

Drainage Strategy

For

Land Off Canal Mews,
Nightingale Lane,
Barnham
Arun, West Sussex



ARCH ASSOCIATES
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

DRAINAGE STRATEGY

for

Land Off Canal Mews,
Nightingale Lane, Barnham
Arun, West Sussex

Client:

Renaissance Group of Companies Ltd.
Unit 12, Headlands Business Park
Ringwood
Hampshire
BH24 3PB

ISSUE		A	B
Issued By	S. Ho		
Date	Aug 2019		
Purpose	Planning		
Approved By	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 Surface and Foul Water Drainage Strategies to support a planning application for the proposed residential bungalows at a land west of Nightingale Lane, Barnham, Arun.

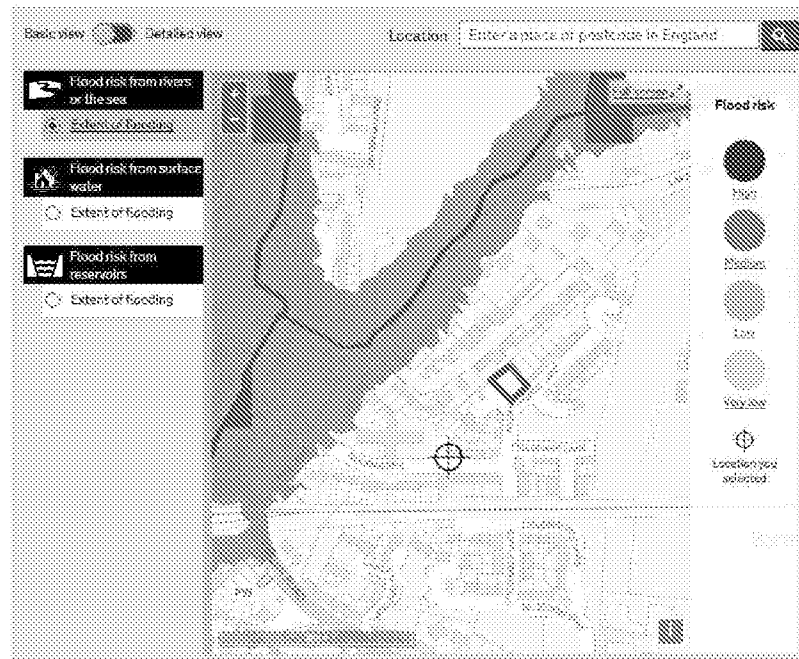
It is proposed that the site will be developed into a residential development comprising up to 3 units of bungalows, which include 2 No. of two-bedroom units and 1 No. of three-bedroom unit. Each of the units will provides 2 car parking spaces and bicycle storage within the shed in the rear garden. Vehicular access to the bungalow units will be gained via Canal Mews onto the south-western boundary of the site under the new proposals. The development will also include the associated car parks and landscaping following the demolition of existing buildings. Refer to **Appendix 1** for details.

2.0 The Site

The circa 0.11 hectare site is an 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 1800m 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 2**.

Review of the Southern Water asset plan confirms that there is an existing foul water main sewer presented within the vicinity area. An existing 150mm diameter foul water sewer is presented 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 surface water sewers presented within the vicinity area. Refer to the Southern Water asset plan in **Appendix 3**.

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 an 150mm diameter foul sewer in Canal Mews. A diversion will be required on-site in order to accommodate the development proposals. Refer to the CCTV Survey in **Appendix 4**.

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. Refer to the Croudace Homes' General Layout plan in **Appendix 5**.

Geology

The soakaway tests were carried out by Robert Clark Associates Ltd, in accordance with BRE 365, in October 2006 for the neighbouring development site off Barn Rise bordered with the north-eastern boundary of the site. The soakaway test results indicate that the soakage rate in the vicinity is on the lower end of the spectrum, and thus the site is considered to be suitable for infiltration drainage technique of the small localised areas including the car parking spaces. Refer to the Robert Clark Associates Ltd's soakaway test results summary in **Appendix 6**.

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 3 dwellings equates to a peak foul discharge rate of approximately 0.14 litres/second. Refer to **Appendix 8** for the drainage calculations.

3.2 Surface Water

It is proposed that the surface water strategy will involve all surface water falling onto the new buildings and car parks will be positively drained via gravity. The conveyed surface water runoff will then be discharged off to the existing ditch bordered with the north-western boundary of the site.

The total site area is circa 1100m². The existing site is covered entirely in vegetation. The post-development impermeable area will be 323m².

The proposed surface water drainage strategy comprises of a gravity sewer system, SuDS management train in the form of lined cellular attenuation crate system and permeable paving car parks. Refer to **Appendix 7** – Drainage Strategy Drawing for details.

The conveyed surface water runoff will be discharged off site, via a hydro-brake at a restricted flow rate of 5.0 litres/second, into the existing ditch bordered with the north-western boundary of the site.

Any additional flows into the existing ditch will have to be agreed with Environment Agency.

The proposed attenuation storages have been designed to attenuate the 1 in 100 year storm + 40% climate change storm event to comply with the EA requirements and LLFAs standards. The net attenuation volume to be provided by the proposed SuDS is circa 10m³. Refer to **Appendix 9** for the drainage calculations.

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. The building would remain safe due to the FFL being set at a minimum of 300mm above the proposed ground levels.

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 building management company, which will be put in place upon commission of the building. 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

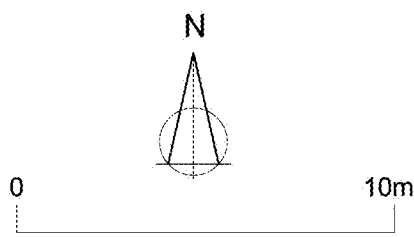
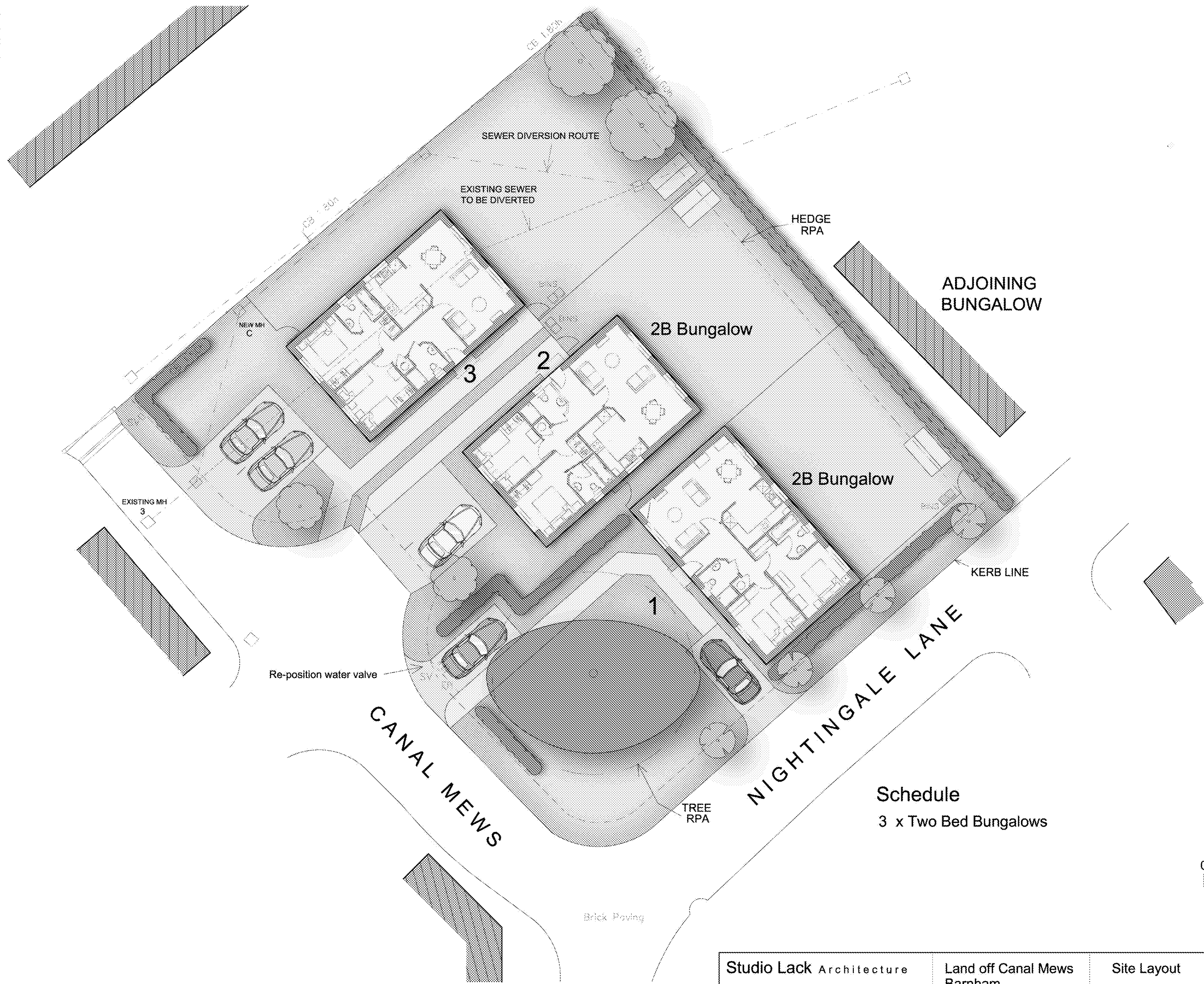
TABLE 20.15 Operation and maintenance requirements for pervious pavements

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

Proposed Site Masterplan

Notes 1. Do not scale from this drawing except for Planning purposes.



Schedule
3 x Two Bed Bungalows

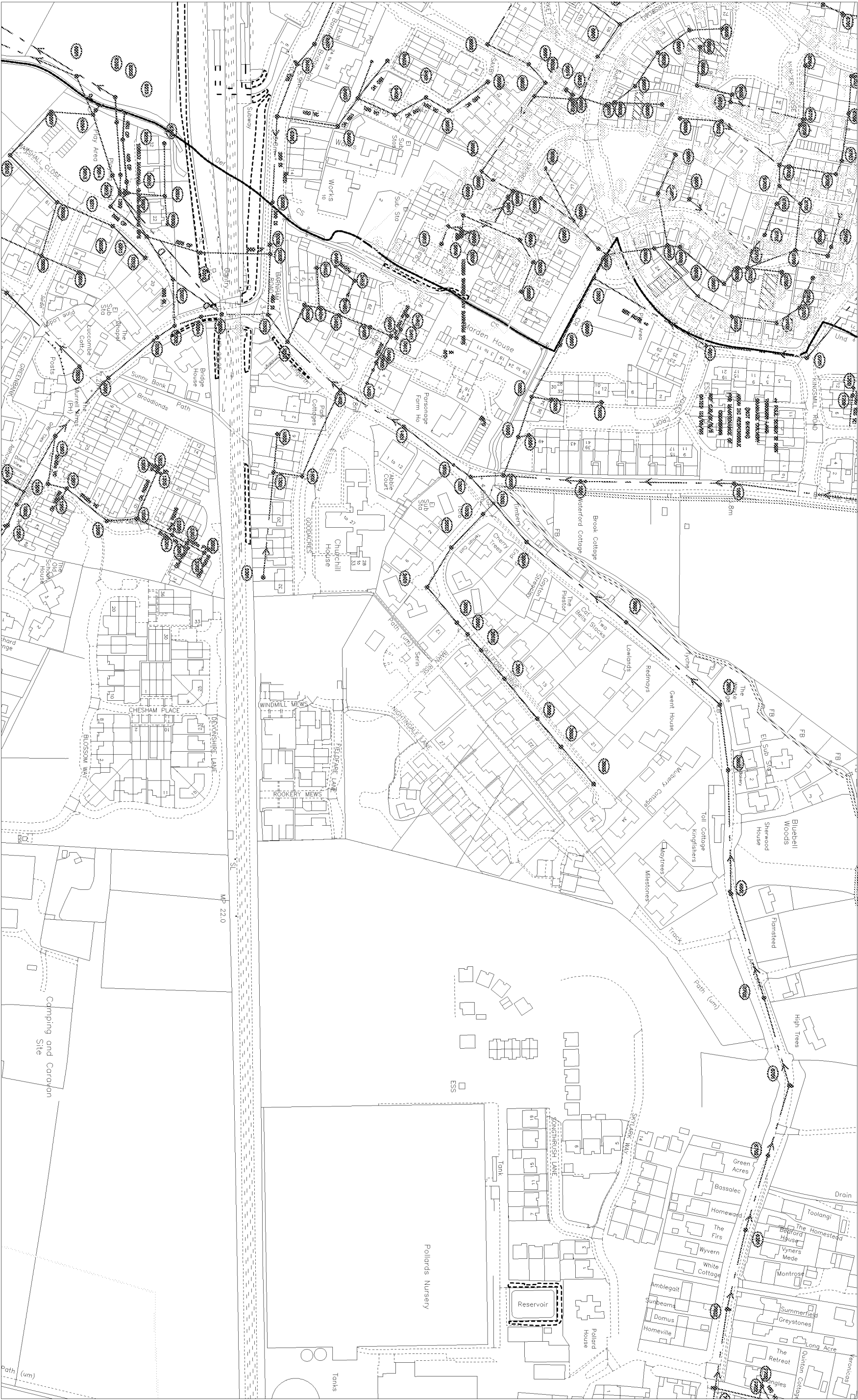
APPENDIX 2

Topographical Survey

APPENDIX 3

Southern Water Sewer Plan and Correspondence

104781



104203

O.S. REF. SU9604SW		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. <i>WARNING: S.W. pipes are construction of British Institute Concrete Waterworks, Ltd. (B.I.C.W.) materials may include British Institute Concrete Waterworks Ltd. (B.I.C.W.)</i>			
Drawn by: gujskew					
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.			
Title: 317229_Land off Canal Mews					

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
0201X	6.9	5.29	225	VC	CIRC	0667X	4.83	3.91	300	VC	CIRC	2304X	2.58	1.21	300	VC	CIRC	9204X	2.58	1.21	300	VC	CIRC	0206X	2.69	1.19	300	VC	CIRC	0201X	6.9	5.29	225	VC	CIRC
0202X	7.05	5.83	175	VC	CIRC	0701X	5.3	3.31	225	VC	CIRC	230DX	7.22	6.07	150	VC	CIRC	2304X	7.22	6.07	150	VC	CIRC	0207X	2.88	2.32	150	VC	CIRC	0202X	7.05	5.83	175	VC	CIRC
0203X	6.86	5.44	UNK	UNK	CIRC	0702X	4.93	4.05	150	VC	CIRC	231DX	7.52	6.39	UNK	UNK	CIRC	231DX	7.52	6.39	UNK	UNK	CIRC	0208X	3.5	3.5	OTHER	UNK	CIRC	0203X	6.86	5.44	UNK	UNK	CIRC
0204X			OTHER	BRC	CIRC	0703X	5.06	4.42	150	VC	CIRC	2401X	7.22	6.07	150	VC	CIRC	2401X	7.22	6.07	150	VC	CIRC	0209X			OTHER	BRC	CIRC	0204X			OTHER	BRC	CIRC
0301X	3.91	2.18	300	DI	CIRC	0704X	5.26	4.09	150	VC	CIRC	2501X	7.38	6.29	150	VC	CIRC	2501X	7.38	6.29	150	VC	CIRC	0302X	4.53	1.816	525	CP	CIRC	0301X	3.91	2.18	300	DI	CIRC
0302X	3.47	2.15	250	DI	CIRC	0705X	5.33	3.71	225	VC	CIRC	2502X	7.69	6.49	150	VC	CIRC	2502X	7.69	6.49	150	VC	CIRC	0303X	3.58	1.82	450	CP	CIRC	0302X	3.47	2.15	250	DI	CIRC
0305X	5.06	4.29	225	VC	CIRC	0707X	5.03	4.15	150	VC	CIRC	2503X	8.14	4.71	175	VC	CIRC	2503X	8.14	4.71	175	VC	CIRC	0306X	3.58	3.58	375	CP	CIRC	0305X	5.06	4.29	225	VC	CIRC
0306X	5.69	4.92	225	VC	CIRC	0708X	5.05	4.15	150	VC	CIRC	2504X	8.29	4.89	150	VC	CIRC	2504X	8.29	4.89	150	VC	CIRC	0307X	3.58	3.58	350	CP	CIRC	0306X	5.69	4.92	225	VC	CIRC
0307X	5.2	1.92	375	VC	CIRC	0709X	5.02	4.27	150	VC	CIRC	2505X	8.49	5.17	175	VC	CIRC	2505X	8.49	5.17	175	VC	CIRC	0308X	3.66	1.07	375	CP	CIRC	0307X	5.2	1.92	375	VC	CIRC
0308X	3.25	2.57	450	DI	CIRC	0710X	5.06	4.27	150	VC	CIRC	3501X	7.68	6.67	150	VC	CIRC	3501X	7.68	6.67	150	VC	CIRC	0309X	3		350	PF	CIRC	0308X	3.25	2.57	450	DI	CIRC
0309X	3.25	2.06	600	CP	CIRC	0712X	5.29	4.48	150	VC	CIRC	3501X	7.88	6.87	150	VC	CIRC	3501X	7.88	6.87	150	VC	CIRC	0310X	1.77	1.879	450	CP	CIRC	0309X	3.25	2.06	600	CP	CIRC
0310X	4.2	1.891	525	CP	CIRC	0751X	5.18	4.41	150	VC	CIRC	3502X	8.02	7.04	150	VC	CIRC	3502X	8.02	7.04	150	VC	CIRC	0400X	2.82	2.82	250	CP	CIRC	0310X	4.2	1.891	525	CP	CIRC
0311X	4.61	1.841	375	CP	CIRC	0752X	5.1	4.41	150	VC	CIRC	3503X	8.02	7.04	175	VC	CIRC	3503X	8.02	7.04	175	VC	CIRC	0401X	3.5	1.879	450	CP	CIRC	0311X	4.61	1.841	375	CP	CIRC
0312X	4.61	1.841	OTHER	BRC	CIRC	0753X	5.05	5.04	150	VC	CIRC	3601X	5.07	3.48	175	VC	CIRC	3601X	5.07	3.48	175	VC	CIRC	0402X	4.1	2.85	250	DI	CIRC	0312X	4.61	1.841	OTHER	BRC	CIRC
0402X	3.85	2.63	150	PF	CIRC	0754X	4.95	4.51	150	VC	CIRC	3602X	5.74	4.09	175	VC	CIRC	3602X	5.74	4.09	175	VC	CIRC	0403X	3.45	2.82	300	DI	CIRC	0402X	3.85	2.63	150	PF	CIRC
0403X	3.58	2.64	150	PF	CIRC	0757X	4.95	4.14	150	VC	CIRC	3603X	8.13	7.23	150	VC	CIRC	3603X	8.13	7.23	150	VC	CIRC	0404X	5.27	3.22	150	VC	CIRC	0403X	3.58	2.64	150	PF	CIRC
0404X	3.79	2.57	150	PF	CIRC	0759X	5.31	4.14	150	VC	CIRC	4601X	7.54	5.37	175	VC	CIRC	4601X	7.54	5.37	175	VC	CIRC	0500X	5.27	3.22	150	VC	CIRC	0404X	3.79	2.57	150	PF	CIRC
0405X	3.8	2.52	150	VC	CIRC	0760X	5.02	4.29	150	VC	CIRC	5701X	8.51	5.93	175	VC	CIRC	5701X	8.51	5.93	175	VC	CIRC	0501X	5.42	4.36	150	VC	CIRC	0405X	3.8	2.52	150	VC	CIRC
0406X	3.77	2.71	150	PF	CIRC	0761X	5.02	4.45	150	VC	CIRC	5702X	8.24	5.61	175	VC	CIRC	5702X	8.24	5.61	175	VC	CIRC	0502X	5.14	4.36	150	VC	CIRC	0406X	3.77	2.71	150	PF	CIRC
0409X	3.69	2.99	150	PF	CIRC	0762X	5.29	4.37	150	VC	CIRC	6701X	9.44	6.27	175	VC	CIRC	6701X	9.44	6.27	175	VC	CIRC	0503X	5.67	4.33	150	VC	CIRC	0409X	3.69	2.99	150	PF	CIRC
0409X			UNK	UNK	CIRC	0763X	5.24	4.46	150	VC	CIRC	7601X	9.51	6.6	175	VC	CIRC	7601X	9.51	6.6	175	VC	CIRC	0504X	5.34	4.12	150	VC	CIRC	0409X			UNK	UNK	CIRC
0409X			UNK	UNK	CIRC	0764X	5.26	4.46	150	VC	CIRC	7602X	9.21	6.45	175	VC	CIRC	7602X	9.21	6.45	175	VC	CIRC	0505X	6.25	5.27	150	VC	CIRC	0409X			UNK	UNK	CIRC
0410X			UNK	UNK	CIRC	0765X	5.24	4.41	150	VC	CIRC	7702X	9.21	6.45	175	VC	CIRC	7702X	9.21	6.45	175	VC	CIRC	0506X	6.25	5.27	150	VC	CIRC	0410X			UNK	UNK	CIRC
0410X			UNK	UNK	CIRC	0766X	5.17	4.14	300	VC	CIRC	770DX			100	VC	CIRC	770DX			100	VC	CIRC	0507X	6.25	5.27	150	VC	CIRC	0410X			UNK	UNK	CIRC
0411X			100	PF	CIRC	0767X	5.23	4.14	300	VC	CIRC				100	VC	CIRC				100	VC	CIRC	0508X	6.25	5.27	150	VC	CIRC	0411X			100	PF	CIRC
0412X			100	PF	CIRC	0768X	5.01	3.95	300	VC	CIRC	8201X	2.8	0.96	375	VC	CIRC	8201X	2.8	0.96	375	VC	CIRC	0509X	6.25	5.27	150	VC	CIRC	0412X			100	PF	CIRC
0413X			UNK	UNK	CIRC	0769X	5.07	4.04	150	VC	CIRC	8401X	6.41	4.11	175	VC	CIRC	8401X	6.41	4.11	175	VC	CIRC	0510X	5.42	4.59	150	VC	CIRC	0413X			UNK	UNK	CIRC
0420X			UNK	UNK	CIRC	0770X	5.24	3.95	300	VC	CIRC	8402X	5.88	3.78	175	VC	CIRC	8402X	5.88	3.78	175	VC	CIRC	0511X	5.42	4.59	150	VC	CIRC	0420X			UNK	UNK	CIRC
0453X			375	CP	CIRC	1201X	8.58	6.02	225	VC	CIRC	8403X	6.59	5.17	150	VC	CIRC	8403X	6.59	5.17	150	VC	CIRC	0512X	5.67	4.33	150	VC	CIRC	0453X			375	CP	CIRC
0454X	3.74	2.44	375	CP	CIRC	1202X	8.45	5.81	225	VC	CIRC	840DX			100	VC	CIRC	840DX			100	VC	CIRC	0515X	5.34	4.12	150	VC	CIRC	0454X	3.74	2.44	375	CP	CIRC
0502X	4.07	2.37	150	VC	CIRC	1203X	7.54	5.81	225	VC	CIRC	8501X	7.42	5.37	150	VC	CIRC	8501X	7.42	5.37	150	VC	CIRC	0516X	6.25	5.27	150	VC	CIRC	0502X	4.07	2.37	150	VC	CIRC
0504X	4.51	2.35	150	VC	CIRC	1204X			225	VC	CIRC	8502X	7.33	5.77	150	VC	CIRC	8502X	7.33	5.77	150	VC	CIRC	051DX	4	1.76	150	VC	CIRC	0504X	4.51	2.35	150	VC	CIRC
0505X	4.36	2.52	150	VC	CIRC	1205X	2.35		UNK	UNK	CIRC	850DX	6.63	4.98	150	VC	CIRC	850DX	6.63	4.98	150	VC	CIRC	0511X	5.4	4.45	150	VC	CIRC	0505X	4.36	2.52	150	VC	CIRC
0506X	4.22	2.78	150	VC	CIRC	1206X			UNK	UNK	CIRC	8509X	7.46	5.38	300	VC	CIRC	8509X	7.46	5.38	300	VC	CIRC	0512X	7.41	5.09	150	VC	CIRC	0506X	4.22	2.78	150	VC	CIRC
0507X	3.99	2.89	225	VC	CIRC	1207X			UNK	UNK	CIRC	8551X	7.28	7.27	150	VC	CIRC	8551X	7.28	7.27	150	VC	CIRC	0513X	7.51	6.13	150	VC	CIRC	0507X	3.99	2.89	225	VC	CIRC
0508X	4.06	2.96	225	VC	CIRC	1208X			UNK	UNK	CIRC	8553X	7.78	5.54	300	VC	CIRC	8553X	7.78	5.54	300	VC	CIRC	0514X	7.52	6.35	150	VC	CIRC	0508X	4.06	2.96	225	VC	CIRC
050PX	4.18	4.17	100	PVC	CIRC	120DX			UNK	UNK	CIRC	8555X	7.73	5.57	150	VC	CIRC	8555X	7.73	5.57	150	VC	CIRC	0515X	6.44	4.5	150	VC	CIRC	050PX	4.18	4.17	100	PVC	CIRC
0512X	3.98	2.26	150	VC	CIRC	121DX			UNK	UNK	CIRC	8601X	7.82	5.57	150	VC	CIRC	8601X	7.82	5.57	150	VC	CIRC	0516X	6.44	2.04	150	VC	CIRC	0512X	3.98	2.26	150	VC	CIRC
0552X	4.51	2.67	300	VC	CIRC	1301X	8.06	6.59	150	VC	CIRC	8602X	8.4	5.88	150	VC	CIRC	8602X	8.4	5.88	150	VC	CIRC	055DX	6.53	5.76	150	VC	CIRC	0552X	4.51	2.67	300	VC	CIRC
0553X	4.37	2.97	225	VC	CIRC	1302X			UNK	UNK	CIRC	8606X	8.62	7.11	150	VC	CIRC	8606X	8.62	7.11	150	VC	CIRC	055DX	6.53	5.76	150	VC	CIRC	0553X	4.37	2.97	225	VC	CIRC
0554X	4.15	3.11	150	VC	CIRC	1303X	1.4		UNK	UNK	CIRC	8607X	8.81	7.32	150	VC	CIRC	8607X	8.81	7.32	150	VC	CIRC	055DX	6.53	5.76	150	VC	CIRC	0554X	4.15	3.11	150	VC	CIRC
0601X	4.16	2.96	225	VC	CIRC	130DX			UNK	UNK	CIRC	8608X	9.06	9.05	150	VC	CIRC	8608X	9.06	9.05	150	VC	CIRC	055DX	6.53	5.76	150	VC	CIRC	0601X	4.16	2.96	225	VC	CIRC
0602X	4.5	3.18	225	VC	CIRC	131DX			UNK	UNK	CIRC	8609X	8.71	7.66	150	VC	CIRC	8609X	8.71	7.66	150	VC	CIRC	055DX	6.53	5.76	150	VC	CIRC	0602X	4.5	3.18	225	VC	CIRC
0603X	4.15	3.88	150	VC	CIRC	1401X	4.59	2.4	300	VC	CIRC	8																							

[illegible]

Drawn by: gujskew	
Title: 317229_Land off Canal Mews	
Date: 15/11/2018	

APPENDIX 4

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: 08267396
Registered office:
100 Church Street
Brighton, East Sussex
BN1 1UJ





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 MEWS

Project Number:
C0007059

Date:
05/01/2018

Scoring Summary	P-1
Project Information	P-2
Section Profile	P-4
Section: 1; FW1 - FW2	1
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
---------	----------	-------	-------------

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

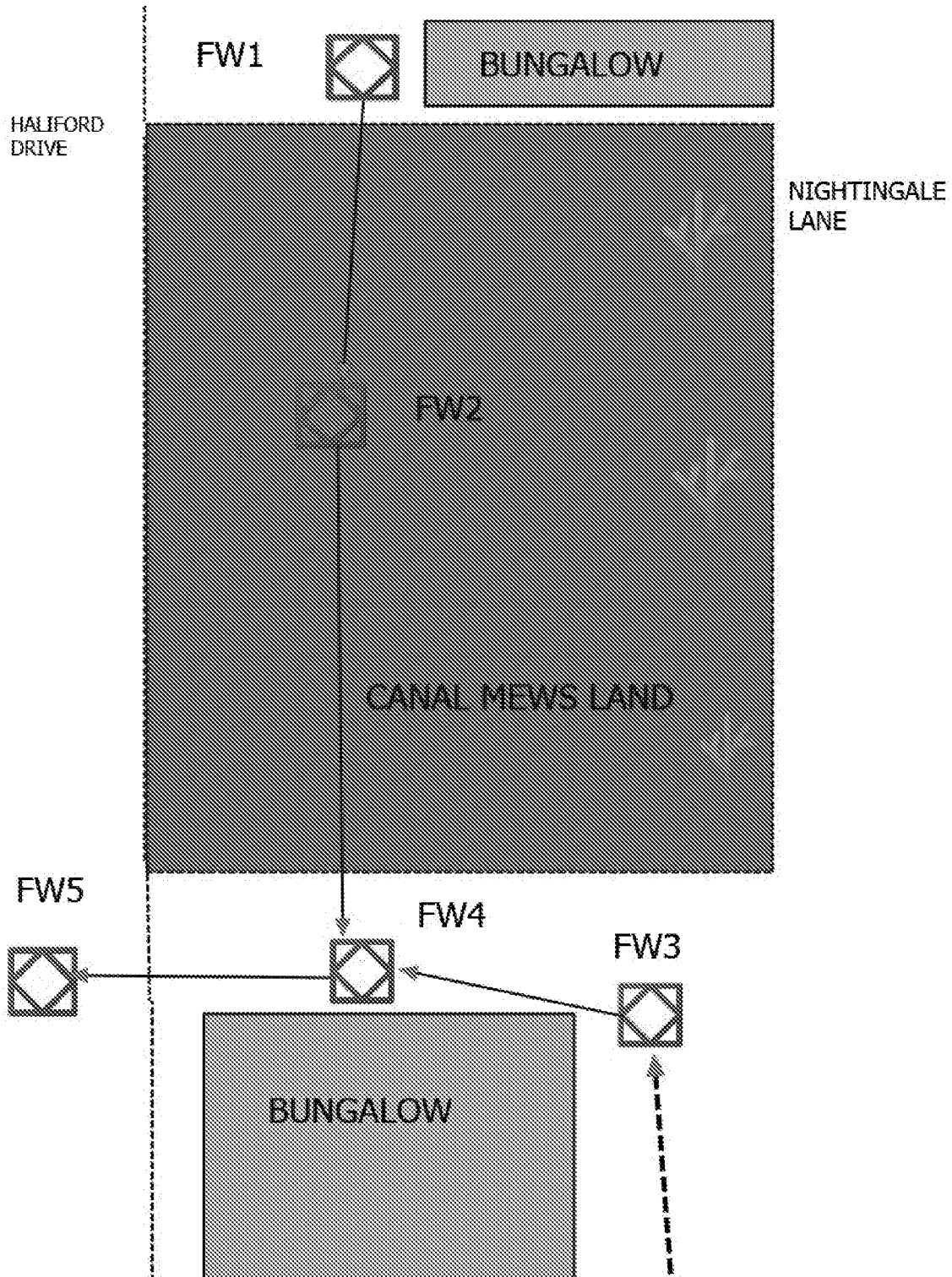
Project Name:
LAND OFF CANAL MEWS

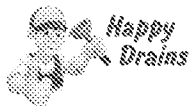
Client's Ref:
C0007059

Contractor's Ref:
C0007059

Project Date:
05/01/2018

Project Description: GENERAL CCTV





Section Profile

Project Name:
LAND OFF CANAL MEWS

Project Number:
C0007059

Project 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])

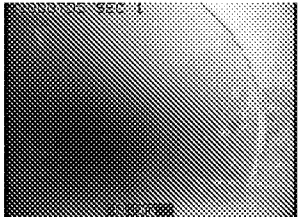
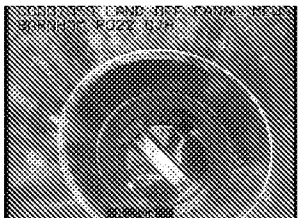
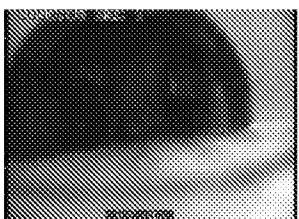
Section Inspection - 05/01/2018 - FW1X

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				
	0.00	MH	Start node type, manhole, reference number: FW2	
	0.00	GP	General photograph taken at this point: OVERVIEW	
	0.01	WL	Water level, 5% of the vertical dimension: IN CONSTANT USE FROM PROPERTIES	
				
				
	17.80	MHF	Finish node type, manhole, reference number: FW1: NO ACCESS	
FW1				
Depth:				

Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
<i>Note: In line with the WRC GRM, plastic pipes are not scored against structural defects.</i>									
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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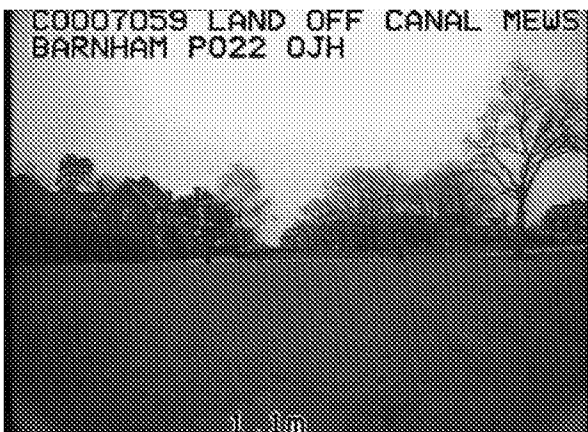
FW1X_0d76fe4c-d64b-4dff-a029-d21ec7f79804_20180110_193300_411.jpg, 0.00m
Start node type, manhole, reference number: FW2



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



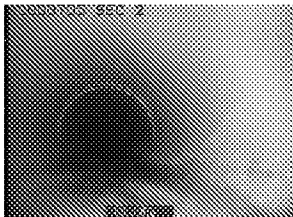
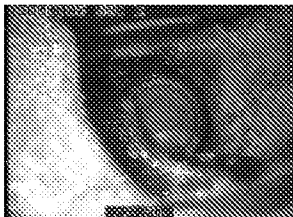
FW1X_7f90da61-620c-44cc-a96b-bed728392652_20180110_193059_014.jpg, 00:00:00, 0.00m
General photograph taken at this point / OVERVIEW



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																																																		
Depth: 1.50																																																						
FW2																																																						
	0.00	MH	Start node type, manhole, reference number: FW2																																																			
	0.01	WL	Water level, 5% of the vertical dimension																																																			
																																																						
				0.00m // 00:00:00 // 1																																																		
				23.50m // // 2																																																		
	23.50	MHF	Finish node type, manhole, reference number: FW4																																																			
FW4																																																						
Depth: 1.90																																																						
<table><tr><th colspan="5">Structural defects</th><th colspan="5">Constructional features</th></tr><tr><th colspan="5">Service and maintenance defects</th><th colspan="5">Miscellaneous features</th></tr><tr><td colspan="10">Note: In line with the WRC SPM, plastic pipes are not scored against structural defects.</td></tr><tr><th>STR no def</th><th>STR peak</th><th>STR mean</th><th>STR total</th><th>STR grade</th><th>SER no def</th><th>SER peak</th><th>SER mean</th><th>SER total</th><th>SER grade</th></tr><tr><td>0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.0</td><td>0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.0</td></tr></table>					Structural defects					Constructional features					Service and maintenance defects					Miscellaneous features					Note: In line with the WRC SPM, 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
Structural defects					Constructional features																																																	
Service and maintenance defects					Miscellaneous features																																																	
Note: In line with the WRC SPM, 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

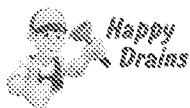
Section Number: 2	Inspection Direction: FW2 ➔ FW4	PLR: FW2X	Client's Ref: C0007059	Contractor's Ref: C0007059
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FW2X_3e2d9e45-481b-4e36-b275-d35d78e19be5_20180110_194004_497.jpg, 00:00:00, 0.00m
Start node type, manhole, reference number: FW2



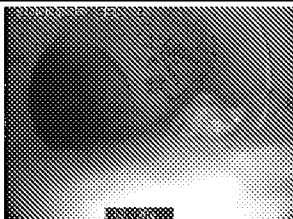
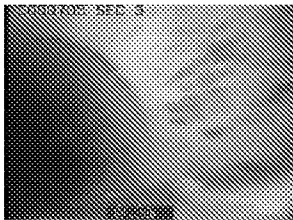
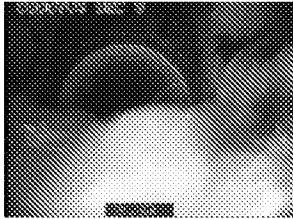
FW2X_123d7814-9d39-47bc-8a50-48c4b4c2e600_20180110_194216_024.jpg, , 23.50m
Finish node type, manhole, reference number: FW4



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	
Depth: 1.80					
FW3					
	0.00	MH	Start node type, manhole, reference number: FW3		
	0.01	WL	Water level, 5% of the vertical dimension: IN CONSTANT USE		
	0.01	LL	Line deviates left		
	9.10	MHF	Finish node type, manhole, reference number: FW4		
FW4					
Depth: 1.90					

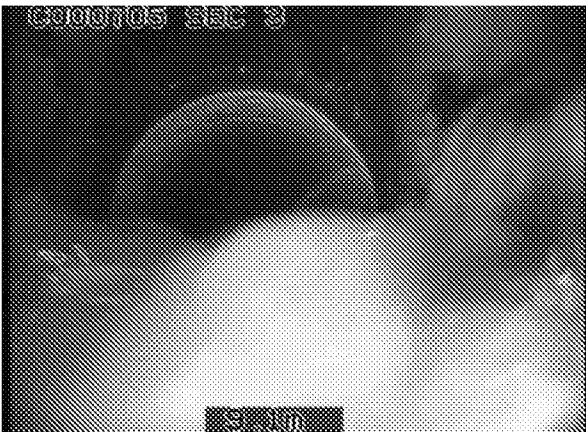


Section Pictures - 02/01/2018 - FW3X

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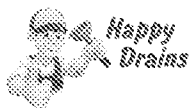
FW3X_ec21d8f3-e28e-4486-895b-98986cc3c2d7_20180110_194747_359.jpg, 00:00:00, 0.00m
Start node type, manhole, reference number: FW3



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

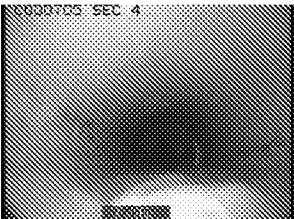
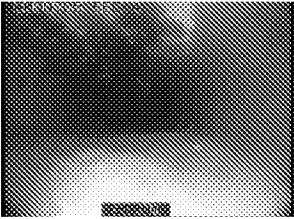
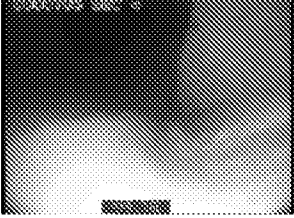


Section Inspection - 10/01/2018 - FW4X

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
Depth: 1.90				
FW4				
	0.00	MH	Start node type, manhole, reference number: FW4	
	0.01	WL	Water level, 5% of the vertical dimension	
				
	31.00	DEG	Attached deposits, grease at 12 o'clock, 5% cross-sectional area loss	31.00m // 00:08:06.85 // 2
	35.70	MHF	Finish node type, manhole, reference number: FW5: BEHIND LOCKED GATE IN PRIVATE ROAD	35.70m // 00:07:43.49 // 3
FW5				
Depth:				

Structural defects					Constructional features				
Service and maintenance defects					Miscellaneous features				
Note: In line with the WRC SPM, 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 5

Croudace Homes' General Layout Plan



Rev Description Initial Date

Croudace
HOMES.CO.UK

BARNHAM
GOODACRES

GENERAL LAYOUT
SHEET 1 OF 2

SCALE: 1:200 @ A0
DATE: _____
DRAWN: INITIALS
CHECKED: _____
DRG No.: 000/000

APPENDIX 6

Extracts of Robert Clark Associates Ltd's Soakaway Test

Robert Clark Associates Ltd

Percolation testing at Land off Barn Rise, Barnham

Results from insitu testing carried out 28 - 31 October 2006

Results are in metres/second

Test No.	TP 1	TP 2	TP 3	TP 4	Average
1	1.24×10^{-6}	4.51×10^{-6}	1.75×10^{-6}	-	2.50×10^{-6}
2	6.08×10^{-7}	2.17×10^{-6}	-	-	1.39×10^{-6}
Av.	9.24×10^{-7}	3.34×10^{-6}	1.75×10^{-6}	-	2.00×10^{-6}

Notes

Test 1 was carried out in open trench and complied strictly with BRE 365

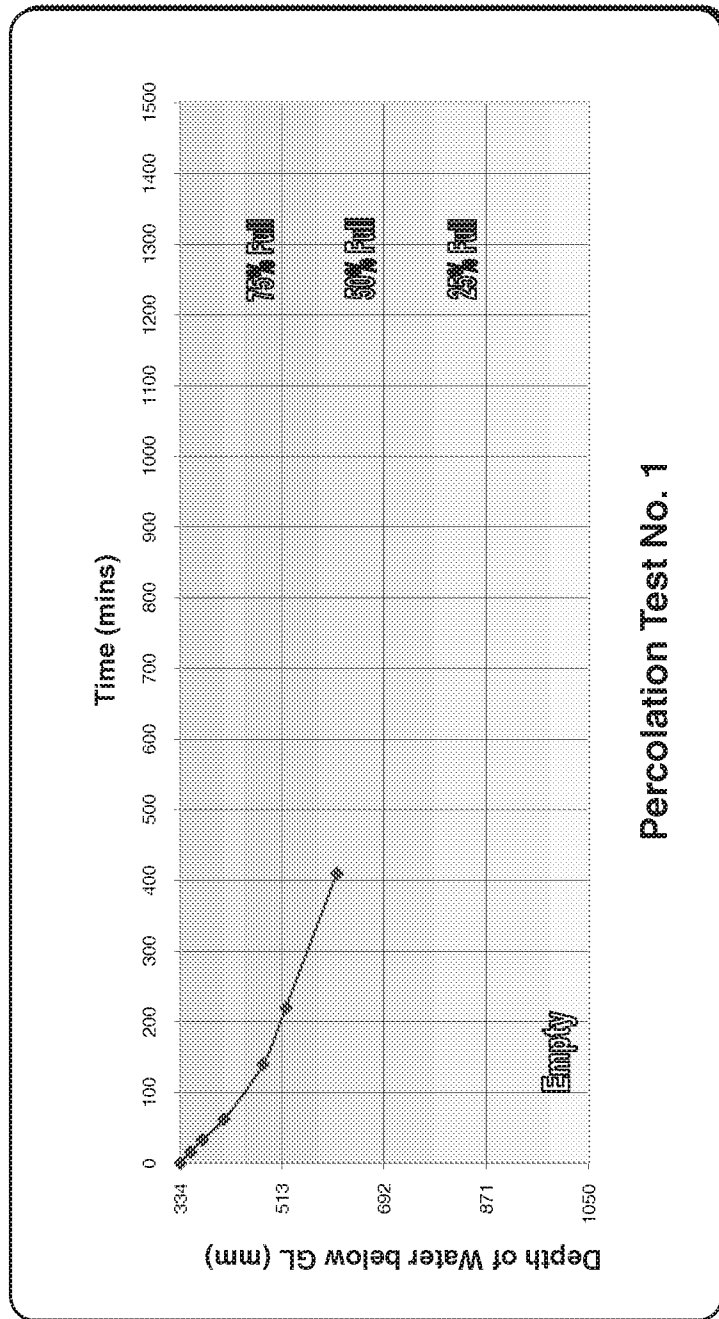
Test 2 was carried out within the standpipe after backfilling of the test pits

The water level in Test Pit 3 rose during Test 2

Groundwater levels in Test Pit 4 were too high to enable tests to be carried out

[illegible]Percolation Test Pit No. 1

1.50 x 0.32 x 1.05m deep pit



Soil infiltration rate:

$$f = \frac{0.172}{1.783 \times 1295.0 \times 60} = 1.24\text{E-}06 \text{ m/s (interpolated)}$$

[illegible]Percolation Test Pit No. 1

The graph plots Depth of Water below GL (mm) against Time (mins). The data points are as follows:

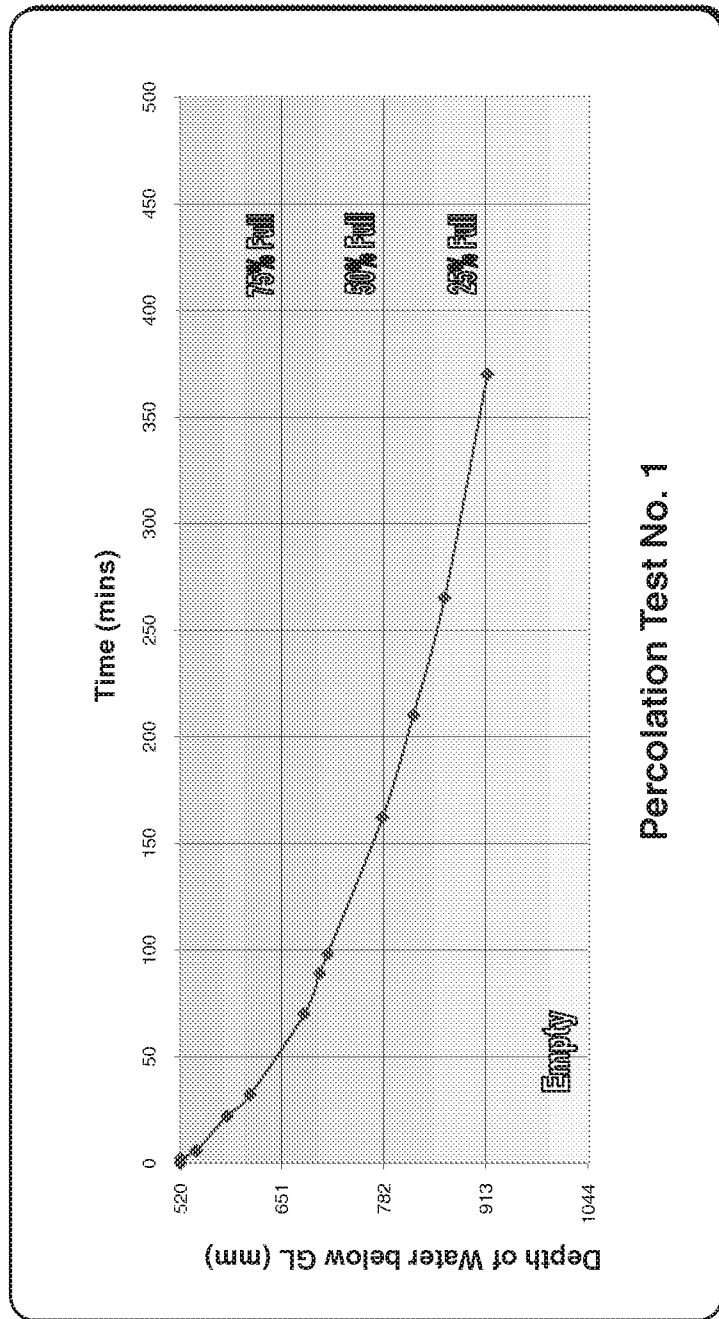
Time (mins)	Depth of Water below GL (mm)	Label
0	330	Empty
~50	~340	
~100	~350	
~120	~360	
~150	~370	
~200	~380	
~250	~390	
~300	~400	
~350	~410	
~400	~420	
~450	~430	
~500	~440	
~550	~450	
~600	~460	
~650	~470	
~700	~480	
~750	~490	
~800	~500	
~850	~510	
~900	~520	
~950	~530	
~1000	~540	
~1050	~550	
~1100	~560	
~1150	~570	
~1200	~580	
~1250	~590	
~1300	~600	
~1350	~610	
~1400	~620	
~1450	~630	
~1500	~640	
~1550	~650	
~1600	~660	
~1650	~670	
~1700	~680	
~1750	~690	
~1800	~700	
~1850	~710	
~1900	~720	
~1950	~730	
~2000	~740	
~2050	~750	
~2100	~760	
~2150	~770	
~2200	~780	
~2250	~790	
~2300	~800	
~2350	~810	
~2400	~820	
~2450	~830	
~2500	~840	
~2550	~850	
~2600	~860	
~2650	~870	
~2700	~880	
~2750	~890	
~2800	~900	
~2850	~910	
~2900	~920	
~2950	~930	
~3000	~940	
~3050	~950	
~3100	~960	
~3150	~970	
~3200	~980	
~3250	~990	
~3300	~1000	
~3350	~1010	
~3400	~1020	
~3450	~1030	
~3500	~1040	
~3550	~1050	
~3600	~1060	
~3650	~1070	
~3700	~1080	
~3750	~1090	
~3800	~1100	
~3850	~1110	
~3900	~1120	
~3950	~1130	
~4000	~1140	
~4050	~1150	
~4100	~1160	
~4150	~1170	
~4200	~1180	
~4250	~1190	
~4300	~1200	
~4350	~1210	
~4400	~1220	
~4450	~1230	
~4500	~1240	
~4550	~1250	
~4600	~1260	
~4650	~1270	
~4700	~1280	
~4750	~1290	
~4800	~1300	
~4850	~1310	
~4900	~1320	
~4950	~1330	
~5000	~1340	
~5050	~1350	
~5100	~1360	
~5150	~1370	
~5200	~1380	
~5250	~1390	
~5300	~1400	
~5350	~1410	
~5400	~1420	
~5450	~1430	
~5500	~1440	
~5550	~1450	
~5600	~1460	
~5650	~1470	
~5700	~1480	
~5750	~1490	
~		

Percolation Test No. 2

$$\text{Soil infiltration rate: } f = \frac{0.009}{0.215 \times 1145.0 \times 60} = 6.08\text{E-}07 \text{ m/s}$$

[illegible]Percolation Test Pit No. 2

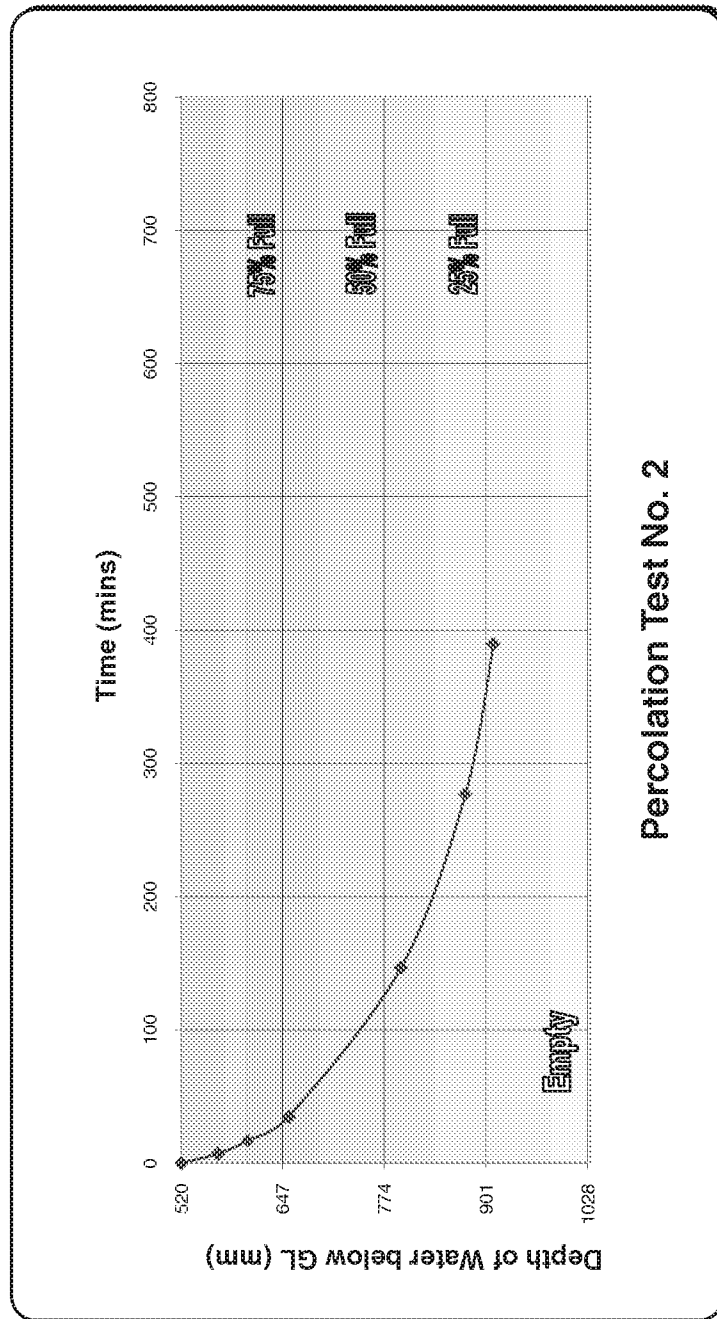
1.20 x 0.32 x 1.045m deep pit



Soil infiltration rate: $f = \frac{0.101}{1.182 \times 315.0 \times 60} = 4.51\text{E-}06 \text{ m/s}$

[illegible]Percolation Test Pit No. 2

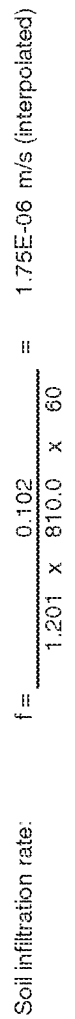
0.21 x 0.21 x 1.030m deep pit



$$\text{Soil infiltration rate: } f = \frac{0.011}{0.258 \times 335.0 \times 60} = 2.17 \times 10^{-6} \text{ m/s}$$

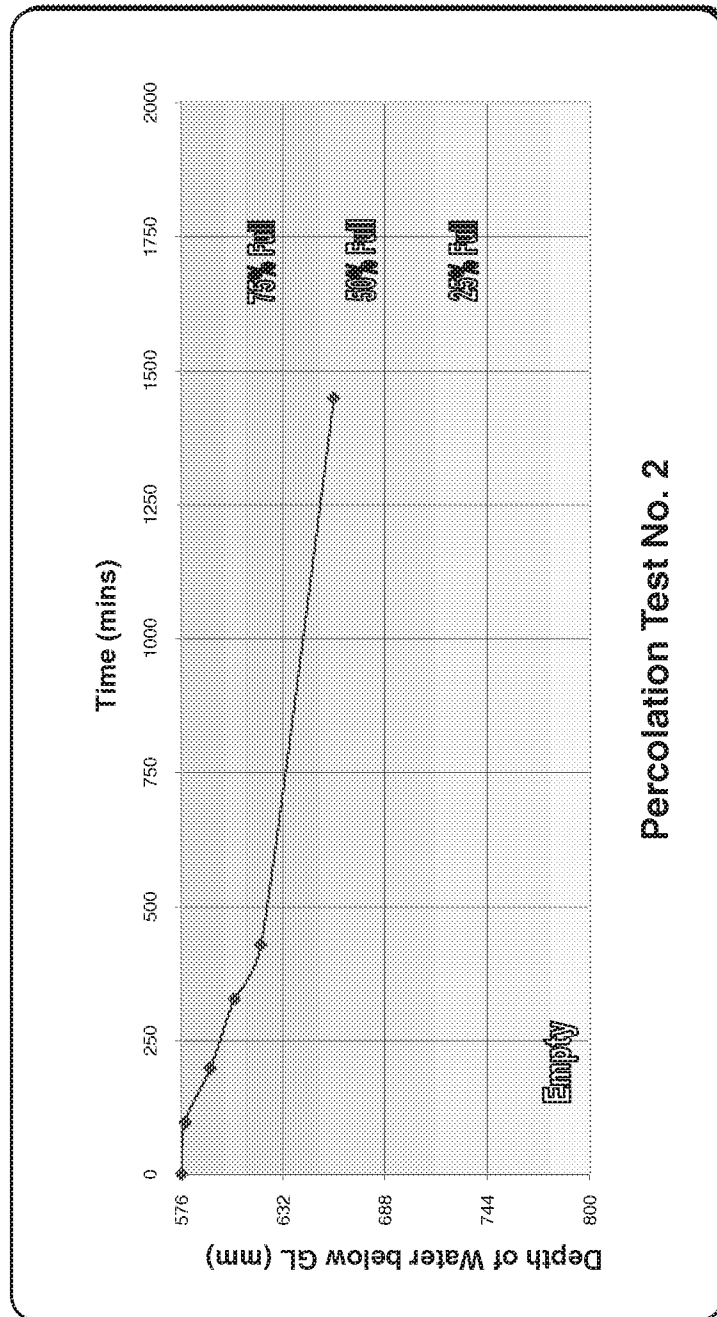
Land off Barn Rise, Barnham

1.25 x 0.32 x 1.02m deep pit



[illegible]Percolation Test Pit No. 3

0.21 x 0.21 x 1.030m deep pit

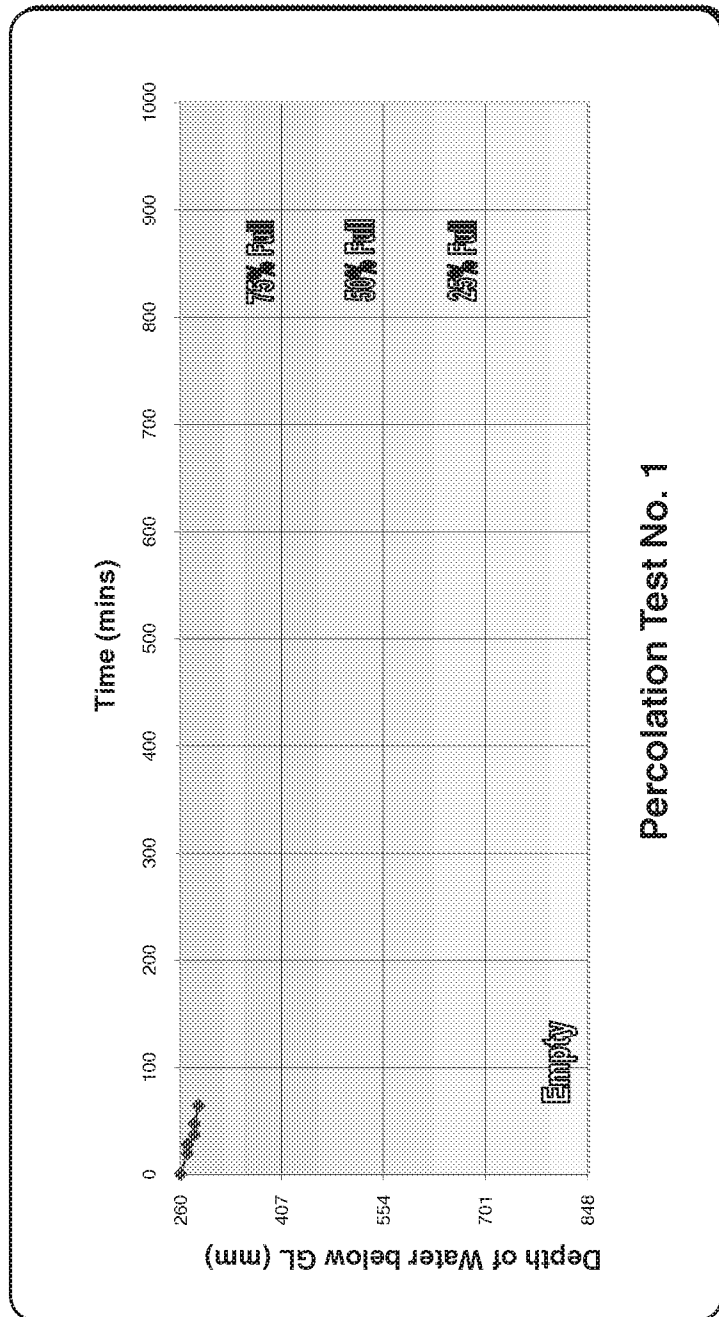


Soil infiltration rate:

$$f = \frac{0.001}{0.063 \times 0.0 \times 60} = \text{unable to calculate}$$

[illegible]Percolation Test Pit No. 4

1.15 x 0.32 x 0.85m deep pit



Soil infiltration rate:

$$f = \frac{0.109}{1.235 \times 0.0 \times 60} =$$

Unable to calculate

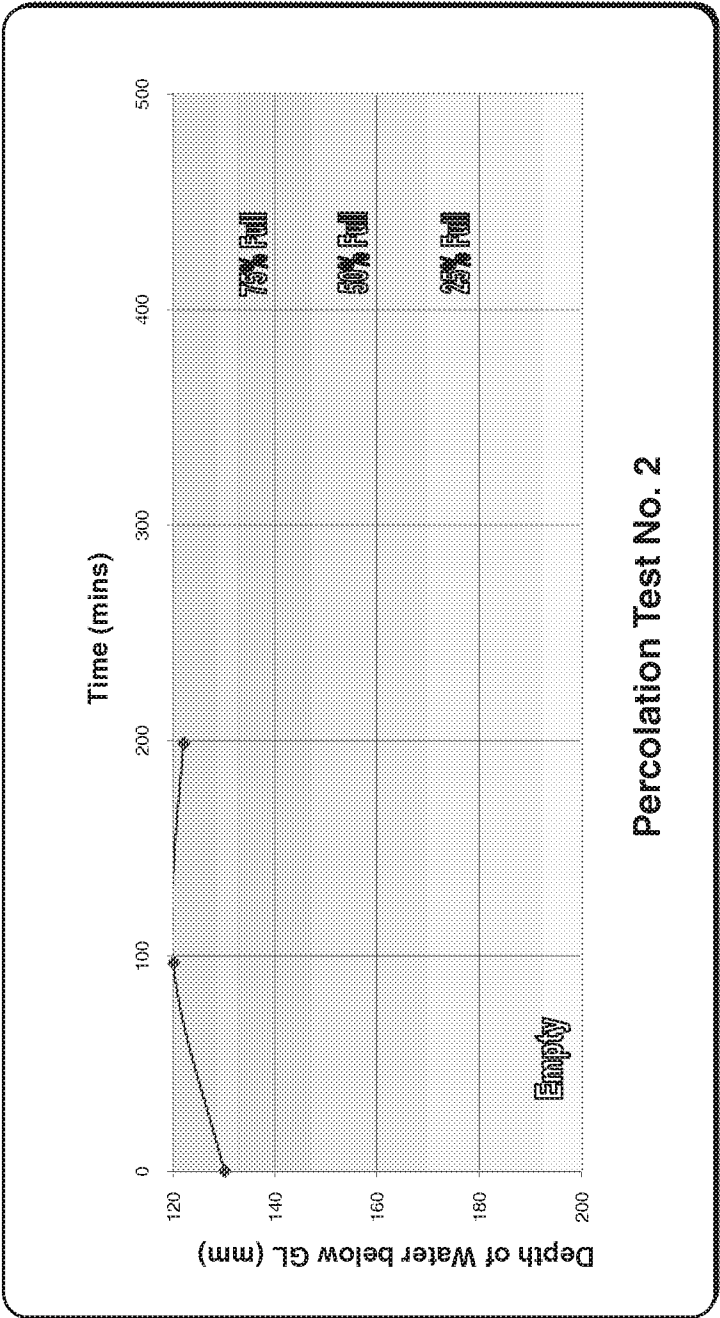
Robert Clark Associates Ltd

Time (mins)	Depth to water surface
0	130
97	120
199	122
	abandoned

Land off Barn Rise, Barnham

Percolation Test Pit No. 4

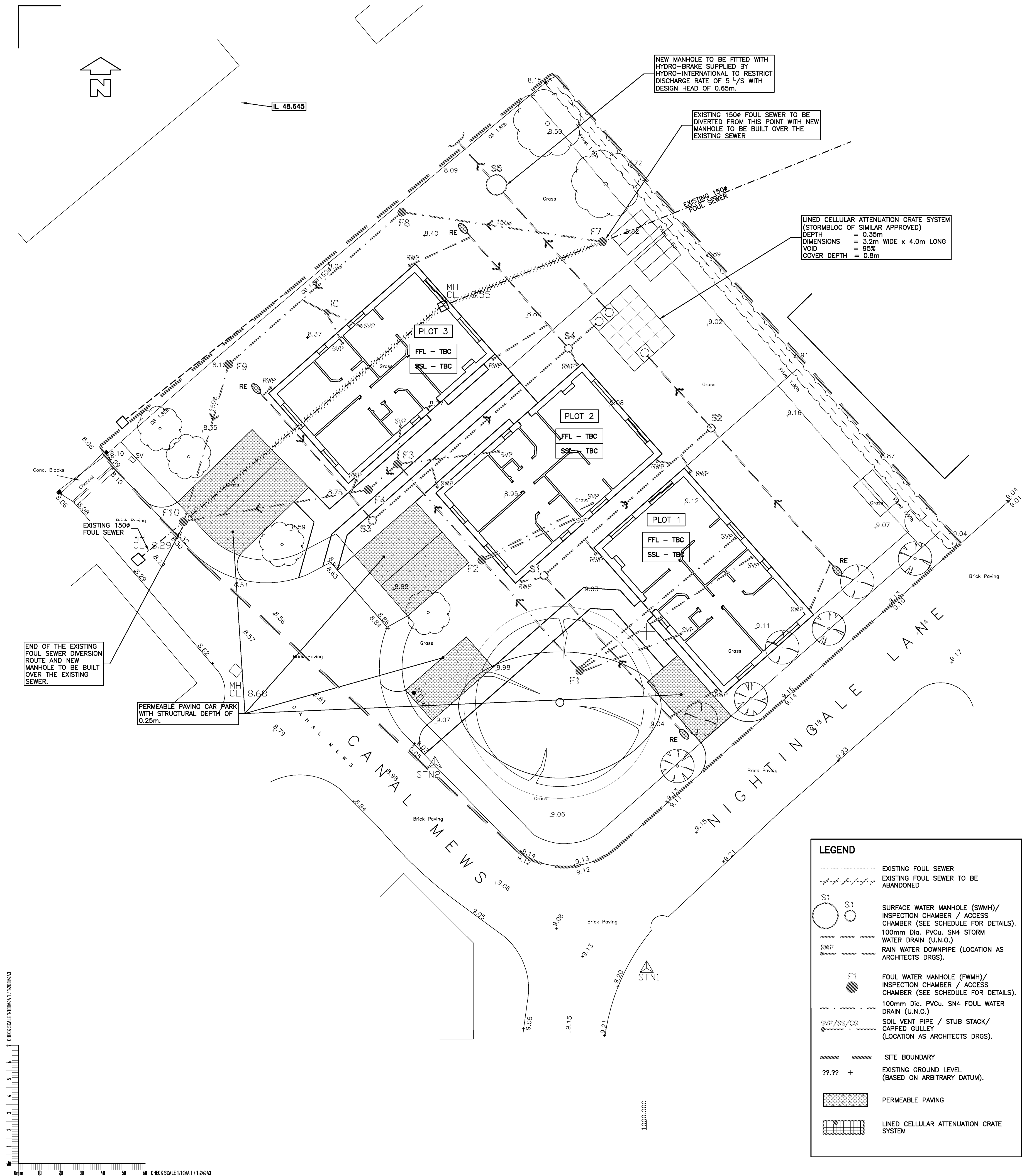
0.21 x 0.21 x 0.13m deep pit



Soil infiltration rate: $f = \frac{0.040}{0.000} \times \frac{60}{60} = \text{unable to calculate}$

APPENDIX 7

Drainage Strategy Drawing



GENERAL SUDS OPERATION AND MAINTENANCE		
MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
REGULAR MAINTENANCE	REMOVE SEDIMENT AND DEBRIS FROM PRE-TREATMENT DEVICES AND 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 AND THEN ANNUALLY
	CHECK ATTENUATION TANK TO ENSURE EMPTYING IS OCCURRING	ANNUALLY

PERMEABLE PAVING OPERATION AND MAINTENANCE REQUIREMENTS		
MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
REGULAR MAINTENANCE	BRUSHING AND VACUUMING (STANDARD COSMETIC SWEEP OVER WHOLE SURFACE)	THREE TIMES PER YEAR AT END OF WINTER, MID-SUMMER, 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
	REMEDiate ANY LANDSCAPING WHICH, THROUGH VEGETATION MAINTENANCE OR SOIL SLIP, HAS BEEN RAISED TO WITHIN 50mm OF THE LEVEL OF THE PAVING	AS REQUIRED
REMEDIAL ACTIONS	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 SUB-STRUCTURES 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 HOURS AFTER LARGE STORMS IN FIRST SIX MONTHS
	INSPECT SILT ACCUMULATION RATES AND ESTABLISH APPROPRIATE BRUSHING FREQUENCIES	ANNUALLY
	MONITOR INSPECTION CHAMBERS	ANNUALLY

ATTENUATION TANK OPERATION AND MAINTENANCE REQUIREMENTS		
MAINTENANCE SCHEDULE	REQUIRED ACTION	RECOMMENDED FREQUENCY
REGULAR MAINTENANCE	INSPECT AND IDENTIFY ANY AREAS THAT ARE NOT OPERATING CORRECTLY. IF REQUIRED TAKE REMEDIAL ACTION	MONTHLY FOR 3 MONTHS, THEN 6 MONTHLY.
	DEBRIS REMOVAL FROM CATCHMENT SURFACE (WHERE MAY CAUSE RISKS TO PERFORMANCE).	MONTHLY.
REMEDIAL ACTIONS	REMOVE SEDIMENT FROM PRE-TREATMENT STRUCTURES I.E. SILT TRAPS AND GULLIES.	ANNUALLY, OR AS REQUIRED.
MONITORING	REPAIR / REHABILITATION OF INLETS, OUTLET, OVERFLOWS AND VENTS.	AS REQUIRED
	INSPECT / CHECK ALL INLETS, OUTLETS, VENTS AND OVERFLOWS TO ENSURE THAT THEY ARE IN GOOD CONDITION AND OPERATING AS DESIGNED.	ANNUALLY AND AFTER LARGE STORMS

FOUL MANHOLE SCHEDULE							
REF	COVER LEVEL	INVERT LEVEL	DEPTH TO INVERT	SIZE	TYPE	COVER	COMMENTS
F1	49.744	48.744	1.000	450#	TYPE 3	B125 300x300	
F2	49.730	48.630	1.100	450#	TYPE 3	B125 300x300	
F3	49.700	48.530	1.170	450#	TYPE 3	B125 450x450	
F4	49.630	48.480	1.150	450#	TYPE 3	B125 450x450	
F5	49.480	48.480	1.000	450#	TYPE 3	B125 450x450	
F6	49.475	48.447	1.028	450#	TYPE 3	B125 450x450	
F7	49.530	48.029	1.501	450#	TYPE 3	B125 450x450	START OF THE DIVERSION ROUTE. NEW MANHOLE TO BE INSTALLED OVER THE EXISTING 150mm DIA. FOUL SEWER.
F8	49.466	47.576 47.916 48.419	1.890	450#	TYPE 3	B125 450x450	BACKDROP MANHOLE
F9	49.380	47.434	1.946	450#	TYPE 3	B125 450x450	
F10	49.050	47.198	1.852	450#	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	49.740	48.938	0.802	450#	TYPE 3	B125 450x450	
S2	49.830	48.728	1.102	450#	TYPE 3	B125 300x300	CATCHPIT RESTRICTED ACCESS
S3	49.500	48.618	0.882	450#	TYPE 3	B125 450x450	
S4	49.650	48.463	1.187	450#	TYPE 3	B125 300x300	CATCHPIT RESTRICTED ACCESS
S5	49.530	48.342	1.188	1200#	TYPE 2	C250 675x675	HYDRO-BRAKE SUPPLIED BY HYDRO-INTERNATIONAL TO RESTRICT FLOW RATE TO 5 L/S. WITH DESIGN HEAD AT 0.65m

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 V/C PIPEWORK. FOR NON-ADOPTED SYSTEM PVCU-SN4 CLASS PIPEWORK AND FITTINGS MAY BE SUBSTITUTED.
- CONCRETE ENCASMENT, 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

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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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CONSULTING CIVIL AND STRUCTURAL ENGINEERS
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civil & structural engineering sustainable environment

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STRUCTURAL
ENGINEERING

Client	SEAWARD PROPERTIES LTD.
Architect	STUDIO LACK ARCHITECTURE
Project Title	

DRAINAGE STRATEGY

Scale	Paper Size	Date	Drawn By	Checked By
1:125	A1	NOV. 2018	PJM	AWR
Project No.	Drawing No.	Revision		
SPR032	500	P2		

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	3	0.14
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		LAND OFF CANAL MEWS																																																																																																																																																																																																																					
Bishops Waltham		NIGHTINGALE LANE, BARNHAM																																																																																																																																																																																																																					
Southampton SO32 1AF		PERMEABLE PAVING-100YR+40%																																																																																																																																																																																																																					
Date 12/12/2018		Designed by SH																																																																																																																																																																																																																					
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XP Solutions		Source Control 2018.1																																																																																																																																																																																																																					
Summary of Results for 100 year Return Period (+40%) Half Drain Time : 1035 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>48.634</td><td>0.094</td><td>0.0</td><td>0.8</td><td>O K</td></tr><tr><td>30 min Summer</td><td>48.670</td><td>0.130</td><td>0.0</td><td>1.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>48.709</td><td>0.169</td><td>0.0</td><td>1.4</td><td>O K</td></tr><tr><td>120 min Summer</td><td>48.749</td><td>0.209</td><td>0.0</td><td>1.8</td><td>O K</td></tr><tr><td>180 min Summer</td><td>48.770</td><td>0.230</td><td>0.0</td><td>2.0</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>48.783</td><td>0.243</td><td>0.0</td><td>2.1</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>48.801</td><td>0.261</td><td>0.0</td><td>2.2</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>48.810</td><td>0.270</td><td>0.0</td><td>2.3</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>48.816</td><td>0.276</td><td>0.0</td><td>2.4</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>48.819</td><td>0.279</td><td>0.0</td><td>2.4</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>48.819</td><td>0.279</td><td>0.0</td><td>2.4</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>48.814</td><td>0.274</td><td>0.0</td><td>2.4</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>48.802</td><td>0.262</td><td>0.0</td><td>2.3</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>48.789</td><td>0.249</td><td>0.0</td><td>2.1</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>48.759</td><td>0.219</td><td>0.0</td><td>1.9</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>48.731</td><td>0.191</td><td>0.0</td><td>1.6</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>48.706</td><td>0.166</td><td>0.0</td><td>1.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>48.683</td><td>0.143</td><td>0.0</td><td>1.2</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>48.663</td><td>0.123</td><td>0.0</td><td>1.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>48.634</td><td>0.094</td><td>0.0</td><td>0.8</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>124.544</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>84.215</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>54.368</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>33.870</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>25.280</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>20.382</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>15.043</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>12.112</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>10.228</td><td>0.0</td><td>600</td></tr><tr><td>720 min Summer</td><td>8.904</td><td>0.0</td><td>720</td></tr><tr><td>960 min Summer</td><td>7.147</td><td>0.0</td><td>914</td></tr><tr><td>1440 min Summer</td><td>5.233</td><td>0.0</td><td>1140</td></tr><tr><td>2160 min Summer</td><td>3.822</td><td>0.0</td><td>1516</td></tr><tr><td>2880 min Summer</td><td>3.054</td><td>0.0</td><td>1932</td></tr><tr><td>4320 min Summer</td><td>2.222</td><td>0.0</td><td>2728</td></tr><tr><td>5760 min Summer</td><td>1.771</td><td>0.0</td><td>3520</td></tr><tr><td>7200 min Summer</td><td>1.486</td><td>0.0</td><td>4320</td></tr><tr><td>8640 min Summer</td><td>1.288</td><td>0.0</td><td>5024</td></tr><tr><td>10080 min Summer</td><td>1.142</td><td>0.0</td><td>5752</td></tr><tr><td>15 min Winter</td><td>124.544</td><td>0.0</td><td>19</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	48.634	0.094	0.0	0.8	O K	30 min Summer	48.670	0.130	0.0	1.1	O K	60 min Summer	48.709	0.169	0.0	1.4	O K	120 min Summer	48.749	0.209	0.0	1.8	O K	180 min Summer	48.770	0.230	0.0	2.0	Flood Risk	240 min Summer	48.783	0.243	0.0	2.1	Flood Risk	360 min Summer	48.801	0.261	0.0	2.2	Flood Risk	480 min Summer	48.810	0.270	0.0	2.3	Flood Risk	600 min Summer	48.816	0.276	0.0	2.4	Flood Risk	720 min Summer	48.819	0.279	0.0	2.4	Flood Risk	960 min Summer	48.819	0.279	0.0	2.4	Flood Risk	1440 min Summer	48.814	0.274	0.0	2.4	Flood Risk	2160 min Summer	48.802	0.262	0.0	2.3	Flood Risk	2880 min Summer	48.789	0.249	0.0	2.1	Flood Risk	4320 min Summer	48.759	0.219	0.0	1.9	Flood Risk	5760 min Summer	48.731	0.191	0.0	1.6	O K	7200 min Summer	48.706	0.166	0.0	1.4	O K	8640 min Summer	48.683	0.143	0.0	1.2	O K	10080 min Summer	48.663	0.123	0.0	1.0	O K	15 min Winter	48.634	0.094	0.0	0.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	124.544	0.0	19	30 min Summer	84.215	0.0	34	60 min Summer	54.368	0.0	64	120 min Summer	33.870	0.0	124	180 min Summer	25.280	0.0	182	240 min Summer	20.382	0.0	242	360 min Summer	15.043	0.0	362	480 min Summer	12.112	0.0	482	600 min Summer	10.228	0.0	600	720 min Summer	8.904	0.0	720	960 min Summer	7.147	0.0	914	1440 min Summer	5.233	0.0	1140	2160 min Summer	3.822	0.0	1516	2880 min Summer	3.054	0.0	1932	4320 min Summer	2.222	0.0	2728	5760 min Summer	1.771	0.0	3520	7200 min Summer	1.486	0.0	4320	8640 min Summer	1.288	0.0	5024	10080 min Summer	1.142	0.0	5752	15 min Winter	124.544	0.0	19
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																		
15 min Summer	48.634	0.094	0.0	0.8	O K																																																																																																																																																																																																																		
30 min Summer	48.670	0.130	0.0	1.1	O K																																																																																																																																																																																																																		
60 min Summer	48.709	0.169	0.0	1.4	O K																																																																																																																																																																																																																		
120 min Summer	48.749	0.209	0.0	1.8	O K																																																																																																																																																																																																																		
180 min Summer	48.770	0.230	0.0	2.0	Flood Risk																																																																																																																																																																																																																		
240 min Summer	48.783	0.243	0.0	2.1	Flood Risk																																																																																																																																																																																																																		
360 min Summer	48.801	0.261	0.0	2.2	Flood Risk																																																																																																																																																																																																																		
480 min Summer	48.810	0.270	0.0	2.3	Flood Risk																																																																																																																																																																																																																		
600 min Summer	48.816	0.276	0.0	2.4	Flood Risk																																																																																																																																																																																																																		
720 min Summer	48.819	0.279	0.0	2.4	Flood Risk																																																																																																																																																																																																																		
960 min Summer	48.819	0.279	0.0	2.4	Flood Risk																																																																																																																																																																																																																		
1440 min Summer	48.814	0.274	0.0	2.4	Flood Risk																																																																																																																																																																																																																		
2160 min Summer	48.802	0.262	0.0	2.3	Flood Risk																																																																																																																																																																																																																		
2880 min Summer	48.789	0.249	0.0	2.1	Flood Risk																																																																																																																																																																																																																		
4320 min Summer	48.759	0.219	0.0	1.9	Flood Risk																																																																																																																																																																																																																		
5760 min Summer	48.731	0.191	0.0	1.6	O K																																																																																																																																																																																																																		
7200 min Summer	48.706	0.166	0.0	1.4	O K																																																																																																																																																																																																																		
8640 min Summer	48.683	0.143	0.0	1.2	O K																																																																																																																																																																																																																		
10080 min Summer	48.663	0.123	0.0	1.0	O K																																																																																																																																																																																																																		
15 min Winter	48.634	0.094	0.0	0.8	O K																																																																																																																																																																																																																		
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																				
15 min Summer	124.544	0.0	19																																																																																																																																																																																																																				
30 min Summer	84.215	0.0	34																																																																																																																																																																																																																				
60 min Summer	54.368	0.0	64																																																																																																																																																																																																																				
120 min Summer	33.870	0.0	124																																																																																																																																																																																																																				
180 min Summer	25.280	0.0	182																																																																																																																																																																																																																				
240 min Summer	20.382	0.0	242																																																																																																																																																																																																																				
360 min Summer	15.043	0.0	362																																																																																																																																																																																																																				
480 min Summer	12.112	0.0	482																																																																																																																																																																																																																				
600 min Summer	10.228	0.0	600																																																																																																																																																																																																																				
720 min Summer	8.904	0.0	720																																																																																																																																																																																																																				
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Arch Associates Limited				Page 2	
Town House St Geroge's Square		LAND OFF CANAL MEWS			
Bishops Waltham		NIGHTINGALE LANE, BARNHAM			
Southampton SO32 1AF		PERMEABLE PAVING-100YR+40%			
Date 12/12/2018		Designed by SH			
File SPR032 Proposed Permeab...		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 Volume (m³)	Status
30 min Winter	48.670	0.130	0.0	1.1	O K
60 min Winter	48.709	0.169	0.0	1.4	O K
120 min Winter	48.749	0.209	0.0	1.8	O K
180 min Winter	48.770	0.230	0.0	2.0	Flood Risk
240 min Winter	48.783	0.243	0.0	2.1	Flood Risk
360 min Winter	48.801	0.261	0.0	2.2	Flood Risk
480 min Winter	48.811	0.271	0.0	2.3	Flood Risk
600 min Winter	48.816	0.276	0.0	2.4	Flood Risk
720 min Winter	48.819	0.279	0.0	2.4	Flood Risk
860 min Winter	48.820	0.280	0.0	2.4	Flood Risk
1440 min Winter	48.812	0.272	0.0	2.3	Flood Risk
2160 min Winter	48.795	0.255	0.0	2.2	Flood Risk
2880 min Winter	48.775	0.235	0.0	2.0	Flood Risk
4320 min Winter	48.732	0.192	0.0	1.6	O K
5760 min Winter	48.692	0.152	0.0	1.3	O K
7200 min Winter	48.657	0.117	0.0	1.0	O K
8640 min Winter	48.628	0.088	0.0	0.7	O K
10080 min Winter	48.605	0.065	0.0	0.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	84.215	0.0	33		
60 min Winter	54.368	0.0	62		
120 min Winter	33.870	0.0	122		
180 min Winter	25.280	0.0	180		
240 min Winter	20.382	0.0	238		
360 min Winter	15.043	0.0	356		
480 min Winter	12.112	0.0	470		
600 min Winter	10.228	0.0	584		
720 min Winter	8.904	0.0	696		
860 min Winter	7.147	0.0	814		
1440 min Winter	5.233	0.0	1166		
2160 min Winter	3.822	0.0	1620		
2880 min Winter	3.054	0.0	2072		
4320 min Winter	2.222	0.0	2936		
5760 min Winter	1.771	0.0	3696		
7200 min Winter	1.486	0.0	4464		
8640 min Winter	1.288	0.0	5104		
10080 min Winter	1.142	0.0	5656		
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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 SH																									
File SPR032 Proposed Permeab...	Checked by AWR																									
XP Solutions		Source Control 2018.1																								
<u>Model Details</u> Storage is Online Cover Level (m) 49.050 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00720</td> <td>Width (m)</td> <td>4.8</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>6.1</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>8.1</td> <td>Slope (1:X)</td> <td>500.0</td> </tr> <tr> <td>Safety Factor</td> <td>3.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>48.540</td> <td>Membrane Depth (m)</td> <td>0</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00720	Width (m)	4.8	Membrane Percolation (mm/hr)	1000	Length (m)	6.1	Max Percolation (l/s)	8.1	Slope (1:X)	500.0	Safety Factor	3.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	48.540	Membrane Depth (m)	0
Infiltration Coefficient Base (m/hr)	0.00720	Width (m)	4.8																							
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Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	48.540	Membrane Depth (m)	0																							
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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			Designed by SH																																																																																																																																																																				
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XP Solutions			Source Control 2018.1																																																																																																																																																																				
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 10 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max E Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>48.728</td><td>0.328</td><td>0.0</td><td>4.9</td><td>4.9</td><td>4.0</td><td>O K</td></tr><tr><td>30 min Summer</td><td>48.754</td><td>0.354</td><td>0.0</td><td>5.0</td><td>5.0</td><td>4.3</td><td>O K</td></tr><tr><td>60 min Summer</td><td>48.724</td><td>0.324</td><td>0.0</td><td>4.9</td><td>4.9</td><td>3.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>48.610</td><td>0.210</td><td>0.0</td><td>4.9</td><td>4.9</td><td>2.5</td><td>O K</td></tr><tr><td>180 min Summer</td><td>48.486</td><td>0.086</td><td>0.0</td><td>4.9</td><td>4.9</td><td>1.0</td><td>O K</td></tr><tr><td>240 min Summer</td><td>48.417</td><td>0.017</td><td>0.0</td><td>4.9</td><td>4.9</td><td>0.2</td><td>O K</td></tr><tr><td>360 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>4.1</td><td>4.1</td><td>0.0</td><td>O K</td></tr><tr><td>480 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>3.3</td><td>3.3</td><td>0.0</td><td>O K</td></tr><tr><td>600 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>2.8</td><td>2.8</td><td>0.0</td><td>O K</td></tr><tr><td>720 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>2.4</td><td>2.4</td><td>0.0</td><td>O K</td></tr><tr><td>960 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>1.9</td><td>1.9</td><td>0.0</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>1.4</td><td>1.4</td><td>0.0</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>1.0</td><td>1.0</td><td>0.0</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>0.8</td><td>0.8</td><td>0.0</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>0.6</td><td>0.6</td><td>0.0</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>0.5</td><td>0.5</td><td>0.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>0.4</td><td>0.4</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>0.4</td><td>0.4</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>48.400</td><td>0.000</td><td>0.0</td><td>0.3</td><td>0.3</td><td>0.0</td><td>O K</td></tr></table>								Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	48.728	0.328	0.0	4.9	4.9	4.0	O K	30 min Summer	48.754	0.354	0.0	5.0	5.0	4.3	O K	60 min Summer	48.724	0.324	0.0	4.9	4.9	3.9	O K	120 min Summer	48.610	0.210	0.0	4.9	4.9	2.5	O K	180 min Summer	48.486	0.086	0.0	4.9	4.9	1.0	O K	240 min Summer	48.417	0.017	0.0	4.9	4.9	0.2	O K	360 min Summer	48.400	0.000	0.0	4.1	4.1	0.0	O K	480 min Summer	48.400	0.000	0.0	3.3	3.3	0.0	O K	600 min Summer	48.400	0.000	0.0	2.8	2.8	0.0	O K	720 min Summer	48.400	0.000	0.0	2.4	2.4	0.0	O K	960 min Summer	48.400	0.000	0.0	1.9	1.9	0.0	O K	1440 min Summer	48.400	0.000	0.0	1.4	1.4	0.0	O K	2160 min Summer	48.400	0.000	0.0	1.0	1.0	0.0	O K	2880 min Summer	48.400	0.000	0.0	0.8	0.8	0.0	O K	4320 min Summer	48.400	0.000	0.0	0.6	0.6	0.0	O K	5760 min Summer	48.400	0.000	0.0	0.5	0.5	0.0	O K	7200 min Summer	48.400	0.000	0.0	0.4	0.4	0.0	O K	8640 min Summer	48.400	0.000	0.0	0.4	0.4	0.0	O K	10080 min Summer	48.400	0.000	0.0	0.3	0.3	0.0	O K
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																
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2880 min Summer	48.400	0.000	0.0	0.8	0.8	0.0	O K																																																																																																																																																																
4320 min Summer	48.400	0.000	0.0	0.6	0.6	0.0	O K																																																																																																																																																																
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8640 min Summer	48.400	0.000	0.0	0.4	0.4	0.0	O K																																																																																																																																																																
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<table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>124.544</td><td>0.0</td><td>7.8</td><td>14</td></tr><tr><td>30 min Summer</td><td>64.215</td><td>0.0</td><td>10.6</td><td>22</td></tr><tr><td>60 min Summer</td><td>54.368</td><td>0.0</td><td>13.5</td><td>40</td></tr><tr><td>120 min Summer</td><td>33.870</td><td>0.0</td><td>16.9</td><td>72</td></tr><tr><td>180 min Summer</td><td>25.280</td><td>0.0</td><td>18.9</td><td>100</td></tr><tr><td>240 min Summer</td><td>20.382</td><td>0.0</td><td>20.4</td><td>126</td></tr><tr><td>360 min Summer</td><td>15.043</td><td>0.0</td><td>22.6</td><td>0</td></tr><tr><td>480 min Summer</td><td>12.112</td><td>0.0</td><td>24.2</td><td>0</td></tr><tr><td>600 min Summer</td><td>10.228</td><td>0.0</td><td>25.6</td><td>0</td></tr><tr><td>720 min Summer</td><td>8.904</td><td>0.0</td><td>26.7</td><td>0</td></tr><tr><td>960 min Summer</td><td>7.147</td><td>0.0</td><td>28.6</td><td>0</td></tr><tr><td>1440 min Summer</td><td>5.233</td><td>0.0</td><td>31.4</td><td>0</td></tr><tr><td>2160 min Summer</td><td>3.822</td><td>0.0</td><td>34.4</td><td>0</td></tr><tr><td>2880 min Summer</td><td>3.054</td><td>0.0</td><td>36.7</td><td>0</td></tr><tr><td>4320 min Summer</td><td>2.222</td><td>0.0</td><td>40.0</td><td>0</td></tr><tr><td>5760 min Summer</td><td>1.771</td><td>0.0</td><td>42.5</td><td>0</td></tr><tr><td>7200 min Summer</td><td>1.486</td><td>0.0</td><td>44.6</td><td>0</td></tr><tr><td>8640 min Summer</td><td>1.288</td><td>0.0</td><td>46.4</td><td>0</td></tr><tr><td>10080 min Summer</td><td>1.142</td><td>0.0</td><td>48.0</td><td>0</td></tr></table>								Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	124.544	0.0	7.8	14	30 min Summer	64.215	0.0	10.6	22	60 min Summer	54.368	0.0	13.5	40	120 min Summer	33.870	0.0	16.9	72	180 min Summer	25.280	0.0	18.9	100	240 min Summer	20.382	0.0	20.4	126	360 min Summer	15.043	0.0	22.6	0	480 min Summer	12.112	0.0	24.2	0	600 min Summer	10.228	0.0	25.6	0	720 min Summer	8.904	0.0	26.7	0	960 min Summer	7.147	0.0	28.6	0	1440 min Summer	5.233	0.0	31.4	0	2160 min Summer	3.822	0.0	34.4	0	2880 min Summer	3.054	0.0	36.7	0	4320 min Summer	2.222	0.0	40.0	0	5760 min Summer	1.771	0.0	42.5	0	7200 min Summer	1.486	0.0	44.6	0	8640 min Summer	1.288	0.0	46.4	0	10080 min Summer	1.142	0.0	48.0	0																																																												
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Arch Associates Limited		Page 3
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 SH	
File SPR032 Proposed Cellula...	Checked by AWR	
XP Solutions		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 49.550

Cellular Storage Structure

Invert Level (m) 48.400 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	12.8	12.8	0.500	0.0	18.6
0.400	12.8	18.6			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0111-5000-0650-5000
Design Head (m) 0.650
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 111
Invert Level (m) 48.100
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.650	5.0
Flush-Flo™	0.204	5.0
Kick-Flo®	0.457	4.3
Mean Flow over Head Range	-	4.2

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	3.8	1.200	6.7	3.000	10.2	7.000	15.3
0.200	5.0	1.400	7.1	3.500	11.0	7.500	15.8
0.300	4.9	1.600	7.6	4.000	11.7	8.000	16.4
0.400	4.6	1.800	8.0	4.500	12.4	8.500	16.9
0.500	4.4	2.000	8.5	5.000	13.1	9.000	17.4
0.600	4.8	2.200	8.8	5.500	13.7	9.500	17.9
0.800	5.5	2.400	9.2	6.000	14.2		
1.000	6.1	2.600	9.6	6.500	14.8		

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