

Drainage Strategy

for

14 Fitzalan Road,
Arundel, West Sussex



ARCH ASSOCIATES
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

DRAINAGE STRATEGY

for

14 Fitzalan Road
Arundel
West Sussex

Client:

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

ISSUE		A	B
Issued By	C Hendry		
Date	July 2017		
Purpose	Planning		
Approved By	CH		

Project No. RRL025

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1.0 Introduction

It is proposed to redevelop the former Blastreat Limited site and erect a new block of retirement apartments. The development will front onto Fitzalan Road and vehicular access will be gained via the Northern boundary as per the current arrangement.

2.0 The Site

The site is located on the north-eastern edge of Fitzalan Road and is currently occupied by Blastreat Limited, an industrial and architectural blast cleaning and finishing company. The site also includes the neighbouring residence and garden to the West of the site. The site is generally flat at circa 2.6m AOD, is roughly rectangular in shape and measures approximately 0.37 hectares in size. The Blastreat element comprises multiple large warehouse structures housing several spray and heat treatment rooms on the west and east. An inverted, roughly L-shaped hard standing area runs in north-south direction across the site. Other features within the site include; an administrative office attached to the northern end of the large warehouse, an electricity substation on the northwest corner, a diesel tank with a 1m high bund wall on the northeast and drums of wastes, gas tanks and chemical storage near the southern boundary. Both untreated and finished metal products are noted on the surface of the hard standing which covers the entirety of the site, except for where there are buildings present. Access is via Fitzalan Road onto the hard standing area to the north and a smaller access off the eastern boundary onto Fitzalan Road to the east.

The total site area is 3660m² and it is generally either impermeable hardstanding or occupied building structures. The garden within the existing site is 1034m². Total existing impermeable is 2626m². Proposed impermeable areas will total 1615m².

Review of the Southern Water asset plans (Appendix 3) confirms that there is an existing 150mm diameter foul sewer running across the East of the site towards a pumping station across Fitzalan Road to the North of the site. From this pumping station the foul is pumped West via the pumping main in Fitzalan Road before out-falling adjacent the nearby allotment gardens.

There are no recoded surface water sewers in the nearby vicinity of the site.

A site investigation report has been carried out by REC Ltd. (Appendix 4), which shows the site to be underlain Made Ground over Alluvium, which was proven to circa 5m depth. The Alluvium is described as CLAY with some variable granular content.

Groundwater was not initially struck during the borehole investigations but further groundwater monitoring encountered groundwater at depths of 1.08m below ground level and 1.39m bgl, which reflects the tidal nature of the area.

Given the impermeable clay soils and high groundwater, traditional soakaways are not considered viable. However, some infiltration into the upper level soils has been proven at nearby developments utilising infiltration blankets set above the groundwater. Values of circa 1×10^{-6} m/s have been used to design these systems.

Existing Site Drainage

Refer to the topographical survey in Appendix 1.

No CCTV drainage survey has been conducted but it is assumed that the existing structures drain their foul water into the existing public foul sewer crossing the site. Manholes within the site in the anticipated vicinity of the sewer would support this assumption.

Surface water from large areas of hardstanding is drained via gullies, which either drain to soakaways or combine with the foul drainage.

3.0 Proposed Foul and Surface Water Drainage

3.1 Foul Water

It is proposed to discharge the foul drainage from the site into the existing 150mm public foul sewer in Fitzalan Road. The existing public foul sewer will need to be diverted around the site, subject to S185 agreement with Southern

Water, and the potential off-site foul lateral from the neighbouring Westbury Lodge will either need to be diverted or divested to form part of the proposed on-site private foul system.

All runs will be laid with a minimum fall of 1 in 80 and designed and detailed in accordance with Sewers for Adoption 7th Edition. Refer to the appended drainage strategy drawing for schematic routes of main runs.

3.2 Surface Water

Although soakage testing to BRE365 has not been undertaken, we estimate that the rate would be in the region of 1×10^{-6} m/s if soakage was achieved at all based on neighbouring infiltration tests and historic infiltration tests within the site itself (see previous planning application ref: AP/47/15/PL). It is therefore proposed to utilise a high-level infiltration blanket set above the groundwater table so that a permeable subbase may act as temporary storage while the design storm rainfalls infiltrate. The permeable subbase will also cater for the piped rainwater from roofs, which will be directed into the subbase using proprietary 'Charcon Permavoid' distribution tanks with preceding filter tanks to catch sediment.

The high proposed FFL of the building at 3.9m AOD allows the rainwater pipes to be run underneath the ground floor slab towards the back of the site, at which point it is still sufficiently shallow to enter the permeable subbase.

The infiltration blanket is designed to cater for the 1 in 100 year storm events plus an additional 40% allowance for climate change as per the current guidelines. Refer to Appendix 5 for calculations.

Area draining to Blanket	=	2981m ²
Area of blanket	=	900m ²

All surface water drainage runs generally will be designed and detailed in accordance with Sewers for Adoption 7th Edition

Exceedance Flows:

Overland/surface exceedance flows due to extreme events or blockage of drainage systems would naturally flow downhill towards the rear of the site.

The building would remain safe due to the FFL being set 1.3m above proposed external 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) outline the required maintenance of the attenuation tank.

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

Consideration has been given to offering the drainage on site for adoption but it is unlikely that Southern Water would want to adopt the drainage. However, the development proposed is a managed retirement complex and therefore there will be a management company required for the life of the

building, which reduces the risk of maintenance being abandoned in the future.

Temporary Drainage During Construction

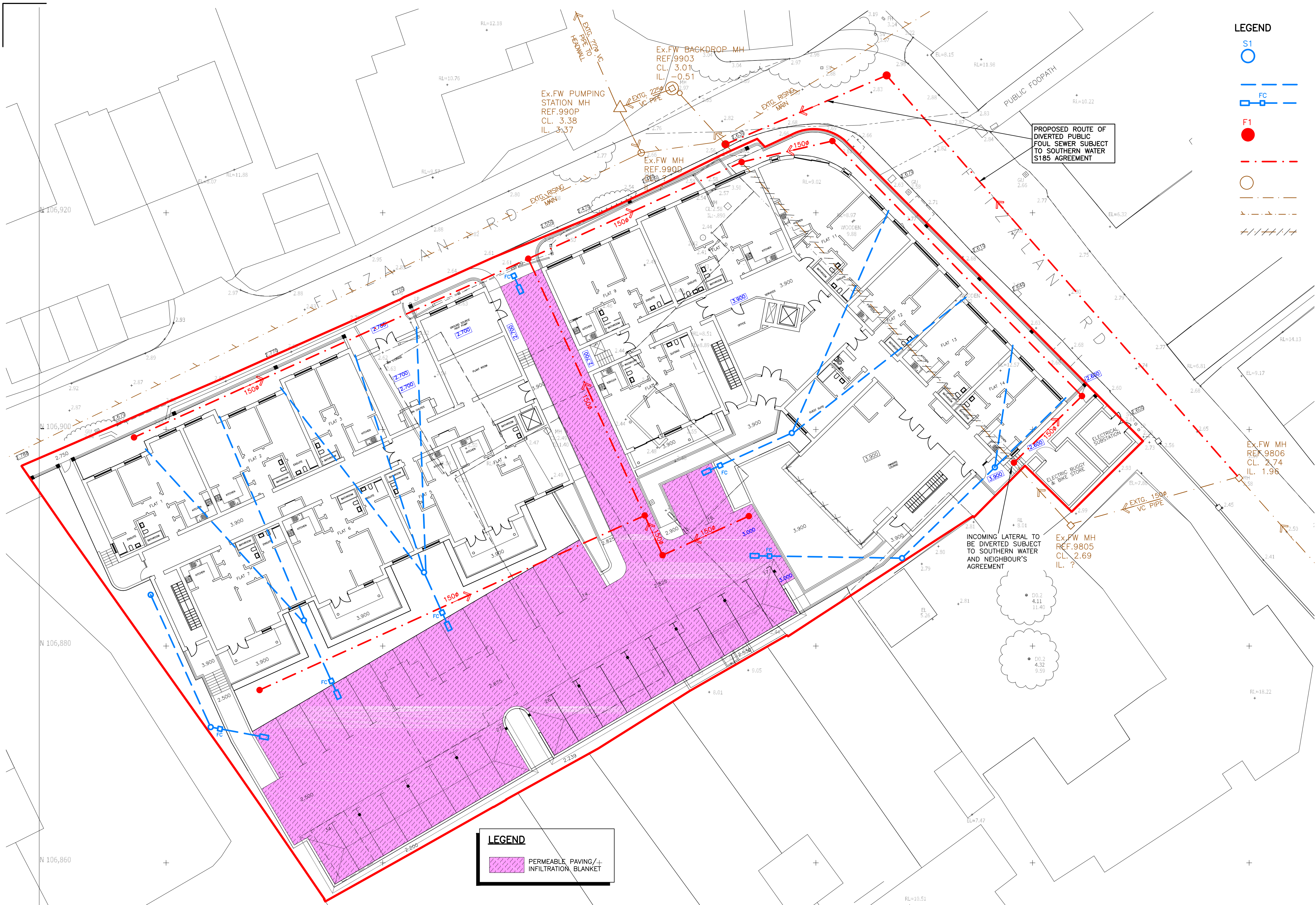
Drainage during construction for surface water falling on the site will generally be allowed to infiltrate into the more permeable top soils. Once the building construction is underway, water falling on the building will be allowed to run off onto earth surrounding the construction through which it will infiltrate. No surface water will be taken into the local foul or highway surface water networks.

APPENDIX 1

Topographical Survey

APPENDIX 2

Drainage Strategy Drawing



LEGEND

- S1 SURFACE WATER MANHOLE / INSPECTION CHAMBER / ACCESS CHAMBER (SEE SCHEDULE FOR DETAILS)
- 150mm Dia. PVCu. SN4 STORM WATER DRAIN (U.N.O.)
- FC FILTRATION CHAMBER
- F1 FOUL WATER MANHOLE / INSPECTION CHAMBER / ACCESS CHAMBER (SEE SCHEDULE FOR DETAILS)
- 150mm Dia. PVCu. SN4 FOUL WATER DRAIN (U.N.O.)
- EXISTING FOUL WATER MANHOLE
- EXISTING FOUL WATER DRAIN
- EXISTING RISING FOUL WATER DRAIN
- EXISTING FOUL WATER DRAIN TO BE ABANDONED

- NOTES
- © This drawing is the copyright of ARCH Associates Limited. It may not be copied, altered or reproduced without their written authority. This drawing must not be scaled. IF IN DOUBT ASK.
- 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 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 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.

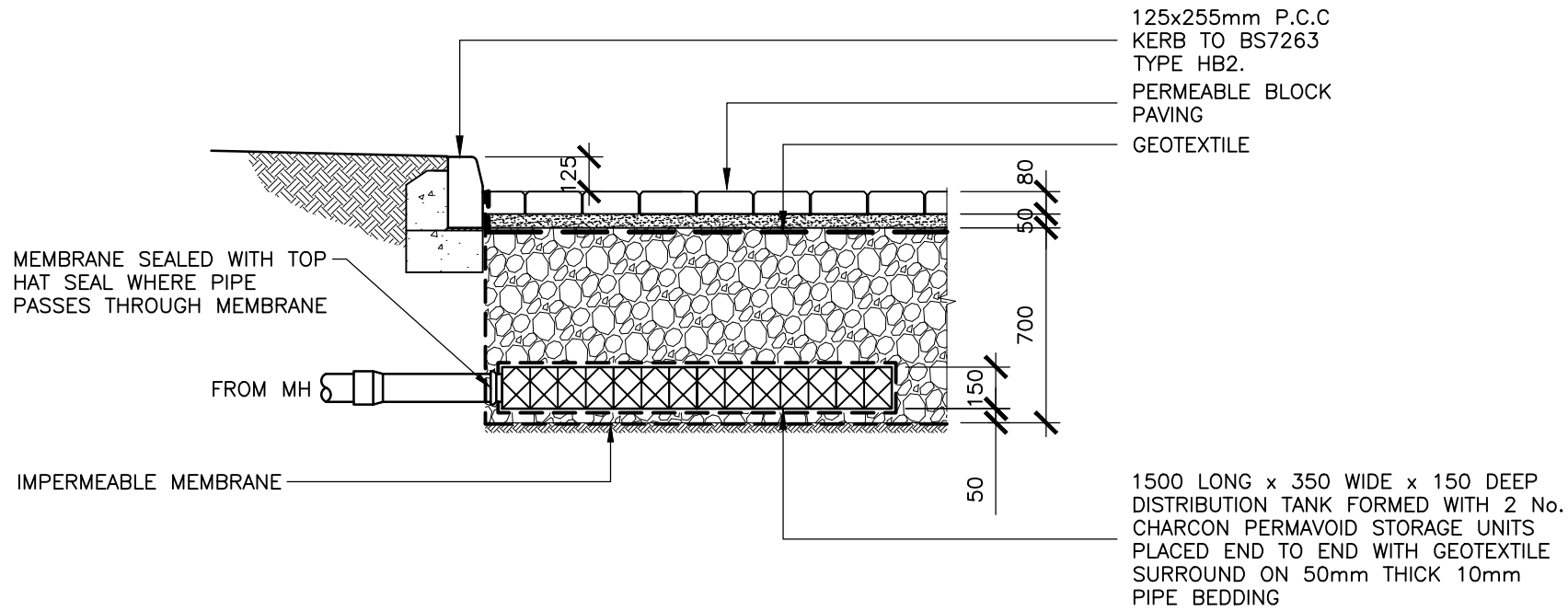
ACTIVITY	HAZARD	CONTROL

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

OPERATION AND MAINTENANCE REQUIREMENTS FOR PERMEABLE PAVING			SUDS OPERATION & MAINTENANCE		
MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY	GENERAL		
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 PREVIOUS SURFACE FROM ADJACENT IMPERMEABLE AREAS AS THIS AREA IS MOST LIKELY TO COLLECT THE MOST SEDIMENT	MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
OCCASIONAL MAINTENANCE	STABILISE AND MOW CONTRIBUTING AND ADJACENT AREAS	AS REQUIRED	REGULAR MAINTENANCE	REMOVE SEDIMENT & DEBRIS FROM PRE-TREATMENT DEVICES & FLOOR OF INSPECTION TUBE OR CHAMBER	ANNUALLY
	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		CLEANING OF ANY GUTTERS & ANY FILTERS ON DOWNPIPES	ANNUALLY
	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		TRIMMING ANY ROOTS THAT MAY BE CAUSING BLOCKAGES	ANNUALLY (OR 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	INSPECT SILT TRAPS AND NOTE RATE OF SEDIMENT ACCUMULATION	MONTHLY IN THE FIRST YEAR & THEN ANNUALLY
	INITIAL INSPECTION	MONTHLY FOR THREE MONTHS AFTER INSTALLATION		CHECK ATTENUATION TANK TO ENSURE EMPTYING IS OCCURRING	ANNUALLY
	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			



CHARCON PERMAVOID DISTRIBUTION TANK(PDT)
(SCALE 1:25@A1)

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Client: RENAISSANCE RETIREMENT
Architect: ASPIRE ARCHITECTS LLP
Project Title: PROPOSED DEVELOPMENT FITZALAN ROAD, ARUNDEL, WEST SUSSEX
Drawing Title: DRAINAGE STRATEGY

Scale: 1:200 Paper Size: A1 Date: JULY 2017 Drawn By: JH Checked By: CH
Project No: RRL025 Drawing No: 500 Revision: P1

APPENDIX 3

Southern Water Sewer Plan



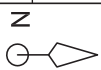
Drawn by: mondaln

Scale: 1:1250

Date: 12/04/2016

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: BAC pipes are constructed of Bonded Asbestos Cement
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

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Southern
Water

SEWER RECORDS PAGE 2 OF 2

[illegible][illegible]

APPENDIX 4

Site Investigation Extract



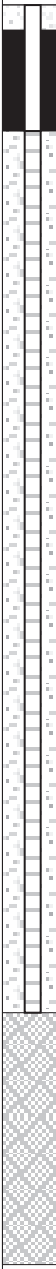
Phase I & II Geo-Environmental Assessment
14 Fitzalan Road
Arundel
October 2016
1CO102284P2R0

APPENDIX IV EXPLORATORY HOLE LOGS

APPENDIX IV EXPLORATORY HOLE LOGS

A CONCEPT LIFE SCIENCES COMPANY



   		Borehole Log			Borehole No. WS101 Sheet 1 of 1				
Project Name: Arundel		Proj. ID: 1CO102284		Easting: Northing:		Hole Type WS			
Location: 14 Fitzalan Road, Arundel, West Sussex, BN18 9JS		Plant: Dando Terrier		Level (m AOD): Final Depth (m): 5.00		Scale: 1:30			
Client: Renaissance Group of Companies		Crew: Borehole Solutions Ltd		Start Date: 29/09/2016 End Date: 29/09/2016		REC Engineer: MN			
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10		Concrete with metal reinforcement [MADE GROUND]		
		0.30 - 0.40	ES		0.40		Brown sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse flint. Cobbles are subrounded flint. [MADE GROUND]		
		0.50 - 0.60	ES		0.90		Firm dark grey yellowish brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint, brick, chalk, ash and ceramics. Cobbles are subangular flint and brick. [MADE GROUND]	1	
		1.00 1.00 - 1.10	SPT ES	N=0 (0,0/0,0,0,0)			Soft orange brown mottled silty slightly gravelly CLAY with low cobble content. Gravel is angular to subrounded fine to medium flint. Cobbles are subrounded flints. [ALLUVIUM]		
		1.90 - 2.00 2.00 2.00	D SPT	HVP=36 N=0 (0,0/0,0,0,0)	1.70		Very soft dark greyish brown slightly silty organic CLAY. Amorphous organic material. Organic smell throughout. [ALLUVIUM]	2	
		2.90 - 3.00 3.00 3.00	D SPT	HVP=15 N=0 (0,0/0,0,0,0)				3	
		3.90 - 4.00 4.00 4.00	D SPT	HVP=5 N=0 (0,0/0,0,0,0)				4	
		4.90 - 5.00 5.00	D SPT	N=0 (0,0/0,0,0,0)	5.00			5	
							End of Borehole at 5.00m		
								6	
Remarks: GPR EM survey undertaken to clear location of services. Inspection pit hand excavated to 1.20mbgl. No groundwater encountered. Hole advanced to 5.00m bgl. 50mm internal diameter monitoring standpipe installed to 4.50m bgl and finished with a flush fitting cover.									

APPENDIX 5

Surface Water Calculations

Arch Associates Limited					Page 1																																																																																																																																																																																																																			
Town House St Geroge's Square Bishops Waltham Southampton SO32 1AF																																																																																																																																																																																																																								
Date 04/07/2017 19:47 File Blank.srcx		Designed by chris.hendry Checked by																																																																																																																																																																																																																						
XP Solutions			Source Control 2016.1																																																																																																																																																																																																																					
Summary of Results for 100 year Return Period (+40%) Half Drain Time : 5447 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 Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>1.911</td><td>0.111</td><td>0.5</td><td>70.0</td><td>0 K</td></tr><tr><td>30 min Summer</td><td>1.949</td><td>0.149</td><td>0.5</td><td>93.9</td><td>0 K</td></tr><tr><td>60 min Summer</td><td>1.991</td><td>0.191</td><td>0.5</td><td>120.1</td><td>0 K</td></tr><tr><td>120 min Summer</td><td>2.035</td><td>0.235</td><td>0.5</td><td>147.9</td><td>0 K</td></tr><tr><td>180 min Summer</td><td>2.061</td><td>0.261</td><td>0.5</td><td>164.1</td><td>0 K</td></tr><tr><td>240 min Summer</td><td>2.078</td><td>0.278</td><td>0.5</td><td>175.2</td><td>0 K</td></tr><tr><td>360 min Summer</td><td>2.103</td><td>0.303</td><td>0.5</td><td>191.1</td><td>0 K</td></tr><tr><td>480 min Summer</td><td>2.122</td><td>0.322</td><td>0.5</td><td>202.6</td><td>0 K</td></tr><tr><td>600 min Summer</td><td>2.136</td><td>0.336</td><td>0.5</td><td>211.4</td><td>0 K</td></tr><tr><td>720 min Summer</td><td>2.147</td><td>0.347</td><td>0.5</td><td>218.4</td><td>0 K</td></tr><tr><td>960 min Summer</td><td>2.163</td><td>0.363</td><td>0.5</td><td>228.9</td><td>0 K</td></tr><tr><td>1440 min Summer</td><td>2.184</td><td>0.384</td><td>0.5</td><td>241.8</td><td>0 K</td></tr><tr><td>2160 min Summer</td><td>2.198</td><td>0.398</td><td>0.5</td><td>250.9</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>2.203</td><td>0.403</td><td>0.5</td><td>253.7</td><td>0 K</td></tr><tr><td>4320 min Summer</td><td>2.197</td><td>0.397</td><td>0.5</td><td>249.9</td><td>0 K</td></tr><tr><td>5760 min Summer</td><td>2.186</td><td>0.386</td><td>0.5</td><td>243.1</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>2.175</td><td>0.375</td><td>0.5</td><td>236.1</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>2.165</td><td>0.365</td><td>0.5</td><td>229.7</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>2.155</td><td>0.355</td><td>0.5</td><td>223.4</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>1.924</td><td>0.124</td><td>0.5</td><td>78.4</td><td>0 K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>126.074</td><td>0.0</td><td>27</td></tr><tr><td>30 min Summer</td><td>84.745</td><td>0.0</td><td>42</td></tr><tr><td>60 min Summer</td><td>54.368</td><td>0.0</td><td>72</td></tr><tr><td>120 min Summer</td><td>33.674</td><td>0.0</td><td>132</td></tr><tr><td>180 min Summer</td><td>25.065</td><td>0.0</td><td>190</td></tr><tr><td>240 min Summer</td><td>20.180</td><td>0.0</td><td>250</td></tr><tr><td>360 min Summer</td><td>14.839</td><td>0.0</td><td>370</td></tr><tr><td>480 min Summer</td><td>11.923</td><td>0.0</td><td>490</td></tr><tr><td>600 min Summer</td><td>10.054</td><td>0.0</td><td>610</td></tr><tr><td>720 min Summer</td><td>8.741</td><td>0.0</td><td>728</td></tr><tr><td>960 min Summer</td><td>7.003</td><td>0.0</td><td>968</td></tr><tr><td>1440 min Summer</td><td>5.114</td><td>0.0</td><td>1446</td></tr><tr><td>2160 min Summer</td><td>3.727</td><td>0.0</td><td>2164</td></tr><tr><td>2880 min Summer</td><td>2.973</td><td>0.0</td><td>2884</td></tr><tr><td>4320 min Summer</td><td>2.159</td><td>0.0</td><td>4196</td></tr><tr><td>5760 min Summer</td><td>1.718</td><td>0.0</td><td>4792</td></tr><tr><td>7200 min Summer</td><td>1.438</td><td>0.0</td><td>5544</td></tr><tr><td>8640 min Summer</td><td>1.245</td><td>0.0</td><td>6240</td></tr><tr><td>10080 min Summer</td><td>1.102</td><td>0.0</td><td>7064</td></tr><tr><td>15 min Winter</td><td>126.074</td><td>0.0</td><td>27</td></tr></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	1.911	0.111	0.5	70.0	0 K	30 min Summer	1.949	0.149	0.5	93.9	0 K	60 min Summer	1.991	0.191	0.5	120.1	0 K	120 min Summer	2.035	0.235	0.5	147.9	0 K	180 min Summer	2.061	0.261	0.5	164.1	0 K	240 min Summer	2.078	0.278	0.5	175.2	0 K	360 min Summer	2.103	0.303	0.5	191.1	0 K	480 min Summer	2.122	0.322	0.5	202.6	0 K	600 min Summer	2.136	0.336	0.5	211.4	0 K	720 min Summer	2.147	0.347	0.5	218.4	0 K	960 min Summer	2.163	0.363	0.5	228.9	0 K	1440 min Summer	2.184	0.384	0.5	241.8	0 K	2160 min Summer	2.198	0.398	0.5	250.9	0 K	2880 min Summer	2.203	0.403	0.5	253.7	0 K	4320 min Summer	2.197	0.397	0.5	249.9	0 K	5760 min Summer	2.186	0.386	0.5	243.1	0 K	7200 min Summer	2.175	0.375	0.5	236.1	0 K	8640 min Summer	2.165	0.365	0.5	229.7	0 K	10080 min Summer	2.155	0.355	0.5	223.4	0 K	15 min Winter	1.924	0.124	0.5	78.4	0 K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	126.074	0.0	27	30 min Summer	84.745	0.0	42	60 min Summer	54.368	0.0	72	120 min Summer	33.674	0.0	132	180 min Summer	25.065	0.0	190	240 min Summer	20.180	0.0	250	360 min Summer	14.839	0.0	370	480 min Summer	11.923	0.0	490	600 min Summer	10.054	0.0	610	720 min Summer	8.741	0.0	728	960 min Summer	7.003	0.0	968	1440 min Summer	5.114	0.0	1446	2160 min Summer	3.727	0.0	2164	2880 min Summer	2.973	0.0	2884	4320 min Summer	2.159	0.0	4196	5760 min Summer	1.718	0.0	4792	7200 min Summer	1.438	0.0	5544	8640 min Summer	1.245	0.0	6240	10080 min Summer	1.102	0.0	7064	15 min Winter	126.074	0.0	27
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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	1.967	0.167	0.5	105.3	0 K
60 min Winter	2.014	0.214	0.5	134.7	0 K
120 min Winter	2.063	0.263	0.5	165.9	0 K
180 min Winter	2.092	0.292	0.5	184.2	0 K
240 min Winter	2.112	0.312	0.5	196.8	0 K
360 min Winter	2.141	0.341	0.5	214.9	0 K
480 min Winter	2.162	0.362	0.5	228.1	0 K
600 min Winter	2.178	0.378	0.5	238.3	0 K
720 min Winter	2.191	0.391	0.5	246.5	0 K
960 min Winter	2.211	0.411	0.5	258.9	0 K
1440 min Winter	2.236	0.436	0.5	274.7	0 K
2160 min Winter	2.255	0.455	0.5	286.9	0 K
2880 min Winter	2.264	0.464	0.5	292.0	0 K
4320 min Winter	2.263	0.463	0.5	291.9	0 K
5760 min Winter	2.252	0.452	0.5	284.7	0 K
7200 min Winter	2.236	0.436	0.5	274.6	0 K
8640 min Winter	2.223	0.423	0.5	266.5	0 K
10080 min Winter	2.209	0.409	0.5	257.9	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	84.745	0.0	41		
60 min Winter	54.368	0.0	70		
120 min Winter	33.674	0.0	130		
180 min Winter	25.065	0.0	188		
240 min Winter	20.180	0.0	248		
360 min Winter	14.839	0.0	366		
480 min Winter	11.923	0.0	484		
600 min Winter	10.054	0.0	602		
720 min Winter	8.741	0.0	720		
960 min Winter	7.003	0.0	954		
1440 min Winter	5.114	0.0	1426		
2160 min Winter	3.727	0.0	2120		
2880 min Winter	2.973	0.0	2804		
4320 min Winter	2.159	0.0	4152		
5760 min Winter	1.718	0.0	5424		
7200 min Winter	1.438	0.0	5984		
8640 min Winter	1.245	0.0	6744		
10080 min Winter	1.102	0.0	7664		
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.298

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.099	4 8	0.099	8 12	0.099

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Model Details

Storage is Online Cover Level (m) 2.600

Infiltration Blanket Structure

Infiltration Coefficient Base (m/hr)	0.00360	Diameter/Width (m)	45.0
Safety Factor	2.0	Length (m)	20.0
Porosity	0.70	Cap Volume Depth (m)	0.000
Invert Level (m)	1.800		

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