

Drainage Statement

for

Land Off Canal Mews,
Barnham, West Sussex



ARCH ASSOCIATES
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

DRAINAGE STATEMENT

for

Land Off Canal Mews,
Barnham, West Sussex

Client:
Seaward Properties

ISSUE	A	B	C
Issued By	C. Hendry	C Hendry	C Hendry
Date	May 2021	28 th May 2021	17 th June 2021
Purpose	Planning	Planning	Planning
Approved By	CH	CH	CH

Project No. SPR032

The Town House, St George's Square, Bishops Waltham, Southampton, Hampshire, SO32 1AF

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1.0 Introduction

Arch Associates has been appointed by Seaward Properties Ltd to undertake the detailed foul and surface water drainage design at the proposed development in Canal Mews, Barnham.

This Drainage Statement and accompanying detailed drainage design have been prepared for submission to the local LPA/LLFA for discharge of the relevant planning conditions. LPA ref: BN/66/19/PL.

2.0 The Site

The circa 0.11 hectare site is greenfield land currently covered in vegetation. The south-east and south-west boundaries are bounded by Nightingale Lane and Canal Mews, which currently provide level access to the site. The north-west boundary is formed of an 1800mm high close boarded fence with a footpath beyond and the north-eastern boundary is marked with a mature hedge. To the south is a mixture of single and two storey housing, to the east a large public 'green' space and to the north and west, bungalows. A mature tree is located in the southern corner of the site and there are saplings along to the boundary with Nightingale Lane.

The site is located within a suburban residential neighbourhood. Barnham Railway is located approximately 104m to the south of the site and a circa 1 hectare of glasshouses tomatoes farm is located approximately 148m to the east.

A review of the UK Government's Flood-Warning Information Services mapping online indicates that the site is located within Flood Zone 1, very low risk of flooding. Refer to the screenshot above.

Existing Site Topography and Drainage

The site has a gradient fall from south-east to north-west at a gradient of 1:33. The topography survey shows the highest spot level within the site is at circa 49.87mAOD in the south-eastern boundary, and the lowest spot is at circa 48.74mAOD at the site entry in the north-west corner of the site. Refer to the topographical survey in **Appendix 1**.

Review of the Southern Water asset plan confirms that there is an existing 150mm diameter foul water sewer in Halliford Drive running in north to south-westerly direction, with the nearest manhole being manhole ref. 2501 located at the T-junction with Barn Rise to the west of the site. There are no existing public surface water sewers presented within the vicinity of the site on the Southern Water asset location plans. Refer to the Southern Water asset plan in **Appendix 2**.

A CCTV drainage survey has been undertaken by Happy Drains Ltd on 2nd Jan 2018. The survey shows that an existing 150mm diameter private foul sewer runs across the site from north-east to the south-west, which is then connected to a 150mm diameter foul sewer in Canal Mews. A diversion is proposed on-site in order to accommodate the development proposals. Refer to the CCTV Survey in **Appendix 3**.

In addition, a general layout plan prepared for the neighbouring development site indicates that there is an existing ditch located to the north west of the site, which runs in north-west to south-west direction. This ditch is then run into a culvert that runs down the wester flank of the site. Refer to the Croudace Homes' General Layout plan in **Appendix 4** and the topographical survey in **Appendix 1**.

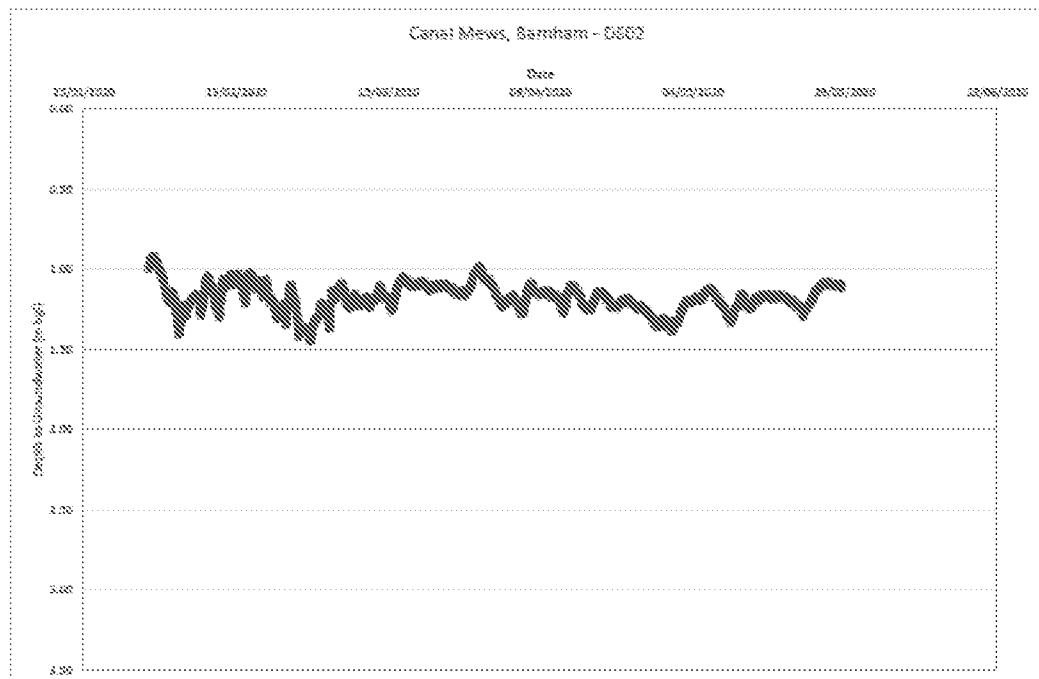
Geology, Infiltration Capacity and Groundwater

A site investigation has been undertaken by Ground and Water, ref: GWPR4066/GIR/February 2021 V1.01. Refer to **Appendix 5** for relevant extracts. The investigation confirms that the site is underlain by fine grained sands and clays of the River Terrace Deposits.

Infiltration testing was completed in late January 2021 and the results are tabulated below.

Soakage Testing Results							
Strata	Trial Hole	Test Number	Depth (m bgl)	Start Depth (m bgl)	Finish Depth (m bgl)	Time Taken (mins)	Infiltration Rate (m/sec)
Granular Unconf. River Terrace Deposits	TP1a	1*	1.25	0.75	1.10	1260	1.827×10^{-6}
		2**	1.15	0.49	1.15	6150	7.729×10^{-7}
		3**	1.10	0.54	1.10	8640	4.013×10^{-7}
Cohesive Unconf. River Terrace Deposits	TP2b	1*	1.25	0.72	0.99	1260	1.328×10^{-6}
		2**	1.15	0.51	1.15	6165	6.602×10^{-7}
		3**	1.10	0.46	1.10	8640	4.685×10^{-7}
	TP3b	1*	1.20	0.66	0.71	90	2.749×10^{-6}
		2**	1.12	0.62	1.12	6141	9.867×10^{-7}
		3*	1.10	0.67	0.94	8640	2.213×10^{-7}
*These tests were deemed incomplete (i.e. less than 75% of the volume of water drained into the soils)							
**These tests were noted to fill overnight/a number of days since the last monitoring round, and therefore these rates may be conservative.							

Groundwater monitoring has been provided by Tweadie Evans Consulting, the results of which are shown in the graph below, as well as in **Appendix 6**.



In addition to the TEC monitoring, the Ground & Water investigation reports striking groundwater at 1.30m bgl and 1.70m bgl in late January.

3.0 Proposed Foul and Surface Water Drainage

3.1 Foul Water

It is proposed to discharge the foul water run-off from the site into the existing 150mm diameter foul sewer located to the south-west of the site, via a new foul network gravity system. The proposed foul water drainage strategy has been designed in accordance with the Sewers for Adoption 7th Edition and Part H of the Building Regulations. Refer to **Appendix 7** – Drainage Strategy Drawing for details.

The length of the existing sewer that runs across the site will need to be diverted in order to accommodate the proposed development site layout. Any new connections and alterations in drainage flows to the existing sewers will have to be agreed with Southern Water and Third Parties under the Water Industry Act (WIA) Section 106 Agreement.

The hydraulic design for the discharge rate for the foul wastewater design has been calculated in accordance with Sewers for Adoption 7th Edition which states design flow rates for dwellings should be 4000l/day. Therefore, the discharge rate for the proposed residential development of 2 dwellings equates to a peak foul discharge rate of approximately 0.10 litres/second. Refer to **Appendix 8** for the drainage calculations.

3.2 Surface Water

Given the high groundwater and poor infiltration capacity of the soils, traditional buried soakaways are not deemed suitable for this development. This is also noted with the site investigation report by Ground & Water.

The run-off from the roof areas is to be diverted via gravity into a shallow crate storage unit within the rear soft landscaping where it will be allowed to infiltrate where possible using a permeable geotextile wrapping. However, infiltration will not be accounted for in the calculations and therefore the tank will be designed for attenuation storage only. Refer to Appendix 9 for Calculations.

Permeable paving with a porous subbase and permeable geotextile is proposed for the driveways of both plots so that high level infiltration can be

used to drain the hardstanding. However, as the target half drain down time will not be achieved, an overflow will be provided in the wider surface water drainage system. The attenuation tank will therefore be designed to cater for the car park areas and the storage within the subbase will not be accounted for in the tank calculations for conservatism.

Impermeable Roof Areas:

Plot 1 – 99m²

Plot 2 – 110m²

Parking Areas:

Plot 1 – 40m²

Plot 2 – 48m²

Total Area Draining into Attenuation Tank = 297m²

Overland/surface exceedance flows due to extreme events or blockage of drainage systems would naturally flow towards the north-west of the site, and into the existing ditch where it will then flow into the culvert. The buildings would remain safe due to the FFL being set at a minimum of 150mm above the proposed ground levels generally.

Maintenance of SUDS features:

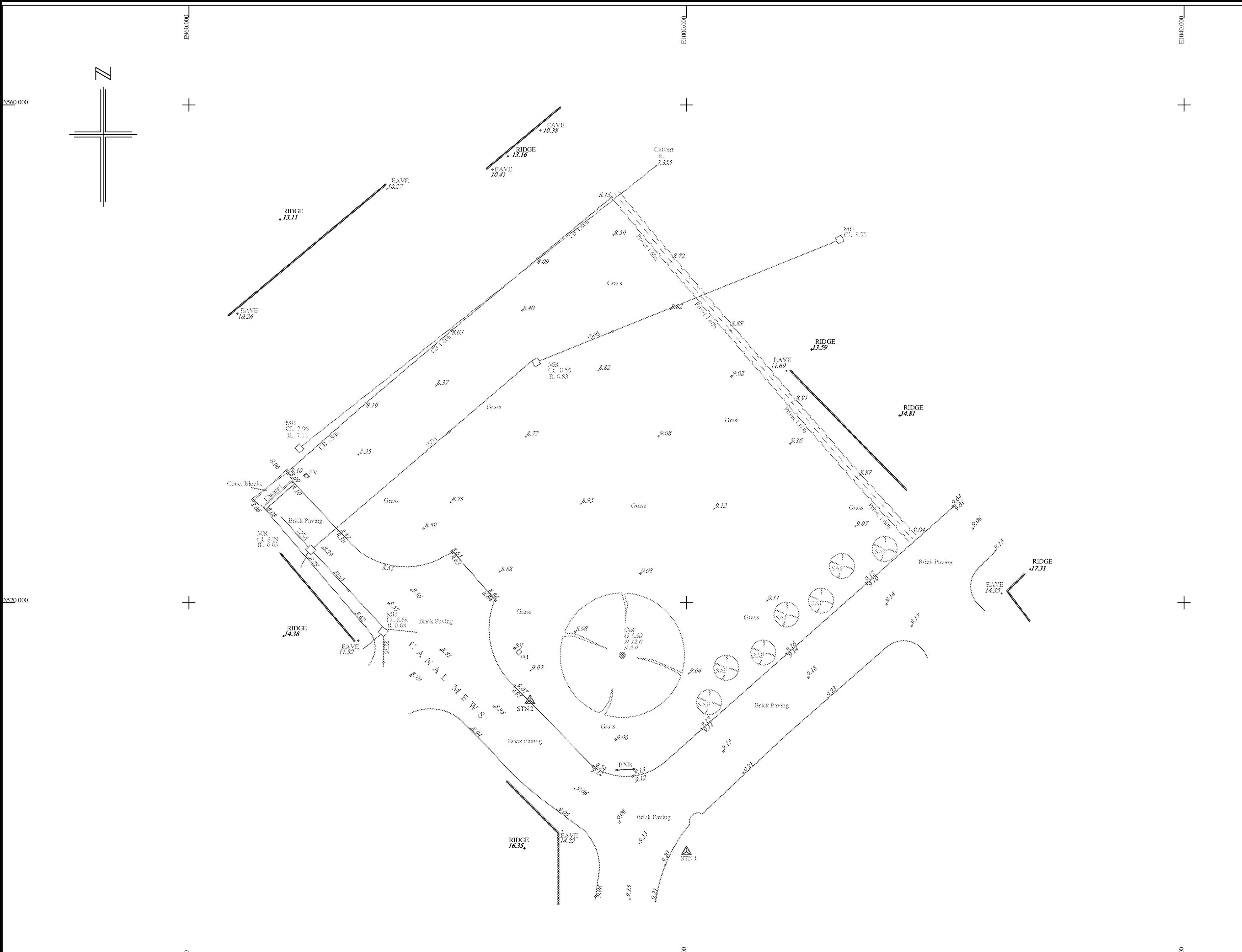
The maintenance regime of the surface water drainage system and its components is outlined on the drainage strategy drawing. This maintenance will be the responsibility of the future dwelling owners. The table below taken from The SUDS Manual 2015 (CIRIA C753) outline the required maintenance of the cellular attenuation crate system and permeable paving.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	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	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

TABLE 20.15 Operation and maintenance requirements for pervious pavements		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

APPENDIX 1

Topographical Survey

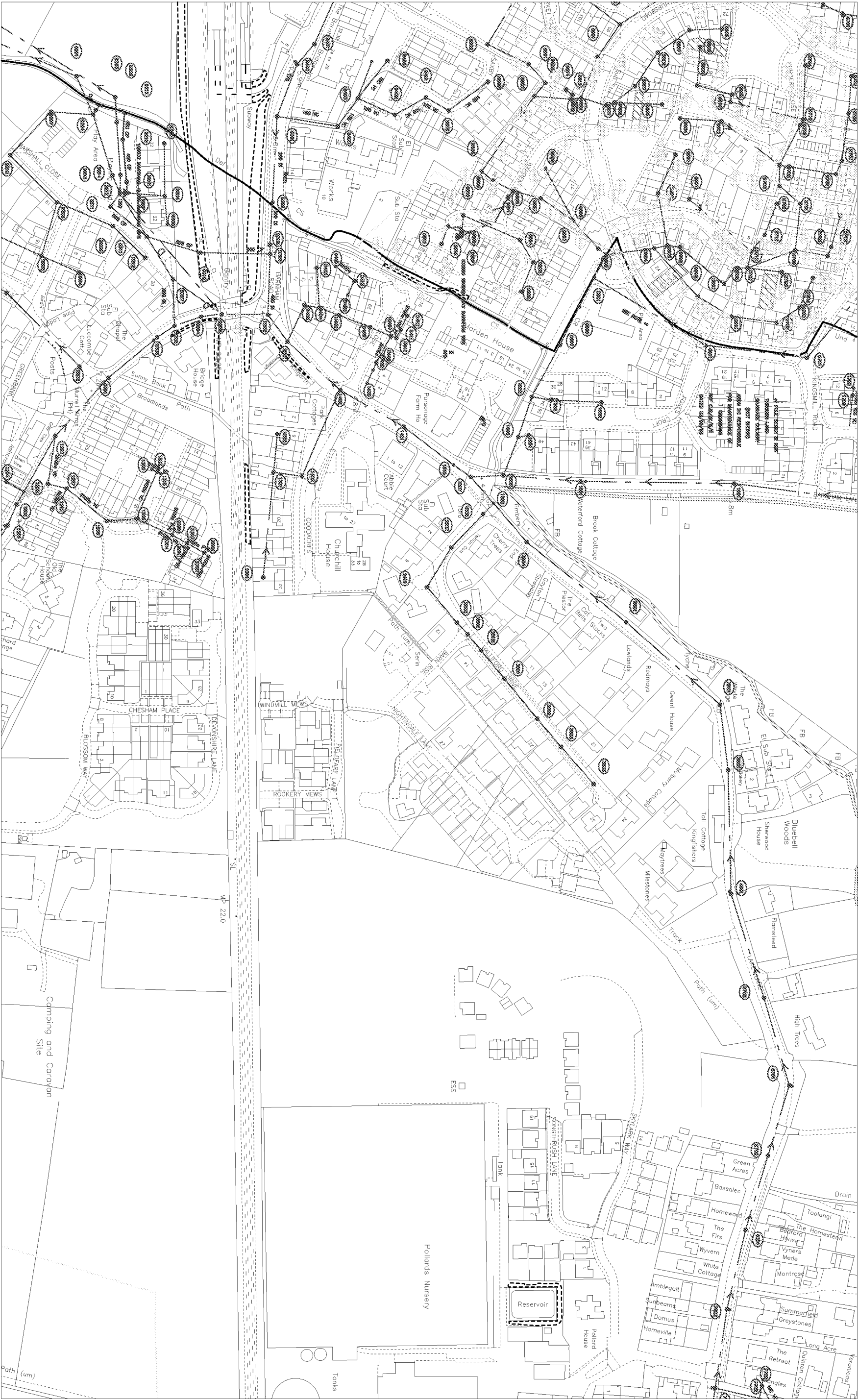


Scale	Date
1:200m	January 20

APPENDIX 2

Southern Water Sewer Plan

104781



104203

O.S. REF. SU9604SW		Drawn by: gujskew	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. WARNING: THIS DRAWING IS A REPRESENTATION OF THE SITUATION AND IS NOT A GUARANTEE OF THE ACCURACY OF THE INFORMATION. THE INFORMATION IS PROVIDED AS IS AND WITHOUT WARRANTY. THE INFORMATION IS NOT TO BE USED FOR ANY OTHER PURPOSE.
Title: 317229_Land off Canal Mews			
Scale: 1:2500		Date: 15/11/2018	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.
Date:			
495845		496789	

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	
0201X	6.9	5.29	225	VC	CIRC	0667X	4.83	3.91	300	VC	CIRC	2304X			UNK	VC	CIRC	9206X	2.69	1.19	300	VC	CIRC	9206X	2.69			UNK	VC	CIRC	9206X	2.69	1.19	300	VC	CIRC	9206X	2.69	1.19	300	VC	CIRC
0202X	7.05	5.83	175	VC	CIRC	0701X	5.3	3.31	225	VC	CIRC	2307X			UNK	PVC	CIRC	9207X	2.88	2.32	150	VC	CIRC	9208X			UNK	VC	CIRC	9208X			UNK	VC	CIRC	9208X			UNK	VC	CIRC	
0203X	6.86	5.44	175	VC	CIRC	0702X	4.93	3.81	150	VC	CIRC	2310X			UNK	PVC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	
0204X			UNK	UNK	CIRC	0703X	5.06	4.05	150	VC	CIRC	2320X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	
0205X			OTHER	BRC	CIRC	0704X	5.09	4.42	150	VC	CIRC	2401X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	9209X			UNK	VC	CIRC	
0301X	3.91	2.18	300	VC	CIRC	0705X	5.26	4.09	150	VC	CIRC	2501X			UNK	VC	CIRC	9210X	3.5		OTHER	CP	CIRC	9210X			UNK	VC	CIRC	9210X			UNK	VC	CIRC	9210X			UNK	VC	CIRC	
0302X	3.47	2.15	450	DI	CIRC	0706X	5.33	4.09	150	VC	CIRC	2502X			UNK	VC	CIRC	9211X	4.53	1.816	525	CP	CIRC	9211X			UNK	VC	CIRC	9211X			UNK	VC	CIRC	9211X			UNK	VC	CIRC	
0305X	5.06		250	DI	CIRC	0707X	5.03	3.71	225	VC	CIRC	2503X			UNK	VC	CIRC	9212X	3.58	1.82	450	CP	CIRC	9212X			UNK	VC	CIRC	9212X			UNK	VC	CIRC	9212X			UNK	VC	CIRC	
0306X	5.89	4.29	225	VC	CIRC	0708X	5.05	4.15	150	VC	CIRC	2504X			UNK	VC	CIRC	9212X	3.58	3.58	375	CP	CIRC	9212X			UNK	VC	CIRC	9212X			UNK	VC	CIRC	9212X			UNK	VC	CIRC	
0307X	5.2	1.92	375	VC	CIRC	0709X	5.02	3.87	225	VC	CIRC	2505X			UNK	VC	CIRC	9213X	3.66	1.07	375	CP	CIRC	9213X			UNK	VC	CIRC	9213X			UNK	VC	CIRC	9213X			UNK	VC	CIRC	
0308X	3.25	2.06	450	DI	CIRC	0710X	5.29	4.27	150	VC	CIRC	2601X			UNK	VC	CIRC	9214X	3		350	PF	CIRC	9214X			UNK	VC	CIRC	9214X			UNK	VC	CIRC	9214X			UNK	VC	CIRC	
0309X	3.25	2.06	800	CP	CIRC	0712X	5.29	4.48	150	VC	CIRC	3502X			UNK	VC	CIRC	9215X	3.5	1.879	450	CP	CIRC	9215X			UNK	VC	CIRC	9215X			UNK	VC	CIRC	9215X			UNK	VC	CIRC	
0310X	4.2	1.891	525	CP	CIRC	0751X	5.18	4.41	150	VC	CIRC	3503X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
0311X	4.61	1.841	525	CP	CIRC	0752X	5.1	5.04	150	VC	CIRC	3601X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
0312X			375	CP	CIRC	0753X	5.05	5.04	150	VC	CIRC	3602X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
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0409X			UNK	UNK	CIRC	0764X	5.26	4.46	150	VC	CIRC	6702X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
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0508X	4.06	2.89	225	VC	CIRC	1207X			UNK	VC	CIRC	8551X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
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0512X	3.98	4.17	100	PVC	CIRC	120DX			UNK	VC	CIRC	8555X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
0512X	4.51	2.26	150	VC	CIRC	121DX			UNK	VC	CIRC	8601X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
0552X	2.87	2.97	300	VC	CIRC	1301X			UNK	VC	CIRC	8602X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
0553X	4.37	2.87	225	VC	CIRC	1302X			UNK	VC	CIRC	8606X			UNK	VC	CIRC	9216X	2.82	1.77	450	CP	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	9216X			UNK	VC	CIRC	
0554X	4.15	3.11	150	VC	CIRC	13																																				

APPENDIX 3

Extracts of CCTV Drainage Survey



Happy Drains Ltd

Unit 12A Chalex Industrial Estate, Manor Hall Road, Southwick, BN42 4NH

Ref C0007059

Date: 2nd January 2018

David West
Seaward Properties Ltd
Land off Canal Mews
Barnham
PO22 0JH

Dear Sirs

1. DESCRIPTION OF PROPERTY

Residential Properties.

2. DRAINAGE SYSTEM

This is a foul drainage system accessible by FW1. The pipework is circular in shape, 150mm in diameter and PVC plastic material. Further specific variations can be found in the report content.

3. SHARED

The sections identified within the property boundary are for the sole use of this property and therefore the responsibility of the site owner to maintain.

The sections as shared or beyond the property boundary generally are the legal responsibility of the local water company to maintain.

4. CIRCUMSTANCES

- Survey arranged for planned building works.

5. SUMMARY

- No access to manhole Fw1 - located on private property.
- No access to manhole Fw5 - Behind locked gates in private road.
- No structural defects all free flowing.
- Communal drainage from manhole Fw4

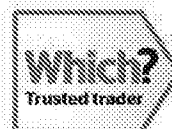
If you require more information or wish to discuss this matter, please contact us.

Yours sincerely

Happy Drains Ltd

Company No: 08267398
Registered office:
100 Church Street
Brighton, East Sussex
BN1 1UJ

Checkatrade.com
★★★★★ Where reputation matters





Project

Project Name	LAND OFF CANAL MEWS
Project Description	GENERAL CCTV
Start Date	02/01/2018
Project Status	Complete
Inspection Standard	MSCC5 Sewers & Drainage (GB) (SRM5 Scoring)



Table of Contents

Project Name
LAND OFF CANAL MEWSProject Number:
C0007059Date:
05/01/2018

Scoring Summary	P-1
Project Information	P-2
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Section: 2; FW2 -FW4	3
Section: 3; FW3 -FW4	5
Section: 4; FW4 -FW5	7



Scoring Summary

Project Name :
LAND OFF CANAL MEWS

Project Number :
C0007059

Date :
05/01/2018

Structural Defects

Section	Pipe Ref	Grade	Description
---------	----------	-------	-------------

Acceptable Structural Condition

Grade 3: Best practice suggests consideration should be given to repairs in the medium term.

Grade 4: Best practice suggests consideration should be given to repairs to avoid a potential collapse.

Grade 5: Best practice suggests that this pipe is at risk of collapse at any time. Urgent consideration should be given to repairs to avoid total failure

Service / Operational Defects

Section	Pipe Ref	Grade	Description
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4	FW4X	4	Attached deposits, grease at 12 o'clock, 5% cross-sectional area loss
---	------	---	---

Grade 3: Best practice suggests consideration should be given to maintenance activities in the medium term.

Grade 4: Best practice suggests consideration should be given to maintenance activity to avoid potential blockages.

Grade 5: Best practice suggests that this pipe is at a high risk of backing up or causing flooding.

Abandoned Surveys

Section	Pipe Ref	Description
---------	----------	-------------

All Surveys Completed

Information

These summaries are based on the SRM grading from the WRC.

**Project Information**Project Name:
LAND OFF CANAL MEWSClient's Ref:
C0007059Contractor's Ref:
C0007059Project Date:
05/01/2018**Project Description:** GENERAL CCTV**Site**

Company or Site Name: Seaward Properties Ltd

Contact: David West

Department:

Street: Canal Mews

Town or City: Barnham PO22 0JH

Phone: 07802447160

Fax:

Mobile:

Email:

Contractor

Company or Site Name: Happy Drains Ltd

Contact: David/Will

Department:

Street: Unit 12a Chalex Industrial Estate Manor Hall Road

Town or City: Southwick East Sussex BN42 4NH

Phone: 0800 849 8099

Fax:

Mobile: 07824 757572

Email: Service@happydrains.co.uk



Project Information

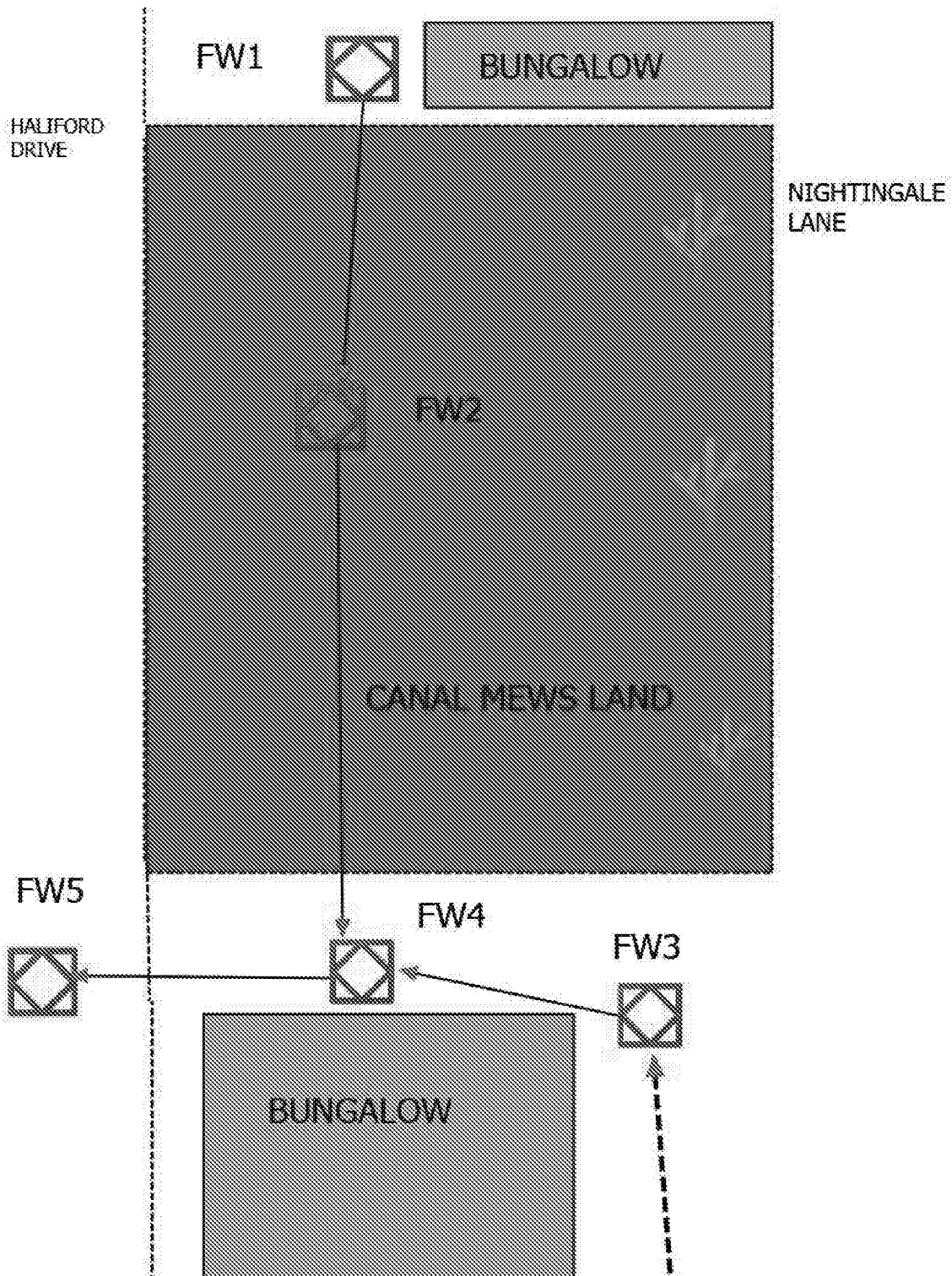
Project Name:
LAND OFF CANAL MEWS

Client's Ref:
C0007059

Contractor's Ref:
C0007059

Project Date:
05/01/2018

Project Description: GENERAL CCTV





Section Profile

Project Name:
LAND OFF CANAL MEWSProject Number:
C0007059Project Date:
05/01/2018

Section No.	Upstream Node	Downstream Node	Date	Road	Pipe Material	Expected Length [m]	Inspected Length [m]
2	FW2	FW4	10/01/2018	CANAL MEWS	Polyvinyl chloride	23.50	23.50
3	FW3	FW4	02/01/2018	CANAL MEWS	Polyvinyl chloride	9.10	9.10
4	FW4	FW5	10/01/2018	CANAL MEWS	Polyvinyl chloride	35.70	35.70

3 x Circular 150 = 68.30 Expected Length [m] (68.30 Inspected Length [m])

Section No.	Upstream Node	Downstream Node	Date	Road	Pipe Material	Expected Length [m]	Inspected Length [m]
1	FW1	FW2	05/01/2018	CANAL MEWS	Polyvinyl chloride	17.80	17.80

1 x Circular 150/150 = 17.80 Expected Length [m] (17.80 Inspected Length [m])

Total: 4 = 86.10 Expected Length [m] (86.10 Inspected Length [m])

**Happy Drains Ltd**Unit 12a Chalex Industrial Estate Manor Hall Road, Southwick East Sussex
BN42 4NH**Section Inspection - 05/01/2018 - FW1X**

Section: 1	Inspection: 1	Date: 05/01/18	Time: 10:29	Client's Ref : C0007059	Weather: Rain	Pre Cleaned: Yes	PLR: FW1X
Operator: Mpl		Vehicle: EX58 OLO		Camera: Xti	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer

Town or Village:	Barnham	Insp Dir:	FW2 ← FW1	US MH:	FW1
Road:	Canal Mews	Inspected Length:	17.80 m	US Depth:	
Location:	Fields (farmland and public open space)	Total Length:	17.80 m	DS MH:	FW2
Surface Cover:	Grass	Pipe Length:	0.00 m	DS Depth:	1.50 m
Use:	Foul	Pipe Shape:	Circular		
Lining Type:	None	Height / Width:	150 / 150 mm		
Inspection Purpose:	Routine inspection of condition	Pipe Material:	Polyvinyl chloride		
Year Constructed:		Flow Control:	No flow control		

Comment:

Recommendation:

1:155 Position m Code Observation Grade

Depth: 1.50

FW2



Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
Note: in line with the WRC SRM, plastic pipes are not scored against structural defects.									
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0



Section Pictures - 05/01/2018 - FW1X

Section Number: 1	Inspection Direction: FW2 ↔ FW1	PLR: FW1X	Client's Ref: C0007059	Contractor's Ref: C0007059
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FW1X_0d76fe4c-d64b-4dff-a029-d21ec7f79804_20180110_193300_411.jpg, , 0.00m
Start node type, manhole, reference number: FW2



FW1X_ae57d161-f9c4-4092-a28d-53740de2bdf6_20180110_193636_768.jpg, , 17.80m
Finish node type, manhole, reference number: FW1 / NO



FW1X_94c783ad-9477-49a7-978e-bf66089f40ef_20180110_193136_514.jpg, 00:00:00, 0.00m
General photograph taken at this point / OVERVIEW



FW1X_7f90da61-620c-44cc-a96b-bed728392652_20180110_193059_014.jpg, 00:00:00, 0.00m
General photograph taken at this point / OVERVIEW

**Happy Drains Ltd**Unit 12a Chalex Industrial Estate Manor Hall Road, Southwick East Sussex
BN42 4NH**Section Inspection - 10/01/2018 - FW2X**

Section: 2	Inspection: 2	Date: 10/01/18	Time: 19:37	Client's Ref : C0007059	Weather: Rain	Pre Cleaned: Yes	PLR: FW2X
Operator: Mpl		Vehicle: EX58 OLO		Camera: Xti	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer

Town or Village:	Barnham	Insp Dir:	FW2 → FW4	US MH:	FW2
Road:	Canal Mews	Inspected Length:	23.50 m	US Depth:	1.50 m
Location:	Fields (farmland and public open space)	Total Length:	23.50 m	DS MH:	FW4
Surface Cover:	Grass	Pipe Length:	0.00 m	DS Depth:	1.90 m
Use:	Foul	Pipe Shape:	Circular		
Lining Type:	None	Height / Width:	150 / 0 mm		
Inspection Purpose:	Routine inspection of condition		Pipe Material:	Polyvinyl chloride	
Year Constructed:			Flow Control:	No flow control	
Comment:					
Recommendation:					

1:204 Position m Code Observation Grade



Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
Note: in line with the WRC SRM, plastic pipes are not scored against structural defects.									
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0



Section Pictures - 10/01/2018 - FW2X

Section Number: 2	Inspection Direction: FW2 ➔ FW4	PLR: FW2X	Client's Ref: C0007059	Contractor's Ref: C0007059
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FW2X_3e2d9e45-481b-4e36-b275-d35d78e19be5_20180110
_194004_497.jpg, 00:00:00, 0.00m
Start node type, manhole, reference number: FW2



FW2X_123d7814-9d39-47bc-8a50-48c4b4c2e600_20180110
_194216_024.jpg, , 23.50m
Finish node type, manhole, reference number: FW4

**Happy Drains Ltd**Unit 12a Chalex Industrial Estate Manor Hall Road, Southwick East Sussex
BN42 4NH**Section Inspection - 02/01/2018 - FW3X**

Section: 3	Inspection: 3	Date: 02/01/18	Time: 19:43	Client's Ref : C0007059	Weather: Rain	Pre Cleaned: Yes	PLR: FW3X
Operator: Mpl		Vehicle: EX58 OLO		Camera: Xti	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer

Town or Village:	Barnham	Insp Dir:	FW3 → FW4	US MH:	FW3
Road:	Canal Mews	Inspected Length:	9.10 m	US Depth:	1.80 m
Location:	Other pedestrian area	Total Length:	9.10 m	DS MH:	FW4
Surface Cover:	Block Paved	Pipe Length:	0.00 m	DS Depth:	1.90 m
Use:	Foul	Pipe Shape:	Circular		
Lining Type:	None	Height / Width:	150 / 0 mm		
Inspection Purpose:	Routine inspection of condition	Pipe Material:	Polyvinyl chloride		
Year Constructed:		Flow Control:	No flow control		
Comment:					
Recommendation:					

1:79	Position m	Code	Observation	Grade
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Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
Note: in line with the WRC SRM, plastic pipes are not scored against structural defects.									
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0



Section Pictures - 02/01/2018 - FW3X

Section Number: 3	Inspection Direction: FW3 ➔ FW4	PLR: FW3X	Client's Ref: C0007059	Contractor's Ref: C0007059
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FW3X_ec21d8f3-e28e-4486-895b-98986cc3c2d7_20180110_194747_359.jpg, 00:00:00, 0.00m
Start node type, manhole, reference number: FW3



FW3X_87f3fb8b-06d2-4f23-9bf1-9e042a1563d5_20180110_194933_042.jpg, 00:00:00, 9.10m
Finish node type, manhole, reference number: FW4



FW3X_31ec5b81-d325-4d26-9daa-c960a3abd43a_20180110_194828_893.jpg, , 0.01m
Line deviates left



Section Inspection - 10/01/2018 - FW4X

Section: 4	Inspection: 4	Date: 10/01/18	Time: 19:49	Client's Ref : C0007059	Weather: Rain	Pre Cleaned: Yes	PLR: FW4X
Operator: Mpl		Vehicle: EX58 OLO		Camera: Xti	Preset Length [m]:	Criticality Grade:	Type of Pipe: Gravity drain/sewer

Town or Village:	Barnham	Insp Dir:	FW4 → FW5	US MH:	FW4
Road:	Canal Mews	Inspected Length:	35.70 m	US Depth:	1.90 m
Location:	Other pedestrian area	Total Length:	35.70 m	DS MH:	FW5
Surface Cover:	Concrete Highway	Pipe Length:	0.00 m	DS Depth:	
Use:	Foul	Pipe Shape:	Circular		
Lining Type:	None	Height / Width:	150 / 0 mm		
Inspection Purpose:	Routine inspection of condition	Pipe Material:	Polyvinyl chloride		
Year Constructed:		Flow Control:	No flow control		
Comment:					
Recommendation:					

1:310 Position m Code Observation Grade



Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
Note: In line with the WRC SRM, plastic pipes are not scored against structural defects.									
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0.0	0.0	0.0	1.0	1	5.0	0.1	5.0	4.0



Section Pictures - 10/01/2018 - FW4X

Section Number: 4	Inspection Direction: FW4 ➔ FW5	PLR: FW4X	Client's Ref: C0007059	Contractor's Ref: C0007059
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FW4X_94e5ead6-dc09-4da9-acc3-f3e4d655e641_20180110_195351_931.jpg, 00:00:00, 0.00m
Start node type, manhole, reference number: FW4



FW4X_e9b28669-9564-4422-bd69-d97c942bd698_20180110_200309_751.jpg, 00:07:43, 35.70m
Finish node type, manhole, reference number: FW5 /



FW4X_d168865b-8a15-48a5-abc0-75b79300f2b4_20180110_200004_508.jpg, 00:08:06, 31.00m
Attached deposits, grease at 12 o'clock, 5% cross-sectional

APPENDIX 4

Croudace Homes Layout Plan



APPENDIX 5

Extracts of Ground & Water SI Report

a CBR of 4.5% being applicable. The cohesive soils were generally described as sandy gravelly silty clay therefore they were **likely to be frost susceptible**.

Undifferentiated River Terrace Deposits (granular)

Roads and hardstanding constructed on the granular Undifferentiated River Terrace Deposits should be designed based on a CBR value of 30.0%. This is based on reference to Table C1 of TRL1132 and average construction conditions. Based on wet conditions a CBR of 20.0% should be adopted, with dry conditions a CBR of 40.0% being applicable. The granular soils generally had 8.4 – 10.4% passing the 150µm sieve in geotechnical testing, therefore they were **likely to be frost susceptible**.

All formation levels for roads and hardstanding should be proof rolled to highlight any soft areas which should then be dug out and replaced with selected granular material compacted in thin layers to a suitable specification.

6.6 Surface Water Disposal

Soakage testing in accordance with BRE365 was undertaken within TP1a, TP2b and TP3b, with the results tabulated below.

Soakage Testing Results							
Strata	Trial Hole	Test Number	Depth (m bgl)	Start Depth (m bgl)	Finish Depth (m bgl)	Time Taken (mins)	Infiltration Rate (m/sec)
Granular Undif. River Terrace Deposits	TP1a	1*	1.25	0.75	1.10	1260	1.827×10^{-6}
		2**	1.15	0.49	1.15	6150	7.729×10^{-7}
		3**	1.10	0.54	1.10	8640	4.013×10^{-7}
Cohesive Undif. River Terrace Deposits	TP2b	1*	1.25	0.72	0.99	1260	1.328×10^{-6}
		2**	1.15	0.51	1.15	6165	6.602×10^{-7}
		3**	1.10	0.46	1.10	8640	4.685×10^{-7}
	TP3b	1*	1.20	0.66	0.71	90	2.749×10^{-6}
		2**	1.12	0.62	1.12	6141	9.867×10^{-7}
		3*	1.10	0.67	0.94	8640	2.213×10^{-7}
*These tests were deemed incomplete (i.e. less than 75% of the volume of water drained into the soils)							
**These tests were noted to fill overnight/a number of days since the last monitoring round, and therefore these rates may be conservative.							

Based on the infiltration rates provided above, and the shallow groundwater encountered, soakaway systems may not be proved to be appropriate for the site.

Any soakaways should be located sufficiently away from buildings and infrastructure, in order to prevent undermining of foundations.

The site was located on a Secondary (A) Aquifer comprising superficial deposits of the Undifferentiated River Terrace Deposits, underlain by Unproductive Strata associated with the London Clay Formation. The ground conditions encountered generally comprised a capping of Made Ground overlying the Undifferentiated River Terrace Deposits.

Examination of the Environment Agency records showed that the site was not located within a Groundwater Source Protection Zone (SPZ) as classified in the Policy and Practice for the Protection of Groundwater.

Consultation with the Environment Agency must be sought regarding any use that may have an impact on groundwater resources.

The principles of sustainable urban drainage system (SUDS) should be applied to reduce the risk of flooding from surface water ponding.

Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP1	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.35			MADE GROUND: Brown gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded flint (80%), brick (10%) and glass (10%).	
								Yellowish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS).	
					1.30				
					1.50			Orangish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	
								End of Borehole at 1.500m	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Fresh roots were noted for the full depth of the trial hole (1.50m bgl). A groundwater strike was noted at 1.40m bgl.	
---	---

Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP1	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.35			MADE GROUND: Brown gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded flint (80%), brick (10%) and glass (10%).	
								Yellowish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS).	
					1.30				
					1.50			Orangish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	
								End of Borehole at 1.500m	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Fresh roots were noted for the full depth of the trial hole (1.50m bgl). A groundwater strike was noted at 1.40m bgl.	
---	---

Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP1a	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.35			MADE GROUND: Brown gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded flint (80%), brick (10%) and glass (10%).	
								Yellowish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS).	
					1.25			End of Borehole at 1.250m	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks		
Fresh roots were noted for the full depth of the trial hole (1.25m bgl). No groundwater was encountered		
COUNCIL BN/79/21/DOC		

Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP2	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.45			MADE GROUND: Brown/greyish brown clayey gravelly sand. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded, flint (70%), brick (20%), and concrete (10%).	
								Yellowish brown/brown gravelly sandy CLAY, with greyish brown and orangish brown mottling. Sand was fine to coarse. Gravel was rare, fine to coarse, sub-angular to sub-rounded flint. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	1
					1.65			Orangish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	
					1.70			End of Borehole at 1.700m	2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks							
Fresh roots were noted to a proved depth of 1.70m bgl. No groundwater strikes were encountered.							

Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP2a	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.45			MADE GROUND: Brown/greyish brown clayey gravelly sand. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded, flint (70%), brick (20%), and concrete (10%).	
								Yellowish brown/brown gravelly sandy CLAY, with greyish brown and orangish brown mottling. Sand was fine to coarse. Gravel was rare, fine to coarse, sub-angular to sub-rounded flint. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	
					1.20			End of Borehole at 1.200m	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Fresh roots were noted for the full depth of the trial hole (1.20m bgl). No groundwater strikes were encountered.							
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Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP2b	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.45			MADE GROUND: Brown/greyish brown clayey gravelly sand. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded, flint (70%), brick (20%), and concrete (10%).	
								Yellowish brown/brown gravelly sandy CLAY, with greyish brown and orangish brown mottling. Sand was fine to coarse. Gravel was rare, fine to coarse, sub-angular to sub-rounded flint. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	
					1.25			End of Borehole at 1.250m	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Fresh roots were noted for the full depth of the trial hole (1.25m bgl). No groundwater strikes were encountered.							
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Trial Pit Log

Project Name: 2 Bungalows, Canal Mews			Client: Seawards Properties			Date: 21/01/2021		
Location: Barnham, West Sussex PO22 0DP			Contractor:					
Project No. : GWPR4066			Crew Name:			Equipment:		
Location Number TP3		Location Type TP		Level		Logged By		Scale 1:25 Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.45			MADE GROUND: Brown/greyish brown clayey gravelly sand. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded, brick (40%), flint (30%), concrete (20%) and carbonaceous material (10%).	
								Yellowish brown/brown gravelly sandy CLAY, with greyish brown and orangish brown mottling. Sand was fine to coarse. Gravel was rare, fine to coarse, sub-angular to sub-rounded flint. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	1
					1.65 1.70			Orangish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	
								End of Borehole at 1.700m	2
									3
									4
									5

Dimensions		Trench Support and Comment				Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks		Date	Rate	Remarks

Remarks Fresh roots were noted to a proved depth of 1.70m bgl. No groundwater strikes were encountered.								
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Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP3a	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.45			MADE GROUND: Brown/greyish brown clayey gravelly sand. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded, brick (40%), flint (30%), concrete (20%) and carbonaceous material (10%).	
					1.20			Yellowish brown/brown gravelly sandy CLAY, with greyish brown and orangish brown mottling. Sand was fine to coarse. Gravel was rare, fine to coarse, sub-angular to sub-rounded flint. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	
								End of Borehole at 1.200m	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Fresh roots were noted for the full depth of the trial hole (1.20m bgl). No groundwater strikes were encountered.	
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Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP3b	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.45			MADE GROUND: Brown/greyish brown clayey gravelly sand. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded, brick (40%), flint (30%), concrete (20%) and carbonaceous material (10%).	
					1.20			Yellowish brown/brown gravelly sandy CLAY, with greyish brown and orangish brown mottling. Sand was fine to coarse. Gravel was rare, fine to coarse, sub-angular to sub-rounded flint. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	
								End of Borehole at 1.200m	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Fresh roots were noted for the full depth of the trial hole (1.20m bgl). No groundwater strikes were encountered.	
---	---

Trial Pit Log

Project Name: 2 Bungalows, Canal Mews		Client: Seawards Properties		Date: 21/01/2021	
Location: Barnham, West Sussex PO22 0DP		Contractor:			
Project No. : GWPR4066		Crew Name:		Equipment:	
Location Number TP4	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			MADE GROUND: Brown clayey very gravelly sand. Sand was fine to coarse. Gravel was occasional, angular to sub-angular, fine to coarse brick (40%), concrete (40%) and flint (20%).	
					0.70			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					1.80			Brownish grey/orangish brown mottled gravelly sandy CLAY. Sand was fine to coarse. Gravel was rare, fine to coarse, sub-rounded to rounded flint. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	1
					2.00			Yellowish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS).	2
								End of Borehole at 2.000m	
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks		
Fresh roots were noted to a proved depth of 1.30m bgl. No groundwater strikes were encountered.		
COUNCIL BN/79/21/DOC		

Trial Pit Log

Project Name: 2 Bungalows, Canal Mews			Client: Seawards Properties			Date: 21/01/2021		
Location: Barnham, West Sussex PO22 0DP			Contractor:					
Project No. : GWPR4066			Crew Name:			Equipment:		
Location Number TP5		Location Type TP		Level		Logged By		Scale 1:25 Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			MADE GROUND: Brown slightly gravelly sandy clay. Sand was fine to coarse. Gravel was occasional, fine to coarse, sub-angular to sub-rounded flint.	
					0.60			MADE GROUND: Brown/greyish brown clayey gravelly sand. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded, brick (60%), concrete (20%) and flint (20%).	
					1.70			Greyish brown/yellowish brown clayey gravelly SAND, with reddish brown mottling and frequent black specks. Sand was fine to coarse. Gravel was occasional, fine to coarse, angular to sub-rounded flint. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS)	1
					2.30			Yellowish brown silty SAND. Sand was fine to coarse. (UNDIFFERENTIATED RIVER TERRACE DEPOSITS).	2
								End of Borehole at 2.300m	3
									4
									5

Dimensions		Trench Support and Comment				Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks		Date	Rate	Remarks

Remarks Fresh roots were noted to a proved depth of 1.70m bgl. Dead roots were noted to a proved depth of 1.50m bgl. No groundwater strikes were encountered.								
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APPENDIX 6

Groundwater Monitoring By TEC

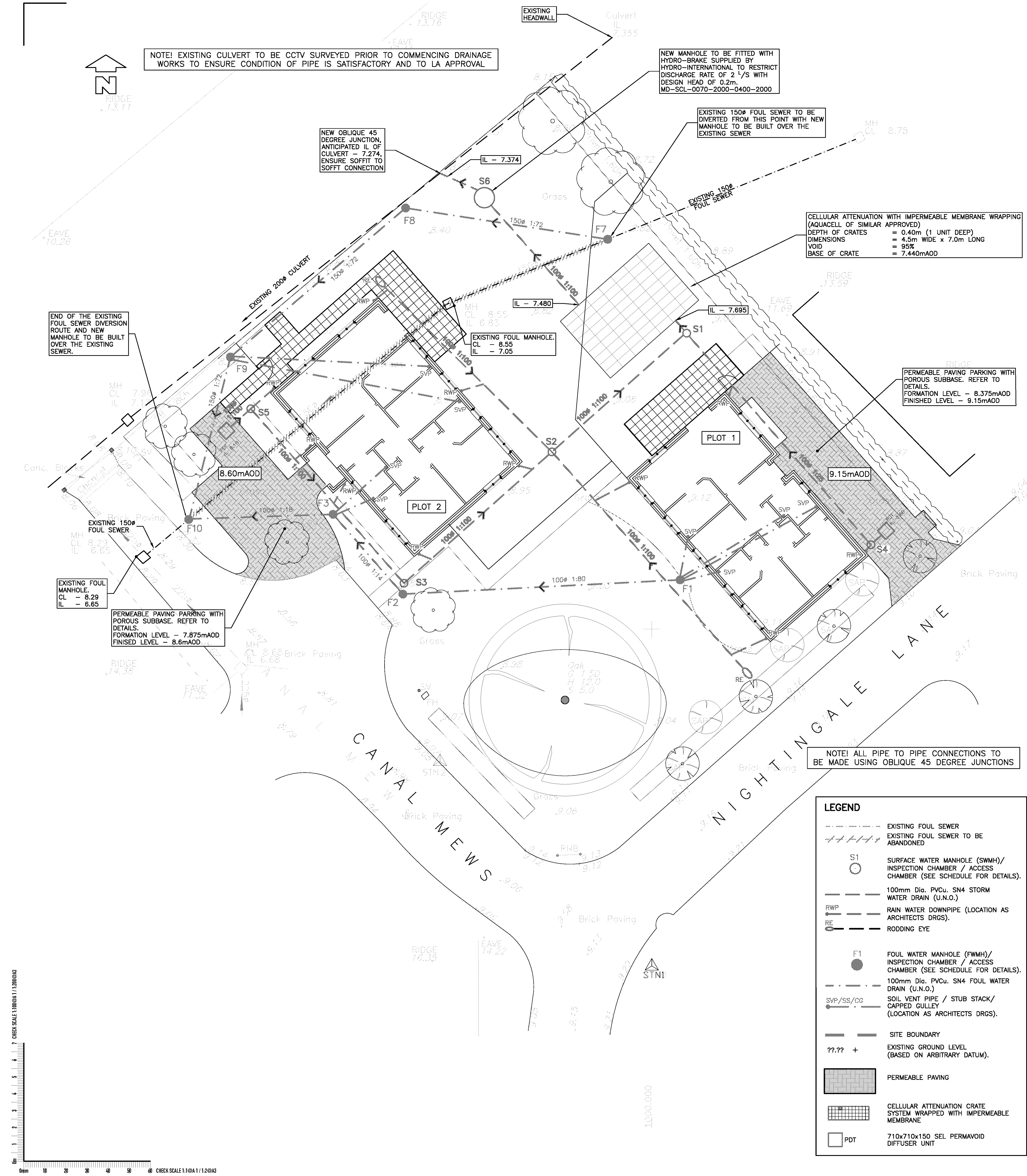
ERROR: undefined
OFFENDING COMMAND: get

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/quit
-dictionary-
-mark-

APPENDIX 7

Drainage Strategy Drawing & Details



SUDS OPERATION & MAINTENANCE		
GENERAL		
MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
REGULAR MAINTENANCE	REMOVE SEDIMENT & DEBRIS FROM PRE-TREATMENT DEVICES & FLOOR OF INSPECTION TUBE OR CHAMBER	ANNUALLY
	CLEANING OF ANY GUTTERS & ANY FILTERS ON DOWNPIPES	ANNUALLY
	TRIMMING ANY ROOTS THAT MAY BE CAUSING BLOCKAGES	ANNUALLY (OR AS REQUIRED).
MONITORING	INSPECT SILT TRAPS AND NOTE RATE OF SEDIMENT ACCUMULATION	MONTHLY IN THE FIRST YEAR & THEN ANNUALLY
OPERATION AND MAINTENANCE REQUIREMENTS FOR PERMEABLE PAVING		
MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
REGULAR MAINTENANCE	BRUSHING AND VACUUMING (STANDARD COSMETIC SWEEP OVER WHOLE SURFACE)	ONCE A YEAR, AFTER AUTUMN LEAF FALL, OR REDUCED FREQUENCY AS REQUIRED, BASED ON SITE-SPECIFIC OBSERVATIONS OF CLOGGING OR MANUFACTURER'S RECOMMENDATIONS - PAY PARTICULAR ATTENTION TO AREAS WHERE WATER RUNS ONTO PERVIOUS SURFACE FROM ADJACENT IMPERMEABLE AREAS AS THIS AREA IS MOST LIKELY TO COLLECT THE MOST SEDIMENT
	STABILISE AND MOW CONTRIBUTING AND ADJACENT AREAS	AS REQUIRED
OCCASIONAL MAINTENANCE	REMOVAL OF WEEDS OR MANAGEMENT USING GLYPHOSATE APPLIED DIRECTLY INTO THE WEEDS BY AN APPLICATOR RATHER THAN SPRAYING	AS REQUIRED - ONCE PER YEAR ON LESS FREQUENTLY USED PAVEMENTS
	REMEDIAL WORK TO ANY DEPRESSIONS, RUTTING AND CRACKED OR BROKEN BLOCKS CONSIDERED DETRIMENTAL TO THE STRUCTURAL PERFORMANCE OR A HAZARD TO USERS, AND REPLACE LOST JOINTING MATERIAL	AS REQUIRED
REMEDIAL ACTIONS	REHABILITATION OF SURFACE AND UPPER SUB-STRUCTURES BY REMEDIAL SWEEPING	EVERY 10 TO 15 YEARS OR AS REQUIRED (IF INFILTRATION PERFORMANCE IS REDUCED DUE TO SIGNIFICANT CLOGGING)
	INITIAL INSPECTION	MONTHLY FOR THREE MONTHS AFTER INSTALLATION
MONITORING	INSPECT FOR EVIDENCE OF POOR OPERATION AND/OR WEED GROWTH - IF REQUIRED, TAKE REMEDIAL ACTION	THREE-MONTHLY, 48 HOURS AFTER LARGE STORMS IN FIRST SIX MONTHS
	INSPECT SILT ACCUMULATION RATES AND ESTABLISH APPROPRIATE BRUSHING FREQUENCIES	ANNUALLY
	MONITOR INSPECTION CHAMBERS	ANNUALLY
	INSPECT TREATED TIMBER EDGING AND REPLACE AS AND WHEN REQUIRED.	ANNUALLY
OPERATION AND MAINTENANCE REQUIREMENTS FOR ATTENUATION STORAGE TANKS		
MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
REGULAR MAINTENANCE	INSPECT AND IDENTIFY ANY AREA THAT ARE NOT OPERATING CORRECTLY. IF REQUIRED, TAKE REMEDIAL ACTION	MONTHLY FOR 3 MONTHS, THEN ANNUALLY
	REMOVE DEBRIS FROM THE CATCHMENT SURFACE (WHERE IT MAY CAUSE RISK TO PERFORMANCE)	MONTHLY
	FOR SYSTEMS WHERE RAINFALL INFILTRATES INTO THE TANK FROM ABOVE, CHECK SURFACE OF FILTER FOR BLOCKAGE BY SEDIMENT, ALGAE OR OTHER MATTER. REMOVE AND REPLACE SURFACE INFILTRATION MEDIUM AS NECESSARY	ANNUALLY
	REMOVED SEDIMENT FROM PRE-TREATMENT STRUCTURES AND/OR INTERNAL FOREBAYS	ANNUALLY, OR AS REQUIRED
REMEDIAL ACTIONS	REPAIR/REHABILITATE INLETS, OUTLETS, 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	ANNUALLY
	SURVEY INSIDE OF TANK FOR SEDIMENT BUILD-UP AND REMOVE IF NECESSARY	EVERY 5 YEARS OR AS REQUESTED

- NOTES
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- GENERAL NOTES
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND DETAILS.
 - ALL FIGURED DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED DIMENSIONS.
 - ANY DISCREPANCIES BETWEEN THIS DRAWING AND OTHER INFORMATION IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF THE WORKS ON SITE.
 - THE TOPOGRAPHY SURVEY SHOWN ON THIS DRAWING HAS BEEN PRODUCED BY STUART BAILEY LAND SURVEY ON JANUARY 2017, BASED ON ARBITRARY DATUM RATHER THAN THE TRUE DATUM INFORMATION. IT SHALL BE NOTED THAT ARCH ASSOCIATES TAKES NO RESPONSIBILITIES TO THIRD PARTIES PRODUCTS.
 - THE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR THE SETTING OUT AND ACCURACY OF ALL DIMENSIONS.
 - THE CONTRACTOR IS TO ENSURE THE STABILITY AND STRUCTURAL INTEGRITY OF THE EXISTING PROPERTY AT ALL TIMES DURING WORKS AND IS TO BE RESPONSIBLE FOR ALL PROPPING AND SHORING AS REQUIRED.
 - MAIN CONTRACTOR TO PROVIDE AND FIX SUITABLE BRACING AND PROPPING FOR ALL ELEMENTS IN THE TEMPORARY CONDITION DURING CONSTRUCTION STAGE, SUCH AS TO ENSURE STRUCTURE STABILITY AT ALL TIMES.
 - IT IS THE CONTRACTORS SOLE RESPONSIBILITY FOR ASCERTAINING SAFE DISPOSAL OF ANY OFF-SITE EXCAVATED SPOIL. NO CLAIM RESULTING FROM ABNORMAL TIP REQUIREMENTS WILL BE ENTERTAINED.
- DRAINAGE
- ALL MATERIALS AND WORKMANSHIP TO 'SEWERS FOR ADOPTION, 7th EDITION'
 - ALL MATERIALS AND WORKMANSHIP TO COMPLY WITH BS EN 752-1: 1996
 - WHEN USING VITRIFIED CLAY PIPEWORK WITH FLEXIBLE JOINTS, SUPERSTRENGTH SHALL BE USED. ALL ADAPTABLE WORKS SHALL USE PIPEWORK FOR NON-ADOPTED SYSTEM PVCU-SN4 CLASS PIPEWORK AND FITTINGS MAY BE SUBSTITUTED.
 - CONCRETE ENCASEMENT, MINIMUM 150 BED AND HAUNCH, TO BE USED ON PIPEWORK UNDER ROADS WITH LESS THAN 1200 COVER TO CROWN.
 - UNLESS OTHERWISE STATED, ALL PIPEWORK TO BE BEDDED AND SURROUNDED IN 10mm SINGLE SIZE AGGREGATE UP TO 450mm DIAMETER. FOR LARGER PIPEWORK, 20mm SHALL BE USED.
 - REFER TO MANHOLE SCHEDULE FOR SIZES, COVERS ETC.
 - ALL MATERIALS TO COMPLY WITH THE RELEVANT BS-EN, LATEST EDITION, FOR PIPEWORK AND FITTINGS.
 - UPON COMPLETION, ALL WORKS TO BE THOROUGHLY CLEANED BY FLUSHING.

CDM REGULATIONS 2015		
ARCH ASSOCIATES HAVE CONSIDERED AND, WHERE REASONABLY PRACTICABLE, AVOIDED FORESEEABLE RISKS IN THE PREPARATION OF THE DESIGN SHOWN ON THIS AND RELATED DRAWINGS. SIGNIFICANT RISKS WHICH REMAIN AND ASSOCIATED CONTROL MEASURES ARE IDENTIFIED BELOW AND SHOULD BE GIVEN PARTICULAR ATTENTION BY THE MAIN CONTRACTOR ON SITE.		
ACTIVITY	HAZARD	CONTROL
NOTE: THE ABOVE ASSESSMENT RECORDS ONLY THOSE ELEMENTS CONSIDERED UNUSUAL, DIFFICULT TO MANAGE OR OUTSIDE OF THE ANTICIPATED EXPERTISE OF A COMPETENT CONTRACTOR		

COLOURED
DRAWING
REQUEST A COLOURED COPY IF
THIS STAMP IS NOT RED

THIS DRAWING IS TO BE
READ IN CONJUNCTION WITH
DRAWING No.SPR032-551

FOUL MANHOLE SCHEDULE							
REF	COVER LEVEL	INVERT LEVEL	DEPTH TO INVERT	SIZE	TYPE	COVER	COMMENTS
F1	9.150	8.400	0.750	450ø	TYPE 3	B125 300x300	
F2	8.900	7.600	1.300	450ø	TYPE 3	B125 300x300	
F3	8.850	7.150	1.700	450ø	TYPE 3	B125 450x450	
F7	8.820	~7.200	1.620	450ø	TYPE 3	B125 450x450	START OF THE DIVERSION ROUTE. NEW MANHOLE TO BE INSTALLED OVER THE EXISTING 150mm DIA. FOUL SEWER.
F8	8.200	7.030	1.170	450ø	TYPE 3	B125 450x450	
F9	8.200	6.830	1.370	450ø	TYPE 3	B125 450x450	
F10	8.330	6.700	1.630	450ø	TYPE 3	C250 450x450	END OF THE DIVERSION ROUTE. NEW MANHOLE TO BE INSTALLED OVER THE EXISTING 150mm DIA. FOUL SEWER.

SURFACE WATER MANHOLE SCHEDULE							
REF	COVER LEVEL	INVERT LEVEL	DEPTH TO INVERT	SIZE	TYPE	COVER	COMMENTS
S1	9.000	7.724	1.276	450ø	TYPE 3	B125 450x450	300MM SUMP/CATCHPIT
S2	8.850	7.830	1.020	450ø	TYPE 3	B125 450x450	
S3	8.900	7.945	0.955	450ø	TYPE 3	B125 450x450	
S4	9.100	8.400	0.700	450ø	TYPE 3	B125 450x450	300MM SUMP/CATCHPIT
S5	8.850	8.082	0.768	450ø	TYPE 3	B125 450x450	300MM SUMP/CATCHPIT
S6	8.300	7.395	0.905	1200ø	TYPE 2	C250 675x675	HYDRO-BRAKE SUPPLIED BY HYDRO-INTERNATIONAL TO RESTRICT FLOW RATE TO 2 1/2 S, WITH DESIGN HEAD AT 0.2m

P7	17.06.21	AMENDED TO SUIT LLFA COMMENTS	CH
P6	28.05.21	AMENDED TO SUIT LLFA COMMENTS	CH
P5	18.05.21	AMENDED TO SUIT LLFA COMMENTS	CH
P4	12.04.21	PLOT 1 UPDATED	JH
P3	09.04.21	SITE LAYOUT & DRAINAGE UPDATED	JH
P2	12.08.19	SITE LAYOUT & DRAINAGE UPDATED	JH
P1	12.12.18	PRELIMINARY ISSUE FOR COMMENT	PJM
Revision	Date	Description	By

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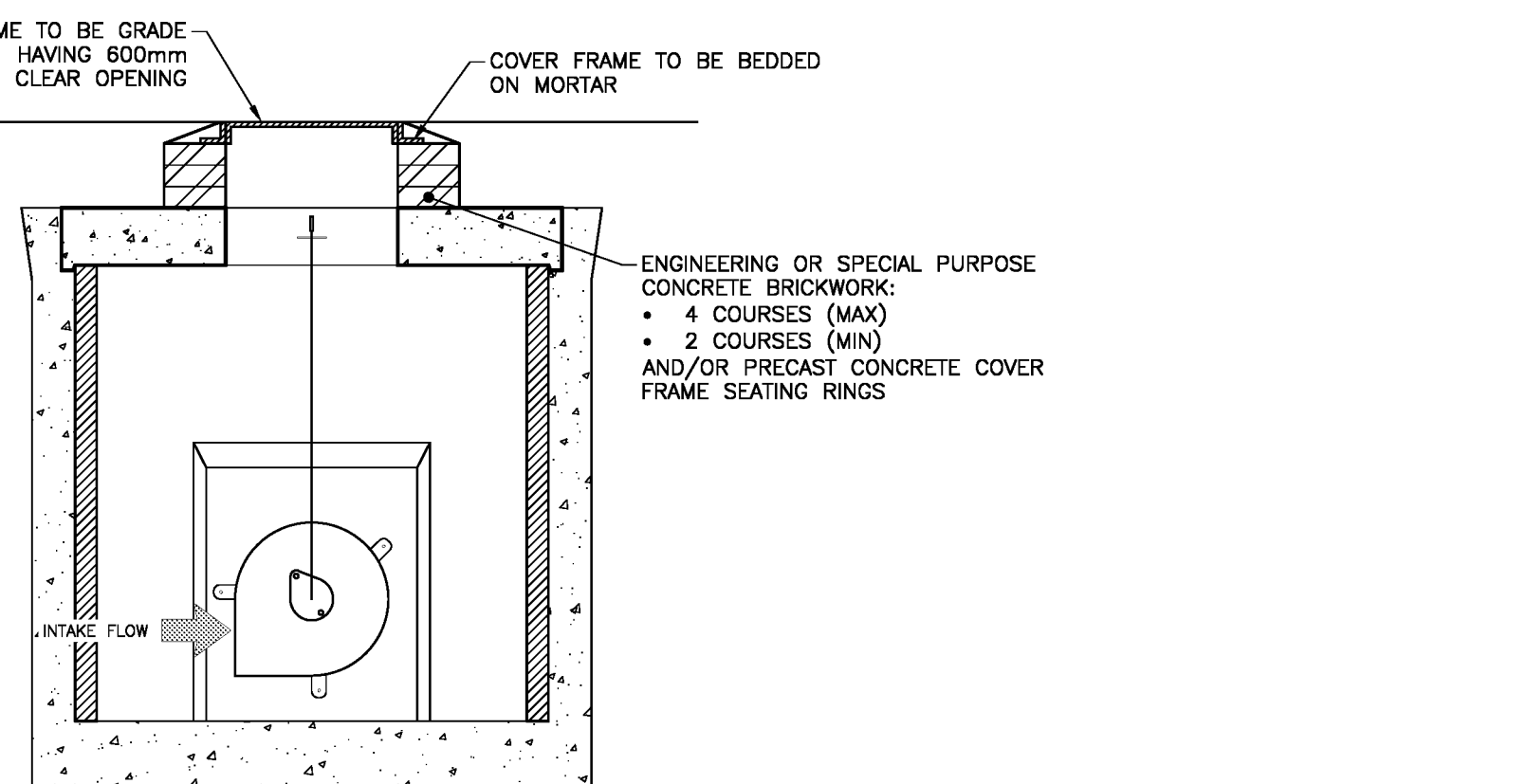
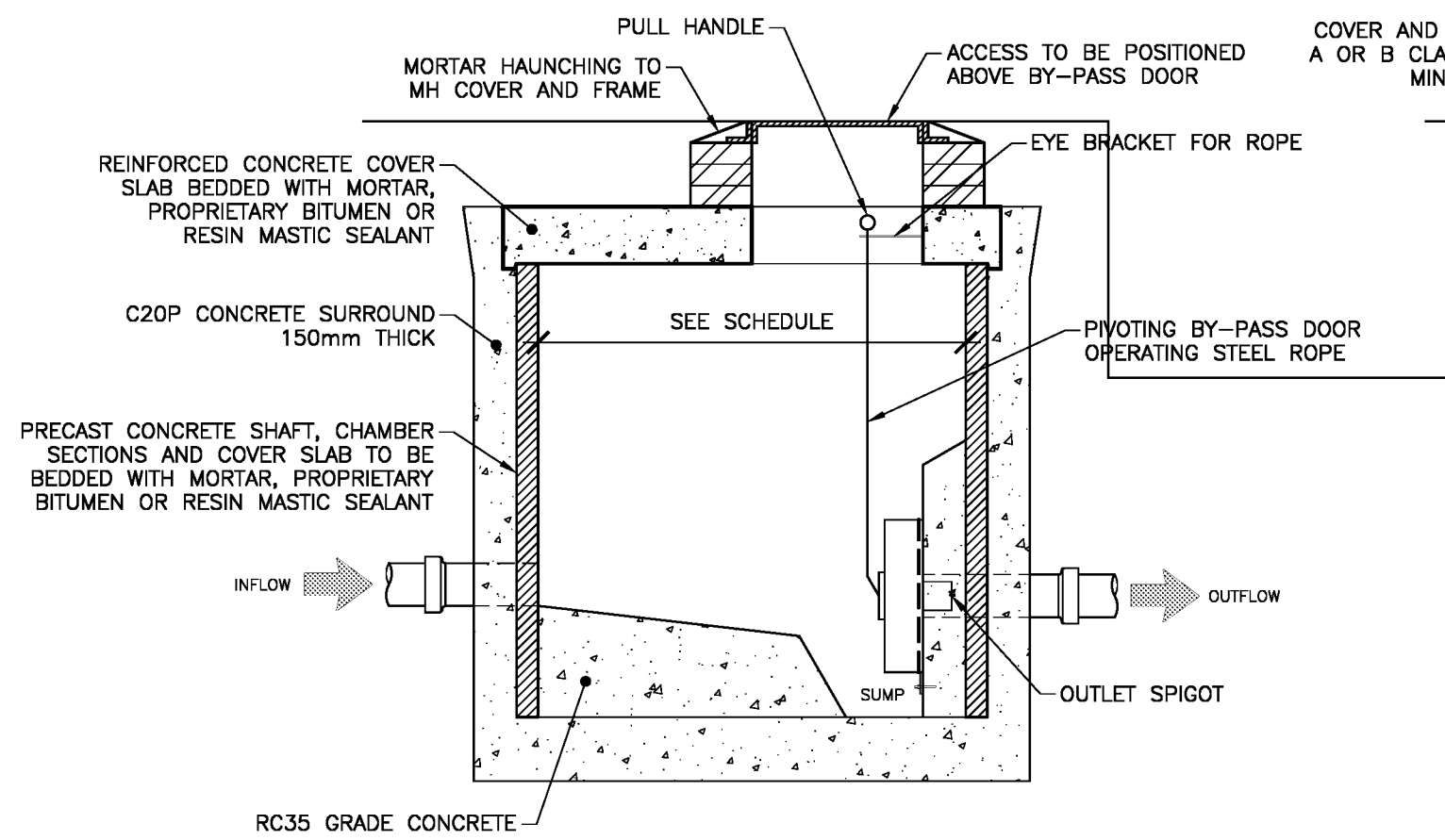
ace
landscape architecture engineering design environment

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Architect: STUDIO LACK ARCHITECTURE
Project Title:

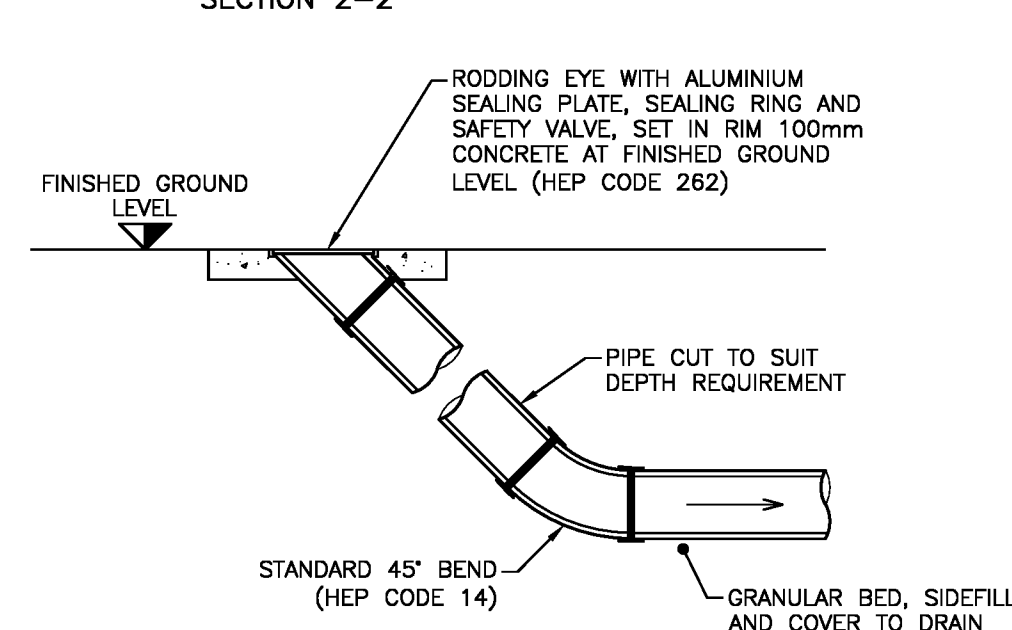
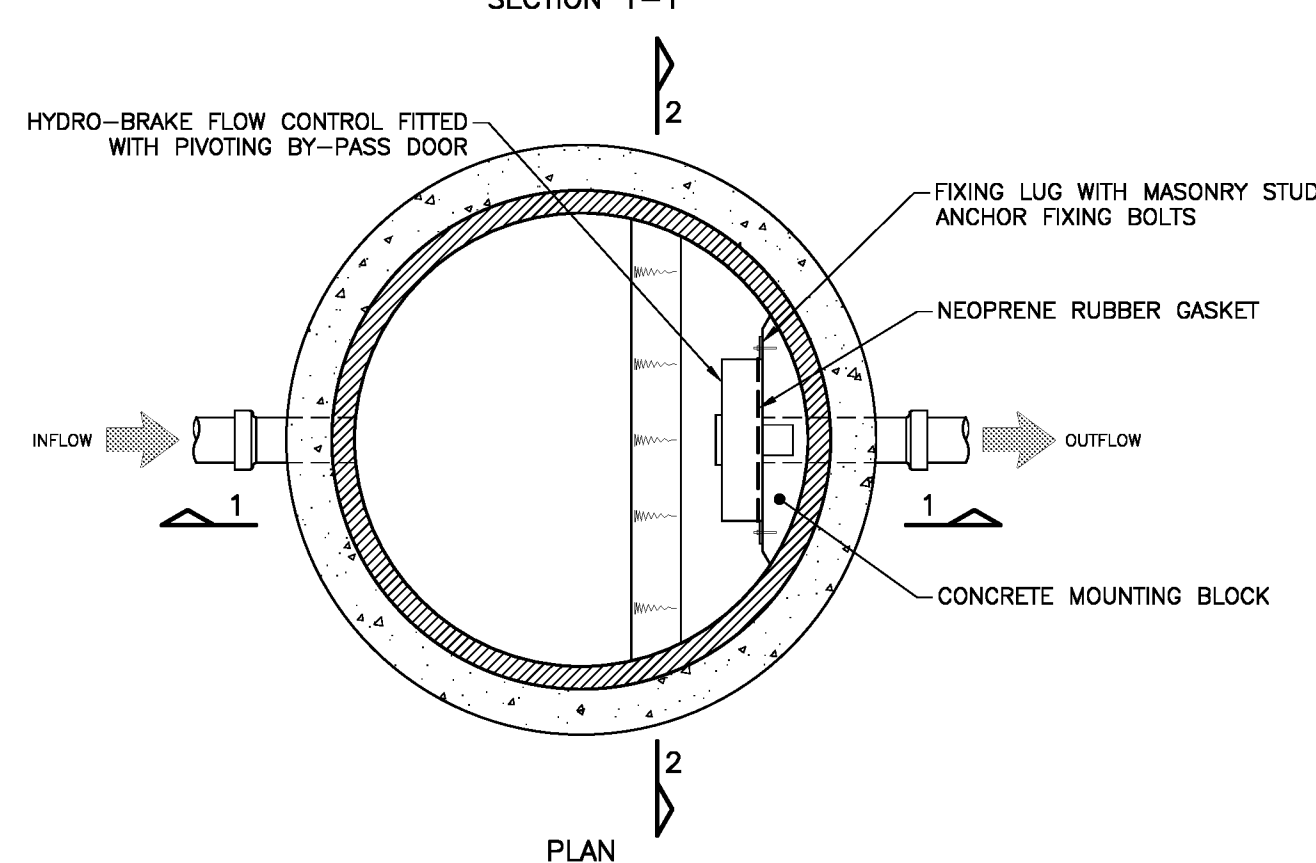
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BARNHAM

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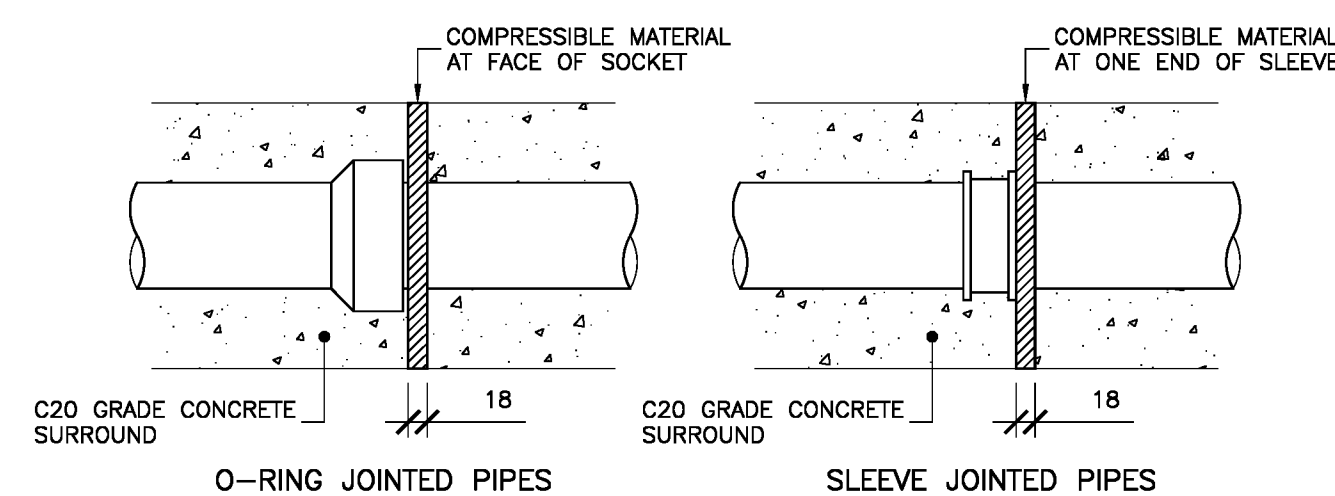
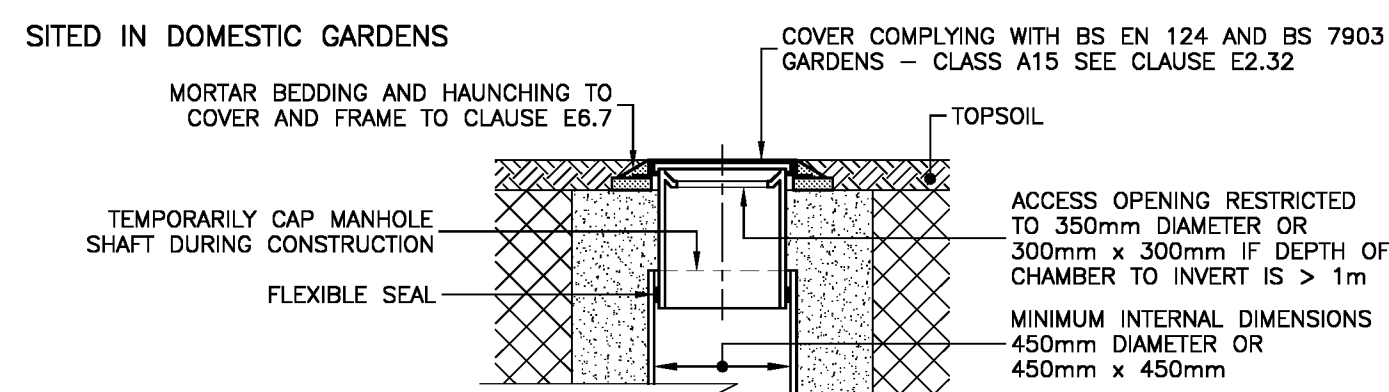
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Project No. SPR032	Drawing No. 500	Checked By AWR	Revision P7



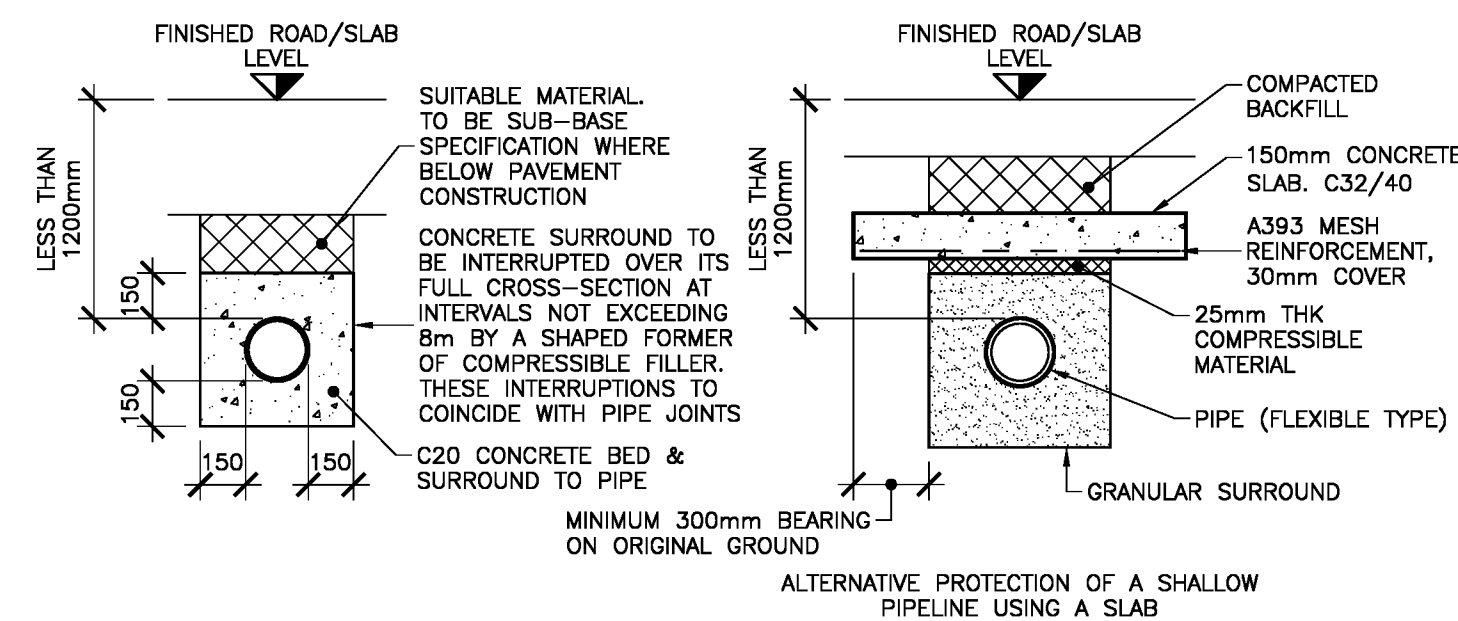
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DRAWING No.SPRO32-500



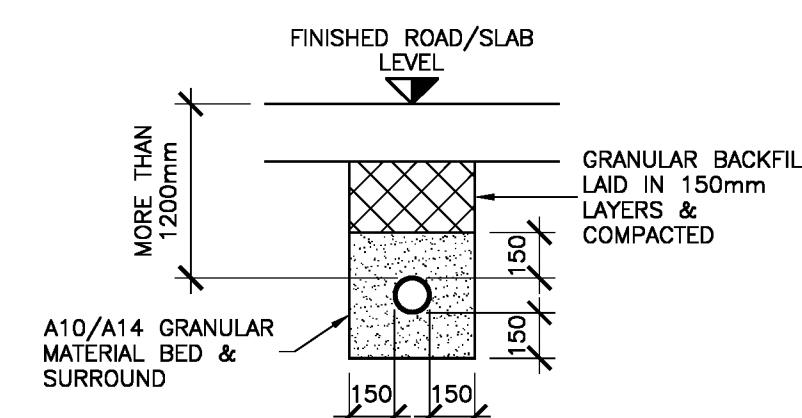
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MD-SCL-0070-2000-0400-2000
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ACCORDANCE WITH THE SPECIALIST MANUFACTURER'S RECOMMENDATIONS)
(1:25)



THE FLEXIBILITY OF A PIPELINE BEDDED ON, OR SURROUNDED WITH, CONCRETE SHOULD NORMALLY BE MAINTAINED BY THE PROVISION OF A FLEXIBLE CONSTRUCTION JOINT THROUGHOUT THE CONCRETE AT PIPE JOINTS. THESE SHOULD BE MADE FROM BITUMEN IMPREGATED INSULATING BOARD COMPLYING WITH BS 1142 PARTS 3, OR OTHER EQUALLY COMPRESSIBLE FILLER MATERIAL SUCH AS EXPANDED POLYSTYRENE. THE BOARD SHOULD BE CUT TO FIT THE PIPES & PLACED AT THE FACE OF THE PIPE SOCKETS OR AT ONE END OF SLEEVE JOINTS. THE JOINT MATERIAL SHOULD BE AT LEAST 18mm THICK PLACED AT 5.0m CENTRES MAX.



ALTERNATIVE TOP DETAILS FOR LIGHT VEHICLE LOADING
AND LANDSCAPED AREAS – TYPE 3
(1:25)



SIZE OF GRANULAR MATERIAL (TO BS 882: 1983)		
NOMINAL PIPE BORE OF (mm)	SIZE (mm)	
	SINGLE-SIZED	GRADED
100 & 150	10	—
225 & 300	10 OR 20	20 TO 5
375 — 500	20	20 TO 5

FLEXIBLE INLETS / OUTLETS AND / OR BEND (MAXIMUM ANGLE 45°) TO FACILITATE CONNECTION

MAIN FLOW →

JOINT TO BE AS CLOSE AS POSSIBLE TO FACE OF CHAMBER TO PERMIT SATISFACTORY JOINT AND SUBSEQUENT MOVEMENT

FLEXIBLE INLETS / OUTLET AND / OR BEND (MAXIMUM ANGLE 45°)

MAIN FLOW ↓

WHERE CHAMBERS ARE POSITIONED ON 90° CORNERS ALWAYS USE THE MAIN CHANNEL BY FITTING A 45° BEND ON THE INLET AND OUTLET

ALTERNATIVE BASE LAYOUT

CHECK SCALE 1:1 @A 1 / 12 @A2

60mm

60

50

40

30

20

10

0mm

10 20 30 40 50 60

CHECK SCALE 1:1 @A 1 / 12 @A3

P3	17.06.21	HYDROBRAKE REF. ADDED	JH
P2	18.05.21	HYDROBRAKE REF. ADDED	JH
P1	09.04.21	PRELIMINARY ISSUE	JH
Revision	Date	Description	By

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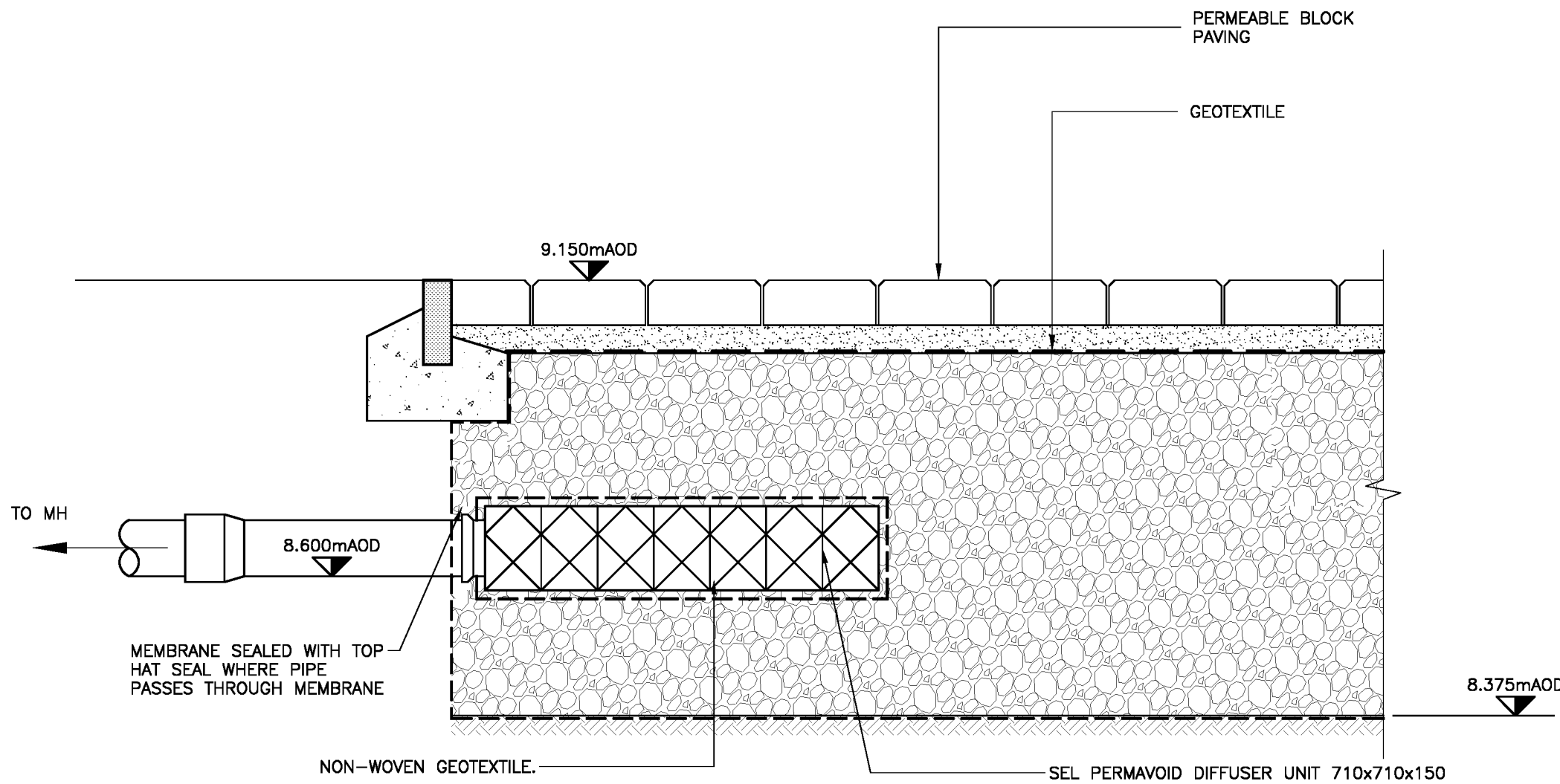
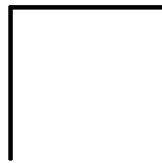



Client	SEAWARD PROPERTIES LTD.
Architect	STUDIO LACK ARCHITECTURE
Project Title	

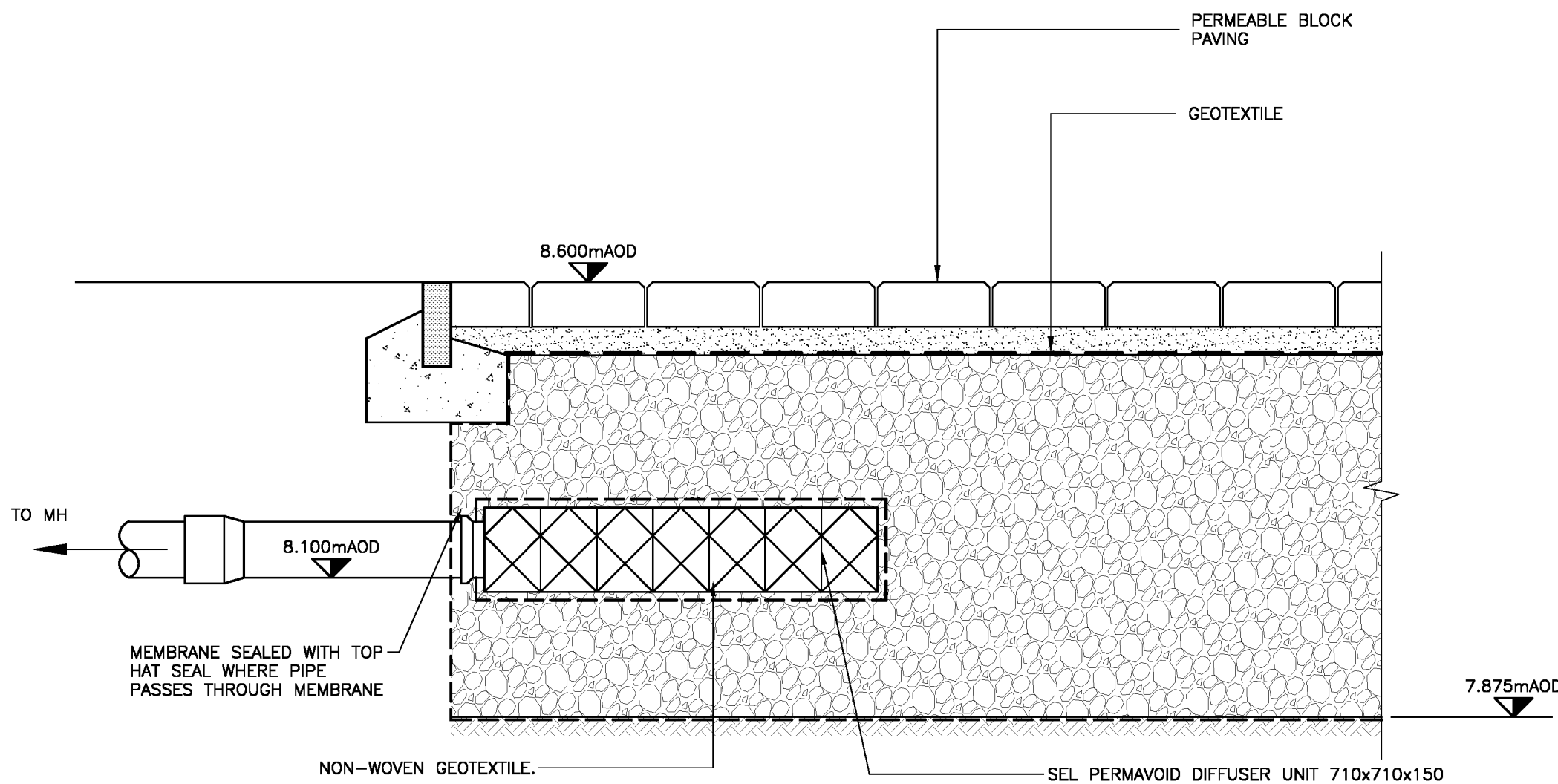
LAND OFF CANAL MEWS
BARNHAM

Drawing Title
DRAINAGE & EXTERNAL WORKS DETAILS
SHEET 1

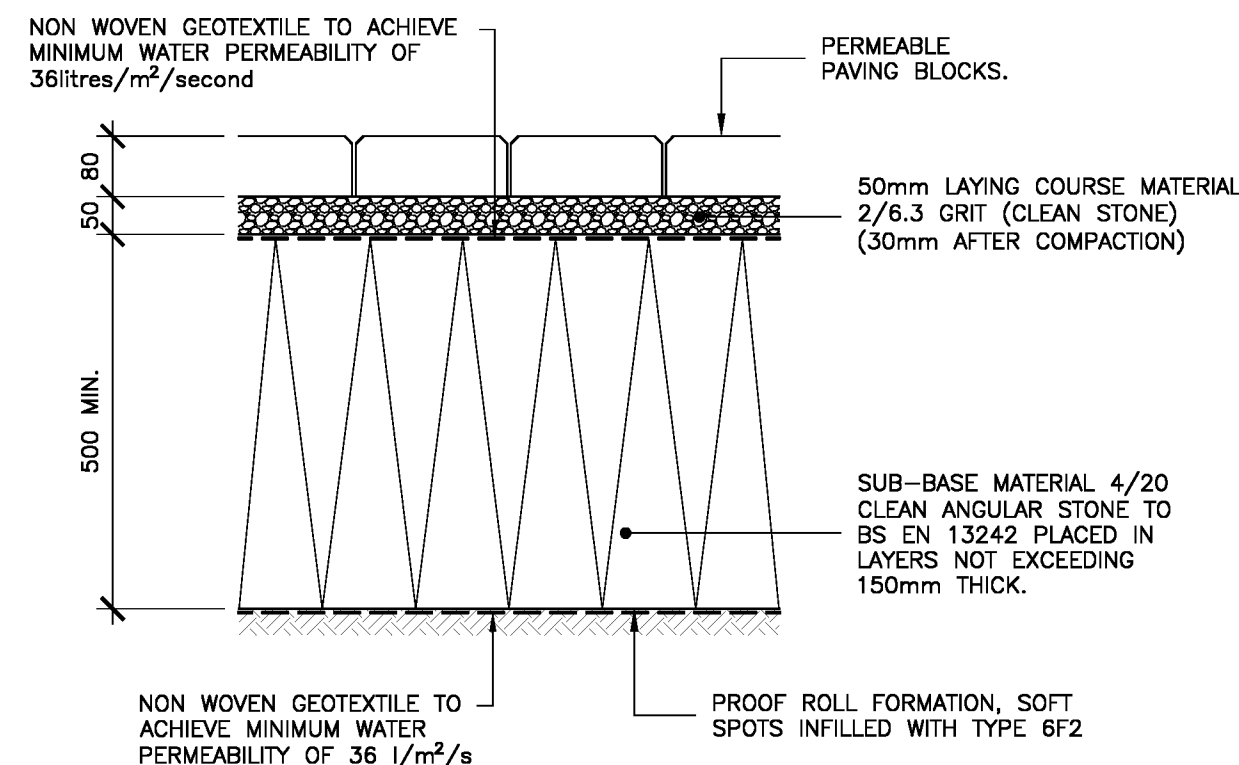
Scale AS SHOWN	Paper Size A1	Date MARCH 2021	Drawn By JH	Checked By CH
Project No. SPR032			Drawing No. 551	Revision P3



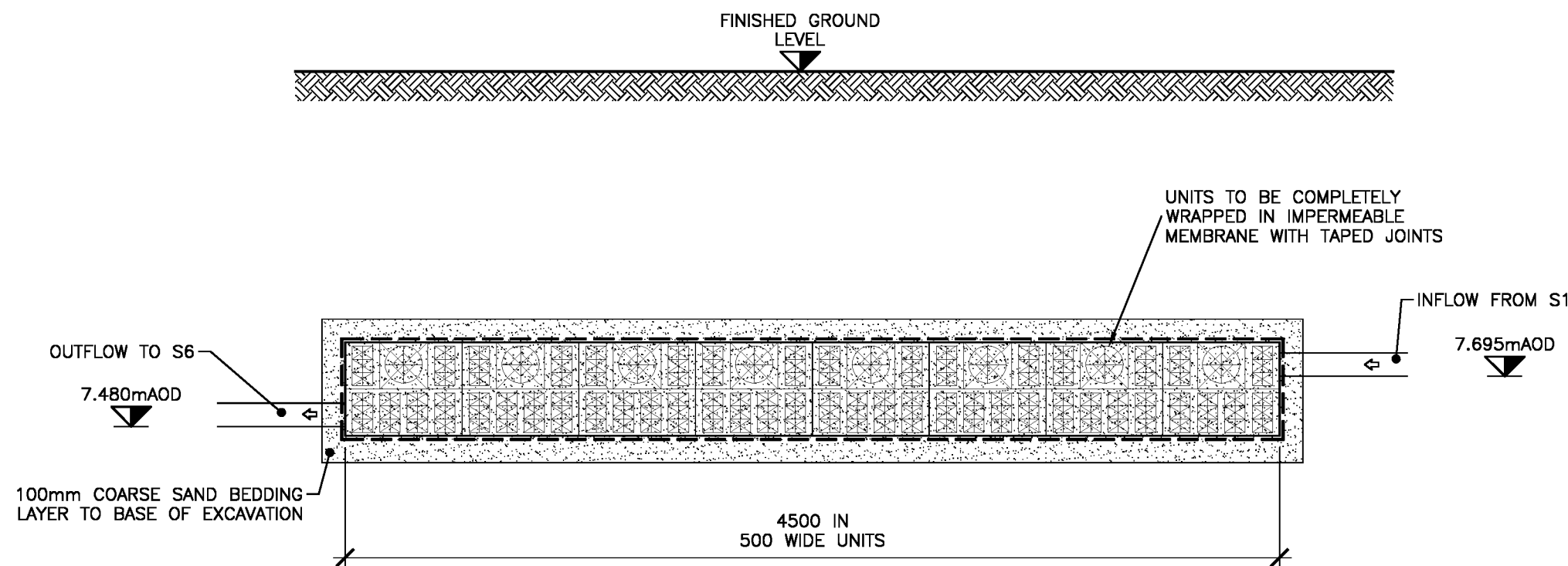
S.E.L. PERMAVOID DIFFUSER UNIT DETAIL FOR PLOT 1
(SCALE 1:25@A1)



S.E.L. PERMAVOID DIFFUSER UNIT DETAIL FOR PLOT 2
(SCALE 1:25@A1)



**PARKING AREAS PERMEABLE BLOCK PAVING
CONSTRUCTION DETAIL**
(SCALE 1:10@A1)



ATTENUATION TANK
[OUT OF WAVIN / INTESIO 'AQUACELL' CRATES OR
SIMILAR APPROVED PROPRIETARY MODULAR SYSTEM]
(SCALE 1:25@A1)

NOTES

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GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND DETAILS.
2. ALL FIGURED DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED DIMENSIONS.
3. ANY DISCREPANCIES BETWEEN THIS DRAWING AND OTHER INFORMATION IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF THE WORKS ON SITE.
4. THE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR THE SETTING OUT AND ACCURACY OF ALL DIMENSIONS.
5. THE CONTRACTOR IS TO ENSURE THE STABILITY AND STRUCTURAL INTEGRITY OF THE EXISTING PROPERTY AT ALL TIMES DURING WORKS AND IS TO BE RESPONSIBLE FOR ALL PROPPING AND SHORING AS REQUIRED.
6. MAIN CONTRACTOR TO PROVIDE AND FIX SUITABLE BRACING AND PROPPING FOR ALL ELEMENTS IN THE TEMPORARY CONDITION DURING CONSTRUCTION STAGE, SUCH AS TO ENSURE STRUCTURE STABILITY AT ALL TIMES.
7. IT IS THE CONTRACTORS SOLE RESPONSIBILITY FOR ASCERTAINING SAFE DISPOSAL OF ANY OFF-SITE EXCAVATED SPOIL. NO CLAIM RESULTING FROM ABNORMAL TIP REQUIREMENTS WILL BE ENTERTAINED.

**THIS DRAWING IS TO BE
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DRAWING No.SPRO32-500**

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ACTIVITY	HAZARD	CONTROL

NOTE: THE ABOVE ASSESSMENT RECORDS ONLY THOSE ELEMENTS CONSIDERED UNUSUAL, DIFFICULT TO MANAGE OR OUTSIDE OF THE ANTICIPATED EXPERTISE OF A COMPETENT CONTRACTOR.

P4	17.06.21	PLOT 2 DIFFUSER SECTION ADDED	CH
P3	28.05.21	UPDATED TO SUIT LLFA COMMENTS	CH
P2	18.05.21	UPDATED TO SUIT LLFA COMMENTS	CH
P1	09.04.21	PRELIMINARY ISSUE	JH
Revision	Date	Description	By

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Client:
SEAWARD PROPERTIES LTD.

Architect:
STUDIO LACK ARCHITECTURE

Project Title:

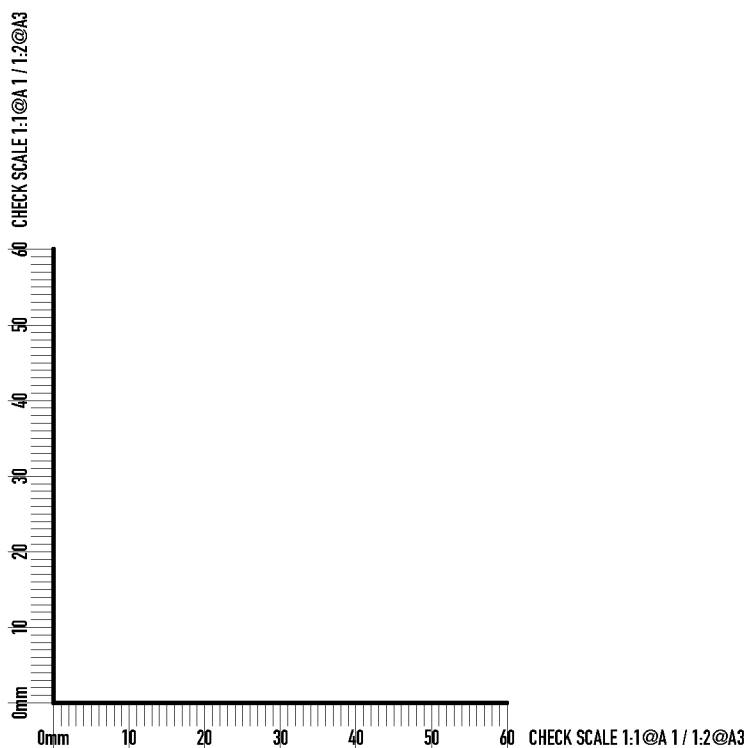
**LAND OFF CANAL MEWS
BARNHAM**

Drawing Title:

**DRAINAGE & EXTERNAL WORKS DETAILS
SHEET 2**

Scale	Paper Size	Date	Drawn By	Checked By
AS SHOWN	A1	MARCH 2021	JH	CH

Project No.	Drawing No.	Revision
SPR032	552	P4



APPENDIX 8

Foul Water Drainage Calculations

Foul Water Design Flows

	DWF (l/day)	Daily Design / Peak Flow (l)	No. of Units	Q l/s
General Housing per dwelling (3 persons)	600	4000	2	0.09
School per pupil	80	528		
Assembly Hall per seat	10	66		
Cinema per seat	10	66		
Theatre per seat	10	66		
Sports Hall per person	50	330		
Hotel per room	550	3630		
Guest House per room	200	1320		
Motel per room	300	1980		
Holiday Apartment per person	150	990		
Leisure Park per person	220	1452		
Caravan Pk standard per space	250	1650		
Caravan Pk serviced per space	450	2970		
Camping site standard per space	200	1320		
Camping site serviced per space	350	2310		
Public House per seat	150	990		
Restaurant/Day Care Centre per person	270	1782		
Drive in restaurant per seat	380	2508		
Hospital per bed	750	4950		
Nursing/Care Homes per bed	375	2475		
Offices per 100m ²	750	4950		
Shopping Centre per 100m ²	400	2640		
Warehouse per 100m ²	150	990		
Commercial premises per 100m ²	300	1980		
Manufacturing unit per 100m ²	550	3630		
			Total Flow =	0.1 l/s (6x DWF)

**Sourced from Thames Water Foul Flows*

APPENDIX 9

Surface Water Drainage Calculations

Arch Associates Limited							Page 1
Town House St Geroge's Square Bishops Waltham Southampton SO32 1AF			LAND OFF CANAL MEWS NIGHTINGALE LANE, BARNHAM PROPOSED CELLULAR-100YR+40%				
Date 12/12/2018 File SPR032 Proposed Cellula...			Designed by CH Checked by AWR				
XP Solutions			Source Control 2018.1				
Summary of Results for 100 year Return Period (+40%)							
Half Drain Time : 51 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	7.751	0.271	0.0	2.0	2.0	8.1	O K
30 min Summer	7.820	0.340	0.0	2.0	2.0	10.2	O K
60 min Summer	7.860	0.380	0.0	2.0	2.0	11.4	O K
120 min Summer	7.867	0.387	0.0	2.0	2.0	11.6	O K
180 min Summer	7.849	0.369	0.0	2.0	2.0	11.0	O K
240 min Summer	7.824	0.344	0.0	2.0	2.0	10.3	O K
360 min Summer	7.775	0.295	0.0	2.0	2.0	8.8	O K
480 min Summer	7.721	0.241	0.0	2.0	2.0	7.2	O K
600 min Summer	7.671	0.191	0.0	2.0	2.0	5.7	O K
720 min Summer	7.632	0.152	0.0	2.0	2.0	4.5	O K
960 min Summer	7.584	0.104	0.0	2.0	2.0	3.1	O K
1440 min Summer	7.556	0.076	0.0	1.6	1.6	2.3	O K
2160 min Summer	7.539	0.059	0.0	1.2	1.2	1.8	O K
2880 min Summer	7.531	0.051	0.0	1.0	1.0	1.5	O K
4320 min Summer	7.522	0.042	0.0	0.7	0.7	1.2	O K
5760 min Summer	7.516	0.036	0.0	0.6	0.6	1.1	O K
7200 min Summer	7.513	0.033	0.0	0.5	0.5	1.0	O K
8640 min Summer	7.511	0.031	0.0	0.4	0.4	0.9	O K
10080 min Summer	7.509	0.029	0.0	0.4	0.4	0.9	O K
15 min Winter	7.750	0.270	0.0	2.0	2.0	8.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	124.544	0.0	9.3	17			
30 min Summer	84.215	0.0	12.6	31			
60 min Summer	54.368	0.0	16.3	52			
120 min Summer	33.870	0.0	20.3	86			
180 min Summer	25.280	0.0	22.7	120			
240 min Summer	20.382	0.0	24.4	154			
360 min Summer	15.043	0.0	27.1	222			
480 min Summer	12.112	0.0	29.1	286			
600 min Summer	10.228	0.0	30.7	344			
720 min Summer	8.904	0.0	32.0	398			
960 min Summer	7.147	0.0	34.3	502			
1440 min Summer	5.233	0.0	37.7	736			
2160 min Summer	3.822	0.0	41.3	1100			
2880 min Summer	3.054	0.0	44.0	1468			
4320 min Summer	2.222	0.0	48.0	2184			
5760 min Summer	1.771	0.0	51.0	2936			
7200 min Summer	1.486	0.0	53.5	3656			
8640 min Summer	1.288	0.0	55.6	4376			
10080 min Summer	1.142	0.0	57.5	5136			
15 min Winter	124.544	0.0	9.3	17			
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Arch Associates Limited							Page 2
Town House St Geroge's Square Bishops Waltham Southampton SO32 1AF			LAND OFF CANAL MEWS NIGHTINGALE LANE, BARNHAM PROPOSED CELLULAR-100YR+40%				
Date 12/12/2018			Designed by CH				
File SPR032 Proposed Cellula...			Checked by AWR				
XP Solutions			Source Control 2018.1				
Summary of Results for 100 year Return Period (+40%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	7.820	0.340	0.0	2.0	2.0	10.2	O K
60 min Winter	7.859	0.379	0.0	2.0	2.0	11.3	O K
120 min Winter	7.857	0.377	0.0	2.0	2.0	11.3	O K
180 min Winter	7.827	0.347	0.0	2.0	2.0	10.4	O K
240 min Winter	7.788	0.308	0.0	2.0	2.0	9.2	O K
360 min Winter	7.697	0.217	0.0	2.0	2.0	6.5	O K
480 min Winter	7.622	0.142	0.0	2.0	2.0	4.3	O K
600 min Winter	7.579	0.099	0.0	2.0	2.0	3.0	O K
720 min Winter	7.566	0.086	0.0	1.8	1.8	2.6	O K
960 min Winter	7.549	0.069	0.0	1.5	1.5	2.1	O K
1440 min Winter	7.534	0.054	0.0	1.1	1.1	1.6	O K
2160 min Winter	7.524	0.044	0.0	0.8	0.8	1.3	O K
2880 min Winter	7.519	0.039	0.0	0.6	0.6	1.2	O K
4320 min Winter	7.512	0.032	0.0	0.5	0.5	1.0	O K
5760 min Winter	7.509	0.029	0.0	0.4	0.4	0.9	O K
7200 min Winter	7.506	0.026	0.0	0.3	0.3	0.8	O K
8640 min Winter	7.504	0.024	0.0	0.3	0.3	0.7	O K
10080 min Winter	7.503	0.023	0.0	0.2	0.2	0.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	84.215	0.0	12.6	31			
60 min Winter	54.368	0.0	16.3	56			
120 min Winter	33.870	0.0	20.3	90			
180 min Winter	25.280	0.0	22.7	128			
240 min Winter	20.382	0.0	24.4	166			
360 min Winter	15.043	0.0	27.1	232			
480 min Winter	12.112	0.0	29.1	284			
600 min Winter	10.228	0.0	30.7	326			
720 min Winter	8.904	0.0	32.0	384			
960 min Winter	7.147	0.0	34.3	500			
1440 min Winter	5.233	0.0	37.7	734			
2160 min Winter	3.822	0.0	41.3	1080			
2880 min Winter	3.054	0.0	44.0	1456			
4320 min Winter	2.222	0.0	48.0	2148			
5760 min Winter	1.771	0.0	51.0	2920			
7200 min Winter	1.486	0.0	53.5	3672			
8640 min Winter	1.288	0.0	55.6	4328			
10080 min Winter	1.142	0.0	57.5	5056			
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Town House St Geroge's Square Bishops Waltham Southampton SO32 1AF	LAND OFF CANAL MEWS NIGHTINGALE LANE, BARNHAM PROPOSED CELLULAR-100YR+40%	
Date 12/12/2018	Designed by CH	
File SPR032 Proposed Cellula...	Checked by AWR	
XP Solutions		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 9.000

Cellular Storage Structure

Invert Level (m) 7.480 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	31.5	31.5	0.401	0.0	40.7
0.400	31.5	40.7			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SCL-0070-2000-0400-2000
Design Head (m) 0.400
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise blockage risk
Application Surface
Sump Available Yes
Diameter (mm) 70
Invert Level (m) 7.480
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	2.0
Flush-Flo™	0.097	2.0
Kick-Flo®	0.259	1.6
Mean Flow over Head Range	-	1.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.1	1.200	3.3	3.000	5.1	7.000	7.7
0.200	1.5	1.400	3.6	3.500	5.5	7.500	8.0
0.300	1.8	1.600	3.8	4.000	5.8	8.000	8.2
0.400	2.0	1.800	4.0	4.500	6.2	8.500	8.5
0.500	2.2	2.000	4.2	5.000	6.5	9.000	8.7
0.600	2.4	2.200	4.4	5.500	6.8	9.500	9.0
0.800	2.7	2.400	4.6	6.000	7.1		
1.000	3.0	2.600	4.8	6.500	7.4		

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Town House St Geroge's Square Bishops Waltham Southampton SO32 1AF			LAND OFF CANAL MEWS NIGHTINGALE LANE, BARNHAM PERMEABLE PAVING-100YR+40%				
Date 12/12/2018			Designed by CH				
File SPR032 Proposed Permeab...			Checked by CH				
XP Solutions			Source Control 2018.1				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time exceeds 7 days.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.476	0.101	0.0	0.0	0.0	1.3	O K
30 min Summer	8.514	0.139	0.0	0.0	0.0	1.9	O K
60 min Summer	8.557	0.182	0.0	0.0	0.0	2.5	O K
120 min Summer	8.603	0.228	0.0	0.0	0.0	3.1	O K
180 min Summer	8.615	0.240	0.0	0.1	0.1	3.3	O K
240 min Summer	8.616	0.241	0.0	0.1	0.1	3.3	O K
360 min Summer	8.619	0.244	0.0	0.2	0.2	3.4	O K
480 min Summer	8.621	0.246	0.0	0.2	0.2	3.4	O K
600 min Summer	8.622	0.247	0.0	0.2	0.2	3.4	O K
720 min Summer	8.622	0.247	0.0	0.2	0.2	3.4	O K
960 min Summer	8.622	0.247	0.0	0.2	0.2	3.4	O K
1440 min Summer	8.620	0.245	0.0	0.2	0.2	3.4	O K
2160 min Summer	8.619	0.244	0.0	0.2	0.2	3.4	O K
2880 min Summer	8.618	0.243	0.0	0.2	0.2	3.3	O K
4320 min Summer	8.616	0.241	0.0	0.1	0.1	3.3	O K
5760 min Summer	8.614	0.239	0.0	0.1	0.1	3.3	O K
7200 min Summer	8.612	0.237	0.0	0.1	0.1	3.3	O K
8640 min Summer	8.611	0.236	0.0	0.1	0.1	3.3	O K
10080 min Summer	8.610	0.235	0.0	0.1	0.1	3.2	O K
15 min Winter	8.476	0.101	0.0	0.0	0.0	1.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)			
15 min Summer	124.544	0.0	0.0	19			
30 min Summer	84.215	0.0	0.0	34			
60 min Summer	54.368	0.0	0.0	64			
120 min Summer	33.870	0.0	0.0	124			
180 min Summer	25.280	0.0	0.4	180			
240 min Summer	20.382	0.0	0.7	196			
360 min Summer	15.043	0.0	1.1	242			
480 min Summer	12.112	0.0	1.5	302			
600 min Summer	10.228	0.0	1.7	362			
720 min Summer	8.904	0.0	1.9	426			
960 min Summer	7.147	0.0	2.3	542			
1440 min Summer	5.233	0.0	2.8	792			
2160 min Summer	3.822	0.0	3.3	1144			
2880 min Summer	3.054	0.0	3.7	1492			
4320 min Summer	2.222	0.0	4.2	2192			
5760 min Summer	1.771	0.0	4.6	2920			
7200 min Summer	1.486	0.0	4.9	3672			
8640 min Summer	1.288	0.0	5.1	4400			
10080 min Summer	1.142	0.0	5.2	4976			
15 min Winter	124.544	0.0	0.0	19			
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Town House St Geroge's Square Bishops Waltham Southampton SO32 1AF			LAND OFF CANAL MEWS NIGHTINGALE LANE, BARNHAM PERMEABLE PAVING-100YR+40%				
Date 12/12/2018			Designed by CH				
File SPR032 Proposed Permeab...			Checked by CH				
XP Solutions			Source Control 2018.1				
Summary of Results for 100 year Return Period (+40%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	8.514	0.139	0.0	0.0	0.0	1.9	O K
60 min Winter	8.557	0.182	0.0	0.0	0.0	2.5	O K
120 min Winter	8.603	0.228	0.0	0.0	0.0	3.1	O K
180 min Winter	8.616	0.241	0.0	0.1	0.1	3.3	O K
240 min Winter	8.617	0.242	0.0	0.1	0.1	3.3	O K
360 min Winter	8.620	0.245	0.0	0.2	0.2	3.4	O K
480 min Winter	8.621	0.246	0.0	0.2	0.2	3.4	O K
600 min Winter	8.621	0.246	0.0	0.2	0.2	3.4	O K
720 min Winter	8.621	0.246	0.0	0.2	0.2	3.4	O K
960 min Winter	8.620	0.245	0.0	0.2	0.2	3.4	O K
1440 min Winter	8.618	0.243	0.0	0.2	0.2	3.4	O K
2160 min Winter	8.616	0.241	0.0	0.1	0.1	3.3	O K
2880 min Winter	8.614	0.239	0.0	0.1	0.1	3.3	O K
4320 min Winter	8.612	0.237	0.0	0.1	0.1	3.3	O K
5760 min Winter	8.610	0.235	0.0	0.1	0.1	3.2	O K
7200 min Winter	8.609	0.234	0.0	0.1	0.1	3.2	O K
8640 min Winter	8.609	0.234	0.0	0.0	0.0	3.2	O K
10080 min Winter	8.608	0.233	0.0	0.0	0.0	3.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)			
30 min Winter	84.215	0.0	0.0	34			
60 min Winter	54.368	0.0	0.0	64			
120 min Winter	33.870	0.0	0.0	124			
180 min Winter	25.280	0.0	0.4	172			
240 min Winter	20.382	0.0	0.7	192			
360 min Winter	15.043	0.0	1.1	252			
480 min Winter	12.112	0.0	1.5	316			
600 min Winter	10.228	0.0	1.7	380			
720 min Winter	8.904	0.0	1.9	446			
960 min Winter	7.147	0.0	2.3	568			
1440 min Winter	5.233	0.0	2.8	820			
2160 min Winter	3.822	0.0	3.3	1164			
2880 min Winter	3.054	0.0	3.7	1528			
4320 min Winter	2.222	0.0	4.2	2204			
5760 min Winter	1.771	0.0	4.6	2824			
7200 min Winter	1.486	0.0	4.9	3704			
8640 min Winter	1.288	0.0	5.1	4256			
10080 min Winter	1.142	0.0	5.3	5048			
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Town House St Geroge's Square Bishops Waltham Southampton SO32 1AF	LAND OFF CANAL MEWS NIGHTINGALE LANE, BARNHAM PERMEABLE PAVING-100YR+40%	
Date 12/12/2018	Designed by CH	
File SPR032 Proposed Permeab...	Checked by CH	
XP Solutions		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 9.150

Porous Car Park Structure

Infiltration Coefficient Base (m/hr) 0.00000	Width (m) 4.8	
Membrane Percolation (mm/hr) 1000	Length (m) 10.0	
Max Percolation (l/s) 13.3	Slope (1:X) 500.0	
Safety Factor 3.0	Depression Storage (mm) 5	
Porosity 0.30	Evaporation (mm/day) 3	
Invert Level (m) 8.375	Cap Volume Depth (m) 0.500	

Pipe Overflow Control

Diameter (m) 0.100	Entry Loss Coefficient 0.500	
Slope (1:X) 100.0	Coefficient of Contraction 0.600	
Length (m) 2.000	Upstream Invert Level (m) 8.600	
Roughness k (mm) 0.600		

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