

DRAINAGE REPORT



Project: Ambulance House, Littlehampton

Made by:	Date:	Project No:	Checked by:	Approved by:	Pages	Rev
MT	18/12/25	25196		MT	3	

Item	Details and Design Rationale	References and output
Method of surface and foul water discharge	It is proposed to construct a block of flats on land previously occupied by the Ambulance Station on Paterson Wilson Road, Littlehampton. Surface water flows from new developments should be dealt with in the following order of preference: 1. Soakaways (infiltration drainage), 2. Attenuated discharge to a water course, 3. Attenuated discharge to a surface water sewer, 4. Attenuated discharge to a combined sewer. In line with this protocol infiltration tests to BRE365 were attempted on 17th December 2025. Water level drop in the test pits was minimal for 4 hours, and the tests were abandoned. The site is effectively impermeable and infiltration drainage is not viable. Currently all surface water discharges to the on site combined sewer, which is connected to the wider local public combined sewer system. There are no adjacent watercourses or surface water sewers. Infiltration drainage has been found to be unviable. Discharge of surface water will be via attenuated discharge to the on-site combined sewer, in line with the design hierarchy above. Foul water will also be directed to the on-site combined sewer. A S106, Consent to Connect application has been lodged with the Water Authority.	Building Control Hierarchy

Calculations Attenuation Design	The new roof, access road and parking bays will create an impermeable area of 568m2. Greenfield rates (Qbar) are in the range 3-5 l/s per hectare, giving a greenfield run off rate of 0.17 to 0.29 l/s for the site (0.057ha). It is generally accepted that discharge rates below 1l/s are not practical as control orifices are too small and may easily block, increasing flood risk. Surface water discharge rate for the site has therefore been limited to 1 l/s. Storage of excess flows is provided in the voids of the sub-base stone of the access and parking paving. The attached calculations show the required storage volume for the 100 year storms (plus 40% climate change), with discharge restricted to 1.0l/s, and the volume provided by the proposed system. To summarise: Impermeable area: <table><tr><td>Roof</td><td>= 215</td></tr><tr><td>Paving</td><td>= 353</td></tr><tr><td>Total</td><td>= 568m2</td></tr></table> Required storage = 34.50 m3 Provided Storage = 34.90 m3 Orifice diameter for 1.0l/s discharge = 21mm Note: The system is an attenuation system with all storage below ground for storms up to and including the 100 year event plus 40% climate change. Other storm events are checked below. 1:2 yr <table><tr><td>Required storage</td><td>= 5.60 m3</td></tr><tr><td>Provided Storage</td><td>= 34.90 m3 = OK</td></tr></table> 1:30yr <table><tr><td>Required storage</td><td>= 14.60 m3</td></tr><tr><td>Provided Storage</td><td>= 34.60m3 = OK</td></tr></table> 1/2 drain time must be less than 24hrs Storage vol = 34600 l Discharge = 1 l/s 1/2 drain time = (34600 / 2) = 17300 sec = 4.8hrs <24 - OK Please refer to the attached calculation sheets for details.	Roof	= 215	Paving	= 353	Total	= 568m2	Required storage	= 5.60 m3	Provided Storage	= 34.90 m3 = OK	Required storage	= 14.60 m3	Provided Storage	= 34.60m3 = OK
Roof	= 215														
Paving	= 353														
Total	= 568m2														
Required storage	= 5.60 m3														
Provided Storage	= 34.90 m3 = OK														
Required storage	= 14.60 m3														
Provided Storage	= 34.60m3 = OK														

Exceedance	In any surface water design scenario it is possible that the peak design storm could be exceeded or the system could fail through damage or blockage. The exceedance flow route indicates how water will behave in this event, and must ensure that it is controlled and dispersed safely, avoiding risk to property or persons. The site falls towards the front gate. Levels will be set to ensure that Exceedance flows will emerge at the low point of the paving at the gate and flow safely away from neighbouring buildings, and disperse onto the highway. Replicating the existing flow path of excess surface water from the site. Given the constraints of the site and adjacent land this is the only available safe exceedance path.	
Foul Drainage	The new flats will discharge foul water to the existing, on-site, combined sewer under an 'indirect connection' S106 agreement with the Water Authority.	

Appended:

Attenuation Volume Calculations

Maintenance Schedule

Drawing – Drainage Layout and Details – 25196/01

GENERAL DATA

site location: **England and Wales**

60 min rainfall depth of 5 year return period 'R' [mm] = **20**

M5-60 to M5-2d rainfall ratio 'r' = **0.30**

proposed discharge rate 'v₁' [litre/s] = **1.00**

proposed discharge rate 'v₂' [litre/s] =

allowance for climate change: **40%**

SUMMARY OF CALCULATIONS

required storage volume for discharge rate 'v₁' = **34.51** m³

required storage volume for discharge rate 'v₂' = m³

AREA DATA

	impermeability [%]	effective area [m ²]
impermeable area 'A ₁ ' [m ²] = 568	100.00	568
landscaping and/or green roof area 'A ₂ ' [m ²] =	80.00	0
other partially permeable area 'A ₃ ' [m ²] =	20.00	0
AREA DRAINED TO ATTENUATION TANK =		568 m²

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₁

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M100-D			ignore			ignore			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.34	6.80	1.83	17.45	9.91							0.30	9.61
10	0.49	9.80	1.91	26.14	14.85							0.60	14.25
15	0.59	11.80	1.94	32.03	18.19							0.90	17.29
30	0.77	15.40	1.99	42.97	24.41							1.80	22.61
60	1.00	20.00	2.03	56.84	32.29							3.60	28.69
120	1.25	25.00	2.01	70.35	39.96							7.20	32.76
240	1.57	31.40	1.96	86.11	48.91							14.40	34.51
360	1.78	35.60	1.93	95.95	54.50							21.60	32.90
600	2.12	42.40	1.87	111.05	63.08							36.00	27.08
1440	2.84	56.80	1.76	140.25	79.66							86.40	0.00

* Z2 is a growth factor from M5 rainfalls

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₂

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M30-D			M100-D			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.34	6.80											
10	0.49	9.80											
15	0.59	11.80											
30	0.77	15.40											
60	1.00	20.00											
120	1.25	25.00											
240	1.57	31.40											
360	1.78	35.60											
600	2.12	42.40											
1440	2.84	56.80											

* Z2 is a growth factor from M5 rainfalls

GENERAL DATA

site location: **England and Wales**

60 min rainfall depth of 5 year return period 'R' [mm] = **20**

M5-60 to M5-2d rainfall ratio 'r' = **0.30**

proposed discharge rate 'v₁' [litre/s] = **1.00**

proposed discharge rate 'v₂' [litre/s] =

allowance for climate change: **0%**

SUMMARY OF CALCULATIONS

required storage volume for discharge rate 'v₁' = **5.60** m³

required storage volume for discharge rate 'v₂' = m³

AREA DATA

	impermeability [%]	effective area [m ²]
impermeable area 'A ₁ ' [m ²] = 568	100.00	568
landscaping and/or green roof area 'A ₂ ' [m ²] =	80.00	0
other partially permeable area 'A ₃ ' [m ²] =	20.00	0
AREA DRAINED TO ATTENUATION TANK =		568 m²

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₁

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M2-D			ignore			ignore			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.34	6.80	0.79	5.37	3.05							0.30	2.75
10	0.49	9.80	0.79	7.74	4.40							0.60	3.80
15	0.59	11.80	0.79	9.36	5.32							0.90	4.42
30	0.77	15.40	0.80	12.33	7.00							1.80	5.20
60	1.00	20.00	0.81	16.20	9.20							3.60	5.60
120	1.25	25.00	0.82	20.50	11.64							7.20	4.44
240	1.57	31.40	0.83	26.11	14.83							14.40	0.43
360	1.78	35.60	0.84	29.75	16.90							21.60	0.00
600	2.12	42.40	0.84	35.72	20.29							36.00	0.00
1440	2.84	56.80	0.86	48.59	27.60							86.40	0.00

* Z2 is a growth factor from M5 rainfalls

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₂

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M30-D			M100-D			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.34	6.80											
10	0.49	9.80											
15	0.59	11.80											
30	0.77	15.40											
60	1.00	20.00											
120	1.25	25.00											
240	1.57	31.40											
360	1.78	35.60											
600	2.12	42.40											
1440	2.84	56.80											

* Z2 is a growth factor from M5 rainfalls

GENERAL DATA

site location: **England and Wales**

60 min rainfall depth of 5 year return period 'R' [mm] = **20**

M5-60 to M5-2d rainfall ratio 'r' = **0.30**

proposed discharge rate 'v₁' [litre/s] = **1.00**

proposed discharge rate 'v₂' [litre/s] =

allowance for climate change: **0%**

SUMMARY OF CALCULATIONS

required storage volume for discharge rate 'v₁' = **14.57** m³

required storage volume for discharge rate 'v₂' = m³

AREA DATA

	impermeability [%]	effective area [m ²]
impermeable area 'A ₁ ' [m ²] = 568	100.00	568
landscaping and/or green roof area 'A ₂ ' [m ²] =	80.00	0
other partially permeable area 'A ₃ ' [m ²] =	20.00	0
AREA DRAINED TO ATTENUATION TANK =		568 m²

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₁

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M30-D			ignore			ignore			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.34	6.80	1.45	9.86	5.60							0.30	5.30
10	0.49	9.80	1.49	14.58	8.28							0.60	7.68
15	0.59	11.80	1.50	17.74	10.08							0.90	9.18
30	0.77	15.40	1.53	23.53	13.37							1.80	11.57
60	1.00	20.00	1.54	30.87	17.53							3.60	13.93
120	1.25	25.00	1.53	38.33	21.77							7.20	14.57
240	1.57	31.40	1.51	47.31	26.87							14.40	12.47
360	1.78	35.60	1.49	52.94	30.07							21.60	8.47
600	2.12	42.40	1.46	61.71	35.05							36.00	0.00
1440	2.84	56.80	1.40	79.47	45.14							86.40	0.00

* Z2 is a growth factor from M5 rainfalls

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₂

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M30-D			M100-D			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.34	6.80											
10	0.49	9.80											
15	0.59	11.80											
30	0.77	15.40											
60	1.00	20.00											
120	1.25	25.00											
240	1.57	31.40											
360	1.78	35.60											
600	2.12	42.40											
1440	2.84	56.80											

* Z2 is a growth factor from M5 rainfalls

Old Ambulance Station 18/12/2025

Orifice Discharge

$$Q = C_d \left(\frac{1}{4} \pi D^2 \right) \sqrt{2gh}$$

Cd 0.6 Sharp orifice

D 0.021 m

g 9.81

h 1.27 m

Q 0.001037498 m³/s

1.0 l/s

21mm orifice = 1.0l/s discharge

Storage Volume - Porous Paving

Area 353.0 m²

Depth 0.33 m

Void 30 %

Volume = 34.95 m³



Surface Water Drainage System Maintenance Schedule

Project: Old Ambulance Station, Littlehampton

Made by:	Date:	Project No:	Checked by:	Approved by:	Pages	Rev
M Taylor	18/12/25	25196		MT	2	

Ownership and Responsibilities:

Drainage systems and permeable pavements within the bounds of the property will become the responsibility of the landlord/property owners.

Such responsibilities shall be passed on to any future new owner during conveyance, to ensure continuity of maintenance for the lifetime of the system.

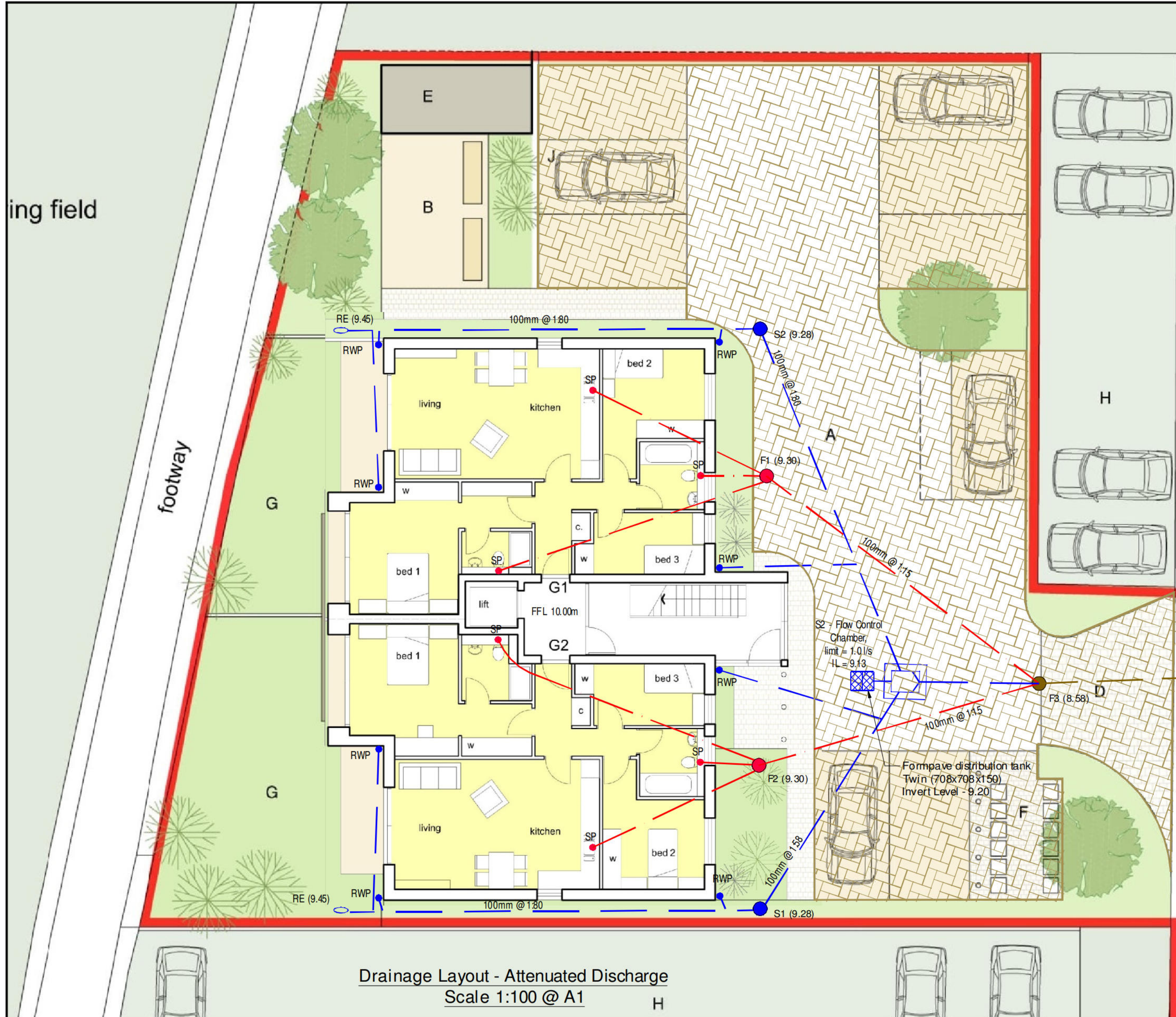
Current Owner : Agilitee

Contact:

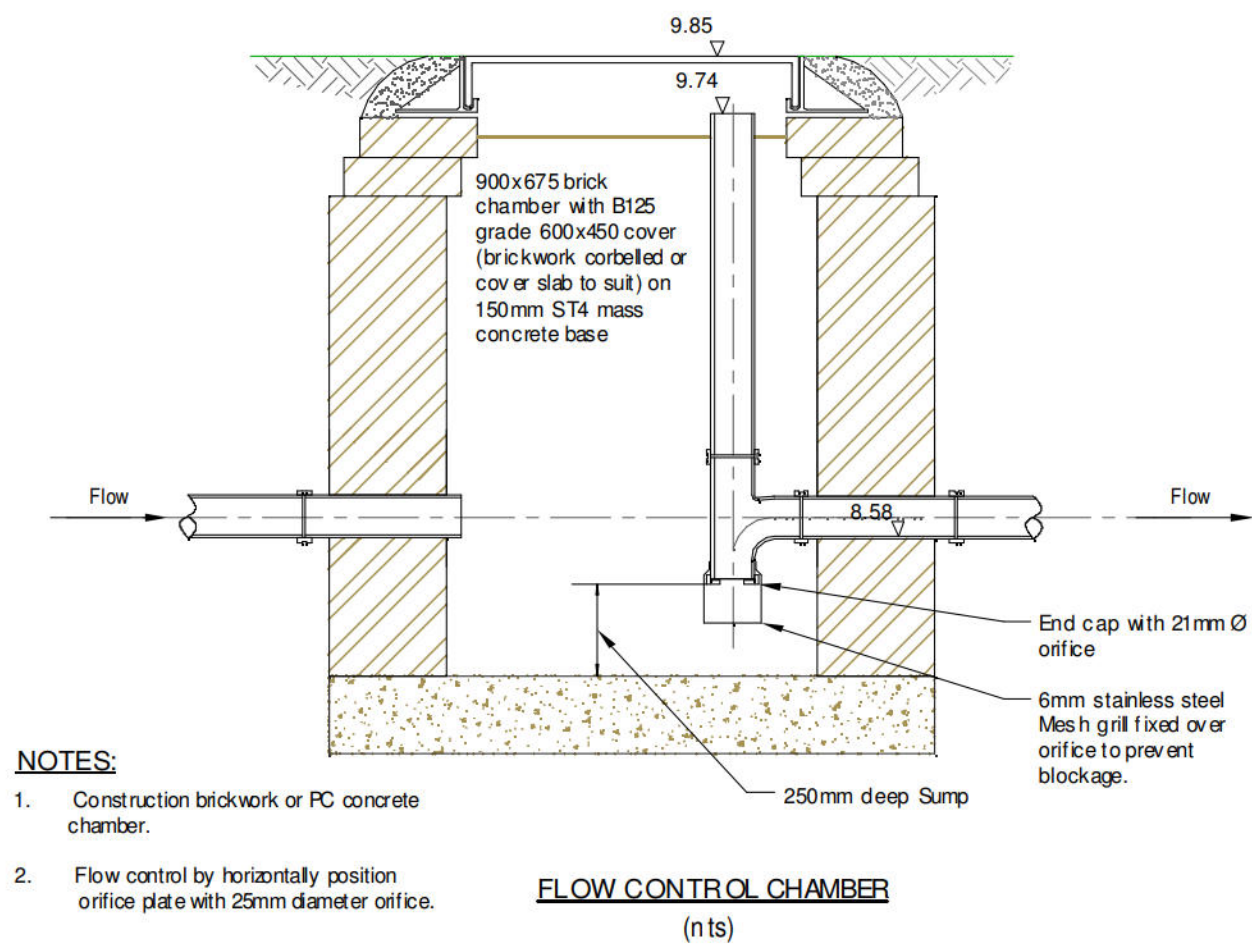
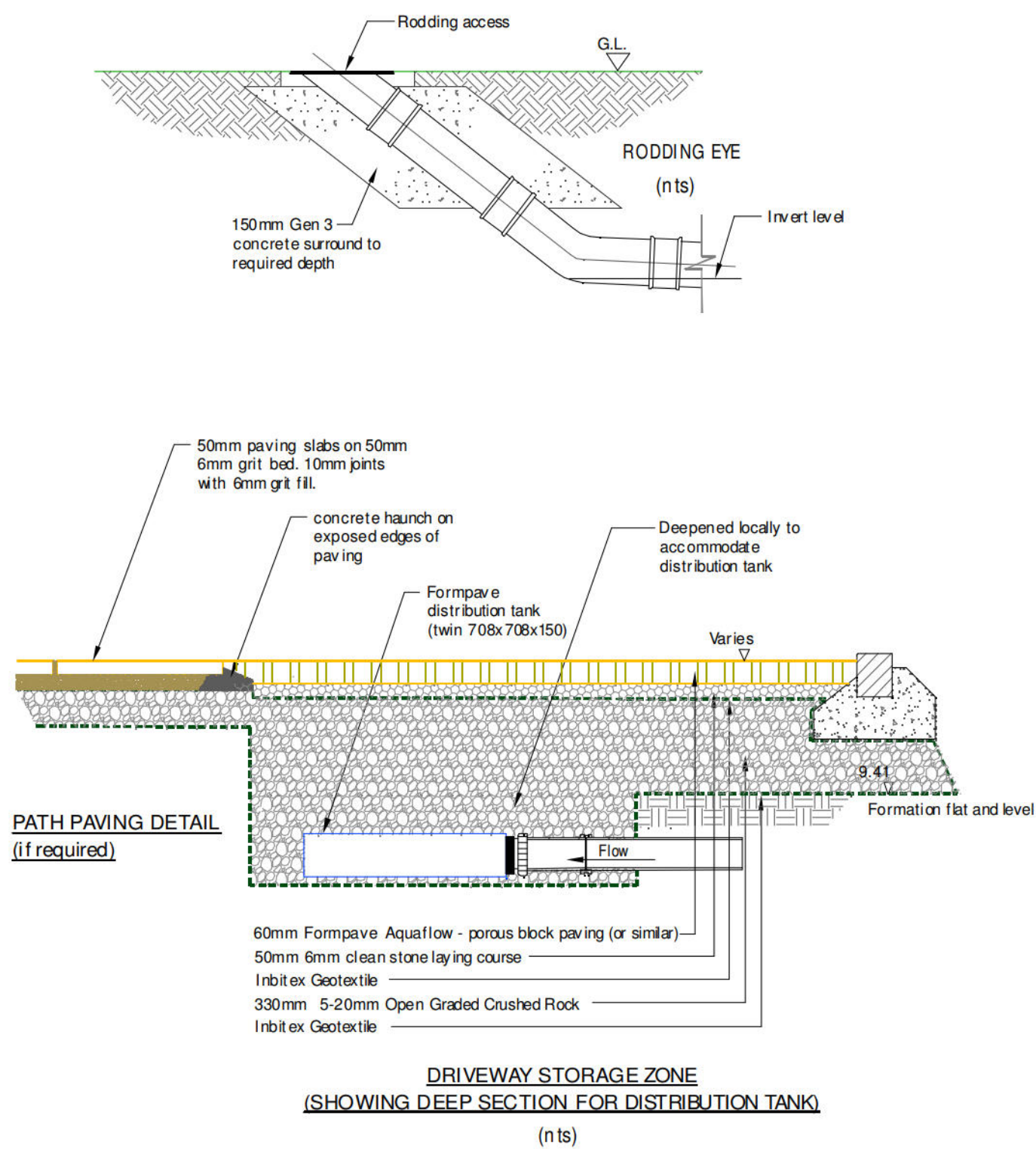


Item	Maintenance Operation	Frequency
PIPE NETWORK & CHAMBERS		
Regular	Inspect silt traps for build up, clean as required. Inspect area over storage for waterlogging or subsidence, lift and repair as necessary	Monthly for first 3 months then annually after leaf fall Annually during winter
Occasional/ Remedial	CCTV survey of pipe network & chambers, repair/replace as necessary	5 years (or when evidence of failure is witnessed)

POROUS PAVEMENT		
Regular	Raking and weeding. (standard cosmetic maintenance over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site observations of clogging. Pay particular attention to areas where water runs on to pervious surfaces from adjacent impermeable areas as these areas are most likely to collect sediment.
Occasional	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using polyphosphate applied directly into the weeds foliage by applicator rather than spray	As required – once per year on less frequently used pavements
Remedial	Remediate any landscaping which, through vegetation growth or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions or rutting considered detrimental to the structural performance or a hazard to users.	As required
	Rehabilitation of surface and upper substructure by lifting, cleaning and relaying the porous media.	Every 10 to 15 years or as required if infiltration performance is reduced due to clogging.
Monitoring	Initial inspection	Monthly for 3 months after installation

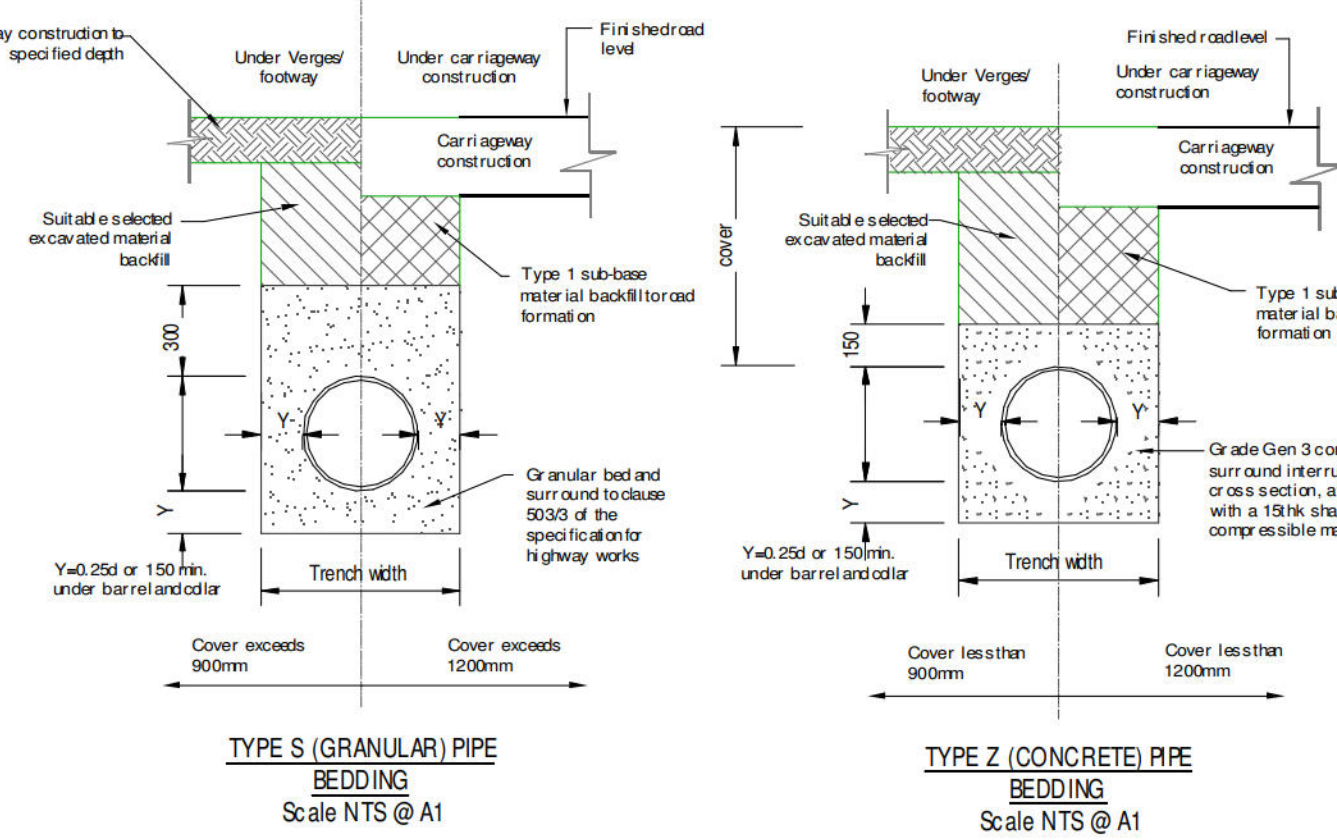
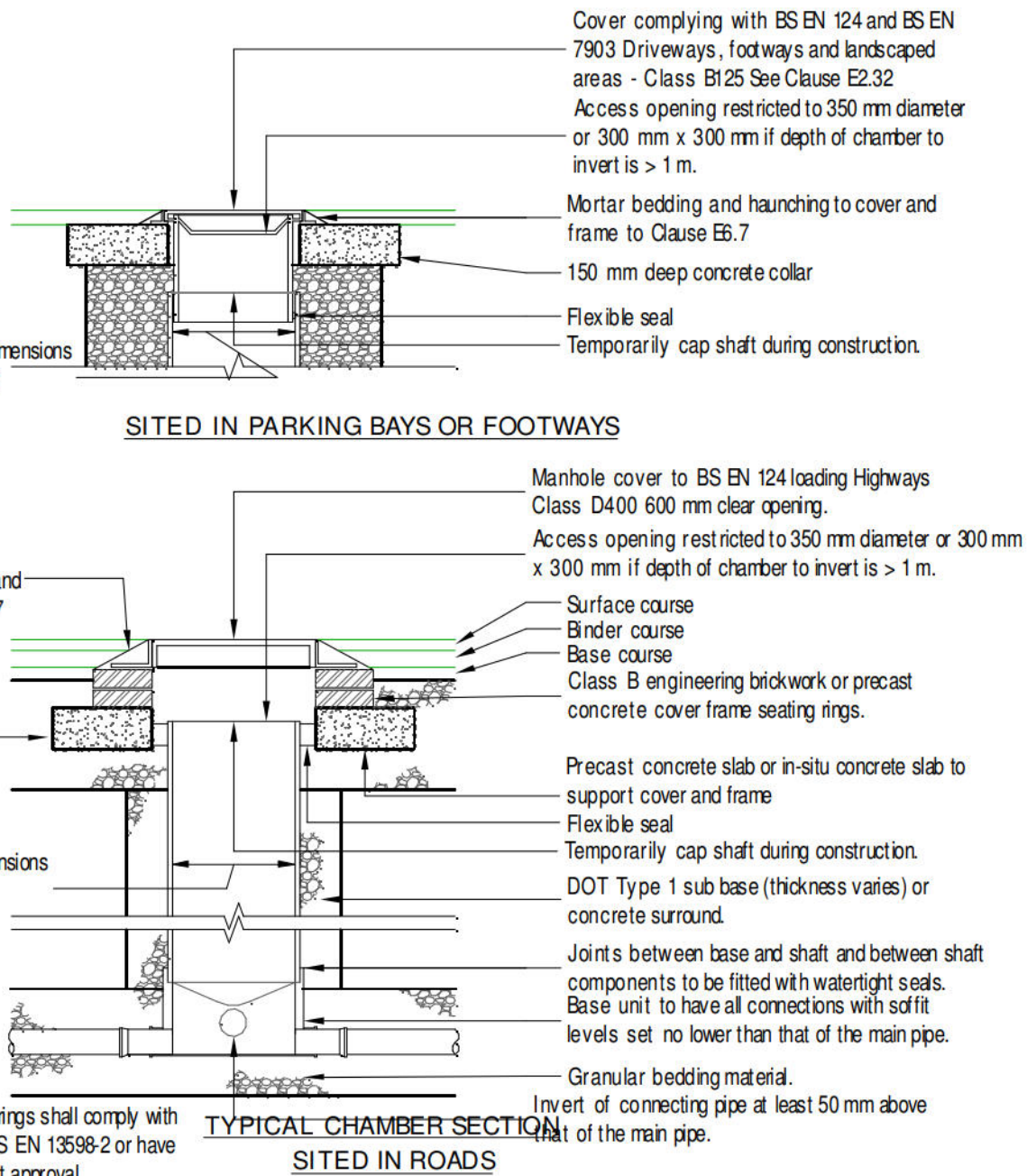
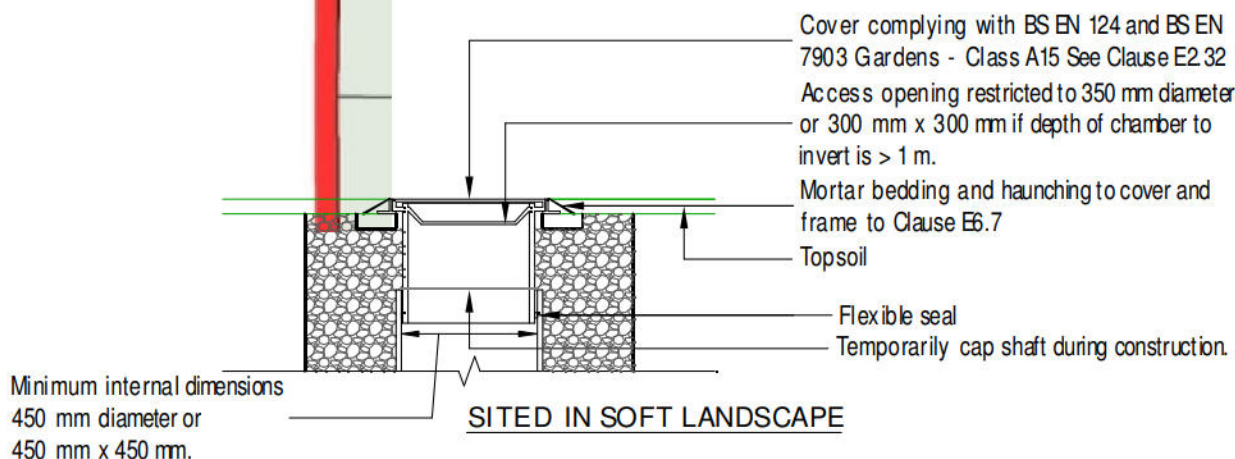
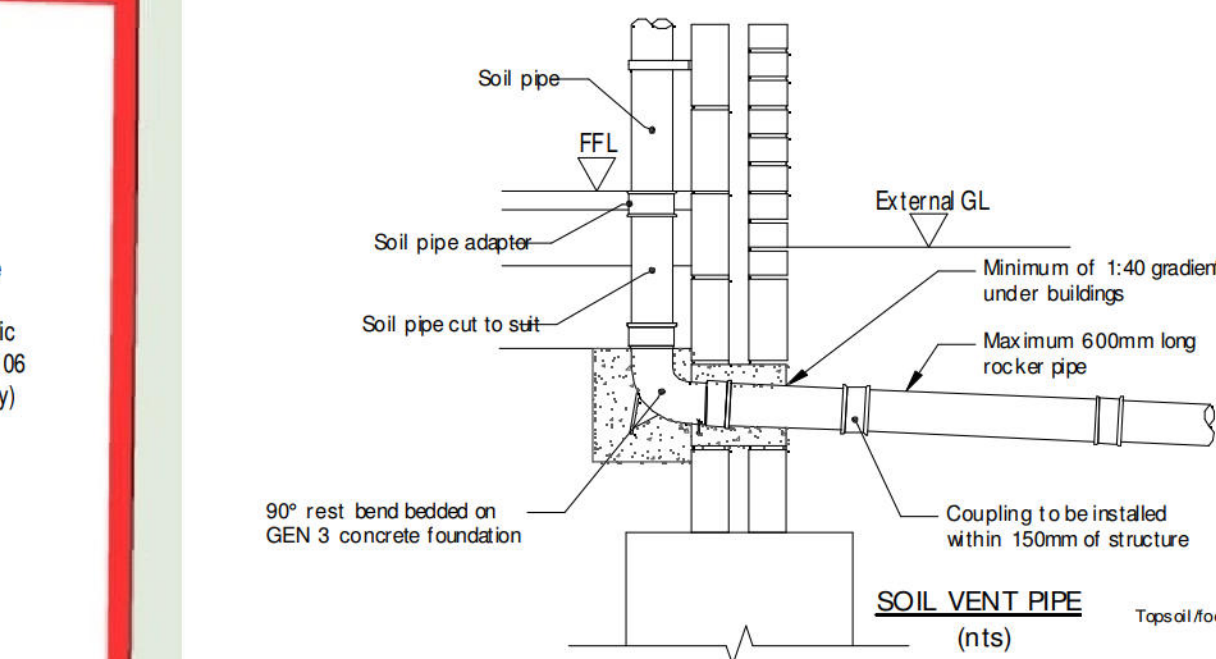
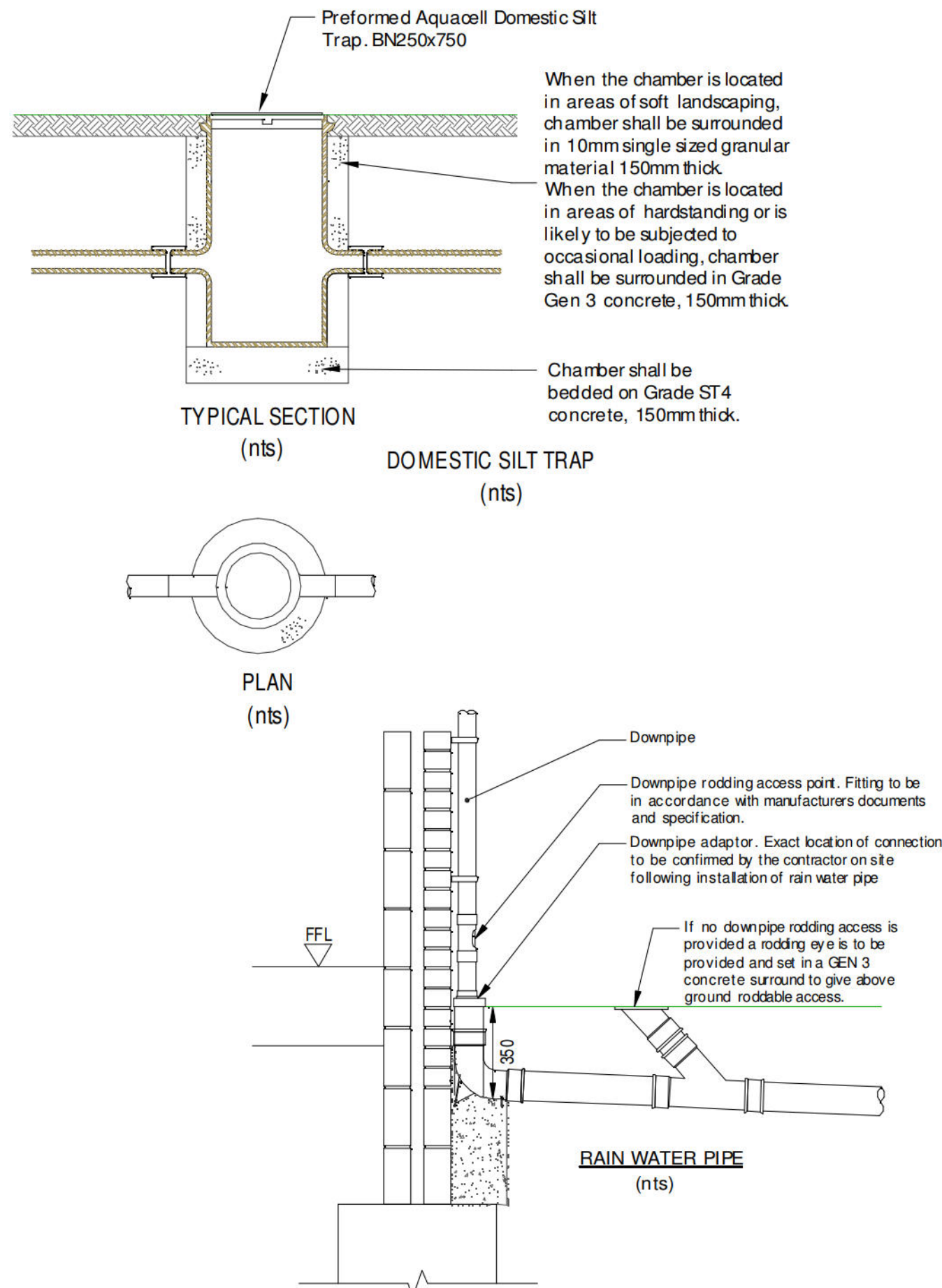


Drainage Layout - Attenuated Discharge
Scale 1:100 @ A1



- NOTES:
- Construction brickwork or PC concrete chamber.
 - Flow control by horizontally position orifice plate with 25mm diameter orifice.

- KEY
- Permeable paving
 - 100mm @ 1:80 Proposed surface water sewer (Size - Gradient)
 - RWP Rainwater pipe
 - RE (9.45) Rodding Eye
 - S1 (9.30) Surface water silt trap (invert level shown)
 - Flow Control Chamber
 - Distribution/Collection Tank
 - Exceedance route
 - Existing combined sewer
 - 100mm @ 1:15 Proposed foul water sewer (Size - Gradient)
 - SP Soil pipe
 - F4 (9.05) Proposed Foul water access chamber Type 3 (Invert level shown)



- NOTES: DRAINAGE
- This drawing to be read in conjunction with all relevant documents and specifications.
 - Dimensions not to be scaled.
 - The Contractor shall carry out a level check of the existing drainage and confirm the results to the Engineer for confirmation of the design, prior to the laying of any new drainage.
 - Covers & frames to existing chambers to be adjusted to suit new levels.
 - All manhole chamber covers to be installed parallel to final kerbs, edgings, paving joints or building lines.
 - This drawing details all below ground drainage up to finished floor level. For details of drainage above finished floor level, refer to Architect's drawings.
 - External private pipework may be either VC, thermoplastic structured wall sewer pipe, or PCV-U to BS EN 13476 160, and shall comply with WIS 4-35-01. Pipes shall be BS Kitemarked, or have equivalent third party certification.
 - All open drainage connections, sumps, gullies, manholes, etc. shall be protected throughout the construction period to prevent the ingress of debris to the systems.
 - All drainage to be laid within ± 10 mm of the design invert levels and shall have a positive fall towards the outfall, no backfalls are permitted.
 - Pipe bedding and surround to be granular (type S), or concrete (type Z) depending on position and depth.

P1	Preliminary Issue	17/12/25 MT	
Rev.	Description	Date	Chkd
 t: 07837 685280 e: info@flowdrainagedesign.co.uk w: www.flowdrainagedesign.co.uk			
Client :	Agilitree		
Project :	Old Ambulance Station Littlehampton		
Title :	Drainage Layout & Details		
Project Engineer :	M. Taylor	Scale :	As Shown @ A1
Project Director :		Date :	Dec 2025
Status :	PRELIMINARY		
Drawing No.	25196/01	Rev	P1