63.9	23.3	0.129
8.000	1.452	57.7	25.1	0.139
8.001	4.877	86.2	25.1	0.139
1.005	1.493	164.9	167.9	0.929
9.000	2.295	18.0	9.6	0.053
9.001	0.999	7.8	9.6	0.053
1.006	1.257	138.8	192.6	1.066
1.007	1.236	136.5	203.8	1.128
1.008	1.420	156.9	203.8	1.128



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SW NETWORK CALCULATIONS
ALL EVENTS

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	0	0
30	40	0	0				

Node SIC5 Online Orifice Control

Flap Valve	✓	Replaces Downstream Link	✓	Diameter (m)	0.075
Downstream Link	2.001	Invert Level (m)	27.450	Discharge Coefficient	0.600

Node SIC7 Online Orifice Control

Flap Valve	✓	Replaces Downstream Link	✓	Diameter (m)	0.090
Downstream Link	3.001	Invert Level (m)	27.500	Discharge Coefficient	0.600

Node SIC9 Online Orifice Control

Flap Valve	✓	Replaces Downstream Link	✓	Diameter (m)	0.100
Downstream Link	5.001	Invert Level (m)	27.315	Discharge Coefficient	0.600

Node SIC11 Online Orifice Control

Flap Valve	✓	Replaces Downstream Link	✓	Diameter (m)	0.090
Downstream Link	4.001	Invert Level (m)	26.900	Discharge Coefficient	0.600

Node SIC13 Online Orifice Control

Flap Valve	✓	Replaces Downstream Link	✓	Diameter (m)	0.075
Downstream Link	6.001	Invert Level (m)	26.600	Discharge Coefficient	0.600

Node SIC15 Online Orifice Control

Flap Valve	✓	Replaces Downstream Link	✓	Diameter (m)	0.060
Downstream Link	7.001	Invert Level (m)	26.150	Discharge Coefficient	0.600

Node SIC17 Online Orifice Control

Flap Valve	✓	Replaces Downstream Link	✓	Diameter (m)	0.050
Downstream Link	8.001	Invert Level (m)	26.150	Discharge Coefficient	0.600

Node SIC19 Online Orifice Control

Flap Valve	✓	Replaces Downstream Link	✓	Diameter (m)	0.050
Downstream Link	9.001	Invert Level (m)	26.400	Discharge Coefficient	0.600

Node S11 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.008	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0277-4400-1200-4400
Invert Level (m)	24.900	Min Outlet Diameter (m)	0.300
Design Depth (m)	1.200	Min Node Diameter (mm)	1800
Design Flow (l/s)	44.0		

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	20.000	Depth (m)	0.550
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	27.890	Length (m)	29.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	59	Slope (1:X)	35.0		

Node PP5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.500	Depth (m)	0.700
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	27.650	Length (m)	20.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	22	Slope (1:X)	20.0		

Node PP6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.500	Depth (m)	0.700
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	27.040	Length (m)	20.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	17	Slope (1:X)	20.0		

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	14.000	Depth (m)	0.700
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	27.358	Length (m)	70.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	55	Slope (1:X)	60.0		

Node PP7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.000	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.738	Length (m)	18.500	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	29	Slope (1:X)	30.0		

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	20.000	Depth (m)	0.600
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.510	Length (m)	37.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	94	Slope (1:X)	60.0		

Node PP8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	11.500	Depth (m)	0.650
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.300	Length (m)	50.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	188	Slope (1:X)	1000.0		



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Node PP4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	17.500	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.597	Length (m)	22.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	48	Slope (1:X)	60.0		

Node S11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	25.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	164

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	250.0	0.0	1.200	250.0	0.0	1.210	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	29.069	0.047	4.9	0.0891	0.0000	OK
15 minute summer	S2	11	27.761	0.076	19.2	0.1575	0.0000	OK
15 minute summer	PP1	13	28.091	0.201	21.8	3.3861	0.0000	SURCHARGED
15 minute summer	SIC5	14	28.053	0.603	12.2	0.0959	0.0000	SURCHARGED
15 minute summer	PP5	12	27.797	0.147	7.9	0.5546	0.0000	SURCHARGED
15 minute summer	SIC7	13	27.662	0.162	5.8	0.0257	0.0000	SURCHARGED
15 minute summer	S12	11	27.162	0.117	42.0	0.2017	0.0000	OK
15 minute summer	PP6	12	27.153	0.113	7.7	0.3560	0.0000	SURCHARGED
15 minute summer	SIC11	12	27.079	0.179	6.2	0.0285	0.0000	SURCHARGED
30 minute summer	PP2	22	27.606	0.248	23.1	5.5385	0.0000	SURCHARGED
30 minute summer	SIC9	22	27.604	0.289	19.2	0.0878	0.0000	SURCHARGED
15 minute summer	S3	11	26.541	0.131	57.5	0.1484	0.0000	OK
15 minute summer	PP7	13	26.882	0.144	8.6	0.9477	0.0000	SURCHARGED
15 minute summer	SIC13	13	26.821	0.221	5.1	0.0352	0.0000	SURCHARGED
15 minute summer	Dummy MH	11	26.205	0.141	67.9	0.2559	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute summer	S1	1.000	S2	4.4	0.946	0.211
15 minute summer	S2	1.001	S12	19.0	1.178	0.248
15 minute summer	PP1	2.000	SIC5	12.2	0.890	0.373
15 minute summer	SIC5	Orifice	S12	8.8		
15 minute summer	PP5	3.000	SIC7	5.8	0.742	0.888
15 minute summer	SIC7	Orifice	S12	5.7		
15 minute summer	S12	1.002	S3	42.1	2.113	0.477
15 minute summer	PP6	4.000	SIC11	6.2	0.816	0.658
15 minute summer	SIC11	Orifice	S3	6.2		
30 minute summer	PP2	5.000	SIC9	18.3	0.579	0.310
30 minute summer	SIC9	Orifice	S3	10.1		
15 minute summer	S3	1.003	Dummy MH	57.5	1.852	0.347
15 minute summer	PP7	6.000	SIC13	5.1	0.715	0.619
15 minute summer	SIC13	Orifice	Dummy MH	5.0		
15 minute summer	Dummy MH	1.004	S9	67.6	2.170	0.408

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP3	24	26.677	0.167	21.1	5.3838	0.0000	OK
30 minute summer	SIC15	22	26.675	0.525	10.4	0.0835	0.0000	SURCHARGED
180 minute summer	PP8	124	26.405	0.105	14.2	14.0923	0.0000	OK
60 minute winter	SIC17	38	26.427	0.277	11.4	0.0441	0.0000	SURCHARGED
15 minute summer	S9	11	25.548	0.203	87.3	0.9489	0.0000	OK
30 minute summer	PP4	23	26.709	0.112	8.7	2.1492	0.0000	SURCHARGED
30 minute summer	SIC19	23	26.703	0.303	3.6	0.0481	0.0000	SURCHARGED
15 minute summer	S4	11	25.381	0.272	104.2	0.5886	0.0000	OK
15 minute summer	S5	11	25.271	0.251	114.2	0.5021	0.0000	OK
120 minute summer	S11	80	25.216	0.316	75.9	51.5073	0.0000	OK
15 minute summer	S6	1	24.845	0.000	39.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
30 minute summer	PP3	7.000	SIC15	10.4	0.555	0.194
30 minute summer	SIC15	Orifice	S9	5.3		
180 minute summer	PP8	8.000	SIC17	9.7	0.356	0.168
60 minute winter	SIC17	Orifice	S9	2.6		
15 minute summer	S9	1.005	S4	86.8	1.184	0.527
30 minute summer	PP4	9.000	SIC19	3.6	0.905	0.200
30 minute summer	SIC19	Orifice	S4	2.7		
15 minute summer	S4	1.006	S5	103.4	1.261	0.745
15 minute summer	S5	1.007	S11	115.5	1.838	0.846
120 minute summer	S11	Hydro-Brake®	S6	43.0		

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	29.124	0.102	17.5	0.1922	0.0000	OK
15 minute summer	S2	12	28.391	0.706	70.6	1.4645	0.0000	SURCHARGED
30 minute summer	PP1	27	28.499	0.609	70.4	27.5555	0.0000	FLOOD RISK
30 minute summer	SIC5	27	28.436	0.986	11.4	0.1567	0.0000	SURCHARGED
30 minute summer	PP5	23	28.239	0.589	25.4	6.8693	0.0000	FLOOD RISK
15 minute summer	SIC7	13	28.071	0.571	9.3	0.0908	0.0000	SURCHARGED
15 minute summer	S12	12	27.993	0.948	104.5	1.6365	0.0000	SURCHARGED
30 minute summer	PP6	22	27.576	0.536	24.8	5.7327	0.0000	FLOOD RISK
15 minute summer	SIC11	13	27.423	0.523	10.4	0.0831	0.0000	SURCHARGED
60 minute summer	PP2	43	28.009	0.651	63.2	34.4115	0.0000	FLOOD RISK
60 minute summer	SIC9	43	28.004	0.689	16.6	0.2094	0.0000	FLOOD RISK
15 minute summer	S3	12	27.212	0.802	114.7	0.9072	0.0000	SURCHARGED
30 minute summer	PP7	23	27.217	0.479	27.8	8.9801	0.0000	FLOOD RISK
30 minute summer	SIC13	21	27.126	0.526	7.6	0.0836	0.0000	SURCHARGED
15 minute summer	Dummy MH	12	26.971	0.907	134.9	1.6487	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute summer	S1	1.000	S2	16.9	1.221	0.804
15 minute summer	S2	1.001	S12	56.3	1.547	0.733
30 minute summer	PP1	2.000	SIC5	11.4	1.027	0.349
30 minute summer	SIC5	Orifice	S12	11.4		
30 minute summer	PP5	3.000	SIC7	9.4	1.207	1.444
15 minute summer	SIC7	Orifice	S12	10.0		
15 minute summer	S12	1.002	S3	92.0	2.327	1.044
30 minute summer	PP6	4.000	SIC11	10.5	1.341	1.118
15 minute summer	SIC11	Orifice	S3	10.7		
60 minute summer	PP2	5.000	SIC9	16.0	0.615	0.271
60 minute summer	SIC9	Orifice	S3	16.6		
15 minute summer	S3	1.003	Dummy MH	117.1	2.014	0.707
30 minute summer	PP7	6.000	SIC13	7.6	0.977	0.931
30 minute summer	SIC13	Orifice	Dummy MH	7.7		
15 minute summer	Dummy MH	1.004	S9	136.5	2.190	0.823

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	PP3	58	26.979	0.469	41.8	39.8290	0.0000	SURCHARGED
60 minute winter	SIC15	58	26.973	0.823	7.4	0.1308	0.0000	SURCHARGED
180 minute winter	PP8	164	26.674	0.374	21.1	61.3393	0.0000	SURCHARGED
180 minute winter	SIC17	164	26.673	0.523	11.3	0.0832	0.0000	SURCHARGED
30 minute summer	S9	20	26.443	1.098	174.8	5.1356	0.0000	SURCHARGED
60 minute winter	PP4	50	26.900	0.303	17.2	14.8470	0.0000	SURCHARGED
60 minute winter	SIC19	50	26.889	0.489	3.7	0.0777	0.0000	SURCHARGED
120 minute winter	S4	118	26.132	1.023	124.4	2.2181	0.0000	SURCHARGED
120 minute winter	S5	118	26.116	1.096	135.9	2.1924	0.0000	SURCHARGED
120 minute winter	S11	122	26.100	1.200	135.1	261.3741	0.0000	SURCHARGED
15 minute summer	S6	1	24.845	0.000	44.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
60 minute winter	PP3	7.000	SIC15	7.4	0.612	0.139
60 minute winter	SIC15	Orifice	S9	6.7		
180 minute winter	PP8	8.000	SIC17	11.3	0.405	0.195
180 minute winter	SIC17	Orifice	S9	3.7		
30 minute summer	S9	1.005	S4	171.4	1.554	1.039
60 minute winter	PP4	9.000	SIC19	3.7	0.888	0.204
60 minute winter	SIC19	Orifice	S4	3.5		
120 minute winter	S4	1.006	S5	123.6	1.121	0.890
120 minute winter	S5	1.007	S11	135.1	1.225	0.990
120 minute winter	S11	Hydro-Brake®	S6	44.0		

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	13	29.799	0.777	22.8	1.4700	0.0000	SURCHARGED
15 minute summer	S2	12	29.243	1.558	86.0	3.2322	0.0000	FLOOD RISK
60 minute summer	PP1	46	28.655	0.765	70.6	42.9181	0.0000	FLOOD RISK
60 minute summer	SIC5	46	28.582	1.132	12.3	0.1800	0.0000	FLOOD RISK
30 minute summer	PP5	24	28.447	0.797	33.4	12.2316	0.0000	FLOOD RISK
30 minute summer	SIC7	21	28.389	0.889	10.7	0.1414	0.0000	SURCHARGED
15 minute summer	S12	12	28.618	1.573	110.8	2.7150	0.0000	FLOOD RISK
30 minute summer	PP6	23	27.766	0.726	32.6	10.2134	0.0000	FLOOD RISK
30 minute summer	SIC11	20	27.669	0.769	11.8	0.1223	0.0000	SURCHARGED
60 minute summer	PP2	43	28.149	0.791	83.7	50.1631	0.0000	FLOOD RISK
60 minute summer	SIC9	42	28.140	0.825	21.8	0.2508	0.5959	FLOOD
15 minute summer	S3	12	27.629	1.219	118.9	1.3789	0.0000	SURCHARGED
30 minute summer	PP7	25	27.356	0.618	36.5	14.7422	0.0000	FLOOD RISK
30 minute summer	SIC13	21	27.304	0.704	8.5	0.1119	0.0000	SURCHARGED
15 minute summer	Dummy MH	12	27.370	1.306	140.4	2.3739	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute summer	S1	1.000	S2	19.3	1.196	0.914
15 minute summer	S2	1.001	S12	69.2	1.741	0.902
60 minute summer	PP1	2.000	SIC5	12.3	1.001	0.376
60 minute summer	SIC5	Orifice	S12	12.2		
30 minute summer	PP5	3.000	SIC7	10.7	1.369	1.638
30 minute summer	SIC7	Orifice	S12	11.4		
15 minute summer	S12	1.002	S3	103.6	2.606	1.176
30 minute summer	PP6	4.000	SIC11	11.8	1.511	1.260
30 minute summer	SIC11	Orifice	S3	12.2		
60 minute summer	PP2	5.000	SIC9	21.0	0.594	0.355
60 minute summer	SIC9	Orifice	S3	18.3		
15 minute summer	S3	1.003	Dummy MH	122.6	1.972	0.740
30 minute summer	PP7	6.000	SIC13	8.5	1.084	1.033
30 minute summer	SIC13	Orifice	Dummy MH	8.6		
15 minute summer	Dummy MH	1.004	S9	142.0	2.176	0.856

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	PP3	120	27.126	0.616	33.9	68.1610	0.0000	FLOOD RISK
120 minute winter	SIC15	118	27.124	0.974	7.0	0.1549	0.0000	FLOOD RISK
180 minute winter	PP8	180	26.877	0.577	27.1	96.8777	0.0000	SURCHARGED
180 minute winter	SIC17	180	26.876	0.726	10.1	0.1155	0.0000	SURCHARGED
120 minute winter	S9	96	27.199	1.854	126.0	8.6745	0.0000	FLOOD RISK
120 minute winter	PP4	120	26.996	0.399	13.9	25.5102	0.0000	SURCHARGED
120 minute winter	SIC19	118	26.996	0.596	3.8	0.0947	0.0000	SURCHARGED
120 minute winter	S4	96	27.170	2.061	148.8	4.4693	0.0000	FLOOD RISK
180 minute winter	S5	132	27.150	2.130	134.9	4.2593	0.0000	FLOOD RISK
180 minute winter	S11	132	27.123	2.223	134.1	286.3062	0.0000	FLOOD RISK
15 minute summer	S6	1	24.845	0.000	44.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
120 minute winter	PP3	7.000	SIC15	7.0	0.523	0.130
120 minute winter	SIC15	Orifice	S9	7.0		
180 minute winter	PP8	8.000	SIC17	10.1	0.368	0.174
180 minute winter	SIC17	Orifice	S9	4.3		
120 minute winter	S9	1.005	S4	123.7	1.134	0.750
120 minute winter	PP4	9.000	SIC19	3.8	0.856	0.209
120 minute winter	SIC19	Orifice	S4	3.8		
120 minute winter	S4	1.006	S5	147.7	1.339	1.064
180 minute winter	S5	1.007	S11	134.1	1.216	0.983
180 minute winter	S11	Hydro-Brake®	S6	59.2		

Appendix E - Drainage Maintenance & Management Plan

1.0 OWNERSHIP & MAINTENANCE RESPONSIBILITIES

The drainage features will be cared for by the Estate Management Company which will be set up by the developer to administer the site-wide infrastructure. This includes:

- Permeable Pavings
- SDS tank
- Control Chambers
- associated manholes / piped systems

The following sections set out schedules detailing the maintenance requirements for each of the main drainage items used within the scheme. The Estate Management Company will undertake the inspections and maintenance activities in accordance with these schedules.

Additional reference should be made to currently established best practice and guidance documents such as The SuDS Manual (CIRIA C753, 2015) and other resources available at the susdrain website (www.susdrain.org).

This Drainage Management and Maintenance Plan (DMMP) should be considered a live document: The frequency of maintenance intervals may need to be increased or decreased based on the observed performance of the drainage systems over time. Changes should be agreed with the drainage authority and recorded and dated in the Plan.

2.0 CONTAMINATION OR DILUTION OF SPILLAGE

The Environment Agency would prefer all spillages on any highway to be contained to prevent any downstream contamination. However, this cannot always be achieved, depending on the nature of the spillage. In all circumstances involving the spillage of substances on the highway it is important that the Environment Agency are notified as soon as possible so that they can provide advice and take appropriate action.

Prompt action following a spillage can prevent or reduce its effects, whilst inappropriate action may cause or worsen the pollution effects. In the design of the drainage on this site, a number of measures have been put in place to prevent any pollution entering the groundwater such as Green roofs and permeable paving. The permeable paving sub-base is lined with a geotextile fabric.

In the event of a spillage on site it is the responsibility of the Management Company's staff to clear up any spillage before it enters the drainage system. The primary method of dealing with any spillage of Hydrocarbons should be to use sand to soak up the leak and prevent any Hydrocarbons entering the drainage system. Once sand has been contaminated it should not be washed into the drainage system but disposed of by a Licensed Contractor.

Environment Agency – Emergency Contact Number

In the event of a spillage the Environment Agency should be contacted to notify the event and seek advice. The Environment Agency Incident Hotline is **0800 80 70 60 (Freephone 24hrs)**.

3.0 HEALTH AND SAFETY

All those responsible for and involved in the maintenance of the site drainage systems should be safety-conscious and comply with the relevant health and safety legislation. This includes:

- The Health and Safety at Work etc Act 1974
- The Management of Health and Safety at Work Regulations 1999
- The Workplace (Health, Safety and Welfare) Regulations 1992

The Estate Management Company is responsible for suitable risk assessment and management to ensure safe working conditions and practices. Measures to protect potential visitors also need to be considered.

Specialist contractors used should work to industry guidelines and be able to demonstrate safe working practices.

Employers have a duty to employees to inform them about the risks of their work environment and to decrease the risk as far as reasonably practicable. Appropriate personal protective equipment (PPE) should be provided and policies implemented based on risk assessment.

Operatives should be trained for working near water. Risks of contaminated water should be considered. Checking for open cuts and using nitrile gloves, waterproof plasters etc is advised.

Entry of pipes, chambers, tanks and culverts should be avoided wherever possible. Work should be carried out from the surface using appropriate equipment. In the event that entry cannot be avoided to perform a critical task, the required safety training, protection measures and precautions must be implemented prior to entry. Lone working should never be attempted.

For further information refer to Section 36 of The SuDS Manual (CIRIA C753).

4.0 SURFACE WATER DRAINAGE

Pipes, Chambers, Sewers, Gullies and Silt Pits

Inspection Frequency: Annually.

Maintenance Requirements: Carry out visual check of all inspection chambers, manholes and the outfall to ensure all pipes are clear and free flowing. If not, clean out by rodding or jetting.

The following maintenance requirements for all SUDS features below are taken from CIRIA C753 (The SuDS Manual).

Schedule	Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action. Especially outfall manhole to pond with hydrobrake.	6 Monthly
	Common yard & car park & other hard standing areas to be swept clear of debris, to prevent possibility of blockages to the receiving drainage systems.	Weekly
	Debris removal from gullies & silt pits, channel drains (where may cause risks to performance).	6 Monthly – after autumn leaf fall, or as required based on observations
	Lift and inspect receiving manholes to check for blockages.	Monthly
Remedial Actions	Repair any damaged gully gratings or silt pit covers.	As required
	Replace / fix any loose channel drain covers.	As required
Monitoring	Carry out full CCTV survey to confirm ongoing integrity of all drains. Inspect all gullies and silt pits & drainage channels during the survey.	10-yearly intervals

In all instances, inspection and cleaning should be carried out only by a specialist contractor and in accordance with the guidelines given in 'Safe Working in Sewers and at Sewage Works' published by National Joint Health and Safety Committee for the Water Services.

Regular inspection and maintenance is required to ensure the effective long-term operation of private drains, manholes, gullies & silt pits.

Prior to construction: a CCTV survey to be carried out on all existing sewer systems (not being demolished as part of the scheme) and any downstream receiving systems, prior to connection with adopted sewers.

Post Completion: a CCTV survey to be carried out on all new and retained existing drainage systems and any downstream receiving systems, prior to connection with adopted sewers.

The report will be used to prove the integrity of the as-built drainage system prior to issue of practical completion certificate and will be handed over to the Client & Management Company for future reference.

Permeable Pavements

Inspection Frequency and Maintenance Requirements: as per table below.

Schedule	Action	Frequency
Regular Maintenance	Standard road sweeper	Annually after autumn leaf fall
Occasional Maintenance	Weed removal	Annually
Remedial Actions	Remediate adjacent landscaping to original levels	As required
	Paving repairs including replenishment of lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required if infiltration is reduced by clogging
Monitoring	Initial inspection	Monthly for first three months
	Inspection for evidence of poor operation and/or weed growth	Quarterly, 48 hrs after storms in first 6 months
	Inspection for silt accumulation to establish sweeping frequencies	Annually
	Monitor inspection chambers	Annually

Safety information is set out in Section 3.

SDS Attenuation Tanks

Maintenance Schedule	Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action Remove sediment from pre-treatment structures and/or internal forebays	Monthly for 3 months, then annually Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed. Survey inside of tank for sediment build-up and remove if necessary	Annually Every 5 years or as required

To be inspected & checked for blockage **6 monthly** and jetted/cleared if necessary.

A CCTV Drainage Survey of the perforated pipe should be carried out every **5 Years** and any of blockage/silt build up should be jet washed or removed.

5.0 FOUL DRAINAGE

Sewage Treatment Plant – to be maintained in accordance with Manufacturer's Guidelines.

General Network:

Pipes/Chambers/Manholes

Inspection Frequency: 5 Yearly (gravity system)

Maintenance Requirements: Visual inspection of chambers & manholes should be completed on a 5 Yearly basis and any signs of blockage / waste build up should be jet washed or removed by a Licensed Effluent Disposal Contractor.

A CCTV Drainage Survey should be completed every 10 Years and any blockage/waste build up should be jet washed / removed by a Licensed Effluent Disposal Contractor.

Appendix F – BioBubble Design Information

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BIO-BUBBLE WASTEWATER TREATMENT PLANT

INTRODUCTION

These proposals relate to the supply of a Bio-Bubble waste water treatment plant designed to receive the loadings stated under "design criteria" and, meet the discharge concentrations listed under "final effluent quality", as detailed in the "design parameters" below.

The effluent will be retained in the Balance Tank ready for transfer to the Reactor on demand. Two pipes connect between the Balance Tank and Reactor as the provision of a service duct for cabling, ventilation and aeration lines, effluent transfer and emergency overflow. The waste water will undergo biological treatment within the reactor prior to being batch discharged after settlement into the final outfall or soak away system. A Small green GRP kiosk located nearby, will house the control system and delivers low-pressure air to the Reactor via an interconnecting duct pipe supplied by others.

TREATMENT PLANT DESIGN PARAMETERS

The design loading has been based on the following: 19 units and the wellness space with the assumed loading below; this should be evaluated to ensure the client is happy with the loadings.

1) Loadings - Design Data							
Application	No. of People or Meals	Flow per person [l/day]	Total Flow [l/day]	Organic Load per person [gBOD5/day]	Total Organic Load [gBOD5/day]	Ammonia Load per person [gNH4-N/day]	Total Ammonia Load [gNH4-N/day]
Industrial							
Office / Factory without canteen	0	50	0	25	0	5	0
Office / Factory with canteen	0	100	0	38	0	5	0
* Day Staff 19 units (Av. 4)	76	90	6840	38	2888	5	380
* Part Time Staff (4 hr Shift)	0	45	0	25	0	3	0
Catering Wellness							
Wellness Staff	7	90	630	38	266	5	35
Wellness Visitor (150 / day assume 50% using facilities)	75	45	3375	25	1875	3	225
Snack Bars & Bar meals	0	15	0	19	0	2.5	0
Customer toilets							
Visitors to units Toilet Blocks (per use)	19	10	190	12	228	2.5	47.5
Toilet (WC)	0	10	0	12	0	2.5	0
Toilet (Urinal)	0	5	0	12	0	2.5	0
Special Load							
Special Load	0						
2) Loadings - Summary				3) Design Discharge Quality			
Total Daily Flow	11035 l/day		74 PE	BOD:		10 mg/L	
Total Daily Organic Load	5257 gBOD ₅ /day		88 PE	SS:		20 mg/L	
Organic Concentration	476 mg/l BOD ₅			Ammonia:		< 1 mg/L or better	
Total Daily Ammonia Load	688 gNH ₄ -N/day						
Ammonia Concentration	62 mg/l NH ₄ -N						

BIO-BUBBLE WASTEWATER TREATMENT PLANT

Design Criteria		
Population Equivalent organic	88	PE
Maximum Hydraulic Flow	11.0	m ³ /d
Maximum Organic Loading	5.2	kg /d
Maximum Ammonia Loading	0.69	kg/d
Organic concentration	476	mg/l
Final Effluent Quality		
Biological Oxygen Demand (BOD ₅ ATU)	10	mg/l
Suspended Solids 105°C (SS)	20	mg/l
Ammonia (NH ₃ -N)	<1	mg/l
To Consent Compliance	95	percentile

All waste water discharging to the system is assumed to have a treatable consistency of domestic sewage with no uncharacteristic inhibition or toxicity to biochemical carbonaceous oxidation (BOD reduction) and nitrification (ammonia reduction). Alkalinity concentrations and nutrient levels are assumed to be adequate to sustain biological nitrification at all times and without deficiency so as to cause any inhibition detrimental to process performance, with a PH greater than 7.

As with all small domestic sewage treatment systems, care should be taken to avoid discharging excess solids into the system such as disposable nappies, sanitary towels, etc. We advise a hygiene (sanitary) bin should be placed in the WC for disposing of such items.

Please note that we have based the following equipment selection on a duty-only system supply. Furthermore, the plant has been designed to receive flows from a separate sewer drain system. Infiltration and surface waters are assumed to be taken elsewhere.

The Bio-Bubble has 2 modes of operation: Sleep Mode and Normal Mode. This application will undergo 2 discharges from the Reactor every 24 hours.

BIO-BUBBLE WASTEWATER TREATMENT PLANT

TANK DIMENSIONS

Balance Tank Dimensions		
Number of Balance Tanks	1	
Tank Internal diameter	2.4	m
Depth To Invert	1.0	m
Gross Tank Depth	4.0	m
Working Balance Capacity	18	m ³
Reactor Dimensions		
Number of Reactors	1	
Reactor Internal Diameter	3.0	m
Freeboard	0.4	m
Gross Tank Depth	4.0	m
Gross Capacity	28.0	m ³
Pre-Cast Concrete Components		
Item	No	Size
Supplied by others		

DRIVE SYSTEMS APPLIED

Item	No	Type
Main Blower	1	DT 4.40
Balance Tank Loading Pump (Optional Duty Standby)	1	SEG 40.12
Reactor Discharge Pump	1	AP35 40 06 A1

BIO-BUBBLE WASTEWATER TREATMENT PLANT

BALANCE TANK

Sewage will be retained in a Balance Tank ready for transfer into the Reactor on demand.

A single Balance Tank is proposed with a balance gross volume of 18.0 m^3 . Under normal flow conditions, a membrane diffuser within the Balance Tank will intermittently mix the sewage to prevent settlement and alleviate variations in the incoming influent strength. The membrane diffuser receives its air from the main blower housed in the GRP control kiosk. In the event of a failure or loss of power to the plant, the Balance Tank holds approximately 30 hours retention. The Balance Tank can also be used to remove the incoming waste water during emergency situations.

BALANCE TANK PROCESS MONITORING

Twice each day, the level of the Balance Tank will be monitored to ensure there is sufficient waste water to initiate a treatment cycle. The PLC control monitors the level during a sequence of data windows throughout the settlement phase to determine the requirements for the next cycle. A separate level indicator will provide high level detection and raise an alarm.

REACTOR LOADING PUMPS

Wastewater will automatically be transferred into the Reactor from the Balance Tank by initiation of the submersible loading pump. The Pump will provide duty only operation and will be controlled by the ultrasonic level detector in synergy with the Bio-Bubble patented "Intelligent Reaction" system to determine the volume of transfer. Simultaneous backup protection has also been incorporated with timed fill and discharge cycles to ensure continuous operation during wastewater transfer. The Pump is situated in the base of the Balance Tank and mounted on S/S Guide rails with S /S lifting chain. (See Option for Duty Standby)

BIO-BUBBLE REACTOR

A single Reactor with gross volume 28.0 m^3 constructed from pre-cast concrete rings has been selected. Tank construction materials are NOT included in our scope of supply; however alternative materials and construction methods are available depending upon site requirements. Costs associated with the tank supply may be variable and will depend upon specific site requirements including ground conditions, drainage, access etc.

REACTOR AERATION GRID

The system utilises the Bio-Bubble Advanced-Aeration process and incorporates several exclusive internationally patented technologies. Advanced Aeration is a unique British development that instils the most favourable conditions by applying aeration to stimulate and cultivate healthy, naturally selected micro-organisms to form an activated sludge. A low sludge loading and advanced sludge-age promotes the formation of a healthy dense flocculation with clear liquid interface to produce a high quality effluent

A programmed cycle of biological treatment instilled by a sequence of aerobic phases utilising low-pressure air dispersed through membrane diffusers and, anoxic phases under quiescent conditions will ensue. When these phases have completed, a settlement phase will induce suspended active and inert solids to settle out from the treated liquor. A draw phase will discharge the clarified liquor to an outfall or watercourse to complete the cycle.

BIO-BUBBLE WASTEWATER TREATMENT PLANT

REACTOR AERATION BLOWER

A rotary vane blower, located in the GRP kiosk, producing air at 40 m³ at 500mbar per hour will provide the aeration. The blower will be controlled by **"Intelligent Reaction"** operating to the required cycle of events. Cycle selection will depend upon the level within the Balance Tank.

DISCHARGE PUMP

Treated effluent will eventually be discharged from the Reactor through a single submersible pump. The pump is suspended on lifting chains within the decant zone of the reactor. The pump will be controlled by **"Intelligent Reaction"** operating to the required cycle of events.

REACTOR SURPLUS SLUDGE REMOVAL

Bio-Bubble surplus sludge (humus) has undergone treatment and the volume is greatly reduced having been composted. Upon service the level is checked and our engineer will advise the amount to be removed by tanker, this will be significantly less frequent than systems that store primary sludge's in a tank prior to the liquid being passed forwards into the treatment zones.

REACTOR FINAL EFFLUENT DISCHARGE

Depending upon stipulated consent requirements, the final effluent will be suitable for discharge to watercourse with the appropriate permissions. The selected discharge method will be subject to final design approval and should be priced by the installation contractor.

The sample chamber will be fitted with a sack screen and weir to retain a small proportion of the last discharge which can be used for laboratory analysis to check the quality of the final effluent.

Flow metering is not included; however, effluent quantities can be verified from the control system which retains information of the accumulated throughput. Where exceptionally strict stipulation requires the final effluent to be measured by a flow meter, this can be included at additional cost.

CONTROL KIOSK

A roadside GRP kiosk (Green) with nominal dimensions 1400mm wide 800mm deep and 1500 mm high, will be provided to house the controls. Our standard supply allows a maximum distance of 3 metres between the control kiosks and Reactor; however this may be extended if necessary but may be subject to further costs.

POWER SUPPLY

We have allowed terminals for connection of a 2.5 mm three core SWA cable. The power supply should be laid to the kiosk plinth with at least 1.5 m allowed for connection to be supplied by others. The cable size and copies of the necessary certification of the supply will need to be supplied to us prior to commissioning. All equipment has been selected as single phase TBC at detail design.

BIO-BUBBLE WASTEWATER TREATMENT PLANT

ALARM SYSTEM

The unit will be supplied with GSM Modem using SMS text messaging as standard. This is subject to a signal being available and comes supplied with ample credit from the outset; therefore, no other costs are involved apart from topping up credit to the card. Costs will depend upon the number of texts sent and can be charged at annual service renewals. This option provides the facility and added benefit of receiving details of plant status to ensure all machinery is functioning correctly and, the power supply has not been interrupted, without the necessity of having to visit site, in addition to alleviating potential site response charges. A broad band option is available either wired or wireless for real time monitoring and updates.

ENERGY UTILISATION GUIDE

@ Maximum load	22.2	kWh per day
@ Minimum load	5.5	kWh per day

BIO-BUBBLE SLUDGE PRODUCTION

Sludge production is on average 90 % less than other treatment systems. Advanced-Aeration pursues the natural qualities of an extended sludge-age with the very advanced stages of endogenous decay. This approach yields a high-density floc contributing to significant improvements in sludge stability. On average 0.1 kg SS is produced per each kg BOD removed: far less than other treatment processes all with minimum surpluses greater than 0.7 kg SS/kg BOD. Moreover, the sludge stability yields humus concentrations of 3 % dry solids.

3% dry solids could expect to have approximately 9m³ of sludge removed on an annual basis, assuming maximum loading.

ONGOING SERVICE & MAINTENANCE

The option of a service agreement is available to all plant owners. A service agreement will provide a comprehensive maintenance plan for the upkeep of your plant by an approved Bio-Bubble engineer. It also entails emergency cover for breakdowns where required without incurring a call-out fee over the normal response charge.

For emergency situations, such as when the use of facilities would be limited or pollution could occur, we aim a response within 24 hours of a reported failure. However, unlike practically all other systems, each plant has additional capacity which can be used without limiting facilities or having to affect a pollution discharge, therefore, out of hours or weekend responses are not normally required.

The annual service will include testing of all mechanical and electrical equipment in addition to process proving to ensure the final effluent will continue to remain within consent. The plant will be cleaned and tidied, and any parts showing wear or signs of pending failure will be replaced. Where required and providing sufficient land has been allocated, sludge removal will be undertaken. The

BIO-BUBBLE WASTEWATER TREATMENT PLANT

option of collecting a sample of the final effluent for analysis by independent accredited laboratories can be included at additional cost. Free telephone technical support is available during office hours.

The annual service cost is index linked (price on application). All our engineers undergo in-house training for a minimum period of 6 months and all electrical engineers are certified to the 16th Edition Wiring Regulations.

WARRANTY

All Bio-Bubble installations are guaranteed against faulty components and workmanship for 12 months from the date of commissioning which is recorded on the Bio-Bubble completion certificate (See warranty exclusions / conditions below).

The warranty on the installation covers replacement of failed components and the labour involved to replace the failed component. Any failures or alarms must be reported to Bio-Bubble within 24 hours. The labour cost attributed to a warranty claim is subject to the installation of the specific Bio-Bubble alarm and monitoring system as agreed. It should be noted that failure of the alarm system supplied under the contract is covered; however, the owner must ensure the alarm system is not disconnected or remains non-operational for durations longer than 24 hours prior to the failure being reported.

Effluent Quality - The quality of the final effluent is guaranteed to be within compliance of the consent standards set out within the terms of discharge negotiated with the Environment Agency. A copy of the Consent to Discharge must be forwarded to Bio-Bubble for our records.

Bio-Bubble reserve the right to pass on costs to the client attributed to failures that result as a direct consequence of any delay or lack of warning to Bio-Bubble of such a failure that is not a direct fault of Bio-Bubble. These include but are not limited to inorganic materials being disposed of down the system, lightning strikes, flooding and interference by non-approved personnel. There is no warranty on Effluent Quality for operating the plant outside the design loading.

SCHEDULE OF PRICES (ALL exclude VAT at Prevailing rates)

1.	Supply, Deliver and Commission Bio-Bubble Waste Water Treatment Plant Delivery 8 -10 weeks from date of order	£58,100.00
Option	Discharge screen at time of order	£650.00
Option	Davit, Socket and manual winch for removal of pumps.	£2,970.00
Option	Standby loading pump, S/S Guide rails & S/S Lifting Chain	£3,980.00
Option	Interface for Broad Band connection	£1,000.00

TERMS (The above Prices are net of all discounts)

BIO-BUBBLE WASTEWATER TREATMENT PLANT

EXCLUSIONS

The following items have NOT been included within our scope and are deemed to be supplied by the appoint groundworks contractor.

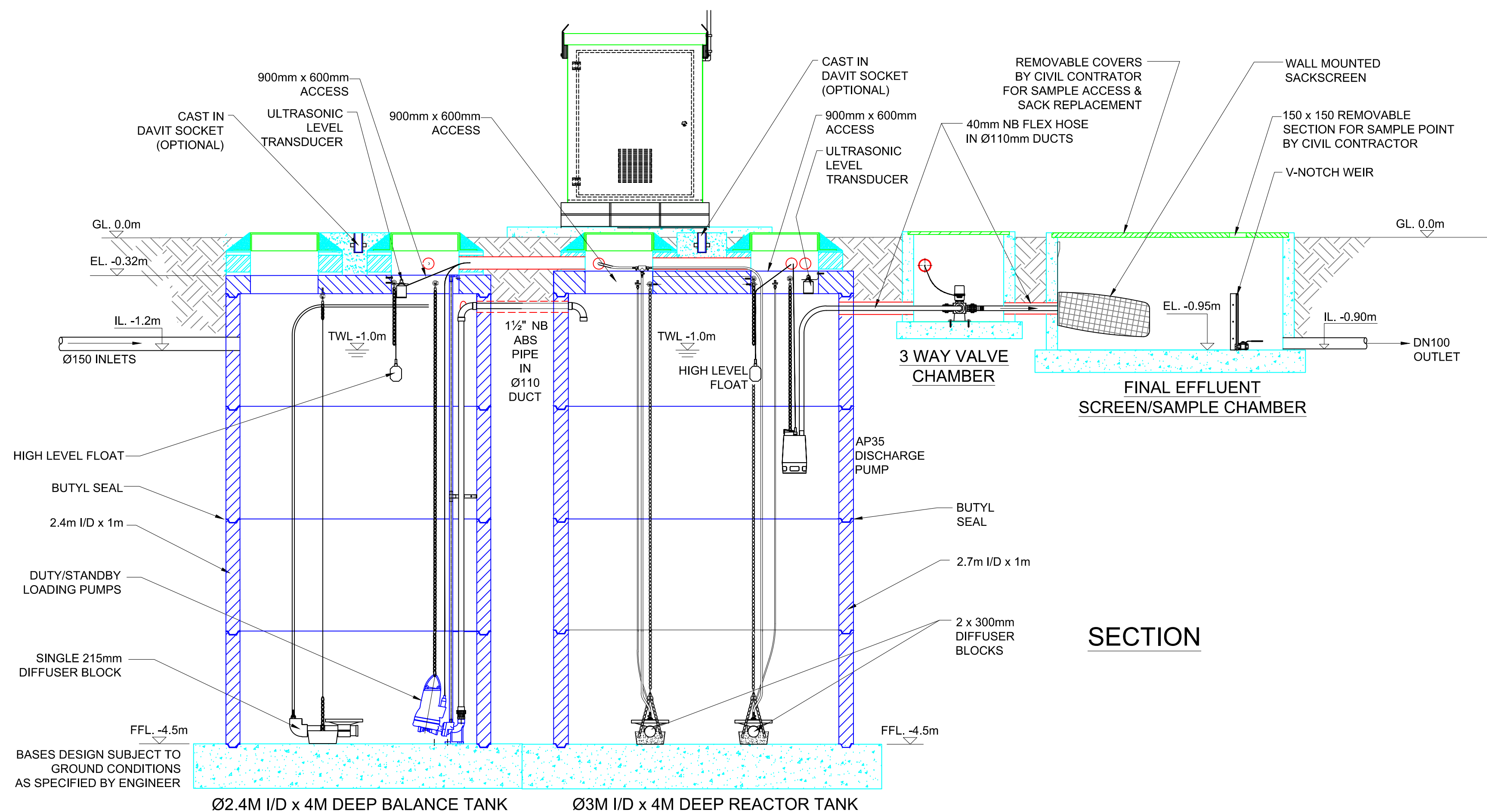
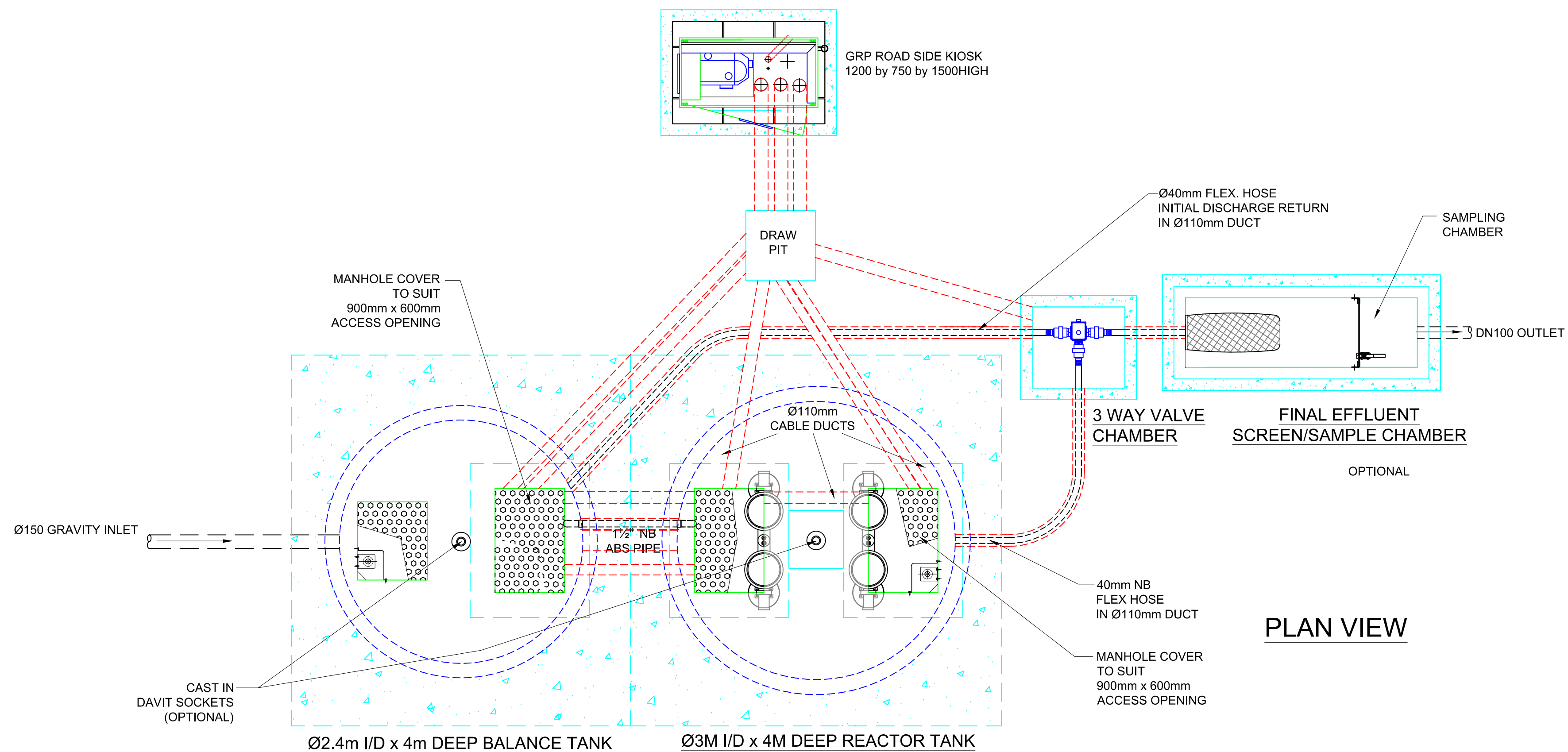
- Site setting out and civil works
- Tank Materials
- CDM, Health & safety and site welfare facilities (2 weeks required for M and E install)
- Tank installation and water testing
- Manhole covers & frames
- Sample Chamber & Valve chambers
- Drainage or ducts including cable, pipe & air ducts
- Casting of control kiosk bases
- Vent pipes and "Spiromatic" cowls
- Supply, installation and certification of the power supply's to kiosk, 3 phase availability to be confirmed

No Main Contractor discount has been allowed, if required this should be added.
Retention for sub contract 0%, No Liquidated damages accepted.

Please note that ALL costs quoted are valid for a period of 60 days and exclude VAT.

Payment terms:

40% of the contract sum due with order
40% of the contract sum due on delivery of equipment to site
20% of the contract sum due upon commissioning



NOTES:-

- A) Tanks & chambers supplied, installed & water tested by others
B) Tank step irons should be removed from the concrete rings.
C) Interconnecting pipework- ducts- drawpits & ventilation by others
D) Manhole Covers & Frames by others (1.5t GMS concealed hinge, spring lift assist, concealed lockable hasp & staple. Deep water covers to have additional hinged safety grid as Technocover or similar)
E) Single Phase power supply to kiosk by others
F) Ethernet/Fibre coms link to kiosk with static IP address by others
G) Distance from tank to kiosk base less than 3m. if further inform Advanced Aeration.

CLIENT

BEDFORD PARK DEVELOPMENTS

CONSULTANTS

CIVIL CONTRACTOR

REV	DESCRIPTION	BY	DATE
0	FIRST ISSUE	BS	06-02-24

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HOLDS

QUOTATION USE
ONLY
SITE SPECIFIC
DRAWINGS TO
FOLLOW

BI BUBBLE
TECHNOLOGIES

**ADVANCED
AERATION**

COMBINED WASTEWATER & SLUDGE TREATMENT
TEL : - 02392 200669 FAX : - 02392 387460

DRAWING TITLE :-
GATEHOUSE INDUSTRIAL ESTATE
WwTP TYPICAL INSTALLATION LAYOUT
PLAN & SECTION

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
BS	06-02-24				

DRAWING No :-
BB1571/24/101/001

UNITS IN mm	SCALE	NTS	A1	SHEET 1 OF 1	REV 0
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Project N°	1837
Project Title	The Farmers Stores Gatehouse Lane Hassocks
Planning Ref	DM/23/1051
Date	12th April 2024
Item	Response Document to MSDC drainage engineer's comments
MSDC Ref	DM/24/0421/DOC



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Introduction

This response has been prepared following receipt of the comment from MSDC's drainage engineer Natalie James. Natalie's comments are repeated in the text box below:

The submitted detailed drainage design shows surface water drainage piped to a single attenuation tank before discharging into an adjacent watercourse. This approach to surface water drainage is in line with the drainage strategy submitted as part of the original planning application for the site. The surface water drainage calculations show appropriate CV and climate change allowances have been utilised. However, the proposed discharge rate is set to 44l/s.

The drainage statement states that the proposed 44l/s discharge rate was approved at application stage. The recommendation for a drainage condition to be utilised at planning stage does not constitute approval of any element of a drainage strategy. Rather, it confirms that Mid Sussex District Council's Flood Risk and Drainage Team consider an applicant to have shown that in principle drainage could be achieved for a development. The planning consultation response (dated 2023-06-28) provided as part of the original application states that surface water discharge should be restricted to as close a practically possible to the Greenfield (undeveloped) QBar runoff rate for all events up to and including the 1:100 plus climate change event.

We will, therefore, require additional information to be submitted which shows that the proposed discharge rate is based on the Greenfield QBar runoff rate for the impermeable area (which we understand is 1.1Ha) and attenuation has been sized accordingly. Following receipt of the above information our team will be in a position to review the drainage design further.

Response

Herrington's FRA and Drainage Strategy submitted at planning stage which formed the basis of the design for discharge of planning condition 3 notes the following:

Existing Site Characteristics

Total area of site	= 1.63 hectares
Developed (Brownfield) impermeable area	= 0.98 hectares
Peak runoff from existing site (1:100 yr event)	= 522.5 litres/second
Greenfield runoff rate (1:100 yr)	= 28.07l/s/ha = 45.75 litres/second

Details from Herrington's FRA and Drainage Strategy Continued.....

Errors were identified in Herrington's calculations and corrections have been made in the figures reported below.

Proposed Site Characteristics

Total area of site	= 1.63 hectares
Impermeable area	= 1.1 hectares
Proposed discharge rate (1:100yr event +CC)	= 44 litres/second

Table 5.2 – 1:100 year event with 45% CC

Existing discharge rate	= 522.5 litres/second
Proposed discharge rate	= 44 litres/second
Betterment	= 91.5%

Comments

1. We note that there was tacit acceptance of the original betterment in Herrington's report and the corrected figures above, still demonstrate a very significant improvement of 91.5% (not 95%)
2. It is noted that the undeveloped greenfield QBAR runoff rate is the preferred target for all events including climate change. However, it seems unreasonable in this specific circumstance not to take account of the site and its existing unmanaged discharge rate and the proposed betterment that the drainage strategy will offer. For reference, greenfield QBAR for the site is approximately equal to 9.5 litres/second.
3. We acknowledge that the recommendation of a drainage condition at planning stage does not constitute approval of any element of the drainage strategy, and only confirms that in principle drainage could be achieved for the development. However, imposing a strict restriction on discharge rate at this stage compared to what has been demonstrated at planning approval stage would significantly impact the proposed development in terms of proposed layout and configuration.
4. As shown on the drainage strategy drawing (1837-500), attenuation has been maximised within the site, both within the subbase underneath all parking areas (subbase depth between 500 and 700mm), and within the proposed attenuation tank in the service yard. The depth of storage within the tank is constrained by both achieving an acceptable cover depth over the tank for the expected loading, and the invert level at the proposed outfall to the ditch. Reducing the discharge rate further would require a large increase to the attenuation storage capacity, which would impact the viability of the development.
5. We trust that we have demonstrated that we have maximised SuDS within the constraints of the site and we are as close as possible to meeting the target discharge rate by adopting a practical approach to the drainage design, which yields a significant reduction in flood risk.